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Yes, You Can Eat That: How Communities that Forage in Vermont Interact with Invasive Species

Sheridan Plummer

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Sheridan Plummer

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Advisors:
Karen Nordstrom, PhD, UVM
Katherine Elmer, Lecturer, UVM

Abstract

Invasive species have permanently altered the world, both socially and ecologically, and the rate of introductions shows no sign of slowing down in the future. In Vermont, foragers are in regular contact with these introduced species and can play an integral role in their removal through the gathering, harvesting, and consumption of edible invasive plants. Through questionnaires to the public, in-depth interviews with foraging experts, and participation in community herb walks and plant harvesting, I explored perspectives on foraging in Vermont and its relation to the collection and consumption of invasive plant species. By interpreting the feedback, responses, and observations gathered, I deciphered emergent ideas and common themes as they relate to foraging for these species. Conversations about our food system cannot, and should not, ignore the growing influence of invasive species on our familiar landscapes. Several themes emerged after thorough analysis and reflection. These themes include: aligning the values of the foraging community with the impact of foraging for invasive species, reframing language and attitudes surrounding these species, understanding our changing world, and capitalizing on benefits and addressing barriers of invasive species foraging. Based on the results of this research, the foraging community of Vermont could be a unique and valuable avenue to use in spreading awareness and knowledge of this movement.

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Table of Contents

Yes, You Can Eat That:
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In the waning sunshine of a mild May evening, I found myself tugging at a five-foot-long root of Japanese knotweed in the claylike floodplain of a nearby stream. As I wrestled the root with my body weight, its strong spindly arms pointed further and further south. Japanese knotweed is a highly prolific and abundant grower; it colonizes disturbed areas and streambanks and forces competing vegetation out. In other words, it is invasive.

Japanese knotweed and many other invasive plant species of Vermont, such as garlic mustard, wild fennel, and burdock, can be gathered and harvested to make food and medicine. I had harvested the young green and pale pink shoots of the plant earlier in the day to make strawberry knotweed pie and was now removing the roots for a medicinal tincture. Although perhaps an unusual pastime, foraging for invasive species has extraordinary potential.

These species are often undervalued and underutilized. The term “invasive” emanates a sense of grimy destructiveness, not something to be collected, brought home, and served to loved ones on a plate. According to the International Union for the Conservation of Nature (IUCN), invasive species are listed as the second greatest threat to biodiversity on the planet. This issue is rapidly increasing as our world becomes more connected and globalized.

Through the help of humans, plants and animals have been introduced to many new and vulnerable spaces around the globe. When an organism is introduced and finds the ecosystem suitable to their growth and abundance, it may quickly begin to colonize and fill the available niche. When an introduced organism becomes harmful to the economy, environment, or human health of its new surroundings, it crosses the threshold into invasive (NISC, 1999). However, this is a somewhat distorted, anthropocentric view of species based on their perceived or misunderstood value to humans.

Many invasive species provide highly valuable ecosystem services to the habitats in which they are introduced. Yes - Japanese knotweed, with its immense underground root system, crowds out native vegetation and can dramatically impact the functioning of an ecosystem through decreasing its diversity, clogging waterways, and lowering the quality of riparian habitat for fish and wildlife ("Vermont Invasives," n.d.). On the other hand, it is great for attracting pollinators, it can restore eroding riparian zones through anchoring soils, it detoxifies highly polluted soils, and it has several uses for food and medicine. Remarkably, it has been used to treat Lyme disease, a rapidly expanding illness across the United States.

The distribution of flora and fauna is constantly in flux all around the globe. Our ecosystems are inherently dynamic and the rate of invasive and introduced species shows no sign of slowing down. All over the state of Vermont people are foraging for ramps, fiddleheads, mushrooms, and other highly sought after wild edibles. If these practices were to include the collection and consumption of invasive species, like Japanese knotweed, garlic mustard, burdock, purslane, and lamb's quarters, foragers could positively impact conservation, diversify their diets, decrease pressure on vulnerable wild species, and offer an alternative food source.

Some gatherers are already incorporating these ideas into their practice, which is what brought me elbow deep in a streambank wrestling with a five-foot-long Japanese knotweed root. I have nibbled on purslane while weeding at a small farm, I have sold lamb's quarters at a New York farmers market, I have made wild weed pesto for a potluck. I have reframed my perspective on invasive species and their value. Throughout the state, other Vermonters are doing the same.

Literature Review

Introduction to Invasive Species

Humans have long had an interest in categorizing species based on different determinants: size and physical features, habitat type and ecological adaptations, offspring and mating practices, etc. However, it was not until the mid-nineteenth century that the division between native and non-native species was first made by H.C. Watson (Thompson, 2014). Watson, an amateur British botanist, purposed that a native species was one in which there was "little to no reason for supposing it to have been introduced by human agency" (Thompson, 2014). If a species can be native others must be non-native, and thus began a modern understanding of invasive species.

Since then, invasion ecology has been widely studied and largely controversial (Bonanno, 2016; Jeschke et al., 2014; Mack et al., 2000; Russell & Blackburn, 2017; Simberloff, 2014; Thompson, 2014). In 1958, Charles Elton, often touted as the father of invasion ecology, posed that "organisms flourishing in regions where they did not evolve should be considered invaders that pose imminent harm to their introduced ecosystems" (Orion, 2015). More recently, according to the National Invasive Species Council (NISC) invasive species are understood to be "alien (non-native) species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (*Exec. Order No. 13112*, 1999).

Although these definitions are useful in succinctly introducing the concept of invasive species, they are largely problematic. Humans are the most prolific dispersers of species around the globe and, as the world becomes ever more globalized, species are brought together that, without intervention, would have taken a very long time to meet (Thompson, 2014). However, the more than two million known and unknown organisms on the planet are dynamic and their

distribution constantly changes (Coates, 2006; Thompson, 2014). Dispersal of species over large distances is not unusual and nativeness can be described by where a species evolved, where it has been present for the longest period of time, where it is present today, or where it thrives without human assistance (Thompson, 2014). In many cases, these all may be different places (Thompson, 2014). Therefore, a distinction between native and non-native can be brought into question.

The second portion of the NISC definition of invasive species, in regards to the harm imposed on social and ecological systems, is equally troublesome. Defining the impact of these newly introduced species on economic, environmental, and human health systems can be extremely difficult (Jeschke et al., 2014). There are various terms to define introduced species (i.e. alien, non-native, and invasive – which will be used interchangeably) and there is little consensus in the scientific community on a clear definition of their negative or positive impacts (Bonanno, 2016; Coates, 2006; Jeschke et al., 2014; Mack et al., 2000; Orion, 2015; Russell & Blackburn, 2017; Simberloff, 2014; Thompson, 2014).

It is safe to say that, in our highly integrated and globalized 21st century society, the world has been permanently altered by the establishment of innumerable introduced species and the rate of introductions shows no sign of slowing down (Thompson, 2014). These introductions are typically the result of direct or indirect human actions and can cause drastic changes to the systems in which they are introduced (Jeschke et al., 2014).

Impacts of Invasive Species in Vermont

Vermont is not immune to these introductions and, in fact, is currently home to hundreds of known and unknown invasive terrestrial plants, forest pests, and aquatic invaders ("Vermont Invasives," n.d.).

In 2000, an influential report on the impacts of invasive species in the United States was released, estimating that the “damage and losses” caused by the approximately 50,000 invasive species in the country totaled nearly $137 billion each year (Pimentel, Lach, Zuniga, & Morrison, 2000). In 2010, a report by the Vermont Agency of Natural Resources (ANR) concluded that the economic and environmental impact of invasive species has negative effects on numerous human and ecological entities in the state, including: recreation, tourism, timber, property values, biodiversity, habitat, water quality, and human health (Vermont Agency of Natural Resources, 2010). Currently, nine aquatic invaders, 19 forest pests, and 49 invasive terrestrial plants have been identified as present in the state of Vermont ("Vermont Invasives," n.d.).

The specific impacts of individual invasive terrestrial plants in Vermont are recorded in an online database, provided by various state and national bodies, in which their identification, origin, habitat, and “ecological threat” are documented and made available to the wider public ("Vermont Invasives," n.d.). According to this database, invasive species change the composition and function of native ecosystems ("Vermont Invasives," n.d.). Invasive species have several direct impacts on the ecosystems of Vermont, including “out-competing native species for food or other resources, preying on native species, causing or carrying disease, and preventing native species from reproducing or killing their young” ("Vermont Invasives," n.d.).

The economic impacts of invasive species in Vermont are varied. Presence of invasive species may affect recreational activities such as boating, fishing, swimming, and hunting (Vermont Agency of Natural Resources, 2010). Monocultures of invasive plant species or impacts to native fall foliage species, such as sugar maple (*Acer saccharum*), may degrade the quality of visitor experiences and effect tourism in Vermont (Vermont Agency of Natural

Resources, 2010). Invasive species such as Japanese barberry (*Berberis thunbergii*) and Norway maple (*Acer platanoides*) can impact the availability and quality of timber in the state (Vermont Agency of Natural Resources, 2010). Forest pests, like the hemlock woolly adelgid (*Adelges tsugae*) and the emerald ash borer (*Agrilus planipennis*), also pose significant threats to the health of trees used for timber (Vermont Agency of Natural Resources, 2010). Property values in Vermont can be negatively impacted by the presence of destructive invasive species (Vermont Agency of Natural Resources, 2010). Additionally, the maple industry in Vermont, which was valued at $2.8 million in 2010, is currently threatened by the presence of the Asian longhorned beetle (*Anoplophora glabripennis*) (Vermont Agency of Natural Resources, 2010).

Similarly, there are numerous negative environmental impacts of invasive species on the state of Vermont, as reported by the Vermont Agency of Natural Resources (2010). The introduction of invasive species can result in a loss of biodiversity, through impacts to habitat and food sources and through competition and resource use (Vermont Agency of Natural Resources, 2010). Presence of invasive species also can induce habitat and water quality degradation in Vermont through the disruption of ecosystem function (Vermont Agency of Natural Resources, 2010). The report also lists impacts to human health, such as burns from giant hogweed (*Heracleum mantegazzianum*) and wild parsnip (*Pastinaca sativa*) and a higher presence of ticks in Japanese barberry (*Berberis thunbergii*) infested areas (Vermont Agency of Natural Resources, 2010).

Contrary to these overwhelmingly negative impacts of invasive species on the human and ecological communities of Vermont, invasive species can also provide useful ecosystem services. To be sure, "The services offered by invasive species are different from those offered by native species, but their different ecological characteristics are representative of real-time

ecological dynamics" (Orion, 2015). Black locust (*Robinia pseudoacacia*), while invasive to Vermont, is a nitrogen fixer, meaning that it makes this vital nutrient available to the wider ecosystem (Orion, 2015). Spotted knapweed (*Centaurea stoebe*), also broadly invasive in Vermont, is such an extremely efficient accumulator of phosphorus that it contributes to increased biological availability of this essential nutrient (Orion, 2015). Japanese knotweed (*Fallopia japonica*) is known to attract pollinators and restore riparian zones (Orion, 2015). And finally, zebra mussels (*Dreissena polymorpha*) are exceptional filter feeders, increasing water clarity and enhancing freshwater food webs (Orion, 2015; Thompson, 2014).

Introduced, invasive species have been conventionally understood as having largely negative effects on human and ecological systems (Bonanno, 2016; Jeschke et al., 2014; Mack et al., 2000; Orion, 2015; Russell & Blackburn, 2017; Simberloff, 2014; Thompson, 2014). However, this perspective often ignores the cross-scale, bidirectional impacts of introduced species (Jeschke et al., 2014; Thompson, 2014). The invasive species epidemic across the United States, and specifically in Vermont, is often oversimplified and misunderstood (Bonanno, 2016; Chaffin et al., 2016; Orion, 2015; Pearce, 2015; Russell & Blackburn, 2017; Vince, 2011). In order to properly manage invasive species and assess the complexity of their impacts, one needs to dissect the diverse perspectives and perceptions associated with their presence.

Perceptions of Invasive Species

Public perspectives on invasive species range from acceptance and integration to disgust and hostility (Bonanno, 2016; Chaffin et al., 2016; Coates, 2006; Orion, 2015; Pearce, 2015; Russell & Blackburn, 2017; Vince, 2011). There is extraordinary diversity in the impacts, implications, and knowledge of invasions from terrestrial or aquatic to intended or unintended (Chaffin et al., 2016; Jeschke et al., 2014). This necessitates a similar diversity in responses and

problem-solving decisions regarding their management and control (Chaffin et al., 2016; Jeschke et al., 2014). Dissecting this range of perspectives is integral to developing best management practices for invasive species monitoring and control (García-Llorente, Martín-López, González, Alcorlo, & Montes, 2008).

In some high-profile cases, public perceptions of invasive species are overwhelmingly negative (Engeman, Jacobson, Avery, & Meshaka, 2011; Shine, 2015). The cane toad (*Rhinella marina*) in eastern Australia and the Burmese python (*Python bivittatus*) in Everglades National Park in Florida are two examples of this alarmist aggression connoted in the language surrounding invasive species. Several community groups within tropical Australia have developed with the primary purpose of killing cane toads, an activity that has quickly become somewhat of a "sport" in the region (Shine, 2015). In Australia, the toads have become hugely reviled, consistently ranking among the public as the "worst" invader (Shine, 2015). The toads are described as hideously ugly and public reactions have largely been shaped by popular media (Shine, 2015). Similarly, the Burmese python in southern Florida has been vilified and feared by much of the local population and media (Anthony, 2017). Images of Burmese pythons eating native American alligators (*Alligator mississippiensis*) and sightings of these massive snakes by the public have created hysteria around the species (Engeman et al., 2011). The results of this language and hyperbole surrounding invasive species are fear and extreme attempts at eradication (Anthony, 2017; Engeman et al., 2011).

In a contrasting story, the invasive feral pigs of Hawaii (*Sus scrofa*) have not lead to fear or revulsion but to the incorporation of the species into indigenous culture (Nuñez, Kuebbing, Dimarco, & Simberloff, 2012). This species was intentionally introduced as a food source during colonization but its population has since exploded in growth and caused widespread destruction

and biodiversity loss on the islands (Nogueira-Filho, Nogueira, & Fragoso, 2009; Nuñez et al., 2012). Nogueira-Filho et al. (2009) posit that feral pigs "reduce the abundance of native plant species, enhance conditions for the establishment of invasive non- indigenous plants, and perhaps indirectly negatively impact native forest bird species" on the Hawaiian Islands. The foraging and travel patterns of the pigs are also thought to increase soil erosion and contribute to watershed degradation (Nogueira-Filho et al., 2009). Despite these negative impacts to the fragile ecological systems in Hawaii, the eradication of the feral pigs remains difficult (Nogueira-Filho et al., 2009). The hunting rituals and food traditions surrounding this invasive species are seen as indigenous, they have been incorporated into local cultures and are valued for their cultural and religious significance (Nogueira-Filho et al., 2009; Nuñez et al., 2012). Consequently, a controversy exists between conservationists and hunters on the Islands, which poses a threat to potential eradication initiatives aimed at conserving biodiversity (Nuñez et al., 2012).

In another case study, perceptions of invasive weeds in southern Italy have undergone several revolutions (Federman, 2011). Weeds - such as chicory (*Cichorium*), sea fennel (*Crithmum*), sorrel (*Rumex acetosa*), and plantain (*Plantago major*) - were historically an alternative food source for farmworkers and lower income populations in the region (Federman, 2011). These weeds were therefore incorporated into culinary traditions and family recipes (Federman, 2011). In recent generations, however, consuming weeds was a sign of poverty, so a stigma remerged against them as a peasant food (Federman, 2011). Without the regular removal of these weeds for consumption, the populations were again erupting causing big problems for local farmers and agriculturalists (Federman, 2011). In the 1970s, thanks to renowned chef and forager, Patience Gray, there was a resurgence of the cultural tradition of eating weeds in this

region of southern Italy (Federman, 2011). The tradition is being revived and reimagined as a way of preserving culture and protecting ecological systems (Federman, 2011).

Other studies have also been conducted assessing the public perception of human consumption as a management tactic to invasive species, specifically on the invasive Indopacific lionfish (*Pterois*) in the Caribbean (Carrillo-Flota & Alfonso, 2017; Chapman, Anderson, Gough, & Harris, 2016; Malpica-Cruz, Chaves, & Côté, 2016; Moore, 2012). According to Chapman et al. (2016), targeted fishing for human consumption is considered to be the most cost-effective and feasible lionfish management intervention among the seafood industry, distributors, chefs, researchers, fishers and conservationists. The flaky, white flesh is similar to snapper and grouper and therefore should be desirable and familiar to most fish-eaters. Stakeholders around the Caribbean - including fishermen, restaurant owners, and fish eaters – understand the impacts of this species on native fish and coral reefs and have expressed willingness to incorporate lionfish into their diets and markets (Carrillo-Flota & Alfonso, 2017). Control of the invasion, the creation of alternative livelihoods for fishermen, and improving food security are a few of the potential benefits of market-based approaches to lionfish management (Moore, 2012).

These varying perspectives, from the animosity towards the Burmese python to the sociocultural value of feral pigs in Hawaii to consumption of the Indo-Pacific lionfish, affect the development of best management practices and the viability of human consumption as a population control mechanism.

Invasive Species Management & Conservation Implications

Introduced species, as discussed, have various impacts on the social, economic, and ecological systems they invade, and the perspectives of invasive species range from hatred to

culturally valuable. The conservation and management implications regarding invasive species are similarly complex; they involve many stakeholders, are often unsuccessful, and can cause more harm to an ecosystem than good (Larson et al., 2011; Orion, 2015). The perceptions and language surrounding invasive species often guide management proposals and solutions (Chaffin et al., 2016; García-Llorente et al., 2008; Orion, 2015).

One of the leading invasion ecology perspectives is the ideal of “frozen moment,” a pre-human, pre-industrial time in which there was a specific place for everything (Thompson, 2014). However, as Thompson (2014) explains, "Adopting the frozen moment as one's perspective leads to the temptation to regard attractive, harmless (and especially rare) species as native; and, conversely, to consider species we don't like as alien." This perspective is based on distortions of the definition of nativeness and can lead to problematic management and restoration initiatives (Thompson, 2014).

Definitions of invasive are largely subjective reflections of human interests (Orion, 2015). Unfortunately, management proposals are similarly subjective and often play into industry interests (Jeschke et al., 2014; Orion, 2015; Thompson, 2014). Prevention is the ideal management approach to invasion ecologists, it is cost-effective, successful, and solves an issue before it even emerges (Leung et al., 2002; Orion, 2015; Thompson, 2014). However, ecologists have struggled to understand why some species succeed at invading and others fail (Thompson, 2014). Presently, there is no reliable way of predicting which species are likely to cause problems and although prevention is the most successful method of invasive species control, it is highly unrealistic (Thompson, 2014). Introductions of species and changes in distribution have been occurring since the formation of the Earth, and as humans have exacerbated many of these introductions, their rate shows no sign of slowing in our increasingly connected and globalized

world (Thompson, 2014). Therefore, land managers and restoration ecologists must work towards invasive species management initiatives post-introduction.

Many ecological restoration efforts and conservation campaigns focus on invasive species as a problem to be eradicated (Larson et al., 2011; Orion, 2015). The three primary invasive species management approaches are chemical, mechanical, and biological (Horan & Lupi, 2010; Orion, 2015). Chemical management of invasive species involves the application of herbicides and pesticides to target unwanted plants or pests (Orion, 2015). However, this mechanism of control can result in significant non-target effects, including the killing of native species, toxicity to other organisms, chemical soil residue, the development of herbicide resistance, and unknown synergistic effects of their mixtures (Larson et al., 2011; Orion, 2015). In Rachel Carson's *A Silent Spring* (1962), she writes "By their very nature chemical controls are self-defeating, for they have been devised and applied without taking into account the complex biological systems against which they have been blindly hurled." Unfortunately, publicly funded land grant universities, state and federal policy makers, and nonprofit conservation organizations have close ties to the chemical industry and pesticide manufacturers through funding and donations (Orion, 2015). The widespread use of chemical controls of invasive species is largely linked to this collusion (Orion, 2015).

Today, land managers and restoration practitioners often "view herbicides as regrettable but necessary parts of restoring an ecosystem or protecting native species…from the apparent threats posed by invasive species" (Orion, 2015). For instance, the Vermont Invasives database lists a series of recommended management options for each identified invasive species. Among these options is chemical control through the application of herbicides such as glyphosate, Roundup, and triclopyr ("Vermont Invasives," n.d.).

There are also nonchemical control agents utilized in invasive species management, most commonly these are biological and mechanical controls (Horan & Lupi, 2010; Larson et al., 2011; Orion, 2015). Biological control usually entails the introduction of a predator or disease to kill the invasive plant or animal (Orion, 2015). This method of control, although more ecologically sound than chemical controls, is highly susceptible to unintended consequences (Orion, 2015). The complexity of ecological interactions is often beyond our understanding and some biological control initiatives have vastly altered ecosystems in negative ways (Larson et al., 2011; Orion, 2015). Many bio-control species are generalists and therefore can decimate populations beyond the targeted invasive (Orion, 2015). They also have the potential of bringing diseases to the region, and they can affect the functioning of the larger food web (Orion, 2015). For example, the cactus moth larvae (*Cactoblastis cactorum*) were introduced in the Caribbean to control the spread of prickly pear (*Opuntia*), but this bio-control agent has now moved to Mexico, Florida, and the southwest U.S., where it is decimating native cactus species (Orion, 2015).

Mechanical control approaches, such as the physical removal of invasive plant or animal species, are similarly problematic (Orion, 2015). Mechanical control, such as burning or mowing, is often unspecific and highly disruptive, which can harm sensitive native plant species (Orion, 2015). This method can also be time consuming and costly, and when the invaded area is extensive mechanical removal might not be economically viable (Orion, 2015).

All three of these invasive species control methods, chemical, biological, and mechanical are also typically used within an eradication framework, a perspective that is not holistic and thus not ultimately effective (Orion, 2015). Additionally, where eradication efforts have been

successful, niches are left available and ecosystems are therefore still open for invasion (Orion, 2015).

A permaculture approach, on the other hand, embeds the issue of invasive species within a larger ecosystem-based analysis (Orion, 2015). These divergent perspectives affect management decisions; the conventional ecological management approach often leading to oversimplified, extreme eradication efforts and the permaculture model leading to a dynamic, multi-faceted, systems level approach in which invasive species control involves diverse, integrated management options (Chaffin et al., 2016; Orion, 2015). Tao Orion (2015), prominent permaculturalist and restoration ecologist, argues for a restructuring of our perspectives on invasive species, stating, "It is time to start thinking about the species that are thriving in new environments as allies in a quest to more thoughtfully steward our local ecosystems." The world has been permanently changed by the establishment of thousands of introduced species, the best option may be to shift the focus away from eradication, and move towards a more conciliatory approach that recognizes that many of these species perform useful functions (Chaffin et al., 2016; Thompson, 2014).

Foraging – A Brief Introduction

Wild food plants act as a vital and vibrant part of many food and health systems around the globe. The gathering of wild plants and fungi for food and medicine provides both sociocultural and material benefits to numerous cultures in various parts of the world, from rural Africa to urban New York City (Poe, McLain, Emery, & Hurley, 2013). The United Nations Food and Agriculture Organization (FAO) estimates that nearly one billion people utilize wild food in their diets globally and nearly 300 million people rely on non-timber forest products for livelihoods and food (Bharucha & Pretty, 2010). Wild foods are plants that grow without being

cultivated (Łuczaj et al., 2012). Non-timber forest products (NFTPs) are materials gathered in a forest or wild space for a variety of uses beyond timber, such as food, medicine, and art (McLain, Hurley, Emery, & Poe, 2014).

These plants are often found in forests and foraged, or collected. As described by Poe et at. (2013), this practice "involves the removal of fungi, plants, or parts of plants with the intention of using the materials gathered for foods, medicines, crafts, fuel, ceremony, decoration, or exchange." Foraging takes place in forests, gardens, agricultural fields, parks, urban areas, rural towns, and nearly every place plants grow (Benítez, Molero-Mesa, & González-Tejero, 2017; Bharucha & Pretty, 2010; Geng, Zhang, Ranjitkar, Huai, & Wang, 2016; McLain et al., 2014; Turner et al., 2011).

People who gather wild foods are identified by a variety of names, including foragers, gatherers, harvesters, and wildcrafters (Bharucha & Pretty, 2010; Poe et al., 2013; Turner et al., 2011). These cultures are adapted to localities and they often possess rich, abundant local knowledge of ecology, botany, and herbalism (Bharucha & Pretty, 2010; Poe et al., 2013). Foraging and the knowledge of local ecological systems fosters a deep connection to nature in a culturally meaningful way (Poe et al., 2013). In addition to building a connection to place, wild foods and medicines create dietary diversity and have diverse uses (Bharucha & Pretty, 2010). These plants can be described as a "hidden harvest," providing the communities who utilize them substantial sociocultural, health, and economic benefits (Bharucha & Pretty, 2010; Paumgarten, Locatelli, & Witkowski, 2018; Poe et al., 2013). This is particularly true for vulnerable communities, such as those suffering from poverty (Bharucha & Pretty, 2010). Wild foods provide important sources of micro- and macro-nutrients and act as an important supplement to general incomes for communities around the globe (Bharucha & Pretty, 2010).

However, local knowledge and access to wild food plants is declining (Bharucha & Pretty, 2010). Unsustainable harvesting, commercialization of species, rising poverty, HIV/AIDS, war and conflict, loss of local ecological knowledge (LEK), and the loss of traditional food systems all pose threats to the future of wild foods (Bharucha & Pretty, 2010). Loss of LEK is of particular concern "as communities rely increasingly on store-bought foods and move away from land-based livelihoods" (Bharucha & Pretty, 2010). Conversely, trends point to wild gathered foods gaining significant popular attention in the media and health-oriented communities (Bharucha & Pretty, 2010; Łuczaj et al., 2012). Evidence of this popularity can be seen in field guides, food/foraging workshops, culinary trends, community herb walks, and gleaning programs (Łuczaj et al., 2012). This intersection between the declining availability and a growing interest in wild foods has the potential to be reconciled by the foraging and consumption of edible invasive plants.

Foraging for Invasive Species

Edible invasive species provide an interesting connection between local ecological knowledge, conservation, and food security. Edible invasive species, also described as edible weeds, are abundant, diverse, and nutritionally robust and have been used in many different cultures for generations as a supplementary food source (Díaz-Betancourt et al., 1999; Federman, 2011; Hatfield, 1969; Rapoport, Raffaele, Ghermandi, & Margutti, 1995). There is considerable economic, cultural, and ecological potential in eating edible weeds as a response to the rising demands of a growing population coupled with biodiversity loss and invasive species proliferation (Díaz-Betancourt et al., 1999). Edible invasive species are an underutilized food and medicine source and have rarely been studied (Termote, Raneri, Deptford, & Cogill, 2014).

Consequently, these species have not been taken into account in discussions on nutrition and conservation programs and policies (Termote et al., 2014).

A whole-systems approach to invasive species management can begin to address this nexus of food security, nutrition, and conservation via the foraging, consumption, and disposal of edible invasive plant species. In the state of Vermont, invasive species such as garlic mustard (*Alliaria petiolate)* and Japanese knotweed (*Fallopia japonica*) as well as common weeds like lamb's quarters (*Chenopodium album*) and purslane (*Portulaca oleracea*), are often perceived as noxious and invaluable (Hatfield, 1969; Rapoport et al., 1995). Mechanical and chemical removal, through the spraying of herbicides, is often recommended by ecological restoration managers ("Garlic mustard," ; "Japanese knotweed,"). However, these species provide ecosystem services that are not being addressed. Japanese knotweed and garlic mustard attract bees and aid in pollination, the presence of Japanese knotweed also secures streambanks and provides services in watershed restoration (Limback, 2016; Orion, 2015). Weeds like purslane and lamb's quarters are quick to establish, protect, and restore soils that have been left exposed by disturbance, human or non-human caused, which protects topsoil and limits harmful erosion (Schonbeck, 2013). These pioneer plants begin the process of ecological succession and an understanding of their roles in a farm, garden, or wild ecosystem is necessary in order to ensure successful management practices (Schonbeck, 2013).

The removal, harvesting, and eating of invasive species, like those listed above, can act as a supplementary approach to conservation initiatives (Nuñez et al., 2012; Snyder, 2017; Varble & Secchi, 2013). This approach has recently been gaining popularity; the Illinois Department of Natural Resources has a campaign for the consumption of invasive Asian carp (*Hypophthalmichthys molitrix*), the U.S. National Oceanic and Atmospheric Administration has

an “Eat Lionfish!” project, and the Mid-Atlantic Exotic Pest and Plant Council’s “Eat Those Invasives!!” initiative suggests harvest strategies and recipes for common invasive plants of the region (Nuñez et al., 2012). Some argue that humans are notorious for overharvesting and overconsumption and therefore, the introduction of invasive species into our diet may result in the desired outcome of decreased populations and potential eradications (Roman, 2015). Nuñez et al. (2012) explains that eating invasive species has the potential to increase awareness of the species, assist in early detection and rapid response, and boost the local economy. However, there are potential downfalls to this conservation approach as well.

Many ecologists critique this approach, claiming that human consumption of invasive species will either fail to affect invader population size or create a market for its continued survival (Downey, 2017; Lambertucci & Speziale, 2011; Nuñez et al., 2012; Snyder, 2017). Edible invasive plants are often harvested for their “leaves (e.g., kudzu), fruit (e.g., eglantine, autumn olive, blackberry), or stems (Japanese knotweed), leaving behind reproductive parts that can later resprout or reseed” (Nuñez et al., 2012). This implies that the foraging and consumption of edible invasive plants may be ineffective unless it is coupled with other management methods (Nuñez et al., 2012; Snyder, 2017).

Similarly, if an invasive species is being incorporated into local culture and local markets, it may be even harder to ensure the complete removal of this highly valuable species (Nuñez et al., 2012). In some cases, invasive species may even become more highly valued than their native counterparts, as is the case for lake trout (*Salvelinus namaycush*) and red deer (*Cervus elaphus*) in South America (Lambertucci & Speziale, 2011). The commercial value of these species for fishing and hunting has led to the protection of the invasives by government, farmers, and land owners, sometimes at the expense of native species (Lambertucci & Speziale,

2011). Ornamental plants and shrubs, such as Japanese barberry (*Berberis japonica*), in the United States are another example of overvalued or highly economic invasive species (Nuñez et al., 2012). These conflicting priorities can cause major clashes between environmental groups and the industries in question (Lambertucci & Speziale, 2011; Nuñez et al., 2012).

However, the foraging and eating of edible invasive plants has several compounded benefits. The removal, harvesting, and consumption of these plants generates a strong connection to place, engages people in the outdoors, improves local ecological knowledge, diversifies diets, and offers an alternative food source (Bharucha & Pretty, 2010; Łuczaj et al., 2012; Poe et al., 2013). In addition, the removal of invasive species from the ecosystem improves native species chances of survival and increases overall ecosystem health (Bonanno, 2016; Larson et al., 2011). Even so, these initiatives can and should act in complement to other management approaches, thereby creating a stronger combined effect (Nuñez et al., 2012).

Alternative Food Sources & Foraging

Foraging for wild foods also has the potential of playing a role in food security and nutrition (Bharucha & Pretty, 2010; Díaz-Betancourt et al., 1999; Erskine et al., 2015; Termote et al., 2014). Wild edibles often supplement food and income and can act as a buffer against hunger or nutritional deficiency (Bharucha & Pretty, 2010). Historically, humans utilized an extraordinarily diverse diet (Rapoport et al., 1995). In 1995, Rapoport et al. discovered and analyzed the stomach contents of two men believed to be from the Iron Age. They discovered 66 different plant species within the remains (Rapoport et al., 1995). In contrast, today, the FAO estimates that roughly 90% of the world's exchange of edible plants falls to only twelve different species (Rapoport et al., 1995). Edible invasive plants can reintroduce this diversity and potentially act as a supplementary food source (Rapoport et al., 1995).

Wild and underutilized foods are particularly important to vulnerable households (Erskine et al., 2015; Paumgarten et al., 2018; Termote et al., 2014). A study in Baringo, Kenya found that wild and underutilized foods had the potential to "meet nutrient needs of families while keeping costs to a minimum, improving resilience, and respecting cultural traditions" (Termote et al., 2014). Wild foods are particularly important to these vulnerable communities during periods of food scarcity (Paumgarten et al., 2018). A case study of Timor-Leste found that the use of wild foods as a buffer can increase the resiliency and reduce the vulnerability of poor at-risk households (Erskine et al., 2015).

Edible weeds like lamb's quarters, dandelion, purslane, and stinging nettle are highly nutritious and found throughout the state of Vermont (Hatfield, 1969). In a revolutionary gardening handbook published in 1969, Audrey Wynne Hatfield explored the many overlooked and misunderstood edible weeds common in the United States. For example, lamb's quarters (*Chenopodium album*) is higher in iron, protein, vitamins B1 and B2, and calcium than many common table vegetables like cabbage and spinach (Hatfield, 1969). Dandelion (*Taraxacum*) has constituents that are highly beneficial to the bloodstream, liver, digestive tract, and the kidneys and bladder (Hatfield, 1969). Purslane (*Portulaca oleracea*), which is distributed nearly all over the world, has a crisp lemony flavor and its medicinal properties can be utilized for fevers, inflammations, and coughs (Hatfield, 1969). Stinging nettle (*Urtica dioica*), once so highly valued they were widely cultivated in European gardens, is high in minerals, like iron, and vitamin C (Hatfield, 1969). Many of these species thrive in disturbed areas and can be found in backyards and urban zones, making them highly accessible to many different communities (McLain et al., 2014).

Wild food and edible invasive species are also argued to be heartier and more resilient to changes in climate and season than their cultivated counterparts (Paumgarten et al., 2018). Invasive plant species have traits that facilitate rapid range shifts and can therefore establish more quickly in newly suitable climates (Dukes et al., 2009). Generally, they may also be better adapted to changes in carbon dioxide composition of the atmosphere (Dukes et al., 2009). This is especially important in the face of climate change and the associated social and ecological adaptations taking place around the globe (Paumgarten et al., 2018). As phenology and species ranges are changing, edible invasive species may be utilized as an abundant food and nutrition substitution to their native counterparts.

Conclusion

In Henry David Thoreau's *Walden* (1854), he writes, "I have made a satisfactory dinner off a dish of purslane which I gathered and boiled. Yet men have come to such a pass that they frequently starve, not from want of necessaries, but for want of luxuries." The foraging of weeds and other underutilized, undervalued, invasive plants can provide numerous ecosystem services, from human consumption to ecological restoration. And similar to communities all over the globe from southern Italy and the Yunnan Province to Timor-Leste and inner city Baltimore, foragers throughout the state of Vermont are currently engaging and interacting with invasive species in vast and various ways (Erskine et al., 2015; Federman, 2011; Geng et al., 2016; McLain et al., 2014).

Methods

Research Objectives

In this project, I hoped to gather an understanding about the relationship between foragers in Vermont and edible invasive plants. Inherent in the act of foraging is an innate respect and knowledge of the natural world from which one gathers. I was interested in discovering who is foraging in Vermont, what they are harvesting, and why they are drawn to the action. After gathering this baseline knowledge, I assessed how communities that forage in Vermont interact with invasive species in particular. Additionally, I discussed access and barriers to foraging in Vermont and how invasive species can play a role in the larger local food system. Finally, using a systems thinking framework I linked my findings with broader systemic ideas presented in the literature.

Data Collection

The data collected to inform my study on the foraging of terrestrial invasive plants in Vermont was gathered from various communities that participate in foraging; namely, recreational and professional foragers, gleaning teams, indigenous groups, farmers, and researchers. I employed a mixed methodology approach, utilizing both questionnaires (see Appendix A) and in-depth interviews (see Appendix C). Mixed methodology combines both quantitative and qualitative research in a study (Creswell & Creswell, 2017). Quantitative information was gathered through the questionnaire, in which I evaluated the habits, values, and perspectives of the larger foraging community in Vermont. Qualitative information was gathered through in-depth interviews with experts in the fields of conservation, food systems, and foraging.

Quantitative Methodology

In an effort to represent the heterogeneity of foragers in this community I utilized various outreach approaches ranging from social media platforms, email blasts, and flyers at several community hubs; similar to the style of García-Llorente et al. (2008). An online version of the questionnaire was created using the platform, LimeSurvey. A flyer was then created calling for the participation from those that "identify as someone who collects, harvests, or consumes wild foods." The flyers were posted around Burlington at City Market Co-op, Fletcher Free Library, and the Intervale Center with a QR-code and a link to the LimeSurvey questionnaire (see Appendix B). I also shared the link to the online questionnaire on the Vermont Foragers Facebook page, which has 1,900 members across the state of Vermont, and through the Sterling College weekly e-newsletter. These events, flyers, and forms of online outreach provided an apt population of 80 questionnaire responses from foragers and gleaners who contributed to my understanding of the behaviors, motivations, and barriers to the foraging and consumption of invasive species in Vermont.

Similar to the work of Carrillo-Flota and Alfonso (2017), who studied stakeholder perceptions on the invasive species red lionfish, the questionnaire was designed to record the practices, values, and perspectives of stakeholders within the foraging community in Vermont. Focusing on current, self-identified foragers, the questionnaire was created to dissect the values of the Vermont foraging community and to see if the harvesting of edible invasive plants aligned with these values. A variety of question styles were utilized; including binary and multiple choice questions, open-ended questions, and Likert-Scale questions. The questionnaire included sections on: I) personal definition, values, and purpose of foraging; II) what plants are being harvested; III) ways of learning and development of knowledge around edible wild plants; and

IV) demographics on who is participating in foraging (gender, age, income, etc.). Through piloting and trial runs, the questionnaire was narrowed down to six content questions and an optional five question demographics section. The questionnaire was entirely anonymous. The questionnaire was distributed both online and via flyers at heavily trafficked Burlington locations.

Qualitative Methodology

Through preliminary discussions with core community members who participate in foraging for edible and medicinal plants in Vermont, I developed a diverse list of potential interviewees. In an effort to include the heterogeneity of perspectives, participants were selected from different areas of expertise and experiences (García-Llorente et al., 2008). These community leaders included: 1) two local herbalists and well-known foragers, 2) a gleaning and food rescue expert, 3) two university researchers, 4) a regenerative farmer, 5) a researcher and urban foraging expert, and 6) a wild food expert from the Abenaki community. For the purpose of the study, the interviewees will be referenced using pseudonyms.

Speaking with core participants in the foraging and gleaning communities allowed me to examine the practices and perspectives of knowledgeable individuals. One of my goals was to gather diverse perspectives across various fields that engage with invasive species and wild foods. To do so, I interviewed key stakeholders from several different communities.

With a focus on the role edible terrestrial invasive species can play in the Vermont food system, these interviews were semi-formal and open ended (McLain et al., 2014). The interviewees were encouraged to lead the discussion based on their expertise and to expand upon free-flowing thoughts and opinions. I discussed at length, the behaviors, motivations, and barriers to foraging for invasive species. Questions and topics covered include, but were not

limited to: the work the interviewee is currently exploring, their perceptions and values surrounding wild foods, potential barriers and benefits of wildcrafting for invasive species, and exposure of the public to wild edible and invasive species. The interviews helped me tell the stories of the complexities and diversity of foraging practices and have aided my understanding of the perspectives these communities have on invasive species consumption.

Analysis

The analysis stage took place over several weeks, during which I aimed to identify emergent themes and common perspectives from both the questionnaires and the interviews. In my analysis I embedded the quantitative data collected via questionnaires within the qualitative data collected via interviews (Creswell & Creswell, 2017). I analyzed the responses to the questionnaire using both quantitative and qualitative analysis techniques. The multiple choice and likert-scale questions required quantitative analysis in which frequency and value were examined. Visual representations of this data through graphs and figures were created. The responses to open-ended questions and comment sections were assessed through content analysis. These responses required interpretive analysis, focusing on mentions of edible invasive species. Simple coding was also done on the question “What plant species do you gather?”, in which species listed were coded as native, nonnative non-invasive, and nonnative invasive. I then was able to embed this information into my qualitative analysis of in-depth interviews.

In-depth interview responses were fully transcribed and later analyzed based on interpretive content analysis approaches. The interviews were reviewed to identify interesting points and areas of further exploration. Themes or topics that were mentioned across a majority of the interviews were noted, as well as those that were slightly less pervasive but still prominent. Strong quotes, unique perspectives, and otherwise informative material informed my

findings. I also took into account the various perspectives and areas of expertise that were being engaged during the interviews, from farmers to indigenous leaders to researchers. Through the merging of this comprehensive analysis style, I was able to outline the main themes that emerged throughout the 80 questionnaires and eight interviews. The results from the questionnaire built upon the themes that emerged with leaders in the field during interviews (Creswell & Creswell, 2017).

Limitations

The limited timeframe, technology, and budget available for the project did, however, present difficulties and limitations. The online format of the questionnaire means it may not have reached those populations that do not have access to smart phones or computers. Additionally, the questionnaire was only offered in English and created a language barrier that excluded the significant portion of new-Americans and non-English speaking community members in the state of Vermont. Consequently, this questionnaire, although comprehensive, may not have reached the entire foraging population and therefore may include potential biases. The aim of this study is to assess the interaction and engagement of foragers to the consumption of invasive species and the community members involved in the study have provided a broad synopsis of this interaction.

With a limited timeframe, scheduling interviews proved to be a challenge. Many potential interviewees were traveling or otherwise unavailable to meet with me during the weeks I was performing interviews. I also aimed to keep my interviews around 30-minutes long – so as not to inconvenience the interviewees and to maintain manageable amounts of data analysis. Additionally, due to the nature of informal interviews, interviewees occasionally strayed into personal tangents or stories that were not fully relevant to the topic at hand.

It is also important to acknowledge that the interviewees were presenting personal accounts and perspectives, not generalized community-wide narratives. Therefore, while the interviews drew upon the perspectives of several communities, one cannot draw sweeping conclusions. Similarly, the questionnaire responses were designed to engage personal experiences and narratives. The questionnaire was also based on convenience, voluntary sampling which inevitably leads to sometimes extreme perspectives. These difficulties and limitations are necessary to acknowledge but do not diminish the key findings of this research.

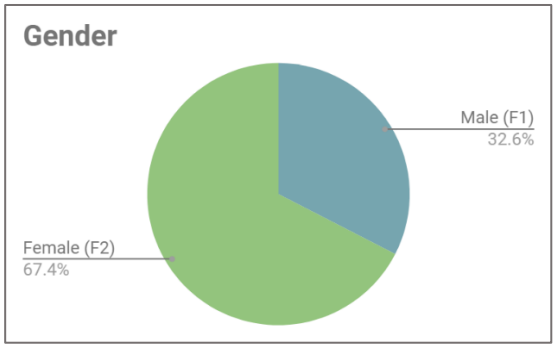
Results

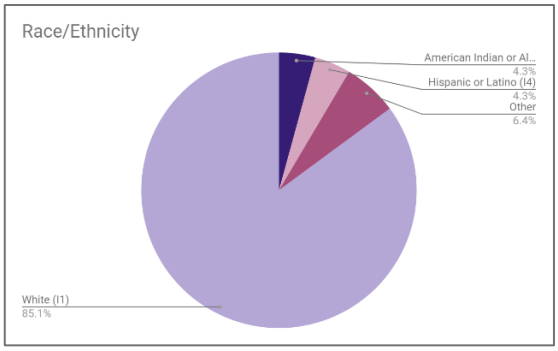
Overview

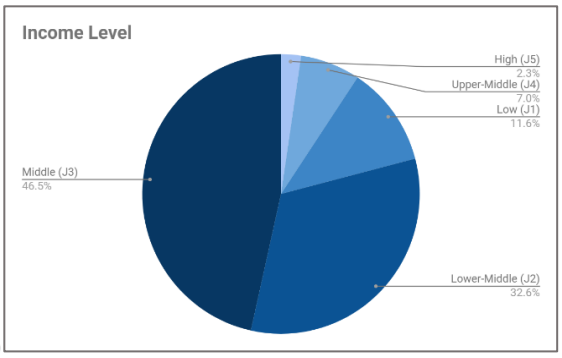
Results of this study spanned a variety of areas and themes. The questionnaire bred valuable quantitative information and provided a succinct introduction to the foraging community of Vermont. The in-depth interviews and analysis further detailed the relationship between foragers in Vermont and edible invasive species. Several themes emerged and are described below, including: a demographic overview of the Vermont foraging community, the motivations behind the practice of foraging, selection of species for harvest, sources of knowledge, benefits of foraging for invasive species, and barriers to foraging for invasive species.

The Foraging Community of Vermont

The community of foragers in Vermont is both diverse and abundant. Over the course of close to four months, 80 people throughout the state contributed to an online survey asking about their foraging practices. A demographic section within the survey shed light on the some of the trends within this community. The respondents were majority female (Figure 1A) and identified as white-American (Figure 1B). However, greater diversity was seen in self-identified income level (Figure 1C) and place of residence (Figure 1D).

A) 

B) 

C) 

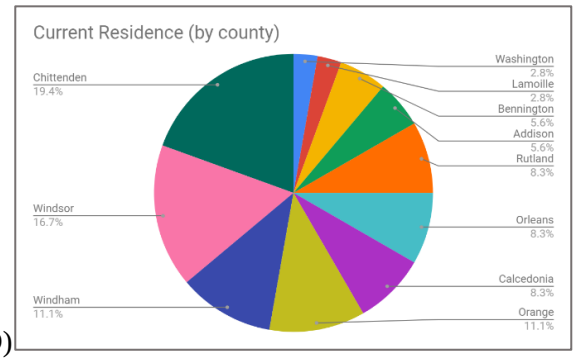
D) 

Figure 1. Respondent demographics shows minimal diversity in gender and race/ethnicity but substantial diversity in income level and place of residence. From left, A: gender, B: race/ethnicity, C: income level, D: current place of residence.

Motivations for Foraging

Within this diverse community of people in Vermont that gather, harvest, and consume wild foods there are many reasons behind their practice. Wild foods provide numerous sociocultural, health, and economic benefits to the communities that utilize them (Bharucha & Pretty, 2010). As the survey results suggest, respondents practice foraging for a multitude of reasons (Figure 2). The majority of respondents practice foraging for recreation, health/nutrition, and to foster a strong connection to place. Participants also cited free food, a form of income/occupation, stress relief, art material, and a lower carbon footprint as "other" purposes for their foraging practice.

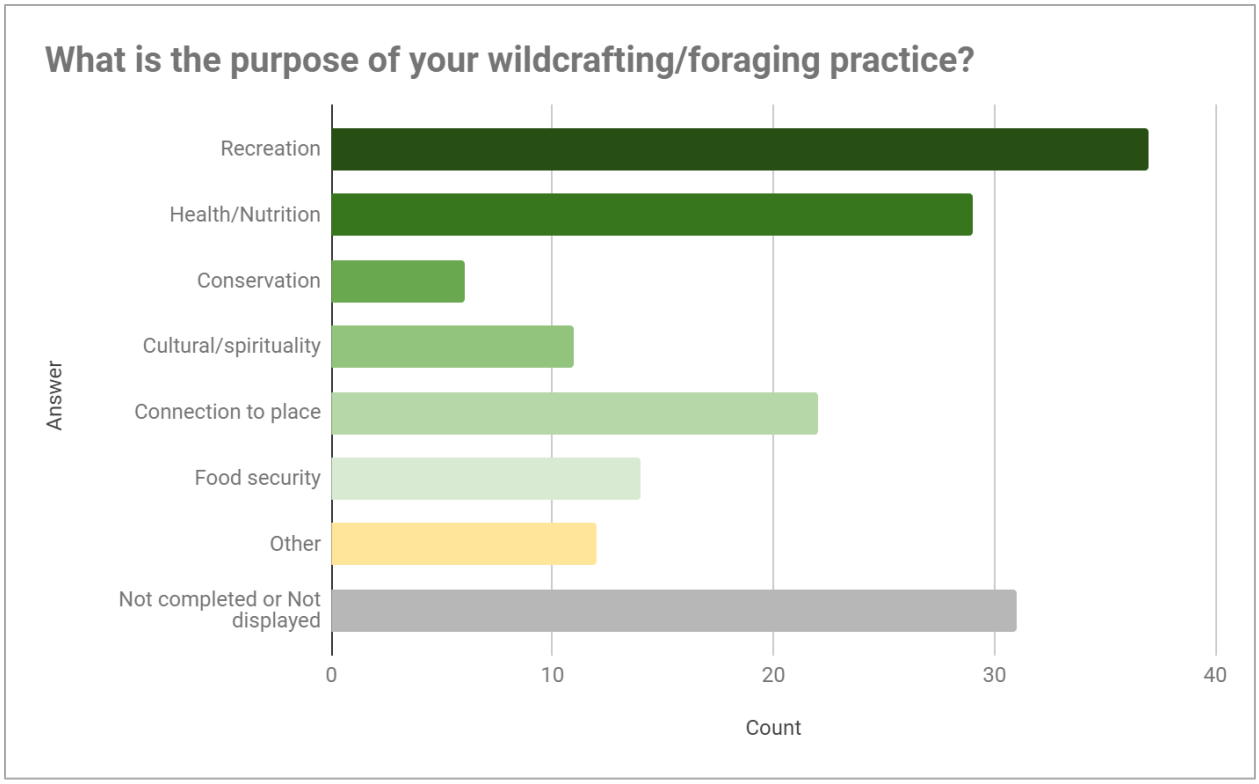


Figure 2. Questionnaire responses to "What is the purpose of your wildcrafting/foraging practice?" Respondents could select more than one option.

Additionally, one respondent wrote "The value in this foraging is truly a way of life, a way to enjoy the outdoors, and to live seasonally while obtaining food that is nutritionally superior." The purposes and benefits of foraging for wild plants in Vermont overlap in many ways and in some cases, respondents selected all of the available options listed. Another participant wrote,

> "Often I feel people overlook the accessibility of materials to work with and just see wild [plants as] food or medicine. Utilizing different barks, grasses, trees, and even resources such as animal sinew can create marvelous projects and useful tools. Foraging for Willow or Cattail to make a basket or a piece of art is life-changing! Keep your eyes open and the whole environment around you becomes alive with possibility and character!"

These perspectives further prove the multitude of resources and gifts wild food plants provide. The foraging community in Vermont takes part in and utilizes many of these gifts.

Species Selection

Within the survey, participants were also asked to list the species they collect while foraging. A number of survey participants indicated that the list of species they collect was too long to write out. The most diverse response received listed 53 different plants and fungi. Among these lists, many edible invasive species were included; the most frequent of which was dandelion (*Taraxacum*) (Figure 4). Interestingly, 40% of all responses to this question included at least one species that can be categorized as invasive.

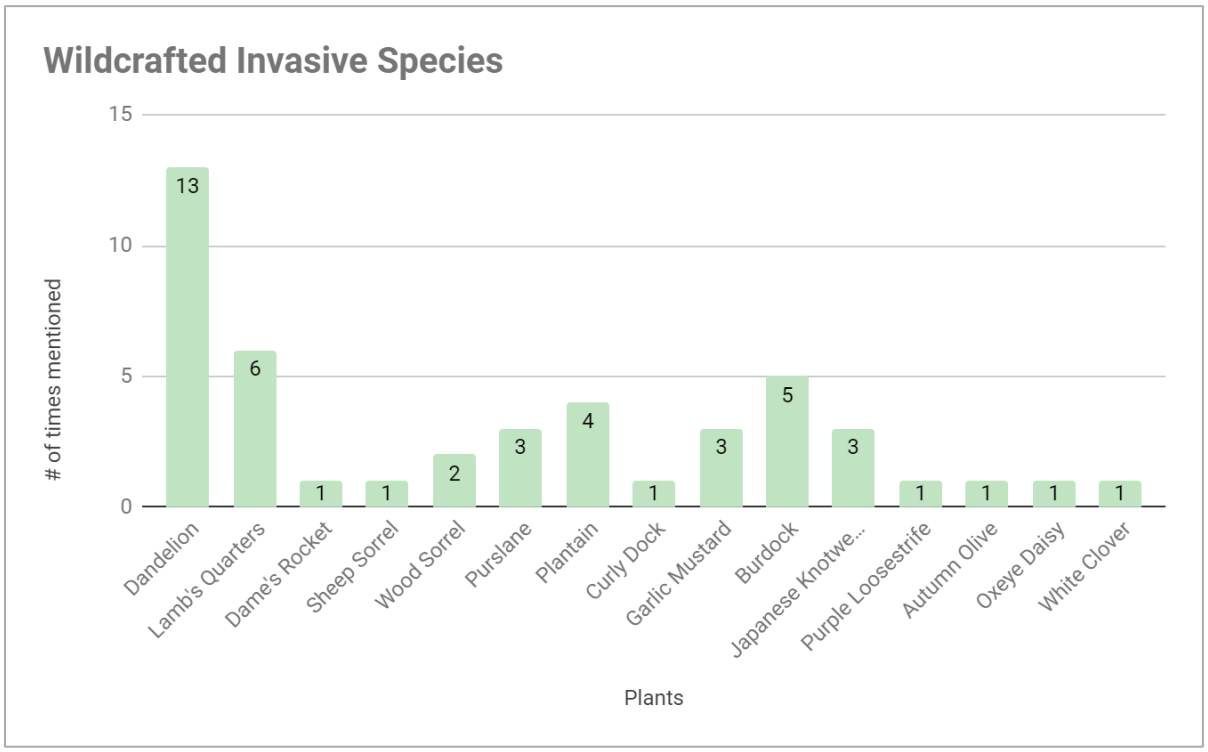


Figure 4. Frequency of invasive species mentioned in questionnaire response when asked to list plants gathered.

Knowledge Sources

Foragers around the world are known to utilize an extremely diverse number of species in their practice. According to Bharucha and Pretty (2010), at one point in human history more than 7000 species were being used throughout the world. Today, in industrialized countries, collection

and use of wild plant species has been declining (Bharucha & Pretty, 2010). However, through diverse local ecological knowledge, the foraging community in Vermont has identified a large number of different species that they collect for food, medicine, and craft.

Some of the most prominent barriers to participating in foraging are lack of knowledge and experience. In order to understand how participants learned to practice foraging, they were asked to identify their knowledge source (figure 6). Most respondents (34%) taught themselves through online resources, books, and field guides. This was followed by a parent, friend, or elder passing on their knowledge and experience (22%) and finally through some sort of formal training such as a workshop or class (12%).

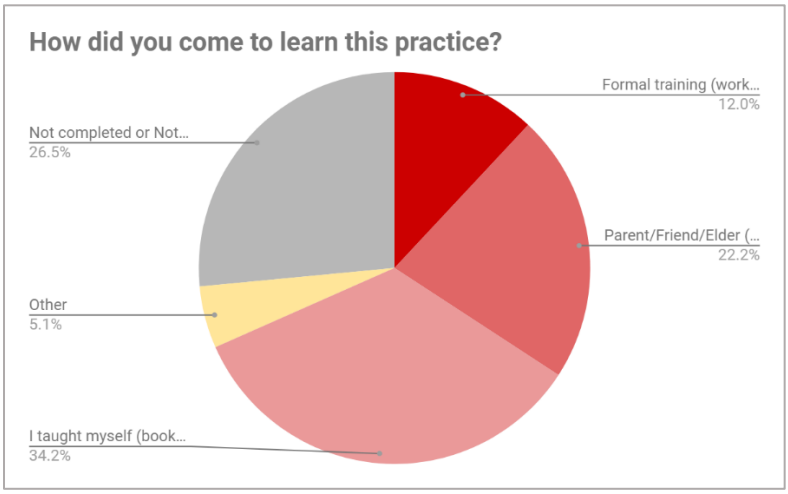


Figure 3. Questionnaire responses to "How did you come to learn this practice?"

Benefits of Foraging for Invasives

a) Strengthening Sense of Place

As shown above, fostering a connection to the land they are a part of is one of the primary reasons people participate in foraging in Vermont. Inherently, the collection of wild plant food requires knowledge of the space and a sense of respect and gratitude for the harvest (Poe et al., 2013). Foraging creates and enhances local ecological knowledge, promotes nature

exploration and time outdoors, and fosters a cultural and spiritual connection to place (Bharucha & Pretty, 2010; Poe et al., 2013). Several questionnaire respondents expressed these values. When asked about the reason behind their foraging practice, one respondent wrote,

> "I wild harvest to gain deeper connection with local landscape and to learn the practice of utilizing accessible food, medicine, and material. It is a process in which I am continually learning the wonders of my immediate environment and cultivating a perspective of viewing the natural world as alive, full of personality, and my kin (family.)"

Another respondent wrote that they, "[Use] wildcrafting to connect with, learn from and live off the land." As the natural landscapes of Vermont continue to change due to human development and anthropogenic climate change, the plant composition in our wild spaces will change alongside it. Foragers will have the opportunity to adapt to the changes that occur and connect with the natural areas as they change and adapt with the introduction of new species. When speaking about the future of global food systems, researcher Joshua R. said,

> "The effect of agriculture on wild ecosystems has been huge for thousands of years and we are at another pinch point here, so we need to be thinking of other ways to be managing land and of feeding ourselves and eating good, healthy, and tasty food. I think that invasives could be part of that future, which is now."

b) Nutrition & Health

Wild, locally harvested foods are also highly nutritious and can play a role in improving people's diets. Foraging, as a practice, connects participants to the land around them and provides valuable nutrients that can be difficult to find otherwise. Several questionnaire respondents expressed these values. When asked about their practice, one respondent wrote of the wild edible plants they gather "It is more nutritious than everything I can grow or buy." Others explained that they forage because it enhances or improves their diet: "I forage wild foods for a substantial portion of my yearly calories and the majority of my yearly medicine." These

questionnaire respondents were speaking to the general topic of wild edible plants but a similar value can also be found in edible invasive species.

Registered dietician and wild food guide, Margot B., spoke about the many nutrients and phytochemicals found in pervasive, common invasive species. Japanese knotweed, for example, is very high in resveratrol, an antioxidant that has properties that are anti-aging and anti-cancer, it improves heart health, and it is one of the main plant medicines used to treat Lyme disease. Similarly, garlic mustard, according to Margot B., is "way more nutritious than leafy greens at the grocery store and at the Farmers Market." These species are highly efficient and nutrient-dense. Cathy M., a member of the Abenaki community, spoke about the use of wild plants as medicine versus conventional prescription drugs, saying "With the plant, I'm using the whole plant, everything that's in the plant and that's balanced. So it kind of brings your body into balance and helps deal with it rather than just causes even more health issues." Harvesting edible plants that grow within the same environment that the forager is a part of can play an extraordinary role in health and nutrition through localizing and diversifying diets.

c) Ecological Stewardship

The collection and consumption of edible invasive plant species also has the opportunity to positively impact the ecosystems in which they are found. Questionnaire respondents expressed significant concern for the sustainability of foraging as a practice. When asked about values (i.e. principles or standards of behavior) surrounding their foraging activities, 67% of respondents mentioned principles of sustainability. Several responses focused on specific personal rules such as, "not taking more than I will use, always leaving some to propagate," or limiting harvest to a portion of what is available, like "never harvest more than half," "1/3rd," or

even "1/5th" of the population. As one respondent wrote, a general overview of many foragers values when harvesting wild plant foods is:

> "Take only what is needed. Survey area and population to determine what is appropriate to take. Make sure to know the conservation status of plant or material. Make sure to know what is edible or medicinal about plant and where to cut when harvesting so it can regrow/regenerate. Offer gratitude to the plants, walk lightly. Find out if you can give back to the area or region from taking by seeing if you can plant or build soil health."

However, one respondent wrote, "An exception to this rule would be if the edible in question were an invasive species."

Interview participants expressed similar concerns over the sustainability of foraging and the severe impacts that can occur when a species becomes popular in this community. Professional forager and edible plant guide, Margot B., spoke about the ecosystem degradation she has seen from people foraging species on the threatened or endangered species list, like fiddleheads and ramps. She expressed a desire to see people shift their focus towards more abundant invasive species and specifically mentioned Japanese knotweed and garlic mustard. Botanist, Mark S., explained how this shift of focus can impact natural systems, "…if you are interested in going out and eating wild stuff, you can choose the native or invasive species. So, if you're going to eat 100 plants and you intentionally eat 75 of them as invasive species, you help preserve the native plants because our native plants are under pressure." Through harvesting invasive species, a forager can relieve the pressure on native, perennial plants that are under pressure and have slow recovery rates.

Additionally, by shifting the focus to invasive species, a forager does not have to be concerned about the sustainability of their practice. Instead, the tendency of humans to overharvest can be exploited to benefit the ecosystem through the clearing of invasive species

and the opening of niches to natives. Biologist, Joshua R., when talking about his exposure to this concept in regards to invasive edible European green crabs said,

> "Since I work as a conservationist, we are often trying to control people's appetites so it occurred to me that we found a species or a group of species that we would actually encourage people to go out and harvest. They could actually be making a positive impact or at least reducing their footprint, their ecological footprint, by taking invasives rather than natives from the environment."

Foraging for invasive species contributes to a smaller ecological footprint, relieves pressure on sensitive native species, and potentially gives native species a chance to inhabit the newly opened niches. However, participating in this practice also enhances one's local ecological knowledge. As Joshua R. said, "it's not just about reducing invasives but it's about learning the ecological history of the area and being good stewards of the environment. That's really what it's about, ultimately."

Barriers to Foraging for Invasives

a) Education & Familiarity

When discussing potential barriers to incorporating edible invasive species into more mainstream foraging practices and food systems, several interviewees mentioned a lack of experience or familiarity with these species. Mark S. identified two major barriers, "learning how to harvest and learning how to cook." According to Mark S., having a positive experience when foraging for edible invasive plant species requires accurate identification, knowledge around proper harvest (i.e. season, plant part, life cycle stage, etc.), and a good recipe. However, he also states, "To get people to used to them, it's a matter of familiarity and education and demonstration. If you can demonstrate to people how yummy these are, you change the game."

Joshua R. stated similar barriers of education and familiarity within foraging for invasive species. His experience with edible invasives has shown him that there are a few key factors

necessary for introducing someone to an unknown wild food, they should be “easy to identify and find… and it should taste fresh and good.” He spoke about challenges such as native species being confused for invasive and the “yuck factor.” Many of these barriers are based on knowledge and experience. One way in which Joshua R. attempts to rectify these obstacles is through collaborations with restaurants. He states, “If you get served something on a menu at a restaurant that you haven't heard before, that will start giving you some ideas, that creates a demand or an interest.” Joshua R. works with chefs around the country and gives them the tools to become “knowledge brokers” in an effort to introduce larger populations to the idea of eating invasive species.

On a larger scale, both Mark S. and Samantha A. mentioned the “food culture” of Vermont as a barrier to foraging for invasive species. As part of her gleaning organization’s mission statement, Samantha A. is “fostering food culture [through] exposure, exposure, exposure… We are opening their minds, encouraging them to take risks and try new things and not be scared.” Mark S. spoke about the lack of a rich cooking culture in the United States, a culture that “uses a lot of different ingredients and has in place certain techniques and has a vision of what good food should be and how to make it…” Without these fundamental skills and a community around good food, introducing people to new foods and new ideas about food can certainly be a challenge.

Research participants did, however, exemplify various avenues in which to tackle this barrier. Joshua R. runs a website on edible invasive species, from terrestrial plants and animals to those found in fresh and saltwater. Miranda E. and Margot B. mentioned teaching their children and grandchildren the techniques of foraging for wild food and medicine and the importance of teaching respect and gratitude for these natural systems. One of the organization’s involved in

this study is working on a 3-year plan that focuses on improving the cooking culture for their clients through community engagement and knowledge sharing. Joel H. welcomes college classes to his farm every season to show them how regenerative agriculture and "farming on the wild side" increases biodiversity and life on his property. These actions address education, familiarity, and support a more rich food culture in Vermont.

b) Reframing Language & Attitude

Two community members interviewed chose not to engage with the harmful categorization of native species versus invasives – Cathy M., member of the Abenaki community, and Joel H., regenerative farmer. The extraordinarily negative, combative language surrounding these species as detrimental to the health of the environment may play a role in the willingness to incorporate invasive species into foraging practices.

Cathy M., described her process of gathering wild plants in our interview. She explores her landscape and researches the plants that she finds, whether they are native or invasive, in order to understand how they can provide for her. She then gathers the plant according to tradition and offers tobacco "as a sign of honoring and thanks." She is careful not to disturb any pollinators that may be present, choosing to leave the area if she finds bumble bees or butterflies buzzing around. She describes that it is all about balance between all of the different relatives that depend on the plant. When explaining the Abenaki philosophy on foraging she said,

> "Every relation, we're all in a circle and we're all on an equal status as far as the four legged, the two legged, the rooted ones, the standing still's, the flyers, the creepy crawlers - we're all related. We're all equal. No one stands above the other. And so it becomes a thing of the whole philosophy of do you consider everyone in the circle when you're gathering? That's really of the utmost importance to me when I'm gathering. Being respectful, not only of the rooted plant but also of the ones who depend on it for their survival."

Cathy M. does not distinguish between native and invasive species when foraging for the wild jellies she makes. She also stated, “We all have a part to play in the ecology and the balance and when you start targeting specific members of the Earth, then it affects the balance.”

Joel H. has a similar philosophy regarding invasive species on his property. He described his technique as “farming on the wild side,” a non-intensive more hands-off approach to farming in which grasses grow long and biodiversity is welcome. He said, “we're the most invasive species by any definition that probably has ever lived in the history of time, going everywhere and altering ecosystems and damaging other life forms. And so for us to get down on other species, I find a little bit hypocritical.” Speaking about the many ecosystem service that invasive plants provide, he said, “just to look at the bad side of a species instead of trying to find out all the good things about it, is kind of shortsighted I think.” When asked about the barriers to incorporating invasive species into common practice, Joel H. said attitudes were the biggest challenge but also thinks that “it’s a matter of time before people start accepting these plants as part of our new recombinant ecosystem. Like they have clover or earthworms…”

c) Time & Access

Another significant barrier to foraging for invasive species is time. The foraging community is relatively small and this, in part, is due to the fact that learning how to forage takes time. In order to address the barriers listed above – education and familiarity – one needs to dedicate substantial time and energy. These barriers are intertwined in many ways. Samantha A. spoke about these access issues when she said,

> “…it takes people’s time. That's a huge part of it; you have to get your basket, get your scissors, your knife, plan to go down and figure it out. I think that's something that people that don't have a lot of money or have a lot of conflicting demands of them don't have the time to do.”

However, Miranda E. has conducted research on this particular question and the barriers to engaging in foraging. Interestingly, she found that, when divided into three income brackets, the group that forages the most by volume and number of species is the lowest income group. Next was the highest income group. Those that foraged the least were actually in the middle-income bracket. She attributes this to opportunity cost and disposable time, stating that those on either ends of the economic spectrum have either a higher drive to access free, readily-available edible plants or just have more available time to spend engaging in these activities. Miranda E. has also looked at barriers surrounding access to wild edible plants, both physical access and social access. She explained,

> "There's the biological availability of something, is it present on the landscape? And clearly that's key. But then there's also what are the social terms of access to it, so that goes to governance systems of all kinds about land ownership and legality. And that's both formal, on the books governance, and informal governance, like norms and practices and social stigmas."

Though her research, she has found that identity and privilege can play an important role in the desire and ability to forage for wild food. Whereas foraging for wild food may be a status enhancer for certain social groups, there is also significant stigmatizing of the practice for other social groups and this she attributes to institutionalized structures of power and privilege. She stated,

> "Social stigmas do factor in. They may be a function of the identity of the individual. So, for example, someone like me is out foraging and it's really cool, but -- there was a student in geography and food sciences who did a really interesting master's thesis on this and talked to gardeners in Burlington's community gardens and one of the African gardeners that she interviewed said 'Please don't tell them I eat weeds.' Which ultimately became the title of her thesis. So, for that individual with her identity, it's a stigmatized practice. With my identity it's actually quite the opposite. It's a status actually."

There is a convergence of economic and social structures playing a role in the availability of foraging as a practice to Vermonters through issues surrounding time and accessibility.

Discussion

Overview

After conducting interviews with leaders in the foraging community, utilizing questionnaires in the field, and participating in observation-based foraging activities, I have gathered a comprehensive view of the diverse perspectives among foragers in Vermont. Conversations about foraging cannot, and should not, ignore the growing influence of invasive species on our familiar landscapes. The conventional framework of eradication has proven to be ineffectual and therefore a systems-level paradigmatic shift is necessary in order to improve the management and maintenance of Vermont's wild and cultivated landscapes. The perspectives and values of foragers in Vermont provide an apt avenue to address this shift. Several themes emerged after thorough analysis and reflection on the data collected during this research. The following sections will outline these themes, which include: foragers as a starting point, reframing language in a changing world, capitalizing on benefits and addressing barriers, and areas for further research.

The Foraging Community – A Starting Point

By nature, those that practice foraging are engaging in and exploring their natural landscapes. As reiterated in research from Poe et al. (2013), communities that gather wild edible plants have an abundance of local ecological knowledge and harbor a strong connection to place. My research has found that to be exceedingly true of foragers in Vermont. Foragers must have a knowledge and understanding of local species, natural areas, phenology, harvest techniques, and ecosystem function in order to forage successfully. These attributes therefore give the community a higher baseline starting point for incorporating invasive species into their practice and diets.

Additionally, the values described by my research participants fully align with the benefits of foraging for edible invasive species. The foraging community's values reflect an awareness and concern for both ecological and personal health. Overharvesting of popular sensitive native species like fiddleheads and ramps is a major concern for the community. As evidenced by their feedback, the foraging community of Vermont is attuned to the conservation issues surrounding their practice. A refocusing of energy towards invasives can provide relief and a chance for resurgence for threatened species. This data corroborates with the work of Bonanno (2016) and Larson et al. (2011), who state that the removal of invasive species from an ecosystem through foraging can open a niche for native species and increase their chances of survival thereby improving overall ecosystem health. This approach can be incorporated into a wider method of how land managers and conservationists maintain ecosystem health and integrity in Vermont.

As evidenced through this research, the incorporation of invasive species into one's diet also provides significant micronutrients and phytochemicals, diversifies diets, and can supply various medicinal benefits. Questionnaire data confirms that health and nutrition are listed as the second most popular reason for foraging. The community placed significant value on the fact that wild plants provide extraordinary health benefits. The registered dietician who partook in this study indicated that invasive edible plants provide the same, if not more, health benefits when incorporated into diets and medicine. The data collected further substantiates the findings of Rapoport et al. (1995) and Bharucha and Pretty (2010), indicating that edible invasive species could potentially play a role in improving local diets and nutrition. This information could thereby inform local food security and nutrition-based organizations or government entities to include widely available and accessible edible invasive species in education initiatives.

For these reasons, the foraging community is especially receptive to a reframing of perspectives on invasives and a refocusing of foraging efforts from sensitive, native plants to abundant invasive species. This group, however, is relatively small and tends to be more radical, ready to ignore societal norms and conveniences. As suggested by an edible invasives researcher during an interview, in order to engage larger audiences and create a more widespread impact, more mainstream avenues may need to be used. In concurrence with Nuñez et al. (2012), these initiatives can and should act in complement to other management approaches, thereby creating a stronger combined effect. These complementary management approaches should be varied and comprehensive in order to successfully ignite a paradigm shift in the way communities interact with invasive species. Ecological stewardship-based initiatives can be implemented through the work of land and natural resource managers stewarding wild spaces without criminalizing invasive species but instead capitalizing on their value. The benefits to health and nutrition can be utilized by hunger and food justice organizations through incorporating information on edible invasive species into education initiatives. Agriculturalists can embrace permaculture frameworks and allow invasive species to grow, thereby improving holistic approaches to cultivated spaces. Collaboration with chefs and through restaurants can include incorporating invasive species into menus. These approaches would introduce invasive species into common diets and markets which addresses this paradigm shift in a more conventional way, as has been done with various invasive species around the world.

A Changing World

As the world continues to change with increased globalization and anthropogenic climate change, so too will the composition of our natural landscapes. Biodiversity in Vermont and around the world is dynamic. Vermont forests and natural areas will most likely see continued

species composition change through an increase in invaders due to their ability to fill niches, adapt quickly, and outcompete natives. However, as Orion (2015) argues, we must move beyond the war on invasive species and shift our perspective towards seeing these new species as allies in ecological stewardship.

These species are thriving in our changing environments, they provide numerous ecosystem services, and they can be used as food and medicine. During interviews, Japanese knotweed was identified as a colonizer of empty streambanks and stabilizer of soil, thereby preventing harmful erosion. Resveratrol, a phytochemical found in that same species, was mentioned as a potential source of incredible income for the state of Vermont for its medicinal properties in anti-aging, anti-cancer, heart health, and the treatment of Lyme disease. This species and other "nuisance" species – like dandelion, glossy buckthorn, and honeysuckle – can also attract pollinators, as Joel has seen on his farm. These examples indicate that, with global environmental change, invasive species may become a valuable source of ecosystem services, food, and medicine.

There is an interesting connection between some of the issues we are seeing in our changing world and the presence of ecological invaders. Cases of Lyme disease in the U.S. have increased dramatically over the past few years. According to the Center for Disease Control, cases of Lyme disease in the U.S. have doubled from 2004 to 2016. Coincidentally, we are also seeing a drastic increase in the amount of Japanese knotweed, an effective plant medicine in treating this disease, in our natural areas. The plight of colony collapse and reduced numbers in pollinator species is also occurring at the same time as numbers of invasive species that attract these same pollinators are coming in to these spaces. As addressed by Orion (2015) and further explored in this research, perhaps the issues we are seeing in our ecological systems are not due

to the presence of invasive species but due to the way we think about and manage invasions. It is common that environmentalists and natural resource managers regularly vilify invasive species and utilize mechanical, biological, or chemical control agents in futile attempts at eradication in the name of maintaining ecosystem health. It is problematic that those who claim to love nature can develop such hatred towards a species found within nature. Furthermore, this perspective of good versus bad nature perpetuates the human inclination towards a God complex, falsely believing in our own infallibility in fighting self-determined evil.

Similar to the ideas of Thompson (2014), the biosphere of Vermont has never been "frozen," it is built of innumerable dynamic and complex systems. The changing composition of forests and natural areas in Vermont throughout history is proof of this complexity. As new species thrive in the changing conditions around us, this research shows that foragers are likely open to adapting their practice accordingly.

Capitalizing on Benefits & Addressing Barriers

Connection to place, ecological stewardship, and health/nutrition benefits are the primary benefits that should be capitalized on as this movement continues to develop. However, in order to capitalize on these benefits one of the largest barriers needs to be addressed first – education and familiarity. In ecological systems, adaptation is the key to successful survival. As the effects of anthropogenic climate change come to fruition through changing weather patterns, extreme storms, sea-level rise, and numerous other seen and unforeseen changes, we too must adapt our perspectives and practices to thrive in these new environments. Foraging and finding the value in invasive species can be one of these adaptations.

There are several benefits in incorporating invasive species into a foragers regular practice. Foraging for invasive species can increase one's spiritual and physiological connection

to place and it aligns with foragers value in ecological and dietary health. These compounded benefits indicate a profound opportunity to shift this community's thinking in regard to invasive species. The most significant reason people in Vermont forage is for recreation. This community enjoys spending time in natural areas and getting to know the names and uses of the species that occupy them. Invasive species will continue to be a part of these spaces and one should accept their presence as part of the changing environments we are a part of. Foragers local ecological knowledge and time spent outdoors recreating gives them a positive foundation to change this perspective. By embracing invasive species as allies in ecological stewardship and utilizing the gifts they provide through food and medicine, foragers can strengthen their deep connection to place – even if that place is changing. This research explains that the relationship between foragers and these wild species can be symbiotic.

To accomplish this shift towards a symbiotic relationship, the data shows that it is necessary to increase the awareness and education around edible invasive species. To do this, we must foster a culture of knowledge sharing. While foraging has notoriously been a practice that is private and often secretive in order to protect patches of edible plants and fungi from overharvesting and other detrimental actions, knowledge sharing is vital to increasing the foraging and consumption of edible invasive species. By definition, invasive species are relatively new to the landscapes they are inhabiting. Therefore, the knowledge necessary to properly enjoy these species as wild food and medicine can be hard to come by. Identification, proper harvest, and cooking techniques are all fundamental to successfully incorporating these species into our practice and our diets. This study found various ways that participants partake in fostering a culture of knowledge sharing. From an informational website to intergenerational storytelling, and college classes on regenerative agriculture, there are a multiplicity of avenues

available for the spread of this knowledge. As these efforts show, there are systems in place to improve the knowledge and awareness of how foraging for invasive species can be beneficial to human and ecological systems. Utilizing these systems to shift the focus of foragers to these abundant, diverse, and nutrient rich invasive species is key in their incorporation to common diets.

To address other barriers to foraging for invasive species includes addressing barriers to foraging in general: destigmatizing the practice of gathering wild plant foods and addressing the valuation of our time. As identified in my study, identity and privilege play substantial roles in the desire and ability to forage for wild foods. In some cultures, eating wild foods can be a sign of poverty and can therefore carry a stigma around the practice of collecting and consuming edible wild plants (Federman, 2011). On the other side of the spectrum, when a wealthy, western, white person practices foraging it can actually elevate their status as a person connected to nature and who has the time to devote to these "luxury" hobbies. However, wild plant foods are inherently available to all and free for all. It is important to destigmatize the practice of foraging as it serves all practitioners equally. This, again, can perhaps be addressed through knowledge sharing and a community awareness.

Time was also mentioned as one of the most prominent barriers to practicing foraging. While this is a valid and significant concern, it places different values on how one spends their time. It can be argued that, although grocery shopping is convenient, we often do not take into account the time spent earning the money necessary to buy the food and get back and forth to the store. Maybe if we did consider this time, the time spent outdoors collecting wild edible plants and prepping the food for cooking would seem like less of a burden. The group least likely to practice foraging are also those with the least amount of "disposable time." These are middle-

income people, usually holding full time jobs. This barrier involves conventional understandings of success and valuable time and may be the most difficult to address. Given the responses received in this research and a comprehensive exploration of the literature, overcoming this kind of barrier involves a systems-level paradigmatic shift.

To propel this paradigmatic shift into motion and to impact expansive, diverse audiences numerous actions need to take place. The diversity in survey respondents and interviewees within this research provides an apt framework for addressing the benefits and barriers of incorporating edible invasive species into common diets. This research focuses on the foraging community as a potential entry point for systems-level change making and it is vital to remember that the foraging community is made up of distinctive individuals that represent a heterogeneous whole. The paradigm shift that is proposed therefore needs to incorporate varied approaches and avenues in order to properly capitalize on the benefits and address barriers. These approaches can include ecology-based initiatives, economic or market-based initiatives, social justice-oriented initiatives, or a combination thereof. Restaurants, community gardens, farms, public parks, wild spaces, grocery stores, urban planning, cookbooks, field guides, food shelves, newspaper articles, academic institutions, and countless other avenues have the potential to reach the diverse population of Vermonters that can be impacted by a shift in thinking around edible invasive plants.

Areas for Further Research

As this research project concludes, there are various topics that can and should be addressed in further research. This project attempts to identify the practices and values of the general foraging community in the state of Vermont. One of the areas that could not be fully explored, due to time and resource limitations, was the incorporation of perspectives from new

Americans in our community and those that do not speak English. These voices could contribute significantly to the findings of this research and paint a more full picture of the foraging community in Vermont. Additionally, I was not able to answer questions about the potential of edible invasive plants to act as an alternative food source. Further research is needed in regards to the nutritional components of specific abundant invasive plants. I would propose further research on whether these species can contribute significant calories for food insecure and hungry communities.

Conclusion

Expressed throughout the literature and within all my interviews, it is time to accept that invasive species are a part of our future. Although perhaps not ideal by some standards, invasive plant species are nearly impossible to eradicate once established. Preventing introduction is the surest way to protect local ecosystems from invasion, but after establishment we need to shift our approach to dealing with these new species. Attempts at eradication are futile. Instead, we should be exploring the unique benefits these new species can provide – like beneficial ecosystem services, food, and medicine.

The foraging community in Vermont is most likely open to incorporating invasive species into their practice. This community values a strong sense of place, ecological stewardship, and healthy, diverse diets. Foraging for invasive species aligns with these values. Accepting invasive species as part of the changing landscape can enhance a physical and spiritual connection to place through embracing the "good" and the familiar along with the "bad" and the unfamiliar of an environment. Collecting and consuming edible invasive species can relieve pressure on popular native wild edible plants and can also potentially open a niche for natives. Invasive edible plants can also be rich in micronutrients and phytochemicals that aid in health and the diversification of diets. These attributes make edible invasive species incredibly suitable to incorporation within broader foraging practices.

However, the foraging community in Vermont is rather small and tends to consist of limited demographics. To see any kind of impact on invasive species populations this movement may need to utilize mainstream avenues like restaurants and chefs, academic institutions, or justice organizations. These "knowledge brokers," may be the best way to make people aware of

the situation. That being said, the foraging community can be used as an apt starting point to spread awareness and knowledge of this movement.

Through this study I have attempted to explain that a shift in thinking around invasive species can result in expanding the way one approaches the wider food system. Although management of invasive species has widely been left to roles in natural resources and conservation, I argue that these species and our perspectives of them can have a profound impact on the Vermont food system and beyond. Similar to the way people think about which species belong in our natural spaces and which do not, many people have limited perspectives on what belongs on our plates and what does not. To have an interdisciplinary, systems-level perspective is to understand that these systems are complex and interwoven. Incorporating edible invasive species into common diets is one way to address the misguided compartmentalization of ecological stewardship and the food we eat.

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Appendix A

Questionnaire

Do you wildcraft (forage)?

1. (Open-ended) In a few sentences, how would you *define* your practice - be that foraging, wildcrafting, wild harvesting, etc.?

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

2. (Rank order) What is the purpose of your wildcrafting/foraging practice? If more than one, please rank by order of importance (1 being the primary reason for your practice).

   ___ Recreation
   ___ Health/nutrition
   ___ Conservation
   ___ Cultural/spirituality
   ___ Connection to place
   ___ Food security
   ___ Other: _____

3. (Open-ended) What are your motivations or values in connection to this practice? Please briefly explain.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

4. (Tick-box) How did you come to learn this practice?

___ Formal training (workshop, apprenticeship, etc.)
___ Parent/Friend/Elder
___ I taught myself (books, online, etc.)
___ Other: _____

5. (List) What plants do you gather?

_____ _____
_____ _____
_____ _____
_____ _____

Demographic Information (optional)
Gender (mark one): Male Female Other
Year of birth: _____
Town, state/province, and country of residence:_____
Which race(s)/ethnicity(ies) do you consider yourself? (mark as many as relevant)
White Black or African American American Indian or Alaskan Native Hispanic or Latino Native Hawaiian Chinese Japanese Filipino Korean Vietnamese Other Asian Pacific Islander
Other:_____
In your own opinion, how would *you* define your income level? (circle one)
Low

Lower-Middle

Middle

Upper-Middle

High

Appendix B

FALL 2018

Do you forage (wildcraft)?

Help a UVM senior with her thesis and fill out a brief survey!

©Burton

I want to hear about your experiences!

Wild food plants act as a vital and vibrant part of many food and health systems around the globe. The FAO estimates that nearly *one billion* people utilize wild food in their diets globally and nearly *300 million* people rely on non-timber forest products for livelihoods and food. People who gather wild foods are adapted to localities and they often possess rich, abundant local knowledge of ecology, botany, and herbalism.

If you identify as someone who collects, harvests, or consumes wild foods please take a moment to ***fill out a brief, anonymous survey*** by scanning this code or by following this URL: https://survey.uvm.edu/index.php/159584?lang=en

FALL 2018

Do you forage (wildcraft)?

Help a UVM senior with her thesis and fill out a brief survey!

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If you identify as someone who collects, harvests, or consumes wild foods please take a moment to ***fill out a brief, anonymous survey*** by scanning this code.

Or by following this URL:
https://survey.uvm.edu/index.php/159584?lang=en

If you have any questions, please email me: sheridan.plummer@uvm.edu

Appendix C

Interview Guide

1) What role do you/your organization play in the VT food system or invasive species research?
2) What do you see as the barriers and benefits to wildcrafting for edible invasive species?
3) What is your perspective of invasive species?
4) a. How do you strive to be a steward of the land?
   b. How do you envision a just, sustainable VT food system?