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In the Weeds

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IN THE WEEDS

By

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PART I

After a smoky week in the dry heat pulling weeds at the PEAS Farm in Missoula, Montana, I looked back to see a pile of greens in a greater heap than any harvest we'd had all Summer. It's an awful shame we can't just eat those, I began to wonder to myself. This thought nagged in my head as I headed to my night shift at the restaurant downtown. I swept up chunks of wasted collard greens, rice imported from China and other non-organic, non-local ingredients I had slopped into little cardboard bowls for the endless stream of consumers, a beaming smile that twitched at its edges when I greeted each person as they entered, one by one, with the same phrase: *What are you havin' tonight?*

As each day came to a close, I would bring home huge metallic pans of rice and meat, dried out from their long day under the flickering heat lamps. I was twenty and I was hungry. Every morning I grazed in the fields, the richest raw foods by the handful, leaving with pockets full of slowly wilting snap peas and later, crisp little holey apples from the orchard. Every day at noon we would break for lunch - cooked by members of our farm crew using only foods from the field. At night I scarfed down leftovers from the restaurant, although if I stared too long at my plate I began to realize how much it resembled the dust pan I repeatedly clanked against the side of the trash can, thumping loose wet chunks of sauce and the fatty bits of meat customers spit right onto the floor. I hated that job, but I loved my mornings at the farm. Still, I hated waking up early to stand in the heat, wobbling unsteadily on my feet after a long night, untangling clumps of organic matter from the roots of weeds with my bleach-fried fingernails as I tossed them lazily over my shoulder into massive piles.

Some weeks it felt like all we did was pull weeds; weeds that couldn't even go to the compost pile because of their virility. Some of them put out roots when dropped on the hard, dry cracked surface of the soil, forgotten in the pathways and even trampled under foot. I yearned to be as resilient as these weeds. I wanted to consume them, I wanted to become them, I wanted to be rid of them. I had dreams of quack grass strands longer than me, tugging and pulling until the final pop as they released from the soil, only to realize the satisfying sensation was a snap. From the broken off chunks of root underground, more would only grow in tufts stronger and thicker. It felt as hopeless, and as useless, as I did then.

One afternoon I'd had enough. I gathered the withering heap of weeds up into my arms, bits of dirt and writhing worms falling between stems as I began to lift it and pack the mess into the backseat of my car. It was destined for the dumpster and I wasn't going to let that happen. For me, it was nearly impossible to fall asleep after my long summer days. No matter how my eyelids drooped towards the end of the night, vision blurring as I stared at the analog clock, avoiding eye contact with customers as I spoke, by the time I crawled into bed I felt wired. I spent the nights torturing my already burning eyes staring deeply into the blue light beam of my laptop, desperately trying to learn everything I could as if the internet would be gone by the morning.

The night before, I had been up until that morning searching keywords: dandelions, I knew, were edible thanks to a strange and wonderful aunt's advice growing up. I needed to know what else I could make use of. Galinsoga, Amaranth, Pigweed, and Perslain, which made up the vast majority of the piles dragged to the dump, were all, remarkably, edible. A feeling of sheer excitement rose in my stomach as I scrolled through pages on the screen, a feeling I had almost

forgotten. *I know what I'm havin' tonight*, I thought to myself as the gray light of dawn pierced through the thin window blinds of my cheap student housing apartment, *probably over rice.*

The Battle Against Succession

Moving forward, I will be describing some of the weeds common to us here in Western Montana, many of which can also be found in my home state of Washington. I will be sharing recipes as well as strategies for management of these species, including the benefits and drawbacks to each plant. These plants are all unique, but also highly similar. Much like species we don't consider to be weeds - these plants must be considered on an individual basis, but also with close attention to their environmental context.

At the PEAS Farm we learned about what it means to be a weed. See, weeds are a human concept, and a highly subjective one. Whether or not we consider a plant to be a weed depends entirely on its context - and in the context of agriculture, anything the farmer doesn't intend to grow is a weed. Many of these plants are relatively harmless in the natural environment, while others are noxious invasives viciously outcompeting native species as efficiently as they choked out our crops of greens. The truth is that most invasive species have been transported by humans (Pollan 1989). Tracked in on boats and dirty boots, or carried with pride as ornate species from the wider world, the weeds of the United States are here through no fault of their own. And yet, they spread like wildfire, an obtuse metaphor to use here in the Rocky Mountain West.

Most of these plants we consider to be weeds are primary succession species (Benet-Pierce, N. 2014; Stark et al. 2020), which is why freshly disturbed agricultural landscapes are such a hot spot for growth. Primary succession species follow wildfire as well, springing up in empty spaces before native species can regain their grip (Benet-Pierce, N. 2014; Stark et al. 2020). Indigenous cultures used burning techniques to forage, following the scorched path of

freshly burned swaths of forest and prairie, altering the growth patterns of food plants and even the migration patterns of animals to be hunted (Benet-Pierce, N. 2014). The settlers who brought with them a regime of fire suppression may have been the most noxious invasive species on our continent, but not for the weeds they brought with them.

Before we continue our discussion of weeds, it's important to outline some of the characteristics that make plants invasive, versus less harmful non-native species. Weeds, as stated previously, are made up of primary succession species (Benet-Pierce, N. 2014; Stark et al. 2020). Indigenous groups had very few problems with species like these, simply because there was less disturbed land (Pollan 1989). When we look at vicious weed species such as bindweed, we discover that bindweed still has very little effect on undisturbed natural areas. In fact, some claim that bindweed only follows the plough (Pollan 1989).

Even Emerson and Thoreau wrestled with the concept of what makes a plant a weed. Emerson once said, "a weed is simply a plant whose virtues we haven't yet discovered" (Pollan 1989; Thoreau 1854). I believe this to be true. Thoreau, however, struggled with this idea in his famous book Walden to accept the presence of weeds as a part of nature. Repeatedly, he insists that he will refrain from making "invidious distinctions" between the different orders of nature, resisting hierarchy as he is known to do in his writings (Thoreau 1854). But as he struggles with his meager bean patch at the little house by the pond, he begins to recognize the need to weed to preserve his crops. Most gardeners are familiar with this experience, the frustrating reality that cultivation is in some ways, fighting against the natural succession of growth (Stark et al. 2020). This is true even when the natural succession of growth involves unnatural plants, such as species which are not native to the area. Those are plants we might call weeds.

Fire Suppression, Invasives & Foraging

Here in Montana late in the summertime, a strange haze begins to fill the air. Smoke from wildfires billowing into our valley makes its way through the sky, seemingly reaching further and further each year. To some, this seems to be just another sign of the seasons changing, like the leaves turning in the Fall or blossoms flowering early in Spring. The reality is that an era of fire suppression leading into this era of climate change has magnified the risk these fires pose to not only our human values but to our ecosystems as well. Fire suppression, which largely began in the United States after settlers crossed the country, has caused an accumulation in many areas of fuels that would otherwise burn up (Brown et al. 2003; Kimmerer 2001). Fire risk increases dramatically as fuels are allowed to build up on the landscape, increasing the potential for devastating wildfires (Harrington et al. 2007).

However, wildland fires do not inherently cause destruction to the ecosystem, and in fact, fire plays an important role on many landscapes (U.S. Department of the Interior 2021; Brown et al. 2003; Carey 1995). Upon the arrival of European settlers to this continent, they brought with them worldviews that contrasted sharply to those held by native inhabitants. Presuming fire to be a source of destruction, they began suppressing all forms of it, and anthropogenic fire practices largely disappeared from the landscape between the early 1700's and the year 1900 (Kimmerer 2001). Indigenous people who had managed fuels on the landscapes for centuries possessed advanced knowledge about fire technology, and as settlers

moved West, increasingly federal Indian policy removed these land managers from their homelands and thus from their traditional roles as stewards of the land (Bear Don't Walk 2019; Kimmerer 2001).

The dominant perception of fire began to shift as colonialism took hold, and as traditional land management practices halted (Kimmerer 2001). Fires were ignited for a variety of reasons prior to colonization, largely dependent on the resource needs of tribes based on their location. For example, this kind of anthropogenic burning was used less by coastal tribes, because they tended to rely more on marine resources than forest productivity cycles (Kimmerer 2001). Tribes which relied heavily on forest productivity, which can be notoriously inconsistent, utilized fire to create more vegetative diversity across landscapes (Kimmerer 2001).

Since fire suppression began, the landscape has shown increasing homogeneity- highlighting the efficacy of traditional burning practices at creating a diverse mosaic of different succession stages across the landscape (U.S. Department of the Interior 2021; Kimmerer 2001). Clearing village sites, long-distance signaling, timber harvest, clearing travel corridors, hunting and even reducing pest populations are some of the many reasons indigenous land managers set fires across the landscape (Kimmerer 2001). This anthropogenic fire history shaped the land greatly, and influenced fire regimes across the continent (Kimmerer 2001). Some studies have shown that enhanced productivity garnered from traditional burning practices made agriculture unnecessary for many tribal groups, favoring instead to manage the ecosystem for specific plants of cultural or resource value (Kimmerer 2001).

The cessation of tribal burning practices occurred alongside the removal of indigenous groups from their traditional lands by no coincidence, and interrelates with the steep decline of

foraging and gathering as a piece of traditional foodways. For most tribes in what is now Western Montana, foraging provided an invaluable source of calories and nutrients for the diets of indigenous people (Bear Don't Walk 2019; Kimmerer 2001). Fire was used as a tool to diversify or open up landscapes to foragers, and as such, many species which coevolved alongside indigenous burning tactics have now become threatened despite the relief of pressure directly from foraging practices. This counters what many people believe about foraging, that it's arguably bad for plants to be picked. In fact, most native species have adapted to foraging, in the same ways they have adapted to grazing by animals and fire disturbance on the landscape (Kimmerer 2001).

Invasive species, on the other hand, typically become invasive due to the lack of environmental pressures imposed on them. Many invasive species do not have natural predators in the United States, and do not make up keystones in the diets of native animals and insects. For these plants, to remove them from the landscape it must be done manually by humans. Here is where modern foraging can come in: effectively removing invasives from the landscapes, while simultaneously providing alternative nutrition for the ever-growing population of Americans. Many of these invasive species threaten their native counterparts, which already struggle in places such as the Rocky Mountain West in the absence of regular, low-intensity fire disturbance across the landscape. With the rise in popularity of foraging, particularly across Montana, we have seen foragers competing with indigenous groups and native animal species for their traditionally foraged foods (Strass 2010). The most typical example is the huckleberry, which has become a sort of symbol across Montana.

Foragers who harvest huckleberries in Montana have begun to deplete crops of huckleberries, combined with a warming climate and a harsh, dry spring and summer season

(Strass 2010). Not only does this make it difficult for tribes to continue their traditional usages of these berries, but it also deprives many native animal species from the valuable calories and nutrients provided by the yearly flush of huckleberries (Strass 2010). So much so, that it has become illegal to harvest huckleberries for commercial purposes in some places, citing the starkly limited harvests each season (Strass 2010). Folks who grew up picking huckleberries in Montana are enraged by this scarcity and its implications on their family traditions, craving the return to these fond memories, often centered around childhood. Frustrated, they assert that they have a right to be picking too. Perhaps they do, but what's important to recognize is that it was never about the berries themselves. Although huckleberries are a tasty treat and they make for sweet nostalgic memories, there are other plants to be picked. There are new memories to be made - if Montanans are willing to learn new modes of foraging, new plants, and to continue passing down this knowledge through their families.

As tempting as it may seem to recommend foraging as a means of supplementing food intake for the average Montanan, this often poses a threat to native species and indigenous cultures which rely on foraging for threatened native species (Aziz et al. 2022; Strass 2010). This is much bigger than a shortage of huckleberries. Due to environmental conditions and other threats to native species, such as the removal of regular, low-intensity fires across the landscape, it may be more appropriate to tell non-tribal members not to forage whatsoever. It is nearly impossible to forage ethically unless directly affiliated with a tribe, and the recent rise in popularity of foraging threatens cultural practices as many native species become rarer and more heavily sought after by non-indigenous gatherers (Aziz et al. 2022; Strass 2010). However, this doesn't mean that it's unethical to harvest any foods from nature.

Foraging is an act of resistance in itself, but if done incorrectly it can also be an act of violence towards local tribes and their cultures. Until cultural burning practices can be restored, it would be wise for non-tribal people to leave native species where they are entirely. The widespread concept of *take only what you need* doesn't apply when we begin to realize that we simply don't need to gather these plants unless it is to restore our own culture. For most newbies interested in the world of foraging, that's not the case (Aziz et al. 2022). So, what can be done? Should those who hold a degree of privilege to be foraging in the first place, forgo this act entirely?

I don't believe this to be the case, although some of the claims I will make moving forward may seem strange at first. We needn't avoid foraging, only foraging for native species which are culturally valuable to indigenous groups and ecologically important or threatened. Surprisingly, this still leaves us with a vast array of tasty, healthy, and readily available plants to gather and consume. If we learn to consume invasive and nonnative species over the highly sought-after native species, we are not only lessening our reliance on the conventional food system but also providing an ecosystem service by removing these species from the landscape (Aziz et al. 2022). In terms of agriculture, which will be greatly impacted by the changing climate in the next decades, some of these less invasive species may even become more appropriate to cultivate in controlled agricultural settings than typical grains and vegetables. It may take time to get comfortable with this concept, but it doesn't have to be a shock to our pallets. Many of the weeds I will be talking about taste similar to foods we are already familiar with, such as lettuce, quinoa, spinach, and even artichokes. But first, it's important to analyze what the act of foraging truly means for our food system, and how this act can help us to build food justice for all Montanans.

Building a Resilient, Just, and Equitable Food System in Montana

In the coming decade there is much work to be done in Western Montana towards building a resilient, just, and equitable food system. For the purpose of this short analysis, I will be focusing specifically on hunting and foraging. First, I will argue why an equitable food system must include access to traditional lifeways such as foraging. Next, I will be synthesizing the many social, political, and economic factors which provide the contextual framework for this argument. Then, I will outlay in the following sections barriers to securing access to relevant knowledge and information, as well as more direct barriers such as land access. Finally, I will examine both top-down and bottom-up factors facing the greater foraging movement, including governmental policies which either prevent or protect the right to forage, as well as grassroots social movements aiming to restore this right.

Before diving deeper into this discussion on foraging and the larger food system, it's important to first outline the historical significance of this act. Indigenous cultures across the world have used foraging techniques for subsistence across millennia. Following the rise of colonialism, and its later expansion into globalized capitalism, traditionally appropriate foraging access has been greatly depleted (Bear Don't Walk 2019). But this is not an abstract global issue for us - in fact, here in Western Montana this is a particularly salient sociopolitical dispute. Local indigenous groups foraged in these areas for more than 10,000 years prior to first contact with settlers (Bear Don't Walk 2019). As the newly formed Federal government sought to overpower sovereign indigenous nations, they used methods of erasure in addition to a wide variety of

nefarious, direct actions against indigenous groups and their food systems (Whyte 2018). By attempting to prevent sovereignty of the tribes, they placed legal barriers in the way of traditional foodways, creating a shift towards dependence on federal resources such as food supplement programs, leading to exacerbated health effects in these already vulnerable communities (Bear Don't Walk 2019; Ponca Tribe of Nebraska 2023).

There is much more to be said about this historical travesty, but for the purpose of this section I would simply like to acknowledge the context in which foraging began to disappear from food systems across the country, beyond the loss of traditional burning practices on the landscape. There are many implications of this today, most of them aligning with the deeply entrenched systemic racism wrought in our federal government. I also think it's important to note that the disconnect between people and the ability to provide their own foodways leads to a greater dependence on these unjust systems, superseding racial or class boundaries. Today all Americans are dependent on our current model of the food system, barely kept afloat through vast inputs of fossil fuels and synthetic chemicals, and subsidy programs headed by the federal government (Bear Don't Walk 2019). To truly create an equitable, just, and sustainable food system moving forward, in the next decades we will need to begin finding other ways to separate ourselves from the conventional food and agriculture system in the United States.

There is a vast array of social, political, and economic factors which make doing so incredibly difficult. But there are also factors which can strengthen the movement to become less dependent on the conventional food system, economically, politically, and socially. Economically, the past few years have illuminated the shortcomings, and simultaneously, vast potentials of our food system in the United States. As food prices rise and shortages become the norm, we have begun to see a dramatic increase in people who are seeking knowledge about

cultivating, gathering, and processing their own food at a local level (Sachdeva et al. 2017). It's also important to acknowledge the economic situation many Americans find themselves in, or their families, since even before pandemic times. Only a few decades ago, it was possible to support a household with only one income across the United States, but as inflation and other factors drive up the cost of living, we are trapped in a capitalist cycle.

Although foraging may seem like a perfect solution to some, most people do not have the time to commit to seeking out the food itself - or the knowledge necessary to undertake feeding themselves or their families with such techniques. It's common to hear people talk about simply not having the time to cook for themselves after they get off work, or finish classes, or childcare and other caretaking tasks, so it's important to also acknowledge the privilege that modern access to foraging entails. However, there are ways to make the dissemination of this information smoother, and more easily accessible to people who are struggling to learn (Sachdeva et al. 2017). This brings us to the social systems which could help support a timely, just, and equitable transition to foraging as a means to supplementing nutrition for the average American.

Although it may seem informal to some academics and professionals, social media networking has the potential to greatly increase dissemination of information regarding foraging in layman's terms (Grandjean 2015). In fact, as the wave of the Organic food movement has come to a crest in recent times, we're beginning to see an online transition from entertainment to media that is more informative or educational (Sachdeva et al. 2017). It's no coincidence that many people are seeking relief from main-stream news media given recent events in the country and the world's political climate. Young people especially are seeking out media which informs rather than warns, providing solutions and strategies instead of using fear-mongering techniques as bait to collect advertising revenue. The nature of the algorithm on many of these social media

sites only strengthens this trend, drawing out more of the increasingly popular content to create a sort of snow-ball effect of information spread (Grandjean, 2015).

Of course, there are negatives to this style of algorithm - such as the rapid spread of false or incomplete information. This carries with it a unique danger when it comes to survival skills or food safety guidelines, both encompassed within the act of foraging. However, as the topic continues to increase in popularity, there is widened rhetoric discussing the validity of each claim. One great example comes from the online application Tik Tok, an app which has garnered massive media attention since its inception in 2016. The premise of this app, at its most basic level, is that users upload short videos and share them with friends, or with strangers, from across the world.

Again, there is the potential here for very negative outcomes, many of which have received a disproportionate amount of societal recognition compared to the mass of alternative content across the platform. Most news circulating about the app focuses on the younger demographic utilizing the platform, and the various risks carried for youth using any applications online. But sometimes, the good news breaks; news about how hungry people are for information, and connection, and the many ways apps like this one can educate and connect people with other like-minded individuals.

The best example I can think of here is Alexis Nikole Nelson, also known as the Black Forager. Nelson created profiles on various social media platforms including the application Tik Tok to share her adventures foraging, and the channel rapidly became popular across the platform after she corrected a young man who joked about eating cattail plants, and how he wished they were edible. But her videos do not only include information such as what can be

eaten, where to find certain plants and how to identify and process them, she also uses her platform to share important information about the history of foraging, and to bring awareness to the justice issues which surround this topic. One of the key ideas that she talks about in her videos is access. Beyond acknowledging that most Americans who forage do so as a hobby, they are also typically white and as such hold a degree of privilege that others do not.

This wasn't always the case, as Nelson shared with the National Public Radio in an interview in September of 2021, "So back when a lot of Black folks were still enslaved, there was a whole lot of knowledge trading between Black folks and Indigenous folks in a lot of the southern states — and a lot of midwestern and northern states, too, actually. And for a lot of people who were enslaved, the way that you beefed up the meager meals or the scraps that you were given was often by supplementing with foraging, with trapping, with fishing. So that knowledge that was a huge part of early Black culture here in the Americas" (Mohtasham et al 2021). Nelson examines where the shift began to take place, shortly after the emancipation of enslaved Americans. Laws designed to prevent indigenous groups from accessing traditional foraging grounds were easily twisted to encompass land access for all, with an insidious focus on marginalized and oppressed groups for whom foraging was most valuable (Hartman 2022). Although these systemic barriers to foraging will be difficult to untangle, and no short feat, content creators and educators such as Nelson are taking the steps we need to see in the next decade to move towards a more equitable, just and sustainable food system.

Barriers to foraging are deeply intertwined with the colonial history in our country. Land access, greatly impacted for indigenous groups through acts ranging from the Allotment Act to the Wilderness Act, has also been affected for the general public (Bear Don't Walk 2019; Hartman 2022). The very basis of our federal government was set up to create a dependence on

itself, effectively trapping all members of society, not only those in oppressed social or racial groups, into its system in perpetuity (Hartman 2022). What they had not anticipated were the future implications of this, as the population continues to swell and the food system cannot sustainably support the American people, at least not with our Americanized diets. Due to systemic political barriers preventing indigenous and emancipated groups from foraging, a vast wealth of knowledge has now been lost (Hartman 2022; Whyte 2018). This traditional knowledge of food sovereignty is of the utmost importance, and although erasure tactics have obscured or degraded much of this information, there are ways to recover and rediscover these skills. There is no better time to lessen our dependence on the conventional food system in our country than in the coming decade, except perhaps if we had already started.

According to Kyle Whyte, environmental justice scholar, activist and author, "Today, US settler colonial laws and policies remain a problem" (Whyte P.360, 2018). In his piece Food Sovereignty, Justice, and Indigenous Peoples: An Essay on Settler Colonialism and Collective Continuance he analyzes the relationship between indigenous peoples and the federal government, particularly with a focus on the food system and access to foraging. He examines how the US Forest Service still "considers it illegal to perform activities that include gathering acorns, mushrooms, berries, basketry materials, and the use of fire to create the proper conditions for these species" (Whyte P.245, 2018). Whyte considers this to be an example of food injustice, which occurs when one group systematically dominates another group through their connections to and interactions with one another in local and global food systems (Whyte 2018). It is simply not possible to build a just food system on this foundation of dominance. In the coming decade, first and foremost we must address the inherent injustice in our food system, and work to restore the human rights encompassed within.

There are international policies which stand in contrast to these domestic ones, however. The Right to Food has been upheld in various political actions by alliances between international governmental and nongovernmental organizations, such as the United Nations Declaration on the Rights of Indigenous Peoples, which affirms this sovereign right violated by the colonial practices of the United States federal government (Hoover 2017). In Elizabeth Hoover's book *The River Is in Us: Fighting Toxics in a Mohawk Community* she examines the sovereign Right to Food of indigenous peoples, and the grassroots movements which have arisen in response to the violation of this right by the United States federal government. In her book *The River Is In Us*, Hoover intends to spotlight the ways in which we can learn from various community-based projects, including research projects intended to determine specific courses of action, "that are built, at the very foundation, in partnership with Indigenous communities" (Hoover 2017 P.5).

Hoover draws this same connection between food justice and environmental justice, even referencing Kyle Whyte, who has noted that the structure of environmental injustice is often tied to a disruption of indigenous food systems (Hoover 2017 P.13). She cites examples including the suppression of burning techniques traditionally used for foraging and hunting, reshaping the landscape and creating hazardous conditions, the pollution of waterways which has drastically changed and even wiped out fish migration patterns, and the trickle-down effect this has across entire ecosystems, including grave impacts to human health. All of these environmental justice issues which she discusses are also issues of food justice, the two concepts being so deeply intertwined in our landscape that it would be an oversimplification to discuss one in isolation from the other.

One grassroots group of citizen activists which Whyte explores is the Akwesasne Task Force on the Environment (ATFE). ATFE's original purpose, which is still an active

organization today in 2023, is to bring together the complex tribal government systems in the Akwesasne community to create a unified front to face researchers in their community (Hoover 2017). Unify they did, and with this shared power of community ATFE took on the United States federal government, the New York state government, and multiple municipalities in Canada, as their traditional lands span across the international border. They achieved sovereignty over research done on their tribe, which has important implications on environmental justice and food justice alike. Research is a key first step to prioritizing goals by governmental agencies and NGO's, but has historically ignored and even deliberately jeopardized traditional ecological knowledge through its standard practices.

If grassroots organizations like ATFE can take a stand against corruption in research, seizing back control, then they serve as another strong example for the power of community and education towards building a sustainable and just food system. One of the members of ATFE whom Hoover spoke to while writing *A River is in Us*, Jim Ransom, shared a meaningful quote about his experience becoming a part of this grassroots political movement, "It was just amazing what we were doing and I think a lot of it was because nobody told us we couldn't do it, and nobody else was doing it for us. So we learned hands-on how to do it ourselves and we found a lot of allies along the way who were there to transfer knowledge to us" (Hoover 2017, P.86). There's a lot we can glean from this short quote. Hoover attributes the organization's success in part because it's so removed from the political process, claiming this means similar groups can advocate for community-based solutions (Hoover 2017).

We have already touched on some of the top-down policies affecting foraging accessibility in the United States, which include federal mandates regulating access to land and resource use, and moved into a brief discussion of grassroots community activism strategies to

fight back. We examined some of the barriers outside the political sphere, encompassing social and economic context. This included the privilege associated with modern foraging, with a certain economic prerequisite to be viable for most Americans today, and the history of systemic racism and erasure which led to this violent disrupt. This discussion also included the new challenges and opportunities we face in the modern age, such as the use of social media to educate and empower people to take back control of the food system, and therefore of our environment. To conclude this section, let's zoom back into foraging as an act of resistance.

Although foraging is an exciting and engaging topic for most, regardless of political leanings or class status, some people struggle to make the connection between the rise of foraging, hunting, trapping, or any other means of procuring one's own food independently from the conventional food system, and the worsening global climate crisis. Our modern conventional food system, particularly so in the United States and other comparable countries, is a huge driver of both general greenhouse emissions and more direct pollution and destruction of the environment (Lynch et al. 2021). The industrial agriculture system is heavily dependent on the use of fossil fuels, not only for the production process itself such as running machinery, but also for the massive transport needs to distribute this food across our country. In addition to this, we consume a huge amount of imported goods, which require an even greater amount of fossil fuels to reach our plates.

It gets worse - even if we could use more sustainable energy sources as a fuel for this industry, such as solar or wind power, this does not encompass the extent of environmental degradation caused by the conventional food and agriculture system. Chemical inputs such as fertilizers and pesticides and herbicides wreak havoc on our ecosystems, impacting every aspect from soil health to waterways. To truly create a more equitable, just and sustainable food system,

we must first dismantle the conventional model. Before we can safely dismantle such a complex system, we need to lessen our reliance on these conventional methods. The simplest way I can think of to begin doing this in the next decade is to educate and empower people to find or produce their own food, independent from the industrialized food system that we have today. This comes with greater challenges as the changing climate makes it difficult for small farmers to grow food, fighting back weeds as they go. Food is power, and foraging gives us greater control over our food-systems and our communities.

PART II

When I was a little girl I loved to boast that Salmon Berries were my favorite food. Bushes with bright green, jagged leaves lined the pathways of the yard where I grew up. I spent more time outside than inside, save for the late night hours voraciously consuming adventure stories by flashlight. In the late Spring and Summer, even deep into Autumn, I was ecstatic to gather plant foods from outside. Some were inedible, and I can remember more than a few occasions nursing a belly ache in secret, not wanting to get in trouble for eating strange things off the ground. But Salmon Berries were unmistakable, always a safe bet.

Without fail, I would attempt to impress other kids with my advanced wilderness skills any time we found ourselves outside. I would point out plants I knew were edible, and plants I wasn't sure about, stuffing my mouth full regardless to prove myself. It's a miracle I survived, although I have my patient parents to thank. It was clear from a very young age to my family how fascinated I was by plants. My grandmother tells me warmly that the only way she could stop my crying as an infant was to bring me outside, turning my face to the sky so I could stare up into the trees and watch their boughs swaying gently above. As I grew my parents began to show me the proper ways to pick and process plants from our yard in the rainforest of Western Washington. They explained which ones were safe to eat, and which ones weren't even safe to touch. My gifts for Christmas and birthdays included plant and mushroom identification guides, adventure novels and endless writing supplies. I couldn't have been luckier.

As I continued to grow and the angst set in, I recall climbing the tallest cedars to look down and watch my family searching for me outside, frantically. I would wait until they gave up

to descend from my perch, not wanting to give away my secret. Later we had a treehouse where I concocted my potions and salads, teas and salves, my fingers and toes usually covered in rashes from wading through patches of stinging nettle and thorny blackberry bushes barefoot. I didn't discriminate between the two - although now I've come to understand why the blackberry bushes grew even in the urban areas of town, alongside the roads and reaching their spiny vines through the chainlink fence of my elementary, allowing me to demonstrate for the other kids my willingness to eat just about anything.

These blackberry bushes were an invasive species, outcompeting the native variety and taking over our little town. To me, I was simply bewildered by the generosity of nature. I hated wearing shoes and I refused to let anyone brush my hair. I was determined that one day I would live outside, and nobody could make me do anything because I would be able to feed myself from the vines, trees, and bushes surrounding my hometown. I scrawled my own adventure stories in half-filled notebooks and diaries, about a girl and her cat - the only thing still holding me to society, I felt - finally going it alone in the forest. I don't think I impressed anyone but my future self, but I look back fondly now, vowing not to lose that little girl in the torrent of adulthood. I still write awful stories, and I still eat things off the ground. I'll never stop.

Lately I've been thinking back to the invasive Himalayan blackberries, thick brambles slowly creeping their way across my home state. I've spent more time reflecting on the salmon berries plucked from feathery bushes in my yard, nostalgia sweeter than their flesh. But most of my memories of the blackberry bushes are clouded with terror and pain, like that time my friend's rope swing snapped just over a ravine filled with thick vines, sending me tumbling so deep into the thicket nobody dared venture near to help me climb out. The more I moved and struggled, the deeper the thorns sank into my already sunburned skin. I pulled my shirt from my

body and wrapped it around my head to protect my eyes and nose, and tore my way aimlessly, blindly, in any direction that seemed up. The gashes stretched and oozed blood for days, seemingly every time I moved, each new angle reopening another wound, shocking me with a fresh jolt of pain. Yellowing bruises outlined the deep cuts on my body, and I tenderly rubbed at sore spots where the vines had cut through my hair and sliced into my scalp.

So it may seem strange to say I was pleasantly surprised to see my old friend, and sworn mortal enemy, here in Missoula. Climbing its way out of a drainage ditch I saw the familiar, jagged red woody vines of the Himalayan blackberry. Now I know this isn't good, actually I know this is very bad news for our local ecosystem. I've seen already in my short life how these vines grow with a ferocity and smother the surrounding bushes, the gangling trees too. By the time you've spotted one with berries, it's already much too late. But somehow it was comforting to finally see a plant I recognized so far from home, to see its glossy berries picked at unabashed by crows, creeping its way from the dirty water in defiance. I stopped and ate some of its dark berries, careful not to touch anything but.

Unrecognizable Berries

Salmon Berries are named as such because of their salmon-flesh color when first ripe, although as the long season progresses the berries turn to deeper, darker shades of pink and purple. Before the Salmon Berries ripen in Spring, little magenta flowers bloom from the tips of their branches. These flowers stood out from the greens and browns of the forest, the first pop of color signaling the change of seasons in Washington. I would pop the petals off these flowers, careful to leave the little white nubs of young berries in the center. These dainty petals had an aroma and taste I struggle to describe, dry and delicate. Perhaps this was the one move which did work to impress the other kids, gently plucking the silky purple petals and eating them whole. Not only are the salmon berries edible, but the little flower buds are too. Their berries resemble raspberries and blackberries visually, but the delicate taste lacks the sweetness expected from a berry.

Later I discovered wild raspberries growing in patches near our front gate, so soft that they would be crushed into a red jam as soon as I removed them from the vine, little fingertips stained red as I hunched low to the ground, seeking out more of the gritty, juicy delicacies. We had bushes growing in our forest that I had always called huckleberries. Little red berries on spindly shrubs with little round, light green leaves, their stems bowing and bouncing as I made my way between them. My sister and I gathered them up by the bucket, determined to save them in the freezer to have during the winter, although they never made it long. When I first moved to Montana for college, I was eighteen, and apparently still not over impressing the other kids at school by eating wild berries. For my freshman orientation trip, the University of Montana sent

us with guides into the wilderness areas surrounding Missoula for a short backpacking trip. I found myself surrounded by beautiful yet frustratingly unfamiliar plants. Even the trees looked different, even the dirt on the ground. Finally, miles into the Anaconda-Pintler Wilderness, I spotted a plant that I recognized.

Huckleberries! I exclaimed excitedly, the other freshman turning to look my way. These looked different, growing low to the ground more like a wild raspberry than the huckleberries I knew. Still, I hadn't a single doubt in my mind. I began to pop the little red berries into my mouth. The guides they had sent us with were sophomore and junior students, who seemed at the time much older and much cooler than us, although now I recognize they were barely in their twenties. Leaping into action, our guide approached me with a look of sheer horror across his face - one I recognized from childhood. Those are *not* huckleberries, he gasped, the realization of how far we were from medical help dawning on his expression, turning from panic to anger. His face turned redder than the little berries, still rolling around in my hand as I rose back to my feet. Turning to address the rest of the group, sternly, he warned the others not to eat anything other than the food we had packed in. I laughed and reassured him that my family would understand if I died this way. He wasn't amused in the least bit.

After we returned from our trip I began to research - apparently, huckleberries in Montana are purple and grow on tall bushes. I had no idea what I'd eaten, but the berries looked and tasted identical to the huckleberries I had picked growing up. I discovered that there are multiple varieties of huckleberries, although the little red berries are not commonly known as huckleberries in the Rocky Mountain West due the much more popular, much sweeter purple variety that the region is famous for. I informed our guide of this fact on the car ride back to Missoula, and still, he was unamused. I stared out the window as the foreign brush rushed by the

van. I missed my home. I missed picking Salmon Berries. I missed knowing with certainty, or at least with some confidence, what I could pick up and eat from the forest. It felt like a return to early childhood - rediscovering the plants around me. Everything was unrecognizable, even myself.

Jubilee

When I began working on a farm for the first time I was a senior in high school, and I couldn't have been more miserable with my life. I think this is pretty typical for an eighteen year old kid, but I had briefly lost touch with myself in the throes of highschool. I went to school in the city, away from the plants and natural areas I knew and loved, surrounded by city-kids who were, to say the least, not impressed with my foraging skills. I threw myself into their world. I woke up early every morning to paint my face with makeup, armed with wings of eyeliner and soles bruised and tender from wearing high heels daily. I joined the school's dance team, I even fumbled my way through a beauty pageant. I wore designer clothes and proudly flaunted my new Macbook - more as an accessory than a device for my late nights of secret research. But I hadn't felt like myself in a long time.

My senior year of high school we were encouraged to find an internship, and not wanting to commute into the city anymore than I already had to in order to finish my last credits, I wanted to choose a place closer to home. There was a little farm not far from the house where I grew up, where I had spent summers playing in the fields with other local kids while our parents shopped at the CSA and drank wine during dusky summer events. This farm was one of the few places outside of my home where I could remember feeling at home - so I reached out to the owners. I wrote the farm manager an email to see if he remembered the wild-haired shoeless little girl who would roam around the farm over a decade before, and he did.

I was so excited to begin my work at the farm. Not only did I get to step away from my life at school, but I got to step back into my childhood. What I didn't expect was how difficult

this work would be, how quickly my manicured nails became chipped and caked with dirt, how fast my daily-curled hair would convert back into a sweaty, matted clump of knots. I absolutely loved it. I finally felt like me again. I wasn't sure what that meant, but I knew that I needed to lean in to the feeling.

The farm was called Jubilee, aptly named in my opinion. A Jubilee is a celebration, and I felt like my work there was finally in celebration of my younger self. I let her take back control of my life, rewriting our dreams and goals, and I came to the University of Montana to study agriculture the next year, freshly inspired. By the time I graduated in 2021, I was exhausted, burnt out, and riddled with chronic back pain. The work of farming felt like it might break me, even though I think it saved me, and I found myself frustrated and confused by the process. It felt ridiculous to me how hard we worked to grow the foods we ate, all the while surrounded by foods growing so freely that we fought them back daily as they encroached on our crops of green.

I was amazed to discover during my time working in agriculture that most of the crops we grew were actually all the same plant - Brassica oleracea. Kale, broccoli, brussel sprouts, even mustard greens were all the same plant, altered over the years through selection for certain traits. Broccoli was bred for its large, juicy flowerhead while kale was bred for its broad, crinkly leaves. This revelation only confirmed my suspicion - our diets today lack diversity. I already felt as if it were strange to be eating only a few types of common vegetables, but to find that many of these vegetables were in fact the same plant, I needed to try something new. Perhaps this was on my mind when I began to research the heap of weeds, desperately trying to find anything else to eat that felt new again.

But I also found myself curious to know, if it could look so many different ways, what did Brassica look like before it put on its disguise? These plants - really, all the same plant - were bred from the mighty wild mustard. I saw myself in this plant, tamed and altered by the world around it, changing in appearance until it met some unclear standard of normalcy. The wild mustard plant, or Brassica, is considered to be a weed now, forgotten for all the common vegetables mankind morphed it into. Growing along roadsides and riverbanks, you can see the sproutly plant with its tiny yellow blossoms bouncing and flailing in the wind. Most who wander by overlook this little plant, growing low to the ground and abundant in nearly every landscape across Montana, from the mountains to the prairies to the little urban bubbles like Missoula. Its range extends all the way to the far coasts, seeds floating from here back to my home.

PART III

Wild Mustard - Brassica oleracea

Wild mustards emerge in the late summer, spotting the sides of pathways and fields of farms through the early fall (Michigan State University). These hardy greens can tolerate temperatures as low as 22 degrees Fahrenheit, making it one of the longest-living invasives in Western Montana (Sustainable Agriculture Research & Education 2023). Grains as well as soybeans and corn can be threatened on an industrial scale by these seemingly harmless weeds, which reduced some crop varieties by up to two-fold their biomass when wild mustards are present, according to researchers at Michigan State University. Wild mustards and conventional vegetable adapted from these plants make up what is called the Brassica family, which contains over 3700 subspecies spread across 338 genera (Filho et al 2018).

Ancient agriculturalists have been cultivating mustard plants for over 5,000 years and it can be found on every continent, including Antarctica (Deane 2007, Filho et al 2018, Grant 2023). Wild mustard has been recorded in various ethnobotanical studies as a cooking herb, although these records show a steady replacement of wild mustards by more conventional vegetables- such as the numerous vegetal descendants of this plant. Brassicas have a high genetic variability, which is part of what made them so easy to adapt into various conventional vegetables, and additionally shows why there is such a wide variety of wild species as well (Filho et al 2018).

Wild mustard is one of the plants found closest to the North Pole, and yet it is one of the plants we eat most, even filling our parks and paths in the city. These plants are thought to

originally derive from Eurasia, the ancient continent which split into many of the land masses we are familiar with today. This may explain why brassica plants are found worldwide, but it does not explain why worldwide this plant is considered to be a weed (Filho et al 2018). Herbicides and manual means of removal have been recommended to rid the fields of this plant (Filho et al 2018).

It seems a miracle that all wild mustard plants are edible, and this includes every part of the plant - roots, shoots, flowers, leaves and stems (Deane 2007, Grant, A. 2023). Its leaves are the tastiest when they are in the first stage of growth, young and tender. Some people find the older plants to be unpalatable, with a spicy, rich flavor that not everyone enjoys (Grant, A. 2023). For this same reason, wild mustard has an unusual use - to stop a dog from chewing things, simply rub the latex of wild mustard onto the item. The active ingredient in most commercial products used for this purpose actually derives from mustard plants (Grant, A. 2023).

The milky white latex of wild mustard can be used as a lubricant for construction, too, because it thickens but never fully dries out (Grant, A. 2023). This latex can also be hardened and chewed for pain relief (Grant, A. 2023). Mustard is most familiar to us through the popular yellow condiment, which is derived from the seeds of various mustard plants. Each individual mustard plant can produce up to roughly 3500 seeds (Deane 2007). These seeds often remain dormant underground, a biological process which is triggered by the cold (Deane 2017; Sustainable Agriculture Research & Education 2023). Some studies have found viable seeds buried deep in soil that are over 60 years old (Sustainable Agriculture Research & Education 2023).

Due to the high amount of stomata on the leaves of all brassica plants, they are not particularly drought-tolerant, perspiring like an overheated farmer in the summer. This can be a challenge for farmers trying to grow other varieties of the brassica family, which include many conventional vegetables. But wild mustard mustard retains a characteristic bred out of the conventional varieties, which is its extensive root system. One study found that the length of all roots combined on a single plant were found to be 3 feet by the fifth day of growth, and by the 21st day they have nearly reached 400 feet (Sustainable Agriculture Research & Education 2023). The growth rate of both above-ground vegetation and root systems depends heavily on nitrogen content of soil, meaning these weeds tend only to be weedy in nitrogen-rich agricultural areas, especially those treated with synthetic nitrogenous fertilizers (Sustainable Agriculture Research & Education 2023). In this way, wild mustards help to soak up excess nitrogen in soils and waterways.

Not only do these ancient varieties of familiar plants like broccoli, kale, brussel sprouts, kohlrabi, turnips and more outcompete their heavily bred counterparts in terms of growth rate, all while retaining a similar flavor-profile. They also offer an array of scientifically proven medicinal benefits (Ashwin et al 2022). A 2018 study found that the variety Sinapis arvensis, one of the most common subspecies of wild mustard, has exhibited similar anti-inflammatory properties to the conventionally used pharmaceutical synthetic Diclofenac (Rus Jacquet et al 2018). As someone who has been prescribed this medication, I would much rather find a natural remedy for the inflammation caused through chronic and situational pain - such as garnered from long seasons of agricultural work.

Chronic ailments such as rheumatoid arthritis require indefinite treatment using antiinflammatory drugs, but the conventional methods often carry with them adverse side effects

such as cardiovascular, renal, and gastrointestinal problems (Ashwin et al 2022). This study showing nearly 80% effectiveness when comparing a concentrate of wild mustard extracts to one of the most commonly prescribed antiinflammatory drugs shows not only the great importance of this special weed, but the need for more research into natural medicines as an industry.

When compared to more conventional brassica plants grown across the United States, wild mustards showed a similar nutritional value, sharing a relatively consistent protein content and concentration of water (Filho et al 2018). Brassica plants are a rich source of vitamin A, contributing up to 40% of the daily recommended value in one single serving (Filho et al 2018). Potassium and calcium can also be found in significant amounts in these plants, as well as a substantial amount of iron and selenium (Filho et al 2018). Selenium is important for the body to produce and process antioxidants from other foods, and can only be absorbed through whole foods (Filho et al 2018, Rus Jacquet et al 2018). As far as iron concentration, brassica plants including wild mustard can contribute more than 80% of the recommended daily value, again in only one serving (Filho et al 2018).

Like many of these weeds, I saw my young self in the wild brassica. It's a highly adaptive plant, finding its home in agricultural areas, pastures, and gardens, city parks and poking up its leaves in the city from between sidewalk cracks. It has been morphed into many identities, but retains its core traits on an internal level. I find some comfort when I see it, and I feel grateful somehow that it's still here. Despite the years of agricultural engineering, its exists still in its most raw form, as its most wild ancestor.

Chenopodium Album - *It's What's for Dinner*

Climate model projections tell us a lot about what our world will look like in the year 2100. Even if we cease the burning of fossil fuels, we are committed to a warming planet (Pederson et al. 2010). Projections indicate a global rise in temperatures, but models show that some areas, including Montana, will see a rise of temperatures three times greater than the global average (Pederson et al. 2010). An increase in the number of hot days per year leaves us with less cold days, and when combined with an overall projected decrease in precipitation across the region, we will see drastically lessened snow-pack each year (Pederson et al. 2010).

Montana is a state known for its wheat industry, but this agricultural keystone will be negatively affected despite anecdotal theories of an inevitably longer growing season as beneficial to Montana farmers (Pederson et al. 2010). Many other typical agricultural plants, such as the popular Brassica group of veggies, will suffer from the increased heat and decreased soil moisture content. Even livestock industries will be affected negatively, from feed shortages to a lack of arable pasture land for grazing (Pederson et al. 2010). So what does all of this mean for the way we've become accustomed to eating?

As Americans, we've gotten used to readily available produce of all kinds, and we consume a diet incredibly high in meat and other animal products (USDA 2022). But as our climate warms, certain foods contain the potential to out-compete foods we consider to be *what's for dinner.* Animal agriculture requires massive inputs, and will be less viable and more expensive as the climate continues to become more erratic. For this reason, we will likely eat less meat, or animal products in general, as well as delicate greens which provide an array of

nutrients. One of the most common leafy greens to eat is lettuce, and it's higher-nutrient compatriot spinach. Both of these plants stand to become much less popular, as they require huge quantities of water to grow, soil that is incredibly high in organic matter and/or chemical inputs, and they cannot tolerate heat stress or drought well. This is where our unlikely hero, Chenopodium album, comes into play.

Although many farmers in Western Montana are familiar with the noxious invasive Lamb's Quarters, sometimes also called Goose Foot, some do not know the various uses or characteristics of the Chenopodium album plant. The name Goose Foot has a fairly straight-forward origin, because the leaves of this plant are shaped similarly to the webbed foot of most waterfowl. But many farmers know Chenopodium album by the name pigweed, because pigs will devour the entire plant, from its juicy young sprouts to the prolific grain heads, even the roots, flowers, and thick shoots. Chenopodium album is a plant closely related to spinach, and in fact, in many parts of the world it is grown traditionally as an agricultural food staple (Poonia, Upadhayay 2015).

Not only is this plant grown for its hardy, quinoa-like grains, but the succulent green leaves of Chenopodium can be eaten raw in salads or sauteed in the same way one would use spinach greens. One thing to note is that Chenopodium contains elevated levels of oxalic acid, a component also found in beets and many other food crops we eat here in the United States (Poonia, Upadhayay 2015). Oxalates are broken down by heat, meaning that when cooked, the levels of oxalic acid become a non-factor. If someone was planning to eat these succulent greens raw in a salad, however, they may want to limit their consumption, as oxalic acid has been theorized in some studies to cause bladder stones if consumed in high quantities (Deane 2018).

When using the greens of this plant, it's best to harvest in late spring and early summer, when the young leaves on these plants still retain their bright color and soft texture. But in the autumn, as these plants go to seed, they produce a grain very similar to quinoa. To cook the grain it must first be rinsed to remove any bitterness, which can be done using a simple method with a sieve and a source of running water. One of the benefits to this method of cooking is that the grains will boil for long enough to sterilize the water you're cooking with, making this a highly viable foraging option for supplementing carbohydrate intake anywhere. After this, simply bring the grains to a low simmer for 15 minutes, allowing them to rest after draining off excess water for approximately 10 more minutes. This method is very similar to the preparation of grains like couscous and quinoa.

In parts of Northern India and Pakistan, a variation of this crop is grown widely and known as Bathua (Poonia, Upadhayay 2015). Cultivating this vegetable is not difficult, due to the hardy nature of these weedy plants. If grown for their greens, there is a simple way to integrate these plants into a crop rotation pattern without allowing them to take over the fields as a weed. To do this, it's important to harvest the greens before they begin to bolt (that is, produce flower heads), so that they do not distribute their seeds into the soil and return annually.

Many people are nervous to grow these plants because they are considered to be a noxious weed, and they can out-compete most of the other veggies in a small garden or large farm. But on an agricultural scale, they are no more difficult to cultivate than most leafy greens, which typically are not allowed to go to seed in the fields either. These plants are considered so difficult to manage as weeds because of their prolific seed-distribution, but compared to most other local invasives in Montana, they pull out of soil relatively easily, with shallow root systems that release from the soil with only a short tug.

For the same reason these plants are considered to be a pest, they will continue to thrive under changing climate conditions. These plants are known to do particularly well in disturbed soils, being first secession wave greens (Benet-Pierce, N. 2014). This means that they can be cultivated just about anywhere, indoors or outdoors, even where the soil is not suitable for most typical food crops. I've seen these pesky little sprouts popping up between the cracks of sidewalks, or making homes on the sides of roads. These plants also require very little water, which is part of why they are used in drier regions of India and Pakistan (Poonia, Upadhayay 2015). Seeds from Chenopodium album uncovered from over 1700 years ago have germinated, demonstrating the strength and resilience of these plants (Pollan 1989).

Additionally, the oxalic acid which can be easily cooked off, acts as a natural barrier to pests in a similar way to the organic pesticide Pyrethrin. Pyrethrin contains crystalline acid structures very similar to oxalates, which destroy the digestive tract of small bugs but are relatively harmless to bigger animals such as humans and their livestock (Chrustek et al. 2018). Similarly, these plants can grow just about anywhere in the United States, from high mountainous regions to drier lowlands, and even popping up in nearly every riparian zone along waterways across the Western United States, following long meandering creeks and rivers which carry their seeds (Benet-Pierce, N. 2014).

Many foragers are more concerned with specialty items such as berries, herbs, and mushrooms, which realistically cannot support the caloric needs for the average adult human. In the United States, we consume a huge amount of carbohydrates through grains such as wheat and corn (USDA 2022). Wild grains such as Chenopodium Album, as well as Amaranth, may be the best replacement for these grain crops, as industrial scale agriculture - and agriculture in general - becomes less viable for feeding larger populations. These plants are also easily recognizable,

and there are no common poisonous plants that resemble Chenopodium in any stage of its growth. The fact that you can consume both the seeds and leaves of this plant means that it can be consumed throughout the growing season regardless of growth stage, and its grains can be dried and stored throughout winter. The leaves of this plant can also be blanched and frozen, or dried and stored as most other similar greens, such as spinach. Chenopodium is also such a hardy green that it can be found throughout winter even in places with winters as harsh as we have here in the Rocky Mountain West, meaning that it may be one of the few fresh, leafy greens that can be foraged for in the winter.

Beyond its value as a caloric and nutritional staple, with a very similar nutritional value to spinach, Chenopodium album also had medicinal uses (Poonia, Upadhayay 2015). When the leaves are chewed to create a poultice, this can be used to cure skin ailments such as nettle stings, insect bites and even to calm flaking sunburns. It can also be used as an anti-inflammatory in small quantities. These benefits come from the rich nutritional makeup including amino acids, iron, potassium, phosphorus and calcium (Poonia, Upadhayay 2015). The plant is also incredibly high in vitamins A, B, C, as well as high levels of antioxidants (Poonia, Upadhayay 2015).

These plants can grow as tall as ten feet, although most are smaller, more manageable sizes remaining within a foot or so from the ground. Pigs and goats can process oxalic acid in much higher doses than the human digestive tract can handle, making these a useful source of animal feed as well (Deane 2018). When hay, corn, wheat, and soy are no longer viable to be wasted on animal agriculture, small farmers can still find food for their animals and their families throughout the year using this strange and underrated invasive species. Also, it tastes very similar to foods already familiar to us, such as spinach and quinoa.

For the many reasons I've outlined above, Chenopodium has the potential to out-compete other species in cultivation capacity as climate change progresses. Perhaps by the year 2100, we will see this weed on our plates and in our bowls at dinner. Or maybe, we have the potential to still see a ham sandwich, meat-pigs and dairy-cows fed on Chenopodium, with a hearty grain bread and of course, a leafy green garnish on top. But for now, I'll simply share a more basic recipe to use these hardy grains.

Ingredients:

- Grain from Chenopodium album
- Seasoning of choice - I recommend a healthy shake of garlic powder

Directions:

- First rinse or soak the grains, discarding water after use
- Then, bring the grains with just enough water to cover the top of the grains to a low simmer for about 15 minutes
- Drain off any excess water, then allow the grain to rest after for around 10 more minutes. If there is still moisture left after draining, it's alright, as the grains will absorb the remaining moisture

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Galinsoga Parviflora - *Guascas*

Galinsoga, or Shaggy Soldier, is another notorious weed known by many names. This plant is relatively easy to pull from the ground, at least compared to weeds like thistles or quack-grass, due to its shallow root system. Galinsoga doesn't have large tangles of roots or prickles, although its hairy texture may appear spikey at first glance (Nafici 2016). Many organic farmers, particularly in the midwest and northeast, but increasingly towards the Northern Rockies as well, struggle to keep these pesky weeds at bay. Early in the summer, Galinsoga sprouts begin to spring up from the soil, generating multiple successions of generations after this first growth (Nafici 2016). In fact, if left unchecked, Galinsoga can continue to reproduce in large patches until the first frost in uncultivated areas around farms, releasing huge swaths of airborne seeds into the fields of other crops (Nafici 2016). This can rapidly become an issue as each plant produces numerous flowerheads which are capable of producing thousands of seeds per flowerhead (Grant, B. 2023). This allows for 3 to 5 generations of the species in a single grow season, competing effortlessly with crop species as well as native species (Grant, B. 2023).

There are a few advantages this pesky plant uses besides its mass reproduction. Many of the names for Galinsoga mention its shagginess, referring to the tiny hairlike structures along the stems and leaves. These little hairs, when they meet the soil surface, can become adventitious roots. For the Shaggy Soldier, this is an ultimate survival mechanism that allows them to thrive anywhere (especially if you make the mistake of throwing them into your compost pile!) For farmers and land managers, this means that all the individual plants pulled must be removed completely from the field, a meticulous process which removes valuable organic matter from the

soil. In some cases, this mass of organic matter can be desiccated and broken down using advanced methods to kill off or germinate internally the remaining weed-seeds. This can provide for nitrogen-rich biomass that breaks down easily, but poses a risk of worsening weed pressures if done incorrectly. These weeds can also spread through air dissemination much like dandelions, and their stiff hairs make for bur-like sticky bits that allow their prolific seeds to be transported on the equipment and clothing of humans and furs and feathers of animals alike (Grant, B. 2023).

The flowers of Galinsoga weeds make them easy to spot in the field, with little white rayed and disc florets about a quarter of an inch across (Lesica et al 2012). They are self-sowing herbaceous annual plants, which are usually low growing but can grow over two feet in height (Lesica et al. 2012). Early tilling may help prevent seed-germination of these species in a crop field because Shaggy Soldier germinates more readily in lightly tilled soil that has been turned shallowly. Summer cover crops are also a great method for smothering out the pressure from these weeds. Another method suggested is organic mulching, either with natural materials such as straw or wood chips, or with thin materials still penetrable by sunlight to create a barrier against weed pressures. Crop rotation, regular hand-weeding, and diligently cleaning equipment between cultivating different fields and areas on the land is vital to keeping this plant from taking over the landscape (Grant, B. 2023). That is, if there's a need to eradicate this delicious and strange plant from an agricultural landscape.

Originally, Shaggy Soldier came from South America, where it is lovingly referred to as Guascas (Jaine 2014). In some South American countries, such as Argentina and Colombia, Guascas is actually considered to be a culinary herb and is grown intentionally for its mild flavor (Jaine 2014). Galinsoga made up the bulk of my great heap of weeds from the PEAS farm in 2019. Although its hairy exterior discouraged me from trying it raw, I discovered a wealth of

information about how to process this delicious weed. The flavor of guascas is very similar to the flavor of artichokes, and sunchokes as well. The flavonoid silymarin is responsible for this distinct flavor across all three plants, which has actually been shown to improve liver and skin health, and round up free radicals from the bloodstream (Gillessen 2021).

Galinsoga parviflora is not only delicious as an herb to flavor soup, or sauteed on its own, but it also packs an impressive amount of nutritional benefits (Bazylko 2014). Aside from the flavonoid silymarin, fresh leaves can be juiced or eaten raw, and they have been reportedly used medicinally across the world to treat a variety of ailments including dermatological disorders such as eczema and tough-to-heal wounds (Studzińska-Srok et al 2018; Joghee 2017). This juice can be used orally for colds, flus and even sores of the mouth and nettle stings (Bazylko 2014). Commonly, Galinsoga was brought aboard ships to prevent scurvy due to its high potency of vitamin C (Studzińska-Srok et al 2018). The array of flavonoids contained in Galinsoga have been shown to reduce inflammation and possess analgesic properties, and have even been shown to protect against UV radiation (Studzińska-Srok et al 2018). Extracts from Galinsoga were proven to be antiviral, antifungal, and antibacterial (Bazylko 2014). Additionally, “Various chemical compounds and extracts of gallant soldier have shown α-glucosidase, hepato-protective, nematicidal, and hypoglycemic activities” (Studzińska-Srok et al 2018).

Guascas is the special ingredient to the traditional South American potato soup called Ajiaco, which I tried my hand at making. This soup was a cheap dish to make, using, of course, the leftover chicken from my job at the restaurant and the potatoes skewered by a pitch fork earlier that week on the farm. Potatoes usually store well, some varieties even lasting through the winter, but if their thin skin is pierced during the harvest process they will rot and possibly cause the others stored aside them to rot as well. For this reason, we were cautioned not to carelessly

stab our pitchforks into the ground during potato harvest, although some casualty was inevitable. The stabbed through potatoes piled up, and members of the farm crew carried them home in great heaps.

After washing the potatoes, I boiled them as if planning to make mashed potatoes. Then in went the chicken, oil, and finally, the Galinsoga painstakingly pulled leaf by leaf from the stem. I set some of the delicate leaves aside, later sauteeing them in butter. I was astonished to discover the familiar flavor of artichokes in these sauteed greens, and excitedly, I cooked up more and brought them into the farm the following day alongside a steaming pot full of Ajiaco soup. The soup warmed our hungry bellies and provided a nice break from the greens and fruit-heavy diet provided by the other vegetables cooked from the farm.

I was enlivened and encouraged by this recipe to keep experimenting with eating the weeds from the farm, and the strange looks as I harvested weeds stopped after everyone on the crew got a taste of this delicious soup. I'd like to share the recipe I have developed since my first try below, which can be mastered by any beginner at cooking, and altered greatly depending on personal taste and other dietary preferences or needs:

Ajiaco Soup

Ingredients:

- 8 cups fresh or 10 cups dried Galinsoga leaves
- 2 pounds potatoes of any kind, chopped into quarters
- 1-2 onions and 2-4 cloves garlic, depending on taste. These are better if browned beforehand in oil or butter for a few minutes over medium heat
- ¼ cup olive oil, butter, or another fat of choice

- **Optional Add-ins:**
- Shredded or diced chicken
- 1 cup heavy cream or whole milk
- Vegetables and herbs: I recommend cilantro, corn and carrots
- Chicken broth to thin the soup as slow cooking thickens the dish
- Bread or crackers for dunking into the soup while serving

Directions:

1. Bring potatoes to a boil in lightly salted water, draining roughly half of the liquid after they become fork-tender
2. Add in the oil, galinsoga leaves and other herbs, spices, meats, or vegetables if desired
3. Cook on a low simmer as long as time allows, anywhere from one to ten hours, with flavor only improving as time goes on, creating a thicker and more rich soup

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Portulaca oleracea - *Purslane*

Succulent vines creep their way between rows of veggies, little yellow flowers bursting from the tips of their stems. Purslane is a weed like no other, naturalized across the world (Bauman 2021). Here in Montana, the sight seems stranger, but stranger yet when we envision these same little round leaves, plump and green, maroon and so alive, growing on every continent but Antartica (Proctor et al 2011). Scholars have already made the connection between Purslane's high nutritional content, combined with its advanced drought resistance, and the future of the human diet in our changing climate (Petropoulos et al 2019; Uddin et al 2014). Purslane is a succulent that conserves moisture in its own leaves, storing it for use during times of extreme drought and heat (Petropoulos et al 2019). In fact, Purslane has a body made up of 90% water (Zimdahl 1989). Beyond the midland area of the United States like Montana, as sea levels begin to rise and groundwater becomes contaminated by the ocean, Purslane has shown a remarkable tolerance to salinity (Gonnella et al 2010; Petropoulos et al 2019). With its sour tasting, gooey flesh, Purslane packs an unusual nutritional content, rivaling the modern superfoods which boast their extreme health benefits.

Compared to any leafy green vegetable typically cultivated, Purslane has the highest levels of two key omega fatty acids, alpha-linolenic acid and gamma-linolenic acid (Uddin et al 2014). Even when compared to omega rich health-foods ranging from rapeseed oil, walnuts, butternuts, beechnut, wheat and oat germ, soybeans, cabbage, cauliflower, broccoli, strawberries, spinach, peas, corn and beans of all varieties, Purslane stands alone as the richest source of these vital fatty acids (Uddin et al 2014). Purslane also contains eight out of nine of the essential amino

acids (Petropoulos et al 2019). And yet, it springs up in our gardens, on farms, in the ditches on roadsides and the small patches of green adorning swaths of scalding hot pavement in the summertime. Purslane often goes unnoticed in Montana, underappreciated, when even as a weed it's considered, largely, to be no threat to the fields, composted and even tossed aside to wilt, rot, and dry slowly in the heat of the sun.

Comparing this plant to spinach, once again, we see higher levels of alpha-tocopherol, ascorbic acid, and beta-carotene (Uddin et al 2014). It claims higher levels, even, of beta-carotene than contained in carrots (Longacre 2022). Purslane is rich in vitamins A and C, in calcium, iron, magnesium, potassium, phosphorus and zinc, antioxidants, as well as another surprising chemical compound (Aberoumand 2009; Longacre 2022; Petropoulos et al 2019). Purslane is one of the few edible plants which contains naturally occurring melatonin, a chemical responsible for regulating circadian rhythms in the human body, or put more simply - our sleep cycles (Bauman 2021; Longacre 2022). But Purlsane can be used for much more than a sleep aid, and has been used across the world by various communities for a shockingly broad list of ailments. From bizarre uses such as inducing medical abortions, the treatment of STDs like gonorrhea and syphilis and even to shrink hemorrhoids, to what we think of as more typical herbal medicines such as for its anti-inflammatory, antimicrobial, and antioxidant properties, Purslane has many different kinds of applications (Bauman 2021; Petropoulos et al 2019; Uddin et al 2014). Purslane can even be found in the ancient Ayurvedic texts (Petropoulos et al 2019).

Purslane has a long history of use by humans across the world, proven after fossilized remnants of the succulent plant were found during archaeological digs of waste sites (Bauman 2021). This plant was widely cultivated across Europe during the Middle Ages, and was even grown in monasteries (Bauman 2021). Ancient Greeks and Romans referenced the weedy plants

in their writings, including Greek physician Pedanius Dioscorides and the Roman naturalist Pliny the Elder during the first century (Bauman 2021). Native Americans began using this plant after it found its way to North America, powderizing the seeds of Purslane to make flour for baking, dehydrating its plump stems for high caloric winter-rations, and some tribes even using Purslane as feed for their sheep (Bauman 2021). Sheep weren't the only animals feeding on Purslane's nutrient rich flesh, it has also been found that chickens fed with the leaves of Purslane lay eggs that have a significantly higher content of omega-3 fatty acids (Bauman 2021). Some studies have also suggested that Purslane is a "highly likely candidate as a useful cosmetic ingredient" due to its anti-inflammatory properties and high lipid content (Aberoumand 2009; Uddin et al 2014).

Unlike many leafy greens which may be high in nutrients but lack other nutritional qualities, Purslane is a substantial source of protein, fiber and fats (Aberoumand 2009; Gonnella et al 2010). The protein content of Purslane has been shown between 23% - 34%, with a lipid content over 5.3%, over 63% carbohydrates and 14% fiber (Aberoumand 2009). Although this plant does contain oxalic acid, early harvest and thorough cooking can decrease levels, making it safe for consumption in large quantities (Petropoulos et al 2019). Purslane was classified in 1977 as one of the "12 non cultivated species that have been most successful in colonizing new areas" (Holm et al. 1977).

To consume Purslane, there are many different recipes and uses. The one constant to follow - Purslane must be washed thoroughly. The textured stems of Purslane cling particles of soil to the plant, making for a gritty and unwelcome surprise (Longacre 2022). However, Purslane is relatively common in the Mediterranean diet, utilized still in Greek and Italian cooking (Bauman 2021; Longacre 2022; Petropoulos et al 2019). One typical dish to find

Purslane in combines cucumbers, vinegar and other herbs, tossed as a salad (Longacre 2022). In Mexico, Purslane is commonly added to omelets (Petropoulos et al 2019). The leaves, stems and even flowers can be steamed for approximately 4-5 minutes and served as a stand-alone dish, improved upon with salt and butter, of course (Longacre 2022). Purslane makes a vitamin C rich addition to smoothies and can even be juiced like any other fruit or vegetable (Longacre 2022). Typically, Purslane is used as a substitute for ingredients like watercress, spinach, and arugula (Longacre 2022). Its thickening qualities can be attributed to the plant's water-soluble polysaccharides, which are also useful as thick gums (Gonnella et al 2010).

The gelatinous nature of Purslane when cooked can be used as a thickening agent in soups and sauces, and is commonly added to soups in areas surrounding the Mediterranean coast (Bauman 2021; Longacre 2022). In Turkey, purslane is called Semizotu, and used to create a wide variety of dishes, one of which I will share below (Dogan 2012).

Turkish Semizotu Pilaf

Ingredients:

- 2 cups chopped purslane, rinse thoroughly
- ½ cup rice, unsoaked
- 2 tomatoes, peeled and diced
- 1 onion, diced
- 1 tablespoon tomato paste
- 1 tablespoon olive oil
- Pinch of salt

Directions:

- Wash the purslane thoroughly, first removing the leaves, then chopping the stalks roughly.
- In a large pot, first heat the olive oil and saute the onion on medium heat until browned
- Add tomatoes, tomato paste, and uncooked rice
- Finally, add all parts of the purslane plant in with your salt
- Mix the ingredients together and lower the heat to a simmer, cooking until the rice is soft, about 20 minutes
- Let rest for at least 5 minutes after cooking

Amaranthus Palmeri - *Palmer Amaranth*

Palmer amaranth is much different from its native compatriot Redroot Amaranth, which is native to Montana (Jhala & Knezevic 2017). Both of these plants are edible, and surprisingly nutritious and easy to cultivate. Palmer Amaranth grows rapidly, scaling 2-3 inches per day and reaching heights over 6 feet tall (Montana Living 2019). Palmer Amaranth can produce half a million seeds per plant (Montana Living 2019). This variety of Amaranth is a new invader to Montana, first taking root recorded in the last five to seven years (Montana Living 2019). What's disturbing to farmers about Palmer Amaranth is that it is resistant to herbicide treatments, including glyphosate (Jhala & Knezevic 2017, Deane 2018, Montana Living 2019).

Despite the trouble this variety of Amaranth has caused for agriculturists, this plant has actually been foraged and cultivated by indigenous populations for centuries (Deane 2018). At least seven tribes were known to have prepared Palmer Amaranth in their cooking, including the Cocopa, Mohave, Navajo, Papago, Pima, Pima Gila River and Yuma tribes, and many more tribes utilized other varieties of Amaranth (Deane 2018). Palmer Amaranth can be considered a dietary analogue to spinach when its young leaves are prepared, a close relative in the Amaranthaceae family (Deane 2018; Moghadam et al 2021; Orr 2023). However, older plants can accumulate high levels of nitrates and oxalates in their leaves, so it's best to only consume the leaves of these plants when they are still in their first stage of growth (Deane 2018). However, some livestock including pigs process these antinutrients with little to no problem, giving them the nickname pigweed, often leading people to confuse this plant with Chenopodium album which often goes by the same name for the same reason (Deane 2018). This doesn't mean

that these plants are useless as they grow taller and their leaves begin to darken in color. When Amaranth goes to seed, a farmer's nightmare, this is a foragers dream come true. The Palmer Amaranth variety produces a huge amount of seeds which can be used to supplement grain in the diet (Deane 2018).

Palmer Amaranth has adapted to grow in harsh, dry and hot conditions, much like the climatic conditions projected for Western Montana by the year 2100 (Moghadam et al 2021). This plant has a long, spindly taproot which makes it obnoxious to pull from the ground as a weed, but this taproot allows it to reach water far below the dry surface of the soil in extreme heat (Deane 2018). For this reason, it can easily outcompete other crops such as corn and soybeans, drinking up all the water at the surface level and digging deeper to find more below (Jhala & Knezevic 2017). This deep root also acts to stabilize the plant, giving it firm resistance against harsh winds and other storms (Moghadam et al 2021). Amaranth also competes for nutrients, light and growing space, making it a direct threat to agricultural crops (Moghadam et al 2021). In the Southern United States, industrial agricultural operations have struggled for decades to keep this weed at bay - seemingly, the harder they have tried to eradicate the hardy weed, the more it adapts to continue thriving. Crops of corn, cotton, soybeans, and peanuts have been significantly reduced attributed specifically to this variety of Amaranth (Jhala & Knezevic 2017). This is why agrarians and land managers feared the ever-encroaching weed as it migrated from state to state, eventually reaching Montana only relatively recently (Montana Living 2019).

Palmer Amaranth was not only feared for its ability to penetrate much deeper into soils than agricultural crops, but mainly for its increasing resistance to herbicides including glyphosate (Deane 2018; Jhala & Knezevic 2017). Amaranth is a wind-pollinated plant, meaning genetic traits can spread rapidly and across far distances, even crossing with other varieties of Amaranth

(Deane 2018; Jhala & Knezevic 2017). Herbicide resistant Palmer Amaranth has now been reportedly found in more than 20 states, and it has steadily been making its way North and East from the Southwestern regions it is native to (Deane 2018; Jhala & Knezevic 2017). Other weeds are now also developing resistance to herbicides such as glyphosate, creating what are typically referred to as superweeds (Deane 2018). However, Palmer Amaranth only grows in developed agricultural areas, and does not appear to be a threat to the larger ecosystem except where herbicides are used for conservation of native species (Deane 2018).

The young leaves can be eaten raw or cooked and are typically eaten boiled with salt (Edible Wild Food 2021). Leaves can also be dried, which allows the early greens to be enjoyed even when the plants have grown to their grain stage, with reddish leaves elongating to soak up sunshine and nourish their long, droopy flowers. Amaranth can be baked, boiled or dried for use in winter (Deane 2018). Sugar can even be extracted from its seeds, a common use by indigenous groups before colonization (Deane 2018). Seeds are often ground to make a flour-like powder, but the seeds are gelatinous when whole and can be used to thicken soups and sauces when soaked (Ajmera 2018, Edible Wild Food 2021). To cook the seeds into a porridge, typical recipes call for one part Amaranth seeds to three parts water, or two parts water if used to make a dough (Orr 2023). These seeds can be used in place of other grains like rice, couscous and even pasta in some recipes (Ajmera 2018). To eat the young greens, some sources say to saute in butter or oil the same way as spinach, and to expect a similar outcome of shrinkage when cooking (Orr 2023).

The grains can also be sprouted, which breaks down antinutrients and makes them easier to digest if consumed regularly (Ajmera 2018). You can begin to harvest seeds from Amaranth plants in middle to late summer. The seeds are ready to harvest when they start dropping from the plant, littering the ground below where new seedlings will arise shortly after (Orr 2023).

The family Amaranthaceae actually includes other commonly eaten greens such as spinach, beets and chard, and even a favorite of mine - Chenopodium album. Amaranth plants were a staple in the Aztec diet, and there is evidence that it was first foraged wild and later cultivated by Aztec people as long as eight thousand years ago (Orr 2023). Amaranth contains double the amount of ascorbic acid (vitamin C) as kale and quadruple the amount found in spinach (Orr 2023). The greens are also high in vitamin A and calcium (Orr 2023). One serving of amaranth exceeds the daily nutrient suggestion for manganese, necessary for production and regulation of amino acids, cholesterol, glucose levels, and carbohydrate metabolism as well as reactive oxygen processes, bone formation, healthy reproduction and immunity (Filho et al 2018, National Institutes of Health).

Amaranth is also an exceptionally high source of magnesium, a vital nutrient which plays a role in more than 300 bodily functions including muscle movement and DNA synthesis (Ajmera 2018). This plant is also abundant in phosphorus, a mineral that promotes bone health, as well as iron, which supports the production of blood (Ajmera 2018). Amaranth contains high amounts of phenolic acids, plant compounds with antioxidant properties such as gallic acid, p-hydroxybenzoic acid, and vanillic acid. These antioxidants may offer protection against illnesses such as cancer and heart disease (Ajmera 2018). In a study done on rats, amaranth was even demonstrated to enhance the function of certain antioxidants in the liver, safeguarding this vital organ from alcohol-related damage (Lopez et al 2011).

Amaranth is one of those plants that makes a statement. The harder we try to control the amaranth, the more it adapts. Even our most powerful herbicides, responsible for vast environmental damage, only seem to set the amaranth stronger in its course. We can take

advantage, too, of this rapidly growing threat as it has reached us now in Montana. The next smoky sky late summer barbecue in Montana, I hope to try this recipe below:

Amaranth & Eggplant "Burger" Patties

Ingredients:

- 3 cups eggplant, diced
- 2 tablespoons Bragg Liquid Aminos
- 1/4 cup amaranth
- 3/4 cup broth - chicken, beef, or veggie will work
- 1 teaspoon oil
- 1/2 onion, diced
- 1 clove garlic, minced
- 1 tablespoon nutritional yeast
- 2 teaspoons dried basil
- 1 teaspoon dried oregano
- 1 teaspoon liquid smoke, or smoked tea
- salt and pepper - to taste

Directions:

1. To begin, preheat the oven to 400 degrees. Cover a baking sheet with parchment paper.
2. Toss the diced eggplant with oil of your choice and amino acids, then spread them evenly across your lined baking sheet. Add salt and pepper to taste.
3. Roast the eggplant in the oven for about 20 minutes, tossing them to mix after about 10 minutes halfway through. Set aside to cool briefly.

4. While the eggplant is still in the oven, cook your amaranth seed. Combine the amaranth and broth in a small pot, covering it to trap steam. Bring this mixture to a boil, then immediately reduce to a simmer and crack the lid to release the pressure. Let this simmer until all the liquid has cooked away, usually less than 20 minutes. Fluff the grains with a fork and set them aside to cool.

5. While the eggplant bakes and the amaranth simmers, lightly brown the onion and garlic together in a small pan.

6. Next, combine the eggplant, onion & garlic, along with all desired spices, adding nutritional yeast and smoke flavor into a food processor, blending until combined but not emulsified.

7. Add this blended eggplant to the now cooked amaranth, thoroughly mixing them together.

8. Divide this mixture into 4 equal parts and form into patties - you can use the same parchment covered baking sheet that you used earlier to cook the eggplant. Bake the patties at the same temperature for about 35-40 minutes, flipping after about 20 minutes.

9. After baking, the patties can be fried in the onion/garlic pan to firm them up, slightly browning the outsides. For a barbeque, these patties can be grilled instead.

Stinging Nettle - *Urtica dioica*

Blackberry thorns weren't the only enemy I had as a child. I remember painful, swollen rashes covering my fingers and toes, arms and legs, covered in welts from swimming through patches of stinging nettles. Nettles are a complicated plant, considered to be a noxious invasive by some and a healing herb by others (Carey 1995). There are three varieties of nettles which grow across the continent, ranging from two native species to an invasive European variety (Montana Vascular Plants Field Guide). Oftentimes native varieties, such as the type most commonly found across Western Montana, are still considered to be unwanted pests. This is because nettles inject irritants into the skin when touched, and even the slightest brush against the tiny hollow hairs across their leaves and stems burns into a rash of tiny, white welts that sting and ache like a wasp's sting. One the ends of these hairs hide an incredibly thin silica tip, which splinters easily by the stroke of an unexpecting hand or the lightest-stepping little feet, revealing a thin needle-like hair that injects formic, tartaric and oxalic acids beneath the skin (Yi Fu et al 2006). But the full cocktail of toxins released by the sting of a nettle is still disputed (Cummins & Olsen 2011).

Nettles contain a surprising chemical compound, which is familiar to most people as the happy hormone - serotonin. When released from the sting of a nettle however, this hormone, usually responsible for our mood regulation, acts as a skin irritant (Easton et al 2021; Yi Fu et al 2006). Many scientists argue that this hormonal reaction is the responsible party for the aching of a fresh nettle sting, while others cite the formic acid - which is also the main component in ant bites - as the source of pain. Neither of these compounds are found in high enough rates to

account for the long-lasting pain caused by merely brushing against the leaves of these plants, leading researchers to believe there is a synergy between the multiple irritants likely adapted as a unique defense mechanism for the nettle (Yi Fu et al 2006). Nettles have another unlikely defense mechanism, one which may be more easily respected, and one that is particularly relevant for the changing landscape here in Western Montana.

While a nettle can produce up to twenty thousand seeds per shoot, these seeds remaining atop the swaying plants until frost covers the ground, nettles also spread underground through rhizomes (Carey 1995). Reaching their spindly brown arms beneath the soil to clone themselves, spreading under their dense patches into a complex network invisible to those above ground, until the shoots burst from the soil and rise to meet the sunlight penetrating the surface of the moist soil, this alternative method of spread protects the nettles ability to reproduce in an unexpected way. The underground spread of rhizomal material shields these populations of nettles from aggressive wildfires on the surface of the soil (Carey 1995). The huge quantities of seeds and plant matter above the surface of the earth may burn into ash, halting photosynthesis and preventing the spread of seed aerially. This ash simply sinks into the soil as a nutritional boost for the rhizomes still growing steadily beneath.

Wildfires caused by a combination of fire suppression and changing climatic conditions, such as increasing temperatures and unstable rates of precipitation, often have devastating impacts on vegetation across areas like the Rocky Mountains (Kimmerer 2001). But nettles have been spotted as some of the first plants to re-establish themselves after major fire events in Montana and Idaho (Carey 1995). Nettles thrive on disturbance, like many pest plants, their swaths growing thicker and stronger beneath the ground as uncertainty shakes the earth above (Carey 1995). Nettles can survive not only the heat of burning flames, but also winterkill in

harsh, cold climates like mountainous Montana; their dried, dead canes standing rigid to create an insulating barrier of snow and retaining temperatures just beneath the soil, where the young nettles lay in waiting to burst free from the soil (Carey 1995).

Ironically, although the pain of a nettle sting is an indication of inflammation, nettles have actually been shown to reduce inflammation throughout the body (Easton et al 2021; Turner 1973). Nettles have been used by indigenous groups across North America for millenia, treating ailments ranging from arthritis, tendonitis, insect bites, eczema, muscular strains and hypertension, hay fever, anemia, benign prostatic hyperplasia, to urinary tract infections and more (Adhikari et al 2015; Carey 1995; Easton et al 2021; Lopatkin et al 2007; Qayyum et al 2016; Turner 1973). Nettles have been shown to help stabilize blood sugar levels in studies done on rats, implicating their usefulness in the treatment of diabetes (Ahangarpour et al 2012; Kianbakht et al 2013; Obanda et al 2016; Said et al 2007).

The fibrous stems of nettles, which grow tall and straight, have also been used as materials to make rope, twine and similar types of cordage such as fishing nets by indigenous groups including the Kwakiutl and other northwestern coastal groups (Carey 1995; Turner 1973). These irritating little plants are useful for more than their sturdy plant matter and range of medicinal marvels when brewed as a tea: nettles can also be consumed as a green. When soaked, boiled, or dried, the mysterious stinging mechanism is doled, revealing an elusive and delicate flavor behind in their bright green leaves. These leaves can be eaten like spinach or other greens such as those described in earlier sections, and pack a surprising nutritional benefit.

What's more is that many livestock animals appear to be unbothered by the stinging capacity of nettles, giving opportunity for nettles as a grazing staple after fires have cleared other

grasses and forbs (Carey 1995). Dried nettles, stems and all, actually outcompete other fodder types nutritionally such as alfalfa (Carey 1995). An extract made from the leaves of nettles and water, soaked for multiple weeks, can also be used as an organic fertilizer - making it a popular choice for organic farmers to replace other sources of nitrogen in the soil (Garmendia et al 2018). These plants have also been shown to increase beneficial insects around the garden and farm, providing shelter for predatory aphid-eaters and native pollinators alike (Bhusal et al 2022).

Nettles contain up to 4 times the amount of Vitamin C as oranges (Adhikari et al 2015). One study compared powdered nettle leaves to common cereal grains, such as wheat and barley, and found significantly higher level of bioactive compounds such as phenolic compounds, gallic acid, tannins, flavonoids, phenylpropanoids, caffeic acid analogues and other antioxidant properties (Adhikari et al 2015). Nettles contain substantial levels of nutrients such as calcium, iron, and omega fatty acids (Adhikari et al 2015). This same study showed that powdered nettles contain over nine times the amount of crude dietary fiber, and more than ten times the carotenoids - which are the precursors to vitamin A (Adhikari et al 2015). Fiber from nettles is low glycemic and contains very little carbohydrates compared to plant foods with a similar nutritional profile (Adhikari et al 2015).

My sister is the person who taught me how to handle nettles safely from our yard, after honing her own skills through a process of trial and error. She demonstrated, proudly, how she discovered places on the nettle plant which she could touch without being stuck, such as across the tops of the leaves, stroking them gently to show her affection for the plants, which terrified me deeply. She gently folded the leaves, little fingers pressing on either side to hold the spiky underlayer together, and showed the swift but gentle motion necessary to pluck each leaf, one by one, from its stock. I remember her telling me the sting is mostly in your mind, not to flinch

when the burning begnis otherwise the irritants can be rubbed across more skin, any jolting motion awakening the danger as if these swaying stocks were a predator out to get us. I practiced and pretended the stings didn't bother me, hoping that if I believed her words enough the pain would fade away faster. It didn't work.

When I grew older and began to read about the benefits of stinging nettle tea - toted by hipster cafés in Seattle as a cure-all, I thought back to her advice. Instead, I layered my hands with pairs of my father's thick socks, using the woolen armor like oven mits to tear large clumps of stinging nettles from the sides of our driveway and road leading up to our house, now paved, but still succumbing to the ever encroaching swaths of nettles, bowing into the sides of the roads, threatening through car windows. I ripped them out by the roots, sending clumps of dirt flying, stuffing the greens into a trash bag carefully so as not to touch anything but my protected hands to their greens. I supposed I could have gone delicately, plucking each leaf with my bare fingers, but as a teenager and a new farmer I felt a need to force my strength onto nature. I felt like I could exact my revenge, like I could excavate them completely from the landscape of my childhood. That didn't work either. The tea tasted terrible and more nettles only popped up in their place weeks later.

I work at a tea shop now and we blend with nettles. I've begun to develop a taste for them. Although, I haven't been magically cured of my ailments. The nettles we source are grown agriculturally, not ripped from anyone's yard or public parks or walking trails, but planted by seed and raised up with intention. I think it's strange to farm a plant that grows so voraciously in unwanted places. Like guascas in South America, it's a highly sought after herb both for its flavor and medicinal benefits. A lot of times I wonder if it would be easier to farm only plants like these, plants like the ones I have been describing, taking out the backbreaking labor of

weeding them out from the array of brassicas so distant from themselves they can barely survive outdoors. There's certainly a market for it.

Neighboring farmers might be distraught by this concept, planting weeds in the fields that spread viciously. Certainly it wouldn't be ethical to plant invasive species, but what about cultivating them? In places where they already exist, especially such as in existing agricultural operations, why not harvest rather than eradicate? This would lessen the perceived need for herbicides to keep weeds at bay, chemicals which only strengthen weeds like sneaky Palmer amaranth. Weeds like nettles can replace the need for other chemical inputs, such as nitrogen fertilizers, benefitting the descendents of wild mustard grown across farms in America, which require vast nutrient inputs (Anjum et al 2012).

There's more to weeds than we would like to believe, more uses for them beyond our own needs or wants as humans, perhaps a certain strange place in nature for these invaders, for natural competition. There are also exciting and strange uses for our own benefit, one of which I will share below. Although the taste of nettle tea may not be alluring to most, and the use of weeds as greens in a salad growing tired as this list goes on, there are unexpected and delicious ways to use these albeit terrifying little plants. As a replacement or an addition to basil, nettles make for a delicious pesto-base which can be eaten on pasta, potato salads, or smeared on bread:

Stinging Nettle Pesto

Ingredients:

- 6 cups of fresh nettle, boiled or soaked and chopped finely
- 2 garlic cloves, minced
- 1/3 cup of pine nuts (toast lightly in a hot pan for better flavor)

- 1/2 cup of grated parmesan cheese (optional but adds flavor)
- 1/3 cup of olive oil

Directions:

1. Briefly boil the nettle leaves in water for about one minute, then chop it roughly
2. Combine the blanched nettle, garlic, pine nuts, parmesan cheese, and a little salt and pepper to taste in a food processor or blender
3. Blend the mixture until it becomes smooth, pausing to scrape down the sides
4. Gradually add the olive oil while the food processor is running, add until the mixture is evenly distributed throughout

The painful stings of nettles were one of the first real uses of medicinal plants that I discovered as a kid, after hours spent crying in the bathroom as my mom pressed cold washcloths against my burning skin. My sister later showed me that another plant growing in our yard, horsetail, would work to neutralize the acids injected by the defensive little plant, easing stinging and releasing swelling. This instilled in me a newfound curiosity - not only could I find plants outside to eat, but also plants that could relieve my agonizing pain. I needed to know more. I came to find out that there are numerous other plants which have a similar effect on the sting of a nettle which interestingly include both chenopodium album and galinsoga parviflora, as well as the invasive plantain. Plantain also grows across this country, from Washington to Montana and as far as the eastern coast and the deserts of the south, and although it is considered a weed it goes typically ignored because it doesn't proliferate as aggressively as most other invasive species.

Plantain - *Plantago major*

Common plantain has been used for centuries as a medicinal plant for much broader uses than soothing the sting of a nettle; treating a range of conditions from diseases related to the skin, poor circulation, some cancers, to treat pain and prevent the spread of infection, and even for the respiratory, digestive, and reproductive systems (Najafian et al 2018; Samuelson 2000). These healing benefits come from a wide variety of bioactive compounds, acting synergistically to create a myriad of effects (Hussan et al 2015; Samuelson 2000). These compounds include flavonoids and terpenoids like the other plants we have examined, as well as iridoid glycosides and polysaccharides, lipids, phenolic acids and caffeic acid derivatives (Hussan et al 2015; Najafian et al 2018; Samuelson 2000). This plant has value to humans outside of its numerous medicinal benefits, simply as an edible plant which is easy to find and forage year round. Plantain contains vitamins A, B, C and K, calcium, fiber, fat, protein, silicon, sodium, zinc, tannin and mucilage (Samuelson 2000). Its seeds contain oils and rich protein (Samuelson 2000).

Multiple studies done on rats demonstrated how an extract from plantain decreases inflammation caused by liver injury (Hussan et al 2015; Türel et al 2009). Another similar study found this extract to promote healing of ulcers in the stomach lining of rats (Melese et al 2011). Further, studies have suggested that consuming the seeds of plantain may slow the growth of certain cancer cells (Kartini et al 2017). Plantain may also slow the movement of the digestive tract, which has the potential for treatment of digestive issues such as diarrhea and chronic IBS (Najafian et al 2018; Triantafillidis et al 2016). The most common application for plantain in ancient medicines was for its wound-healing effects, backed by modern studies which illustrate

how plantain not only increases the rate of healing but also reduces inflammation, blocks microbial growth and relieves pain (Kurt et al 2018, Thomé et al 2012). In traditional persian medicine, plantain was documented as widely prescribed over 1000 years ago (Najafian et al 2018). Even Shakespeare mentions the wound-healing effects of plantain in his famous play Romeo and Juliet in Act I, Scene II from the period 1592–1609.

Romeo: Your plantain leaf is excellent for that.
Benvoleo: For what, I pray thee?
Romeo: For your broken shin.

Plantain "Peanut" Butter

Directions:

1. Remove seeds from the stocks of plantain in early Fall, squeezing stems firmly and pulling with pinched fingers downward towards the ground to release the seeds most easily

2. If desired, chaff can be removed from the seeds by crushing them manually and dropping them in front of a small fan over a bowl or other catchment device. Repeat this process as many times as necessary until the seeds have reached a desired purity. The chaffing may add grittiness, but will not alter the flavor of the final product

3. Using a food processor, coffee bean grinder, or mortar and pestle, grind the seeds and whatever chaff may be left over into a smooth paste

4. Mix 1 part plantain seed paste with 1 part melted butter, or another alternative

5. Refrigerate or cool outside to thicken this paste, and spread on toast, add into sandwiches, or enjoy on top of ice cream

Mullein - ***A Case for Compassion and Complexity***

Those who are new to foraging around Montana are likely familiar with mullein, a plant harvested since ancient times around the world for its medicinal benefits when drunk as a tea. What many aren't aware of, including myself until recently, is that mullein is an invasive plant in North America, listed as a noxious weed in Beaverhead, Deer Lodge, Lewis & Clark, Mineral, Stillwater, and Yellowstone Counties across Montana (MSU Extension Office). Although invasive, the sight of mullein stocks stretching up from barren ground is a familiar silhouette to those who grew up in and around the plains of Montana and across the Rocky Mountain range.

Mullein provides an excellent example for the complicated nature of managing invasives on the landscape, a complex practice with various ethical dilemmas. Not all invasives behave the same, as we have already discussed in previous sections. These plants are as unique as native varieties, spreading at different rates across different landscapes, and with varying levels of threat to native species, including both native plants as well as animal and insect species. One study which examined mullein treatment across the landscape discovered an interesting phenomenon - with some invasive species protecting native plants, in an albeit small way, from the effects of other more noxious weeds (Kellogg & Leipzig-Scott 2015).

This study found that mullein invasion has relatively few negative impacts on an ecosystem, and that any benefits associated with its removal are typically lost within a year from treatment (Kellogg & Leipzig-Scott 2015). In fact, the chemical and manual removal of mullein plants acts as a disturbance event on the landscape, similar to the effects of wildfire as described earlier, creating opportunity for other types of weeds to pop up in their place. This particular study examined the effects of not only mullein invasion, but invasive cheatgrass as well,

comparing and contrasting the two as well as examining the ways in which the removal of these two populations interrelated on the landscape during management practice (Kellogg & Leipzig-Scott 2015). The results of this study imply that management for invasive species must encompass a dynamic approach, taking into account more than one species at a time, and heavily weighing the context of each potential treatment site (Kellogg & Leipzig-Scott 2015).

These researchers found that although mullein does little harm to the diversity and abundance of native species, despite being classified as an invasive, its removal opened up the opportunity for more harm on the landscape. When compared to cheatgrass removal, which can be directly shown to degrade populations of native species as well as worsening risk for devastating wildfires, Kellogg & Leipzig-Scott deemed it largely unnecessary to remove mullein, favoring instead to focus resources on removing cheatgrass and other more insidious invasives (Kellogg & Leipzig-Scott 2015).

The implications of the Kellogg & Leipzig-Scott study go far beyond the comparison of mullein and cheatgrass, illustrating the root of the current problem in our techniques to manage invasive species across America. Beyond the risk for worsening invasion of introduced species through removal of certain less-aggressive invasives, such as mullein, the removal of native species may also directly harm native plant species (Didham et al. 2005, Gurevitch and Padilla 2004; Kellogg & Leipzig-Scott 2015; Rodriguez 2006; Sagoff 2005). One clear way this occurs is through the use of herbicides, but an often overlooked means of destruction to native biota includes the general disturbance created by human activity on the landscape (Didham et al. 2005, Gurevitch and Padilla 2004; Sagoff 2005). Managers need to access remote areas to treat invasion, and sometimes may cause more harm by entering these otherwise untrampled areas with equipment and large crews.

There is no single measure for plant invasion, these researchers assert, backing their claim with evidence for how invasives vary in both direction and magnitude of impact on native species (Kellogg & Leipzig-Scott 2015). In many areas, native species extinction cannot be directly linked to the spread of invasives, given that habitat loss and degradation occurs simultaneously (Didham et al. 2005, Gurevitch and Padilla 2004; Kellogg & Leipzig-Scott 2015; Rodriguez 2006; Sagoff 2005). This creates a sort of *chicken or the egg* issue, causing some researchers to wonder if the invasive plants themselves are directly driving this ecosystem degradation, or if they simply follow in its footsteps. As human activities and climate change alter landscapes directly, they may in fact clear a path for these new invaders, similar to the ways in which wildfire disturbance opens up available resources for invasive species to colonize (Didham et al. 2005, Gurevitch and Padilla 2004, Sagoff 2005).

Surprisingly, invasives or sometimes called exotic plant species can have positive effects rather than exclusively negative effects on already degraded ecosystems (Rodriguez 2006). One researcher notes that they create habitat for native species, such as the invasive European nettle acting as a hide-out for beneficial insect species, as mentioned in a previous section (Bhusal et al 2022). Additionally, invasives can diversify the available food for native animal and insect species, even in some cases being shown to increase overall vegetative diversity (Sagoff 2005). This does come with a drawback, of course, even as small-scale diversity may increase through the spread of invasives, on a global scale this creates less biodiversity, pushing the vegetative makeup across continents towards homogeneity (Pyšek et al. 2012; Sagoff 2005; Stark et al. 2020).

Returning to our subject at hand - mullein is a plant that challenges its own classification. Although it’s an invasive, it's a stronghold against newer and more noxious invasives like its

counterpart cheatgrass (Kellogg & Leipzig-Scott 2015). More importantly, in my opinion, it makes us question what it means to classify a plant as anything beyond non-native. To claim something is invasive, exotic, introduced, or simply a weed, carries with it a human bias the depths of which we often fail to understand. Like finding our own place in the natural world, we cannot expect a simple answer. Nature simply doesn't behave by our own awkward moral standards.

Mullein, like many of the plants I have described above, is known to have anti-inflammatory and antimicrobial properties, typically touted for its healing properties on the respiratory system (Dimitrova et al 2013). Other properties of this plant include antiseptic, sedative, diuretic, immunomodulatory and antiviral benefits, making it a popular choice for extracts, tinctures and teas across the world (Dimitrova et al 2013). Harpagoside, an active molecule found in common mullein, has been shown to have remarkable results in mice studies for the reduction of inflammation, similar to the studies examined prior on Brassica oleracea (Dimitrova et al 2013; Rus Jacquet et al 2018).

Mullein tea:

To brew tea from the leaves of mullein, first dry them either in the sun or using a low setting on an oven or dehydrator indoors. Then, bring water to a boil and remove from heat before pouring over the dried leaves. Allow the leaves to remain submerged in the hot water for over 10 minutes, with the potency and strong flavor increasing with time. About two tablespoons of the crushed leaves with 16oz of hot water is appropriate, but adding more or less can adjust the

flavor and potency of this tea. This is best when drunk warm, and can be mixed with other types of tea to change the flavor profile.

Taraxacum officinale - ***Dandelion***

The first plant I knew as a weed was the dandelion. I believe this is the first introduction to weeds many kids get, curious about their little tufts of seeds in the fields of playgrounds, parks, and back yards. Dandelions grow everywhere across the Northern hemisphere, from cool highlands of the tropics to Northern temperate regions, and even in subarctic conditions (Olas 2022; Wirngo & Jeppeson 2016). These hardy weeds can tolerate both drought and frost, allowing for them to proliferate abundantly across regions like Montana which can be difficult for many other plant species to grow, due to the drastically different environmental conditions between freezing cold winters and scorching hot summers (Wirngo & Jeppeson 2016). There are more than 2800 species of dandelion, all of which boast similar nutritional benefits and phytochemical activity (Wirngo & Jeppeson 2016).

Naturalized across the world, it's no surprise that the dandelion has been used as a medicinal by numerous cultures and for a wide variety of health benefits (Carson 2019; Napoli & Zucchetti 2021; Olas 2022; Ponca Tribe of Nebraska 2023; Wirngo & Jeppeson 2016). For this reason, the latin name Taraxacum officinale has its roots in the plant's medicinal benefits, coming from taraxos (disorder or ailment) and aekos (treatment or remedy) (Napoli & Zucchetti 2021; Olas 2022). This may seem broad, naming a plant, essentially, cure for illness; but the dandelion heals such a vast variety of illness that it is aptly named. Dandelions are a rich source of vitamins A, C, E, K (potassium), and a variety of B complexes (Carson 2019; Napoli & Zucchetti 2021; Olas 2022). Dandelions also contain minerals essential to the body's functions,

such as minerals like calcium, sodium, magnesium, iron, copper, silicon, zinc, manganese (Olas 2022).

However, each part of the dandelion plant contains different types and concentrations of vitamins and minerals, as well as phenolic acids, flavonoids, and terpenes (Olas 2022; Napoli & Zucchetti 202; Wirngo & Jeppeson 2016). The roots are high in inulin, which is a complex carb that has been studied as a probiotic, hypoglycemic, and immune-boosting phytochemical found only in certain plants (Olas 2022; Wirngo & Jeppeson 2016). Its roots also contain elevated levels of carotenoids, essential fatty acids, choline vitamins, trace minerals and even naturally occurring sugars (Wirngo & Jeppeson 2016). Inulin has been attributed to the elimination of pathogens throughout the gastrointestinal tract, as well as the repression of obesity, some types of cancer, and the bone disease osteoporosis (Wirngo & Jeppeson 2016). Extracts made from the leaves are most effective for the treatment of cardiovascular issues as well as type-2 diabetes, two main health epidemics across the United States today (Olas 2022; Wirngo & Jeppeson 2016).

The blossoming, sticky yellow flowers and their dark green leaves have a significantly higher concentration of polyphenols than the stems (Wirngo & Jeppeson 2016). These phytochemical benefits throughout every part of the plant create a vast array of medical properties in the dandelion, including diuretic, choleretic, hepatoprotective properties, as well as immunoprotective, anticancer, anti-colitis, antiarthritic, antibacterial, antidiabetic, antifungal, antiobesity, antioxidant, antiviral, anti-inflammatory, antioxidative, antithrombotic and antirheumatic properties (Napoli & Zucchetti 2021; Olas 2022; Wirngo & Jeppeson 2016). Some indigenous cultures used the dandelion for medicines, including the Cherokee and Iroquois

people, as its aerodynamic seeds had reached this continent long before white settlers brought with them the majority of other invasive species (Carson 2019; Ponca Tribe of Nebraska 2023).

One 2011 study found dandelion extract to inhibit the viral activity of HIV-1 (Han et al. 2011). A different 2011 study uncovered the dandelion's potential to prevent flu infections through a similar pathway, inhibiting virus replication (He et al. 2011). In 2019, a study found that dandelion can help treat symptoms of autoimmune disorders through activating a biological signaling pathway, which is often misregulated in those who suffer from these types of disorders (Sang et al. 2019).

Some viruses can also be inhibited in the body using extracts from dandelion, including hepatitis B and C (Flores-Ocelotl et al. 2018; Yang et al. 2020), as well as one serotype of the dengue virus (Rehman et al. 2016). The dandelion also possesses antimicrobial and antibacterial properties, leading researchers to discover its uses against Staphylococcus aureus, Bacillus cereus, Escherichia coli, Klebsiella pneumoniae and Proteus mirabilis, (Kenny et al. 2015; Diaz et al. 2018; Napoli & Zucchetti 2021; Qian et al. 2014; Wang 2014). These names may sound unfamiliar at first, but this list includes the culprits behind E. Coli outbreaks and Staph infections. Dandelion has even shown varying levels of effectiveness for the treatment of different types of cancer, including breast cancer, leukemia, colorectal, prostate and pancreatic cancer cells. Often in Western medicine, dandelion is administered alongside more modern cancer treatments such as chemotherapy and radiation (Napoli & Zucchetti 2021).

Because of these incredible health benefits, dandelion is cultivated for medicinal and culinary uses across the world including places like Bulgaria, Romania, Hungary, Poland and China (Wirngo & Jeppeson 2016). From Europe to Asia, and throughout the Middle-East,

dandelion can be found as an ingredient in a wide variety of recipes. Dandelion wine is very popular throughout Europe, particularly in England (Carson 2019; Olas 2022). In Italy, dandelion flowers form the base of marmalades and liquors (Olas 2022). Of course, the greens of this plant, like many of the other plants we have previously discussed, can be eaten raw in salads, sauteed, and even added to soups or teas. Across what is now modern day Turkey, dried dandelion leaves are used as a seasoning to flavor various foods, and as a base for a traditional soup (Esiyok et al. 2004). Saison is a popular drink throughout England as well as in Canada, which is a beer drink with dandelion flowers and extract (Olas 2022). These flowers can also be candied by themselves, or baked into savory dishes similar to the recipe I will be sharing next.

Many people are familiar with eating the leaves of dandelions, which have a bitter taste most Americans find unpalatable. Harvesting younger, brighter green leaves can be one way around this for creating a salad, and sauteeing the greens can also break down some of the compounds which make these leaves so bitter (Carson 2019). I wanted to give a different type of recipe here, not centered around the greens - or the roots, which are often used as an addition or replacement to coffee (Olas 2022; Wirngo & Jeppeson 2016). The puffy yellow dandelion flowers, easy to spot and easy to harvest, are edible and can create a delicious, unusal garnish, or the base for hearty recipes such as the one below. This recipe was adapted from a 2017 Martha Stewart recipe, which pleasantly surprised me to see that foraging for weeds is beginning to rejoin mainstream culinary practices in the United States.

Dandelion Fritters

Ingredients:

- 2 cups unsprayed dandelion flowers, wiped clean

- 1 ¼ teaspoons salt, plus more to taste
- 1 tablespoon fresh lemon juice
- 1 cup all-purpose flour
- 1 cup fine cornmeal
- ¼ teaspoon freshly ground pepper
- ½ teaspoon chile powder
- 1 tablespoon chopped fresh thyme, or 1 teaspoon dried thyme
- 1 large egg
- ¼ cup milk
- 2 cups corn or safflower oil

Directions:

1. Before using, soak the flowers in a bowl of salted water to lure bugs out and other possible debris. Lemon juice can also be added to speed up this effect, gently pressing the flowers beneath to the surface of the water to clean them. Dry them off using a paper towel afterwards.
2. After the flowers have been washed, or while they are still soaking, mix together the flour, cornmeal, about a 1/4 teaspoon each of salt, pepper, and chile powder. Curry powder also adds a nice kick!
3. Add the thyme and other herbs at this stage if desired, incorporating them fully into the flour mixture.
4. Combine egg and milk with a whisk, pouring the mixture into the flour and stirring until a cake-batter consistency - if this is too thick, add more milk.

5. Dip each flower into the batter, allowing them to absorb as much as possible, before placing them into a pan of already heated oil. Fry each flower for about 2 minutes on each side, or until golden brown on the outside.
6. I like to add another sprinkle of spices to the outside after the fritters have cooled and drained the excess oil onto a paper towel or cloth for a few minutes. For an odd, sweet, and savory treat, dust the final product with powdered sugar and a squirt of lemon juice.

I think one of the reasons I've felt drawn to the weeds in Montana is because they're recognizable to me. I saw the same weeds at the farm where I worked in the Snoqualmie Valley, the place I called home, as I did at the PEAS Farm in Missoula, my new home. Much like these weeds I'm a transplant, some might even call me an invasive, here consuming the limited resources such as housing, jobs, and academic grants. Although I've dedicated my time to learning the species native to Western Montana with the same intimacy I learned the species of Western Washington, nothing will feel as familiar and comforting to me here as the little tufts of dandelions sprouting through lawns, fields, and gardens. Everywhere I travel I see the noble dandelion, waving in the wind as if to say, *Hello, old friend, it's nice to see you again somewhere so far away.* A dandelion is a chance to wish - we learn this as little kids. But we forget along the way that a wish is hope for the future. As an environmentalist, I think hope is invaluable and extremely hard to come by.

These are the weeds, and the recipes, which give me hope that we can find new ways to piece ourselves into the world as the climate continues to change. The future has always been uncertain, but like any other species, I believe we will find some way forward.

PART IIII

Early this spring my grandfather passed away. I feel lucky to have gotten to know him, although later in life. I hoped he would be around to see me finish graduate school, to read this thesis, and possibly compare it to his own. I longed to share stories of how exhausting the process was, how maybe he felt out of place in his own cohort, too. He was a lot like me, or perhaps more so, I'm a lot like him. A deeply passionate lover of music, of art, a chef and a scholar, untamed thick red hair - and before it grayed, he was a writer, like me. We have the same eyes. We have the same handwriting. We shared the same dreams. I worry that we may have the same downfalls as well. Disorganized and paranoid, writerly in a sense but deeply isolated, even around those who cared for him, hiding the things he was most passionate about in notebooks scrawled to the brim. We bonded over our shared love of music, over our distinctly and oddly similar mannerisms, but mostly over our disdain for just about anything that isn't related to the natural world.

He lived in a house on a hill that seemed to slide farther down each time I came to visit. He refused to move, having been there for decades, watching the trees once seedlings now towering, threatening the house. He would sooner be crushed than allow me to cut them. His own grandfather was a writer too, who came from Armenia. Armen came to America fleeing genocide, his life's work in writing clutched tightly. I didn't know until recently of how he made it to this country, snuck aboard a ship bound for this bountiful country. I also didn't know until recently, when I began to research the origins of the noxious Himalayan blackberry that they,

too, had originated in the mountainous regions of Armenia. I was already painfully familiar with these brambles from my childhood, memories scored into my young flesh, when I first came to visit my grandfather in Seattle.

Largely, I've avoided going into the city where I attended high school - favoring instead to revisit the meandering valley I called home as a child. Blackberry bushes entwined the two, both choked through thick vines of a deep red and green color. At first I joked with my grandfather that the steadily growing thicket around his old house was the only thing holding it in its place on the hillside. Between the invasive ivy and the Himalayan blackberries, the house looked as if it had rooted itself into the ground, stubborn as our blood. But over the years the vines grew thicker, their stems like the branches on a tree, thorns thicker than the blade of a razor. He told me they caught on his clothes, sticking into his wild hair as he made his way through the vining tunnel up to the house. What had once been a stairway and a path gradually became a sort of portal to the home where he resided, itself unchanging in so many years. It was the sort of portal where you wondered if you might arrive on the other side still yourself, still in one piece, unscathed.

I worried for him there, although still he refused to leave that old house behind. Each summer I came back, armed with a pair of bolt cutters and my thick canvas jacket, prepared to follow each vine to its root and cut clean from the source at the base of each plant. The blackberry bushes died slowly, wilting from the severed end to their tips over a matter of months. The ivy grew new roots, leaching nutrients from the aging trees which still grew in the yard. I began to understand the reality of managing invasive species, much worse than I had imagined while popping small weeds from the soil on the farms where I had worked before. I watched the vines begin to consume his home, and we both knew that soon he would have to leave.

Miraculously, or tragically, he remained in this house until the end of his life. There's not much more we can ask from this life than to remain ourselves, to hold onto the tangible pieces of our identity in this world until we unclasp entirely. I've felt that kind of loss, and the scramble to reroot yourself when you're not sure who you are anymore. But when you're young, you have time. The last time I saw him we cursed those damned berry vines, listening to a scratched CD on a dusty player in the living room, watching out the front window as they encased the walls around us. I told him I'd be back again to clip them in the summer, an ongoing battle that we both knew we had already lost. In a strange way it brought us together. Two writers, two naturalists, and two sworn enemies of the Himalayan blackberry, hailing from the same far away mountain range which neither of us had ever really called home.

Conclusion

As we've examined each of these plants, making up still only a small handful of those prevalent in Western Montana, it's clear that there is no easy answer to the phenomena of *weeds*. While some of these species cause destruction and chaos, like the Himalayan blackberry vines winding through my memories, creeping from my hometown to the streambanks of Missoula; others are relatively inert, such as the plantain poking its leaves from lawns, the nettles covering freshly burned swaths of the forest, and Mullein stalks keeping other invaders at bay.

It's important that we use caution above all else when gathering plants of any kind, being mindful not to gather in areas where harmful chemicals may reside in the soil. Unlike the Palmer amaranth, us humans are not so unbothered by chemicals like glyphosate. Some phytochemical compounds, as well, have the potential to cause irritation in the digestive tract. This is why it's so important to begin by eating only small amounts of anything new, to test for adverse reactions. This goes for any new kind of food you may be trying, not only those gathered from nature.

It's hard to say what the changing climate will bring us in the coming decades, and what those implications will be on our food system. We must prioritize building an equitable, just, and sustainable food system, one that is less reliant on the conventional models of agriculture. Focusing our efforts on the smaller scale makes this feat more feasible, such as examining what we can do as Montanans for our local soil and waterway health, and for the health of our communities. As for the ever encroaching invasives, as Dr. Vicki Watson eloquently puts it, ***if you can't beat 'em, eat 'em!***

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