Spring 2024

Compost Toilet As A Radical Act Of Care? A Gentle Invitation to Deal With Our Shit

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Compost Toilet As A Radical Act Of Care?

A gentle invitation to deal with our shit.

Senior Project Submitted to

The Division of Social Studies

of Bard College

by

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Annandale-on-Hudson, New York

May 2024

to those who protect water and tend soils

Thank you to my family, Dad, Mom, Lisa, Thomas, Charlie and Penny, for supporting me endlessly. Thank you Rob, Tracy, Laurie, Zac, Tycho, and Kipper, for many yummy dinners and for the home away from home. I love you all.

Thank you Elias Dueker for your encouragement and guidance, every semester and during this process. Thank you Stephanie Lee, Margaux Kristjansson, Patricia Kaishan, Beate Leipert, Jordan Ayala, Tatjana Myoko von Prittwitz und Gaffron, Beka Goedde, and Vivien Sansour.

A big thank you to Thena Tak, for your sustained and careful attention and wisdom. And another big thank you to Michael Cohen, for your openness and kindness, awesome reading suggestions, and for always being enthusiastic about toilets. It has been a true pleasure to be advised by you both.

Thank you Samuel Rose, for your mentorship, support, and carrots. Thank you for feeding the community. Thank you Sam Leipert for your joy and vision, and for teaching me how to use the Riso and do many tiny things. Krista Speroni, thank you for our garden days, hugelkultur beds, and shared harvests. Rebecca Yoshino, thank you from the bottom of my heart, for teaching me how to grow food and flowers with spirit. And for letting me learn from a bounty of mistakes.

Thank you Cotton, Flax, Pokeberry, Black Walnut, Marigold, Indigo, and Hopi Red Dye Amaranth.

Thank you to all the people and volunteers who orchestrated the 2023 New Moon Mycology Summit. Thank you Alyssa and Molly for your unmatched poop-composting efforts.

Thank you to my family and dear friends at Pickle House: Peri, Leila, Shan, and Sam. I love eating breakfast with you guys. Thank you to the light-filled people and old trees I became friends with in Bhutan, all those who survived the double-dragon. Thank you Jacinta “life-solutionator” Creel, for the help and the giggles. Thank you Havvah, for everything. Thank you Lilly Montana, it has been the most scrumptious of treats to learn with you these past few years. And thank you Grace, for getting me out to the dirt convention. On bikes no less. Bug kisses to you all.

“Staying with the trouble requires making oddkin. That is, we require each other in unexpected collaborations and combinations, in hot compost piles. We become with each other or not at all.”

– Donna Haraway, in *Staying With The Trouble*

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Land acknowledgement

(by the way, this is not enough)

I have been writing this paper while living with the unceded, stolen, and ancestral homelands of the Munsee and Muhheaconneok peoples,[1] among maples and eels. I have been residing with this land, studying at an educational institution, communing with forests and helping grow food in soil, these past four years. I have also done some of this writing and thinking in the unceded, stolen, and ancestral homelands of the Coast Miwok, the land which raised the sapling of myself, among redwoods and ocean. I have also been involved in this project in the unceded, stolen, and ancestral homelands of the Abenaki and Wabenaki peoples, among loons and fungi.

[1] The Munsee and Muhheaconneok peoples are also known as the Stockbridge Munsee Community, and many now reside in what is known as Wisconsin. Their people experience(d) multiple forced removals from this land and also land in what is known as Massachusetts.

Who is the intended audience of this paper?

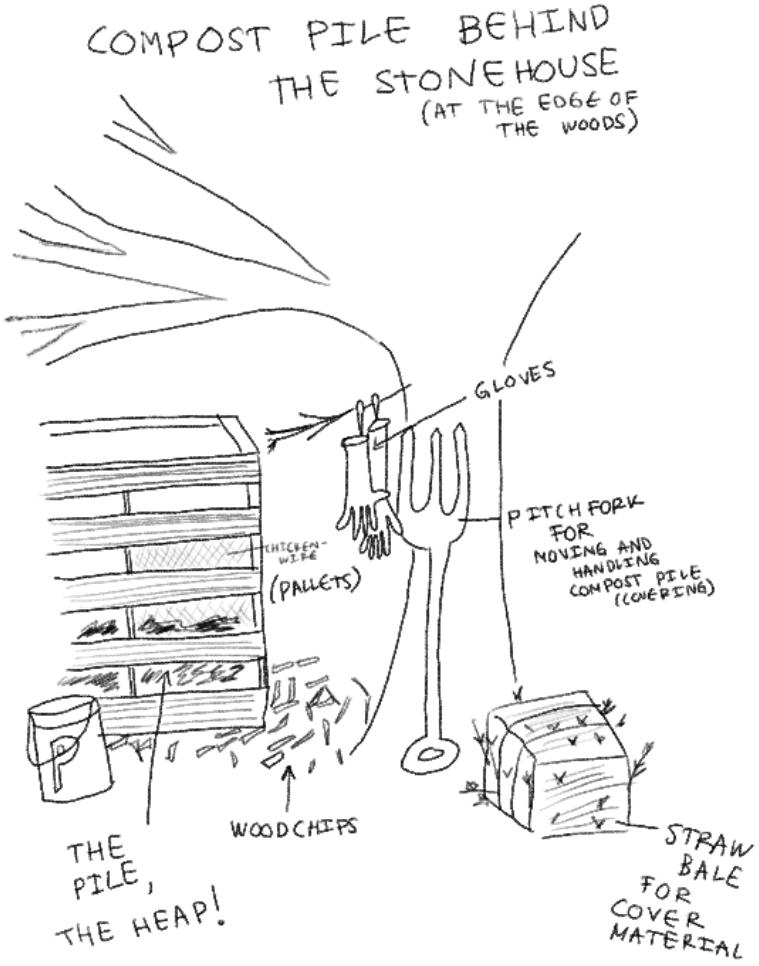
The intended audience is someone who encounters it or any of its parts, in any past or future forms. The audience is a big heaping hot compost pile of other ideas who might encounter these ideas and become together. The audience is 'people like me.' It's for my friends. And for people who tend. It's for someone who poops. Someone who has a belly. It's for someone with hunger. It's for someone who's curious about what composting is and how to do it. It's for someone who experiences frustration with where and how science falls short, but who is wildly curious. It's for someone madly confused with who and what they are and how to live and belong with an aching planet. It's for someone who came from water. It's for someone who loves the smell of soil, or someone who has not had the chance to smell rich soil. The audience is the microorganisms in my body and your body—and I am patiently listening for their responses—because they are also writing this story. Without them, there is no audience.

Prologue

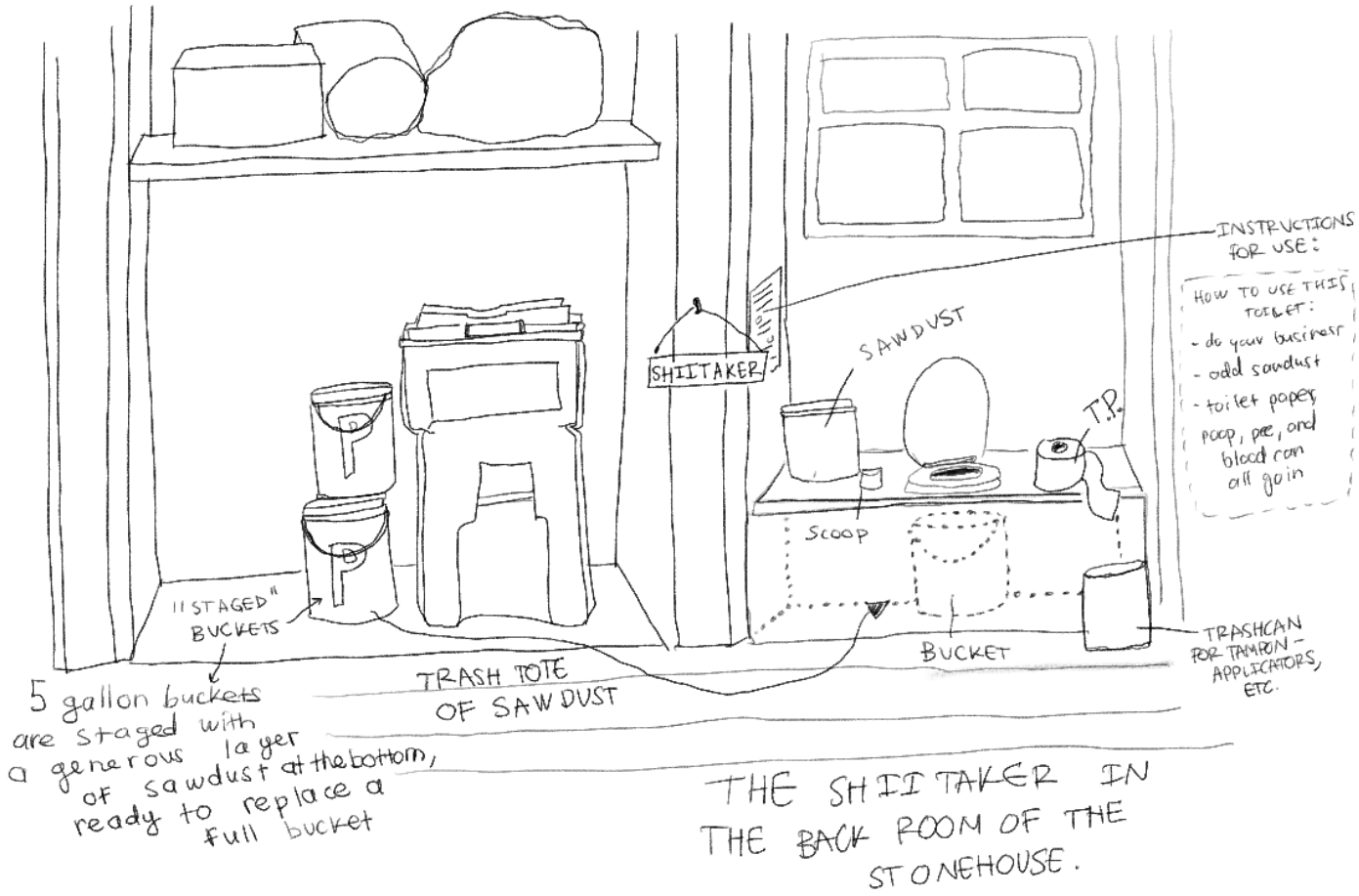
I unzip the tent door and slip on my boots, checking for opportunistic slugs. It's early and last night's rain lingers in the air, on the side of our shelter, on the grass. I have missed waking up outside, smelling the earth like this. I imagine all the mushrooms which emerged last night in the moisture—Puhpowee—"the force which causes mushrooms to push up from the earth overnight. A word for rising, for emergence."[2] *I sleepily trudge along toward the stonehouse, maneuvering around mud puddles, trying to stay quiet as I pass other tents. Opening the door of the stonehouse, the earthy smell of sawdust greets me. I step in, latch the door behind me, and lift the wooden lid of the Shiitaker. My body does what it does. After using some toilet paper, I add two generous scoops of sawdust into the bucket, close the lid, and wash my hands at the hand-made, quickly assembled pump sink. On my way out, I notice someone has switched out a full bucket and left it right outside the door—-ready for a compost fairy to bring it to the active compost pile at the forest's edge. "We are destined to be tree food."*[3] *I carry the five-gallon bucket, which is labeled with a big purple "P" for poop, about a minute's walk to the pile. The compost pile is built out of four wooden pallets, and lined with chicken wire to keep out critters. On the forest floor is a thick layer of wood chips which act as a biofilter. It is one of two compost piles, serving seven compost toilets, and about five-hundred bellies/bodies/poopers this week. I put on the rubber gloves hanging from a tree branch and use the rake to move away the straw*

[2] Kimmerer, *Braiding Sweetgrass*, 49.
[3] Ostendorf-Rodríguez, *Let's Become Fungal!*, 34. "TEACHING FOUR: How to Re-think Decay and Decomposition"

cover material. I add the organic material from the bucket to the active center of the pile, where food scraps, poop, and plant material are being turned into compost by an infinity of tiny beings—bacteria, fungi, protozoa, insects, worms. Using the rake once again, I move the straw to cover the compost pile. I rinse and scrub the bucket thoroughly with a small amount of water and biodegradable soap. I return the empty bucket to the stonehouse, stage it with a thick layer of sawdust, and once again wash my hands with soap at the pump sink—first with the gloves on, and then my bare hands. I recently heard someone use the term "last responders"[4] to describe the folks who do the essential work of dealing with and processing waste. I am thankful for this invisible work, done at all hours, by people and by organisms we cannot see.



[4] ZuLoo, "Point of Shift CEO Kelsey McWilliams."



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This project began with the lingering, imperfect half-question: "*compost toilet as a radical act of care?"* In August 2023, during a summer of too much rain, smoke, and heat, I spent my week-long vacation from the much-beloved Bard Farm attending the New Moon Mycology Summit, in Wheelock, Vermont. I volunteered as a Compost Fairy—an affectionate title for the ten or so of us responsible for tending to the summit's compost toilet system. New Moon is a gathering for communal learning in and around

environmental and social justice, through the lens of fungi[5]—held this time in occupied Abenaki and Wabenaki territory.

As the summit began, the land became adorned with volunteers' and attendees' tents. My days were spent encountering fungi in the woods on mycelial forays, and attending workshops, panels, and lectures by various artists, scientists, mycologists, knowledge bearers, and activists. The temporary spaces where communal learning occurred, whether in an event tent or on a rug in the woods, were transformed with each gathering. In a large tent, known as *Hyphae Commons*, set up cozily with rugs, chairs, and a projector, I learned about soil remediation and ecological reconciliation done with the application of mycorrhizal fungi in a degraded riparian buffer.[6] Another afternoon, in the same tent, I attended a workshop called *Towards a Fungal Ontology: Facilitating Mycological Art Practices and Cultures* by artist and mycologist Kaitlin Bryson, whose work focuses on community-based artworks that center mycoremediation and storytelling in polluted and damaged soils.

And under the same tent, with about forty other humans, I tasted, for the first time, the fungal partner and symbiont of maíz, *huitlacoche*[7], in the workshop *Decolonizing Huitlacoche* led by Mario Ceballos[8] and Doğa Tekin.[9] Before I met

[5] "The Mycelium Underground."
[6] Rubin and Görres, "The Effects of Mycorrhizae on Phosphorus Mitigation and Pollinator Habitat Restoration within Riparian Buffers on Unceded Land"; "Carol Billings McGranaghan - Vermont Abenaki Artists Association."
[7] *Huitlacoche* is known by monocrop-method agriculture as "corn-smut", considered to be caused by pathogenic fungi. In the United States, Huitlacoche has been subject to control and eradication in industrial corn production. *Huitlacoche* and *maíz* have evolved together.
[8] Mario Ceballos is of the Yaqui band of Southern California and is the co-founder of the POC Fungi Community (POCFC), which facilitates fungal education centered on edible and medicinal mushroom which works on facilitating programming, events, and education centered on culturally-relevant edible and medicinal mushrooms and re-connection to traditional foods.
[9] Doga Tekin's work focuses on multispecies ethnography, semiotics, and embodiment. She is currently working on her PhD in linguistic anthropology at UCLA, where she focuses on interspecies meaning-making and the circulation and reinforcement of colonial ideologies about land and nature relations; "Doğa Tekin."

huitlacoche by taste, I met them by smell, sound, and sight. While Mario cooked *huitlacoche*, which was brought all the way from Oaxaca, Mexico, in hot oil, onions, and garlic, sizzle and aroma filled the space. As they cooked, he shared stories of the fungal being. We all passed around paper plates of hot *huitlacoche*, each eating one little bite—a few dark, almost purple, kernels pinched between our fingers and placed on our tongues.

It tastes like earth.

I was learning, eating, and camping with people I had not known before arriving (a few who I have since crossed paths with—something they say will happen once you myceliate into the New Moon network). People journeyed from all over for the summit, and here we all were, teachers and students, seeking answers to questions that fungi might help us answer about how to be in the world. I had never been in class with mamas nursing babies, or among such an abundance of wise elders and emerging leaders. In between these classes, I also made acquaintance with the full buckets of the "Shitaakers" (the compost toilets), hauling and offering their organic material contents to designated compost piles built in the forest. Each morning, the poop team met at the top of the hill next to *Hyphae Commons*. I usually brought my breakfast, which had been prepared by volunteers early in the morning, up the hill and ate at these meetings. Alyssa and Molly went over everyone's shifts for the day ahead and mentioned any toilets that needed extra attention. We each tended to the toilets nearest our campsites in the mornings and evenings. We were scheduled throughout the day to steward specific toilets (bring full buckets to the pile, re-stage buckets, restock toilet paper, sawdust, and soap) and tend to anything else that might need care: refilling the pump

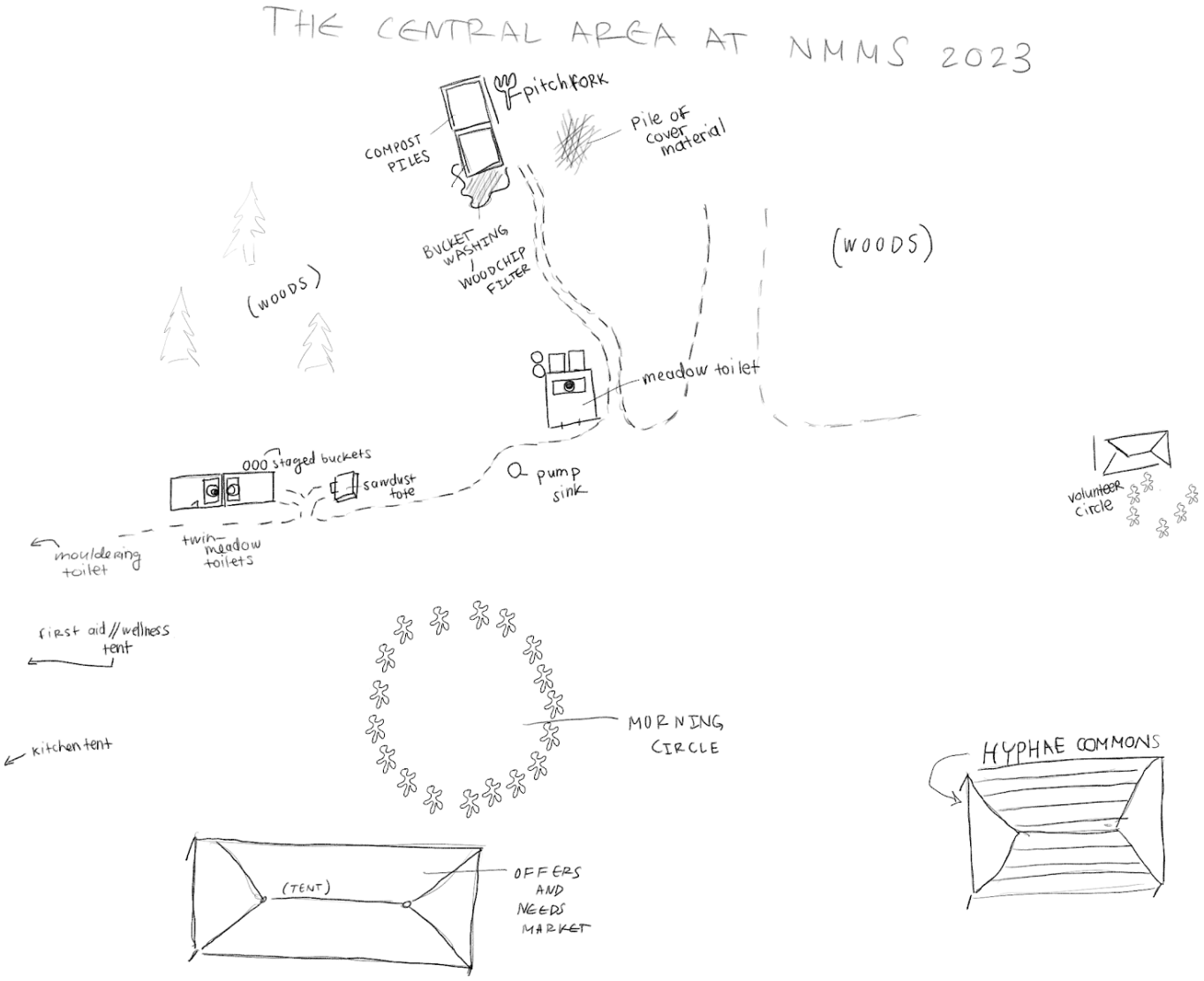
sinks, hauling cover material to the compost sites, bringing wheelbarrows of food waste from the dish tent to the compost piles, or piling wood chips for greywater filtering.

From our small volunteer circle, we walked down the hill to join the summit morning circle, on the slanted hillside next to the kitchen tent, the offers and needs market, the medical tent, and the meadow toilets. All attendees joined the morning circle, and organizers went over the events for the day, spoke intentions and guidelines for communal gathering, and also went over event logistics: like, where and how to poop. There is something quite endearing about hundreds of adult humans learning how to use a compost toilet together, and realizing there are folks among them who are going to deliver buckets of their poop to a compost pile. One of the most enjoyable aspects of the compost-fairy role was the sincere spoken appreciation from fellow attendees for the people managing their "waste", conversations which often turned into shared giggles. It was significant that we were all in such close proximity to our poop, that these overlapping dynamics were part of the ephemeral emergent ecosystem at the summit.

The meadow toilets were the most used, as they were central and closest to campsites. They included four toilets: one moldering, the twins, and the lone meadow. The moldering toilet was one of three toilets that existed on site at the farm prior to the summit. The moldering toilet differed from the bucket-system toilets that operate by collecting smaller batches of organic material and moving them to a designated compost pile with frequency. In a moldering toilet, more material builds up into a pile, slowly composting with sawdust. Typically, moldering toilets work for less-frequently used bathrooms off the beaten path. Because processes of hot composting are not necessarily ensured with moldering toilets, an eventual transfer of their material to an active

compost pile is important. The twins and the lone meadow operated on a bucket system. They were built specifically for the summit, and their components consisted of the same elements and materials as the Stonehouse toilet I described earlier. Each had a pump sink: two five-gallon buckets stacked one on top of the other. The bottom bucket was filled with water, and contained a hose that linked to a rubber pump to step on. The opening of the hose dangled over the top bucket to receive the graywater. Tending to these toilets became especially important around peak biological times. This time coincided with morning circle, just after breakfast…eleven full buckets during the 9:00am volunteer shift…oh, the power of grits and coffee![10]

[10] While surprisingly gratifying, a lot of this work was not particularly easy. It required heavy lifting, lots of movement, and the occasional stink caused only by lack of sawdust.



What was necessary for all this pooping and composting, was the collective act of eating and nourishing. We had arrived early, our bike-packing trip cut short by torrential rain, and found refuge in the warm Coral Kitchen. The old, well-loved kitchen felt like the homey insides of a large wooden ship. It was adorned with art and prints telling the stories of past gatherings and movements nourished. And also wet socks hanging on makeshift lines, drying by the woodfire stove. The kitchen was lively, a

handful of volunteer cooks coordinating a bountiful vegetarian dinner with donated food for the pre-summit volunteers. We filled our bellies together at a long table and washed many dishes that night. When the summit officially began, these meals moved outside, shared among hundreds on the summer grass—sheltered, one night, in a big, lively tent while it poured rain. Reflecting on these enactments of communal eating, I am reminded of a Palestinian phrase (translated into English), which I learned from artist and founder of the Palestine Heirloom Seed Library, and also my teacher here at Bard, Vivian Sansour:

To eat alone is to die alone.

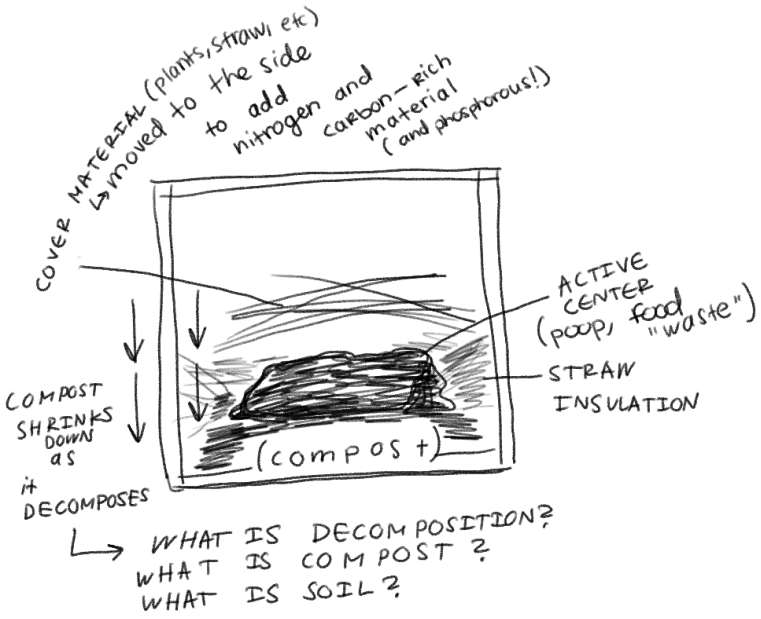
During the Summit, I was moved by the invitation to consider poop and what comes out of our bodies as an *offering* to the Land we may reside with or be guests of, through the right steps, the dedication of compost fairies, and the patience of slow decomposition time.

I offer you the story of what we ate here, together.

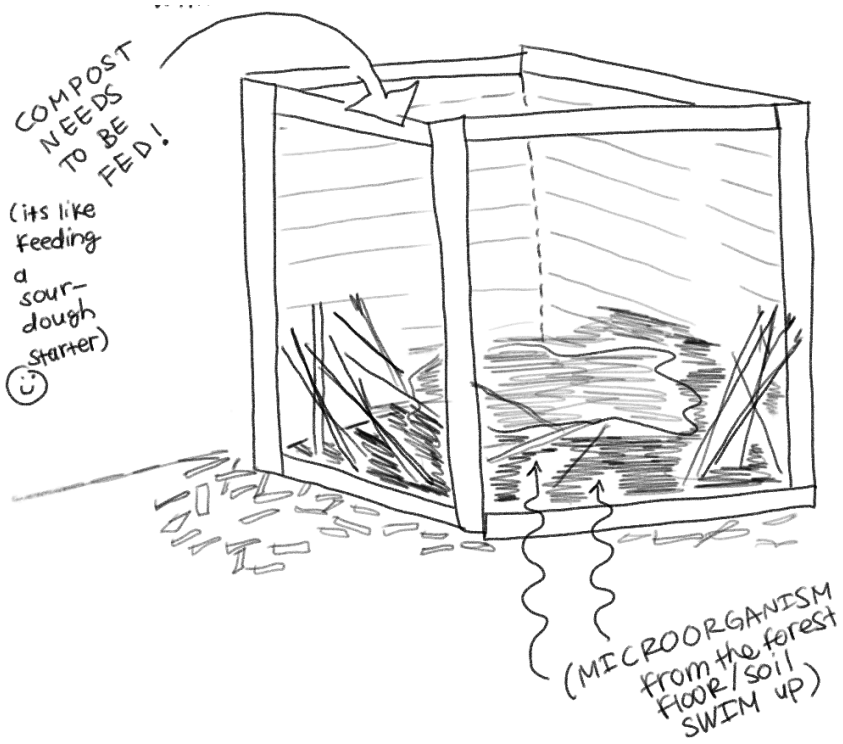
The day before the summit, during our orientation to the compost toilet system, Alyssa was explaining what the active compost pile would soon be up to once all the poop arrived. I remember her, pitchfork in hand, saying, *"there's no reason we should be pooping in clean drinking water."*

The compost pile would soon become really microbially active with the large supply of nitrogen-rich material (poop and food waste) and carbon rich material

(plants). The pile would get really hot and the organic material would decompose quickly, turning to rich compost. During this initial peak in temperature, nearly all, if not all, potential pathogens present in the poop would die off. The temperature was to be monitored with a compost thermometer



throughout these processes. The pile would continue to cure for a year after the summit, to ensure full decomposition and pathogen die-off. It would shrink down over time, move closer in toward the forest floor, becoming rich with the scent of humus. And maybe, get inoculated by a mycologist with Lion's mane, which would have bloomed this past Spring.



In orienting us to the composting system, Alyssa framed poop as a gift to the land. With the help of microorganisms and slow time, it could eventually nourish the soil and the land which gave us both home and classroom for a short while. Poop as offering was something unfamiliar to me in practice, but compelled me toward feelings and questions of reciprocity. In *Braiding Sweetgrass*, Potawatomi botanist Robin Wall Kimmerer recalls, from childhood, her family's practice of offering the first cup of coffee to the earth when they went camping:

> …every morning I watched the coffee disappear into the crumbly brown humus, as if returning to itself. In the same way that the flow of coffee down the rock has opened the leaves of the moss, ceremony brought the quiescent back to life, opened my mind and heart to what I knew, but had forgotten. The words and the coffee called us to remember that these woods and lakes were a gift…The visible became the invisible, merging with the soil.[11]

As if returning to itself

> …we said *"here we are,"* and I imagined the land heard us—murmured to itself, "Ohh, here are the ones who know how to say thank you."[12]

How are acts of offering and gifting a part of the multi-way conversation we are involved in with Land? How does gratitude shape these acts and graciously touch the invisible?

How can it be expressed that this is not a one-directional act, but a co-becoming?

[11] Kimmerer, *Braiding Sweetgrass*, 34.
[12] Kimmerer, *Braiding Sweetgrass*, 34.

Kimmerer then asks:

> What else can you offer the earth, which has everything? What else can you give but something of yourself?[13]

These ideas of offering and gifting, especially as an enactment of ceremony, and the awe that compost invokes in its ability to transform "waste" into material rich with the potential for life, all seeded the question: *compost toilet as a radical act of care?* While this question and its particular vocabulary warrant their own breaking down, it was the first inquiry, weighty and a bit messy, that I offered to this project. Writing this paper, which is essentially a literature review, felt like constructing a big heaping compost pile of ideas, texts, voices, and stories, and then trying to make some sense out of the sound they all make together. *A hungry and curious worm wriggling through the pile, munching as it goes on, tasting the apple cores, the abundance of grits, the rotting onion.* While I am beholden to compost as a physical process in forests, farming, gardening and living that transforms "waste" into crumbly soil-like nourishment through the very art of decay, I also embed my mind within this rich darkness in a practice of thinking through, with, and out of dangerous, polluting structures which shape a world also in great need of decay and vital transformation (always and already underway).

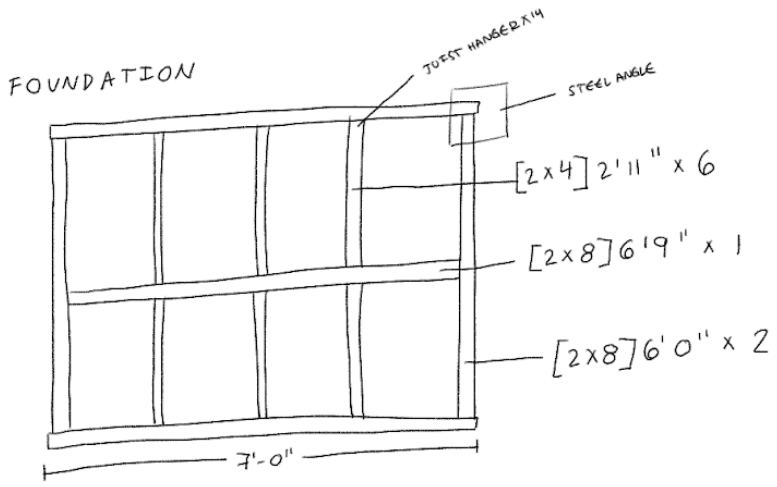
As in any endeavor, this project has had many of its own decompositions. I began with the intention and plans to build a compost toilet system with Four Corners Community Farm in Red Hook, just a few minutes from Bard. Four Corners focuses on providing knowledge, tools, resources, and land to Red Hook community members to

[13]Kimmerer, *Braiding Sweetgrass*, 38.

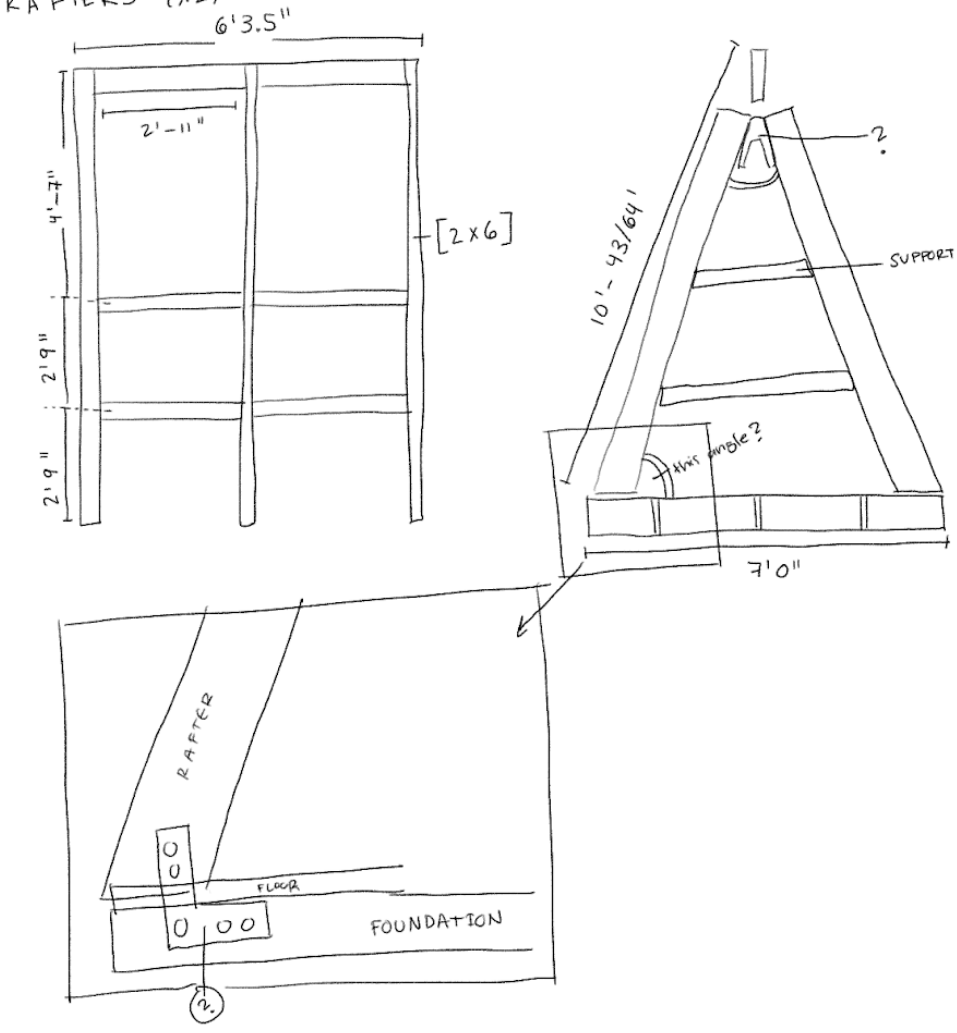
grow their own food. The farm shares produce with food distribution programs in the area at little to no cost, and also supplies to local school cafeterias.

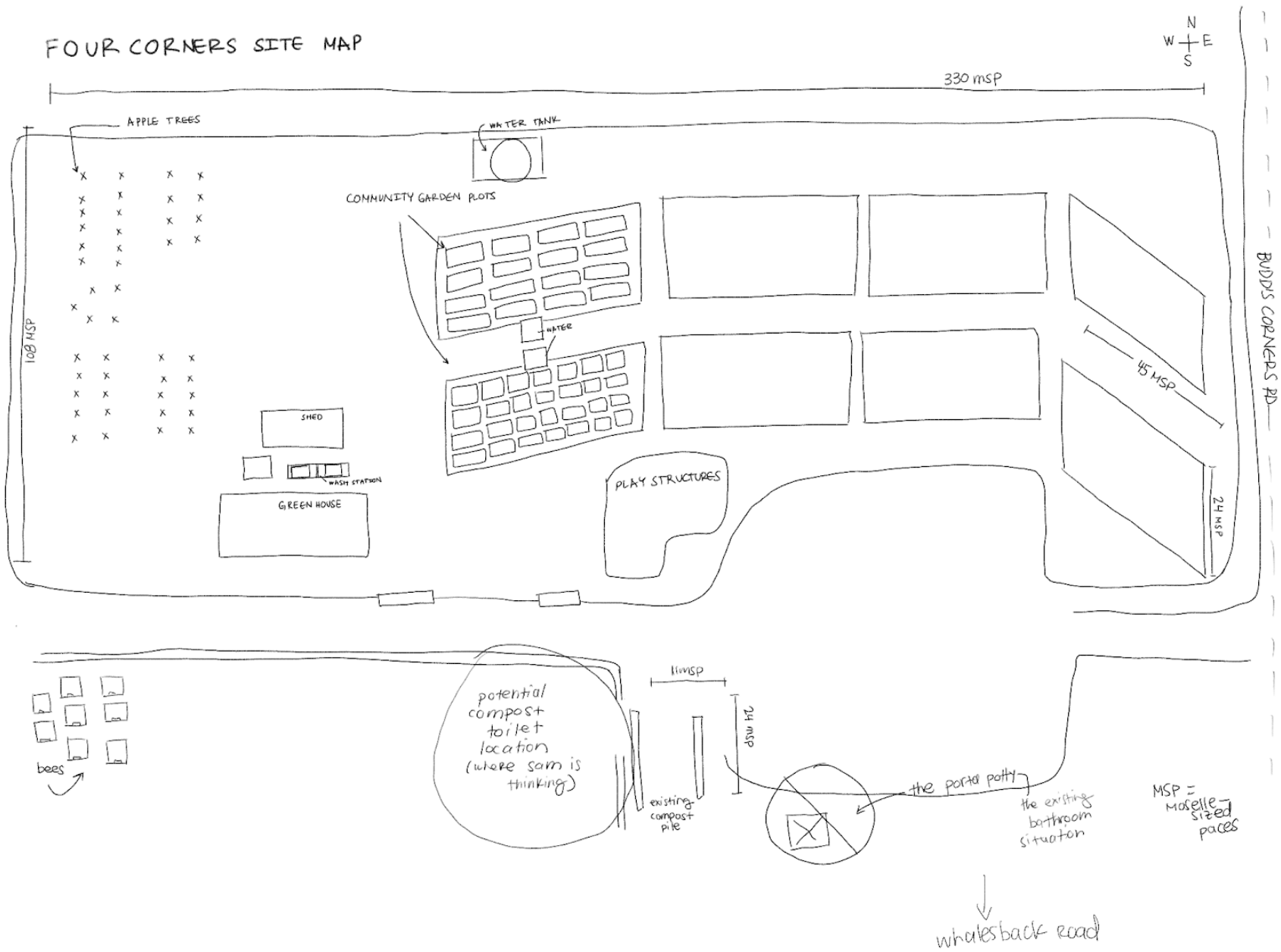
It's sunny, but chilly. The season is beginning its close, leaves turning orange and beds finally being put to sleep for the winter ahead. It's been a long summer, and Sam, the lead farmer at Four Corners, and I are harvesting carrots. We trade off using the hoe to dig them out of the soil. Some are tiny. Some are really big. We are talking about carrots. We are also talking about compost toilets. I share with Sam that I am starting my senior project and have this compost toilet question lingering in my mind. He tells me he's been thinking about a Four Corners compost toilet. We talk bucket or barrel? Urine diversion? Land application? Sawdust?

FOUR CORNERS BUILD



RAFTERS (X2)




FOUR CORNERS SITE MAP
N
W
E
S
330 msp
APPLE TREES
WATER TANK
COMMUNITY GARDEN PLOTS
WATER
108 MSP
SHED
WASH STATION
GREEN HOUSE
PLAY STRUCTURES
45 MSP
24 MSP
BUDDS CORNERS RD
bees
potential compost toilet location (where sam is thinking)
11mSP
24 msp
existing compost pile
the porta potty
the existing bathroom situation
MSP = Moselle sized paces
whalesback road

"Point of shift"!
thank you

COMPOST TOILET AS A RADICAL ACT OF CARE?

MATERIALS BUDGET

TOTAL COST OF COMPOST BINS AND TOILET BUILD: $987

This budget is based off of buying all materials new. However, ideally many of these materials will be sourced used/salvaged.

COMPOST BIN

Item	Quantity	Estimated Cost ($)	LINK TO PRICE REFERENCE
LUMBER			
4x4x8'	4	48	4x4x8
2x4x12'	2	18	2x4x12
2x4x8'	5	22	2x4x8
1x6x12'	5	42	1x6x12
HARDWARE			
16x8' CORRUGATED METAL	1	20	CORRUGATED METAL
1/2" x 3' HARDWARE CLOTH	50'	86	HARDWARE CLOTH
2 1/2" HINGE	6	10	HINGES
SUPPLIES			
2 1/2" SCREWS	10	4	2 1/2 SCREWS
3 1/2" SCREWS	60		3 1/2 SCREWS
3/4"-1" CROWN STAPLES		9	STAPLES
	TOTAL COST	259	

TOILET AND STRUCTURE

Item	Quantity	Estimated Cost ($)	LINK TO PRICE REFERENCE
LUMBER			
2x6x12	7	84	2x6x12
2x6x8	2	13	2x6x8
2x4x12	6	55	2x4x12
19/32" 4x8 PLYWOOD	2	76	19/32" PLYWOOD
3/8" 4x8 PLYWOOD	7	180	3/8" 4x8 PLYWOOD
HARDWARE			
JOIST HANGERS	8	16	JOIST HANGERS
3 1/2" SCREWS		30	3 1/2" SCREWS
PLASTIC PANEL OR SALVAGE WINDOWS	4	60	
A-FRAME ROOF CAP	1	32	ROOF CAP
DOOR HINGES	5	20	HINGES
DOOR LATCH (HOOK AND EYE)	2	8	DOOR LATCH
OTHER			
URINE DIVERTER	1	63	DIVERTER
URINE RECEPTACLE	1	13	JUG
PIPE FOR URINE DIVERSION	1	10	PIPE
5 GALLON BUCKETS	6	48	BUCKETS
DOOR (SALVAGE)	1	20	
TOILET SEAT			
	TOTAL COST	728	

Over the next few months, I had the pleasure of getting to know Sam Rose and Four Corners more deeply. We spent one rainy afternoon in the cooler which had been converted into a honey-spinning operation, scraping the waxy film off combs of warm, melty honey. That Fall, I busied myself planning, budgeting, and applying for grants. These grant applications were approved and I appreciated the support folks were willing to offer for a collaboration like this one. Early this past Spring, an opportunity for Four Corners arose and Sam was able to move his operation to another location in Red Hook and begin a partnership with Hearty Roots, a change that will have wonderful positive impacts on the Red Hook community, food accessibility, and engagement. This move, along with concerns regarding strict composting regulations in New York State, slowed our role, and we decided this was not the right time for the build at Four Corners. Nonetheless, I am so grateful for Sam's enthusiasm, mentorship, and his work with food and community.

While the change surprised me for a moment, I felt sure that it would have worked out if it were meant to, and I gently resettled my ambitions. I entertained the idea of building a temporary installation of a compost toilet at Bard with the designs we would have used for Four Corners and partnering with another community farm that already processes humanure to compost the organic material, but I ended up fracturing my ankle in early March. I decided to honor that healing process and not take on such a physical endeavor. I chose to focus more on writing as a way of digesting the texts I had been eating over the past few months, and the following is a reflection of that practice.

Part One, *The Heap*, moves through various cycles of nutrients and poop on biospheric scales. It spends a generous portion of its early pages conversing with the text *Eat, Poop, Die* by Joe Roman to understand how nutrients move through ecosystems

and bodies (specifically Seabirds, Salmon, Bears, Spruce, and Bison, which are all present in Roman's writing). It invites the concept of string-figures, from Donna Haraway's *Staying With The Trouble*, to thicken the tensions of ecological storytelling. This chapter exemplifies the frictions of communicating and knowing through scientific and ecological language. Its hearty middle considers bison as "eco-engineers" and terraformers in the storying of the prairie grasslands through grazing and pooping, and the interspecies relations which formed those soils, nearly all of which are now exploited for industrial-scale agricultural production. The storying of prairies, woven into which are legacies and presences of genocide and colonization, are exemplary of how the Plantationocene operates through radical simplification and breaking of ties to place.[14] The discussion moves next into a rumination on the notion of the Anthropocene and the ways in which this term falls short. It considers the Capitalocene to patch some of the holes in the Anthropocene story, and specifically, focuses on the trans-ocean trade of sea-bird guano as an act of poop-colonization that shaped and influenced persisting fertilizer/weapons/nutrient/agriculture/city/pollution/sanitation dynamics. It moves through ties between the development of the Haber-Bosch method of fertilizer production and its effects on the Green Revolution in agriculture, and the development of "modern sanitation" and relations of waste and wasting in growing cities. It concludes with defining pollution in conversation with Max Liboiron's *Pollution is Colonialism,* figuring out how pollution comes to make sense through infrastructure as an enactment of the colonial possession of l/Land.

Part Two, *Feeding Soil,* works to decompose the question, "compost toilet as a radical act of care?" Picking up with Liborion's definitions of l/Land, it continues to

[14] Haraway, *Staying with the Trouble*; Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."

unpack pollution through discussing relations with water, as a living and distributed being, and soils, as alive and dying multi-species communities. Understanding care as an "affective relation whose leading ethic is to create attachments, or obligations, within infrastructures of inequity,"[15] it questions which obligations are embedded in wastewater systems and how care networks form. Engaging with Michelle Murphy's proposition of *afterlife* in understanding chemical entanglements, this chapter looks at how wastewater treatment infrastructure entangles industrial waste and toilet material, and accepts Alexis' Shotwell's invitation to be against notions of purity. It unpacks the meaning of critical infrastructures in the reproduction of settler-colonial futures, and tells a story of one of the largest emergency community-managed toilet systems, at the Oceti Sakowin prayer camp during the Standing Rock demonstrations of 2017—an example of what kinds of soil-relations emerge in timelines of resistance and suspension. It also explains what goes on in a compost pile, who is busy breaking down organic material, and how composting poop can happen on a community scale. It considers composting both as a response to failure and an alternative reproductive practice through Silvia Federici's concept of re-enchantment, and honors it as an age-old practice of being at home in the world.

The project concludes with the compost toilet manifesto, a decomposed version of this project created through a practice of lingering and re-composing. It is embroidered into a hand-dyed patchwork, through collaboration with the Black Walnuts who keep me company in the backyard, who I converse with through the window each morning; and also Indigo, Marigold and Hopi Red Dye Amaranth grown at the Bard

[15] Emily Simmonds in Liboiron, *Pollution Is Colonialism*, 115.

Farm, Coffee, and Pokeberry foraged and frozen last Fall. It has been documented and printed into a zine, at Eureka! Press in Kingston, NY.

This writing is propelled by an emerging curiosity of how to build and maintain communal infrastructures that feed soils. By attempting to move and see through a variation of interacting scales, this writing is intended to be an invitation to consider different ways of being in embodied relationship with l/Land, through solidarity[16] with decomposers, that center accountability and complicity.[17] My hope is that after reading this, it comes to mind again the next time you poop. My hope is that it might help you imagine a reality where your poop nourishes decomposers and microbes that nourish soil that nourishes those you love (perhaps a tree, for example).

[16] Morton, *Humankind*, 2.
[17] Shotwell, *Against Purity*, 5.

The Heap

It's Fall, maybe late October, and my friend Rae and I are sitting outside on their small deck among the trees. It's chilly, but not cold yet. They treat me to coffee and bagels, one half is topped with smoked trout and the other half has an egg with a bright yellow-orange, broken-open yolk. I tell them about my idea for this poop project. "That is the most emotional thing ever. Poop, I mean," they say to me. Our bellies hold so much for us, ancestrally and in the present. They digest the world. They tell me they could cry every time they poop in a flush toilet—all those nutrients, your own body, the story of what you ate, the stories your body is digesting—because you are digesting the world—just going away, into 'clean' water. Flushed.

…

When we eat, we ask our bodies to digest the story of the land.[18] We are constantly digesting and then, we poop it out. Processes of eating and pooping are deeply connected to collective stories of land and place, to the aching belly of the planet, and to changing climates. We enact and take part in specific relations with land through these acts and the way we carry them out. If one is interested in working their way out from under settler-colonial[19] and capitalist architectures in regards to poop and sewage treatment, it requires telling stories about eating, and about water, soil, and land. This chapter tries to think through a language of ecology and science to understand how poop

[18] Throughout this first part, The Heap, the word "land" is malleable and imperfect. In the second part of this paper, I engage with Max Liboiron's definitions of *land* and *Land*, which move a step deeper into understanding relational networks. For now, I invite you to read the word "land" with skepticism and curiosity. This word is alive.

[19] Because "colonial" implies varied and unique relations, the practicality of the term and the ways it plays out in reality are also varied. Basically, there is no "stable and sorted definition of colonialism that works across all places." (Covil-Manset, *"Q&A with Max Liboiron, Author of Pollution Is Colonialism.*")

and pee and bodies are involved in land-storying and ecosystem creating, as well as why and how nutrient-pollution comes to make sense through the settler-colonial exploitation of soil and water.

Endeavoring to understand and appreciate the ecological roles that poop and pee[20] play has unfolded in an unveiling of numerous environmental, societal, cultural, and historical interconnections and complications. What follows is a sequence of land-stories that draw from existing literature in ecological, theoretical, scientific, historical, feminist, and queer thinking that have helped add depth and contradiction to how I understand poop and poop infrastructure. The main texts in this chapter, which you will see cited in abundance, are *Eat, Poop, Die* by Joe Roman, *Staying With The Trouble* by Donna Haraway, and *Pollution is Colonialism*, by Max Liboiron. If this were a compost pile, the modes of thinking and understanding these particular texts invite make up the framework—the wooden pallets, the forest floor, the first layer of cover material—that more stories and ideas are then added to, decomposed and fused together, digested—a big heaping, heating up compost pile. In *Eat, Poop, Die*,[21] Joe Roman examines how different animals are responsible for designing the biosphere by transferring nutrients through their acts of eating, pooping, and dying. In the book, Roman focuses mostly on the transfer of nitrogen and phosphorus within living

[20] You might notice that this paper rarely employs words like "excrement" or "feces" in discussing human and non-human poop (by the way, most of your poop is "more-than-human"). I find that these words, along with "waste", tend to limit the emotional, spiritual, and intimately mundane normalness of poop when considering living in a body in this biosphere. "Poop" is the thing that I endearingly obsessed over as a little one, which somehow acted in testament to my young aliveness and my hungry belly. Words like "excrement" and "feces" sound gross—they invoke a weird distance characterized by disgust, rather than curiosity.

[21] In a serendipitous bookstore encounter, I came across *Eat, Poop, Die* at the start of winter break. About the first third of this section builds directly off Roman's work. His writing helped me return to the language of science in a way that both deepened my appreciation and excitement for those ways of storytelling, while also pulling at some of the tensions between the potentially harmful use of scientific practice, and different ways of knowing. It takes work to avoid simplification and not settle into binaries between one thing and the "other" —holding contradiction in between my fingers is an ongoing practice.

ecosystems, and effectively outlines why and how the cycles of these nutrients are broken on a planetary scale. He begins with the volcanic island of Surtsey off the coast of Iceland, which formed in 1963 from an eruption of ash and lava from the seafloor.

As Roman writes, ecologists were thrilled to observe the emergence of Surtsey, as it would be an opportunity to see an island ecology form, essentially, from scratch. Surtsey was barren, but its volcanic rock surface was abundant in phosphorus. However, any seeds that showed up on the island, which were brought floating on the ocean or from bird droppings, were faced with a shortage of usable nitrogen.[22] Nitrogen is the most abundant molecule in this planet's atmosphere, but its presence as inorganic ammonia within soil is essential for plant growth. It is critical to primary production. Primary production is the process through which inorganic substances are transformed into organic compounds, forming living carbon-based beings.

The first guests of Surtsey, other than those arriving seeds, were seabirds and gulls. And the gift they left the young island: poop! Their guano is rich in phosphorus, nitrogen, and potassium. By the time the island was ten years old, it had become home to scurvy and meadow grasses, which were growing in young, nitrogen-rich soil. According to chemical signatures in the soil and plants, ninety percent of the nitrogen on the island came from birds (through guano and carcasses), and the other ten percent from the atmosphere. The ten percent that came from the atmosphere into the soil was absorbed and metabolized directly by microorganisms.

Without the abundance of bird poop, the islands of Surtsey would not be able to support the life of plants. Roman writes that if plants are the Earth's lungs, then animals are its beating heart, pumping nitrogen and phosphorus from "deep sea gorges up to

[22] Roman, *Eat, Poop, Die*, 7.

mountain peaks and across hemispheres," through their bodies.[23] Animals move nitrogen around the planet, making ecosystem boundaries porous, and microorganisms transform it through the process of ammonification, moving nutrients into the soil in a form that plants can use. *Are the plants really using the NH4+? What does "use" even mean to them? They are planting. The soil is soiling. And the microbes are microbing. All relying on each other.*

In the world of Surtsey, seabirds can be considered as ecosystem engineers. Ecologists use the term "ecosystem engineers" to describe species that "modify their environment in a significant manner, creating new habitats or modifying existing ones to suit their needs."[24] The seabirds were designing the emergent ecosystem through nutrient cycling, originally bringing nutrients from what they had eaten elsewhere and then delivering it to the island through their guano.

Ecologies and ecosystems are like nets, a weaving of overlapping interactions and movements—new knots being tied, old ones falling apart. In *Staying With The Trouble,* Donna Haraway uses the idea and historic practice of string-figures as metaphor for practices of storytelling, a cat's cradle of choreographed connections. As theoretical tools, "they propose and enact patterns for participants to inhabit, somehow, on a vulnerable and wounded earth."[25] They are among humanity's oldest games, emerging from cultures all over the world, moving string on and around one's or with another's fingers, mouth, wrist, feet. String-figures have to do with the way collective stories are told and worlds are built.

[23] Roman, *Eat, Poop, Die*, 10.
[24] Roman, *Eat, Poop, Die,* 53.
[25] Haraway, *Staying with the Trouble*, 10.

"It matters what matters matter…

It matters what thoughts think thoughts.

It matters what relations relate relations."[26]

It is not that everything is directly connected to everything else: "nothing is connected to everything. Everything is connected to something."[27] It's through the web, the reaching and often tangled up net or string figure, that connections exist. I think string-figures can be extended to understand the web of relationships that make up living and dying ecosystems. And also, how we might then tell or tune into listening to those ecological stories.

Haraway writes, "companion species play string figure games where who is/are to be in/of the world is constituted in intra-and inter-action. The partners do not precede the knotting."[28] *The partners do not precede the knotting*. Instead, partners are embedded into the ecosystem through their companionships and multi-relations. They do not become in isolation. Companion species are "those who meet and break bread together, but not without some indigestion."[29] Haraway describes the weaving of worlds between companion species on planet Earth, which comes usually with a little bit of indigestion, as terraforming.

We can understand ecologies through the language of science. Seabirds as ecosystem engineers, for example. Science is an access mode[30] to storytelling. But it is also just one way of string-figuring. (And then, within the leaky bowl of science, there

[26] Haraway, *Staying with the Trouble,* 12.
[27] Haraway, *Staying with the Trouble,* 12.
[28] Haraway, *Staying with the Trouble*, 13.
[29] Haraway, *When Species Meet*.
[30] Morton, *Humankind*.

are plenty of variations of string-figuring). If we are to string-figure amongst companion species, then inheriting colonized and imperial histories requires learning how to practice making sense of partial connections.[31] It requires an openness to getting comfortable holding contradiction and not settling within universals, with the fraying string tangled between your fingers or claws. It's risky.[32]

In the forests of the Pacific Northwest and Alaska, salmon, bears, microorganisms, and trees are companion species—all involved in worlding. They are and have been story-ing a string-figure ecology through nutrient transfer, from deep ocean to tree ring. The flow of nutrients downhill and downstream in ecosystems is well understood. Put very simply, nutrients flow down rivers and out to sea. But the flow of nutrients the other way, how the living and dying of the ocean supports the living and dying of the forest, is less understood (by science as an institutional practice).

But there is someone who moves in, against the flow of the water, swimming upstream. Spawning salmon bring a pulse of nutrients to inland streams in the late Fall.[33] Chinook, Chum, Coho, Pink, and Sockeye return from the ocean to their natal streams to spawn and lay their eggs. After hatching, young salmon spend the first two years of their lives in the stream. Then, they follow the river out to its merging with the ocean and enter the tidal world. Salmon become almost all of their salmony selves (ninety-five percent of their body weight) at sea, where they feed on shrimp, krill, anchovies, herring, and capelin.[34]

Bears and eagles rely on the return of salmon for nourishment—bears needing a full belly of salmon before their long winter slumber. As Roman writes, ecologists were

[31] Haraway, *Staying with the Trouble*, 13.
[32] Haraway, *Staying with the Trouble,* 13.
[33] Roman, *Eat, Poop, Die*, 74.
[34] Roman, *Eat, Poop, Die*, 74.

curious if this arrival of nutrients could be playing a role in forest dynamics beyond just feeding bears and eagles—both of whom were then distributing salmon-based nutrients into forest soils . (*Were there more knots being tied? Connections being woven? Were there salmon woven into the trees,*[35] *storied into the concentric circles of their rings?*[36]) Scientists collected isotope data from the foliage of streamside plants. They analyzed this data to examine chemical signatures that reveal different sources of nitrogen present in the plants. They compared the isotope data (which revealed the nitrogen source) and growth rates of plants growing along the stream at spawning sites to plants growing along streams where migration was blocked, such as above waterfalls.[37] The data showed that trees near salmon sites were growing three times faster than those in locations without salmon. Furthermore, chemical signatures in spruce needles near the spawning streams indicated the presence of salmon-derived nutrients in the needles. "About a quarter of the nitrogen in the spruce needles and willow and poplar leaves of riparian forests appeared to be marine-derived."[38] In Alaska, traces of salmon-derived nitrogen have been found over one thousand feet from spawning streams.[39] But how? How is the salmony nitrogen making its way from streams (and before this, oceans) to trees?

I imagine those needles at the top of the spruce, dancing in the wind.

An extension of the deep ocean, touching the sky.

One way to tell this ecological story says that bears are responsible. Bears catch and eat salmon, and release nitrogen through their poop, but mostly their pee (there is a

[35] Roman, *Eat, Poop, Die,* 74.
[36] Derksen, "Mapping Maple Memory," 57.
[37] Roman, *Eat, Poop, Die*, 75.
[38] Roman, *Eat, Poop, Die*, 75.
[39] Roman, *Eat, Poop, Die*, 75.

lot of salmon derived nutrients in brown-bear pee) into forest soils. And, they also leave salmon carcasses among the trees. Like on Surtsey, soil microorganisms transform these nutrients into forms trees can absorb through their own metabolic processes. Roman writes, "Bears moved roughly the same amount of nitrogen into riparian forests as a typical forestry operation would apply in a managed forest."[40] Bears could be forest managers. Or ecosystem engineers. Or bears. Or salmon eaters and tree nourishers. Or poopers and pee-ers. Or terraformers.

Should they be called managers? Who is responsible?—

Salmon? Bear? Tree? Bacteria? Fungi?

How could I understand forestry if it were emancipated from languages of extraction, hierarchy, mechanization?

The salmon and the tree, are they making art?

The ocean and the trees are woven together through the connected acts of living, eating, pooping and peeing, and dying carried out by the salmon, bears, eagles, and scavengers. And microbes and decomposition. Trees grow faster with salmon nutrient pulses, which provide hospitable shade over spawning habitats, which means more comfortable salmon, which means more bear food.[41] Which then means more bear pee and nutrients returned to the trees. There are also transfers of nutrients between trees through rhizomatic fungal networks. *Destined to be tree food.* And what about the salmony nutrients not delivered to the trees or the soil? It probably flows back downstream, eventually, to the ocean.

The thing is, there exist doubts (among ecologists) of the exact truthiness and reliability in the scientific stories of nutrient cycling in coastal forest ecologies. Maybe

[40] Roman, *Eat, Poop, Die*, 96.
[41] Roman, *Eat, Poop, Die*, 96.

this is because ecologists are studying ghostly ecosystems—shadowy-versions of what remains after extreme habitat loss, extinction, genocide, and endangerment. However, one study published in 2019 examined the influence of spawning salmon, in sites with bear-mediated nutrient transfer on Sitka Spruce tree-ring growth—specifically through analysis of tree-ring width and the presence of isotopic nitrogen in trees. The salmon trees have rings that are, on average, 1.5 mm wider than the control trees,[42] which do not receive salmon-nutrient subsidies. The salmon trees also have higher salmon-derived isotopic nitrogen signatures than the control trees. The salmon carcasses left by bears in the soil in the salmon tree areas, and the nutrients left by pear poop and pee, provides nutrient pulses to the riparian vegetation and increases the annual growth of the Sitka spruce. Another study, as Roman writes, showed that the amount of marine-derived nutrients in trees in Oregon and Washington went down after dams were constructed on nearby rivers and streams. "When the researchers cored the trees, they found that the growth rates of trees returned to ambient levels within two years of dam construction."[43] The growth rates of the once-subsidized trees appeared to slow to the levels of trees that did not have salmon-nutrient subsidies, because of how the dam blocked salmon swimming upstream to spawn.

[42] Reimchen and Arbellay, "Influence of Spawning Salmon on Tree-Ring Width, Isotopic Nitrogen, and Total Nitrogen in Old-Growth Sitka Spruce from Coastal British Columbia."
[43] Roman, *Eat, Poop, Die*, 99.

The

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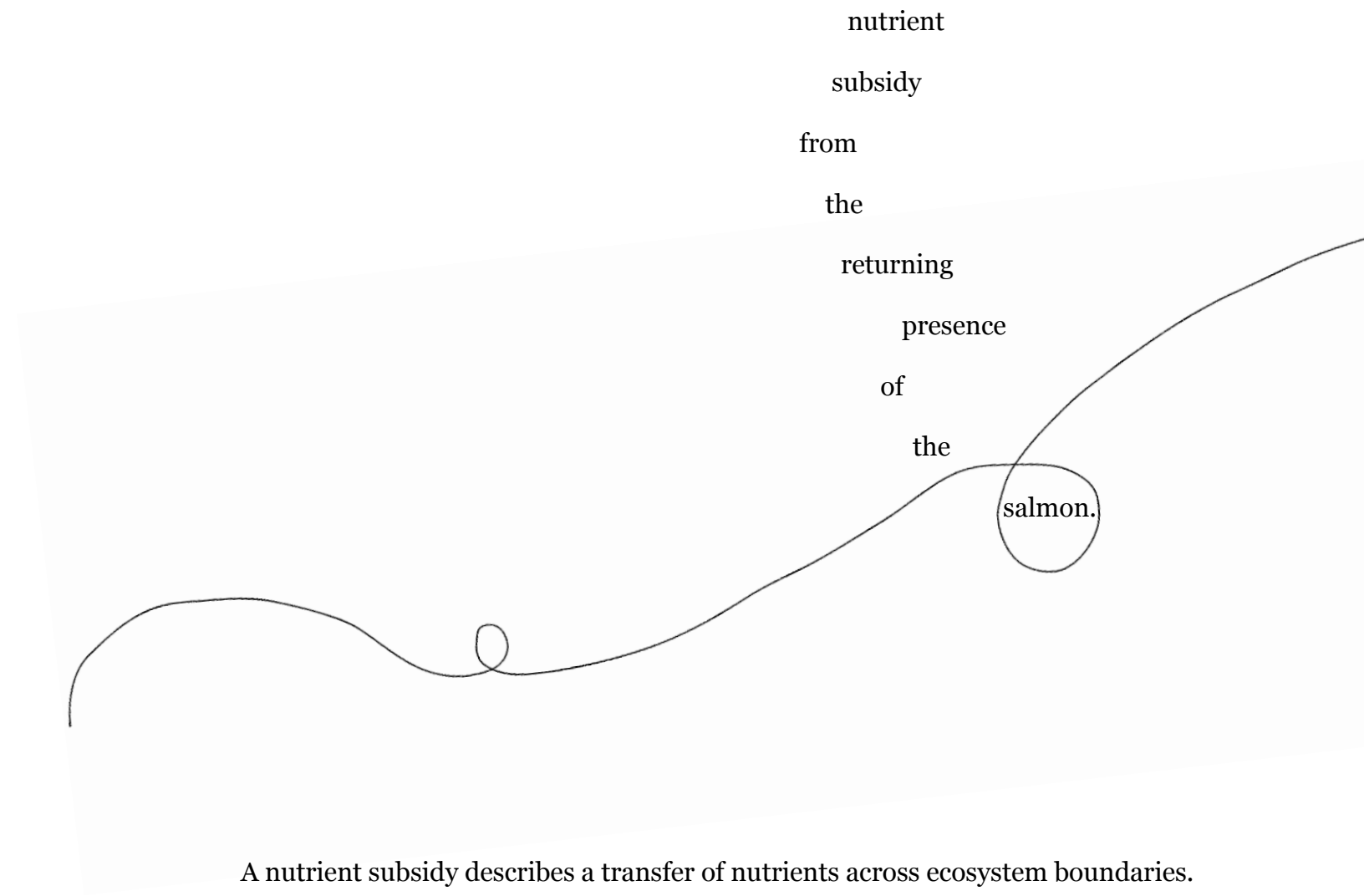


A nutrient subsidy describes a transfer of nutrients across ecosystem boundaries. The ocean-body of the salmon finds its way into the trees through the hungry belly and the digestive system of the bear. The nutrient subsidy, in this case, can be understood as beneficial to the network of the forest. Later on, this chapter will discuss harmful nutrient subsidies which are directly caused by the ways settler-colonial relations to land dictate relations to poop and waste, and to soil and food. These upstream ocean-river-forest relationships have long been understood in realms outside of the correlations[44] of colonially-articulated scientific practice (of course, in these times different ways of knowing are entangled in imperfect knottings). Susanne Simmard,

[44] Morton, *Humankind*.

author of *Finding the Mother Tree,* writes that the knowledge of salmon–tree nutrient relationships has long been understood and "encoded in local stewardship."[45] According to Simmard, Indigenous communities of the so-called Pacific Northwest, including the Nuu-Chah-Nulth, Haida, and Tlingit, buried salmon guts into forest soils and returned bones to streams after eating.[46]

In the chapter 'Burning Cascade Head,' in *Braiding Sweetgrass*, Kimmerer tells the story of salmon ceremonies carried out to welcome salmon back to the headland, before European settlement, in what is current-day Oregon. Every year, at the return of the salmon in the late Fall, the grasses of Cascade Head are burned. The headland becomes a beacon of flaming light, signaling to the salmon to return to the estuary's snaking rivulets. When Spring returns, the lively green grasses return too—energized by the fertilizing ash in the soil, which came from the burning. Then, elk and their calves return to the wild grass prairie, an opening among dark spruce forests.[47]

In the storying of Cascade Head, Kimmerer affirms the way nutrients flowed in a multi-way conversation between companion species. It was the diversity of different salmon that ensured everyone was fed, including the forests, through the nitrogen that they brought inland.

"Salmon fed everyone."[48]

Eating is an act never done truly in isolation.

[45] Roman, *Eat, Poop, Die*, 77; Simard, *Finding the Mother Tree*.
[46] Roman, *Eat, Poop, Die*, 77.
[47] Kimmerer, *Braiding Sweetgrass*, 244.
[48] Kimmerer,Braiding Sweetgrass, 244.

Haraway tells me:

"The more one looks, the more the name of the game of living and dying on earth is a convoluted multispecies affair that goes by the name of symbiosis, the yoking together of companion species,

at the table together."[49]

As Kimmerer explains, destructive and deathly changes encroached on Cascade head with European settlement. Disease—smallpox and measles—destroyed populations in the 1930s, leaving villages along the so-called Oregon Coast nearly empty. In these places, settlers introduced cattle to the native grassland prairies. In some ways, the cows were carrying out the fertilizing acts (through grazing and pooping) that the elk who grazed and the people who once burned the grass had practiced. However, cattle farming in the same prairies that had been ecologically engineered through various relationships, over the time of many salmon returns, became over-intensified. As a result, the headland suffered. The architectures of estuaries were altered through the construction of dikes built to keep water out. Settlers called this "reclaiming the land from the sea"[50]—which literally meant stealing land and attacking estuarine nutrient dynamics (and Indigenous life and worlds) by blocking the very porosity of the boundaries where land became sea. The diking of the river, the "re-claiming", changed

[49] Haraway, *Staying with the Trouble*, 124.
[50] Kimmerer, *Braiding Sweetgrass*, 244.

the river-sea boundary "from a capillary system to a single straightened flow."[51] *Like the beating heart of the planet*. Due to the multiplying effects of deforestation, extreme overfishing, dam building, and intensive cattle grazing and the destruction of the rivulets, the salmon stopped returning to Cascade Head. The old-growth Spruce trees that remain in the soil, I am sure, hold this story within their rings.

The grassland prairies at Cascade Head were formed through repeated practices of burning—a practice which was also embedded into the salmon return through ceremony. Settler cattle grazing and subsequent intensive agricultural development altered the nutrient dynamics and porous boundaries of Cascade Head. These processes are reflective of violence that continues to destroy the great North American prairies,[52] through overly intensified and overly simplified agriculture, in a complicated string-figure storying. The grassland prairies of North America evolved through bison–human relationships. In a chapter titled 'Heartland,' Roman discusses the artistry of bison as the designers and ecoengineers of the "American landscape" —of the prairies—through their roles as grazers and poopers. Tens of thousands of years of grazing *and burning* formed the mid-continental sea of grass which stretched from the Rocky Mountains (so-called) to east of the Mississippi River (so-called), and north to Canada (so-called) and south to central Texas (so-called)—practices of design which included relations with people. A depth of time is embedded into these multi-way conversations and string-figure story layers.

[51] Kimmerer, *Braiding Sweetgrass*, 244.
[52] "Prairie" was a word imposed by English colonizers, taken from the French word for meadow or grassland. The rest of this paper considers prairie as an ecosystem, a life-world, a string figuring, rather than an individual meadow. It considers prairie as a memory, and at the same time, a possible emergence.

It was a continent of bison. There were once between thirty and sixty million bison who migrated in a clockwise circle from the mountains to the farther plains.[53] Bison ranges encompassed twenty-two major biomes. They were the widest-ranging mammal in North America. Bison grazed more grass and pooped more poop than any other native herbivore in the prairies.[54] Prairie plants and grasses evolved with grazing for hundreds of thousands of years. Bison eat grasses and sedges, which are processed through their four-stomach ruminant digestive system. In the rumen, the first chamber, a community of microbes digest and actually *ferment* ingested plant material, allowing the absorption of cellulose. Living beings with rumen are able (well, the microbiota living inside them are able) to eat and digest nutrients available in roughage that other bodies cannot. Roughage is fibrous plant material in the form of cellulose. It takes about eighty hours (3.33 days) for grass to move through a bison digestive system—a slow metabolism that allows for the digestion of food lower in nutritional quality. This also means that Bison can spend less time grazing, and more time moving along or resting than other grazers might. Grass grows from the bottom, so grazing stimulates its growth. Bison poop directly redistributes plant-derived nitrogen to the soil of very recently grazed grass—providing essential nutrient fertilization, along with growth stimulation from munching. A study conducted in 2009 in the National Bison Range in Montana[55] showed a significant positive correlation between concentrations of nitrate (from glasslands with applied bison poop) and vegetation biomass and size. The nitrogen and phosphorus rich bison poop was helping plants grow, significantly more than plants growing in soil without patties. Bison poop is essential to restoring nutrients

[53] Roman, *Eat, Poop, Die*, 110.
[54] Roman, *Eat, Poop, Die*, 114
[55] Poinsatte, "Effect of Bison Fecal Deposition on Vegetation Heterogeneity of Palouse Prairie," 2009.

in soil and supporting future cycles of herbivore-plant-human intra-actions. The National Park Service estimates that an adult bison poops and pees ten to twelve quarts of organic material every day. If there were over sixty million bison on the North American continent, then that is somewhere between six-hundred-million to seven-hundred-and-twenty-million quarts of poop and pee every day into the grassland soil.

Bison create diverse landscapes by browsing one area, eating everything down to the ground and crushing plants with their bodies in that area, nourishing this area with their poop, but will leave an adjacent prairie patch ungrazed.[56] *I am not sure what exactly it is, but that feels so gentle: the decision to graze one place but not somewhere else. Maybe they are leaving something for the next herd.*

[56] Roman, *Eat, Poop, Die*, 114.

I have to think about

the various successions of herds

who migrated

as additional layers,

permeated by

overlapping time

and durational layers of

digestion,

seasons,

fire,

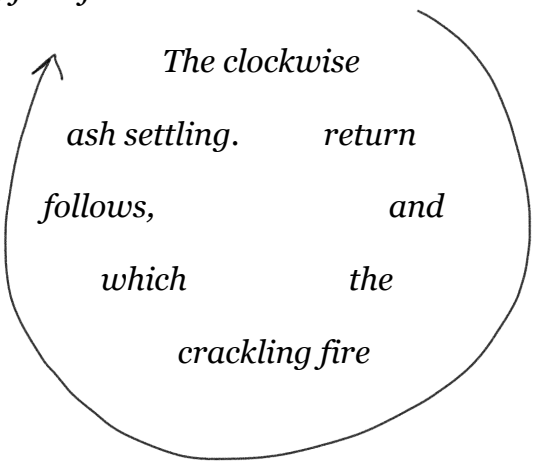
plant growth,

migration circles.

Successive herds of migrating bison created a patch-work quilt[57] of the prairie through their selective grazing choices, which increased biodiversity. Bison tend to prefer areas which have been previously burnt. Fires set by Indigenous peoples in succession to bison grazing prevent the transformation of grasslands into forests. (Remember the prairies at Cascade Head, clearings from the dark Spruce forest which surrounded them.) Additionally, burning promotes the persistence of fire-resistant nut trees with thick bark, including Oak, Chestnut and Hickory. Fire removes dead plant litter from previous years, turning it to phosphorus and potassium-rich ash. Sunlight is then able to touch the newly exposed soil, increasing microbial and root activity, which can trigger seed germination. As long as prairies have existed, generous amounts of bison poop and practices of intentional burning have been the weft of their storying.

This could be called reciprocity, the deliverance of nourishment—the relationships between vital soil and regrowth. The seed which passed through the bison body, now hugged in dark, rich nutrients,

preparing for life.



[57] Ratajczak et al., "Reintroducing Bison Results in Long-Running and Resilient Increases in Grassland Diversity."

A bison patty is a micro-ecosystem.[58] Containing microbes, undigested plant matter, and seeds, they are "elixirs of nutrients"[59] for prairie soil. A single patty can also be home to up to three-hundred species of insects, and contains thousands of individual insect beings.[60] And flies and dung beetles lay their eggs in bison poop. Dung beetles and flies are essential food for box turtles, bats, and birds of the prairie. Furthermore, tunneler and roller dung beetles help decompose bison poop by burying it below the soil surface, placing it into the soil where it directly feeds microbes which can transform nitrogen into ammonium. Because dung beetles of the prairie favor bison dung specifically, they are not as present in areas where livestock, such as cattle, have been introduced, which reduces the ability of the ecosystem to cycle nutrients and build vital soil. The dung beetles are one of the architects of prairie soil systems, feeding deep roots. The roots of native grasses can grow as far as fifteen feet down, making them able to move and sequester carbon deep into the earth, and secure soil in place. Most of the prairie's (plant matter) biomass is below ground, in the soil. Some native plant species have two times the underground biomass than introduced plants.[61] The difference between soil microbial community structure and the health of soil in cultivated and restored grasslands, or let alone undisturbed grassland prairies, is largely significant.[62] The biodiversity of plant species in restored and undisturbed grassland prairies supports the biodiversity of deep-root microorganisms that contribute to long term, carbon storage in the soil. The repetitive plowing of grasslands leads to a substantial loss

[58] "Micro" to a human-sized perception, that is.
[59] "Bison Bellows."
[60] "Bison Bellows."
[61] "Carbon Sequestration in Grasslands | MN Board of Water, Soil Resources," n.d.
[62] Jangid et al., "Development of Soil Microbial Communities during Tallgrass Prairie Restoration."

in soil carbon. The inability to build robust and lively soils threatens the existence of the prairie far into the future.

The total population of the descendents of the Bison ancestors which storied prairies now number at one percent of their ancestor population.[63] More than thirty million bison were killed on the Great Plains in the 19th century. The US government understood the essential and vital role bison played to the prairie and to the pluralities of Indigenous life, including their foodways, and effectively targeted the bison population in an act of attempted extermination. Buffalo hunters made contests of killing bison. Tourists shot bison from trains. In one such hunt in 1871, a group of white men, settlers of New York, led by William "Buffalo Bill" Cody, were accompanied by Major General Phillip Sheridan, "the man with the task of forcing Native Americans off the Great Plains and onto reservations."[64] Sherdian and William Tecumseh Sherman had been appointed by President Ulysses S. Grant to command armies in the Great Plains and enforce the removal of Indigenous peoples to Reservations, including but not limited to tribes of the Sioux, Comanche, and Kiowa. While that hunt with the New Yorkers was not an "official" military mission, Sheridan despicably and explicitly encouraged the extermination of bison. Additionally, army commanders provided bullets to hunters. The army did not need to kill the bison themselves, they just needed to encourage the private sector to do so.[65] With this information, the extermination of bison cannot be disentangled from distinct military efforts of removal, displacement, and genocide—all of which began to destory the prairie, the soils, the People, the overlapping cycles. The ongoing existence of bison meant resistance to farming with a

[63] "American Bison."
[64] Phippen, "Kill Every Buffalo You Can! Every Buffalo Dead Is an Indian Gone."
[65] Phippen, "Kill Every Buffalo You Can! Every Buffalo Dead Is an Indian Gone."

plow (the Homestead Act had been passed nine years earlier, in 1862).[66] Because of their rich soils, which have been cultivated over millennia, the prairies are ideal for large-scale agriculture, on an extremely near-sighted timeline. Today, one percent of the original prairie land remains. Almost all of the rest is now used for agricultural production, becoming home to row crops primarily of corn, soybean, wheat, grown at an industrial scale, and forty-one percent of which is land that is either livestock pasture or cropland used to produce feed for livestock.

In 1868, Sherman, along with a U.S. government peace commission, signed the Fort Laramie Treaty with the Sioux. The treaty recognized the Black Hills as part of the Great Sioux reservation, for occupation exclusively by the Sioux Peoples. One part of the treaty grants the Sioux the right to hunt bison north of the Platte River in (so called) Nebraska. Three years after the treaty was signed, this was nearly the same land where Cody led the New Yorkers in bison hunts.[67] Sherman was absolutely opposed to the Fort Laramie Treaty, as he was determined to clear the land of Indigenous lifeways. In 1877, after gold was found in the sacred Black Hills, Congress passed the Act of 1877 which ceded the Black Hills to the United States government. This was done without Tribal approval. More recently, the Fort Laramie Treaty has been broken by the Army Corp of Engineers in the construction of the Dakota Access Pipeline through land belonging to the Sioux.

> *So far, this has been the most difficult section to write and to be among the facts of. In the process of academic writing, a strange forgetting can happen, a de-sensitization to the gravity of the*

[66] The Homestead Act was enacted during the American Civil War. It granted claim to any U.S. citizen or immigrant intending to become a citizen to 160 acres of land, in an effort to develop the so-called "American West."
[67] Phippen, "Kill Every Buffalo You Can! Every Buffalo Dead Is an Indian Gone."

> *material we involve ourselves with. Academic positions offer somewhat of a false removal from the realities being "researched" and learned from. I am involved with a practice that means looking for and finding facts to tell a story which might compel someone to think about something deeper. But how do I walk a line where this does not turn into an endeavor in extraction? There is so much death here. And I am not interested in a business of casually throwing genocide in your face to prove a point, as if quantities alone tell the story. In this research, I felt an aching grief in my heart that heavied my body and also a stomach-churning disgust in my gut. I descend from white German ancestors who homesteaded stolen grasslands with plows, granted to them through the Homestead Act, who later turned into cowboys who "broke" horses and managed cattle. My mother grew up close to grass and cattle, horseback. Inheriting these realities means responsibility to attend to details and tell stories filled with facts.*[68]

The exploitation of prairie soil for industrial row-crop agriculture radically simplified the complex, time-layered, living, decomposing, regenerating, and ever-changing ecosystem. It is these same articulations of violence that characterize the "Anthropocene." The Anthropocene is a term used to describe the proposition of a current geological age, moving out of the Holocene, in which human activity has had a

[68] "Tell stories filled with facts. Make people touch and taste and KNOW. Make people FEEL, FEEL, FEEL!" Written by Octavia Butler, in her journal.

planetary impact on climate and the biosphere. It is most popularly dated to the start of the Industrial Revolution in the 1800s, when fossil fuel emissions began increasing the greenhouse gas effect in the atmosphere.

The term Anthropocene falls short in a few major respects, and dating it is a process as slippery and porous as climate change itself. *As if climate change could be one thing. An "itself."* Timothy Morton uses the word "hyper-object" to describe these *things* which are "massively distributed in time and space relative to humans."[69] Hyper-objects are churning, wrestling, and alive. Climate change, which is at the same time a key turned in the ignition of a car[70] and also a water molecule melting from glacier into sea, is a hyper-object. The "Anthropocene" is a hyper-object, with wastewater treatment systems and the mass-manufacturing of fertilizer wound up in it. Also wound up is the dung beetle making home in a patty of bison poop, dropped by one of the thirty-thousand bison alive in North America today. The academic and scientific practice of producing terms to explain these overwhelmingly huge and complex happenings can make it feel as though the "Anthropocene" is heavily looming over, somehow on a scale vastly unapproachable.

The first major fault in the term Anthropocene is that it was not/is not/will not be a species-act.[71] A species act implies that the entirety of humanity as a "species", *anthro,* can be held responsible for inoculating a geological era. Of course, this is not true. The Anthropocene is a set of historical, situated and in-place conjectures[72] contingent on unequal articulations of power. As a living and dying legacy, the Anthropocene has been

[69] Morton, *Hyperobjects*, 1.
[70] Morton, *Humankind*, 73.
[71] Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."
[72] Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."

inherited by people (human and non-human) of this biosphere that, for the most part,[73] "have precisely not lived and exercised the same kinds of processes that break generations, that radically simplify ecologies, that drastically force labor in a mass way that creates a kind of global transformation and global wealth that is in and of itself genocidal and extinctionist."[74] *What are the implications of inheriting an aching planet?* The Anthropocene can be told in a multitude of string figures which weave together and are forced apart—one being the prairie story told by me (in collaboration with many others) here in this paper, wherein I emphasized bison poop. This also means that the Anthropocene unfolds on an infinity of intra-acting scales and timelines.

Other critiques and alternative names to the Anthropocene unearth more questions of how to understand the ongoingness of extractive capitalism on a biospheric scale (*climate change*). Some of these alternatives or deepenings include: the Capitalocene, the Plantationocene, the Urbanocene, the Chthulucene, and so on. The Plantationocene conceptualizes the planetary impacts of exploitation of "natural resources," monoculture expansion, and forcible labor. The plantation requires either genocide, removal, or some form of captivity and coerced labor slavery, based in the violent trade and exploitation of Africans and Black bodies through the Trans-Atlantic slave trade. In thinking about the question, "*what is a plantation?"* Haraway says that some combination of the following has been present among the last five-hundred years: "radical simplification; substitution of peoples, crops, microbes, and life forms; *forced labor*; and, crucially, the disordering of times of generation across species, including human beings."[75] The labor of soil, the labor of dung beetles in cultivating that soil, of

[73] But not without exception.
[74] Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."
[75] "Donna Haraway and Anna Tsing Reflect on the Plantationocene."

microorganisms, cattle, manufactured fertilizers, of soy and corn seeds are all also coerced into the production of food on industrial scales. *Can the GMO corn growing there now remember the stories of the bison and the grass in the soil, the smell of smoke?*

I include the invitations of the term Plantationocene because it also prompts the question: *how do I relate to the soil under my feet*—a question which is at the core of this writing and thinking, because to live in a body that eats and poops is therefore to be intimately and intricately connected to soil (and therefore to decomposition and death) whether those relations have been made invisible or not. The Plantacionocene is also precisely connected to actions, decisions, and systems (many tangled knots and frayed, loose ends) that cause cycles of nutrients (particularly nitrogen and phosphorus) to break. Additionally and essential to the Plantationocene, is a violent breaking of ties *to and from place*. There exists a *"radical interruption of the possibility of the care of generations… the capacity to love and care for place is radically incompatible with the plantation."*[76] Breaking ties to place and violently interrupting the ways in which land can become a living being through soil-feeding relationships are essential parts of how the plantation operates.

Can soil-care even exist in the plantation and its most recent iterations?

What is left of place, when love and care have been eradicated?

What exactly is "Care"?

Capitalocone can be another apt way of patching the holes in the Anthropocene story. The Capitalocene, "The Age of Capital", as Jason Moore writes in *The Rise Of Cheap Nature,* understands capitalism as "world-ecological." World-ecological thinking

[76] Mitman, *"Donna Haraway and Anna Tsing Reflect on the Plantationocene."*

is the ecology *of the oikeios:* "that creative, generative, and multi-layered relation of life-making, of species and environments."[77] Capitalism, in the world-ecological, is "neither a purely economic or social system, but 'a historically situated complex of *metabolisms* and *assemblages*.'"[78] The metabolisms of capitalism embed themselves within and are contingent on ecologies and land-stories, whether that be ancient sunlight held in oil deposits, soil cultivated from millenia of reciprocal relationship, or islands of bird poop (which I will get to shortly). The Anthropocene dates inoculation to the burning of fossil fuels during the Industrial Revolution in England. The histories of capitalism, however, cannot be reduced to fossil fuel emissions, and instead involve histories of conquest and appropriations of *"Cheap Nature"* all throughout the planetary biosphere.[79] Capitalism, Moore writes, relies on *Cheap Nature*, which is the "deployment of the capacities of capital, empire, and science to appropriate the unpaid work/energy of global natures within reach of capitalist power."

One such appropriation of *Cheap Nature* was/is the extraction of guano, seabird poop, from islands in and around Peru, which was used as agricultural fertilizer. Some even argue that the start of the Anthropocene should be dated to the beginning of the guano trade because of its eventual ripple effects on the Industrial Revolution, the use of industrial agricultural fertilizer, and disruptions to planetary nutrient cycling.[80] Build up of guano on some of these islands was over two-hundred feet deep, creating an abundant mineral deposit. The Inca peoples knew the guano to be a fertilizer for soil and had been farming with it for tens of thousands of years prior to settler arrival.[81]

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[77] Moore, The Rise of Cheap Nature, 1., Haraway, *Staying with the Trouble*, 47.
[78] Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."
[79] Moore, "The Rise of Cheap Nature," 9.
[80] Roman, *Eat, Poop, Die*, 130.
[81] Roman, *Eat, Poop, Die*, 130.

Alexander Humboldt, the German geographer and naturalist, brought guano samples to France where they were tested by a chemist and found to have high concentrations of nitrogen-rich uric acid, which boosts soil fertility.[82] Britain imported about two tons of Peruvian guano in 1841, and just two years later, two-hundred-twenty-thousand tons.[83] *What is the connection between the exploitation and trade of bird poop on a scale which crossed oceans, and the plantation? How did this influence the use and manufacturing of fertilizer on an industrial scale, and eventually, intensive monoculture expansion (the continuation of the Plantationocene)? How did this influence future relations with soil?*

The guano trade is an articulation of colonialism. The Guano Islands Act authorized the United States' first imperialistic land grab outside of the North American continent.[84] The act stated that the United States could "claim any island that had seabird guano on it, so long as there were no other claims or inhabitants."[85] Any guano extracted or mined was to be sold to American farmers at a reasonable price, to fertilize soil and increase crop yield. About two-hundred islands were claimed through The Guano Islands Act. The unsustainable guano extraction resulted in habitat destruction and extinction of many seabirds. Today, eight islands are still in claim to the United States. One such island, initially claimed for its guano supply, is Johnston Atoll, which was used between 1958 and 1975 as a nuclear test site. These nuclear tests violently killed seabirds and other marine beings. The island is now a U.S. National Wildlife Refuge. *These are historical conjectures contingent on acts of claiming, extinction and radical ecosystem simplification. And war.*

[82] Roman, Eat, Poop, Die, 131.
[83] Roman, Eat, Poop, Die, 131.
[84] "The Smithsonian and the 19th Century Guano Trade."
[85] "The Smithsonian and the 19th Century Guano Trade."

Guano acquired through the Guano Islands Act mainly served North American consumers of meat and sugar.[86] "It wasn't fighting world hunger,"[87] but rather was used for commodity crops like sugar. Additionally, slave labor was used in the extraction of guano. The colonization of guano islands, the extraction of deep layers of mineralized seabird poop from them, the trans-oceans trade of that poop, and its application to enrich colonized and European soil catalyzed a start to high-input farming. This allowed for the growth of cities and urban populations, where city-dwelling people would be digesting nutrients created through the land-storying of islands in the South Pacific. Exchanges of marine and poop-derived nutrients were being altered on a global scale through colonization and agriculture.

Guano was not only used as an agricultural fertilizer, but also used as an oxidizing compound in the production of gunpowder, for its composition of potassium nitrate, at the beginning of World War I. During the war, the British navy blocked the shipment of guano supply from South America to Germany, which left Germany desperate to find new forms of nitrogen to make explosives.[88] A process that synthesized ammonia (similar to what microbial metabolisms carry out in soil) had already been developed by physical chemist Fritz Haber in 1905. The process combined atmospheric nitrogen with hydrogen gas using high pressure and the platinum metal osmium. Osmium, however, was hard to come by. Industrial chemist Carl Bosch found a way to produce ammonia using iron instead of osmium—a process which was used to make explosives during the war.[89] This energy-intensive process that turns atmospheric nitrogen into ammonia through a reaction with hydrogen, using iron as a catalyst,

[86] Roman, *Eat, Poop, Die*, 131.
[87] Roman, *Eat, Poop, Die*, 131.
[88] Roman, *Eat, Poop, Die,* 131.
[89] Roman, *Eat, Poop, Die,* 131.

became the Haber-Bosch process ($N_2 + 3\ H_2 \rightarrow 2\ NH_3$). It is used today as the primary way to manufacture synthetic agricultural fertilizer. The guano trade—acts of poop imperialism—influenced the development of fertilizer and scaled-up the effects of agricultural activity on flows and cycles of nitrogen and phosphorus. It also fed urban population growth. The Haber-Bosch process then massively transformed the scales at which those alterations occur. *The scale of these changes feel so opposed to the delicateness and intimacy of string-figures as a way to describe nets of relationships with and among beings. While "both" are imperfect and leaky, the scale and effect of Haber-Bosch operates like a hyper-object, so overwhelming it feels unknowable. But yet this feeds me. I eat these relations.*

The Haber Bosch process made the Green Revolution possible. The Green Revolution, beginning in the 1960's, transformed agriculture through industrializing technology which was geared to increase crop yields and feed growing urban populations. Haber-Bosch enabled extreme human population growth through fertilizer application, with the global population increasing from 1.6 billion in 1900 to about eight billion today. Norman Borlaug, a midwestern farmer and agronomist, is credited for the Green Revolution and its spread globally, to so-called "developing" countries.[90] The Green Revolution expanded intensified farming methods such as monocropping—a method derived from colonial cash-crop plantations that exploited slave labor. These intensified practices repeated an increased crop production cycle over and over.[91] In these systems, the soil does not experience rest. It is not left like an un-grazed patch of the prairie. Instead, it is "used" repeatedly to exhaustion. This means that there is no return of organic matter back to soils, and they experience rapid degradation as a result.

[90] "The Haber-Bosch Process."
[91] John and Babu, "Lessons From the Aftermaths of Green Revolution on Food System and Health."

Agricultural revolutions pace soil fertility with demands for food production, shaping human-soil relations.[92] The Green Revolution then relied on inorganic manufactured fertilizer produced though Haber-Bosch to apply loads of nutrients to soil depleted by overuse. The legacy of the plantation is very present today, but has been "so naturalized that many people believe that that is the meaning of the term agriculture." Anthropologist Anna Tsing continues, "We forget that there are other ways to farm."[93]

What is the effect of mass amounts of nitrate and ammonium fertilizer application on nutrient cycling? More than one-hundred-and-sixty-five-million tons of reactive forms of nitrogen are produced globally each year, more "than all natural processes combined." [94] About twelve million tons of nitrogen and four million tons of phosphorus fertilizer (fifty percent of which comes from phosphate mines) are applied to crops in the continental United States each year. The mass amounts of fertilizer applied to land often end up as runoff, polluting lakes, streams, rivers, and oceans. Soil erosion and intense weather events such as heavy rains trigger the movement of nutrient runoff. These nutrient subsidies cause eutrophication in watery environments, which is the build up of organic matter that ultimately changes the productivity (who and what eats and grows) in the environment. Eutrophication supplies too much food for a healthy amount of cyanobacteria, leading to extreme overgrowth. This overgrowth results in massive algal blooms that block sunlight, cause oxygen deprivation, and secrete toxins which ultimately kill aquatic beings. In addition to nutrient runoff from agriculture, water bodies also receive nutrient subsidies from wastewater, which, whether treated or not, contains high levels of nitrogen and phosphorus. All of these

[92] De La Bellacasa, "Soil Times."
[93] Mitman, "Donna Haraway and Anna Tsing Reflect on the Plantationocene."
[94] Roman, *Eat, Poop, Die*, 144.

nutrient subsidies are displaced far away from their source. In the Hudson Valley, the growth of the so-called invasive plant species *Phragmites australis* in wetlands is linked to subsidies of nitrogen from wastewater and agricultural runoff.[95] *Phragmites australis* is thought to sequester carbon in the short-term, but erode deep layers of soil over time, and increase wetland methane emissions by altering microbial soil relations.[96] Methane has a greenhouse gas effect over eighty times stronger than carbon dioxide over a twenty year timescale.

During the guano trade, at the same time nutrients in the form of seabird poop were being shipped across the world to be used as fertilizer to feed growing metropolises, cities such as Paris and London were constructing their first sewage systems to move human organic material out of the city in a new flow of nutrients.[97] As cities expanded, so did the number of eating and pooping people within them, which led to a big question of just how to deal with all that poop so massive outbreaks of disease would not occur. In the mid 1800s, London and Paris both experienced *great stinks*. In London, human excrement was being dumped directly into the river Thames. When a bout of hot weather struck, there was so much human poop in the river that just the airborne stench and contaminant was making people ill.[98] The great stinks shut down these cities—London for two weeks, and Paris for two months. In response, London quickly built eighty-two new miles of sewage pipes to bring poop farther downstream and away from the city. Around the same time, New York City began constructing sewer systems in response to a large cholera outbreak. Up until 1992, New York City was still

[95] Sritrairat et al., "A History of Vegetation, Sediment and Nutrient Dynamics at Tivoli North Bay, Hudson Estuary, New York."
[96] Kim et al., "Microbial Mechanism for Enhanced Methane Emission in Deep Soil Layer of *Phragmites*-Introduced Tidal Marsh."
[97] Roman, *Eat, Poop, Die*, 180.
[98] David S. Barnes, *Filth, The Great Stinks,* 35.

shipping raw sewage out to a dumpsite twelve miles offshore, which caused bacterial overgrowth and heavy metal pollution in the ocean.[99]

The great stinks accelerated and triggered intense technological change in waste management, and established the rhetoric of treating human poop as waste, and moving it far out of sight by way of water, on a city scale. This was necessary for the functioning and health of growing urban areas as they were, and worked well to prevent diseases like cholera and other public health issues characteristic of growing cities at the time. The implementation of such large-scale sewage systems during the great stinks established "modern, civilized, sanitized"[100] norms and reshaped the modalities of urban life for decades to come. But the notions of being "civilized" that go along with wastewater treatment systems are also harmful.

Today, more than half of the global human population lives without safely managed sanitation. This global lack of adequate, safe, and comfortable sanitation causes 432,000 diarrhoeal deaths every year.[101] Sanitation refers to public health conditions relating to clean drinking water and treatment and adequate sewage disposal. Due to assumptions and ties between sanitation and twisted notions of what it means to be civilized or live in a "developed" country, many are not fully aware of the severity of the sanitation crisis in the United States and its uneven dispersal. In her book *Waste,* Catherine Flowers tells the story of Lowndes County, Alabama, where ninety percent of households have failing or inadequate sewage systems.[102] Flowers writes that many Americans living in rural areas lack affordable and clean ways to process "waste." In Lowndes County, residents with failing septic systems are at risk of being criminally

[99] Roman, *Eat, Poop, Die*, 180.
[100] David S. Barnes, Filth, *The Great Stinks,* 15.
[101] World Health Organization, ""Sanitation."".
[102] Flowers, *Waste,* 6.

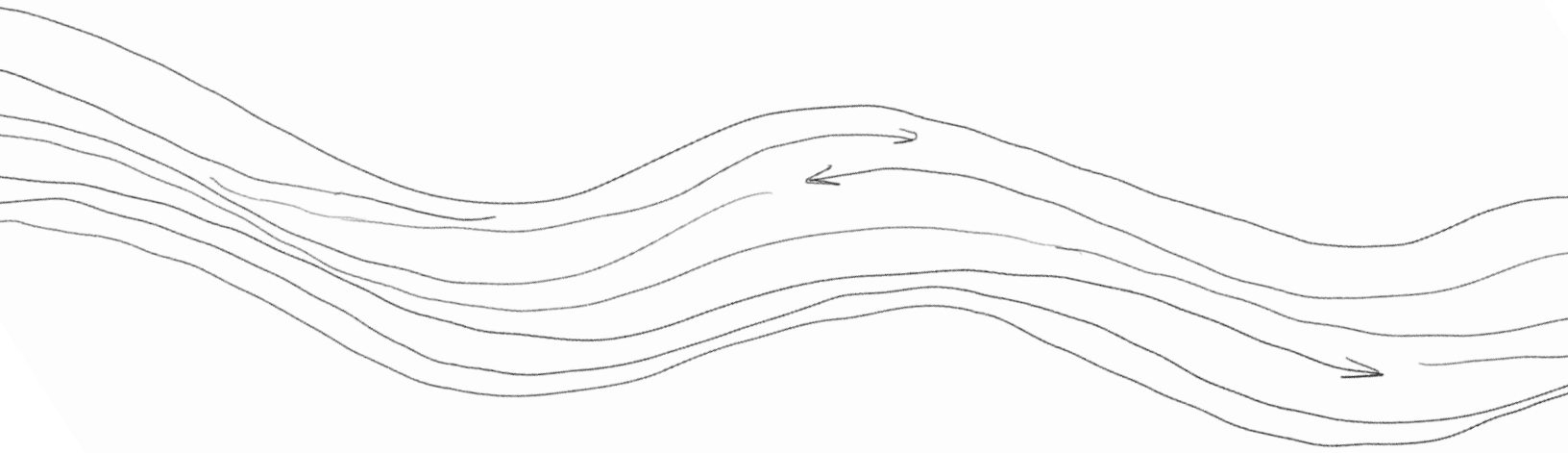
prosecuted by the state. In this way, policing becomes a part of the waste infrastructure. But the very technology that residents are required to purchase is failing, as it is not compatible with the soil or the water table in the area.[103] This results in the flooding of sewage all over backyards where the septic systems have been installed. The health implications and risk of disease associated with these failing systems are serious, but doctors in the United States often do not know how to diagnose and treat these connected diseases, like hookworm. Such illnesses are considered "tropical diseases" and are associated with so-called "third-world countries" that are associated with not having the wastewater infrastructure that is more widely implemented in the United States. Eventual testing among fifty-five Lowndes County residents, made available by Flowers' work with the community and with doctors studying so-called tropical diseases, showed that nearly thirty-five percent of them tested positive for hookworm.[104] With warming climates, the environments where diseases like hookworm are likely to occur will expand. The way that this infection goes unnoticed by doctors and leaves people with misdiagnoses is directly connected to the ways in which wastewater treatment is associated with ideas of so-called development and civilization.

Inherent in definitions of modern sanitation is an entanglement with water-based treatment systems—bringing into question our personal, pathogenic, as well as systemically architectural and infrastructural relations with water. Sewage treatment, entangling water bodies and poop through the magic of the flush toilet, creates waste and tries to render it invisible from the everydayness of our environments—where it reeks and wreaks havoc *somewhere else*. But as seen in the story of Lowndes County, that somewhere else is actually intimately close to the people on the front lines of

[103] Flowers, *Waste,* 130.
[104] Flowers, *Waste*, 133.

climate change. Wastewater treatment facilities in the United States process approximately thirty-four billion gallons of wastewater every day.[105] Once processed and cleaned, this water is typically released into water bodies, where its high levels of nitrogen and phosphorus challenge the balance of marine and aquatic ecosystems. However, not all "waste" goes through the treatment process. A recent report by Riverkeeper, "New York's clean water advocate", revealed 2.5 billion gallons of sewage being released into the Hudson River Watershed in 2018.[106] The waters of the Hudson River are also entangled in many other legacies of pollution and toxicity.

In 2013, the state of New York issued the Sewage Pollution Right To Know Law, requiring that all publicly owned treatment works and sewer systems must report sewage spills to the public.[107] From these alerts, the Department of Environmental Conservation (DEC) has created excel sheets containing entries for each event. This is data accessible to the public. While working with this data to conduct a GIS spatial analysis of sewage discharges into the Hudson River, I continued to run into an issue with the visibility and clarity of the data (or lack there-of). The data is difficult to sift through and unharmonized across years and treatment locations. Sifting through six

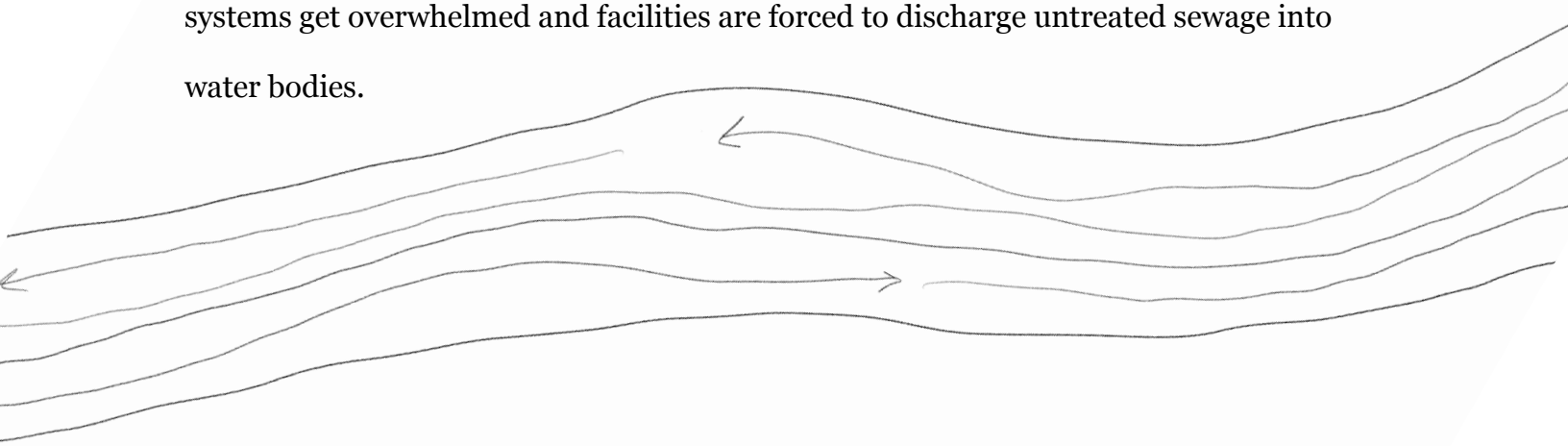


[105] "Sources and Solutions: Wastewater | US EPA."
[106] Shapley, "Report: Hudson River most affected by sewage overflows."
[107] "Sewage Pollution Right To Know - NYSDEC."

thousand entries for all of New York State in 2019, I was able to reduce this to nine-hundred entries with the Hudson River as the receiving water body.

The largest discharges into the Hudson occur from a waste treatment facility in the state's capital, Albany, New York. But the quantity of these particular entries are virtually invisible in the spreadsheet. The translation of these events, of which our bodies are most definitely embedded, into quantitative data ends up reinforcing invisibility, fogging the intricacy to which one is connected with environmental degradation, through the hard-to-decipher spreadsheet.

For the analysis, I carefully examined each entry to locate the events, and then conducted manual equations to determine the total gallons of sewage discharge.[108] For Albany, the quantity of untreated discharge per event in total gallons is often in the millions. And the noted cause nearly every time: *weather conditions*. In the case of sewage pollution, the present and futures are complicated by a changing climate (as is… nearly everything?). Most of the sewage treatment facilities in New York State are combined sewage and stormwater systems. In storm events or high amounts of rainfall (which are predicted to increase in the Hudson Valley in the years to come), these systems get overwhelmed and facilities are forced to discharge untreated sewage into water bodies.



[108] Most of the entries in the DEC 2019 data for sewage discharge events are recorded in duration in hours and quantity in gallons per minute.

The scales of climate change are myriad and interconnected. It is not just that harmful effects of wastewater treatment are intensified by weather events, these systems also produce large amounts of greenhouse gasses which contribute to changing weathers. The waste sector (including landfill and wastewater treatment) is one of the largest anthropogenic sources of methane on the planet. New research shows that municipal wastewater treatment emits almost double the amount of atmospheric methane than was previously estimated among scientists.[109] In wastewater treatment and landfills, methane is released due to anaerobic decomposition. The 2015 IPCC report estimated that waste and wastewater treatment accounts for 2.86 percent of total global GHG emissions.[110]

In the poop data analysis, the challenge of making the data visible is reflective of the *invisibility* of waste processing and pollution making. These systems, like landfills or treatments of industrial waste, are designed to bring waste to the periphery of our everyday lives, somewhere far away. In the case of poop, which before sewage treatment had been recycled for its rich nutrients for millenia, the very systems used to *treat* "waste" actually create it, and by its displacement, pollution. Where is *away*?[111] Activist Julia Butterfly, who beginning in 1997 lived for seven-hundred-and-thirty-eight days in Luna, a thousand year old redwood tree, to protect her from being logged, describes the relationships that create waste as dependent on a societal "disposability consciousness." She describes disposability consciousness as a result of a "separation syndrome" between society and natural resources, the earth, the trees, the petroleum complex, all that on which capitalism deeply depends. Butterfly asks, "Where is away? There is no

[109] "Princeton Engineering - Wastewater Sector Emits Nearly Twice as Much Methane as Previously Thought."
[110] "10.2.2 Wastewater Generation - AR4 WGIII Chapter 10: Waste Management."
[111] "Disposability Consciousness."

such thing. And where away *actually is* is social and environmental justice issues." Usually, "away" is the backyards, land, waterways, or bodies of people already most harmed by extraction and land theft. Everything which is called "waste" or "disposable", as Butterfly says, are the ways in which the planet and its people are thrown away. And those forms of disconnect—flushing the toilet and not ever thinking twice—work best when they subtly weave themselves into the fabric of our lives.[112] Disposability consciousness is a "weapon of mass-destruction," causing destruction, extinction, and toxicity. *The story of what we grew and ate together flows with the river, flows with the low and high tides of the estuary, overwhelmed by the storm.*

Wastewater treatment is necessitated on the assumption of access to land as a sink.[113] The assumption of land as a sink is also the assumption of access to and ownership of land. The current waste systems are architectures of *s(t)ink*! And this is a matter of colonialism. Colonialism, as Liboiron writes in *Pollution is Colonialism*, is the assumed access by settler and colonial projects to Indigenous lands for settler goals.[114] It is also a "way to describe relationships characterized by conquest and genocide that grant colonialists and settlers ongoing access to L/land and resources, that contradictorily provide the material and spiritual sustenance of Indigenous societies on the one hand, and the foundation of colonial settler state-formation on the other."[115] Colonialism is about genocide and access: "stealing Land and dispossessing people are events with temporal edges, but ongoing Land theft *requires maintenance and*

[112] "Disposability Consciousness."
[113] Liboiron, *Pollution Is Colonialism*, 40.
[114] Liboiron, *Pollution Is Colonialism,* 5.
[115] Liboiron, *Pollution Is Colonialism*, 9.

infrastructure, given that colonization is an ongoing process."[116] Ongoing dispossession is enacted through pollution.[117]

Entitlement to Land (including these waters of the Mahicantuck, the River Which Runs Both Ways) as a sink is entitlement to assimilate pollution. As Liborion explains, pollution science makes sense of pollutants through the threshold theory of pollution and the notion of assimilative capacity.[118] Assimilative capacity is "the theory that a water body can handle a specific amount of contaminant before harm occurs."[119] The threshold is the arbitrary line, created by universalizing science, between pollution and nonpollution. As Liboiron explains, the notion of assimilative capacity evolved from the idea of self-purification, developed by two sanitation engineers' testing the Ohio River's capacity to purify itself of organic toilet-based pollutants, in 1940. Based on these studies, they concluded that "the principles underlying the phenomenon of self-purification as a whole are applicable to virtually all polluted streams."[120] Determined by the ecosystem's metabolism (well, the Ohio River's), the threshold tells us what amount of pollution is deemed acceptable.

I'm curious about the word "metabolism"—how it is used to describe the chemical and biological ways in which ecosystems

digest, turnover, die, renew, cycle.

There is something about it, the word 'metabolism', that feels strange to me. Uncomfortable. Maybe because pollution-affirming-science makes it sound like:

[116] *Pollution Is Colonialism*, 16.
[117] Liboiron, *Pollution Is Colonialism* 77.
[118] *Pollution Is Colonialism*, 58.
[119] Liboiron, *Pollution Is Colonialism*, 39.
[120] Streeter and Phelps, "A Study of the Pollution and Natural Purification of the Ohio River,"; Liboiron, *Pollution Is Colonialism*, 39.

"Just how painful a belly-ache can the land endure?"

Assimilative capacity and threshold theory give polluters the right to pollute, and often do not even begin to make sense when considering "non-organic" types of pollutants. These laws of pollution science transform bodies of water and other environments into a *resource* for waste disposal. And through everyday reliance and engagement with architectures of pollution, the everyday flush-it-all-away, these land relations are made normal, effective, even good. And of course they are "good" when considering their obligations to public health and safety. But these structures too might need a little re-thinking. In this way, pollution can be best understood as a colonial regime for living.[121] Colonial relations that use land as a sink, and capitalist relations of production and waste-making, have woven the Capitalocene and the Plantationocene and have reshaped planetary nutrient cycles. Similar to how the river is treated as a resource in the form of a sink, soil is treated as a resource for the purpose of production, rather than a living collective memory. If the planet has sixty years of topsoil left,[122] turning toward assemblages of care that do not solely engage in relationships of resource is vital. I rest in this question, posed by Robin Maynard in a letter to Leanne Simpson, in *Rehearsals For Living*:

How can worldmakings based on living, rather than on human, ecological, animal, microbial waste be envisioned?[123]

[121] Michelle Murphy; Liboiron, *Pollution Is Colonialism*.
[122] Lyons, *Vital Decomposition,* 141.
[123] Maynard et al., *Rehearsals for Living*, 36.

Feeding Soil

The following is about how soils are fed and why it matters. It is mostly about how soil-care can take shape in the form of communal compost toilet infrastructures. It is about care as a thread-work of obligations and commitments. And about resting in the failure of systems which need to decompose. The undercurrent of this writing is a yearning to engage with, to carve out time and space for, the proposition of decomposition, hot compost piling, and afterlife as very material and practical ways to face climate and weather changes, as well as ways to deal with and divert from further investment in settler-colonial futures. This part of the paper breaks down the question *"compost toilet as a radical act of care?"* It tends carefully to the parts of this question to understand how wastewater systems are compromised and in some ways, failing. And to understand why and how compost toilet assemblages feed soils, disengage from relations of wasting and linear timescales of production, and complicate beliefs in individuality. It's also, obviously, about poop.

"GOING TO THE BATHROOM"

FLUSH
HOW TO

go into bathroom,
close door behind you,
lock door,
open lid,
pull down pants,
sit on toilet
(look at phone? play sudoku? crossword? text your friends or scroll through instagram?)
poop, pee, etc. → (did I pee yet? I was watching so many reels that I don't even know...?)
wipe w/ toilet paper,
stand up, button/zip pants,
maybe look at what's in the toilet bowl, then...
reach your hand toward the little metal knob and ... apply pressure...
and voila! FLUSHED away in a whirlpool...
lower toilet lid
then, wash hands with soap.

WHO'S LABOR?
↳ water's?

COMPOST
HOW TO

go into bathroom,
smell sawdust
close the door behind you,
lock the door.
open the lid,
pull down pants,
sit on toilet
?
poop, pee, etc.
wipe w/ toilet paper,
stand up, button/zip pants,
look in the bucket,
add generous helping of sawdust, peatmoss, pine shavings to bucket to fully cover your offering.
lower toilet lid.
wash hands w/ soap.
WHEN BUCKET IS FULL, BRING TO COMPOST PILE for composting

WHO'S LABOR?

In being curious about what critical infrastructures that deal with and support compost-rich futures look like, I look to from-the-ground networks and community-based enactments of composting that invite new articulations of "waste" infrastructure. The compost toilet system at New Moon first invited these questions about community care, and the carrying-out of a mundane and repetitive biological (and spiritual, cultural, societal, political…) aspect of living in a body that acts as a humble yet radical departure form the "normal", from the "modern", from the flush. It made me curious about what types of architectures emerge in those spaces oriented toward and desiring mycelial and decidedly anti-colonial futures, to meet these very real and practical needs—particularly when the options to flush and "access" water are not present, or water is in need of conservation or protection.

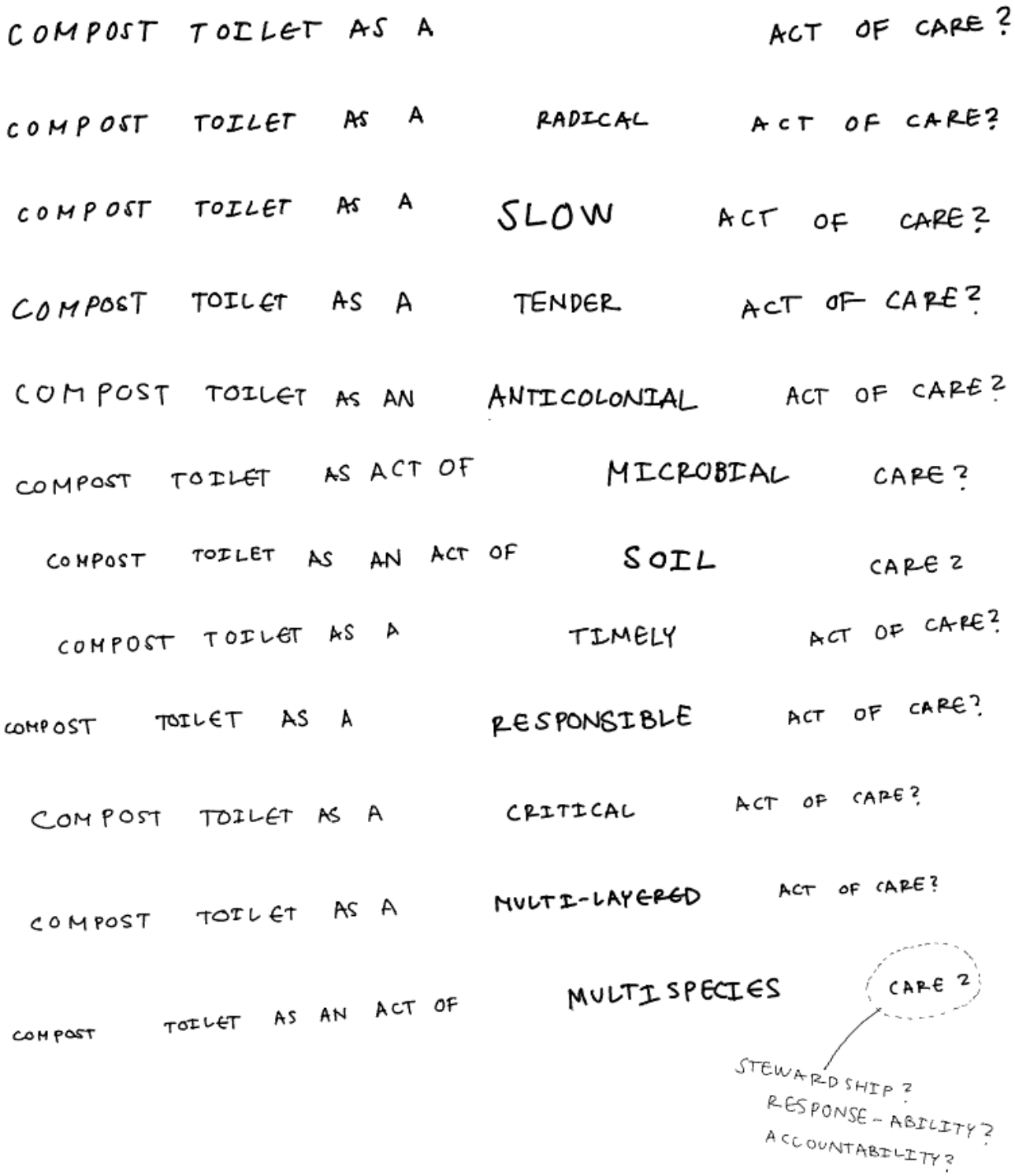
In regards to the word radical in the compost toilet question, I initially entertained the definition of "radical" that Carolyn F. Strauss proposes in the introduction to *The Slow Spatial Reader, Chronicles of Radical Affection*:

> The term radical affection is a call for tender acts of individual and collective imagination through which new axes of caring, connection, and resilience might be forged. Calling those acts 'radical' speaks to their power not only to transform how we live together, but also to a promise of emancipating people from structures and ideologies that have thwarted their agency.[124]

How can the intimacy of everyday acts happen in a way that humbly, yet radically, and on an appropriate scale, transforms people's obligations and agency within waste systems? How can we deal with our shit? The word "radical" can be a hot and loud word and I have debated the presence of it in this questioning for those reasons. And also because I myself have criticized: what's so radical about a five gallon bucket and some

[124] Strauss, *Slow Spatial Reader*, 17.

sawdust? A good practice to explore what this term offers in re-thinking poop relations has been to hold its space and feed the question with possible alternatives to understand why it sticks:



The point of agency in Strauss' definition of radical affection, that radical acts can emancipate people from systems that have otherwise thwarted their agency, can be considered along with being co-constituted with or enmeshed in critical infrastructures that have the potential to cause harm. "Act" also indicates the possible or missing presence of choice. *I poop and pee in this flush toilet everyday and everyday since experiencing an alternative, it feels kind of weird.*[125] Asking compost-toilet questions is a mode of attuning to what's being made invisible through disposability consciousness and relations of wasting. "Invisible" is actually just the peripheral elsewhere, in which one or some might be implicated in terrible consequences on ecosystems and beings.[126]

It is important to address the scale to which flushing causes harm. There are other assemblages (industrial or petro-chemical waste, for example) that cause violence on wider, intensified scales. In terms of nutrient pollution (overload and subsidy) agricultural activity moves more nutrients (and pesticides and other chemicals) into waterways and oceans than toilet-related wastewater treatment. But these systems are meshed and merged together in treatment. I also recognize the practicality of flush toilets, that wastewater systems work for the most part to do the job they have been designed to do, but it's *why* they work that I am most interested in. What relations make pooping in water (as resource and not as agential being) the normal? I am also aware that climate change makes wastewater systems less workable and more prone to problems. And that wastewater systems are compromised with ideas and assumptions of "civilization" and "modernity" that are actually failing to care for the wellbeing of over half of the human population in this biosphere.

[125] I feel like a big part of accountability is getting curious about what gives you the heebeegeebees.
[126] Shotwell, *Against Purity*, 17.

If Care is an "affective relation whose leading ethic is to create attachments, or obligations, within infrastructures of inequity,"[127] then better Care requires considering exactly how and why water and land are treated as sinks for waste through relations of resource. Before going on, let us break down this definition of Care. In *Pollution is Colonialism*, Liboiron quotes this definition from Emily Simmonds, who is a Métis feminist scholar and researcher whose activist research currently focuses on the biopolitics of settler-colonialism, specifically in relation to uranium toxicity. First off, care as an affective relation means care is understood through feeling, through being embodied. Additionally, it pertains to attitudes and perspectives toward that which is cared for or by. Its leading ethic or moral principle is to create and define connections between things and beings, articulating who is accountable and obliged to who else. It is a question of where agency is oriented and who has it, and operates across and through inequity and unevenness. Care reinforces connections and attachments, or pivots out of them. Care is specific to place, time, and community and varies in form. Care is usually hard work, in the sense that it takes time, repetition, attention, and requires labor. "The reciprocity of care is asymmetric and multilateral, collectively shared."[128]

In reflecting on the New Moon Mycology Summit compost system, before being in conversation with the definition above, care felt inherent to the operation of the system—an act of care to community, to soil, to L/land. It felt like care as an obligation to rich soil and tree-food, and as an obligation to *not* produce waste. It was the acts of poop-care, along with communal learning, communal eating, and the sharing of a practice in imagining mycelial futures, that created the sense of community which emerged in such a short span of time.

[127] Emily Simmonds in Liboiron, *Pollution Is Colonialism*, 115.
[128] De La Bellacasa, "Soil Times."

Pooping in a compost toilet is an intimate act that brings you pretty up close and personal to your own body, and to the usually-peripheral *somewhere else* your poop goes, re-organizing the possible shapes toilet infrastructures can take. Compost toilets force poop to linger, and the pooper to linger longer there alongside it, rather than flush it away quickly. They require attention, and a commitment to a next step of processing care. The ephemeral nature of the summit also emphasized the guest-hood of attendees which invited a relationship of accountability to each other and to the land. (*What is the difference between guest and settler? Are these categories compromised with each other? Tangled?)*

Considering poop-water-toilet-soil-climate dynamics requires considering how certain land relations come to exist and persist. In *Pollution is Colonialism*, Liboiron follows the practice of capitalizing or not capitalizing the word *Land*. land refers to landscapes as fixed geographical space that includes earth, rocks, and waterways. land "refers to the concept from a colonial worldview whereby landscapes are common, universal, and everywhere, even with great variation."[129] land, with a lowercase *l*, can generally be made ownable, extractable, objectified, turned into resource, or all of the above. Land, with an uppercase L, which I will return to in a handful of pages, indicates a primary relation or intimate set of relations[130] and is specifically storied. Liborion also explains that pollution is a property right.[131] The ability to possess l/Land (and/or steal "it") makes l/Land pollutable. Access is an iteration of ownership. The foundation for unlimited exploitation of labor and resources is enclosure of land.[132] Liborion explains how the hierarchies embedded in property ownership become codified through most

[129] Liboiron, *Pollution Is Colonialism*, 9.
[130] Liboiron, *Pollution Is Colonialism*, 66.
[131] Liboiron, *Pollution Is Colonialism*, 66.
[132] Federici and Linebaugh, *Re-Enchanting the World*.

environmental regulation, that "under current settler state laws in Canada and the United States, the twinned values of appropriation and possessiveness allow different acts of pollution to make logical and even moral sense." *Why poop in drinkable water?* In the consideration of the toilet, Liboroin urges me to start thinking about sewage and wastewater systems as operating through colonially-defined relations to water (as lowercase, as resource-able, sink-able, and possess-able). These systems entangle the organic material and belly-stories of digesting bodies and communities into topographies of pollution and toxicity. They turn bodily materials *into* waste, thus increasing their potential toxicity to Land and receiving bodies. The possibly toxic effects and intensity of this are unevenly distributed across lines of race, gender, income, and so on (as anyone familiar with movements for environmental justice understands).

Infrastructures and cultures of waste and wasting act on the presumption that the best *use* of water is as a sink. They derive the value of water from its use as a sink, rather than its (*their?*) beingness as a distributed, living being. *But how is the agency of water still recognized?* Wasting coerces the very flowing, gravitational, movable, and distributable characteristics of water into labor for processes of production and consumption. While this use of water for sewage increases the likelihood of waterborne illnesses linked to "inadequate" water-based sanitation systems or systems with anaerobic conditions (pit toilets, for example), it is also about what else gets mixed up with sewage in wastewater systems. *I am also curious about the language that inscribes substances as "pollutants", as inorganic or organic, or understood as dirty, as opposed to a suggestion of an alternative that is clean and untouched.* Alexis Shotwell, in their book *Against Purity: Living Ethically in Compromised Times*, urges the reader to avoid impossible attempts to stand outside the toxic, unjust messiness and contamination of

this world. And rather, to root into the usefulness of thinking about complicity and compromise as a potential beginning or entry point to change.[133] (I think the purity complex inherent in sanitation and disposability consciousness go hand in hand.) This is to engage in what is at its heart a practice of *staying with the trouble*.[134] This practice infiltrates the way that I think about the multiplying and compounding entanglements of waste/water systems. I am moved to linger in and around words like "contaminant", "pollutant", "waste", and to accept a generous amount of imperfection in articulating these ideas and their physical and real attributes and implications. Placing oneself in an orientation against purity requires an immediacy of response-ability[135] and attention. It also requires a recognition, as Michelle Murphy writes in *Alterlife and Decolonial Chemical Relations* in a discussion on the ongoingness of PCB contamination and land theft, that "chemical relations are racist, harmful, even deadly, and that it is up to you to take on the ways that you are caught up in killing (even if they are killing you too, just more softly)."[136] Similarly, regarding complicity and crafting ethical worlds, Shotwell writes, "we do better to start from an assumption that everyone is implicated in situations we (at least in some way) repudiate. We are compromised and we have made compromises, and this will continue to be the way we craft the worlds to come, whatever they might turn out to be."[137] *What does the flush have to do with agency in waste systems? What does it have to do with complicity? To what worlds and realities do I desire having obligations to?*

[133] Shotwell, *Against Purity*, 6.
[134] Haraway, *Staying with the Trouble*.
[135] Haraway, *Staying with the Trouble,* 2.
[136] Murphy, "Alterlife and Decolonial Chemical Relations."
[137] Shotwell, *Against Purity*, 6.

Wastewater and sanitation treatment systems not only process toilet offerings—poop, pee, blood, etc (which also contain traces of pharmaceuticals and chemicals that have entered and moved through a body)—they process a variety of effluents (liquid waste). These include, as discussed in the last chapter, storm runoff that contains agricultural chemicals and byproducts, as well as all the water that runs through a house, hospital, or any building (toilet, sink, shower, laundry, anything dumped down the drain), industrial manufacturers and dumps, and leachate from landfills. Landfill leachate is the liquid which seeps from things piled in the landfill, a characteristically toxic stew accumulated at the bottom of mountains of trash. Some industries that produce wastewater are mining, steel/iron production, pharmaceutical production, power plants, oil and gas fracking, metal finishers, and food production.[138] Industrial wastewaters contain all sorts of substances that are hazardous to human bodies, animal and plant bodies, soils, and water.

An example of such "contaminants" in wastewater are PFAS, (per- and polyfluoroalkyl substances), a classification of manufactured chemicals that have been used in industry and consumer products since the 1940's. Known as "forever chemicals", PFAS are used in non-stick and waterproof products: cooking pans, rain jackets, fabrics, makeup, and so on. Because of the qualities they are designed to possess, they are practically impossible to break down as they pass through wastewater treatment. The EPA states that any level of PFAS in drinking water is dangerous to health. There are many possible contaminants to choose to highlight in acknowledging troublesome impurity and looking for possible intervention points from within that messy acknowledgement. I discuss PFAS specifically here because of the way they glom to

[138]Ahmed, Thakur, and Goyal, "Industrial Wastewater and Its Toxic Effects."

biosolids and complicate practices of composting as after-the-fact responses to large-scale waste-water infrastructures. Their interactions with biosolids exemplify the brokenness of wastewater infrastructure in effectively "purifying" polluted water.

Sixty-eight percent of biosolids, the oopy-goopy material remaining after sewage water has been treated, also known as *sludge*, produced by wastewater treatment facilities in New York State end up in landfills.[139] The conditions in landfills usually lead to anaerobic decomposition, which produces methane gas as a byproduct. Aerobic decomposition (what happens in well-maintained compost that fosters oxygen-rich environments), however, does not produce methane because methane producing microbes are not active in the presence of oxygen. Another sixteen percent of biosolids in NYS are distributed to "beneficial use" through land application, composting, heat drying, and mine reclamation.[140] Using biosolids for agricultural land application is a practice encouraged by the EPA, which claims its safety and effectiveness. Biosolids are also sometimes made into compost for land application. Obviously, processed biosolids are rich in nutrients that offer a considerable subsidy to depleted agricultural soils. Toilet materials that are immediately intended to be composted with carbon-rich materials such as sawdust and plant and food matter differ from biosolids, which only exist as a result of water-use, or lower-case-*l,* relations. The large-scale practice of composting and/or land application of biosolids tries to remedy the results of these relational systems that are not designed to treat chemicals, through re-cycling, rather than interject at a critical juncture wherein poop, pee, and water become entangled with industrial waste. Due to the water-propelling qualities of PFAS, they end up in extremely high concentrations in biosolid sludge. When this composted sludge is

[139] Baker, "Biosolids Management in New York State."
[140] Baker, "Biosolids Management in New York State."

land-applied, PFAS are fed to soils and fed to what grows in them. Relations to bodily "waste" are tangled up in the various ways soils are built and cared for, whether they are fed with toxic contaminants or not. The failing of these systems, which work and fail at the same time, is a consequence of structural conditions.[141] Practices of attempting to remedy an already-failure of responsible relationship exemplify that waste infrastructures have been failing since their inception. "Under certain circumstances," as Jack Halberstam explains in *The Queer Art of Failure*, "failing, losing, forgetting, unmaking, undoing, unbecoming, not knowing may in fact be more creative, more cooperative, more surprising ways of being in the world." *Where are the critical junctures located, where alternative, surprising ways of being can take place?*

Returning to Liboiron, *Land*, with the capital *L*, indicates a primary relation or intimate set of relations. Land is a verb. A continuous making and unmaking which also contains compromised pasts and presents. Among Land, no hierarchy of privilege places one being over another.[142] Land is a collection of string-figurings and co-becomings, historically embedded, present, and oriented to particular, varying, and multiplying realities being or not being yearned for. My body *is* soil. I *am* soil. I *am* water. As Kimmerer writes, Land is where one's "responsibility to the world is enacted."[143] Land is also a set of many kinships, good or bad, and sometimes contradictory. Kinships are the relationships to people—human, plant, soil, water, or even structures of harm—that one is accountable to. Kinship is also far more interesting when the boundaries of the individual are understood to be porous. In defining kin Haraway writes:

> Kin is a wild category that all sorts of people do their best to domesticate. Making kin as oddkin rather than, or at least in addition to, godkin and genealogical and

[141] Halberstam, *The Queer Art of Failure*, 3.
[142] Liboiron, *Pollution Is Colonialism*, 44.
[143] Robin Wall Kimmerer, *Braiding Sweetgrass,* 13*;* Liboiron, *Pollution Is Colonialism*, 44.

> biogenetic family troubles important matters, like to whom one is actually responsible. Who lives and who dies, and how, in this kinship rather than that one? What shape is this kinship, where and whom do its lines connect and disconnect, and so what? What must be cut and what must be tied if multispecies flourishing on earth, including human and other-than-human beings in kinship, are to have a chance?[144]

In defining the contours of kin and activities of kinship, the phrase "to whom one is actually responsible" stands out in figuring out how to imagine mutual worldings that move out from settler-colonially infiltrated ways of being. The shape of kinship is similar to the possible shapes of care networks. Both are about the whos, whats, whys, whens, and hows of obligations and accountability. Like the refusal of a purity approach underscores, it can be possible to have obligations to bad kin or infrastructures of harm, or to be bad kin. There is no blank slate from which to start, as the terrain is already compromised.[145]

Murphy describes this compromised terrain as *afterlife*:

> the conditions of being already co-constituted by material entanglements with water, chemicals, soil, atmospheres, microbes, and built environments, and also the condition of being open to ongoing becoming. *Hence, afterlife is already re-compiled, pained, and damaged, but has potentiality nonetheless.* Life holds together tensions between violence and possibility, braiding the organic and the inorganic, body and land, and resides in the indistinctions. Between infrastructures and ecologies, recognizing afterlife attends also to openness, to *a potential for recomposition* that exceeds the ongoing aftermaths.[146]

An ongoing openness, a potential for recomposition that exceeds the ongoing aftermaths

Afterlife is a hot compost pile of networks of material (and cultural, political, and spiritual) infrastructures which entangle people (human and nonhuman), thwarting

[144] Haraway, *Staying with the Trouble*, 2.
[145] Liboiron, *Pollution is Colonialism*, 89.
[146] Michelle Murphy, *Alterlife and Decolonial Chemical Relations;* Liboiron, *Pollution is Colonialism*, 89.

agency at particular junctures. Afterlife is also rich, however compromised, with the potential to feed soil. Anthropologist Anne Spice[147] *in Fighting Invasive Infrastructures: Indigenous Relations against pipelines*, articulates the ways in which critical infrastructures, specifically pipelines, from a settler-state perspective and practice (Spice writes out from the context of occupied l/Lands in so-called "Canada") directly harm the critical infrastructures of Indigenous Peoples, Lands and Nations. In the article, Spice layers two meanings of critical infrastructure: one designed by the settler state, and one defined by the lifeways of Indigenous communities and Lands. The United States government (from a settler state perspective) defines critical infrastructures as infrastructure sectors "whose assets, systems, and networks, whether physical or virtual, are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof."[148] According to the US government, one of these critical infrastructures is waste and wastewater treatment.

Infra literally means *below*. Infrastructures are the underpinning[149] of so-called 'modern' societies. They are in part responsible for the reinscription of colonial dispossession through domination over the materials they circulate and the land those materials are circulated through. They are below-the-ground architectures and pipeworks that allow the normalcy of this world to go on without question or afterthought. These definitions shape the way infrastructure exists, but they are rife with an assumption of inanimacy, that they are not alive.[150] What is left out of such

[147] Anne Spice is a Tlingit member of Kwanlin Dun First Nation, a queer Indigenous feminist and anti-colonial organizer.
[148] "Critical Infrastructure Sectors | CISA."
[149] Larkin, "The Politics and Poetics of Infrastructure."
[150] Spice, "Fighting Invasive Infrastructure," 42.

definitions of critical infrastructure "is a world of relations, flows, and circulations that the settler state has attempted to destroy and supplant."[151] Rather than being "things and the relations between things",[152] infrastructures should be considered as assemblages, sets of *living relations* and the "things" belonging in those relations.[153] The relations, or string figures, between, or knotting and braiding together beings—soil, water, humans, bears, poop, trees, toilets, chemicals, toxins— are alive critical infrastructures.[154] Chemicals are *human*, *water, soil,* and so on, inextricable. Infrastructures are also by definition future oriented.[155] They indicate what futures are being invested in and actively manifested, and their temporality extends onward because they are long-term investments. They indicate to whom and what that future and system has obligations to.

Talking about future is tricky business. Here, in this writing, I understand "future" as a plurality of possibilities that are being tended to or not being tended to in this moment, this moment which is also a plurality of futures based on historical conjectures and alive relations. Settler-colonial and extractive politics have not busied themselves much in the practice of thinking about the actual wellbeing of future kin, but have rather focused on the reproduction of the same harmful systems and obligations over and over to ensure the continuous accumulation of capital. The French Marxist philosopher Louis Althusser wrote, "The ultimate condition of production is the reproduction of the conditions of production." In other words, as Halberstam explains, "In order for a system to work, it has to keep creating and maintaining the structures or

[151] Spice, "Fighting Invasive Infrastructure," 49.
[152] Spice, "Fighting Invasive Infrastructure," 42.; Larkin, "The Politics and Poetics of Infrastructure."
[153] Spice, "Fighting Invasive Infrastructure," 42.
[154] Spice, "Fighting Invasive Infrastructure," 42.
[155] Spice, "Fighting Invasive Infrastructures," 47.

the structured relations which allow it to function."[156] As someone studying the "environment," I am discerning in the way future is talked about in part because it often goes hand in hand with notions of sustainability, and production and development. I always ask, what are you aiming to sustain? A well-intentioned infrastructure built to compost biosolids after the fact of wastewater treatment still sustains a relation with water as a resource for disposal.

Resistance to settler-state critical infrastructures, specifically blockages to pipelines as Spice highlights, slow and disrupt flows of extractive capital, while also attending to the networks of relation that are not typically considered along with the so-called built environment.[157] The resistance to pipeline infrastructure, as Freda Huson (female chief (Dzeke ze') from the Wet'suwet'en people in Canada) says, "protects our [Wet'suwet'en] critical infrastructure. The salmon and the bears: That whole cycle and system is *our critical infrastructure."* [158] Resistance and blockage that protects these relations, through the insistence on Indigenous jurisdictions and assemblages, requires standing in place[159] to disrupt the reproduction of settler futures promised by pipeline construction. This standing-in-place opens up a holding-in-suspension, a sort of pause, to further investment in settler futures and relations. Suspension is more than putting realities on hold (realities where Land and People are dispossessed of each other to build pipelines that will inevitably break and cause extreme harm and pollution). Suspension constitutes its own opening up of a timeline, its own condition,[160] wherein radical possibility might emerge. What architectures (living and material), specifically

[156] Halberstam, *The Queer Art of Failure*, 17.
[157] Spice, "Fighting Invasive Infrastructures," 48.
[158] Spice, "Fighting Invasive Infrastructures," 42.
[159] Spice, "Fighting Invasive Infrastructures," 41.
[160] Spice, "Fighting Invasive Infrastructures," 49.

toilet architectures, emerge in the conditions and timescales of suspension to meet the practical needs of communities enacting suspension and resistance? What seeds get sewn in those moments?

One of the largest emergency community-managed compost toilet systems ever attempted was at the Oceti Sakowin prayer camp during the Standing Rock demonstrations in 2017, where Indigenous water protectors, supporters, and activists were protesting the construction of the Dakota Access Pipeline.[161] The pipeline, one-thousand-and-two-hundred miles long, was built to transfer crude oil from the Bakken field in North Dakota to Illinois.[162] In 2015, the U.S. Army Corps of Engineers published a draft to approve the pipeline, opening it up to public comments on environmental and cultural impacts.[163] Operating as a sovereign nation, the Standing Rock Sioux stated that the pipeline posed "a serious risk to the very survival of our Tribe… and would destroy valuable cultural resources," in a resolution passed in 2015.[164] The pipeline violates Article II of the Fort Laramie Treaty (the same treaty containing the clause which was violated by white settlers killing the Bison of the prairies). The treaty guarantees the "undisturbed use and occupation" of reservation lands, which surround the proposed location of the pipeline.[165] More specifically, the pipeline runs within a half-mile of the current boundaries of the Standing Rock Sioux Reservation, which is land that was taken from The Standing Rock Sioux by Congress in 1958.[166] (All the Land the pipeline runs through is stolen). It runs through cultural and burial sites of

[161] "STANDING ROCK | Give Love."
[162] Fitterman, "The Dakota Access Pipeline (DAPL) - Harvard Law School."; The invitation for public comments was eventually revoked.
[163] Hersher, "Key Moments In The Dakota Access Pipeline Fight."
[164] "Standing Rock Sioux and Dakota Access Pipeline | Teacher Resource."
[165] "Standing Rock Sioux and Dakota Access Pipeline | Teacher Resource."
[166] Fitterman, "The Dakota Access Pipeline (DAPL) - Harvard Law School."

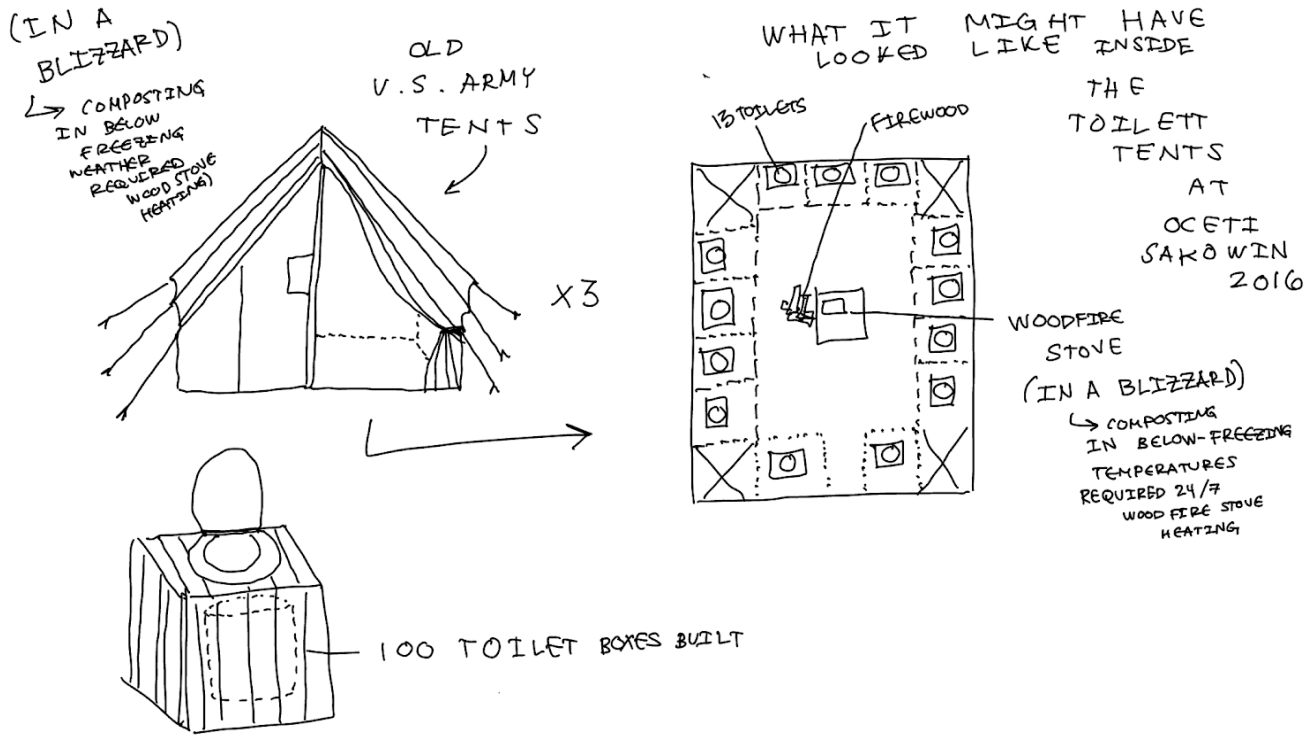
the Standing Rock Sioux and other tribal nations.[167] It poses a severe threat to water health, as inevitable leaks or breaks result in devastating pollution to the Missouri River and Lake Oahe waterways.

By November 2016, the situation at Standing Rock had become intensely militarized. Protestors practicing peaceful assembly were being shot at with rubber bullets and water cannons by the police.[168] The camp's population had grown to over fifteen thousand people[169] and harsh winter blizzards were fast approaching. Soon, the blue chemical-ly liquid of the one-hundred-and-twenty-five porta-potties that protestors and protectors were using would freeze, making them completely unusable. It turns out that the contents of these porta-potties, which included unprocessed human organic material and numerous biocides, were being dumped into open prairie landfills.[170] Historically, portable toilets have used formaldehyde as a deodorizer and biocide. Formaldehyde is a known carcinogen—the same chemical used to embalm corpses and prevent them from decomposing back into the earth. While the use of formaldehyde has dwindled in porta-potties, they still use biocides that are extremely toxic to beneficial soil microorganisms. Excessive land application of biocides causes microbial, plant and animal extinction, and leaves a chemical trace in soils.

Amidst a possible sanitation emergency that could effectively shut down the prayer camp, the Standing Rock Sioux Tribe's EPA needed a sustainable solution that would protect their Land, including their waterways. The system had to be completely waterless due to the freezing temperatures. *Givelove*, a nonprofit organization that

[167] Fitterman, "The Dakota Access Pipeline (DAPL) - Harvard Law School."
[168] "Police at Standing Rock Are Using Life-Threatening Crowd-Control Weapons to Crack Down on Water Protectors | ACLU."
[169] Miller, "Extreme Composting At Standing Rock."
[170] Miller, "Extreme Composting At Standing Rock."

trains communities in safe sanitation and composting,[171] worked with the Sioux Tribe to create and manage a clean compost toilet system that would serve thousands.[172] They planned to build one-hundred compost toilets in retrofitted U.S. Army tents. By early December, as the population decreased in the harsh weather, the toilet operation was centralized into three army tents. Each included thirteen toilet stalls that surrounded the common areas. A woodfire stove was centered in each of these common areas, ventilated through ducting in the fabric roof. The stoves provided the round-the-clock heating necessary to keep the toilet contents from freezing. Compostable Biobags were used so toilet contents did not freeze to the sides of the five gallon buckets.[173]



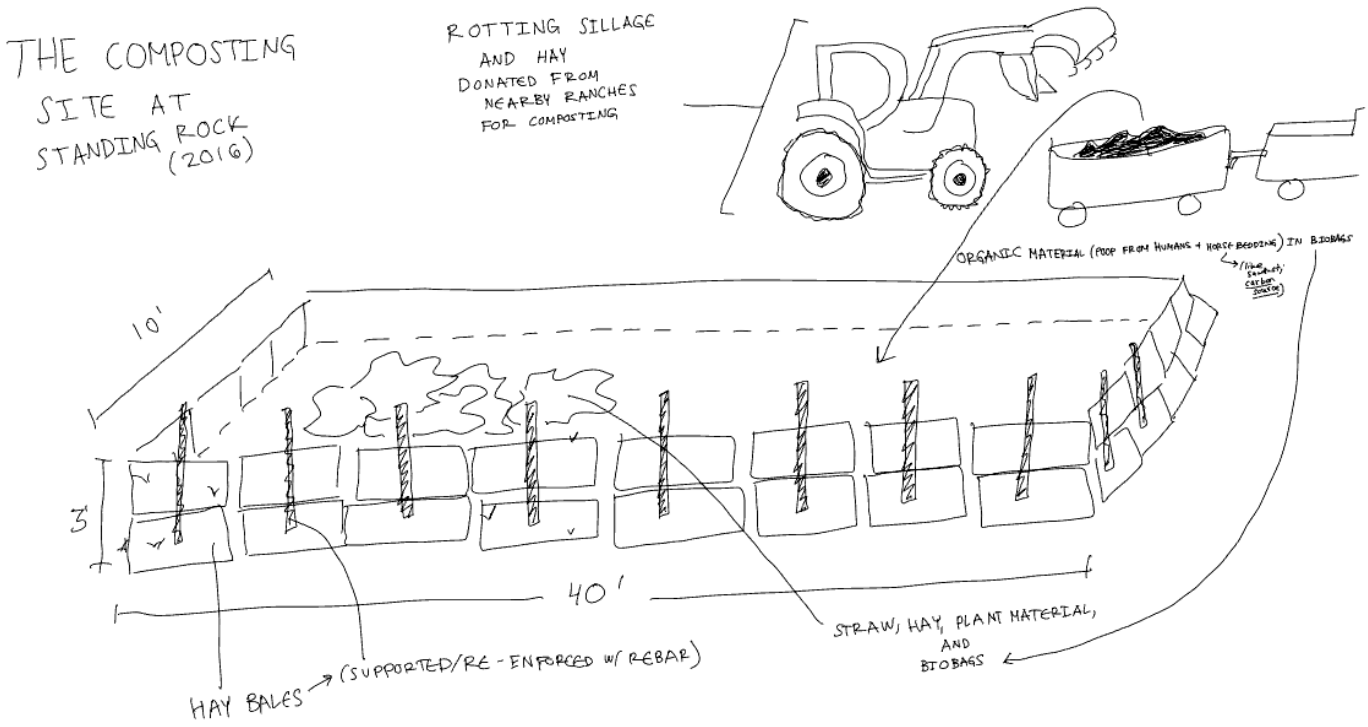
[171] *Givelove* follows the practices of Joe Jenkins, author of the Humanure Handbook and the Compost Toilet Handbook.
[172] Miller, "Extreme Composting At Standing Rock."
[173] Miller, "Extreme Composting At Standing Rock."

The significance of the practical and material transformation of the U.S. Army tents into compost toilets cannot be understated. While the U.S. Army Corps of Engineers, the US government, and the National Guard directed violence, through the construction of the pipeline and through physical attacks, toward the protestors and the Standing Rock Sioux, the composting crew turned these tents into the spaces crucial to the wellbeing and continuance of the prayer camp. Alyssa Keesey, founder of *Givelove*, wrote: "Despite surveillance helicopters, police checkpoints, blizzards and infiltrators trying to sabotage us, we kept working."[174] Here, the architecture of the tent outlived its intended militarian use. It was redefined through its use as a communal toilet, where protestors' poop would be transformed into compost over the next eighteen months, rather than pollute the Land they are protecting. The tents were the material basis for an opening of possibility that restructured care networks within the prayer camp.

In the extreme blizzard, two forty-foot shipping containers were used as deep freezers to store the poop until warmer weather came.[175] This material was already partially decomposed with pine-shaving horse bedding, thanks to the warmth of the woodfire stoves. Four months later, the crew composted four thousand bags of organic toilet material[176] in a designated compost site—the location of which was decided by the Tribe's EPA. The compost site—two forty-foot by ten-foot straw bale bays which were reinforced with rebar—was built by three composting technicians and six volunteers. During construction of the compost site, the crew was handcuffed and detained temporarily "during a raid by state-sponsored forces."[177] The compost material, once moved to this site after the winter passed, went through the aerobic composting process

[174] "Composting on the Front Lines of Standing Rock."
[175] "Composting on the Front Lines of Standing Rock."
[176] "Composting on the Front Lines of Standing Rock."
[177] Miller, "Extreme Composting At Standing Rock."

with added rotting silage and straw and was cured for eighteen months. The biobags were punctured with a pitchfork to make sure the bags and the material inside decomposed. Preliminary tests performed after one year proved the compost samples to be completely pathogen free, and the BioBags were completely disintegrated.[178]



What went on in those compost piles to turn poop into compost and ensure it was pathogen free? First of all, poop from a human digestive system is about seventy-five percent water. The remainder is solid matter composed of bacterial biomass, protein or nitrogenous matter, inorganic phosphate, carbohydrate or undigested plant matter, and fat. There are an estimated one-hundred-billion bacteria per gram of poop. About half of those microbes are alive, and the other half are dead—they have finished their journey living in your gut and helping you digest the world. Adding poop to a compost pile feeds

[178] Miller, "Extreme Composting At Standing Rock."

it with nitrogen. Compost must be fed because it is alive! It is kind of like needing to feed your kitchen sourdough starter, except that that is fermentation.[179] A compost pile must also be kept moist because bacteria are swimmers (having evolved from ocean-beings, just like you), and are mobile through moisture, swimming up from the soil below, through the biofilter, into the pile.

Composting is a reminder of the becoming-together-ness of symbiosis: that one being's waste is another's nourishment. Biologically, there is no such thing as "waste" as one living amongst pollution-affirming infrastructure might understand it. In the process of composting, microorganisms break down organic matter through their digestion. Bacteria are the smallest living organisms, and the most numerous in compost (followed by actinomycetes, fungi, protozoa).[180] They excrete enzymes that chemically break down organic material. Saprophytes, the majority of fungi, decompose dead matter and create life out of death.[181] These beings make sure no energy is lost and is instead transformed to new life.[182] Saprophytes remind me that it's important to let things rot.

The results of composting are the production of carbon dioxide, water, heat, and humus.[183] Humus is the dark, organic material that forms from decay. In *Braiding Sweetgrass*, Robin Wall Kimmerer writes about the physiological effect that the smell of humus has on humans. As research shows, "breathing in the scent of Mother Earth stimulates the release of the hormone oxytocin, the same chemical that promotes

[179] My sourdough starter companion(s), that I co-parent with my housemate Sam, is named Shelly. She is lively, rambunctious, and pungent in a good way.
[180] "CORNELL Composting - Compost Microorganisms."
[181] Ostendorf-Rodríguez, *Let's Become Fungal!*, "TEACHING FOUR: How to Re-think Decay and Decomposition"
[182] Ostendorf-Rodríguez., "TEACHING FOUR: How to Re-think Decay and Decomposition"
[183] "CORNELL Composting - Compost Microorganisms."

bonding between mother and child, between lovers." When we smell the dark, sweet earthy smell that is the result of healthy decomposition, our brains release the love chemical, telling us to love the result of slow decomposition, and to feel at home.

In the Standing Rock compost sites, the BioBags of pine-shaving horse bedding, poop, pee (absorbed into the pine shavings), and toilet paper were composted with straw and rotting silage. The right carbon (plant matter) to nitrogen (poop and food scraps) ratio encourages the activity of heat-producing microorganisms. There are three main phases in composting: mesophilic, thermophilic, and maturation. In the initial mesophilic phase, mesophilic microorganisms begin to break down the soluble material and substrate. During the mesophilic phase, the pile begins to heat up as a byproduct of the microbial action. Once the pile exceeds 104 degrees Fahrenheit, those mesophilic microorganisms slow their role due to the high temperature. This begins the thermophilic stage, where heat-loving microbes start really digesting and breaking down the poop and plant matter fed to the pile. The pile heats up to 131 degrees Fahrenheit.

It's important that compost piles that compost poop be carefully monitored for temperature. Human poop contains pathogens that spread diseases such as cholera and E. coli—which is why sewer systems work to get poop far away (especially because these diseases are waterborne). When thermophilic conditions are sustained for a few consecutive days, any pathogens present die in the heat. As all this happens, the compost shrinks down. Once the organic material has been broken down, temperatures cool back down and mesophilic microbes recolonize the compost. A compost pile that is still being filled up and routinely fed contains additional layers of these processes. When fed, cover material is moved to the side and poop, food waste, and additional plant matter are added into the active center of the pile, and then covered back up.

In this way, a compost pile is thick with timescale layers. There is slow soil-building time, and also fast and hot thermophilic time, the compost pile containing various stages of decomposing and composing. The maturation process for compost is typically a year to two years for piles that eat poop. This can start after no new material is being added to the pile. The maturation process ensures that the compost is not phytotoxic, and safe for land-application. The longer compost cures, the more diverse its microbial community.[184]

When applied to soils, compost increases their ability to store and sequester carbon. Compost encourages mycorrhizal fungi, who convert nitrogen and phosphorus for plants as part of their symbiotic relations. Mycorrhizal fungi produce glomalin, a carbon-rich protein that coats fungal threads.[185] Glomalin lasts up to forty years in soil. About one-thousand-five-hundred gigatons of carbon are sequestered in all of the planet's soils.[186] About a third of that is contained in glomalin.[187] Offering nutritious compost to soils feeds healthy intra-soil relations that sequester carbon over slow time. This past year at the Bard Farm, we spread an estimated one-hundred-and-fifty thousand pounds of compost. This compost is made on campus using food scraps from the dining hall, which are layered with wood chips in huge mounds. All of this compost was spread with five-gallon buckets. (We use shovels to fill the buckets from heaps of compost that are delivered to the farm from the campus dump via truck, and then carry one to two buckets of compost at a time to cover the beds we are building). More than half of this compost, over seventy-five-thousand pounds, went into the no-till beds.

[184] "CORNELL Composting - Compost Microorganisms."
[185] Bone, *Microbia*, 92.
[186] Bone, *Microbia*, 92.
[187] Bone, *Microbia*, 92.

These no-till beds are carbon sinks. As Rebecca Yoshino, the head farmer, manager, and educator at Bard Farm, says, "This is how we are feeding our soil."

To talk about Standing Rock and the Dakota Access Pipeline, and the compost toilet system at the Oceti Sakowin prayer camp, is to talk about water, soils, and life. Water is deeply entangled with histories (and presences) of land theft, dispossession, ownership, and genocide. On personal-water relations, Candace Ducheneaux (Oglala Sioux from the Cheyenne River Reservation), said in an interview in 2016:

> What we have to do is repair that water cycle. The way to do that is to re-establish the small water cycle over our own micro-environment. That means we all have to take responsibility. They say water restoration begins in your own backyard. You have to start thinking of your own self and how you can do it. Like I said, all of humanity has to become involved.[188]

Ducheneaux's proposition that we have to start thinking about our own selves when wondering about how to re-establish healthy water cycles suggests the depth to which each body belongs within local and global water cycles. This personal-entanglement exists amidst systemic ways in which peoples and communities are varyingly-complicit in wasting, and how some are historically deprived of their rights to clean water and are unevenly affected by toxic chemical relations. In discussing optimism and responsibility, Barbara Einrich points out in her book *Bright-sided*, "the flip side of positivity is thus a harsh insistence on personal responsibility… that failure is your own doing."[189] This harsh insistence on personal responsibility has potential to negate the structural causes of failure that have resulted in broken and harmed water cycles. It negates that health is a result of environmental degradation.[190]

[188] Zambelich and Alexandra, "In Their Own Words."
[189] Halberstam, *The Queer Art of Failure*, 3; Ehrenreich, *Bright-Sided*, 8.
[190] Halberstam, *The Queer Art of Failure*, 4.

The compost toilet system at Standing Rock kept the prayer camp alive. It acted as a temporary emergent strategy that met the bodily needs of its community in an act of suspending the pipeline. The dry compost toilet, as a humble material intervention, insisted on an ongoingness of suspension that could have otherwise been forced to end in that moment. Compost toilets, through the physicality of the bucket, create a departure from the normality of the flush as a mundane diurnal engagement. This departure and resistance, and the labor, care, and time that went into turning the toilet-material into compost, is then storied into the soils which receive it. It is sequestered as a story-layer of Land and returned to the prairie. A tree that grows from those soils is a very important tree.

The Oceti Sakowin toilet system also exemplifies an emergent network of care infrastructure with distinct obligations. As Maria Puig de la Bellacasa writes in *Soil Times, The Pace of Ecological Care,* care relations take the shape of the mundane doings of maintenance and repair.[191] In small-scale compost toilet infrastructures, care relations are the hard labor that fosters tender acts of reciprocity. This allows for the continual holding of new conversations with Land. As I experienced at the Mycology Summit, care labor took the material form (from my engagement as a compost fairy) of building the system, transporting and hauling heavy buckets of poop-sawdust material, moving wheelbarrows of wood-chips and food waste, waking early, tending to the needs of other people's bodies, collecting cover material, adapting to varying conditions and arriving needs, scooping sawdust, ongoing communication with peers, eating, resting—all hard work that requires repetition and the return of attention. It also required the care-labor of my gut microbiome, of the soils which grew the food I

[191] De La Bellacasa, "Soil Times."

consumed, of the farms which donated that food, of the volunteers cooking it, of the sawdust, of all the hungry decomposers in the pile.

Just as it matters how water is perceived in shaping communal infrastructure, it matters how soils are understood: "What soil is thought to be affects the ways in which it is cared for, and vise versa, modes of care have effects on what soil is to become."[192] Viewing soil through a food web model, which includes species such as algae, bacteria, fungi, protozoa, nematodes, arthropods, earthworms, larger animals (humans, for example) and plants, allows for understandings of the complexity of soil communities.[193] This way of thinking, of soil as foodweb, or soil as the gut microbiome of the earth,[194] underscores that healthy soils only exist through multispecies community making–through living and dying together. In a palmful of healthy soil, there are ten billion to fifty billion bacteria, seven meters of fungal hyphae, thousands of protists, hundreds of insects, and more.[195]

These interdependent ways of knowing soils also disturb one-directional conceptions of care[196] as they exist in settler-colonial soil relations that relate with them through a means of production and yield, rather than as living assemblages. Disturbing one-directional conceptions of care, that are actually articulations of control, disturbs the linear timescales of production. *(How do I know that this isn't a one-directional act, but a multi-way conversation?)* Soil productionist exploitation creates a timescale that discounts the future by embedding and compressing "everyday practices, relations, and

[192] De La Bellacasa, "Soil Times."
[193] De La Bellacasa, "Soil Times."
[194] Bone, *Microbia*, 96.
[195] Bone, *Microbia*, 96.
[196] De La Bellacasa, "Soil Times."

embodied temporalities of practitioners in this industrious speeded-up time."[197] Everyday rituals have to be enacted on speeded-up timeframes.

Composting can also be considered as reproductive "work", as it has everything to do with eating and feeding and soils. Sylvia Federici, in *Re-enchanting the World: Feminism and the Politics of the Commons*, writes that "reproductive work is the material basis of our life and the first terrain on which we can practice our capacity for self-government, it is the ground zero for revolution."[198] Composting, as an infrastructure of relations and an alternative reproductive practice, insists we rest longer in the threshold of decay. In this sense, composting undoes a capitalist insistence on reproduction, one that is linear and re-enforces the same logics over and over through continuous simplification. Federici calls this process of undoing *re-enchanting*: "discovering reasons and logics other than those of capitalist development."[199] In *The Queer Art of Failure,* Jack Halberstam converses with James C. Scott's idea of "seeing like a state" to understand the fruitfulness of failure. To see like a state, "means to accept the order of things and to internalize them; it means that we begin to deploy and think with the logic of superiority of orderliness." And in seeing like a state, "we erase and indeed sacrifice other, more local practices of knowledge, practices moreover that may be less efficient, may yield less marketable results, but may also, in the long term, be more sustaining." Composting, as a local practice of knowledge which is less efficient, yields less marketable results, but is in the long term more sustaining than "modern" waste infrastructure and manufactured fertilizers, is its own queer art of failure. Lingering longer in the threshold of decay is the art of composting—literally turning shit

[197] De La Bellacasa, "Soil Times."
[198] Federici and Linebaugh, *Re-Enchanting the World,* 195.
[199] Federici and Linebaugh, *Re-Enchanting the World,* 195.

into nourishment. It is an art of re-enchanting relations with soils, water, and hungry bellies, opening up the space to consider what exactly needs to decompose in order to sustain more livable worlds.

Compost toilet systems, as living care infrastructures, invite a new shape to toilet-ritual. Rituals, as Byung-Chul Han writes in *The Disappearance of Rituals: A Topology of the Present*, "turn the world into a reliable place." As processes of "embodiment and bodily performance," rituals act as "symbolic techniques of making oneself at home in the world. They transform being in the world into a being-at-home."[200] Re-thinking settler-colonial relations with l/Land requires new sorts of makings-at-home. Rituals create a sense of dwelling through attention, rendering time habitable.[201] And attention requires repetition in order to deepen. Rituals are not easy. Han writes that ritual is the glue of community, that it reminds us of the bodily dimension inherent to community. *"Ceremony brought the quiescent back to life."*[202] Compost toilets bring soils and water back to life.

Re-thinking toilet-ritual is about the humbleness of right here, the scale of communities, and the intimacies of relation.[203] The 'humbleness of right here' is an ethics and practice of "recognizing you are connected to others and that you cannot do anything without these others."[204] A compost toilet—a bucket, some sawdust, and a compost pile—is a humble intervention. Compost toilet systems, as living care infrastructures that reorganize obligations, insist on non-wasting futures. They also insist on worldmaking and solidarity. Solidarity with the nonhuman, as Morton suggests

[200] Han, *The Disappearance of Rituals*, 15.
[201] Han, *The Disappearance of Rituals*, 2.
[202] Kimmerer, *Braiding Sweetgrass*, 34.
[203] Liboiron, *Pollution Is Colonialism,* 85.
[204] Kimmerer, *Braiding Sweetgrass*; Liboiron, *Pollution Is Colonialism*.

in *Humankind*, is the default of the biosphere. As a political and ecological state, it is the relying-on between beings, species, organisms, timelines. It is the more-non-human-than-human-cells that make up "my" body and digestive system. This default is exploited by the piping of oil across the United States and the water flowing through the pipes in our house. Compost, as a practice that insists on lingering in decay, thickens time and renders it habitable. Thick time, "a transcorporeal stretching between present, future, and past," helps reimagine bodies—digestive systems, bellies, soils, microorganisms—as archives and makers of weather.[205] In a net of thick and layered time, many distinct L/land relationships interact, many strings tangle, and bodies weather the planet[206] in myriad scales. The concept of thick time opens up how I conceptualize climate change, and how I understand the pipeworks which shape the relations and world-makings and endings I belong to, how the story of what I ate is piped to the river and how changing weathers complicate that. It helps me delve into the oopy-goopyness and incommensurabilities of the present. It helps me eat the earth.

And by that I mean:

[205] Neimanis and Walker, "Weathering: The thick time of transcorporeality."
[206] Neimanis and Walker, "Weathering: The thick time of transcorporeality."

To fill my belly
with the sweet potato
which was cured to last the winter,
and which before that
was harvested in the fall.
And before that,
grew in the decomposing hugelkultur beds.
In the hugelkultur beds,
where wood that was once
rings of land memory in tree form
are decomposing.

And in the pockets of dwelling
that the wood and the earth make together,
is a garden snake making home.

Thick time helps me eat the minerals the glaciers deposited here,
who carved this valley and the river which runs both ways
which connects me
to the tiny glass eels in my palm
to their intertidal and eely temporalities.

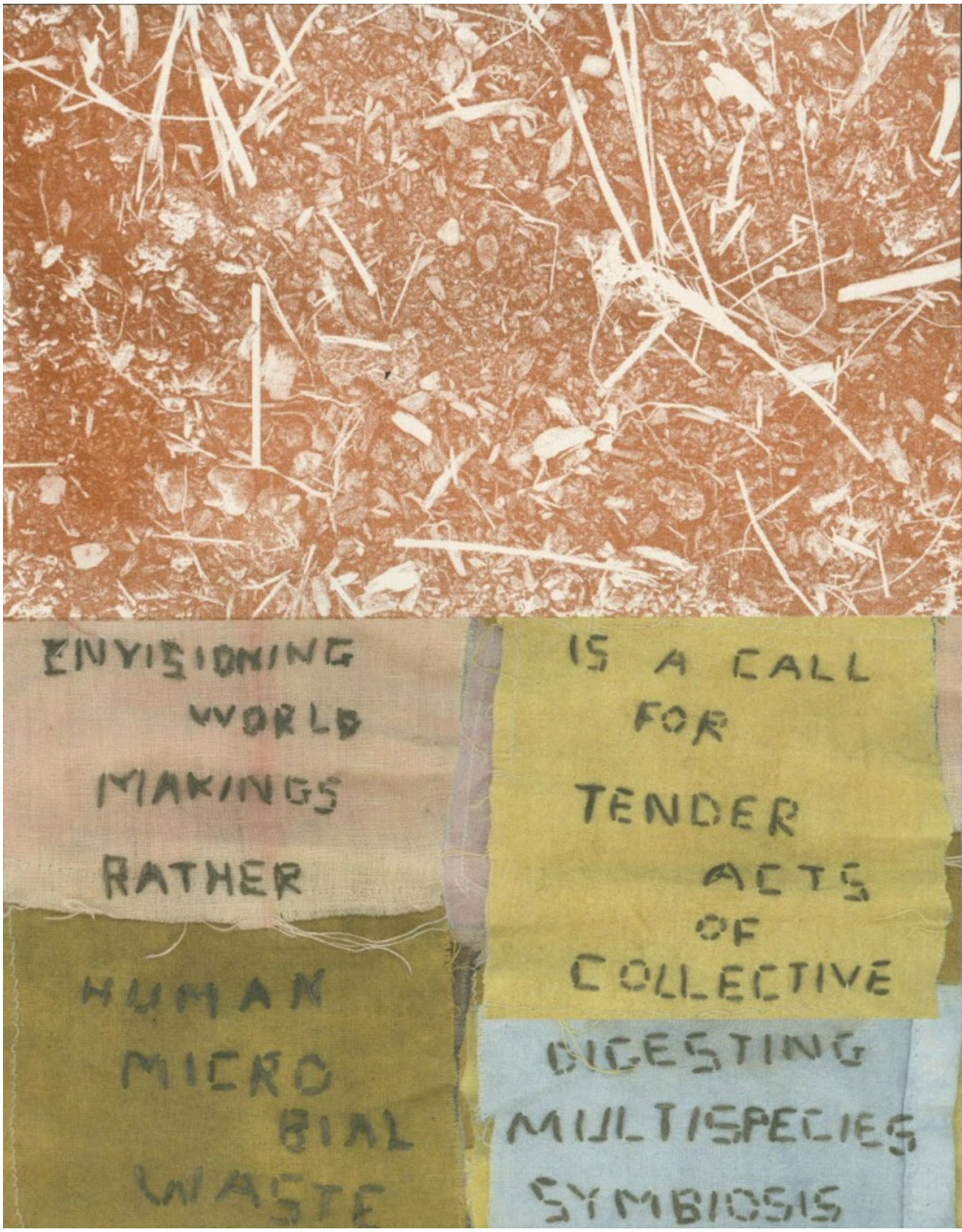
To eat the glaciers which carved this valley,
forming this layered geology and these soils.

Eat the bounty of a summer of too much rain.
Eat the top soil we are in turn feeding, that will give life
to the young and scraggly sweet potato sprouts we planted

mid-summer,

and then with our cold, dirt-covered hands,
garlic in their succession.

To eat the land's overlapping stories.
Thick time helps me eat the land.
And eventually,
after some slow digesting,
poop it out.


ENVISIONING
WORLD
MAKINGS
RATHER
IS A CALL
FOR
TENDER
ACTS
OF
COLLECTIVE
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IS
SLOWLY
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DECAY

compost toilet as a radical act of care? de-composed manifesto

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