The Pennsylvania State University

The Graduate School

RAMP/LEEK "CULTURE" IN NORTHERN APPALACHIA: A STUDY OF ATTITUDES, BEHAVIORS, AND KNOWLEDGE SURROUNDING A NON-TIMBER FOREST PRODUCT

A Thesis in

Forest Resources

by

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Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science

August 2022

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ABSTRACT

Ramps or wild leeks (*Allium tricoccum*, Aiton) are a type of edible wild onion that are wild harvested as a culturally important non-timber forest product (NTFP) in the eastern United States. Despite their importance as an NTFP, little has been documented regarding the cultural and economic significance of ramps in the Northern Appalachian region. This 2019-2021 mixed-methods study involving survey instruments and key informant interviews is the first to provide insights into the knowledge, attitudes, and behaviors of ramp community members in Northern Appalachia and adjacent regions. Harvesters were found to possess a greater level of local ecological knowledge (LEK) about ramps when compared to consumers and had significantly more experience with ramps. Ramp community members revealed that tradition, connection to nature, economic opportunities, and culinary interest are the main drivers of ramp interest and foraging appeal. The popularity of ramps in Northern Appalachia appears to be increasing, with 1 in 6 consumers and 1 in 4 harvesters surveyed reporting being new to ramps in the last 5 years. Most harvesters surveyed (90%) reported using at least one type of management or stewardship practice within their harvest areas to promote the growth of ramp populations. Commercial harvesters (n = 12) were found to have a larger impact on ramp populations on a per person basis, with reported removals of 3,000 to 7,200 pounds per year. Ramps collected for personal use (n = 132, harvesters) was estimated at 250 to 1300 pounds total per year, by comparison. Although these impacts were limited to estimates provided by the convenience and snowball sample frames, the differences in quantities sold for the formal market compared to informal market are notable.

Educational efforts are recommended to ensure responsible engagement with ramps across Northern Appalachia and should target consumers who in this study were found to know much less about ramp biology and conservation needs when compared with harvesters. In particular, targeted consumer education could benefit resource stewardship by delaying consumer ramp season purchases until after plants and bulbs have had a chance to attain maximum size in later spring months, resulting in fewer plants being needed to comprise a given weight.

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ACKNOWLEDGEMENTS

This work would not have been possible without the support of the ramp community in Northern Appalachia. I want to acknowledge the community members who participated in my survey, and those who shared my work across digital and print platforms. To the key informants, thank you for sharing your life experiences with me. It has been an honor to learn and partake in your traditions and share them with the world.

I would like to thank my friends, especially Cassie Stark, and family for their support along the way. Thank you to my field work partners Olivia Stas, Jonathan and Dawn Pugh, and Mike Toolan who made the road trips even more enjoyable. And another special thanks to Mike Toolan for the endless love, support, and encouragement.

For the valuable mentorship and guidance, I thank my advisor, Eric Burkhart. I am forever grateful for your patience and support through this unprecedented COVID-19 graduate journey. Thank you to my committee members Melissa Kreye, Clare Hinrichs, and Elsa Sánchez for your valuable contributions to this thesis and research over the last 3 years.

Support was provided by the Penn State University Ecosystem Science and Management Department and Shaver's Creek Environmental Center. This study was funded by the Pennsylvania Department of Conservation and Natural Resources (DCNR) Wild Resource Conservation Program grant 18585 and the Pennsylvania Department of Agriculture (PDA), Specialty Crop Program grant 44176523. These findings and conclusions do not reflect the views of the funding agencies.

Chapter 1

Thesis Introduction

The purpose of this study is to investigate the cultural and economic importance of ramps in Northern Appalachia by assessing the attitudes, behaviors, and perceptions of community members within the ramp network. The combination of slow population growth of ramps, and harvesting pressures, highlight the need for sustainability considerations within the ramp industry. Findings will identify gaps in community member knowledge and will help inform future educational materials around ramp conservation.

In this chapter, a broad introduction is provided to introduce and frame the study of ramp "culture" in Northern Appalachia. Chapter 2 is comprised of a draft manuscript entitled: *Ramp "culture": community knowledge, attitudes, and behaviors in Northern Appalachia* intended for publication in a peer-review journal. Major themes that are discussed in the study include:

- Ramp community in Northern Appalachia: who belongs and why?
- Ramp popularity in the region: is this new?
- Behaviors and perceptions surrounding ramp harvesting, buying, and conservation
- Management and stewardship of patches
- Impact of commercial harvest on wild ramp populations

Chapter 3 concludes with limitations and implications of this study and suggestions for future research. References and supplemental materials are provided at the end.

What is a ramp?

Ramps, or wild leeks (*Allium tricoccum* Aiton, Alliaceae) are a species of perennial wild onion that have been harvested for centuries as a wild food. All parts of the plant are edible and typically collected for consumption and commerce (Chamberlain et al. 2018). The flavor of the edible bulbs and leaves, eaten fresh or prepared, offer diverse culinary and medicinal uses (Cavender 2006) comparable to garlic, onions, and garden leeks. However, ramps have a much slower growth rate and can take 7 or more years to reach reproductive maturity from seed (Nantel et al. 1996) compared to cultivated green and bulb onions which only require two years as biennials. Ramps can reproduce asexually or by vegetative propagation, by splitting their bulbs or sexually by seed production. Both reproductive strategies occur in wild populations, although it is unclear to what extent each contributes to population growth and maintenance (Nault and Gagnon 1993).

Are ramps being overexploited?

Ramps are susceptible to overharvesting from commercial exploitation throughout the Appalachian region including the Great Smoky Mountains National Park, TN (Gatlinburg and Us 2021), and New River Gorge National Park, WV (National Park Service 2021). Only two states, Virginia and New York, consider ramp populations “secure” across the species’ natural distribution (Kartesz 1994). The province of Québec, Canada has listed ramps as “vulnerable” since 1995 and limits the harvesting of ramps from natural populations to 50 bulbs (“Quebec Vulnerable Classification” 2021). The imposition of harvesting restrictions has resulted in some research into the impacts of harvesting and population recovery. Sustainable techniques have

been suggested by researchers that rely on harvesting a percentage of bulbs in a patch (Nault and Gagnon 1993, Nantel et al. 1996, Rock et al. 2004). However, Rock et al. (2004) suggested a 10% harvest can have a greater impact on small populations. More recent research has considered variable patch densities and harvesting to a fixed density rather than a percentage to ensure sustainable exploitation of ramps (Dion et al. 2016).

Whether one harvests leaves or bulbs can further influence the impacts on a patch. Dion et al. (2016) suggest that selective bulb harvesting can benefit patches that have reached "growth-limiting densities", since thinning provides room for seed germination and reduces competition for resources among individuals. A model based on harvester preference of bulb size indicates that when harvest rates were equal, "choosy harvesters" who select the largest bulbs have a higher impact on populations compared to "busy harvesters" who select bulbs with no regard for size (Nantel et al. 1996). However, busy harvesters were found to remove more plants which could result in higher impact on a population overall (Nantel et al. 1996). Some research has indicated that leaf-only harvesting does not impact survival of an individual but reduces bulb division (Dion et al. 2016). Removing one leaf per plant has less of an impact overall but still stunts asexual reproduction (Dion et al. 2016). Guidelines suggested by Dion et al. (2016) advise delaying harvest until late season (late April – early May in Pennsylvania), limiting bulb collection to retain a patch density of 88 plants per 10 m^2, and limiting leaf harvesting to one leaf per plant for best ramp conservation management.

Are ramps becoming more popular?

No studies have assessed ramp popularity in the Northern Appalachian region, which is comprised of Pennsylvania, eastern Ohio, western Maryland, and southern New York (ARC 2022). Ramps appear to be gaining popularity for those interested in harvesting and consuming wild foods in recent years, as more people subscribe to the local food movement, eat seasonally, and follow social media. Popular media has been implicated in fostering interest in wild foods and foraging (Sachdeva et al. 2018). Baumflek and Chamberlain (2019) found in their analysis of news media that the number of ramp articles have substantially increased in the last decade, with appearances in media well beyond the natural distribution of ramps and Appalachia. During ramp harvest and commerce season (March-May) it is common to see websites sharing ramp recipes (Moran 2021, Spencer 2017), restaurants advertising ramp specials, and ramp photos shared on social media (Personal observation 2022).

Chapter 2

Ramp "culture" in Northern Appalachia: Community knowledge, attitudes, and behaviors

Introduction

Foraging for NTFPs provides food, medicine, and trade opportunities between people as well as a connection to the ecological world. Ramps or wild leeks (*Allium tricoccum* Aiton, Alliaceae) are slow-growing, perennial wild onions native to the deciduous forests of the eastern United States (U.S.). Ramps belong to a subgroup of non-timber forest products (NTFPs) called edible plants. NTFPs encompass species harvested from forestlands for their economic, medicinal, culinary, and aesthetic values (Chamberlain et al. 2018).

Native peoples of the Northeastern U.S. including Cherokee First Nations, and the Menominee, Haudenosaunee, Potawatomi, Anishinaabe, and Iroquois have been consuming ramps as a food source and medicine for thousands of years across the globe (Moerman 1998, Cavender 2006). European settlers and colonizers learned from Native Americans to celebrate the onion as a sign of spring and rejuvenation (Rivers et al., 2014, Cavender 2006). It has been suggested that the name 'ramp' is derived through from its botanical cousin, ramsons (*Allium ursinum* L.), a European analog to *A. tricoccum* of North America. Europeans recognized the similarity to *A. ursinum* and began harvesting ramps after learning about them from indigenous groups (Rivers et al. 2014). The tradition of ramp harvesting has been continued by Native American and European descendent communities, as well as others living in present-day Appalachia (Figure 2-1).

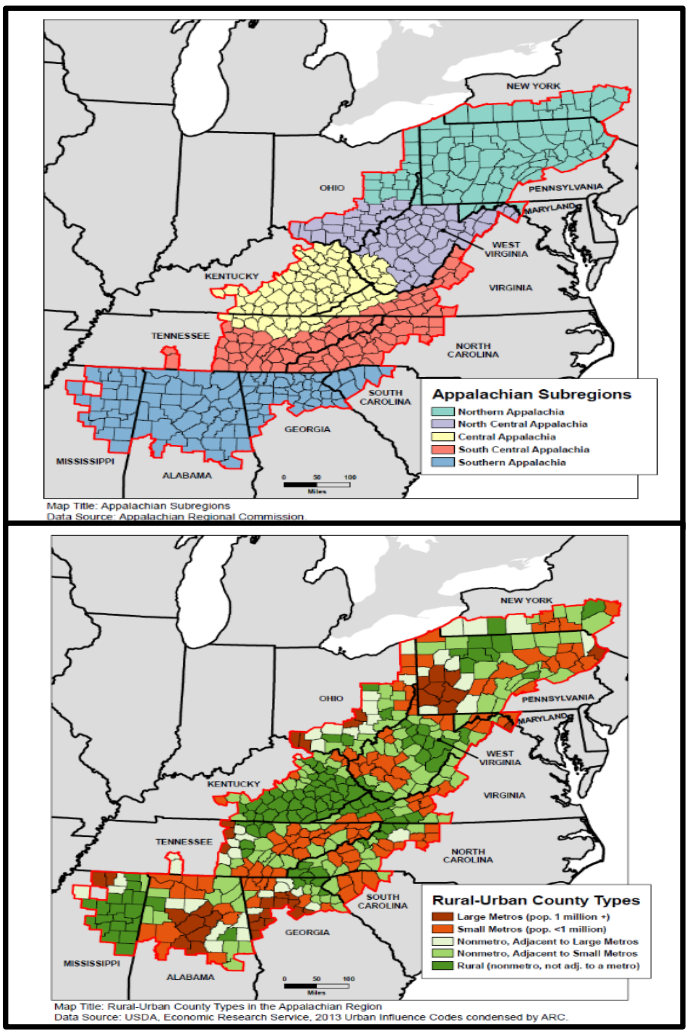

Figure **2-1:** ***Top:*** Appalachian subregions designated by Appalachian Regional Commission based on similarities in geographic location, and demographic and economic characteristics. ***Bottom:*** Rural-Urban County Types in the Appalachian Region Map created by the Appalachian Regional Commission based on data from the USDA, 2013 Accessed 7 March 2022 (ARC 2022).

Appalachia is a cultural region that includes 13 eastern US states within the Appalachian Mountain range (ARC 2022). Some researchers debate whether the Appalachian cultural identity is limited to central Appalachia including western North and South Carolina, eastern Tennessee and Kentucky and southern West Virginia (Lohmann 1990). However, the Appalachian Regional Commission (ARC) acknowledges a much larger geographic range (ARC 2022) (Figure 2-1) that includes Northern Appalachia, a region that is often overlooked in cultural studies. Others have

suggested that the term “Appalachian culture” is too broad and eliminates the nuances and variations in history, geography, demographics and economics between subgroups within the region (Obermiller and Maloney 2016). These subgroups are made up of a mixture of people with Native American, African, English, Scottish, German, Italian and Hispanic/Latinx heritage (Hayden 2004).

The exploration of food is recognized as an important way to explore regional identity (Cantarero et al. 2013, Almerico 2014, Reddy and van Dam 2020). Studies by Shortridge (2005) and Locklear (2006) regard ramps as one traditional food that unifies Appalachian identities, though these studies often exclude the Northern Appalachian region as defined by the ARC (2022).

Here the concept of “culture” around ramps is assessed using the cultural diamond framework established by Griswold (2013) which aims to incorporate how people create meaning in social contexts. The four elements or nodes that make up the diamond include 1) the cultural object, 2) the creator of the object, 3) the audience of the object, and 4) the social world in which the object finds its place (Griswold 2013). Each node of the cultural diamond is connected to the remaining three nodes, creating a system of six linkages or relationships (Figure 2-2). To get a comprehensive understanding of culture, all linkages need to be considered. Cultural objects are socially meaningful and tell a story. In this work, ramps are the cultural object however, the story they tell may vary across or between groups. The creator of the object can be thought of as the person/people who perpetuate the meaning around ramps. Creators may include family members passing on the tradition of ramp harvesting, or chefs selling ramp dishes. The audience includes those who are learning about ramps or participating in ramp events. The social world is where these events are taking place which could vary based on

geographic locations such as rural vs. urban settings, or differences in learning experiences such as in-person vs. virtual platforms. Individuals can fill multiple roles within the cultural diamond which is why "network" is a better suited term for the interactions around ramps. The term "community" is used here to refer to the people participating in the ramp network and are broken into "community groups" based on shared roles. The relationships between and among community groups help to explain the linkages within the diamond of modern ramp culture. Collectively, the interactions between and among these community groups make up what will be referred to as the ramp "network".

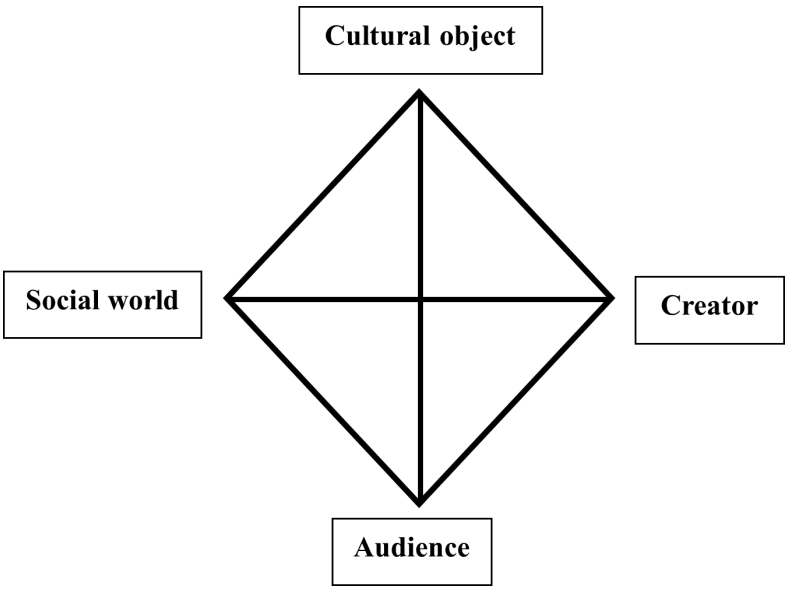

Figure **2-2:** A conceptual model of Griswold's (2013) cultural diamond.

In recent years, ramps have grown in popularity, including in areas beyond Appalachia. Some have attributed the increased popularity of wild foods to their appearance in the media (Sachdeva et al. 2018). Newspaper articles featuring ramps, sharing similar themes, have substantially increased within the last decade (Baumflek and Chamberlain 2019) and are reaching cities on the west coast, well beyond the native distribution of ramps (Kartesz 2014,

Baumflek and Chamberlain 2019). At least one internet search engine (e.g., Google Analytics 2004-2021) indicates growing interest in ramps as a search term, especially during the spring harvest months (Appendix 1). Though the interest around ramps is known to be increasing broadly, there has not been research on ramps in many regions where they are a cultural food item.

For example, Northern Appalachia includes most of Pennsylvania, and parts of eastern Ohio, western Maryland, and southern New York (ARC 2022). The limited knowledge of ramp culture in this region is not due to lack of wild ramp populations. Ramps have been documented in 44 of 67 counties across Pennsylvania (Widmann 2015). Though 16.9 million acres of Pennsylvania are forested, most of the state is not considered rural (ARC 2022), (Figure 2-1, bottom). The convenience of large nearby metropolitan areas and ramp populations in Pennsylvania allows for the establishment of formal ramp markets in urban centers throughout the mid-Atlantic. 'Markets' are defined here as a literal or figurative place where community members come together to exchange ramps or ramp products.

Studies have assessed formal markets for NTFPs (Muir et al. 2006, Chamberlain et al. 2018, Frey et al. 2019) with emphasis on the importance of understanding the impact of trade of forest resources. However, informal markets and associated harvest practices are much less documented and should be included for a more complete understanding of NTFP engagement and to inform management decisions. 'Informal markets' involve the exchange of goods outside of the state regulations and without taxation (McLain et al. 2008, Reimer 2008, Schneider 2015) while 'formal markets' are economies that are 'counted' by the government (Chamberlain et al. 2018, Frey et al. 2019). Though these markets have been defined as separate entities, they are

tightly intertwined and socially constructed, shaped by the context in which the activities occur, and the interest of parties involved (Reimer 2008, Kruger et al. 2020).

This work aims to assess the importance of ramps to Northern Appalachia in both formal and informal markets by addressing the following questions:

1. Who makes up the ramp network in Northern Appalachia, and how are they connected to ramps?
2. How are harvesters engaging with ramps in their harvest areas?
3. Do ramp community members have concerns about overharvesting in Northern Appalachia, and why or why not?

These questions were researched and analyzed using an ethnobotanical approach over a 3-year period (2019-2021), coinciding with the COVID-19 pandemic.

Research Methods

This study used a mixed methods (Palmer 2012) social research approach with a combination of online and mailed survey instruments, along with key informant (KI) interviews. Results that follow will be framed using survey responses and supplemented with relevant KI findings. KI interviews were used to further highlight and provide context for community group perspectives and behaviors. Together, survey and interview data were used to better understand the culture of ramps in Northern Appalachia.

A sample frame was constructed using availability or convenience samples since there was no known documentation identifying the entire population of interest. Sampling frames require the specification of the population from which the desired population is sampled (Improving Health in Slums Collaborative 2019). The construction of sample frames are influenced by the intention of the study and are characterized as being homogenous or

heterogenous (Robinson 2014). The goal of this study was to investigate ramp culture in Northern Appalachia which narrowed the population of interest to a homogenous group. Homogenous samples are drawn from a population with a shared trait which could include geographic location, and similarities in demographic, physical, psychological, or life history (Robinson 2014). In this case, established inclusion criteria required that participants 1) were currently living in Northern Appalachia and 2) harvested, bought, sold, and/or consumed ramps. Those who did not fit both criteria were excluded from the study. By following these inclusion and exclusion criteria, the sample frame was geographically homogeneous, and all participants shared an interest in ramps.

Due to the lack of an established sampling frame, participants were recruited using a combination of snowball (Goodman 1961) and convenience (Robinson 2014) sampling approaches. Some limitations of this sampling strategy include the inability to extrapolate findings to larger populations due to nonprobability and the possibility of sampling coverage error.

Three community groups were identified *a priori* based on literature review of NTPFs (Iponga et al. 2018, Frey et al. 2019). These groups include “harvesters”, “distributors” and “consumers”. Harvesters were classified as people who harvest ramps for personal use or for sale. Distributors were defined as people who buy fresh ramps and sell them as a fresh or value-added product. And consumers are those who buy ramps as fresh or value-added products for personal use or as a restaurant menu item. Both restaurant diners and chefs were considered consumers.

A mixture of recruitment visits and media outreach strategies were used to solicit participation (Table 2-1). Attendance of in-person ramp events including farmers markets,

festivals and dinners were made during the 2019 and 2021 ramp seasons. In 2020, in response to COVID-19 travel restrictions imposed by the University and government, efforts focused on digital recruitment using a variety of virtual platforms.

Table 2-1: Study recruitment outlets and locations visited in 2019-2021.

Location Type	Event Name	Location	Date
Ramp Dinner	26th annual Ramp Dinner at The Mason-Dixon Historical Park	Core, WV	27-Apr-19
Ramp Festival	Mason/Dixon Ramp Festival	Mt. Morris, PA	27-Apr-19
Facebook Group	Wild Ramps and Leeks of Pennsylvania	Digital	8-Jan-20 to 1-Dec-21
Webinar	Ramp/Wild Leek Foraging and Forest Farming: Identification, Uses, and Importance	Digital	6-Apr-21
Webinar	Ramp/Wild Leek Foraging and Forest Farming: Biology, Stewardship, and Practices	Digital	20-Apr-21
Webinar	Ramp/Wild Leek Foraging and Forest Farming: Ramp Culture	Digital	11-May-21
Newspaper/Blog	"Emerging Research on Ramps: A Forest Plant With Growing Commercial Appeal", Forest Leaves	Digital	26-Feb-21
Newspaper/Blog	"In search of the wild leek: The first green of spring in the PA Wilds", Pennsylvania WILDS	Digital	22-Mar-21
Grocery store*	Weavers Way Co-op	Ambler, PA	N/A[a]
Ramp Festival*	CJ Spirits Leek Fest	Kane, PA	24-Apr-21
Newspaper	"Leeks are more than food-they're culture", Kane Republican	Kane, PA	27-Apr-21
Newspaper	"If you can find them, garlicky ramps are a fleeting taste of spring", Pittsburgh Post-Gazette	Pittsburgh, PA	28-Apr-21
Newspaper	"It's ramp season in Pennsylvania: Here's what you need to know", Erie Times-News	Erie, PA	30-Apr-21
Farmers Market*	Rittenhouse Square Farmers Market	Philadelphia, PA	1-May-21
Ramp Festival	Wild Ramp Festival and Market	Roscoe, NY	8-May-21
Ramp Festival	82nd annual Feast of Ramson	Richwood, WV	15-May-21
Farmers Market*	Union Square Market	New York, NY	22-May-21

*Study advertisements with quick response (QR) codes were sent to these locations to be displayed near ramps for sale. Length of time that advertisement was visible varied by location and distributor.
[a] "Not applicable", this location only received a QR code and was not visited.

Key Informant Interviews

Key informants (KI) are individuals who are knowledgeable about the community in which they are a part. In addition to the criteria designating the sample frame, KIs met the following criteria: (1) They have experience harvesting/buying/selling/eating ramps for at least one season. (2) They are considered a "typical" ramp community member in their region, filling one or more of the community groups: harvester, distributor and/or consumer. (3) They are regarded as reliable and knowledgeable about ramps, as indicated by others during the study (referred by other informants during snowball sampling).

KI interviews, lasting 30 to 70 minutes, followed a semi-structured format (Wholey et al. 2010) (Table 2-2). Probe questions were coupled with spontaneous conversation to facilitate in-depth dialogue around study topics. This format let KIs expand upon and clarify their thoughts about the core areas of interest (Ritchie et al., 2014). Due to restrictions enforced to limit the spread of COVID-19, interviews were primarily conducted over the phone and were recorded, with the participant's permission and acknowledgement of IRB documentation, to ensure complete and correct records of the interview. Additional questions were added in the second year of the study and incorporated into the survey instrument to investigate the impact of COVID-19 on ramp community members.

Interviews were analyzed using thematic analysis, a method used to identify trends within qualitative data in a way that produces trustworthy and credible results (Nowell et al. 2017). Audio recordings of each interview were first transcribed using Temi Transcription software (see temi.com). Each transcript was then reviewed manually to ensure accuracy of transcription and coded using an iterative process to identify emergent themes using the software, NVivo (v. 1.6.1, QRS, released in March 2020).

Table **2-2**: The guide of structured questions used for ramp key informant (KI) interviews.

Ramp KI Interview Questions for All Participants
What is your connection to ramps?
What is it about ramps that appeals to you?
How did you first learn about ramps?
Is there anything else you would like to add?
Ramp KI Interview Questions for Harvesters
In what county or counties do you harvest ramps?
How much do you typically harvest in a typical year?
Can you please describe your harvesting technique, and how you decide which ramp individuals to harvest?
Have you noticed any changes in your harvest areas in the last 5 years?*
Do you sell ramps? If so, at what price do you sell them?
Has the COVID-19 pandemic affected your experience harvesting or selling ramps?
Ramp KI Interview Questions for Consumers
Where do you typically buy ramps?
How much do you buy in a typical year?
What do you look for, in terms of quality, when buying ramps?
How much do you pay for ramps over the course of the season?
Have you noticed any changes in ramps being sold in your area in the last 5 years?*
Has the COVID-19 pandemic affected your experience harvesting or selling ramps?
For chefs only:
How do you typically source ramps? If directly from harvesters, do you purchase from the same person each year?
Do you know from where the ramps are being harvested?
When do you start buying ramps in a typical year? How long do you keep them on the menu?

*Question only asked of participants with 5+ years of experience with ramps.

Survey Design and Dissemination

A survey instrument was developed for three community groups (harvesters, distributors, and consumers) following guidance provided by Dillman et al. (2014). The survey instruments were pre-tested with five key informants in 2020 to address issues related to question clarity and survey flow. To provide accessible survey delivery options for all participants, each survey could either be mailed or taken online. Online survey instruments were developed using Qualtrics software (v. 2.20, Qualtrics, released in 2005). Unique, personalized survey links were emailed to each participant requesting to complete the survey online to ensure one completed response was recorded per person. Online surveys (n=349) were distributed on a continuous basis by

request from March to June 2021, corresponding with the ramp harvesting season in Northern Appalachia that year. Mailed surveys (*n*=31) were distributed in June 2021.

All survey instruments included questions regarding the participant's cultural connection to ramps, their perspective on the economic importance of ramps, and the impact of COVID-19 on their experience with ramps in 2020 (Appendices 11, 12, 13). A follow-up, reminder email was sent to all participants who did not reply to the original request. To increase response rate, a nominal non-monetary token (i.e., hand-stamped print of a ramp illustration) was offered as an incentive to those who completed the online survey and automatically sent to those who completed the mailed survey. There is no literature on how homemade art created by the researcher can serve as an incentive; however, it is known that incentives increase survey response rates (Church 1993, Cobanoglu and Cobanoglu 2003, Birnholtz et al. 2004).

Survey responses were coded and analyzed across age, gender, geographic region, and community group. Response rates for each question varied which may have been based on relevance to respondent or personal discretion. Data were analyzed using the Statistical Package for the Social Sciences (v. 26, SPSS Inc., released in 2019) to calculate descriptive statistics and correlation analyses. Pearson chi-square tests of independence were conducted to evaluate the if combinations of categorical variables were related. These categorical variables included years of experience, introduction to ramps, ramp knowledge, age, gender, education, income, and community group as they pertained to the three research questions regarding ramp community, ramp knowledge, and practices associated with ramp engagement

Results and Discussion

A survey was sent to 383 participants across Pennsylvania (67%), New York (18%), rural West Virginia (5%), New Jersey (3%), Maryland (1%), and Ohio (<1%), and others (<1 %) (Table 2-3). The adjusted survey return rate of 56% (*n*= 202) excluded surveys that were returned incomplete (*n*=16) or "not deliverable" (*n*=22) due to incorrect addresses. The response rate is significantly higher than most NTFP surveys in Appalachia (Muir et al. 2006, Kruger et al. 2020, Burkhart et al. 2021, Trozzo et al. 2021). This was likely due to the researcher personally communicating with the participants who then verbally volunteered to complete the survey.

Table 2-3: State of residence of survey respondents.

Community group	Harvesters % (*n*)	Distributors % (*n*)	Consumers % (*n*)	Total % (*n*)
State of residence				
Pennsylvania	50 (102)	1 (3)	15 (31)	67 (136)
New York	5 (10)	0 (0)	13 (26)	18 (36)
West Virginia	3 (6)	0 (0)	2 (5)	5 (11)
New Jersey	<1 (2)	<1 (1)	1 (3)	3 (6)
Maryland	0 (0)	0 (0)	1 (3)	1 (3)
Ohio	<1 (2)	0 (0)	0 (0)	<1 (2)
Other*	1 (3)	0 (0)	2 (5)	4 (8)
Total	62 (125)	2 (4)	36 (73)	100 (202)

*"Other" indicates states with < 1% participation and are located outside of Northern Appalachia (Indiana, Iowa, Michigan, North Carolina, Tennessee, Virginia, and Wisconsin).

Survey respondents were recruited at locations that would help create balanced groupings of community members. For example, to solicit consumer participation recruitment, recruitment efforts were focused on locations where people would be actively consuming or buying ramps (e.g., festivals and farmers markets). Survey respondents self-identified as a "harvester", "distributor" or "consumer" community member in the online format producing uneven groups. Since 4 out of 202 survey respondents identified as distributors, they were not included in cross-

analyses of community groups. However, data from distributors provided important insight and was included in summary findings. The role of distributors will be discussed later in this section.

An ideal sample frame would be representative of the general population of the region of interest. Since the sample frame relied on convenience and snowball sampling, coverage error is an inherent possibility. Usable surveys were received from 49 of 67 counties in Pennsylvania (72%), representing all geographic regions of the state (Figure 2-3). The sample demographics were similar to the general population of Pennsylvania for income level and gender identity (Table 2-4) (U.S. Census Bureau QuickFacts 2019). However, the sample was not representative of education level, and race and ethnicity for the state of Pennsylvania which indicates potential coverage error within the sample. Nearly 75% of the sample reported having an education level equivalent to or higher than a 4-year degree, more than double the proportion representative of the general population of Pennsylvania (32%) (U.S. Census Bureau QuickFacts 2019). Around 75% of Pennsylvania's population identified as white alone (not Hispanic or Lantino), 12% identified as Black, and 18% as Hispanic/Latino/Latina in the US Census (US Census Bureau 2019). Survey respondents were asked to select all ethnicities and races in which they identify. This study is limited by the lack of minority groups represented where only 2% identified as Black, 1% Hispanic, and none as Indigenous or with Asian lineage. Additionally, those who do not participate in digital engagement modes (e.g., email, internet) were missing from this study. Pennsylvania is home to over 80,000 Amish people who constitute the largest Amish community in the country ("Amish Population Profile" 2020). The Amish are a religious group of Anabaptist Christians who partially or completely abstain from the use of electricity. No Amish people were included in this study yet observations in the field suggest that they are distributing ramps at local auctions and farmers markets (personal communication with KI, 2019).

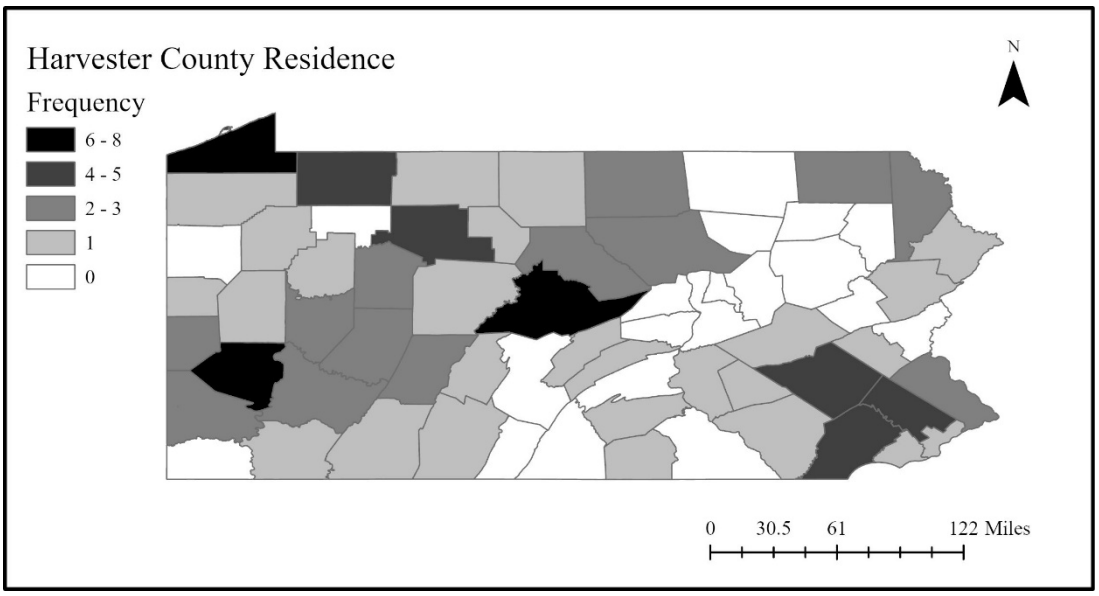

Figure **2-3**: Reported Pennsylvania counties of residence for surveyed harvesters (n = 125).

The demographic variables of age, education and income were associated with significant differences (Table 2-4) between harvester and consumer community groups. Around 60% of harvesters were 50 years and older while nearly 60% of consumers were less than 50 years old.

Table **2-4**: Community group demographics.

Community groups	Harvesters		Distributors		Consumers		**Total**
	Survey	KI	Survey	KI	Survey	KI	
	% (*n*)	% (*n*)	% (*n*)	% (*n*)	% (*n*)	% (*n*)	% (*n*)
Responses	55 (125)	6 (13)	2 (4)	5 (12)	32 (73)	1 (3)	100 (229)
Age (years)							
18-29	9 (11)	8 (1)	0 (0)	0 (0)	7 (5)	0 (0)	7 (17)
30-49	30 (37)	46 (6)	1 (3)	75 (9)	56 (41) *	33 (1)	42 (97)
50-69	46 (57) *	31 (4)	1 (3)	17 (2)	32 (23)	33 (1)	39 (90)
70 +	16 (20) *	8 (1)	0 (0)	0 (0)	4 (3)	0 (0)	10 (24)
Gender							
Male	54 (67)	69 (9)	1 (2)	57 (7)	44 (32)	100 (3)	52 (120)
Female	44 (55)	31 (4)	1 (2)	42 (5)	53 (39)	0 (0)	46 (105)
Non-binary	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (2)
Prefer not to say	<1 (1)	0 (0)	0 (0)	0 (0)	<1 (1)	0 (0)	<1 (2)
Education							
High school graduate	9 (11)	8 (1)	<1 (1)	8 (1)	<1 (1)	0 (0)	7 (15)
Vocational school/ some college	24 (30)	15 (2)	1 (2)	17 (2)	14 (10)	0 (0)	20 (46)
4-year college degree	30 (37)	31 (4)	<1 (1)	33 (4)	49 (36)	33 (1)	36 (83)
Post-graduate degree	38 (47)	23 (3)	0 (0)	8 (1)	34 (25)	33 (1)	34 (77)
Race/Ethnicity							
White	98 (122)	77 (10)	2 (4)	67 (8)	88 (64)	67 (2)	92 (210)
Black or African American	0 (0)	0 (0)	0 (0)	0 (0)	4 (3)	0 (0)	1 (3)
Native American	<1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<1 (1)
Asian	0 (0)	0 (0)	0 (0)	0 (0)	<1 (1)	0 (0)	<1 (1)
Hispanic/Latino/Latina	0 (0)	0 (0)	0 (0)	0 (0)	3 (2)	0 (0)	<1 (2)
Other	4 (5)	8 (1)	0 (0)	0 (0)	4 (3)	0 (0)	4 (9)
Income							
Less than $16,000	4 (5)	0 (0)	0 (0)	0 (0)	3 (2)	0 (0)	3 (7)
$16,000 to $34,999	9 (11)	0 (0)	<1 (1)	8 (1)	7 (5)	0 (0)	8 (18)
$35,000 to $59,999	24 (30)	46 (6)	<1 (1)	25 (3)	14 (10)	0 (0)	22 (50)
$60,000 to $99,999	31 (39)	23 (3)	<1 (1)	17 (2)	21 (15)	0 (0)	26 (60)
$100,000 to $250,000	23 (29)	0 (0)	<1 (1)	17 (2)	37 (27)	67 (2)	27 (61)
Over $250,000	7 (9)	8 (1)	0 (0)	0 (0)	16 (12)	0 (0)	10 (22)

Totals may not sum to 100% due to incomplete responses. *Indicates a significant difference ($p<0.05$), **"Other" responses included Arab (*n*=1), Ashkenazi Jew (*n*=1), Appalachian American (*n*=1) and American (n=1).

Ramp Network

The following sections focus on the first research question, "*Who makes up the ramp network and how are they connected to ramps?*" Popularity of ramps both drives and is driven by the commercial ramp industry. A demand for ramps is met with distribution (e.g., farmers market stands) which in turn elicits new consumer interest. Supply chains are defined by the interconnections and interrelationships of the chain of events that link the source of a product to the consumer (Porter 1985). Three community groups were initially identified: 1) harvesters who acted as the source of ramps, 2) distributors, and 3) consumers who were defined as the final destination. However, since the interactions between community members and the roles any given individual may fill are complicated, the more flexible term of "network" will be used in place of supply chain.

Figure 2-4 visualizes the complexity of the ramp network in Northern Appalachia as ramps move through and between informal and formal markets. Arrows indicate the flow of ramps, but size does not convey any numerical value.

Different types of consumers are found throughout the network and are categorized based on the relationship to their ramp supplier and whether money is exchanged in an informal or formal setting. Informal and formal markets will be defined in the following sections. Those who buy directly from a harvester through an informal setting without taxation, such as Facebook, are considered "local consumers", and those who are related or friends with the harvester are considered "friends and family". Consumers who purchase ramps in the formal setting from specific physical locations (e.g., a farmers' market) are considered "customers" of that place of sale.

Distributors make up the middle of the network and consist of many players that facilitate the movement of ramps in both fresh and value-added states. These include but are not limited to aggregators, produce distributors, grocery stores, farmers market vendors, and value-added businesses. The movement of ramps varies based on intention of the harvester.

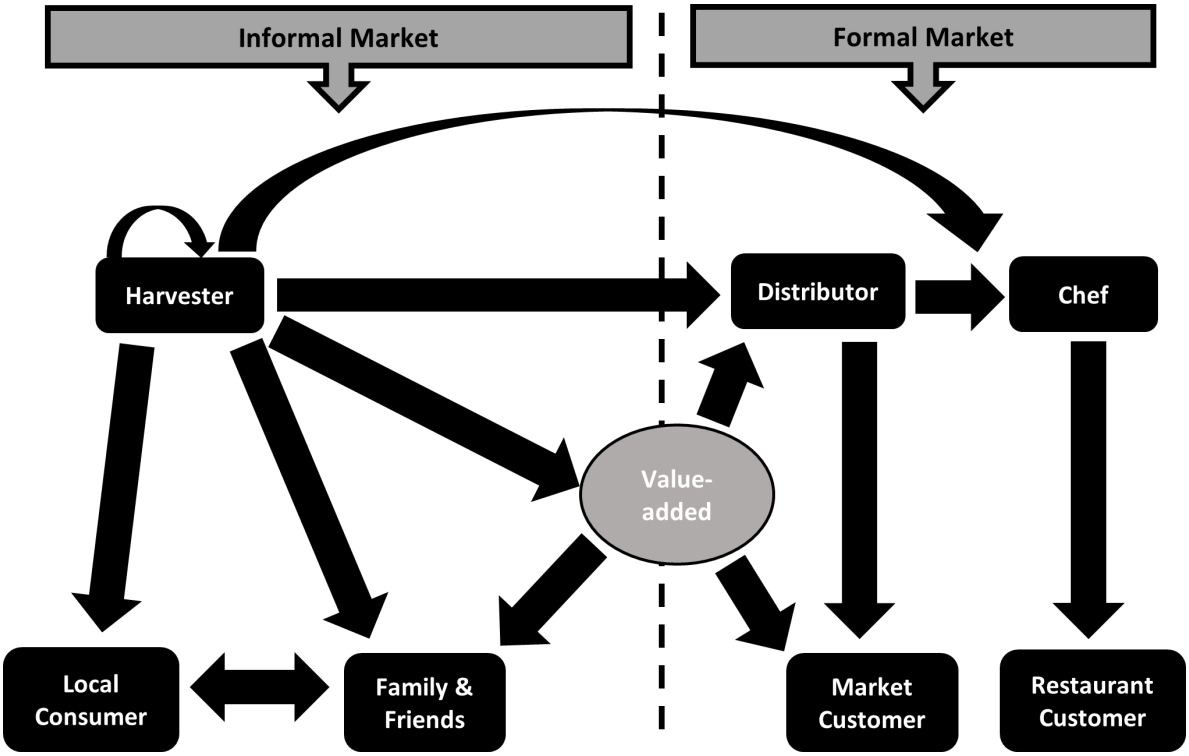

Figure **2-4**: Ramp network in Northern Appalachia showing the movement of ramps from harvest to consumption (n = 229).

Value-added ramp products, as depicted in the ramp network (Figure 2-4), were found to move through the supply chain by harvesters and distributors with intent to extend profits beyond ramp season. Some examples of products for sale in Pennsylvania and New York are shown in Figure 2-5.

Figure **2-5**: Value-added ramp products sold across Northern Appalachia. **Top left**: ramp pesto sold at Union Square farmers market, New York, NY in 2021. **Top right:** Wild Leek Dip, advertised on Facebook group *Wild Ramps and Leeks of Pennsylvania* in 2022. **Bottom left:** Ramp kimchi sold at Union Square farmers market, New York, NY in 2021. **Bottom right:** Leek vodka sold at CJ Spirits Distillery, Kane, PA in 2021.

Informal market

Informal markets, those that are not included or only partially included in regulation and reporting systems, are often overlooked in research (McLain et al. 2008, Reimer 2008). For the sake of understanding the movement of individual ramps, the term *market* includes ramps that are personally collected and consumed, traded, and shared with no monetary compensation. These findings show that more harvesters are participating in the informal market compared to the formal market. All harvesters surveyed (n = 125) and interviewed (n = 7) collect ramps for personal use indicated by the arching arrow that starts and ends at "Harvester". Far fewer

harvesters are participating in the formal market, selling ramps to distributors (n = 7) and chefs directly (n = 5).

Formal market

Moving ramps into and through the formal market is facilitated by a smaller subset of the study population. Yet the commercial flow of ramps is responsible for supplying the increasing demand for ramps in urban centers. Ramp harvesting was reported statewide including both rural and urban counties, but ramps were most frequently reported as being purchased in urban areas (Figure 2-6). However, most consumers surveyed in this study were recruited from urban areas, i.e., Philadelphia and New York City; therefore, these results may reflect this sample frame.

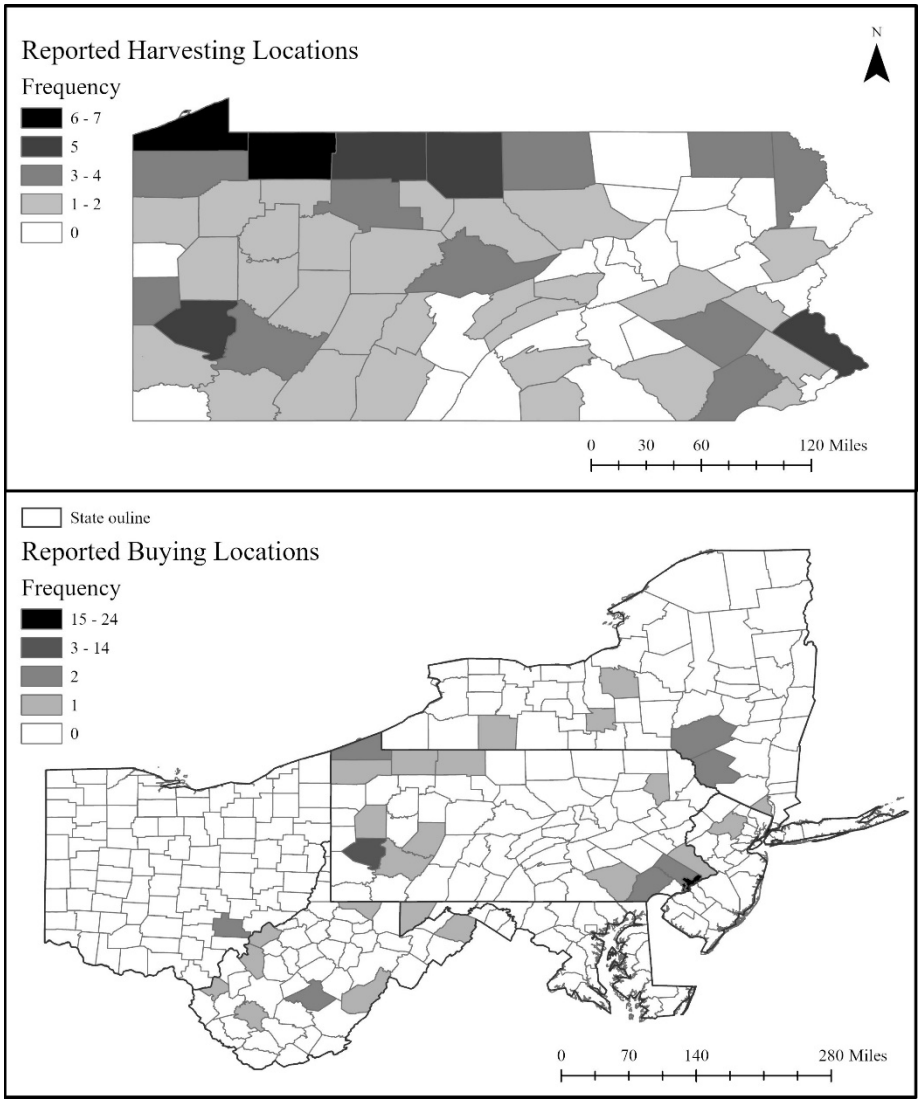

Figure **2-6**: **Top:** Pennsylvania counties reported as ramp harvesting locations by surveyed harvesters (n = 125). **Bottom:** Counties reported as ramp buying locations across Northern Appalachian region and neighboring states (New Jersey, West Virginia). Most frequently reported buying locations include New York county, NY (n = 24), Philadelphia county, PA (n = 15), and Allegheny county, PA (n = 6).

Survey respondents and KIs (*n* =35) reported prices for selling and buying ramps across three years (2019-2021) (Table 2-5). Few survey respondents self-identified as a distributor (4 out of 202), though some of those harvesters were observed selling ramps on Facebook (personal observation, 2021) The price of ramps reported was influenced by demand. Urban markets were observed to sell ramps for the highest price per pound. Prices were not set by sellers based on labor investment as has been reported in NTFPs more generally (Burkhart and Jacobson 2009).

Table **2-5:** Price (per lb) of ramps sold and purchased by harvesters (*n* = 12), distributors (*n* = 9), and consumers (*n* = 24) for 2019 to 2021 seasons.

	2019			2020			2021		
Price ($/lb)	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Harvesters, sold	10	12	11	10	13	11	10	15	12
Distributors, purchased	4	19	11	4	16	11	4	16	12
Distributors, sold	5	20	14	5	18	13	5	20	13
Consumers, purchased[a]	N/A	N/A	N/A	N/A	N/A	N/A	4	30	17

[a] Consumers were only asked to recall prices for the 2021 ramp season, years 2019 and 2020 are noted as "Not applicable" (N/A).

Culture often centers around food (Almerico 2014, Reddy and van Dam 2020) and vice versa (Fine 2003), and is preserved and shaped by the transmission of knowledge and traditions among a community (Kimball 1965). The following sections will discuss survey results and emergent KI themes (Table 2-6) to highlight important findings around the connections, behaviors, and attitudes of the Northern Appalachian ramp community groups.

Table **2-6**: Themes and sub-themes from KI interviews across community groups. Values reported indicate the total number of harvesters (*n*= 13), distributors (*n*= 12), and consumers (*n*= 3) who mentioned the theme.

Theme	Sub-theme	Harvester	Distributor	Consumer
Appeal	*Tradition*	3	0	0
	Connection to nature	5	0	1
	Economic motivation	4	3	0
	Culinary interest	8	5	3
Popularity		5	6	2
Concerns	*Overharvesting*	5	5	1
	Habitat loss	3	1	0
*Selective harvesting**	*Limited harvesting*	5	3	N/A
	Sporadic collection	2	2	N/A
	Leaf-only harvesting	2	3	N/A
	Largest plants	5	2	N/A
*Propagation**	*Scatter seeds*	2	1	N/A
	Transplant bulbs	4	3	N/A
Conservation	*Educate others*	2	3	0
	Patch secrecy	2	0	N/A

*Themes regarding harvesting practices were not discussed with consumers and are denoted here as "not applicable" (N/A).

Connection to ramps

A set of questions were designed to understand how people learn about ramps, and the knowledge held and popularity of ramps across community groups. In combination these questions were used to assess how people are "connected" to ramps within the ramp network. Harvesters surveyed reported that they learn about ramps from friends and family (χ^2=8.401, df= 1, $p<0.05$) and were more likely to pass on the tradition to their children and grandchildren (χ^2=29.896, df=1, $p<0.001$) compared to consumers (Table 2-7). These findings were supported by KI interviews in which the emergent theme *appeal* suggested that community members

valued the sub-themes *tradition, connection to nature, economic motivation,* and *culinary interest* as important drivers of ramp engagement (Appendix 2).

Table **2-7**: Harvester (n =125) and consumer (n = 73) survey responses (%) to the question "*How did you first learn about ramps?*"

Community group	Harvesters % (*n*)	Consumers % (*n*)	Total % (*n*)
Family member	35 (44) *	14 (10)	27 (54)
Friend	30 (37) *	12 (9)	23 (46)
Restaurant	4 (5)	22 (16) *	11 (21)
Social media	7 (9)	10 (7)	8 (16)
Spouse/Partner	5 (6)	4 (3)	5 (9)
Farmers Market	0 (0)	12 (9) *	5 (9)
Book	5 (6)	3 (2)	4 (8)
Other nature interest	5 (6)	1 (1)	4 (7)
Festival	1 (1)	8 (6)	4 (7)
Other **	7 (9)	14 (10)	10 (19)

*Indicates significance ($p<0.001$)
** Most common "Other" responses included learning from locals (*n*=6), and other media sources (TV cooking shows, cooking magazines, newspaper articles) (*n*=5).

KI harvesters were the only community group to cite *tradition* (*n* = 3 of 13) as an important association to ramps in reference to a yearly activity often spent with family. One-third of harvesters and a consumer mentioned a *connection to nature* (*n* = 5 of 13) and this was more important than economic gain for some harvesters. One harvester said, *"*Honestly, it's, you know, I love being out in the woods. That's my number one, you know, first and foremost." For those who collect ramps for personal use, that connection to nature is cherished and intended to be shared with loved ones regardless of how harvesters first learned about ramps. The following harvester describes their long family tradition:

> It's also a connection to my history and my family history. This is what my grandfather did and now I'm the keeper of that knowledge in my family. And I'm passing that on to other people, but I'm passing it on to my daughter and her husband as well. So that this knowledge doesn't get lost.

Another harvester describes how their curiosity led to a new family tradition:

> Anything wild, edible, medicinal, I'm fascinated with it. This year was the first year that I actually got to pick ramps with three generations-myself, my daughter and her daughter. So, it's turned into our family tradition but, it don't go any much further back than me. It's just something I've been fascinated with my whole life.

The economic importance of ramps is driven by consumer demand and supplied by a few harvesters and distributors in the formal market. The sub-theme *economic motivation* emerged in the interviews, with seven out of twenty-seven KIs describing how ramps are a source of supplemental income or were appealing as a source of free food. The selling of ramps is intrinsically tied to economic motivation. However, no one reported that they solely rely on ramps for economic stability. A few KI harvesters mentioned that collecting ramps extends their harvesting season by adding another item to their existing foraging list alongside mushrooms, and other NTFPs (Appendix 2).

Surveyed consumers most frequently reported that they learned about ramps from restaurants and farmers markets, suggesting a stronger connection to ramps through culinary interest rather than family tradition. These findings were corroborated by consumers interviewed (Appendix 2). Since ramps are a wild food, it was expected and found that interest for culinary use spanned across all community groups. All harvesters surveyed and interviewed reported that they harvest ramps for personal use (n = 132), and inherently all consumers were buying ramps with the intent of consuming.

Considering again the definition of culture by Griswold (2013), ramps are a cultural object for all participants in this study. However, the social world in which the object finds its place helps to shape how much a given participant is the creator or the audience of the object. The audience likely includes those who are newly interested in ramps, such as the harvesters

learning from friends and family, or the restaurant customer ordering their first ramp dish. Those teaching and passing along the knowledge and tradition of ramps could be considered the creators. Over time, the audience may become creators themselves, if they pursue teaching others about ramps. As the social context changes so does the meaning of the cultural object, suggesting that ramp culture could evolve over time. Since most consumers were recruited from urban areas, their perspective of ramps primarily revolves around culinary interest. For harvesters who are interacting with ramps in the forest, the story of ramps is broader and includes family tradition and forming a connection with nature, as well as culinary interest.

Knowledge and Attitudes

The locally held and mobilized knowledge of a particular community is known as local ecological knowledge (LEK) (Joa et al. 2018) and is an important part of regional culture (Fine 2003). The phenomenon of learning through personal interactions with nature has been described by researchers as an important step in the acquisition of LEK (Atran et al. 2004, Reyes-García et al. 2009). A common assumption of LEK is that people who interact closely with local resources have a greater, and more nuanced understanding of those ecosystems and therefore will be able to use such knowledge to make sustainable management decisions in natural environments (Yli-Pelkonen and Kohl 2005, Joa et al. 2018). This was found to be true for harvesters who had higher LEK around ramps compared to consumers when prompted with a series of statements that were designed to assess the knowledge (Figure 2-7). However, nearly 40% of harvesters were unaware of bulb-splitting, an essential process that needs to be considered for ramp

conservation efforts (Nault and Gagnon 1993). These findings suggest that educational efforts are needed for consumers as well as harvesters with lower LEK.

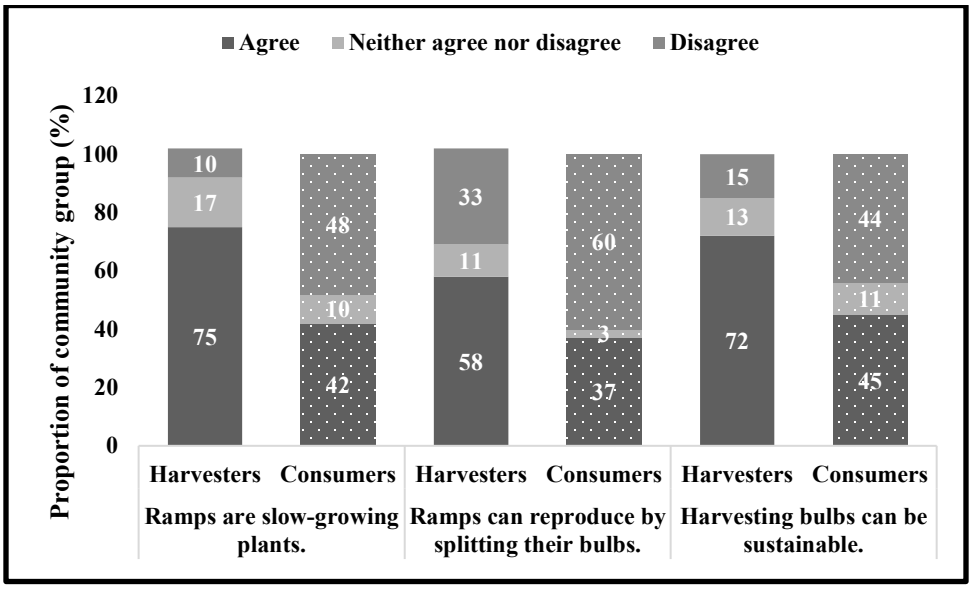

Figure 2-7: Surveyed harvester (*n* =125) and consumer (*n* =73) responses to true ramp knowledge statements.

Rate of Change in Ramp Popularity

To assess rate of change in ramp popularity in Northern Appalachia, survey respondents were asked about their years of experience with ramps where the last five years would be considered recent interest or increased popularity. Many harvesters (43%) and most consumers (63%) reported that they started buying or harvesting ramps within the last five years, suggesting the number of people interested in ramps in Northern Appalachia is increasing (Figure 2-8). However, harvesters (33%) were found to have significantly more experience with ramps when compared to consumers. The discrepancy in experience between harvesters and consumers is likely related to the history of ramp use and the establishment of the ramp industry. The tradition

of ramp harvesting has been occurring for centuries (Cavender 2006, Rivers et al. 2014) while harvesting of ramps as a formal commodity has increased only in recent decades (Brown 2002, Sumner 2012, Dimitri and Effland 2020).

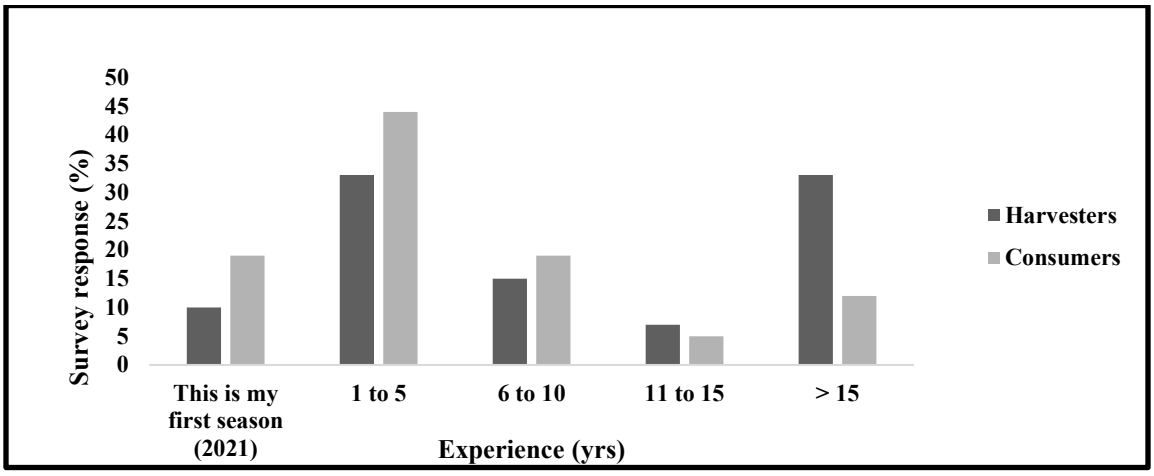

Figure 2-8: Surveyed harvesters (*n* =125) and consumers (*n* = 73) response to question, *"How many years have you been digging/buying ramps?"* Harvesters were asked about *digging* and consumers were asked about *buying* ramps.

The theme *popularity* regarding the perceived rise in ramp interest across Northern Appalachia also emerged from KI interviews (Table 2-5). Thirteen out of twenty-seven KIs across all community groups referenced increased interest in and use of ramps over time. Harvesters reported seeing more evidence of other harvesters using the same public harvesting locations (2 of 13) (Appendix 3). Six out of eleven distributors spoke about ramp popularity as an overall increase in awareness and demand for ramps, however, two reported that ramps have already peaked in popularity.

Harvester Engagement and Impact in Harvest Areas

Increased public interest in ramps merits a closer examination of how people may be interacting with ramps in the forest and the implications for ramp conservation. Until now, no study has documented the practices, timing of harvest, or quantities of ramps collected in Northern Appalachia. The following sections will answer the second research question, "*How are harvesters engaging and impacting ramps in their harvest areas?*" by focusing on the practices reported by harvesters, timing of harvest season, and quantities of ramps harvested in Northern Appalachia.

To better understand engagement within harvest areas, harvesters both surveyed and interviewed were asked, *"What kinds of harvest and stewardship activities do you use to promote the growth of your ramp population(s)? If you do not use any harvesting or stewardship activities, please write "None".”* The open-ended questions were expected to provide information about what the respondent *perceived* to be good management practices and produce richer, more insightful results compared to multiple choice options. However, important omissions may occur due to limitations in respondent memory and what they may consider to be a sustainable practice. For example, some survey respondents may not consider educating others as a stewardship practice worth mentioning.

Results indicate that 90% of harvesters reported some type of engagement with their harvest areas (Figure 2-9). In fact, 4 in 10 people reported that they engage in two or more stewardship practices in their harvest areas (Figure 2-10). These practices were coded and recategorized into the following sub-themes: *limited harvesting, sporadic collection, leaf-only harvesting, largest plants, scatter seeds, transplant bulbs, educate others,* and *patch secrecy*.

These themes were further corroborated by the emergent KI themes of *selective harvesting, propagation,* and *conservation* (Appendices 5, 6, and 7).

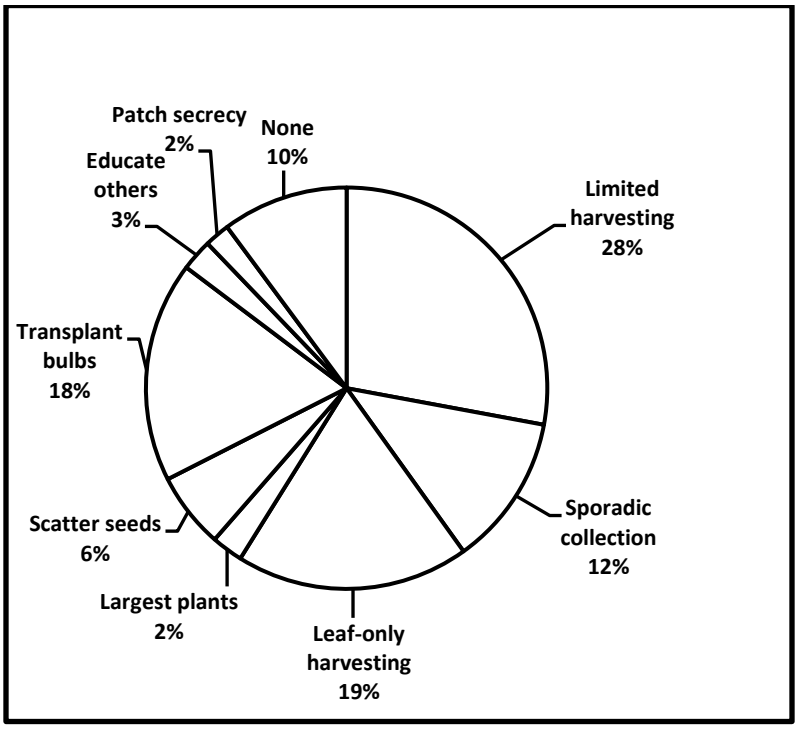

Figure **2-9:** Survey responses of harvesters who answered question, *"What kinds of harvest and stewardship activities do you use to promote the growth of your ramp population(s)? If you do not use any harvesting or stewardship activities, please write "None".* Harvesters could list multiple practices; percentages were calculated using total number of references for each sub-theme.

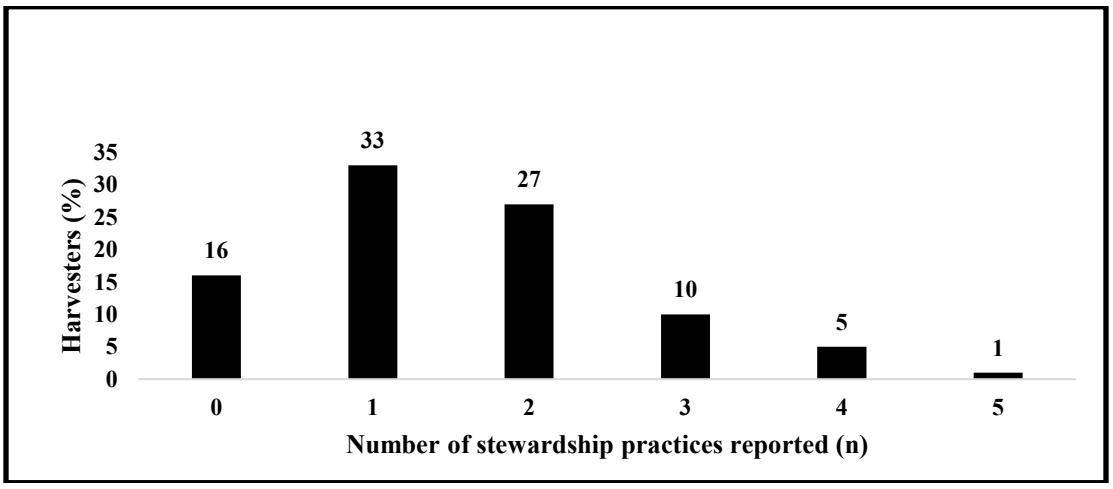

Figure **2-10**: Number of stewardship practices reported by each surveyed harvester in response to question, *"What kinds of harvest and stewardship activities do you use to promote the growth of your ramp population(s)? If you do not use any harvesting or stewardship activities, please write "None".*

Harvesters and consumers reported the estimated quantity of ramps they acquire for personal use in a typical year; those findings will be discussed in next section (Figure 2-11). Estimated ranges are derived from the multiple-choice survey questions, *"How much do you harvest for your own consumption (NOT to sell)?",* asked of harvesters and *"How many pounds of ramps do you purchase to cook at home in a typical year?",* asked of consumers, where respondents selected from options: *Less than a pound, 1 to 10 lb., 11 to 50 lb.,* and *More than 50 lb.* Results indicate that harvesters are collecting and consuming more ramps for personal use (249 – 1341 lb) compared to the quantity of ramps consumers are buying (27 – 93 lb). Fresh ramps are sold by the pound which is an important consideration for the commerce of ramps as more individual plants are needed per pound in early April compared to late May. Within the short growing season in which the leaves are emerged and photosynthesizing, the bulb is doubling in weight in just two weeks between mid and late season (Nilson et al. 2022). As popularity increases, chefs are looking to distributors in southern states to buy ramps before

they are available locally. Local commercial harvesters are pressured to provide ramps earlier in the season to compete with out-of-state distributors. Researchers are promoting the saying “less plants per pound, more plants in the ground” in advocation for later harvesting of ramps (Nilson et al. 2022). Findings reveal that surveyed harvesters and consumers are collecting and buying ramps most frequently during April and May (Table 2-8). Using weight estimates from Nilson et al. (2022), the number of ramps per pound during peak season (late April – early May in Pennsylvania) can vary from 44 to 62 plants.

Table **2-8**: Harvester responses (*n*= 125) to survey question *"When do you typically harvest ramps?"* and consumer responses (*n*= 73) to survey question *"When do you typically buy ramps?"*

Month	Harvesters % (*n*)	Consumers % (*n*)
February	4 (5)	3 (2)
March	15 (19)	7 (5)
April	86 (108)	71 (52)
May	57 (71)	79 (58)
June-July	5 (6)	7 (5)

Participants were able to check more than one response resulting in percentage summation greater than 100%. Each percentage was calculated by dividing response total by total number of survey respondents for each community group.

Harvesters and distributors surveyed and interviewed reported quantities of ramps sold in 2019-2021 as shown in summary in Figure 2-11. Results indicate that quantities have remained consistent over the last three harvesting seasons. Price data was collected in response to multiple-choice questions. The use of categorical responses allows for easier recall by survey respondents but limits the ability to report more precise data. Nonetheless, these ranges provide valuable information of the extent of the ramp industry, as ramps move from harvester to distributor in Northern Appalachia.

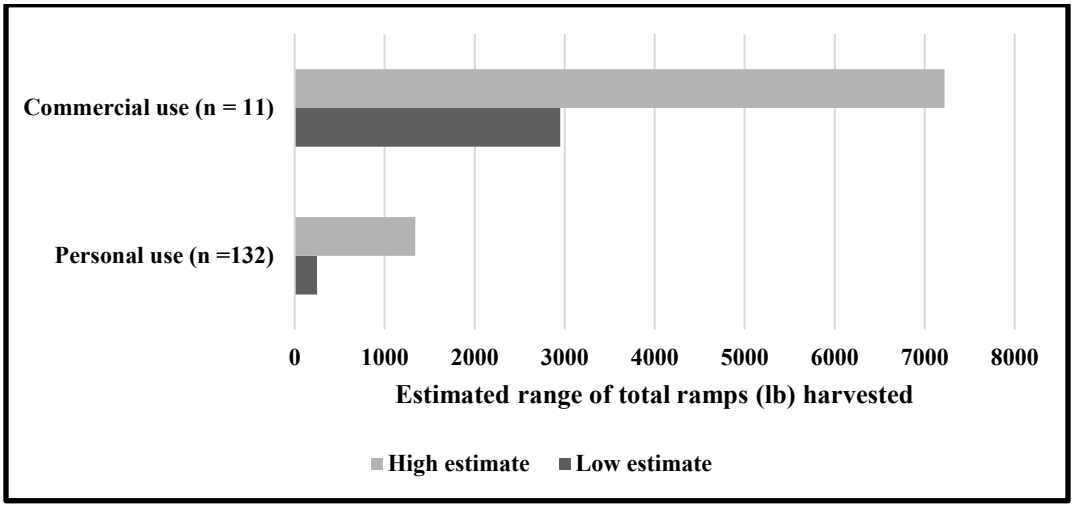

Figure **2-11**: Summary of estimated total pounds of ramps harvested in 2021 as reported by surveyed and KI harvesters.

Results reveal that more harvesters are collecting ramps for personal use (n = 132) at much lower quantities in 2021, compared to far fewer commercial harvesters (n = 12) selling much larger quantities in 2021 (Figure 2-11). Using the estimated quantities reported by surveyed and KI harvesters and metrics reported by Nilson et al. (2022), it was found that the contribution of individual commercial harvesters to the ramps market is approximately 100 times greater compared to individual private harvesters. For example, the average number of ramps reported to be collected for personal use range from approximately 83 to 630 plants per person, whereas commercially harvested ramps reported in 2021 range from approximately 10,820 to 37,300 plants per person. These values are not comprehensive of the entire ramp industry in Northern Appalachia and likely provide conservative estimates.

It is reasonable to expect that commercial ramp harvesting would have a higher impact on ramp populations when compared to harvesters who are collecting for personal use. However, the collective impact of harvesting for personal use remains unclear since some harvesters could be missing from this study. Judging from the number of members in the Facebook group that

was established as part of this project, there are hundreds if not thousands of individuals interested in ramps and ramp harvesting for personal use. These values give a sense of the quantity of ramps moving throughout Northern Appalachia but do not account for other important variables that also contribute to impacts on ramp populations. These variables include harvest area density (Dion et al. 2016), number of harvest areas visited, and plants removed per harvest area (Nault and Gagnon 1993), and precise time and age-class harvested (Nault and Gagnon 1993, Nilson et al. 2022).

Concerns for Ramp Populations

The following section focuses on the third research question, "*Does the ramp network have concerns about overharvesting in Northern Appalachia, and why or why not?"* Topics that will be discussed include perceptions of overharvesting, the influence of landownership on such perceptions, and education.

Because ramps are slow-growing, and due to the recent rise in popularity documented regional overexploitation (Gatlinburg and Us 2021, "National Park Service" 2021, "Quebec Vulnerable Classification" 2021), they are susceptible to overharvesting. Survey results indicate that the perceived level of concern around ramp harvesting is not universally consistent across groups (Figure 2-12). Most harvesters (44%) did not report noticing a difference in their ramp harvest areas in the last five years. However, 25% of harvesters reported seeing a difference and indicated their concern. KI interviews revealed some nuanced perspectives around these concerns.

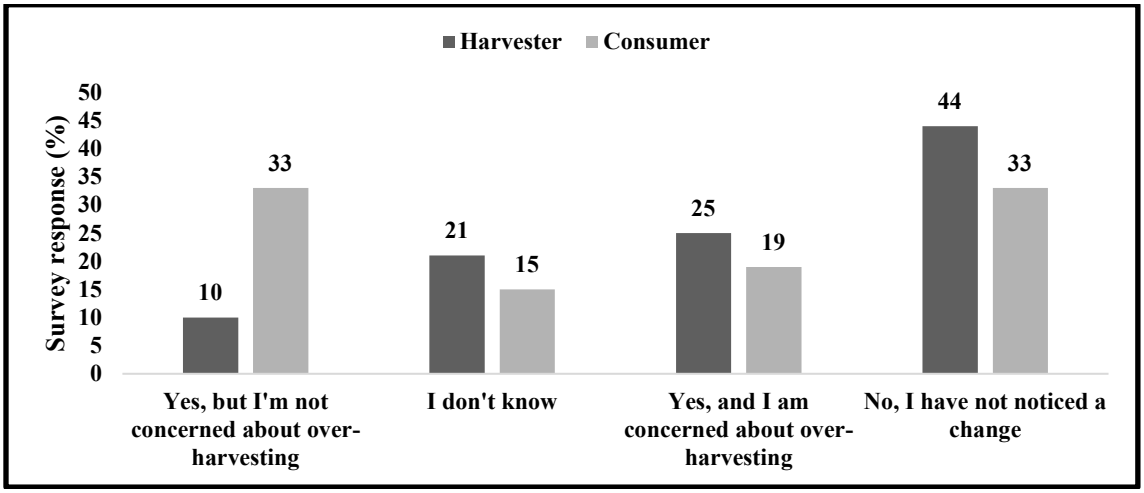

Figure **2-12**: Survey responses to question, *"In your experience, are more people harvesting/selling ramps in your area in the last 5 years?"* Harvesters were asked about *harvesting* and consumers were asked about *selling* of ramps. Data excludes respondents with <5 years experience.

The theme of *concern* and sub-themes: *overharvesting* and *habitat loss* emerged in the KI interviews which includes the presence (n = 12 out of 27) and absence of concern (n =1 out of 27) regarding the state of ramps in Northern Appalachia (Appendix 4). Shrinking habitats across the globe have contributed to increased harvesting pressures of NTFPs, as fewer resources are available yet demand remains high (Chamberlain et al. 2004). People are seeing some of these deforestation events and the subsequent aftermath in their own harvesting areas. The sub-theme *habitat loss* emerged from four KIs who expressed concerns including deforestation, i.e., strip mining and logging, and the encroachment of invasive species.

Land Ownership

Although some large-scale events are outside of individual control, there are strategies to better understand one's personal impact on a ramp population. Findings suggest that these perceptions can stem from how harvesters are interacting with different types of land. Land

ownership was found to play a role in individual perception. Messages analogous to the concept of the "tragedy of the commons", where a common resource is degraded by overuse, were expressed by several KIs in reference to both bulb and leaf-only harvesting on public lands (Appendix 7). Regardless of whether an individual perceives their harvesting technique as sustainable, there are added uncertainties on public land. Two out of 13 harvesters described their experiences harvesting on public land and the challenges they face when doing so. The following harvester comment highlights some confliction about harvesting on public land:

> Even if I think I'm being responsible in the way I'm harvesting, I don't know how many other people have been along harvesting. So, I don't really have a sense for the original size of the patch. I don't know what my contribution is in the grand scheme of everyone who harvests from this spot.

It is difficult to ensure that a public patch will not being overharvested. This is not the case for private lands. A landowner has control over who harvests on their property, a sense of the original patch size, and the impacts of harvest year after year which allows for a better understanding of the state of their harvest area overall.

Size of harvest areas also plays a role in the perception of concern. Eight out of thirteen harvesters described their harvest areas in measurements of "acres" and "football fields." These large swaths of land covered by ramps are reported across the state, in both rural and urban counties. Those who have access to large ramp populations on private lands with a known number of active harvesters, may perceive the likelihood of overharvesting to be low. Personal engagement in harvest areas may also be linked to the perceived state of ramps. The difference in perspectives based on land ownership makes recommending one harvesting technique inappropriate. Land ownership is only one factor of several that should be considered when determining how to harvest ramps.

Education

Educate others was listed as a stewardship practice by 4% of surveyed and interviewed harvesters (Figure 2-8) and was corroborated by KIs in the emergent theme of *conservation* (Appendix 4). Those who referenced the importance of education did so with an optimistic outlook. One harvester said, *"I think it's mostly a lack of education. If people are harvesting in a way that's not sustainable it's because they don't know".* Therefore, those who are informed about the slow-growing nature of ramps, and the practices that promote ramp conservation will be motivated to act in ways that are perceived as responsible. Although this work does not evaluate responsible or sustainable techniques, the stewardship practices that were reported in Figure 2-9 provide insight on how harvesters are thinking about their interactions with ramps. Previous research has focused on recommended practices to promote sustainable harvesting (Nault and Gagnon 1993, Nantel et al. 1996, Rock et al. 2004, Dion et al. 2016); however, no one has addressed the need to educate consumers.

The consumers of the formal market are driving the demand for ramps commercially. As ramps increase in popularity, chefs are pushing to buy ramps earlier in the season from distributors in southern regions of the ramp distribution. In response, there is pressure for harvesters and distributors of Northern Appalachia to dig and sell ramps earlier in the season, which causes more ramps to be removed from their populations before peak harvesting season (Nilson et al. 2022). Education around the role that consumers play in the ramp network could curb the impacts of early harvesting of wild ramp populations and should be done by encouraging a responsible co-stewardship role for consumers.

Conclusion

The results of this mixed-methods study provide needed insight on the little studied culture of ramps in Northern Appalachia. This is also the first study to estimate prices and quantities of ramps being harvested for formal and informal markets. Ramp culture in Northern Appalachia starts with ramps as the cultural object holding two main meanings: that of a seasonal and regional culinary interest for consumers and that of a family tradition and connection to nature for harvesters. The ramp network illustrates that the movement of ramps from harvest to consumption is complicated and made up of many types of people who can fill multiple roles at once. The way in which a participant interacts with ramps, as a creator or the audience of culture, depends on social context and may change over time.

The popularity of ramps has increased in recent years across Northern Appalachia. Overall, there are a variety of cultural and culinary motivations for the interest in ramps. Consumers were found to have less LEK about ramp populations and life cycles compared to harvesters yet they are driving the commercial demand of ramps in the formal market. Commercial harvesters were few but have the largest impact on wild ramp populations when comparing estimated number of plants collected per person. However, the overall impact of commercial harvesting on wild ramp populations remains uncertain without knowing how many people were missing from the study or the combined impact of all personal use harvesters in Northern Appalachia. Most harvesters recognize the importance of patch stewardship and shared practices they use to promote the growth of their ramp populations. However, the extent to which those practices have a positive impact on wild populations is unknown. Future research should focus on assessing efficacy of reported stewardship practices to better inform conservation education around ramps.

Since consumers were found to be less knowledgeable about ramp populations and biology, they may be less likely to understand the ecological implications of purchasing ramps early in the season. Education on ramp biology and the impact of early harvesting is recommended for the entire community broadly but may be especially important for consumers who are now driving the market. These findings are limited to the inability to extrapolate beyond the sample frame due to uncertainty in accuracy of sampling coverage. Additional survey efforts are recommended in Northern Appalachia to better understand the diverse nature of ramps across the broader region and include minority perspectives that were missing in this study.

Chapter 3

Thesis Conclusion

In this chapter, information will be discussed that was found to be beyond the study focus but relevant for future research efforts. Topics include the Coronavirus 2019 Disease (COVID-19), concerns for ramp regulations, and validity of reported stewardship practices. Strengths, limitations, and recommendations for future research will also be discussed.

Ramps during the COVID-19 pandemic

The timing of this study gave the unique opportunity to assess the ramp industry in Northern Appalachia during the global Coronavirus Disease of 2019 pandemic, hereafter COVID-19. Since the start of the pandemic, more people have turned to home food procurement activities (e.g., gardening, hunting, fishing, foraging, food canning) to alleviate financial pressures and obtain supplemental high-quality food (Niles et al. 2021) and avoid COVID-19 exposure. Others have spent more time outside as a crisis coping mechanism (Morse et al. 2020). Restaurants that typically sell ramps in the spring experienced closures and unprecedented supply disruptions, and had to adapt to alternative styles of operation (Leone et al. 2020). Specialty foods such as ramps were not offered by these restaurants to save on food costs. These changes in behaviors and the availability of ramps have implications for the ramp community of interest and were considered for the design of this study. Safety precautions and travel restrictions posed challenges for in-person data collection in the 2020 field season and so methods were adapted to accommodate virtual interactions.

Survey responses to COVID-19 statements indicate that nearly 40% of harvesters agreed that they have had more time to spend in the woods foraging (Appendix 10). Ten percent of survey respondents reported that the pandemic has added strain to their food security. The pandemic exposed the vulnerabilities of the global supply chain, splintering manufacturing, distribution, and retail operations, which resulted in limited access to essential goods and services, i.e., food (O'Hara and Toussaint 2021). Facebook comments also point to the interest in wild foraging to prepare for apocalyptic events, mitigate food insecurity and supplement limited resources (Wild Ramps and Leeks of Pennsylvania, 2021). Though it is unclear from this study the extent to which COVID-19 impacted the ramp community, similar motivations may be driving recent interest in ramps in Northern Appalachia.

Future studies that occur during or directly after the COVID-19 pandemic should consider questions that will assess the perception of and engagement with ramps during a globally disruptive time. Social media analyses of popular ramp Facebook groups could be useful for uncovering themes around ramp interest before, during and after COVID-19.

Concerns for Ramp Regulations

Skepticism around intentions of this academic research has stemmed from concerns for potential regulations. Though most harvesters listed at least one stewardship practice they use, the idea of formal regulation was met with hesitation. Five harvesters and three distributors interviewed mentioned they also harvest American ginseng (*Panax quinquefolius*, L.), a NTFP that has been regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to track export of wild plant material since 1975 (CITES 2020).

Mirroring the experiences revealed in the work on American ginseng by Burkhart et al. (2012), the harvesters are not opposed to regulations that would benefit wild plant populations; however, it is the lack of enforcement around those regulations that causes frustration. For one KI harvester who collects a variety of NTFPs, the problem comes from lack of education and general knowledge of NTFPs on the part of those doing the regulating. They shared a story to illustrate their point:

> I came out of the state park last year with probably like six or seven pounds of chanterelles. They were for me, they weren't to sell, but he [the park ranger] didn't have a clue what I had. He asked me to see what I had and I showed him, but he didn't have a clue.

Although this study did not attempt to assess ramp populations in Northern Appalachia, as discussed in Chapter 2, land ownership was found to shape how people perceive the impacts of harvesting. There was more concern for over-harvesting of ramps on public lands where regulations could be enforced. However, the lack of infrastructure and education needed for law enforcement to uphold regulations would negate any intended conservation goals. Therefore, future conservation efforts should focus on education of those within the ramp network, as recommended by 9 harvesters and 3 distributors surveyed and interviewed.

Evaluating Ramp Stewardship Practices

As discussed in Chapter 2, harvesters shared practices that they use to promote the growth of ramp populations. Since an open-ended question format was used, the responses provide insight on both practices used and what people perceive to be beneficial for their harvest areas. Most practices such as selective harvesting, scattering seeds, and transplanting bulbs have been supported by researchers as techniques for ramp stewardship (Vasseur and Gagnon 1994,

Nantel et al. 1996, Rock et al. 2004, Dion et al. 2016). However, eight survey respondents reported the practice of root propagation in which the bottom third of the bulb with intact roots are replanted after harvest to regrow. I could find no published research to support the efficacy of this method of clonal propagation. Future research should evaluate this practice to better inform ramp stewardship practices in Northern Appalachia.

Study Strengths

This is the first study to highlight a broader ramp network and the growing popularity around ramps in Northern Appalachia. A variety of recruitment methods were used to solicit participation from in-person events and online platforms. The Facebook page called "Wild Ramps and Leeks of Pennsylvania" was created to help build a centralized, voluntary community of ramp enthusiasts. Since its January 2020 launch, the page has grown to over 3,500 members (as of June 2022). This social media group was a useful tool to share my research project, ramp webinars offered in 2021, and to direct those interested in participating in this study to sign up on a formal research website which I also created (e.g., sites.psu.edu/theramppage). The website was designed to offer research transparency, provide resources for ramp events, and share media links in which this research has been featured. Quick Response (QR) codes were displayed at ramp point-of-sale locations and directed users to the website. Though the website allowed participants to easily engage with relevant ramp material and sign up for the survey, there was no way of knowing place of recruitment. Future social research should consider using websites, and social media pages as tools to increase survey response rate and build in a question to identify where digital participants were recruited.

Findings of this work should be used to develop educational materials for outreach events. A guide for harvesting practices based on site factors such as land ownership, harvest area size and density, number of harvest areas, and time of harvesting should all be considered to make more informed decisions. Such a guide should be made available to the public, targeting new and experienced ramp harvesters, through an outlet such as Penn State Extension and/or as a featured webinar topic.

Consumer education is needed to increase awareness of the importance of ramp sourcing and harvest time. Finding consumers proved to be challenging in this study. It is recommended that in-person recruitment efforts and articles in popular food magazines that feature ramps in the spring should be used in combination to reach urban residents and chefs. Point-of-sale locations such as farmers markets and grocery stores could be used to share information about ramp sourcing. QR codes could be used to promote a Penn State Extension article or webinar about what ramp consumers should know before buying ramps or could be used by the harvester or distributor to increase transparency of ramp sourcing by linking ramps to the harvester and the harvest area where the ramps were originally collected. Research shows that technology on a large scale can increase transparency in food supply chains, benefiting both the distributor and consumer (Astill et al. 2019). QR codes proved to be helpful in this research to reach one segment of the ramp network with low cost. This type of advertisement should be considered for future social research recruitment and outreach efforts. It is recommended that if a QR code is used, to ensure there is a way to track recruitment location from each link.

Study Limitations

The extent of the ramp community in Northern Appalachia is unknown and therefore it was difficult to know accuracy of sample coverage (i.e., coverage error). Using snowball and convenience sampling techniques allowed for targeted participation but inherently limited the ability to extrapolate findings beyond the sample frame.

Similarly, this study was completed during a 3-year period. Due to the dynamic and evolving nature of the ramp community and the continued growth in popularity of ramps, frequent (possibly even annual) surveys are recommended to develop longitudinal data that can provide a more robust picture of economic trends and harvesting behaviors in Northern Appalachian forests.

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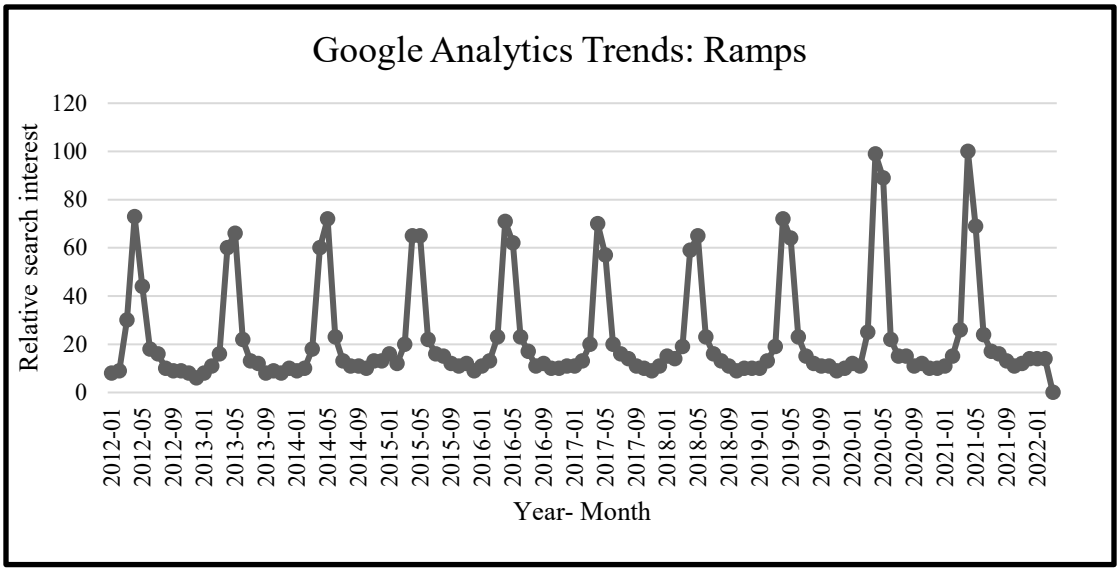
Appendix

Supplemental Material



1: Data source: Google Trends (https://www.google.com/trends). Values represent the relative search interest in ramps to the highest point on the chart (May 2021, relative interest = 100) for the United States over the last decade (2012 – 2022). Peak interest times coincide with ramp harvesting season (April and May).

2: Sub-themes that comprise the emergent KI theme *appeal.*

Sub-themes	Harvester (*n* = 13)	Distributor (*n* = 11)	Consumer (*n* = 3)
Tradition	3	0	0
Connection to nature	5	0	1
Economic motivation	4	3	0
Culinary interest	8	5	3

Tradition

"It's also a connection to my history and my family history. And this is what my grandfather did. And now I'm carrying, I'm the keeper of that knowledge in my family. And I'm passing that on to other people, but I'm passing it on to my daughter and her husband as well so that this knowledge doesn't get lost."

"Wild leeks were a part of my childhood and now coming back to it a little in my later years."

Connection to nature

"Honestly, it's, you know, I love being out in the woods. That's my number one, you know, first and foremost."

"[Harvesting] was a nice escape and it felt like even if things feel like they're falling apart around me. I feel really grounded in the act of foraging and it was a time where I could find some peace."

Economic motivation

"Ramps were always the most lucrative of the items that I harvested."

"I mean ideally my end game is to be exclusively a forager. Ramps gives me the ability to start that process early in the year."

"What love about foraging is that you can go out and get these things that would cost like $20 a pound at a farmer's market or a hundred dollars for a dish at a fancy restaurant. And then you can just make them for free."

Culinary Interest

"I love to cook, so they make a great addition to pretty much everything, you know, as far as flavor goes."

"[Ramps are the] first actual spring vegetable- one of the first signs of spring cooking phase."

"People eating locally and seasonally have been eating root vegetables and are wanting fresh items as they appear in the spring."

3: KI quotes from emergent KI theme *popularity*.

Harvester (n = 13)	Distributor (n = 11)	Consumer (n = 3)
5	6	2

Popularity

“Ramps continue to stay popular throughout the season.”

"They’ve become more popular in the culinary world than they used to be."

"I'd say it's actually gone down a little bit [in popularity], but not very much. I think it's more just like the forged items in general. Well, yeah, there was like a peak, like maybe five, six years ago where it just kind of felt like everyone was super into everything foraged and it's still like up but it's a lot, I'd say less than it was. It's kinda gone through a little downturn."

4: Sub-themes that comprise the emergent KI theme *concerns*.

Sub-themes	Harvester (*n* = 13)	Distributor (*n* = 11)	Consumer (*n* = 3)
Overharvesting	5	5	1
Deforestation	3	1	0

Overharvesting

"That's something that's always on my mind is like, even if I think I'm being responsible in the way I'm harvesting them, I don't know how many other people have been along harvesting. So I, I don't really have a sense for the original size of the patch. I don't know then what my contribution is like in the grand scheme of everyone who harvests from this spot."

"Say you've got a thousand people that walked past a ramp patch every day and say they only take a handful for themselves, but they're cutting those ramps, cutting those ramps, cutting those ramps, pretty soon there's no greens left. The bulbs are still there. But without greens, that plant can't produce a flower, therefore it can't produce a seed."

Deforestation

"Some of my best digging areas have been logged over the past few years, thus sun-lighting the leek patches. They don't seem to do well in full sun.".

5: Sub-themes that comprise the emergent KI theme *selective harvesting.*

Sub-themes	Harvester (*n* = 13)	Distributor (*n* = 11)
Limited harvesting	5	3
Sporadic collection	2	2
Leaf-only harvesting	2	3
Largest plants	5	2

Limited harvesting

"I only harvest a few, leave the rest to propagate."

"[Harvest] 10% of the area. So if I find a small patch and there's only 10 plants I only take one of those plants."

Sporadic collection

"We don't dig in just one spot. You pick a couple here, you move over there, you pick a couple over there, you move over here. You just keep moving around. You don't just sit down with your shovel and dig everything up that's in that spot right there."

Leaf-only harvesting

"Only take green tops and white, leave roots in the ground- allow growth next year"

"As long as you are not taking the bulbs, there's no harm."

Largest plants

"Honestly, if they're really big, I don't even count them. I just leave them alone. So I just, I don't want to bother any of the mature ones or ones that could possibly be more mature."

"I generally look for three leaf ones as opposed to the two leaf ones. Um, three leaves obviously meaning it's been in the ground for longer."

6: Sub-themes that comprise the emergent KI theme *propagation.*

Sub-themes	Harvester (n = 13)	Distributor (n = 11)
Scatter seeds	2	1
Transplant bulbs	4	3

Scatter seeds

"You could come up with some really ingenious ways to plant seed too. I think one of my favorite ways with the patch is I'll go out with a weed eater when they're all up. And the seeds are all up and I'll hit those pods with the seeds or with the weed eater, and those seeds will go everywhere and it actually works really well and it's really efficient."

Transplant bulbs

"I've made a specific effort to kind of spread them out a little bit. There are so many that I can harvest bulbs and leaves."

7: Sub-themes that comprise the emergent KI theme *conservation.*

Sub-themes	Harvester (*n* = 13)	Distributor (*n* = 11)
Educate others	2	3
Patch secrecy	2	0

Educate others

“I think it's mostly lack of education. If people are harvesting in a way that's not sustainable it's because they don't know.”

"*Want to make sure the consumers are aware that this is a sacred plant."*

Patch secrecy

"The best bet is to keep [ramps] secret, you know? I mean, honestly, the ones off the edges of the trails and stuff, they're going to get hit. People are going to see them. It's the stuff far out that people don't go to and that’s the stuff that thrives."

"I think if you have a hot spot, you're not going to take your buddy to cause he might wipe it out or something."

8: Harvester (*n*= 125) and consumer (*n* = 73) responses to cultural and economic importance statements.

	Agree % (*n*)	Neither agree nor disagree % (*n*)	Disagree % (*n*)	Not applicable % (*n*)
Ramps are a family tradition for me.				
Harvester	47 (59)	14 (18)	26 (33)	12 (15)
Consumer	25 (18)	21 (15)	40 (29)	15 (11)
Ramps are a local tradition in my area.				
Harvester	40 (50)	29 (36)	26 (32)	6 (7)
Consumer	52 (38)	27 (20)	16 (12)	4 (3)
Foraging for ramps is important for feeding my family.				
Harvester	14 (18)	21 (26)	53 (66)	12 (15)
Consumer	3 (2)	11 (8)	56 (41)	30 (22)
Ramps are an important source of income for me.				
Harvester	3 (4)	2 (3)	56 (70)	38 (48)
Consumer	1 (1)	7 (5)	48 (35)	44 (32)

9: Harvester (n= 125) and consumer (n = 73) responses to statements about preferences.

	Agree % (n)	Neither agree nor disagree % (*n*)	Disagree % (*n*)	Not applicable % (*n*)
I like to try new dishes.				
Harvester	95 (119)	4 (5)	1 (1)	0 (0)
Consumer	100 (73)	0 (0)	0 (0)	0 (0)
I prefer to support local foods when I can.				
Harvester	97 (121)	6 (8)	0 (0)	1 (1)
Consumer	97 (71)	3 (2)	0 (0)	0 (0)
I enjoy learning about wild foods.				
Harvester	97 (121)	2 (3)	0 (0)	1 (1)
Consumer	97 (71)	3 (2)	0 (0)	0 (0)
I enjoy foraging for mushrooms.				
Harvester	58 (73)	23 (29)	6 (8)	11 (14)
Consumer	23 (17)	26 (19)	30 (22)	21 (15)
I like to learn about foraging from social media.				
Harvester	42 (53)	26 (32)	22 (28)	10 (12)
Consumer	25 (18)	37 (27)	26 (19)	12 (9)

10: Harvester (n= 125) and consumer (n = 73) responses to statements about how the COVID-19 pandemic has affected their life situation.

	Agree % (*n*)	Neither agree nor disagree % (*n*)	Disagree % (*n*)	Not applicable % (*n*)
I have more time to spend in the woods foraging.				
Harvester	38 (48)	33 (41)	23 (29)	6 (7)
Consumer	21 (15)	8 (6)	33 (24)	37 (27)
I have been spending more time in the woods for the exercise.				
Harvester	50 (63)	32 (40)	16 (20)	2(2)
Consumer	36 (26)	14 (10)	29 (21)	21 (15)
Spending time outside has helped my mental wellness.				
Harvester	87 (109)	9 (11)	2(2)	2(3)
Consumer	85 (62)	10 (7)	0 (0)	4 (3)
It has been harder for me to buy food.				
Harvester	4 (5)	14 (18)	76 (95)	6 (7)
Consumer	14 (10)	19 (14)	62 (45)	4 (3)

11: Harvester survey instrument

Section A. Your Experience with Ramps

A1. How did you first learn about ramps? (*Select one*)

- Family member
- Spouse/ Partner
- Friend
- Social media
- Book
- Restaurant
- Festival
- Other _____

A2. Have you introduced any of the following people to ramps? (*Check all that apply*)

- Parent/Aunt/Uncle
- Spouse/ Partner
- Sibling/Cousin
- Friend
- Children/grandchildren
- Stranger
- Other _____

A3. How many years have you been growing/digging ramps? _____years

A4. From what PA county or counties do you grow or harvest your ramps? (*Fill in the blank*)
_____

A5. When do you typically dig ramps? (*Check all that apply*)

- February
- March
- April
- May
- June – January
- I don't dig my ramps

A6. How much do you harvest **for your own consumption (NOT to sell)?** (*Select one*)

- I don't eat ramps; I only harvest to sell.
- Less than a pound
- 1-10 lbs
- 11-50 lbs
- More than 50 lbs

A7. What kinds of harvest and stewardship activities do you use **to promote the growth of your ramp harvest area(s)?** *If you do not use any harvesting or stewardship activities, please write "None". (Fill in the blank)*

_____

____

A8. In your experience, are more people harvesting ramps in your area in the past 5 years? *(Select one*)

- Yes, and I am concerned about overharvesting
- Yes, but there are more than enough ramps for everyone
- No, I have not noticed any difference in the last 5 years
- I don't know

Section B. Your Perception of the Ramp Industry

B1. Please select the level in which you agree or disagree with the following statements **about ramps**. If *the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- Ramps are a family tradition for me.
- Ramps are a local tradition in my area.
- Foraging ramps is important for feeding my family.
- Ramps are an important source of income for me.

B2. Please select the level in which you agree or disagree with the following statements **about your preferences, in general**.
If the statement does not apply to you, please select "Not applicable". (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I like to try new dishes.
- I prefer to support local foods when I can.
- I enjoy learning about wild foods.
- I enjoy foraging for mushrooms.
- I like to learn about foraging from social media. (Ex. Facebook or Instagram)

B3. Please select the level in which you agree or disagree with the following statements **about your knowledge of ramps.** *If the statement does not apply to you, please select "Not applicable". (Select one for each statement)*
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- Red ramps and green/white ramps taste the same.
- Red ramps are male and green/white ramps are female.
- Ramps are slow-growing plants.
- Ramps can reproduce by splitting their bulbs.
- Harvesting bulbs can be sustainable.

B4. Do you sell ramps? (*Select one*)

- Yes **(Continue to *next question*)**
- No **(SKIP to Section D on *page 8*)**

B5. Please select the level in which you, as someone who sells ramps, agree or disagree with the following statements **about ramp market demands.** *If the statement does not apply to you, please select "Not applicable". (Select one for each statement)*
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- More people are interested in buying ramps in recent years.
- I have enough ramp harvest areas to fill my orders.
- I dig as many ramps as I can sell.

Section C. Selling Ramps as a Harvester

C1. How many years have you been selling ramps? (*Select one*)

- This is my first season.
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- More than 15 years

C2. Where do you typically sell ramps?

- In Pennsylvania *(please list towns/cities)*
- Out-of-State *(please list towns/cities AND state)*

_____ _____

_____ _____

_____ _____

C3. How often do you **sell** to the following places? (*Check all that apply*)

- Local farmers market or CSA (Community Supported Agriculture)
- Produce distributor
- Restaurant

- Grocery store or co-op
- Ramp festivals or ramp dinners
- Online
- Other _____

C4. Which part of the ramp do you **sell**? (*Select one*)

- Leaves and bulbs
- Leaves only
- Bulbs only
- Other _____

C5. To the best of your memory, how many pounds of ramps did you **sell** in the past 3 years? (*Select one quantity for each year*)
Quantities that can be selected: 1 to 20 lbs, 21 to 100 lbs, 101 to 500 lbs, 501 to 1000 lbs, and Over 1000 lbs
Years: 2019, 2020, and 2021

C6. On a scale of 0 to 10, please select how confident you feel in correctly recalling the quantities you listed in **Question C5 above?** (*Select one*)

C7. To the best of your memory, what was the minimum and maximum price per pound that you sold ramps for in the past 3 years? (*Fill in the blank for each year*)
Years: 2019, 2020, and 2021

C8. On a scale of 0 to 10, please select how confident you feel in correctly recalling the prices you listed in **Question C7 above**. (*Select one*)

Section D. Impacts of COVID-19

D1. To what extent do you agree or disagree with the following statements **about how the COVID-19 pandemic has affected your life situation, in general?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I have more time to spend in the woods foraging.
- I have been spending more time in the woods for exercise.
- Spending time outside has helped my mental wellness.
- It has been harder for me to buy food.

D2. To what extent do you agree or disagree with the following statements **about how the COVID-19 pandemic has influenced your ramp harvesting?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I have been foraging so I can provide food for myself and/or family.
- I need to dig ramps to sell for additional income.
- It has been difficult to find people to buy my ramps during the pandemic.

Section E. About You

E1. What is your age? (*Select one*)

- 18 to 29 years old
- 30 to 49 years old
- 50 to 69 years old
- 70 years and older

E2. What is your gender? (*Select one*)

- Male
- Female
- Other _____
- Prefer not to say

E3. What is the highest level of formal education you have completed? (*Select one*)

- Less than high school graduate
- High school graduate
- Vocational school/technical school/some college
- 4-year college degree
- Post-graduate degree (e.g. MS, MBA, JD, PhD, MD)

E4. Which of these categories represents your race/ethnic background? (*Check all that apply*)

- Black or African American
- White
- Native American
- Asian
- Hispanic/Latino/Latina
- Other (please specify): _____

E5. What is your overall income? (*Select one*)

- Less than $16,000
- $16,000 to $34,999
- $35,000 to $59,999
- $60,000 to $99,999
- $100,000 to $250,000
- Over $250,000

12: Distributor survey instrument.

Section A. Your Experience with Ramps

A1. How did you first learn about ramps? (*Select one*)

- Family member
- Spouse/ Partner
- Friend
- Social media
- Book
- Restaurant
- Festival
- Other _____

A2. Have you introduced any of the following people to ramps? (*Check all that apply*)

- Parent/Aunt/Uncle
- Spouse/ Partner
- Sibling/Cousin
- Friend
- Children/grandchildren
- Stranger
- Other _____

A3. How many years have you been **buying** ramps?

- This is my first season.
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- More than 15 years

A4. Where do you typically buy ramps?

- In Pennsylvania *(please list towns/cities)*
- Out-of-State *(please list towns/cities AND state)*

_____ _____

_____ _____

_____ _____

A5. When do you typically buy ramps? (*Check all that apply*)

- February
- March
- April
- May
- June – January

A6. In your experience, are more people selling ramps in your area in the past 5 years? (*Select one*)

- Yes, and I am concerned about overharvesting
- Yes, but there are more than enough ramps for everyone
- No, I have not noticed any difference in the last 5 years
- I don't know

A7. Who do you **buy from** over the course of the season? (*Check all that apply*)

- I buy from the same harvester throughout the season
- I buy from several harvesters consistently throughout the season
- I'll buy from anyone selling ramps when they have ramps available
- I buy from a produce distributor or grocery store
- Other _____

A8. Which part of the ramp do you buy? (*Select one*)

- Leave and bulbs
- Leaves only
- Bulbs only
- Other _____

A9. To the best of your memory, how many pounds of ramps did you **buy** in the last 3 years? (*Select one quantity for each year*)
Quantities that can be selected: 1 to 20 lbs, 21 to 100 lbs, 101 to 500 lbs, 501 to 1000 lbs, and Over 1000 lbs
Years: 2019, 2020, and 2021

A10. On a scale of 0 to 10, please select how confident you feel in correctly recalling the quantities you listed in **Question A9, above**. (*Select one*)

A11. To the best of your memory, what was the minimum and maximum price per pound that you **paid for ramps** in the last 3 years? (*Fill in the blank for each year*)
Years: 2019, 2020, and 2021

A12. On a scale of 0 to 10, please select how confident you feel in correctly recalling the prices you listed in **Question A11, above**. (*Select one*)

Section B. Your Perception of the Ramp Industry

B1. Please select the level in which you agree or disagree with the following statements **about ramps**. *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- Ramps are a family tradition for me.
- Ramps are a local tradition in my area.
- Foraging for ramps is important for feeding my family.
- Ramps are an important source of income for me.

B2. Please select the level in which you agree or disagree with the following statements about your **preferences, in general.** *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:
- I like to try new dishes.
- I prefer to support local foods when I can.
- I enjoy learning about wild foods.
- I enjoy foraging for mushrooms.
- I support ramp conservation efforts led by the government.

B3. Please select the level in which you agree or disagree with the following statements about **your knowledge of ramps**. *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:
- Red ramps and green/white ramps taste the same.
- Red ramps are male and green/white ramps are female.
- Ramps are slow-growing plants.
- Ramps can reproduce by splitting their bulbs.
- Harvesting bulbs can be sustainable.

B4. Please select the level in which you agree or disagree with the following statements **about ramp market demands.** *If the statement does not apply to you, please select "Not Applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:
- More people are interested in buying my ramps in recent years.
- My supplier always has enough ramps to fill my orders.
- I buy as many ramps as I can sell.

Section C. Selling Ramps as a Distributor

C1. How many years have you been **selling** ramps? (*Select one*)
- This is my first season.
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- More than 15 years

C2. Where do you typically sell ramps? (*Fill in as many blanks as needed*)
- In Pennsylvania *(please list towns/cities)*
- Out-of-State *(please list towns/cities AND state)*

_____ _____

_____ _____

_____ _____

C3. Where do you typically **sell** ramps? (*Check all that apply*)

- Local farmers market or CSA (Community Supported Agriculture)
- Produce distributor
- Restaurant
- Grocery store and co-op
- Ramp festivals or ramp dinners
- Online
- Other _____

C4. Which part of the ramp do you **sell**? (*Select one*)

- Leaves and bulbs
- Leaves only
- Bulbs only
- Other _____

C5. To the best of your memory, how many pounds of ramps did you **sell** in the last 3 years? (*Select one quantity for each year*)

Quantities that can be selected: 1 to 20 lbs, 21 to 100 lbs, 101 to 500 lbs, 501 to 1000 lbs, and Over 1000 lbs
Years: 2019, 2020, and 2021

C6. On a scale of 0 to 10, please select how confident you feel in correctly recalling the quantities you listed in **Question C5, above**. (*Select one*)

C7. To the best of your memory, what was the minimum and maximum price per pound that you **sold ramps for** in the last 3 years? (*Fill in the blank for each year*)
Years: 2019, 2020, and 2021

C8. On a scale of 0 to 10, please select how confident you feel in correctly recalling the prices you listed in **Question C7, above**. (*Select one*)

C9. Do you make value-added ramp products (e.g ramp mustard, ramp butter)?

- Yes (**CONTINUE** to *next question)*
- No (**SKIP** to section D, on page 7)

C10. Please list the ramp product(s) that you produce and price per quantity.
(*Fill in the blanks*)

Product	Price	Quantity
Example: *Ramp mustard*	**$ *6***	**6oz jar**
	$_____	_____
	$_____	_____
	$_____	_____
	$_____	_____

Section D. Impacts of COVID-19

D1. To what extent do you agree or disagree with the following statements **about how the COVID-19 pandemic has affected your life situation, in general?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I have more time to spend in the woods foraging.
- I have been spending more time in the woods for exercise.
- Spending time outside has helped my mental wellness.
- It has been harder for me to buy food.

D2. To what extent do you agree or disagree with the following statements **about how COVID-19 influenced your ability to distribute ramps?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I need to distribute ramps for additional income.
- It has been difficult to find people to buy ramps from during the pandemic.
- It has been difficult to find people to sell my ramps to during the pandemic.
- Selling ramps has not been a priority for my business during the pandemic.

Section E. About You

E1. What is your age? (*Select one*)

- 18 to 29 years old
- 30 to 49 years old
- 50 to 69 years old
- 70 years and older

E2. What is your gender? (*Select one*)

- Male
- Female
- Other _____
- Prefer not to say

E3. What is the highest level of formal education you have completed? (*Select one*)

- Less than high school graduate
- High school graduate

- Vocational school/technical school/some college
- 4-year college degree
- Post-graduate degree (e.g. MS, MBA, JD, PhD, MD)

E4. Which of these categories represents your race/ethnic background? (*Check all that apply*)

- Black or African American
- White
- Native American
- Asian
- Hispanic/Latino/Latina
- Other (please specify): _____

E5. What is your overall income? (*Select one*)

- Less than $16,000
- $16,000 to $34,999
- $35,000 to $59,999
- $60,000 to $99,999
- $100,000 to $250,000
- Over $250,000

13: Consumer survey instrument.

Section A. Your Experience with Ramps

A1. How did you first learn about ramps? (*Select one*)

- Family member
- Spouse/ Partner
- Friend
- Social media
- Book
- Restaurant
- Festival
- Other _____

A2. Have you introduced any of the following people to ramps? (*Check all that apply*)

- Parent/Aunt/Uncle
- Spouse/ Partner
- Sibling/Cousin
- Friend
- Children/Grandchildren
- Stranger
- Other _____

A3. How many years have you been buying ramps? (*Select one*)

- This is my first season.
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- More than 15 years

A4. Where do you typically buy ramps? (*Fill in as many blanks as needed*)

• In Pennsylvania *(please list towns/cities)*	• Out-of-State *(please list towns/cities AND state)*
_____	_____
_____	_____
_____	_____
_____	_____

A5. When do you typically buy ramps? (*Check all that apply*)

- February
- March
- April
- May
- June – January

A6. In your experience, are more people selling ramps in your area in the past 5 years? (*Select one*)

- Yes, and I am concerned about overharvesting
- Yes, but there are more than enough ramps for everyone
- No, I have not noticed any difference in the last 5 years
- I don't know

A7. How many pounds of ramps do you purchase **to cook at home** in a typical year? (*Select one*)

- I don't buy my ramps
- Less than a pound
- 1-10 lb
- 11-50 lb
- More than 50 lb
- I don't know
- Other_____

A8. On a scale of 0 to 10, please select how confident you feel in correctly recalling the quantity you listed in **Question A7, above**. (*Select one*)

A9. To the best of your memory, what was the minimum and maximum price per pound that you pay for ramps in a typical year? (*Fill in the blank or check the box*)

_$_____/lb

- I don't buy fresh ramps

A10. On a scale of 0 to 10, please select how confident you feel in correctly recalling the price you listed in **Question A9, above**. (*Select one*)

Section B. Your Perception of the Ramp Industry

B1. Please select the level in which you agree or disagree with the following statements **about ramps**. *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- Ramps are a family tradition for me.
- Ramps are a local tradition in my area.
- Foraging for ramps is important for feeding my family.
- Ramps are an important source of income for me.

B2. Please select the level in which you agree or disagree with the following statements about your **preferences, in general.** *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I like to try new dishes.
- I prefer to support local foods when I can.

- I enjoy learning about wild foods.
- I enjoy foraging for mushrooms.
- I like to learn about foraging from social media. (Ex. Facebook or Instagram)

B3. Please select the level in which you agree or disagree with the following statements about **your knowledge of ramps**. *If the statement does not apply to you, please select "Not applicable".* (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- Red ramps and green/white ramps taste the same.
- Red ramps are male and green/white ramps are female.
- Ramps are slow-growing plants.
- Ramps can reproduce by splitting their bulbs.
- Harvesting bulbs can be sustainable.

B4. Which of the following best describes you? (*Select one*)

- **Restaurant Chef**- I use ramps in dishes at my restaurant (**Continue to Section C on *next page***)
- **Consumer-** I just use ramps in my home cooking **(SKIP to SECTION D on *page 8*)**

Section C. Restaurant Chefs

C1. How many years have you been using ramps in your restaurant dishes? _____ years
C2. In what city or region is your restaurant located? (*Fill in the blank*)
_____
C3. Who do you buy from over the course of the season? (*Check all that apply*)

- I buy from the same harvester throughout the season
- I buy from several harvesters consistently throughout the season
- I'll buy from anyone selling ramps when they have ramps available
- I buy from a produce distributor or grocery store
- Other _____

C4. What part of the ramp do you buy for your restaurant? (*Select one*)

- Leaves and bulbs
- Leaves only
- Bulbs only
- Other _____

C5. To the best of your memory, how much did you **buy** in the past 3 years?
(*Select one quantity for each year*)
Quantities that can be selected: None, Less than 1 lb, 1 to 10 lb, 11 to 50 lb, and Over 50 lb.
Years: 2019, 2020, and 2021

C6. On a scale of 0 to 10, please select how confident you feel in correctly recalling the quantities you listed in **Question C5**, above. (*Select one*)

C7. To the best of your memory, in the last 3 years, what was the average selling price per pound for ramps? (*Fill in the blank for each year*)
Years: 2019, 2020, and 2021

C8. On a scale of 0 to 10, please select how confident you feel in correctly recalling the prices you listed in **Question C7,** above. (*Select one*)

C8. When do you use ramps in your dishes? (*Select one*)

- Just during the ramp season
- I preserve ramps so I can use them throughout the year
  How do you preserve your ramps? (*Fill in the blank*)

Section D. Impacts of COVID-19

D1. To what extent do you agree or disagree with the following statements **about how the COVID-19 pandemic has affected your life situation, in general?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I have more time to spend in the woods foraging.
- I have been spending more time in the woods for exercise.
- Spending time outside has helped my mental wellness.
- It has been harder for me to buy food.

D2. To what extent do you agree or disagree with the following statements **about how COVID-19 influenced your ability to distribute ramps?** (*Select one for each statement*)
Response options include: Agree, Neither agree nor disagree, Disagree, Not applicable

Statements:

- I have had to buy less ramps during the pandemic compared to previous years.
- It has been difficult to find ramps to buy.
- I have had to change my menu to accommodate takeout-only services.

Section E. About You

E1. What is your age? (*Select one*)

- 18 to 29 years old
- 30 to 49 years old
- 50 to 69 years old
- 70 years and older

E2. What is your gender? (*Select one*)

- Male
- Female
- Other _____
- Prefer not to say

E3. What is the highest level of formal education you have completed? (*Select one*)

- Less than high school graduate
- High school graduate
- Vocational school/technical school/some college
- 4-year college degree
- Post-graduate degree (e.g. MS, MBA, JD, PhD, MD)

E4. Which of these categories represents your race/ethnic background? (*Check all that apply*)

- Black or African American
- White
- Native American
- Asian
- Hispanic/Latino/Latina
- Other (please specify): _____

E5. What is your overall income? (*Select one*)

- Less than $16,000
- $16,000 to $34,999
- $35,000 to $59,999
- $60,000 to $99,999
- $100,000 to $250,000
- Over $250,000