

1 Introduction to Mural

Zoom in/out

1. Scroll forward on mouse roller.
2. Click on +/- bar in "zoom settings" at lower right corner of this Mural.

Try zooming in on the yellow circle until you can read what it says...

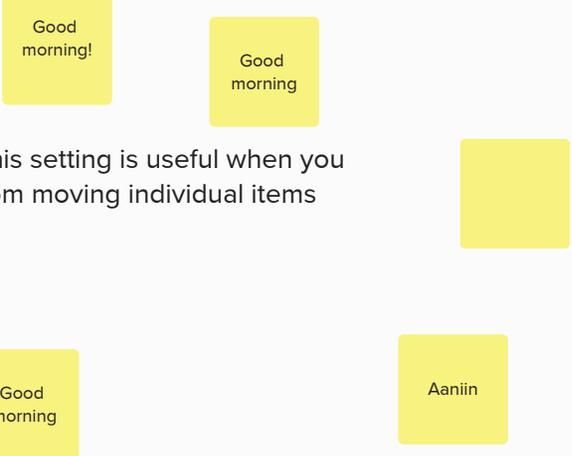


Move around

There are two cursor settings in Mural "Arrow" and "hand". Both help you move around Mural.

- **Arrow** setting: your cursor looks like an arrow. 
This setting lets you move items we haven't locked down by clicking on it, dragging it to a new spot, and releasing it. Try this: Make a note, drag it to a new spot, and delete the note when you are finished.

- **Hand** setting is found to the bottom right of this Mural. 
Clicking on the hand turns your arrow cursor into a hand. It works the way you'd navigate around a map in Google Maps. This setting is useful when you want to move to a different area of the Mural. It also keeps you from moving individual items around by mistake. To switch back to Arrow setting, click on the hand again.



Give both a try!

Add "sticky" note

1. Double click where you want the note to appear.
2. Resize note by dragging out the corner.
3. Change color: Look for colored square in pop-up menu that is visible when you have clicked on a note.
4. Write something on your note. If you leave your note, double click on it to write.
(Click in once more if you don't want to overwrite what is already there.)

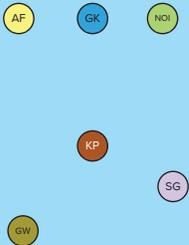
2 Practice using Mural

What you will do today:

- Move around the Mural
 - Move objects
 - Type onto sticky notes

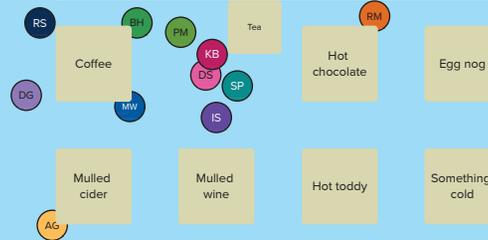
Practice space

Voting stickers



Which of these drinks do you like best in winter?

Vote by dragging the sticker with your initials over to the box with your favorite.



What is your favorite winter beverage?

Double-click to add a sticky note, and type in your favorite

Building consensus

If your vote is a fist, one, or two, be ready to 1) explain your concern, and 2) suggest changes that would get you up to a three WITHOUT losing the supportive votes of others.

No decisions will be made today. **Goal:** Gather critical perspectives and input on proposed recommendations



I do NOT support this recommendation.

I see MAJOR issues we need to resolve now.

I see MINOR issues we need to resolve now.

I see minor issues we can resolve later.

I'm fine with this as it is.

I love this! I will champion it.

Lack of Consensus

Consensus

Duty 3 Recommendations (Statutes and Rules)

(3) develop recommendations for science-based, including traditional ecological knowledge, foraging guidelines for state lands that balance public access and foraging opportunities with conservation needs. The recommendations must be in the form of draft statutory or rule language and must be consistent with Indigenous and other cultural practices and traditions;

1. Define "non-commercial personal and/or community use"

Foraging/harvesting for "non-commercial personal or community use" means plant collecting as part of a non-business activity, without profit motive.

The purpose of "non-commercial personal or community use" harvesting/foraging includes:

- Personal or household consumption,
- Gifting or barter with family, friends, or community members for consumption or ceremonial, cultural, or medicinal purposes.

Foraging/harvesting guidelines for "non-commercial personal or community use" on state lands should consider/be informed by Traditional Ecological Knowledge, Honorable Harvest practices, and regenerative harvesting methods.

AF

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SG

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Grab a sticky note from here, or double-click to create your own.

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			<p>Place on the 2nd line where to change text?</p> <p>using the word "plants" does not include fungi</p> <p>Need to clarify language and terms</p> <p>need consistent use of person, household or community</p> <p>wild food and medicine\ plant</p> <p>sharing instead of barter</p> <p>add text for point in second bullet in leading statement</p> <p>is Community Use necessary?</p> <p>How do we determine that this use is appropriate and does not harm the resource? (e.g. over-harvesting, soil erosion, etc.)</p> <p>I still want to add the language "personal or household use" as these individuals are not commercial or for profit purposes. I'd like to register as a business in WA.</p> <p>Dale this needs to be detailed for sure.</p> <p>at the end add: "Test best practices of invasive species management."</p> <p>include other wildflowers that grow abundantly with us citizens</p>		<p>add the names of the suggestions for adults would like to add to the language</p>

3. Modify Minnesota Administrative Rules Chapter 6100, Outdoor Recreation

The purpose of Chapter 6100, parts [6100.0100](#) to [6100.2400](#), is to regulate public use and promote public enjoyment of state parks and forest lands in ways that will leave them unimpaired and minimize conflicts among users. The following changes are recommended to 6100.0900 Environmental Protection:

- Subpart 1. Generally. Unless otherwise provided by law, no person in a state park or forest recreation area shall disturb, destroy, injure, damage, deface, molest, or remove any state property, including, but not limited to, ~~wildflowers or vegetation of any kind dead or alive~~, ruins, wild animals, geological formations, historical or archaeological artifacts or sites, historic structures, signs, or facilities, except ~~edible fruit, mushrooms~~, legally taken wild animals, and ~~for harvesting/foraging for non-commercial personal or community use~~ vegetation unavoidably damaged or destroyed by the ordinary recreational uses of these areas as specifically permitted by parts 6100.0100 to 6100.2400. Collections for scientific and educational purposes may be made only with the written permission of the commissioner. It is unlawful to damage vegetation or damage and deface rock formations with rock-climbing equipment.
- Subpart 2. E. Collecting or possessing naturally occurring plants in a fresh state in state parks is ~~prohibited~~ allowed, except that edible fruit and mushrooms and may be harvested for ~~personal, noncommercial personal or community use~~ personal, noncommercial personal or community use. Select plant species are protected and require a permit to harvest. Some plant species are endangered, threatened, or of special concern and are prohibited entirely as defined in Minnesota Administrative Rules, Chapter 6134.0300 and 6134.0400.

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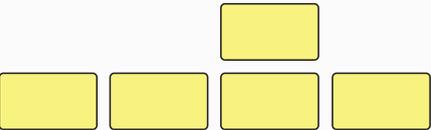
DS

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<p>Consider challenges of staff at the public land units that would have to administer and monitor permits, as well as concerns for public knowledge regarding wild, threatened and endangered species.</p> <p>Concerns with striking language until research has been completed as well as noting existing laws as mentioned the MN Wildflower Law.</p> <p>Revised Subpart 1. Long applied to state parks and forest recreation areas. Some are more or already restricted by other laws. They are some, and comprehensive, laws that apply to general state forest lands. Some of the changes may apply to the Wildflower Law M.S. 64B.01</p> <p>Concerns about lack of research in WMAs or AMAs before significant changes take place.</p>	<p>Need to be consistent with the law in question 1. No harvest of whole plant/roots. This suggests more extensive harvest is allowed. Should be above ground parts unless by permit. Also - SMA should not be included in state lands where harvesting is allowed</p> <p>I do worry about including state parks and things like the visitor experience. If people are picking wildflowers or collecting dirt/rocks etc. viewing of which was one of the reasons that people are visiting that park - The reasoning of exclusions or zones like Washington County had rather than blanket foraging everywhere in state parks might address such issues</p>	<p>This would be OK as long as we have a list of the species that may be endangered</p>	<p>using the word "plants" doesn't include fungi!</p> <p>Insert "they" in 2nd line before may</p> <p>subpart 1, line 5 "for harvesting/foraging." is ambiguous - perhaps add what is being harvested - i.e. plants and fungi</p> <p>I see no reason to restrict citizen science and educational collections</p> <p>sub 1 change wording to include State park, State forest and recreation areas, WMA and AMAs</p> <p>suggesting same language as suggested for other rule changes in the park, some result of herbicides and woody plants, and fungi</p> <p>Cultural harvesting</p>	<p>4 fingers if changes are made</p>	

Grab a sticky note from here, or double-click to create your own.



4. Modify Minnesota Administrative Rules Chapter 6230, Wildlife Management

Chapter 6230 outlines Minnesota Administrative Rules for wildlife management. The following changes are recommended to [6230.0250 General provision for use of wildlife management areas](#):

- Subp. 4. Compatible uses and exceptions. Wildlife management areas may be used for wildlife observation, sport fishing, harvesting/foraging for noncommercial personal or community use, hiking, snowshoeing, and other resource-related uses if the uses are not inconsistent with parts [6230.0250](#) to [6230.0270](#). Exceptions to this part for specific wildlife management areas are provided by parts [6230.0100](#) and [6230.0200](#). Select plant species are protected and require a permit to harvest. Some plant species are endangered, threatened, or of special concern and are prohibited entirely. See Minnesota Administrative Rules, Chapter 6134.0300 and 6134.0400
- Review other administrative rules within Chapter 6230 to ensure alignment with other foraging/harvesting permissions. For example, subpart 20 **Destruction or removal of property.**

This recommendation is redundant

First rule is for state Parks and forest lands. second is for WMA

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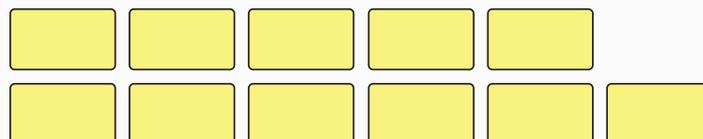
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<p>Modifying this rule may not align with M.S. 86A.05 Sub. 8</p> <p>Should our focus be here first rather than change laws that have been in place for many years to protect resources when we lack significant research on foraging impacts at select locations?</p>			<p>Harvest of whole plants/ roots should not be allowed except by permit of allowable species</p> <p>subpart 4, line 2 "for harvesting/foraging..." is ambiguous - perhaps add what is being harvested...i.e. plants and fungi!</p> <p>Same issue as before with the use of "plant" which would exclude fungi. Recommend change to plants and fungi</p> <p>cultural harvest</p>	<p>Recommend removing the double negative in the first section "not inconsistent" with "consistent"</p> <p>4 fingers but add AMAs to language</p>	

Grab a sticky note from here, or double-click to create your own.



7. Study foraging and its impacts, including changes to statutes and rules [this would require an appropriation]

- Partner with foragers or foraging groups as a source of data and information by creating an optional online form that foragers can fill out to provide information about what they found, where they found it, and any problems or concerns, particularly related to overharvesting or other damage to the landscape.
- Consider removing foraging restrictions for non-commercial personal or community use on select state parks and wildlife management areas to study foraging and its impacts.
- Consider adding questions to existing licensure systems and surveys to learn more about who forages, what they gather, where, and for what purpose.
- Dedicate funding to collect data and research the ecological, cultural, and economic impacts of foraging in Minnesota.
 - Note: LCCMR is a good source for research funding, including small and emerging projects. Next RFP, Jan 2026 (education/outdoor recreation)
- Develop a research plan for gathering needed information to support rules related to foraging.

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SG		IS, RM, LS, PM	GW, DG, NW, KB, NOI	BH, AG, SP	GK
This recommendation is not needed		<p>need clarity on the removing restrictions - seems significant</p> <p>include language to keep this Sustainable Foraging Task Force ongoing</p> <p>there are aspects of this recommendation that contradict others - e.g. bullet 2 and 5 aren't necessary if some of the other recommendations are upheld (e.g. those removing restrictions)</p> <p>remove bullet 2. A research permit could suffice, no need to change regulations</p>	<p>Might be doable without an appropriation through LCCMR</p> <p>I think it is important to study foraging and its impacts before statute or rule change.</p> <p>Could we recommend a pilot project at select state lands to monitor foraging with possible partnership and/or grant funds to support DNR?</p> <p>include state forests in bullet 2</p>		need LCCMR grant to do survey of both existing license buyers and general public.

Grab a sticky note from here, or double-click to create your own.

Duty 6 Recommendations (Permits)

(6) develop recommendations for reduced-priced foraging permits.

8. Revise Administrative Rule XXX to allow for the harvest/foraging of plants for non-commercial personal or community use without a permit.

- No permit required for harvesting edible fruits, edible nuts, wild mushrooms, plant shoots, and plant leaves collected by hand for "non-commercial personal or community use".
- Permits required for:
 - Whole plants, tubers, roots
 - Restricted species (similar to how the DNR puts hunting or fishing limits only on specific species)
- Allow local land managers the ability to set additional limits on harvesting/foraging if necessary.
- If beneficial to state DNR land managers, create a process for large special events and organized public activities to register for harvesting/foraging education on state land or public waters.
- Explore permit differences for state residents versus non-residents as is done for hunting and fishing permits.
- If money is collected for foraging permits, dedicate it to investing in foraging resources. For example, the wild rice license fees go back to the account that helps support the management of wild rice.

AF

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<p>MW, KB, SG, PM</p>	<p>SP</p>	<p>DS, IS, AG, GK, NOI</p>	<p>GW, LS</p>	<p>BH, DG</p>	
<p><small>Administrative Rule XXX is a regulation that is subject to the Administrative Rulemaking Process. Any changes to this rule must be made through the Administrative Rulemaking Process. For more information, please visit the DNR website at www.dnr.wisconsin.gov.</small></p> <p>This recommendation is not needed</p> <p>There is minor permitting now and I do not see issues with that but should be easier system to use. I would not want to add additional permitting without clear understanding of purpose and process. DNR would need to manage.</p>	<p><small>Administrative Rule XXX is a regulation that is subject to the Administrative Rulemaking Process. Any changes to this rule must be made through the Administrative Rulemaking Process. For more information, please visit the DNR website at www.dnr.wisconsin.gov.</small></p>	<p>Managers making inroads without evidence or rationale concerning</p> <p>In first bullet recommend adding "and non-native plants" before collected by hand.</p> <p>do not think its necessary to complicate the issue of foraging by more permits if we cant identify an immediate or potential looming problem</p>			

Grab a sticky note from here, or double-click to create your own.

Sticky note creation area with a grid of 15 yellow rectangular boxes arranged in three rows of five.

9. Improve DNR's existing permit process for plants on state lands [this would require an appropriation]

Potential improvement include:

- Available online
- Digital payment options
- One online permit for all plants foraged for non-commercial personal or community use, rather than individual permits for each plant or fungi
- Explore reduced costs

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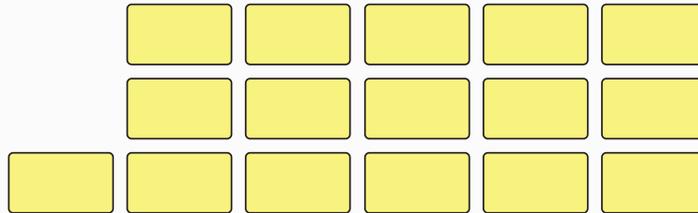
LS

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<p>This recommendation is not needed</p> <p><small>Lever permit structure as is. Current permit fees do not cover administrative costs. Requiring across the board permits, even if rejected, will anger users that have been able to forage without a permit.</small></p>					

Grab a sticky note from here, or double-click to create your own.



10. Improve DNR's existing permit process for aquatic plants from public waters

- [Minnesota Statutes 84.091 Aquatic Vegetation in Public Waters](#)
- [Sec. 103G.615 MN Statutes](#)

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MW, SG, KB			GW, PM, IS, NOI	BH, AG, RM, DG, SP	GK
<p>This recommendation is not needed</p> <p>Aquatic vegetation statues could be recommended for review but assume they are complex due to the water ecosystems that the vegetation is a part of.</p>			<p>Cattails should be allowed to be harvested.</p> <p>what are we agreeing to? what is improvement?</p> <p>allow cultural harvest</p>		<p>Change to allow harvest of aquatic veg.</p>

Grab a sticky note from here, or double-click to create your own.

Sticky note grid:

- 1 yellow sticky note (top)
- 6 yellow sticky notes (middle row)
- 6 yellow sticky notes (bottom row)

Additional recommendations

11. DNR work with Minnesota Department of Agriculture to explore modifications to statute and/or rules to safely transport plants on Minnesota's Noxious Weed List for consumption or medicine

- Should foraging of non-restricted noxious weed/invasive species be:
 - Encouraged as foragers could play a role in rapid detection, early response, and control?
 - Prohibited to prevent spread of seeds/spores?
 - Allowed, with restrictions (perhaps requiring a permit) for harvesting and transport in a manner that reduces risk of spreading?
- Explore revisions to statutes and rules to allow transport of invasive species:
 - Minnesota Statutes Chapter 84D - [84D.01, subd. 16 AND 84D.04, subd. 1\(1\)](#)
 - [Minnesota Noxious Weed List | Minnesota Department of Agriculture](#)
 - [Sec. 18.82 MN Statutes](#)
- Wisconsin resources
 - [Invasive species rule – NR 40 | INVASIVE SPECIES IDENTIFICATION, CLASSIFICATION AND CONTROL | Wisconsin DNR](#)
 - [Wisconsin Invasive Species Council | Wisconsin DNR](#)
 - [Permit information for Chapter NR 40 invasive species | Wisconsin DNR](#)

AF

- RM
- RS
- KP
- LS
- MW

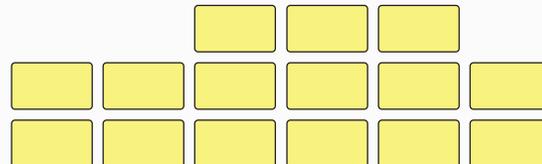
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	SG		SW, KB, NGI	DS, RM, AC, SP, DG, IS, GH	GR
	Needs more discussion		This would b a large body of work that would require agencies to collaborate to effectively determine need for changes to law. Include language that explains allowing foraging here would reduce the costs of paying DNR to remove them and also reducing pesticides to destroy them.		

Grab a sticker from here, or double-click to create your own.



12. Establish regular review cycle of foraging statutes and rules

Ecosystems, species populations, and environmental conditions change over time due to climate shifts, land use, and other pressures. Regular review ensures that foraging statutes and rules stay relevant, evidence-based, and responsive to current conditions—supporting both conservation and access goals.

The Department of Natural Resources shall report back its findings on foraging and its impacts to the State Legislature after five years with a report documenting what it has learned about foraging on public lands under the control of the State of Minnesota and to make recommendations on foraging consistent with the information it has obtained and which best promotes foraging as a recreational and cultural activity in lands that it manages for the State of Minnesota.

AF

RM

RS

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MW

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			NOI SG, GW, IS, SP, KB, BH, AG, DG, PM		GK
			This is OK. It (with #13) may be most of what we need suggest DNR + Others report back (advisory council or appointed others?) If asked for a report - there would have to be set metrics on what we are reporting back on and how do we fund that research, who collaborates on those projects and leads, etc... Free permits need to be documented and recorded. Cultural harvest is not just an activity, it's a traditional way of life. suggest a timeline before 5 years, before monitoring and data. DNR report should be before: SP Review annually or biennial <small>The Department of Natural Resources has been asked to be transparent to you and report the progress of foraging research and monitoring. We will report on the progress of our research and monitoring to you and the Minnesota Legislature and will share the results of our research and monitoring with you and the Minnesota Legislature.</small>		When and how to is ???

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Legislative Response: Sustainable Foraging Task Force, DNR follow-up

Date: 11-26-2025

Prepared for: Minnesota Sustainable Foraging Task Force

Question 1: Peter Martignacco [Following up from the November 10, 2025 memo from DNR]: If I understand correctly the permit terms require the specific identification of one non timber forest product the permit covers and how much was proposed to be harvested. Can the DNR provide more specifics for the 25 permits tallied in their response? Also interested in general which regions these permits were issued.

[Information provided in the October 8, 2025 memo for reference]

State Forests: Most special product permits that the DNR Forestry Division issues are for fuelwood, spruce tops, balsam boughs, and Christmas trees. A summary of special product permits issued in Fiscal Year (FY) 2025 and 2026 are as follows:

Products	FY25	FY26	Notes
Ferns	3	0	Spring harvest
Other Herbaceous	25	0	Spring harvest, likely Solomon’s Seal, etc.
Ginseng	63	70	Fall harvest
Bark	0	3	
Total	91	73	

Answer: Of the 25 “Other Herbaceous” special product permits summarized in the DNR Legislative Response memo from November 10, 2025, all of them were in [DNR’s Central Region](#), primarily in the Lewiston area in Winona County. The permits were for Solomon's seal, watercress, and fiddlehead ferns.

Question 2: [From public input sessions]: How many citations for foraging-related infractions does the DNR issue?

Answer: Based on the Initial Complaint Report (ICR) records system, it is time consuming to pinpoint the citations specifically related to foraging. The only way to tell for sure that a citation was foraging related is to manually go through each ICR in our system to determine what the violator was doing when contacted. It is important to keep in mind on the land type violations, not all violations would be from foragers. For example, Wildlife Management Area (WMA) violations included for things like cutting/destroying vegetation would include hunters cutting shooting lanes.

In addition, enforcement’s primary responsibility is to provide resource protection and public safety by gaining voluntary compliance through education and law enforcement. Voluntary compliance involves knowing and understanding why laws and regulations are important to the protection and preservation of the state’s natural resources and choosing to not only abide by those laws and regulations but to encourage others to do so. Due to the lack of understanding and ambiguity of the rules and laws regarding foraging on state lands, DNR’s

Conservation Officers educate first unless the violation is egregious or there is a clear and obvious intent to circumvent the law.

DNR's Enforcement Division issues citations related to wild rice violations and forest products citations and warnings every year, as well as a few ginseng violations. In past 2 years, Fiscal Years 2024-2025, Conservation Officers documented:

- State Trail (MN Rules 6100.3800.1): 2 citations, 2 warnings
- State Park (MN Rules 6100.0900.1): 10 citations, 11 warnings
- Aquatic vegetation (MN Rules 6280): 48 citations, 113 warnings
- Wildlife Management Area Misc. (MN Rules 6230): 219 citations, 405 warnings
- Aquatic Management Area Misc. (MN Rules 6270): 15 citations, 5 warnings

Citation examples:

- There is a clear example of attempted commercial sale of ramps from a WMA in 2021. Numerous individuals were charged and/or arrested. While patrolling spring turkey hunters, vehicles were observed with milk crates lined with plastic bags and gloves. Walking down the trail an officer observed individuals digging up and taking whole ramps. They were hoping to get 100 pounds of ramps and was planning to work with a friend in the Twin Cities to sell them. They had sold 100+ pounds of ramps for \$7/pound. In addition, they had been shipping ramps as cargo out of the Minneapolis–St. Paul International Airport to Georgia and other states on both east and west coast for almost 4 years. The person said he sold to is a broker who then sells to restaurants. They also confessed to selling mushrooms in the same way.

Offense: WMA - Conduct commercial operation solicit business farm or keep bees within WMA (MN Rules 6230.0250.17).

Offense: WMA - Destroy disturb or remove vegetation property threatened/endangered plants or animals (MN Rules 6230.0250.20).

- Comment from DNR staff: "I think this problem is bad enough and going to get worse that it warrants more specific language to address the various types of foraging and plant harvest. We do get people harvesting plants and seeds, not for consumption, but to take and plant. That should be specifically addressed as well. Additionally, it would be helpful to have more publicity about any changes to foraging rules. There is a huge foraging community in the Twin Cities, so even just outreach in the metro may help as they are traveling to nearby WMAs to harvest. Also wanted to mention that we should also look at the fine schedule associated with this in the WMA statute (I think that is where the fines are detailed). I think the plant fine might be \$25 or \$50. I think this is fine for someone found violating for personal use. Say an individual got some leeks for soup, but maybe only had a 1lb or something and a separate fine for egregious violations - such as those harvesting excessive amounts for commercial use or even excessive amounts for personal use. I talked to a Conservation Officer about the fines - they suggested a scale based on volume or something as they would likely be hesitant to fine someone \$300 for a small amount but would if it was \$25 or \$50 and then a higher amount for larger violations."
- Comment from DNR staff: "The main foraged species are fern fiddleheads, morels/mushrooms and wild asparagus. That being said, we do see trespassing on the state wildlife sanctuary and damage to some trees including birch trees. It's tough to say whether these are from foragers, but I do know of at least one instance of foragers on the sanctuary this spring."

Legislative Response: Sustainable Foraging Task Force, DNR follow-up

Date: 12-15-2025

Prepared for: Minnesota Sustainable Foraging Task Force

Question 1: Nibi Ogichidaa Ikwe: How much does the state spend on herbicides to eliminate invasive terrestrial plants?

Answer: In 2024, in total, the DNR utilized approximately 6,163 gallons of liquid pesticides and 4,540 pounds of dry pesticides to treat approximately 35,196 acres of land. The table below summarizes department pesticide use by DNR Division:

Division	Acres treated	Primary purpose	Gallons of liquid product	Pounds of dry product	Count of different products used
Parks and Trails	9,608	Invasive plants, insects	343	77	24
Forestry; Division managed and/or utility licensed	7,545	Site preparation, release, Invasive plants, insects	1,603	3,060	29
Forestry; Ag leases	4	Weeds	<1	0	2
Fish & Wildlife	16,718	Invasive plants, insects	4,053	1,403	54
Ecological & Water Resources	1,321	Invasive plants	164	<1	19
Operations Services	n/a	n/a	0	0	0
Total DNR	35,196		6,163	4,540	128

The DNR uses an Integrated Pest Management (IPM) approach to invasive species management. IPM is an ecosystem-based strategy for managing pests that focuses on long-term prevention of pests through a combination of methods, such as biological control, habitat manipulation, and modification of cultural practices. Pesticides are used only after all non-chemical treatment methods have been evaluated and monitoring indicates that they are needed. Then pesticide treatments are made with the goal of removing only the target pests.

Question 2: Peter Martignacco [Following up from the November 10, 2025 memo from DNR]: Were any of these permits issued for foraging on Wildlife Management Areas? Were any of these permits requested or issued for foraging ramps? Were any issued for commercial harvest? If so, how many permits were issued and can you estimate how much was harvested or allowed to be harvested under the permits?

[Information provided in the October 8, 2025 memo for reference]

State Forests: Most special product permits that the DNR Forestry Division issues are for fuelwood, spruce tops, balsam boughs, and Christmas trees. A summary of special product permits issued in Fiscal Year (FY) 2025 and 2026 are as follows:

Products	FY25	FY26	Notes
Ferns	3	0	Spring harvest
Other Herbaceous	25	0	Spring harvest, likely Solomon’s Seal, etc.
Ginseng	63	70	Fall harvest
Bark	0	3	
Total	91	73	

Answer: Minn. Rules 6230.0250, Subp. 20 allows for the removal of “edible fruits or seeds and decorative portions of plants” for personal use on Wildlife Management Areas. No permits are issued for this personal harvest. Fuelwood harvesting permits are allowed at the discretion of the Wildlife Supervisor as a habitat management tool and processed through the Area Forestry Office.

The DNR Forestry Division can issue special product permits on Forestry-administered lands. Ramps had been identified as a species with resource sustainability concerns, so harvest was not permitted in FY25. No special product permits were issued for ramps in FY25.

Question 3: Senator Steve Green: How does the state define “large amounts” of berries, mushrooms, or dead fuelwood for personal use for a Special Products permit (as noted on DNR’s website, <https://www.dnr.state.mn.us/forestry/harvest-permits-state-lands.html>)?

Answer: When requesting a permit, the applicant speaks with DNR Forestry staff to determine if a permit is needed and what is allowed for harvest on “state forest” lands. These permits are not available for State Parks, Wildlife Management Areas, or other DNR managed lands.

After an internal project team review, DNR Forestry’s product and utilization standards were updated for clarity in June 2025. A person may harvest herbaceous plants, berries, nuts, seeds, chaga, and mushrooms, in a method that will not destroy the plant for personal use without a permit. Personal use does not have a volume measurement currently.

Fuelwood permits are limited to 12 cords of dead or down wood and live trees cannot be cut as fuelwood. These permits are for personal use only. Any amount of fuelwood over 12 cords or for commercial sale may only be sold on an informal timber permit to a qualified purchaser.

Question 4: Peter Martignacco: Do you need a permit to gather wood for fire when camping or recreating in a State Forest?

Answer: No permit is needed to collect dead fuelwood for fires to be used while recreating in a state forest.

Question 5: Nibi Ogichidaa Ikwe: What plants, berries, mushrooms are currently allowed for commercial sale?

Answer: The DNR does not regulate what plants, berries, or mushrooms are allowed for commercial sale.

On state forest lands only, DNR's Forestry Division will issue special product permits for harvesting for personal use when it involves killing the plant, such as removing the roots or the entire plant, and for specific products. The Forestry Division will also issue special product permits for special forest products harvested for commercial use.

A special product permit minimum price is \$25.00. Some examples of current prices for commercial use:

- Many annual/perennial herbaceous plants can be harvested for \$1.00/gallon.
- Berries and nuts can be harvested for \$1.00/gallon.
- Most bark can be harvested for \$0.10/square foot.
- Mushrooms can be harvested for \$2.00/gallon.
- Sap to make syrups can be harvested for \$0.25/tap.

The Division of Forestry maintains a list of species and taxonomic groups found on state-administered forestlands that have been sold as special forest products and information on sale method(s) and land class(es) where harvest is allowed, product and harvest specifications, harvest recommendations to promote resource sustainability, and prices.



Foraging on State Lands

Background Information Presented to the
Minnesota Sustainable Foraging Task Force

- Minnesota Department of Natural Resources' Public Land Management
- Overview of Outdoor Recreation System
- Foraging on Public Lands
- Statutory and Rule Clarifications
- Management Challenges
- Invasive Species
- Education and Outreach
- Implementation Questions



Minnesota Department of Natural Resources' Public Land Management

- *The mission of the Minnesota Department of Natural Resources (DNR) is to work with Minnesotans to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.*
- **Public lands managed by the DNR**
 - 64 State Parks; 9 Recreation Areas, 235,000 acres
 - 60 State Forests, 4.2 million acres
 - 700+ Aquatic Management Areas; 1,500+ Wildlife Management Areas, 1.37 million acres
 - 168 Scientific and Natural Areas, 190,000 acres

Overview of Outdoor Recreation System

- The outdoor recreation system is comprised of different units that are authorized, established, and administered to accomplish the purpose and objectives of its classification (Minn. Stat. 86A.04).
- **Scientific and Natural Areas (SNAs) (Minn. Stat. 86A.05, Subd. 5)**
 - To protect and perpetuate in an undisturbed state those natural features which possess exceptional scientific or educational value.
- **State Forests (Minn. Stat. 86A.05, Subd. 7)**
 - To provide for multiple uses, including sustained timber and other production, outdoor recreation, and environmental purposes.
- **State Parks (Minn. Stat. 86A.05, Subd. 2)**
 - To preserve, protect, and perpetuate Minnesota's natural features and provide for their use, enjoyment, and understanding without impairment for the enjoyment and recreation of future generations.
- **Wildlife Management Areas (Minn. Stat. 86A.05, Subd. 8)**
 - To protect lands and waters that have a high potential for wildlife production and to develop and manage the lands and waters for the production of wildlife for public hunting, fishing, trapping, and other compatible recreational uses.
- **Aquatic Management Areas (Minn. Stat. 86A.05, Subd. 14)**
 - To protect, develop, and manage lakes, rivers, streams, and adjacent wetlands that are critical for fish and other aquatic life, water quality, biological value, and fishing and other compatible recreational uses.

Foraging on Public Lands

- Minnesota's land management jurisdiction is a shared responsibility, with state, county, federal, and local entities each having specific roles. DNR's management authority exists only over state lands.
- Land uses, including foraging, are managed differently on DNR-managed public lands due to a number of variables including statutory purposes and management direction, funding requirements, federal law, extent of the land base, etc. and treaty rights.
 - **Statute/Rule:**
 - Minn. Stat. 90.195 provides DNR the authority to issue special use and product permits.
 - Minn. Rules 6100.0900 prohibits removal of plants, except edible plants and mushrooms, from State Forests and State Parks.
 - **Funding:**
 - Federal funding received from USFWS may restrict uses to ensure lands are managed for wildlife.
 - **Treaties:**
 - Many treaties include specific areas and resources that can be harvested.

Statutory and Rule Clarifications

No definition of:

- “Personal use” – this term is not defined in rule for any land type, except for wild ginseng (Minn. R. 6282.0400).
- “Edible fruit” – this term can be interpreted differently (either colloquially or botanically)
- “Decorative portions of plants” – this term could be interpreted widely to mean any part of a plant that does not kill the plant.
- Personal possession limits



Management Challenges

- Plant localized and population impacts, lack of detailed population data (i.e., ramps and fiddlehead ferns)
 - Minnesota Biological Survey
- Potential overharvest
- Difficulty determining the effects of plant harvest when viewed with other recreational uses, climate impacts, natural disaster events, etc.
- Foraging requires a careful understanding of the plants harvested and look alike species.
- Improperly identified wild foods can pose serious health risks.
- Establishment of user-created trails or create areas of increased erosion
- Potential spread of invasive species, impact to threatened/endangered species



Invasive Species

Potential invasive species transfer

- Terrestrial Invasive Species
- Golden Oyster Mushrooms and other mushrooms sold online



Education and Outreach

- DNR currently does not have a centralized page describing foraging rules and land types
- Foraging requirements vary across different units of the Outdoor Recreation Act (i.e., State Forests, State Parks, etc.) and can be challenging to apply/interpret
- DNR manages 5.6 million acres and signage and messaging requires significant resources
- Diverse community outreach and translation needs
- Current lack of Best Management Practices (BMPs) for foraging



Implementation Questions

- What is a long-term source of funding or revenue to research and manage state lands for foraging?
- What is a long-term source of funding for the Minnesota Biological Survey to acquire adequate plant population data?
- How should the state ensure Tribal engagement occurs timely where known culturally significant sites are located to avoid unintended impacts?
- What are the right organizations and communication tools to efficiently and inclusively conduct stakeholder engagement?

Questions?

The chanterelle mushroom harvest on northern Vancouver Island, British Columbia: Factors relating to successful commercial development

Tyson Ehlers¹ and Tom Hobby²

Abstract

This paper presents a synthesis of an original case study that investigated the social, economic, and ecological characteristics of the Pacific golden chanterelle (*Cantharellus formosus*) harvest in British Columbia, with an emphasis on northern Vancouver Island. It draws on the experience of wild mushroom harvesters and buyers, current forest mycological research, and global trade data. The wild mushroom resource contributes directly to rural economies and is part of the natural capital of the region. Wage expectations are generally low, but many people pick mushrooms for personal use and recreation, regardless of profit. Sustainability of chanterelle harvests is tied to forest management practices; the absence of any regulatory or policy framework for addressing the management requirements for chanterelles creates uncertainty about future supplies. Shorter timber harvest rotations are implicated in the loss of habitat and harvesting opportunities; however, there is reason to believe that timber and chanterelles can be managed compatibly, albeit with some tradeoffs. Available inventory information can be used to identify the best habitats that should be managed on longer rotations. Alternatively, compatible management strategies could include green-tree retention focussed on the best chanterelle habitat; commercial thinning that maintains a sufficient density of chanterelle host trees, and manipulating younger stands to enhance production at an earlier age. Global trade data indicate a slight decline in the value of the Canadian chanterelle harvest in recent years; however, the industry is relatively young and characterized by fluctuations in production and markets, and there is reason to be optimistic for the future of the industry on Vancouver Island.

KEYWORDS: *British Columbia; Cantharellus formosus; chanterelle; compatible management; non-timber forest products; Vancouver Island.*

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Editor's Note:

Please refer to Mitchell and Hobby (2010; see page 27) in this special issue for a description of the overall non-timber forest product project and details of the methodology employed in the case studies.

Introduction¹

Over 70 species of chanterelles (*Cantharellus* spp.) have been described worldwide, with many different national and regional common names attesting to their global popularity (Pilz et al. 2003). Chanterelles are particularly prized for their culinary value in Europe and North America. Their elegant stature, delicate flavour, and fruity aroma make them one of the most popular wild edible mushrooms (Arora 1990). They are also nutritious: chanterelles are about 10% protein by weight (Danell and Eaker 1998, in Pilz et al. 2003), high in vitamin A, and one of the highest natural dietary sources of vitamin D (Matilla et al. 1994 in Pilz et al. 2003).

While there has been some success with artificial cultivation of chanterelle mushrooms (Danell and Camacho 1997), the practice is not thought to be profitable, given the high cost of producing mushrooms using current methods combined with the relatively low market value of chanterelles compared to other wild mushrooms. World supplies, therefore, are currently limited to wild harvests.

Of the three recognized species of chanterelle mushrooms in British Columbia, the Pacific golden chanterelle (*Cantharellus formosus*) is the primary commercial species (*C. subalbidus* and *C. cibarius* var. *roseocanus* are the other two species; Berch and Cocksedge 2003).² It occurs in western coastal North America, from northern California to northern British Columbia (Redhead et al. 1997). The major commercial harvesting regions in British Columbia are Vancouver Island, on Haida Gwaii (formerly the Queen Charlotte Islands), the southern Coast Mountains (especially around Powell River, the Sunshine Coast, Chilliwack, Hope, and Pemberton), and the northwest coast (Prince Rupert area) (de Geus 1995; Wills and Lipsey 1999). In the United States, commercial production is focussed on coastal areas of Washington and Oregon (Love et al. 1998).

This case study investigated the social, economic, and ecological characteristics of the chanterelle harvest on northern Vancouver Island, British Columbia.

European settlers were likely the first people to harvest chanterelles actively in coastal areas of British Columbia. There is little evidence that coastal Native peoples used chanterelles, or any mushrooms in pre-contact times (Kuhnlein and Turner 1991). Commercial harvesting did not become established until relatively recently in the late 1970s, becoming more wide-scale through the 1980s (Love et al. 1998; Betty Shore, pers. comm., 2001). Since then, the industry has matured, yet there are still no professional associations representing the interests of participants and no formal provincial management strategy to ensure its sustainability.

The purpose of this extension note is to present a synthesis of an original case study that investigated the social, economic, and ecological characteristics of the chanterelle harvest on northern Vancouver Island, British Columbia. The objective of the case study was to gather information in a format that can be adapted to a comparative case study methodology developed by the Centre for International Forestry Research to identify the factors that are most critical to successful commercialization of non-timber forest products (NTFPs) (Mitchell and Hobby 2010, see page 27 in this issue).

Here, we examine the factors involved in the production-to-consumption system for chanterelles as it relates to sustainable forest management and as it contributes to the economic capacity of rural, resource-dependent communities. We profile the harvesters and present economic data for valuing the harvest from individual to global scales, and we discuss the ecology of the species and the role of forest management in sustaining wild harvests.

¹ Extension notes in this issue of the *BC Journal of Ecosystems and Management* are based on a series of case studies that represent an attempt to document economic, social, cultural, and ecological aspects of important non-timber forest products in British Columbia. For more details on the case studies, please contact the Centre for Livelihoods and Ecology through <http://www.royalroads.ca/cle>. It should be noted that the socio-economic data was largely collected through non-random surveys of harvesters, from interviews with key informants (harvesters and buyers), from direct observation, and from a limited amount of published literature from areas outside the case study region. Survey results are based on the responses of a small number of respondents, and should not be taken as necessarily representative of the larger population. Despite these limitations, the extension notes and the case studies on which they are based present new information on little-known resource sectors and suggest a number of useful and important avenues for future research.

Please note that in 2010 the Centre for Non-Timber Resources at Royal Roads University was renamed the Centre for Livelihoods and Ecology.

² British Columbia NTFP Mushrooms website: <http://bcmushrooms.forrex.org/ntfp/index.html>

Chanterelle study details

The broad area considered within this case study is Vancouver Island, with a particular focus on the Nimpkish Valley situated on northern Vancouver Island, around the communities of Woss and Port McNeill (Figure 1). Most lands in the study area are publicly owned Crown land with timber rights allocated to forest companies in the form of tree farm licences. The study area also includes portions of the traditional territories of the 'Namgis, Kwakiutl, and Quatsino First Nations.

Information collected for this study draws largely from past and ongoing research on chanterelle ecology, productivity, and management in the Nimpkish Valley. The North Island Non-timber Forest Product Demonstration Project produced an inventory of NTFP plant and fungal species and baseline information to characterize and map chanterelle habitat.³ Subsequent work focussed on more detailed chanterelle habitat modelling and monitoring annual productivity.⁴ In 2006, as part of the CIFOR comparative NTFP case study methodology, a survey was designed by the Centre for Non-Timber Resources (CNTR), Royal Roads University (Mitchell and Hobby 2010) to gather data on the socio-economic aspects of the chanterelle harvest. Surveys were administered through informal interviews with 15 mushroom harvesters and 2 buyers contacted in the northern Vancouver Island region,

near the community of Woss, in the fall of 2006. There was very little harvesting or buying activity that year because of an exceptionally poor mushroom crop, which limited the number of participants in the survey. A mushroom buyer in Woss assisted in survey data collection by interviewing people she knew had picked in the past when there were more mushrooms. As such, the survey is non-random and biased toward the contacts of a single buyer and community. Though useful in developing the case study, the survey was not rigorous enough to represent the larger chanterelle harvesting and buying community that may exist on the North Island in a good mushroom year. Supplemental information was gathered from experienced chanterelle harvesters and buyers outside the study area, including the primary author's personal observations. Secondary research was also used as input for developing the case study database descriptor variables.

Biology and ecology of the Pacific golden chanterelle

Pacific golden chanterelle is an ectomycorrhizal fungus, associated with western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), Sitka spruce (*Picea sitchensis*), and shore pine (*Pinus contorta* Dougl. ex. Loud. var. *contorta*) (Redhead et al. 1997). Mushrooms

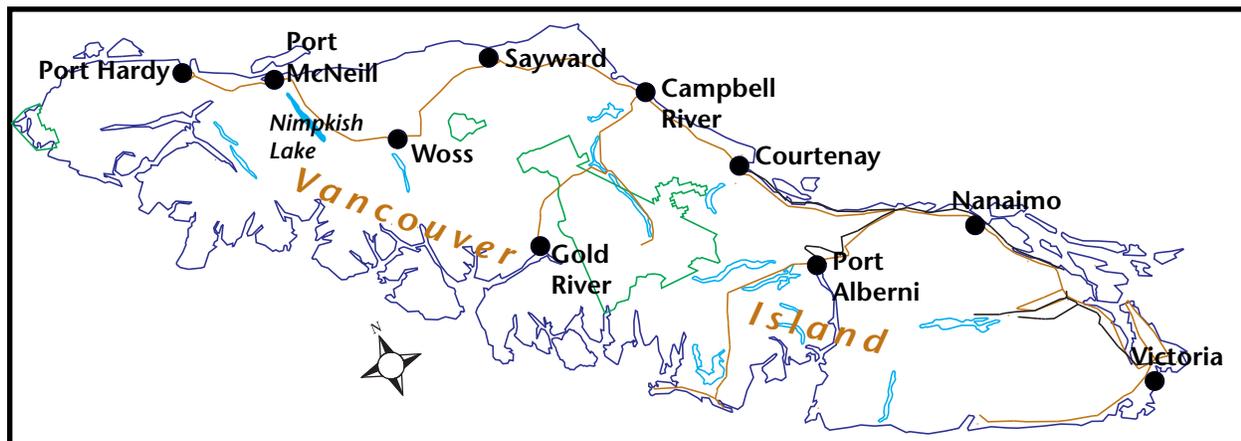


FIGURE 1. Chanterelle case study area on Vancouver Island.

³ Mitchell Consulting Associates 2002. Integrated Demonstration Project for Non-Timber Forest Products, Northern Vancouver Island. Forest Renewal BC (Ref. number: PAR0211-03. Appendix A. NTFP plant and fungal species inventory.

⁴ T. Ehlers. 2007. Chanterelle mushroom habitat modelling and inventory. British Columbia Forest Investment Account, Forest Science Program, Project no. Y082163. Unpublished report. http://www.for.gov.bc.ca/hfd/library/FIA/2007/FSP_Y071163.pdf

are the fruiting bodies (or sporocarps) of the main organism, which resides in the upper horizon of the soil matrix. As long as the mycelium is not damaged, it continues to produce mushrooms under suitable environmental conditions.

Fruiting bodies often appear alone or in scattered patches on the forest floor from mid-summer through fall (July–December). They are variable in size, but robust specimens (up to 14 cm) are not uncommon. The vase-shaped caps (Mckenny and Stuntz 1987) range in colour from dull orange yellow to brown orange (Pilz et al. 2003). The gills are blunt, deeply ridged, forked, and decurrent (run down the stem). They are pale orange-yellow and often with a pink cast (Figure 2). The pale flesh is firm and compact and often has a fruity, apricot-like aroma. The stalk is stout and often contorted. The spore print is yellowish white (Pilz et al. 2003).⁵

Compared to other forest mushrooms, chanterelles grow relatively slowly and are fairly rot-resistant. Growth rates of 2–5 cm per month, and duration of fruiting bodies of more than 90 days, with spore dispersal occurring from 1–2 months have been reported (Largent and Sime 1995; Norvell 1995, in Pilz et al. 2003). Chanterelles are resistant to predation by insects and other animals (de Geus et al. [editors] 1992).



FIGURE 2. Pacific golden chanterelle.

Stand, vegetation and site characteristics

On northern Vancouver Island, Pacific golden chanterelle occurs across a wide range of age classes but production is highest in stands dominated by 40–80 year-old Douglas-fir and western hemlock. Commercial harvesters primarily focus their activities in these maturing second growth stands. Canopy crown closure averages between 70–80%. Understorey vegetation is generally sparse and moss-dominated, though swordfern (*Polystichum munitum*), deerfern (*Blechnum spicant*), salal (*Gaultheria shallon*), and red huckleberry (*Vaccinium parvifolium*) are relatively abundant on some sites. These species (especially salal) are also commercially harvested NTFPs in the region, sometimes from the same sites that produce chanterelles.

Soils are typically well-drained, coarse-textured and nutrient-medium arising from glacio-fluvial or morainal landforms. In northern California, chanterelles have been found to fruit in nitrogen-poor soils (low exchangeable acidity, pH 4.0–5.5), moderate duff depth and in areas with bare humus and needle cover of less than 30% (Bergemann and Largent 2000).

Ecosystem classification⁶

The Coastal Western Hemlock (CWH) biogeoclimatic zone is the predominant biogeoclimatic ecosystem classification (BEC) zone in the study area where the majority of timber and NTFP harvesting activity takes place. Within the CWH, chanterelle production is concentrated in four BEC subzones/variants as described by Green and Klinka (1994): CWHxm (very dry maritime), CWHmm1 (submontane moist maritime), CWHvm1 (submontane very wet maritime), and CWHvm2 (montane very wet maritime). The CWHxm exists in the valley bottom and on lower slopes of the Nimpkish Valley. It has a relatively dry, warm climate, long growing seasons, and moist mild winters with relatively little snowfall. Dominant tree species on zonal (typical) sites are Douglas-fir, western hemlock, and to a lesser extent, western redcedar (*Thuja plicata*). The CWHmm1 exists above and adjacent to the CWHxm. Douglas-fir is a major tree species in this zone. The CWHvm is divided into two variants, the CWHvm1, and above this in terms of elevation, the CWHvm2. The CWHvm1 experiences greater amounts of precipitation than the CWHxm leading

⁵ Common names: Pacific golden chanterelle, chanterelle, common chanterelle, egg mushroom, golden chanterelle, north west golden chanterelle, western chanterelle, yellow chanterelle.

⁶ See Mitchell and Hobby (2010, page 27 in this issue) for a description of the biogeoclimatic ecosystem classification system (BEC).

to a wetter, more humid climate. Summers are cool and winters are mild. Dominant tree species on zonal sites are western hemlock and amabilis fir (*Abies amabilis*), with lesser amounts of western redcedar. The CWHvm2 is colder and wetter than the CWHvm1. Yellow cedar (*Chamaecyparis nootkatensis*) and mountain hemlock (*Tsuga mertensiana*) can grow on zonal sites.

Natural productivity of chanterelles

Baseline information on the distribution and abundance of mushrooms is needed for economic valuations and monitoring efforts to incorporate wild mushroom production into sustainable forest management plans. Chanterelle fruiting is influenced by a number of factors, including host tree vigour (since the host tree provides food to the fungus), annual weather patterns, and environmental conditions of the forest floor during the fruiting season. Productivity can be highly variable from year to year and therefore must be measured over several years to obtain reliable estimates.

Within a generally productive area, chanterelles appear singly or in clusters (patches) unevenly distributed throughout a stand. Harvesters intimate with their areas will target sites in a systematic manner, with the greatest concentration of patches. Since it may be impractical to map the distribution of individual patches across a large area, unbiased estimates of productivity related to ecosystem types that can be modelled at landscape levels are most useful to land managers concerned with sustaining chanterelle production.

On northern Vancouver Island, chanterelle productivity (fresh weight, commercial grade only) averaged about 5 kg/ha across three ecologically similar sites over four years (Ehlers 2009, unpublished data). This is consistent with findings elsewhere: in the Skidegate Lake area on the Queen Charlotte Islands productivity ranged from 3.4 to 7.49 kg/ha (Peterson et al. 2000), and in the U.S. Pacific Northwest it ranged from 2 to 20 kg/ha, averaging 5 kg/ha (Liegel 1998, as cited in Pilz and Molina 2001). These values are for fresh weight and moisture content can vary considerably between collections.

The chanterelle harvest

The chanterelle season on northern Vancouver Island runs approximately from late July to December but varies considerably from year to year. As with all wild mushrooms, the distribution, abundance, and timing of harvests can fluctuate widely. Under optimal weather

conditions, commercial harvests can begin in July, with successive flushes every 2–3 weeks until cold weather precludes further fruiting. In 2006, the year that survey data were collected for this case study, an unusually hot and dry summer and early fall resulted in no significant commercial quantities of mushrooms being produced until mid- to late October. Consequently, there was very little harvesting activity and only one buyer in the town of Port McNeill, B.C., was open intermittently for about 4 weeks. By the time production peaked in late October, most commercial harvesters were discouraged by the short harvest window and lack of available buyers that year. High variability of wild mushroom crops from year to year creates a “boom and bust” situation that is one of the major challenges to commercial development of the wild mushroom industry.

Harvester profile

Mushroom harvesters (pickers) can be broadly categorized as transient or local. Within the transient group are the “circuit pickers,” who follow the annual fruiting patterns of various commercial mushroom species, perhaps beginning their season with the spring morel (*Morchella* spp.) harvest as it progresses from south to north, then targeting the fall fruiters such as boletes (*Boletus* spp.), chanterelles, and pine mushrooms (*Tricholoma magnivelare*), following the fruiting season from north to south. Circuit pickers consider mushroom picking to be a lifestyle, and it is their primary source of income. Another group of transients is the “destination pickers” who are primarily motivated by the recreational rewards of the hunt. For this group, mushroom harvesting provides an excuse to be in nature and might only be one of many activities in which they participate when visiting the area. Many gather only what they need for personal consumption and do not sell their mushrooms. The majority of pickers on northern Vancouver Island are local, from traditionally forest resource-dependent communities. They live close to mushroom-producing forests and can pick whenever opportunity presents. They are motivated by income, recreation, and subsistence.

Survey respondents said they actively harvest from 2–8 hours/day over 2–20 weeks, depending on the season. Experienced harvesters consistently bring only the best quality and most valuable fresh market mushrooms to the buyer.⁷ Inferior quality chanterelles are only incorporated into the harvest when there is a shortage of high quality mushrooms.

⁷ Harvesters who establish relationships with buyers may receive incentives in the form of a bonus, perhaps 10% above the advertised price.

Harvester income

Average picker wages are difficult to determine since seasonal mushroom abundance and daily prices are highly variable. Prices are usually higher to start, and drop as global chanterelle supplies increase. Prices paid to pickers for fresh chanterelles range from CAD\$2.20/kg to \$16.50/kg. The wild mushroom economy still works in pounds, with prices averaging CAD\$2.25/lb. Commercial pickers we interviewed claimed to harvest an average of 4.6–27.3 kg/day. Based on the average price of \$2.25/lb (\$4.95/kg), expected daily incomes range from \$22.50 to \$135.00/day, though at the high end some pickers claim they can pick 45 kg/day and at the highest price this would earn them \$750. Such variability in harvest volumes and prices paid is typical of the wild mushroom industry in general.

Non-timber forest products are largely seasonal with low wage expectations, particularly when compared to the timber, mining, and fishing industries. There can be high volatility in the market due to fluctuating demand and uncertainty in supply. Prices paid to the picker are subject to change daily and wages are never guaranteed. The number of field buying stations available for pickers to sell their mushrooms is also limiting. All of these factors present a disincentive to those who might have the skill or the inclination to pursue NTFPs commercially. Consequently, there are relatively few mushroom pickers, and even when and where wild mushroom resources are plentiful as they can be on Vancouver Island, their value goes unrealized. There is also currently no organizational structure or association supporting the interests of chanterelle harvesters, although there are recognized benefits to organization, including:

- combining harvests and increasing total volumes to bargain for better prices with buyers;
- sharing transportation costs to increase individual harvester profit, reduce pollution, and export mushrooms to a wider range of markets; and
- increasing product awareness and marketing to domestic buyers.

Although NTFPs currently do not generate employment and revenues equivalent to timber and fish resources, they provide additional income opportunities, which help to diversify the regional economy. This is particularly important during economic downturns in traditional forestry and fishing industries. As an example, in 2005 there was a temporary shutdown of forestry operations in the Nimpkish Valley. This directly affected the town of Woss, where most of the residents

are employed by the logging industry. A corresponding increase occurred in the level of mushroom harvesting activity in the forests surrounding Woss that year (L. Corcoran, pers. comm., 2006). High unemployment in traditional sectors, the presence of a mushroom buyer in town, and abundant commercial wild mushrooms all contributed to increasing the number of people who participated in the harvest that year. Resurgent interest in NTFPs following economic downturns in other higher-paying industries is a phenomenon that is likely to be repeated and emphasizes the importance of NTFPs in diversifying local economies.

Sustainability issues related to harvesting

When questioned about their preferred method, harvesters interviewed in the study area either cut or pulled mushrooms from the ground, while at least one said he did both. Long-term studies have demonstrated that there is little difference in future production using either harvest method (Egli et al. 2006; Norvell 1995). Excessive ground trampling during the harvest can affect young mushrooms developing under the duff and reduce total production within a fruiting season; however, it does not appear to have any measurable influence on future production in subsequent fruiting seasons (Egli et al. 2006).

Questions remain, however, about the effect of continuous removal of fruiting bodies on spore dispersal and future establishment of mushroom colonies. It is commonly believed among mushroom harvesters that harvesting can increase spore dispersal because mushrooms are carried throughout the forest and away from where they were found growing. Many harvesters promote the use of ventilated collecting containers to allow spores to pass through, and also return post-processing mushroom waste materials back to the forest (Lonick 1999). Some buyers discourage picking immature, undersize mushrooms (generally based on a cap size equivalent to the diameter of the Canadian \$1 coin, approximately 2.5 cm; L. Corcoran, pers. comm., 2006).

Buyer profile

The number of buyer-distributors for all edible wild mushrooms in British Columbia fluctuates but is estimated to be 10–20 (Tedder et al. 2002). Along with pine mushroom, Pacific golden chanterelle was bought and sold by the largest number of British Columbia wild mushroom buyers (10) interviewed in 2002 (Berch

and Cocksedge 2003). Each buyer-distributor can have many field agents buying for them across British Columbia⁸ and several distributors may be represented in a prime commercial harvesting area. Field buyers are paid a commission, generally around \$1.10–\$2.20/kg of mushrooms they buy.

Processing chanterelles

Chanterelles receive very little post-harvest processing. Mushrooms are brought to field buying stations where they are sorted into three commercial grades: #1 fresh, #2 fresh, and driers (or canned). Not all buyers sort lower quality mushrooms for drying or canning, as there is a limited market for these products. Betty's Best Mushrooms Inc. practises the following grading standards (Chanterelle Grading Specifications, Betty Shore, pers. comm., 2001):

- #1 Grade – Fresh market “buttons,” with the edge of the cap rolled down and curled underneath the cap. There is no dirt on the mushrooms, and they have been sliced cleanly near the base with a sharp knife that minimizes any bruising to the flesh. Size ranges from quarter size (2 cm) to 10 cm.
- #2 Grade – Fresh market “leaf,” whole, firm, clean mushrooms. The edge of the cap can be flat, but not floppy, sagging downward or curled upwards. Mushrooms are not water-logged, or broken at the edges of the cap. Cleanly cut and no dirt.
- Drier Grade – Good older mushrooms. Edges of the cap are becoming thin and slightly tattered. Not waxy feeling. Some trimming of bruised or mouldy areas may be necessary. Also can include damaged Grade #1 and #2 mushrooms.
- Rejects – All mushrooms that are dirty, soggy, bruised, mouldy, previously frozen (slippery or waxy feeling), or generally over-mature.

Processed mushrooms are placed into industry standard plastic storage baskets and weighed. The weight per unit volume will vary with moisture content but, on average, a full basket weighs about 5–7 kg. Full baskets are stored in a cooler and shipped within 1–3 days by air or land to second-order buyers, located mainly in the Vancouver area. Less than 1% of fresh and dried product is marketed to local restaurants (sometimes directly by pickers) or sold to tourists who visit buying stations.

Once received by the buyer-distributors, mushrooms are further sorted and placed in cold storage. It can take 3–5 days for mushrooms to reach their final destination in Europe, during which time there can be an additional 3–7% moisture loss, on top of an estimated 5–10% moisture loss in shipping from field stations (Tedder et al. 2000). Exporters must account for these moisture losses in determining their profit margins.

Global trade

Global trade in chanterelles is estimated to be US\$1.67 billion, based on world production ranging from 150 000 to 200 000 metric tonnes per year (Watling 1997). The primary market is Europe, with France and Germany having particularly high demand (Schlosser and Blatner 1994). Rough estimates of the total volume of chanterelles harvested in British Columbia range from 187 500 kg in a poor year to 750 000 kg in a good year (Wills and Lipsey 1999). Haida Gwaii is one of the largest production regions in British Columbia. Crude estimates of total production there in a good year are approximately 115 000 kg, with a net worth to the pickers ranging from CAD \$225 000 to \$350 000, based on a price ranging from \$5.50–\$9.25/kg; Tedder et al. 2000).

The 1995–2005 trade data for the European Union markets indicate a slight overall decline in the value and volume of Canadian chanterelle mushroom exports, which ranged from \$1 to \$5 million annually (Cocksedge and Hobby 2006). Possible reasons include increased global competition coupled with decreasing domestic production. An exception to the declining trend was 2004, noted by reports from British Columbia harvesters as one of the best commercial mushroom-producing years on record. Unfortunately, the high production levels were met with lower than average prices.

Managing forests for chanterelles

Air pollution, short timber rotations,⁹ clearcutting, depletion of soil litter layers, and harvesting pressure are all cited as factors that have contributed to decreases in the production of chanterelles and other mushroom species in Europe during the past several decades (Pilz et al. 2003). Climate change was also of concern to half of the respondents to the survey.

⁸ Only two buyer-distributors were represented in this case study's surveys of field buyers on northern Vancouver Island in 2006.

⁹ In short rotations there is an average of 50–60 years between tree planting and harvest.

Unfortunately, there is little certainty about, or local control over, the impacts of global climate change and pollution on chanterelle production.

Within the habitat range of Pacific golden chanterelle on Vancouver Island, logging has been the predominant negative impact on the landscape influencing chanterelle distribution and abundance. Habitat loss caused by logging is the major factor implicated in limiting production of chanterelles and other NTFPs by harvesters we interviewed. Before the advent of widespread logging, fires would have been the most frequent disturbance agent on the landscape. Chanterelle abundance correlated positively with fire history in the Skidegate Lake area on Haida Gwaii (Peterson et al. 2000), but fire suppression activities in the last 50 years have greatly reduced the frequency and severity of fires in British Columbia.

Inventory and mapping of productive habitats is paramount to developing effective management strategies. Some of this work has been done for chanterelles and other species on northern Vancouver Island. Given their preference for maturing second-growth stands, chanterelles may now be more abundant on northern Vancouver Island than prior to logging;¹⁰ however, as the timber industry has recently shifted from old growth to second growth, these same stands are now being targeted for logging, at a time when many of them are entering their prime for chanterelle production. Short rotation ages of 50–60 years means that good mushroom stands will only be commercially harvestable for 10–20 years before timber harvesting. Since chanterelles depend on host trees for their growth and survival, clearcutting will preclude mushroom production until a new suitable stand of host trees regenerates. For chanterelles to begin to fruit in the wild, host trees need to be 10–40-years-old (Danell 1994, cited in Pilz et al. 2003). Forty years appears to be the approximate threshold age for optimal chanterelle production on northern Vancouver Island; stands younger than 40 years are rarely targeted by commercial pickers, and have been found to produce fewer chanterelles than older stands (Ehlers 2009, unpublished data). Increasing timber rotation ages in current highly productive chanterelle forests is an important consideration in sustaining chanterelle production until younger stands reach optimal production age.

Options to mitigate timber harvesting impacts on chanterelle habitat may also exist where resource management objectives overlap. Green-tree retention (also referred to as “variable retention”) is a modification of a traditional clearcut timber harvesting system that is gaining wider popularity, particularly in Douglas-fir ecosystems of the Pacific Northwest. Green-tree retention maintains intact legacies of the original stand by reserving a portion of mature trees throughout the timber harvest area, or cutblock. The general goal is to sustain biodiversity and other forest values while economically harvesting timber. Specific applications of green-tree retention designed to optimize timber and chanterelle production need to be investigated, specifically with regard to how much should be retained and in what pattern (density and spatial arrangement of reserved trees). For ectomycorrhizal fungi in general, the greater the proportion of mature trees retained using a combined pattern of even dispersal throughout the opening and larger (1 ha) aggregated patches, the better the effect is on preserving the ectomycorrhizal fungal community in Douglas-fir forests in the United States Pacific Northwest (Luoma et al. 2004).

Chanterelles fruit in clusters; their distribution is linked to the presence of suitable host trees, soils, and other site-specific environmental factors. There is no set pattern to their occurrence, although they will fruit in the same patches year after year. Prior to timber harvest, surveys during peak seasonal fruiting periods, and (or) the expertise of harvesters intimate with the site may be sufficient to identify fruiting locations and associated host-trees that should be reserved from harvest. Chanterelle habitat can be reserved either in smaller patches dispersed throughout the stand, or in larger contiguous areas where chanterelles are concentrated.

With adequate inventory information, green-tree retention can achieve multiple conservation objectives. Stand-level resource inventories are routinely conducted to protect key habitat features for wildlife species. Within the study area on northern Vancouver Island for example, an area of productive chanterelle habitat was incidentally reserved from clearcut timber harvest to protect a nesting site of the red-listed Northern Goshawk (*Accipiter gentilis laingi*). Although much of this once-popular chanterelle harvesting site was logged, chanterelles continued to fruit in the reserve area.

¹⁰ Among respondents to the harvester survey, 87% ($n = 13$) indicated that chanterelle production was highest in second-growth stands resulting from past logging. A few harvesters thought that past fire and stand thinning had a beneficial effect on chanterelle production.

Green-tree retention could also facilitate more rapid colonization of regenerating stands with chanterelle mycelia and accelerate the development of a productive chanterelle stand. Although we are not aware of any studies that have looked specifically at Pacific golden chanterelle, ectomycorrhizal fungal species richness on seedlings has been shown to decrease with distance from the rooting zone of mature trees (Hagerman et al. 1999). Seedlings planted in proximity to paper birch (*Betula papyrifera*) trees reserved within openings were found to have a higher ectomycorrhizal species richness than those outside the rooting zone of reserve trees. Site-specific variables need to be considered in applying green-tree retention, such as the risk of damaging reserve trees, susceptibility to windthrow and other biodiversity objectives for the site. From a timber harvesting perspective, it may be more economical to reserve mature trees in larger patches than in an evenly dispersed pattern throughout an opening.

Commercial thinning is another option to maintain timber flows while sustaining chanterelle harvests. A long-term prospective study on the response of chanterelle productivity to thinning of approximately 50-year-old Douglas-fir and western hemlock stands in Oregon found that although chanterelle productivity drops significantly in the years immediately following stand thinning it rebounds within 6 years and might even surpass pre-thinned levels over time (Pilz et al. 2006). Some of the best chanterelle sites in the Nimpkish Valley were commercially thinned in the past; however, this practice has not been widely adopted likely because of economic constraints in the timber industry.

Enhancing chanterelle production in younger stands also holds promise in accelerating the recruitment of productive chanterelle habitat. Planting seedlings pre-inoculated with chanterelle mycelia soon after timber harvest on suitable sites could result in increased fruiting at a younger age. There has been some success at culturing golden chanterelle (*C. cibarius*) from seedlings (Danell and Camacho 1997). Other mycorrhizal mushroom species, particularly highly valuable truffle species, are widely cultured in plantation settings. Early stand tending could also enhance subsequent chanterelle production. Species selection, stand density, coarse woody debris attributes and amounts, understorey condition, and timing of silviculture treatments are some variables that can be manipulated in attempts to accelerate the development of favourable habitat conditions. The mutual benefits of improved chanterelle production and timber quality need to be evaluated against the associated costs of

silviculture treatments and the potential negative effects of excessive site disturbance.

Comparative stand values

Over the long term, chanterelle production from the best habitat might vary between 5 and 20 kg/ha per year over the total land area generally productive for chanterelles (Liegel 1998). With an average price paid to the picker of \$4.95/kg, the potential value of the chanterelle harvest to pickers ranges from \$24.75 to \$99.00/ha per year. The per-hectare value could be much higher if only the actual area of mushroom patches within the general habitat area were factored into the productivity measurement, and if mushrooms were only sold at the highest price paid in a season. At a field price of \$16.50/kg, for example, the per-hectare value increases to \$330. Pickers who direct market to restaurants can fetch double this price, though this market is currently limited.

Alexander et al. (2002) compared stand value estimates of mushrooms and timber in the United States Pacific Northwest using a method called the Faustman formula, or soil expectation value (SEV) to derive equivalent per-hectare values of mushrooms and timber from the same sites. Using this method, which includes many assumptions about yields, prices, and costs, they found that the discounted present value in perpetuity (SEV) of timber (high-value Douglas-fir in this case) was 12–200 times higher than that of chanterelles for the sites they compared on the Olympic Peninsula in Washington State.

Although the comparative economic values favour timber using this method, the analysis does not reflect other social and environmental values associated with prime mushroom hunting grounds. Alexander et al. (2002) noted that their analysis was for the stand as a whole but point out that, at the scale of an individual mushroom patch and its associated host trees, the value of mushrooms may be greater than the trees over time. Intensive co-management (as discussed above) that identifies and reserves these patches from timber harvest might best optimize the value of land.

Environmental costs are extremely complex to assess, full of uncertainty, and therefore difficult to include in economic analyses. Even though commodity values may be higher for timber than for mushrooms, timber harvesting is more disruptive to forest values, such as fresh water, erosion control, wildlife habitat, and medicinal plants than mushroom picking. Forests managed for mushrooms maintain non-commercial

forest values while providing some economic opportunities. These forests provide not only the value of the food source, but also the value of the experience of foraging for mushrooms. This value may not currently be realized in terms of dollars, but as part of a lifestyle attraction to prospective residents and tourists, it could have real economic value.¹¹

Conclusions

Future development of the wild chanterelle industry on Vancouver Island will depend on global market conditions that dictate prices, a capable labour force (harvesters), and ultimately on the sustainability of wild chanterelle crops. Advancements in cultivation techniques might eventually supplement world supplies, but not in the immediate future. And even if available, plantation-grown chanterelles will not diminish the appeal of hunting for mushrooms in the wild. A British Columbia chanterelle industry has to compete with European industries that have lower production and shipping costs. However, as wild mushroom production has been declining in European forests (Pilz and Molina [editors] 1996), British Columbia might become a more important world supplier of wild chanterelles. As the European and Asian populations, who traditionally eat mushrooms, increase in North America, so too are the domestic markets. With higher prices, there will be a willing labour force to harvest British Columbia chanterelles, as evidenced during the boom years of the pine mushroom industry.

The chanterelle industry on northern Vancouver Island and elsewhere in British Columbia is currently functioning in the absence of any formal management strategy. Recognition for chanterelle and other wild mushrooms in forest planning will help ensure future supplies. Management strategies to enhance wild production and optimize chanterelle and timber yields are needed. Recently some of these information needs are beginning to be addressed. Research examples discussed in this article reflect a growing interest in addressing issues surrounding sustaining wild chanterelle harvests.

Policy proposals

Most picking is done on Crown land, approximately 94% of the land base in British Columbia, although on Vancouver Island there is proportionately more private land. Crown forest land is under the jurisdiction of the B.C. Ministry of Forests and Range. Currently, no tenure

Future development of the wild chanterelle industry on Vancouver Island will depend on global market conditions that dictate prices, a capable labour force, and ultimately on the sustainability of wild chanterelle crops.

or property rights are granted in relation to harvesting wild mushrooms on Crown land.

As with other NTFPs in British Columbia, a lack of any formal property rights, regulations, or policy framework results in few investments being made to sustain or enhance the industry. A large land base coupled with increasing numbers of tourists could, for instance, feasibly support more development in ecotourism involving both the experience of harvesting chanterelles in forest environments and the marketing of locally-harvested mushrooms to visitors and the restaurants they patronize.

Tedder et al. (2002) recommended that the state retain its prescriptive role in administering NTFP resources, but minimize any operational role. Intervention possibilities include harvester education to encourage sustainable harvesting practices and levies against companies who profit from distributing chanterelles with levies re-invested to ensure sustainability of the resource.

Future management strategies should also consider planning, regulation, and enforcement to protect interests of recreational harvesters as conflict between commercial and non-commercial harvesters may increase. Northern Vancouver Island, with its low population, existing forest road network, and large land base capable of producing chanterelles is particularly well-suited to successful commercial development of chanterelles. Economic declines in the primary industries of timber and fisheries could help stimulate interest and investment in other forest resources, including chanterelles. Very little investment is required to harvest chanterelles and there are few barriers to participating in the harvest. Greater attention needs to be focussed on inventory, mapping, technology, and compatible management with timber resources to address future chanterelle supplies.

¹¹ For example, there are guided mushroom hunts on southern Vancouver Island that combine foraging for mushrooms with a gourmet meal.

Note

This series contains information on the ecology and management of non-timber forest products. In promoting implementation of this information, the user should recognize the importance of equitable sharing of any benefits derived from the management and use of this resource as addressed in Article 8(j) of the United Nations Convention on the Conservation of Biological Diversity.

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Test Your Knowledge . . .

*The chanterelle mushroom harvest on northern Vancouver Island, British Columbia:
Factors relating to successful commercial development*

How well can you recall some of the main messages in the preceding Extension Note?

Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. Over 70 species of chanterelles (*Cantharellus* spp.) are recognized worldwide but only three occur in British Columbia.
A) True
B) False
2. Like other forest mushrooms, chanterelles grow quickly and are susceptible to rot.
A) True
B) False
3. Chanterelles require host trees for survival. What is the best age for a stand to provide a suitable host habitat for chanterelles?
A) 10–30 years
B) 40–80 years
C) Old growth

ANSWERS

1. A 2. B 3. B

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Foraging on State Lands

Background Information Presented to the
Minnesota Sustainable Foraging Task Force



- **Review of Foraging on DNR-managed lands:**
 - Wildlife and Aquatic Management Areas
 - State Forests
 - State Parks
 - Scientific and Natural Areas
- **Seasonal and Safety considerations**
 - Road Right of Ways
- **Penalties for non-compliance**
- **Stay Connected (regarding State Parks rules)**

Wildlife and Aquatic Management Areas Overview

AMAs provide angler and management access, protect critical shore land habitat and provide areas for education and research.

700+ AMAs

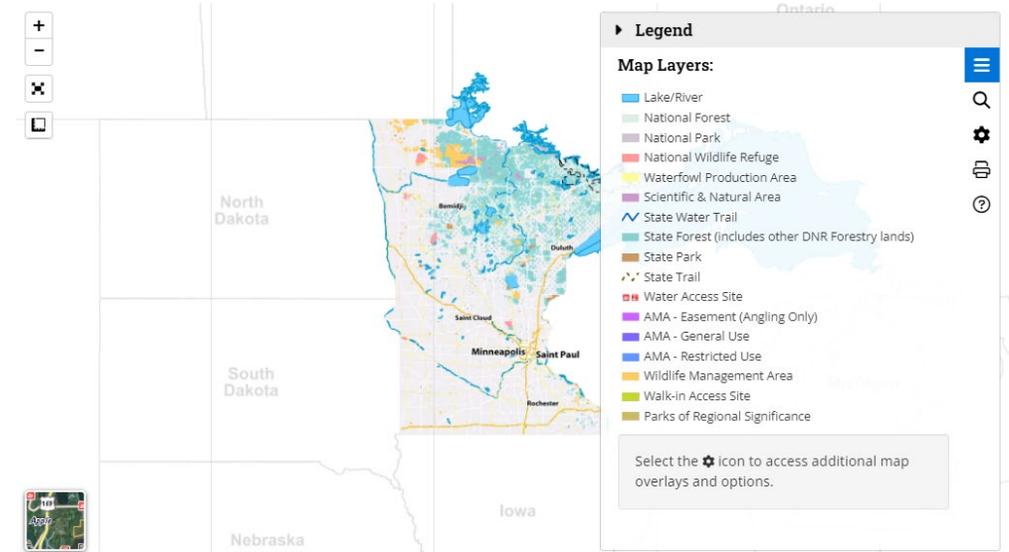
WMAs are for protection and development for wildlife production. These lands are open for hunting, trapping and fishing, along with opportunities such as bird watching, canoeing and other compatible uses.

1,506 WMAs, 1.37 million acres



[Home](#) > [Maps](#) > [Recreation Compass](#)

Recreation Compass



[Terms and Conditions of Use](#)

Wildlife and Aquatic Management Areas

- Individuals can harvest edible fruits, seeds/nuts, and mushrooms for personal use in AMAs and WMAs without a permit.
- WMAs also allow harvesting the decorative portions of plants for personal use without a permit.
- Removal of trees, whole plants, or other vegetative material is not allowed on AMAs and WMAs, except that you may harvest tree sap and dead/ downed trees to be used as fuelwood with proper permits(s) from Wildlife and Forestry.
- Wild rice harvest is allowed on public waters with a wild rice harvesting license (available at ELS agents, where hunting/ fishing licenses are purchased). WMAs and AMAs are open to ricing unless posted as closed.

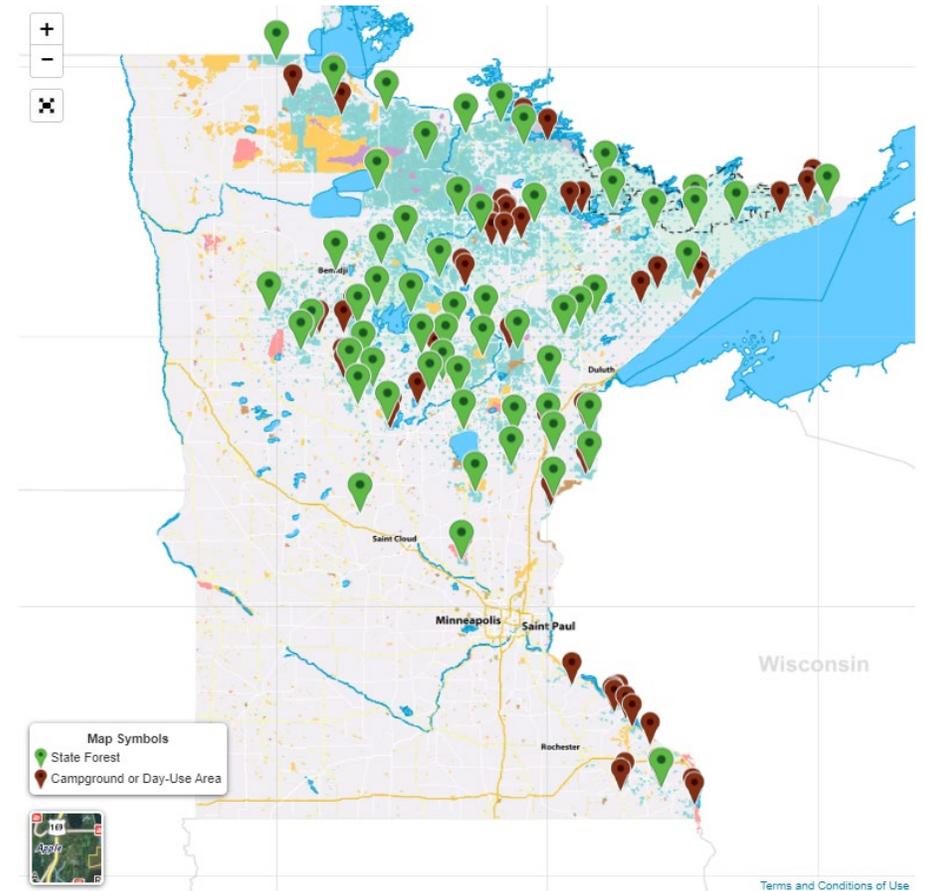
Wildlife management areas (WMAs) are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses.

Aquatic Management Areas (AMAs) are established to protect, develop, and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses.

State Forests Overview

Minnesota forests are managed for sustaining long-term ecosystem integrity, healthy forest economics, and the communities that depend on these resources across multiple ownerships.

60 State Forests; 4.2 million acres



Harvest Permits (for State Forests)

No permit needed to collect small amounts of berries, mushrooms, nuts/seeds or cones from a state forest for personal use.

Large amounts of berries, mushrooms, and seeds (gallons, bushels, etc.), cutting or removing any tree or plant, or any form of commercial harvest all require a household special product permit.

Permits are obtained from the DNR Forestry office near where you plan to harvest.

You need a permit to do the following:

- Cut or remove any trees or plants for any reason, such as: birch bark, trees or shrubs, fiddle head ferns, Solomon's seal, flowers, etc.
- Collect a large amount of berries, mushrooms, or dead fuelwood for personal use or sale.
- Tap trees for syrup for personal use or sale, regardless of amount.
- Harvest Christmas trees, decorative tops, or boughs.
- Harvest decorative forest products, such as birch sticks, spruce tops, boughs, etc.

State Forest Permits

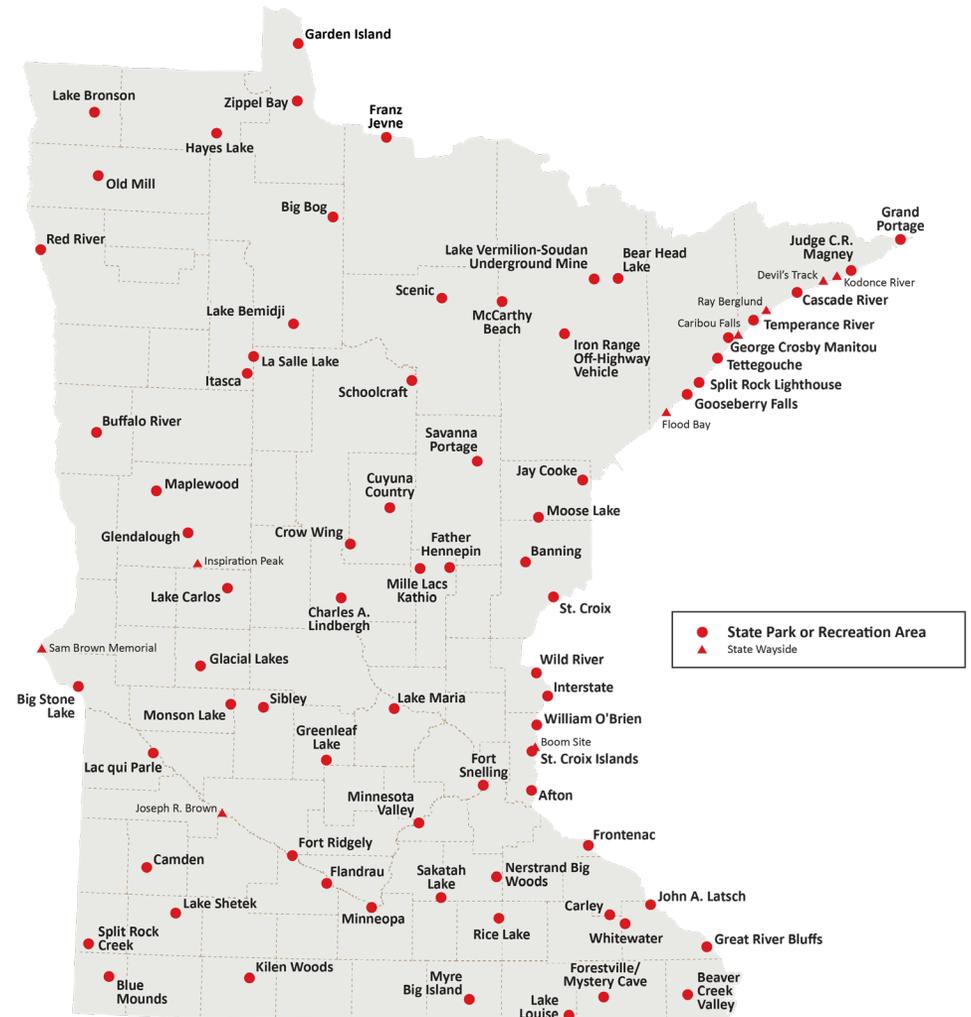
- \$25 minimum special product permit per product for a household from a DNR Forestry office is required to cut, remove or harvest any trees or plants for any reason or collect a large amount of berries or mushrooms.
- **All** commercial harvest or large amounts for personal use requires a permit.
- Permit fees are aligned to current market values.

State forest lands are available for a variety of recreational activities, including hunting, trapping, off-highway vehicle riding, camping, fishing, mountain biking, horseback riding, and wildlife watching.

State Parks Overview

Minnesota state parks and recreation areas preserve the most scenic and historic areas in the state. They offer a variety of facilities, services, and outdoor recreation opportunities. State parks are well developed with modern facilities, but the degree of accessibility varies from park to park.

66 State Parks; 9 Recreation Areas, 235,000 acres



State Parks and Recreation Areas

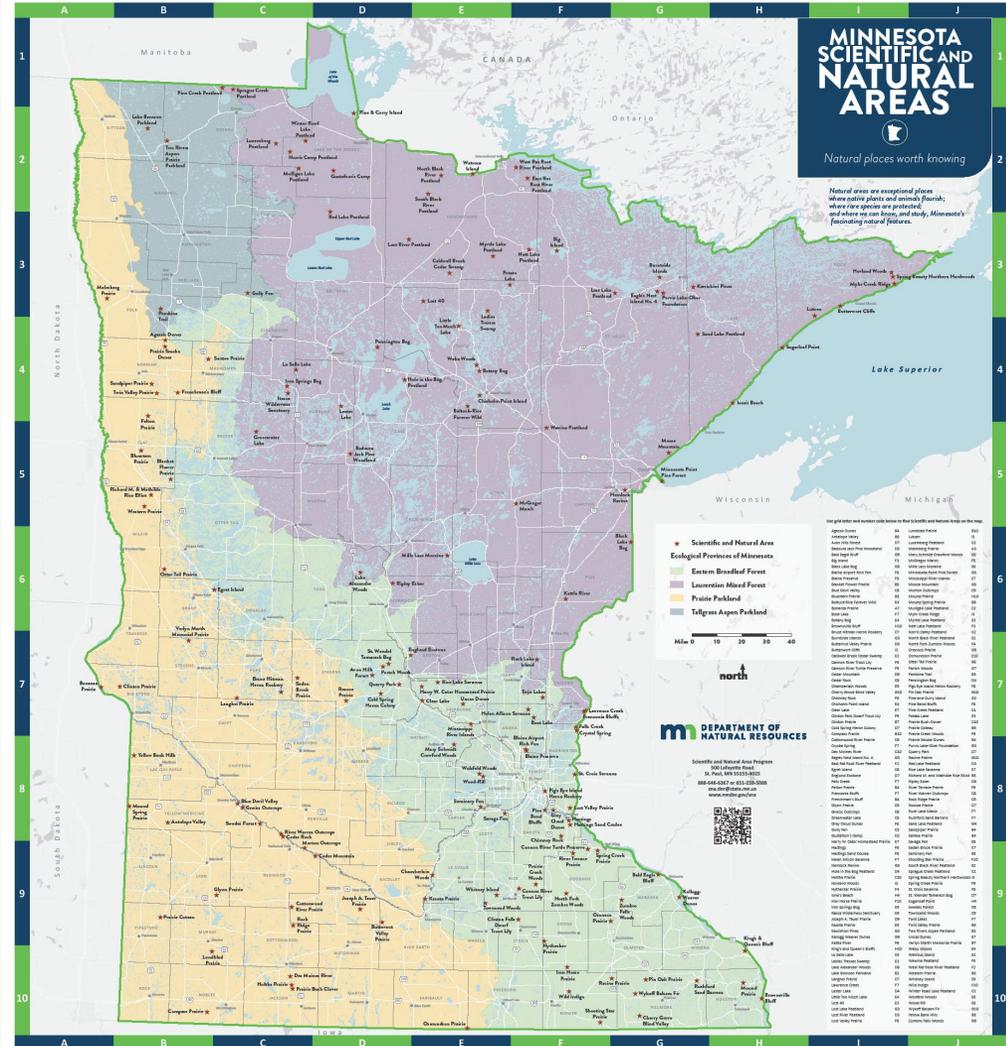
- Visitors can collect edible fruit and mushrooms for personal, non-commercial use.
- It is not allowed to pick wildflowers or other plants (edible or not), even for personal use.

Management shall seek to maintain a balance among the plant and animal life of the park and to reestablish desirable plants and animals that were formerly indigenous to the park area but are now missing. Programs to interpret the natural features of the park shall be provided. Outdoor recreation activities to utilize the natural features of the park that can be accommodated without material disturbance of the natural features of the park or the introduction of undue artificiality into the natural scene may be permitted. Park use shall be primarily for aesthetic, cultural, and educational purposes, and shall not be designed to accommodate all forms or unlimited volumes of recreational use.

Scientific and Natural Areas Overview

Scientific and Natural Areas are exceptional places where native plants and animals flourish; where rare species are protected; and where we can know, and study, Minnesota's fascinating natural features.

168 SNAs
~190,000 acres



Scientific and Natural Areas

- Not allowed at any Scientific and Natural Area:
 - No collecting plants, animals, rocks and fossils
 - Leave plants, animals, rocks, and other natural elements (this includes shed deer antlers) in place to fulfill their life cycle and role in the environment.

Berry and mushroom picking for personal use are allowed at some sites with specific regulations.

Berry picking allowed at:

- Badoura Jack Pine Woodland
- Hovland Woods
- La Salle Lake
- Lutsen
- Moose Mountain
- Myhr Creek Ridge
- Prairie Bush Clover (also includes mushrooms)
- Spring Beauty Northern Hardwoods

Scientific and Natural Areas are exceptional places where native plants and animals flourish; where rare species are protected; and where we can know, and study, Minnesota's fascinating natural features. They protect natural features of exceptional scientific or educational value including:

- native plant communities,
- populations of rare species,
- and geological features.

Safety Considerations

- Improperly identified wild foods can pose serious health risks. Make sure you know how to properly identify and prepare wild foods before eating them and do so at your own risk.
 - Foraging requires a careful understanding of the plants harvested and look alike species.
- Be sure to know where you are when foraging and what those lands permit or prohibit. Minnesota has a diverse landscape of private and public lands.
- Do not harvest from private property without written landowner permission.
- Be careful to avoid spreading invasive species.

Road Right of Ways

- Due to safety concerns for all, MN DOT does not allow harvesting/foraging within road rights of way.
- Broadly discourages harvesting of plants along roadsides, due to:
 - Soil disturbances can cause erosion;
 - Plant population effects and potential overharvest;
 - Concern for sale of products, and
 - Potential consumption of herbicides used to control noxious weeds (required under M.S. 18D) and heavy metals.

Penalties for Non-compliance

- Foraging rules and laws are complex, please be sure what you are harvesting and where you are foraging.
- Consider local rules and regulations to be sure you are foraging safely and legally.
- On state lands, non-compliance may result in a misdemeanor and immediate removal from the park or forest lands and revocation of any permits issued and possible fines.
- On SNAs, non-compliance may result in a petty misdemeanor and fine of up to \$300/violation.
- Ginseng may not be harvested on an AMA and only on a WMA with a special use permit from the Area Wildlife Supervisor.
 - Currently, the only WMA open to ginseng harvest is Whitewater WMA.

Stay Connected

- Parks and Trails rules for recreational activities - including harvesting - in state parks, state recreation areas, state trails and forest lands are being revised.
- The proposed rule changes are not yet available for review.
- For updates, please visit our webpage and sign up to receive notifications.

https://www.dnr.state.mn.us/input/rules/parks/rule_revisions.html

The screenshot shows the Minnesota Department of Natural Resources website. The header includes the logo and navigation links for Recreation, Destinations, Nature, Education & Safety, Licenses, Permits & Regulations, Events & Seasons, and About DNR. The main content area is titled "Possible Amendments to Rules Governing Use of State Parks, State Recreation Areas and Waysides, State Trails, and Forest Lands". It includes a sidebar with links to "Active rulemaking projects" (Fisheries, Use of state parks and other recreational areas, Wildlife), "Background information" (Commissioner's orders page, Natural Resources Rules, Types of Rules Processes, Overview of permanent rulemaking process, Minnesota rulemaking manual, Annual Report on Obsolete, Unnecessary, or Duplicative Rules, Annual Report on), and "What are these rules about?". The main text explains that these rules govern recreational use and lists purposes such as addressing emerging activities, integrating rules, providing common definitions, and responding to changing visitor needs. It also identifies who might be affected by the changes, including individuals and organizations using these lands for special events and commercial purposes.

Questions?



Minnesota Sustainable Foraging Task Force

Centennial Office
Building
St. Paul, MN 55155
Phone: 651-296-0099
www.ser.mn.gov

Date: September 9, 2025

To: Members of the Minnesota Sustainable Foraging Task Force

From: Nick Nero

RE: Minnesota Foraging Laws and Regulations

Memorandum

Minnesota:

Noxious Weed Law	Minn. Stat. § 18.75-91 (2009)	Noxious Weed: “an annual, biennial, or perennial plant that the commissioner designates to be injurious to public health, the environment, public roads, crops, livestock, or other property.” Eradicate: “to destroy the aboveground and belowground plant parts of noxious weeds by a lawful method, which prevents the maturation and spread of noxious weed propagating parts from one area to another.”
Wild Rice Harvesting	Minn. Stat. § 84.091-152 (2016)	Establishes power for commissioner to regulate, creates harvesting season (August 15 – September 30), and protects Native Minnesotans’ harvesting rights
Wild Ginseng	Minn. Stat. § 84.093 (2008)	“The commissioner may establish rules including seasons for harvesting to conserve wild ginseng.”
Wild Ginseng Regulations	Minn. Admin. Rules Chapter 6282 (2008)	Establishes rules for where, when, and how wild ginseng may be harvested. Creates structure for wild ginseng dealers and exportation

Foraging Regulation	Minn. Admin. Rules Part 6100.0900, subpart 1 (2008)	“Unless otherwise provided by law, no person in a state park or forest recreation area shall disturb, destroy, injure, damage, deface, molest, or remove any state property, including, but not limited to, wildflowers or vegetation of any kind dead or alive, ruins, wild animals, geological formations, historical or archaeological artifacts or sites, historic structures, signs, or facilities, except edible fruit, mushrooms, legally taken wild animals, and vegetation unavoidably damaged or destroyed by the ordinary recreational uses of these areas as specifically permitted by parts 6100.0100 to 6100.2400 . Collections for scientific and educational purposes may be made only with the written permission of the commissioner. It is unlawful to damage vegetation or damage and deface rock formations with rock-climbing equipment.”
	Minn. Admin. Rules Part 6100.0900, subpart 2 (A)	“Within a state park, collecting, harvesting, or taking a tangible object for resale or commercial use is prohibited, except by written permission of the commissioner. The commissioner may further restrict collecting, harvesting, or taking a plant, animal, or other tangible object for scientific, educational, commercial, or any other purpose if the commissioner finds it necessary for the protection of the park's resources.”
	Minn. Admin. Rules Part 6100.0900, subpart 2 (E)	Collecting or possessing naturally occurring plants in a fresh state in state parks is prohibited, except that edible fruit and mushrooms may be harvested for personal, noncommercial use.
Native Foraging Rights in Northern Minnesota	1854 Treaty	“And such of them as reside in the territory hereby ceded, shall have the right to hunt and fish therein, until otherwise ordered by the President.”

Nationally:

Foraging Prohibited (without permission or permit):

Alabama	Ala. Code 220-5-07
Arizona	Ariz. R12-8-103
Arkansas	Ark. Park Directive, No. 3150
California	CCR 4306
Colorado	2 CCR 405-1
Delaware	Del. Admin. Code, 9201 § 17-5
Florida	Fla. Rule, 62D-2.013
Georgia	Ga. Admin. Code, 391-5-1-.04(1)(c)
Idaho	Idaho Admin. Code, IDAPA 26.01.20 § 175 (09)
Kentucky	KRS § 433.750
Louisiana	LAC 25:IX.303
Maryland	COMAR 08.07.06.13
Massachusetts	302 CMR 12.04 (21)
Mississippi	40 Miss. Admin. Code Pt. 6, R. 1.2, O, 1
Montana	ARM 12.12.106 (a)

Nebraska	167 NAC 6 § 001.02B
Nevada	Nev.Rev. Stat. § 527.050
New Jersey	N.J.A.C. 7:2-2.10
New Mexico	NM Stat. § 16-2-32 NM Admin. Code 19.2.19.18, A(2)
New York	6 CRR-NY 190.8 (g)
North Carolina	02 NCAC 60B.1028
North Dakota	NDAC 58-02-08-10
Ohio	OAC 1501:46-3-27.
Rhode Island	250 RICR 100-00-7.20
South Carolina	S.C. Code Ann. § 51-3-140
South Dakota	ARSD 41:03:01:05
Texas	31 TAC § 59.134 (l)(1)
Utah	Utah Admin. Code R651-620-2
West Virginia	W.Va. Leg. Rule § 58-31-2, 2.1
Wyoming	Wy. Rules, State Parks & Historic Sites, ch. 1 § 15 (d)

Foraging for Personal Use Allowed:

Alaska	11 AAC 96.020 (a)(3)(B)
Connecticut	Solely mushroom foraging permitted. Conn. Stat. § 23-4 (b) .
Hawaii	HAR § 13-146-32
Illinois	Prohibited in nature preserves: Illinois Natural Areas Preservation Act, 525 ILCS 30/23 Permitted in state parks: 17 IAC § 110.70
Indiana	312 IAC 8-2-10
Iowa	DNR
Kansas	KAR § 115-8-20 (4)(F)
Maine	Permitted on Maine's Public Lands: Bureau of Parks and Lands Prohibited in state parks: 1 CMR 670, ch. 1 (1)
Michigan	DNR
Missouri	3 CSR 10-11.135
New Hampshire	No law directly prohibits: NH State Parks
Oklahoma	Okla. Stat. tit. 61 § 335
Oregon	Oregon State Parks
Pennsylvania	17 PA. Code, Subpart C, Section 21.115 (b)(1)

Tennessee	Tennessee State Parks
Vermont	10 V.S.A. § 4.1(e)
Virginia	4 VAC 5-30-50
Washington	WAC 352-28-030
Wisconsin	NR 45.04(1s)(a)4

Please reach out with any comments or questions. I can be reached at nick.nero@lcc.mn.gov or (651) 296-6033.

Foraging on state forest land

Foraging rules vary depending on the type of state land you are on – so it’s important to know if you’re visiting a state forest, a state park, or another type of land. Minnesota has 4.2 million acres of state forest land, with many opportunities to safely, sustainably, and legally forage wild edibles.

In Minnesota state forests, you do not need a permit to:



Harvest small amounts of edible mushrooms for personal use



Harvest small amounts of edible berries for personal use

To harvest plants, you will need a **special product permit** from a local DNR Forestry office.

Foraging is more limited in Minnesota state parks. Interested in what you can forage in a state park? Visit mndnr.gov/state_parks/harvesting.html

Foraging permits for state forest lands

You need a special product permit to:

- Collect berries, mushrooms, nuts, seeds, cones, or dead fuelwood in any amount to sell (all harvesting for commercial use requires a permit).
- Cut or remove any trees or plants for any reason (personal or commercial use), such as: birch bark, trees or shrubs, fiddlehead ferns, Solomon’s seal, flowers, etc.



How to get a special product permit

Visit or call the DNR Forestry office closest to the state forest where you want to harvest.

Forestry Office Locator:

mndnr.gov/contact/locator.html?unit=FOR

Note: The downtown office in St. Paul does not sell special product permits.

To get a permit, you will need to provide:

- Your name, and the name of anyone else in your household who wants to harvest.
- The location where you want to forage.
- What you want to harvest.
- How much you want to harvest.
- Payment for the permit fee with a check or money order (the minimum fee is \$25.00, but it varies depending on species and amount desired).
- Cash and credit cards are not accepted.

Learn more by visiting

mndnr.gov/forestry/harvest-permits-state-lands.html or scan

the following QR code:



Foraging Permit Application

Phone: [651-430-8370](tel:651-430-8370)

Email: Parks@WashingtonCountyMN.gov

About foraging

If you are interested in foraging in Washington County Parks, you will need to apply for a free foraging permit.

1. Permit is free.
2. Available annually April through October during normal park hours (6 a.m. - 10 p.m.). Applicants must apply every year.
3. Apply online or in-person at a park office.

Foraging Guidelines

By submitting this form, I understand and agree to follow these foraging best practices:

- For your safety and to protect plant habitats, **only forage in areas that are clearly marked as allowed.**
- **You are responsible for correctly identifying plants.** Some poisonous plants look similar to edible ones, so be careful!
- **Know the right season to harvest each plant or mushroom.** Picking at the right time helps keep the plants healthy and ensures they are safe and good to eat.
- **Only take what you plan to use.** Leave some behind for wildlife and to allow the plants and fungi to grow back for future seasons.
- **Use the proper tools** and harvest in a way that causes as little harm to the environment as possible.
- **Do not dig up roots.** You may only collect fungi, berries, nuts, seeds, flowers, and leaves. Avoid disturbing the soil to help prevent the spread of invasive species.

Foraging for commercial purposes is not allowed in Washington County Parks.

By completing this form, I agree to follow these guidelines with applicable park rules and ordinances: _____
(initial here)

Foraging Release of Liability and Waiver Agreement

Participant and/or Parent or Legal guardian must read and agree to the below waivers and disclaimers.

I know that participating in this activity can be potentially hazardous. I should not participate unless I am medically able. I understand the nature of and assume all risks associated with my voluntary participation in foraging including, but not limited to, falls, contact with other participants, the effects of the weather, including extreme temperature and precipitation, ingestion or other use of edible wild mushrooms and any other foraged flora, and traffic. Knowing these facts, I, for myself, heirs, executors, administrators or anyone else who might claim on my behalf, covenant not to sue and WAIVE, RELEASE AND DISCHARGE Washington County, its employees, or volunteers, and any officials affiliated with Washington County's sponsors, volunteers, their representative, successors or assigns for ANY AND ALL claims or liability, whether seen or unforeseen, for death, personal injury, or property damage arising out of, or in the course of, my participation in foraging. I further grant full permission to Washington County and named businesses and concerns, and/or agents authorized by them, to use any photographs, video tapes, motion pictures, or other record of the event for any reasonable purpose, including promotional purposes.



I certify that to the best of my knowledge and belief, I am in good health and able to tolerate the ingestion of edible wild mushrooms and any other foraged flora and the physical exertions required to collect them. I am not aware of any physical, psychological, or medical condition that poses unreasonable danger to me or other participants in foraging activities.

I agree that the material on the Washington County website and in other Washington County information on foraging is presented for general informational and educational purposes only, and under no circumstances is to be considered a substitute for identification of an actual biological specimen by a person qualified to make that judgment.

I affirm that if I am not entirely confident of the identification and edibility of a particular fungal specimen or any other foraged flora, I will seek knowledgeable assistance before sharing it with any others or using or consuming it myself.

Signature: _____ **Date:** _____

Printed Name: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____ **Email:** _____

For minor participants (if any), please include below:

Name: _____ **Name:** _____

Name: _____ **Name:** _____

Optional: Are you interested in receiving an optional survey about the items you collected and where you foraged?

Yes or No (circle your answer)

Washington County Parks Foraging Permits

Seasonal Foraging Times

April—October

To ensure sustainable harvesting timeframes and safe planning for restoration projects such as prescribed burning and invasive shrub removal.

During Park Hours, 6am—10pm



Only Forage in Designated Areas

Maps available online or in-person

To protect foragers, active restoration areas, and sensitive plant communities.

Locations

- Lake Elmo Park Reserve
- St. Croix Bluffs Regional Park
- Cottage Grove Ravine Regional Park
- Point Douglas Park
- Square Lake Park
- Pine Point Regional Park

Free to Apply

Online, or in person at a Park Office

Also, opt in to receive an end-of-the-season survey to share parks you foraged and what you harvested. This survey will serve as an educational research tool for future foraging initiatives.

parks@washingtoncountymn.gov

651-430-8370

Washington
County

Sustainable Foraging Task Force



Meeting 3: October 8th, 2025

Welcome and purpose

- Welcome
- Adoption of previous meeting minutes
- Purpose and duties of Task Force

Purpose of Task Force

Gather and review information on the impact of foraging on species resilience, ecosystem health, and other aspects of Minnesota's biomes, solicit public input when appropriate, and develop recommendations for foraging guidelines reduced-price foraging permits.

Recommendations must be specific, actionable, and consistent with Indigenous and other cultural practices and traditions.

The task force must submit a written report to the commissioner of natural resources and to the chairs and ranking minority members of the legislative committees with primary jurisdiction over natural resources policy.

The recommendations must detail proposals for changes or additions to statute or rules.

Duties of Task Force

- **gather and review data and information**, including **traditional ecological knowledge**, on the **impact of foraging** on species resilience, ecosystem health, and other aspects of Minnesota's diverse biomes;
- **review existing regulations** governing foraging activities on **state lands**;
- **develop recommendations** for science-based, including traditional ecological knowledge, **foraging guidelines for state lands** that balance public access and foraging opportunities with conservation needs. The recommendations must be in the form of **draft statutory or rule language and must be consistent with Indigenous and other cultural practices and traditions**;
- develop **recommendations for increasing public understanding of sustainable foraging practices** that include safety and ecological considerations;
- **solicit public input**, when appropriate; and
- develop **recommendations for reduced-priced foraging permits**.

Task Force meetings

Meeting	Purpose/focus (<i>italics: tentative or details to be confirmed</i>)
1. August 20, 2025 – noon-2:00pm	Learning: foraging basics
2. September 9, 2025 – 10:00am-noon	Learning: MN and other states' statutes & rules
3. October 8, 2025 – noon-2:00pm	Learning: DNR information; MN foraging history and context
October 20, 2025 – 10:00am-noon	Foraging field trip, Ft. Snelling State Park
<i>Dates/times TBD (likely Oct., Nov., Dec.)</i>	Public listening sessions for input from members of the public
4. October 21, 2025 – 10:00am-noon	Learning: <i>foraging practices (including indigenous perspectives)</i>
5. November 18, 2025 – 10:00am-noon	Learning: <i>foraging practices (including indigenous perspectives)</i> ; Recommendations: ideas, including those noted in meetings etc.
6. December 2, 2025 – 10:00am-noon	Recommendations: create and discuss; <i>additional learning</i>
7. December 16, 2025 – 10:00am-noon	Recommendations: discuss and refine; <i>additional learning</i>
8. January 6, 2026 – 11:00am-1:00pm	Recommendations: refine
9. January 27, 2027 – 10:00am-noon	Recommendations: finalize
10. February (date and time TBD)	Report: discuss draft

Agenda

- Welcome and purpose
- Agenda and introductions
- Task Force member interview results
- Adopt charter
- Presentation: Information from DNR
- Presentation: MN Foraging history and context
- Discussion: Scope of task force
- Next steps
- Public input
- Adjourn

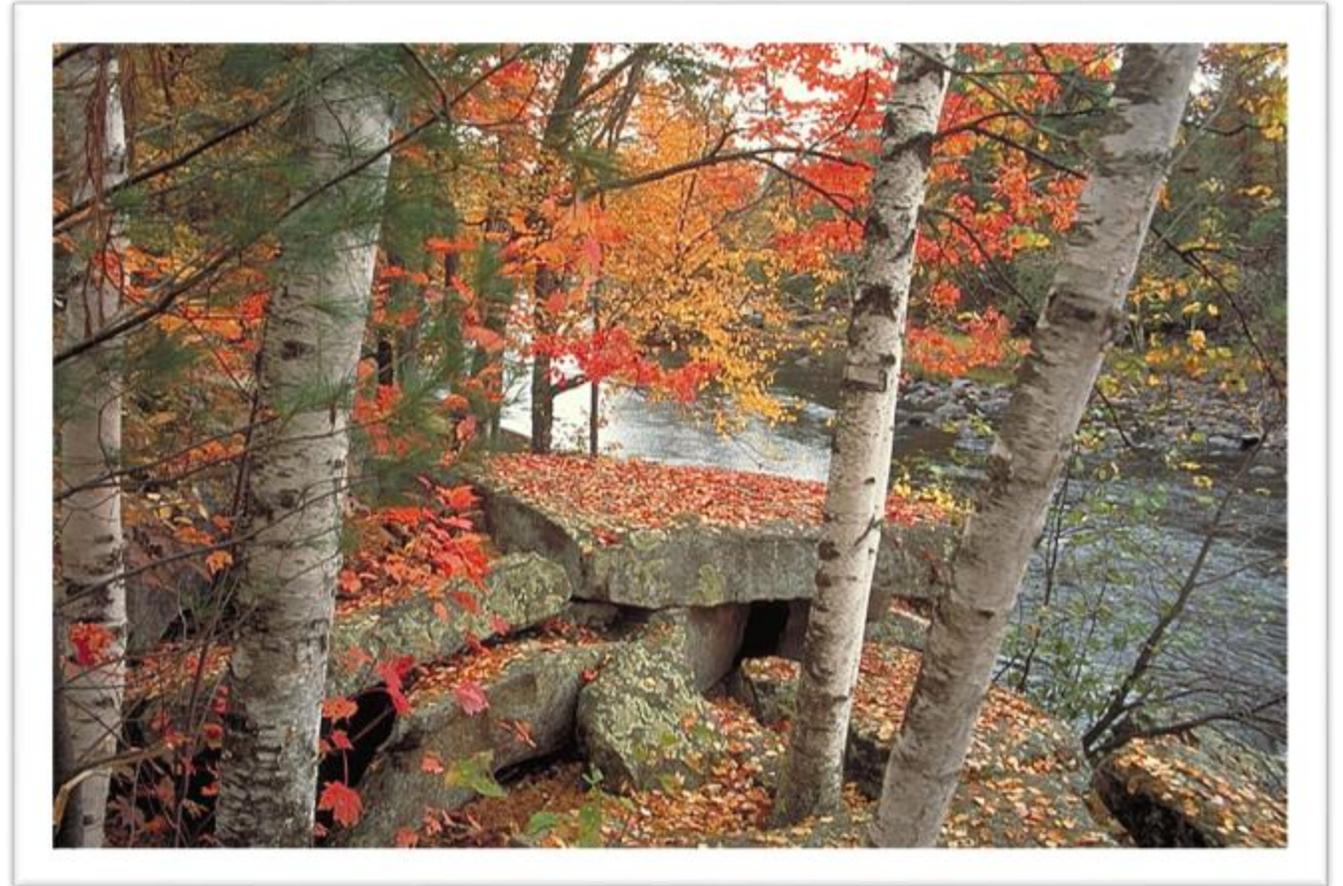
Introductions

- Name and organization



Interview results

- 13 of the 17 members responded to interview invitations
- Results are themes that emerged



Known context

DNR lands: 5.6 million acres, 4 biomes, 59 state forests, school trust acres, forested lands, 1800 wildlife management areas, 66 state parks, nine recreation areas, 9 waysides, 166 scientific and natural areas, 700 aquatic management areas. **Managed by different divisions within DNR and each have different goals, laws, statutes, and rules**

[MN DNR Background Info \(Task Force Mtg. 1, 8-20-25\)](#)

Foraging occurs for a variety of reasons – food, medicine, recreation, art, and cultural purposes.

More people on lands requires more resources to monitor and educate.

Foraging may not be perceived by all stakeholders as a legitimate recreational activity on state lands, like hunting or fishing.

Scope

What's in?	Unknown	What's out?
<ul style="list-style-type: none">• State lands• Personal use• Terrestrial plant species• Mushrooms	<ul style="list-style-type: none">• County managed state land• Aquatic plant species (e.g., cat tails)• Non-food plant species (e.g., birch bark, spruce tops)• Aquatic species (e.g., invasive crayfish)• Insects	<ul style="list-style-type: none">• Tribal, Federal, and private lands• Commercial use• Maple syruping and wild rice (given already established rules and regulations)

Scope – additional considerations

- Native, near native versus non-native or invasive species
- Species that may be particularly impacted by climate change
- *“Two sides of the coin – a) accessibility for everyone and b) species longevity and diversity. Both have value.”*



Success: Shared hopes

- Clear, simple recommendations resulting in accessible foraging on state lands.
- Recommendations accepted by DNR and legislature.
- Balanced, finding middle ground
- Support for cultural practices, including those of MN tribes

Hope we can provide suggestions for new rules or new guidance that is clear and understandable, meets the recreational needs/desires of multiple groups.

That legislature can act upon recommendations. Be very thoughtful that they are as specific as possible so that they're actionable.

Have recommendations that are acceptable to both pro-foraging open access and natural resource managers that want to conserve.

There are certain culturally significant species for our task force to be aware of.

Tensions: Shared concerns

- Balancing accessibility now, with conservation long term
- Balancing individual rights today, with protection for tomorrow

Not erring too far in either direction. Trying to protect nature by keeping us out of it, or foraging rules too wide and not being good stewards. Thoughtful, clear approach. "I do think we can come up with something that allows humans to forage and also allows nature to thrive."

Some might consider sustainable foraging to mean very limited quantities and locations. Others might say we've been foraging in Minnesota for 100 years and haven't seen any species being affected. If not detrimental, why do we need rules and regs? "Don't make rules – we've been doing it and doing fine". Finding that balance.

Important Actions for Consideration

- Defining **key terms** (e.g. sustainable foresting, boundary of personal use)
- Clarify how **different rules apply to different lands**
- Determine when a **permit** is needed
- Explore **certification or education programs** (model from other outdoor recreation programs)
- Explore potential **ripple effects** of expanded foraging (good and bad)
- Consider **whether different rules, rights or restrictions** apply to different groups/foraging purposes (e.g., tribal or non-tribal members, food or medicine)
- Consider development of **standard criteria that would trigger limits on foraging**
- Recognize that we are **not going to solve all of the issues** across the landscape... and what we come up with may be **the best for now**, but not appropriate in 5 years

Themes related to task force operations

- Charter: No modifications suggested.
- Suggestions that each meeting include a reminder of:
 - Task force purpose and member duties
 - Operating agreements
- Perspectives: individual; representing an organization
 - Appointees selected by organizations based on knowledge and expertise
 - Knowledge and expertise are grounded in the organizations members represent – but members are not necessarily speaking *for* their organization
 - Members should feel empowered to share their opinions and expertise – and indicate if they are speaking formally on behalf of the organization they represent
 - If the TF needs formal/official DNR perspective, this will be requested from the TF DNR liaisons (Bob Meier and John Waters)

Adopt Task Force charter

Key sections

- Meetings
- **Operating agreements**
- **Ending discussion and reaching closure**
- Dispute resolution
- Subcommittees
- Roles – duties

Operating agreements

- Say your name before speaking
- If online, cameras on whenever possible
- Come to meetings prepared. Review agenda and materials in advance.
- Take space, make space
- Refrain from side conversations
- Show respect to members and presenters
- Be open-minded and curious about others' opinions, viewpoints, and lived experiences
- Recognize that time or research may be needed before questions are answered
- Focus on the issue, not the people
- Assume good intent but acknowledge harm

Ending discussion and reaching closure

Task force discussions will seek consensus using a gradients of agreement scale, such as the [Fist to Five](#) tool to ensure the six duties of the task force are executed and for internal task force processes, such as approving this charter.

A formal process to finalize the complete list of recommendations developed by the task force will be followed:

- Voting will only take place if a simple majority of members is present.
 - As of the current charter draft, 17 members have been appointed; the presence of 9 members represents quorum
 - With all 19 members appointed, the presence of 10 members will be a simple majority and represent quorum
- Each member shall have one vote, regardless of their affiliation or role on the task force
- There is no voting by proxy
- Participants can choose to abstain from a vote
- Decisions will be finalized when 80% of voting participants indicate agreement
- Every effort will be made to address members' concerns before decisions are made

While these recommendations are advisory, the task force's input will inform the decisions of DNR staff, the commissioner of natural resources, and legislative committees with primary jurisdiction over natural resources policy.

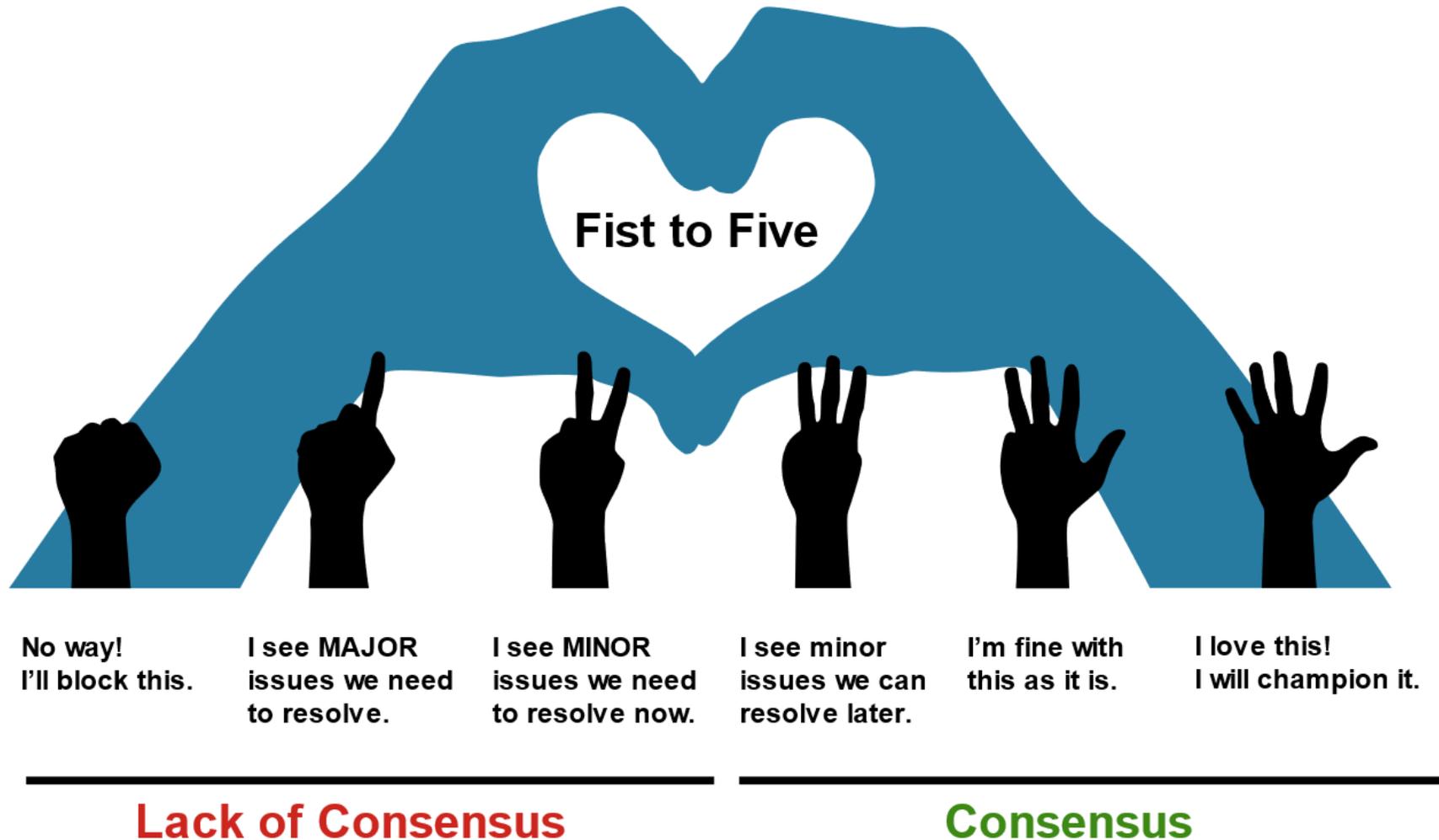
Adoption of charter

- Questions or concerns?
- Vote
 - Yes = adopt the charter
 - No = do not adopt

DNR Presentation

MN foraging history and context

Discussion: Scope of task force



Discussion: Scope of task force

ALL IN

- State lands
- Personal use
- Terrestrial plant species
- Mushrooms

Fist to five: **Agree** these are **IN scope** for the TF

Discussion: Scope of task force

ALL OUT

- Tribal, Federal, and private lands
- Commercial use
- Maple syruping and wild rice (given already established rules and regulations)

Fist to five: **Agree** these are **OUT OF scope** for the TF

Discussion: Scope of task force

Proposed
OUT

- County managed state land
- Aquatic plant species (e.g., cat tails)
- Aquatic animal species (e.g., invasive crayfish)
- Non-food plant species (e.g., birch bark, spruce tops)
- Insects

Fist to five (each): **Agree** this is **OUT OF scope** for the TF

Next steps

- **Field trip**

- October 20, 10am-12pm at Fort Snelling State Park
- Watch for an email with details about the visit

- **Listening sessions**

- Four, 90-minute sessions
- Three online, one in person
- Regionally focused
- Task force member role:
 - Help **promote**
 - Join **one** as an observer

Listening sessions typically include:

- Pre-published questions to help testifiers organize their thoughts
- Short presentation on task force purpose, efforts so far, etc.
- Testimonies; individuals are asked to provide name and contact info in case TF wants to follow up

Listening sessions will be recorded

Public input

- Welcome! Please introduce yourself:
 - Name
 - Location/region
 - Group/organization/community you represent (if applicable)
- Ground rules
 - Limit comments to 2 minutes (additional information in writing is welcome)
 - Respect and appreciate diversity of thought
 - Focus on ideas, not people
 - If you disagree, disagree respectfully
- Reminder: this meeting is open to the public, livestreamed and being recorded

Adjourn

- Adjourn

Thank you

Foraging

What is foraging?

Foraging means collecting wild resources such as plants, fungi, nuts, and berries. Centuries ago to today, people practice foraging as a way to get food and find medicine. Foraging remains a valuable practice across cultures to connect with nature and be self-sufficient.

Washington County Parks Ordinance #218 **(PDF)**

All foraging activities must conform to [Parks Ordinance #218, Chapter V, Section 1 – Natural Resources \(PDF\)](#) on page 17:

“It shall be unlawful for any person to forage or gather flora without a use permit, including but not limited to fungi, berries, nuts, seeds, and oil. Foraging activities must be for personal use and in designated areas.”

Apply for a foraging permit

If you are interested in foraging in Washington County Parks, you will need to apply for a free foraging permit.

- Permit is free.
- Available annually April through October during normal park hours (6 a.m. - 10 p.m.).
- Apply online or in-person at a park office.
- Applicants must apply every year.



Where you can forage

Each park has specific foraging areas. These designated areas help protect nature and keep people safe. Some parts of the parks are off-limits because of land restoration or maintenance

activities like mowing, spraying, or controlled burns. These may change from year to year. Check the latest foraging area map before you go.

- **Lake Elmo Park Reserve:** Designated areas include parkland east of the main entrance road to Lake Elmo and the park boundary, and south of the Nordic Center to the park boundary. The one excluded area is a farm field. [See image of LEPR map \(JPG\)](#).
- **Cottage Grove Ravine Regional Park:** Designated foraging areas include parkland south of the main entrance road, then east of the of Ravine Landing building and parking lot to the park boundary. The natural area between the playground and kayak launch is also included. [See image of CGRRP map \(JPG\)](#).
- **Pine Point Regional Park:** Everything north of the Gateway State Trail is a designated foraging area. [See image of PPRP map \(JPG\)](#).
- **St. Croix Bluffs Regional Park:** Designated foraging areas include parkland south of the main entrance road and boat launch to the park boundary. [See image of SCBRP map \(JPG\)](#).
- **Square Lake Park:** The whole park is open to foraging. [See image of SLP map \(JPG\)](#).

Where you *cannot* forage

- **Big Marine Park Reserve:** No foraging is permitted at this time due to upcoming projects and plant surveys.
- **Long Lake Conservation Area:** No foraging is permitted at this time.

Safety reminder

Be aware of tick exposure while foraging. [Read more about ticks.](#)

Contact Us

Washington County Parks

A division of the Public Works Department

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Minnesota Sustainable Foraging Task Force

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Phone: 651-296-0099
www.lcc.mn.gov/foraging/

Date: December 16, 2025
To: Minnesota Sustainable Foraging Task Force
From: Nick Nero, Research Analyst
RE: Submitted Written Testimony

Written Testimony

Gregory Oja

I forage for mushrooms and berries on public lands. Fyi, in Finland, a person can forage on any land regardless of ownership. I could see where commercial scale harvesting on public lands should be looked at for regulation, but I would advise against requiring permits and/or licenses for foraging for personal use. Also, please remember that the indigenous peoples have treaty gathering rights that cannot be infringed upon.

Jennie Stackhouse

I believe that foraging should be allowed on public land AND remain unpermitted for recreation and personal use. Foraging is something that is done by many cultures, people from all backgrounds and encourages people to get outside. I believe that permitting could ultimately create a road block for people and limit their use of public lands.

Foraging is also a fun hobby for all ages. I remember looking for plants and mushrooms as a child. I would go every year to my special spot and see if the morels popped up yet. It was exciting to find one but also exciting to find something new as I was looking around. This hobby is one of the reasons I grew up playing in the outdoors and eventually made my career in the field of natural resources. Now I enjoy harvesting in all seasons and learning different types of plants, mushrooms and their uses. Although, I don't always go out with the intention of foraging, but may find something on my hike that I want to identify and/or take for personal use. If I needed a permit and didn't have one, would I get fined when I get back to my vehicle? I think the concern of getting in trouble would start to discourage people from foraging at all, which would limit the fun of learning plants and mushrooms.

Teaching sustainable harvesting techniques would be a better practice than permitting. Permitting doesn't teach anything and seems like putting natural resources behind a pay wall. My suggestion would be to teach sustainable harvesting in an online class leading to certification (similar to DNR Hunter-Safety course). Organizations that already teach sustainable harvest, like Minnesota Mycology Society, could be collaborated with for creating a training. This sustainable harvest training would be required for people that harvest large quantities for commercial or business use. It would be optional (but still encouraged) for those taking items for personal use. Most people naturally know this practice, especially indigenous people and those that forage for personal use near their home. Plants and mushrooms are gifts from nature that can grow plentiful, but usually only when sustainably harvested.

Please take this letter into consideration for providing input to the DNR.

Tim Charles

Hi, I'm a resident of St Paul MN and I want to voice my support for maintaining foraging access to the public on State lands. Foraging on state lands is important to me as I don't own property to forage on, as well as state parks and managed areas are much closer and more convenient for access. I fully support a permitting system that would include a best practices training program to teach people how to not overharvest, as well as to raise awareness about controlling invasive species. MN has done these things for anglers and hunters, it's time for foraging to be added to the list of ways Minnesotans can get out and enjoy our beautiful state.

Mary Jo Peterson

Good afternoon. I am writing to say that we pick blueberries wherever we can find them in Minnesota. We live in Mille Lacs County on Lake Mille Lacs. While we are willing to drive all over to pick berries, it would be nice to be able to pick inside of our state parks. Michigan provides burn maps and years they were burned to help blueberry picking, mushroom and other berry pickers as well as hunters. If MN did that it would make it so much easier for foragers and hunters to be successful.

Thomas E. Casey, Friends of Minnesota Scientific and Natural Areas, Inc.

Friends of Minnesota Scientific and Natural Areas is a Minnesota non-profit, tax exempt corporation whose mission is to advocate for the establishment, use, management, and perpetuation of Minnesota's scientific and natural areas in an undisturbed natural state.

Legislative Recommendations

Recognizing that the Legislature requested recommendations that are “... science-based, including traditional ecological knowledge, foraging guidelines for state lands that balance public access and foraging opportunities with conservation needs ...” (Chapter 1, Article 4 Section 24, First Special Session, 2025), we respectfully request the proposed “sustainable foraging” legislation include:

A. Reaffirm that foraging is prohibited on Minnesota Scientific and Natural Areas.

As explained on page 2 of this document, foraging is prohibiting on scientific and natural areas.

B. Other State Land (state parks, wildlife management areas; state forests, etc.)

1. Prohibit all foraging in state parks.
2. Prohibit foraging for commercial use on other state lands, except under license.
3. Establish a moratorium on foraging on state land for any state-listed “special concern” species and other species where science is lacking on what constitutes an ecologically sustainable harvest.
4. Subject to #3, establish harvest limits for commercial and personal use for all foraging activities on state lands, consistent with ecological sustainability of the resource.

C. Licensing

1. Where foraging is not otherwise prohibited, a license shall be required for all commercial foraging and restricted to Minnesota residents.
2. All commercial licensees shall report the species and amount collected each season.
3. Establish a voluntary registration program for non-commercial foraging.

D. Funding – Establish adequate funding for DNR to:

1. Hire botanist/ecological position(s) to:
 - a. Define ecologically sustainable harvest limits;
 - b. Develop a public awareness program on sustainable foraging; and
 - c. Research foraging impacts, develop recommendations, and report to legislature for future legislation and/or rules for sustainable foraging harvesting.
2. Increase law enforcement capabilities to enforce foraging laws.

3. Submit an annual sustainable foraging report to the legislature prior to each session.

E. Non-Commercial Foraging Regulations

We reserve the right – and request the opportunity - to review and comment on whether or not current foraging regulations on state land adequately protect the natural resource.

F. Native American Treaty Rights.

We recognize the foraging on state lands may be subject to Native American treaty rights.

Legal Requirements of Scientific and Natural Areas

Our mission is consistent with the legal purpose – and administrative requirements - of the scientific and natural areas program:

“State scientific and natural areas; purpose; resource and site qualifications; administration; designation. (a) A state scientific and natural area shall be established to protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value.” [Minn. Stat. 86A.05, Subd. 5(a). Emphasis added.]

"State scientific and natural areas shall be administered ... in a manner consistent with the purposes of this subdivision to preserve, perpetuate, and protect from unnatural influences the scientific and educational resources within them." [Minn. Stat. 86A.05, Subd. 5(c). Emphasis added.]

Therefore, state law does not allow foraging on scientific and natural areas, since any such activities will have an ecological impact by disrupting natural processes.

On behalf of Friends of Minnesota Scientific and Natural Areas, I thank you for your kind consideration.

Betsy Nelson

I have been enjoying watching videos of past meetings and also sitting in on the meeting yesterday morning. There are so many facets to foraging! I have always enjoyed being in nature and exploring, and one of my first memories of being truly engaged is discovering the wintergreen plant on a camping trip with my family in northern Minnesota. I picked a leaf (OMG, did I break the law as a 6 year old?) and smelled it and was so amazed that there was a plant growing out in the world that smelled like chewing gum. Anyway, since I have always been ‘plant curious’ and love to go see, touch, smell and sometimes taste the trees and plants that grow in the world I live in. I

am an herbalist and forager and while I am fortunate enough to have a yard and garden of my own, there are still plants that are abundant in Theodore Wirth Park, my main woods walk, that I do gather to make food and medicine.

Most herbalist and foragers that I know deeply love and connect with nature, and are considerate and cautious with not disturbing the environment while gathering the edible and medicinal plants they want to work with. I like to say that a walk in the woods is so much richer when you know the names of the plants, trees, birds and bugs around you. It is like going to a big party where you know so many of the guests which so much more fun than going to an event where you know no one. Personally, the more I learn, the more I want to learn. It is so interesting to learn the names of the plants, their history of whether they are native plants or introduced, and invasive or endangered. I also think it is very important to know which plants to respect and give their space....such as poison ivy, stinging nettle, wild parsnip and water hemlock. I feel like there is such a great opportunity to educate Minnesotans about the value of all the wildlife that lives in this amazing and beautiful state with us.

I volunteer to pull garlic mustard and buckthorn through the Quaking Bog and also Eloise Butler Wildflower garden. One time I had arranged through the park board to get a group of folks together to pull garlic mustard. When emailing the contact for the park, I had asked if the garlic mustard was safe to eat...meaning not sprayed. The contact person had to call me and say that we could eat the garlic mustard, but she had to call and not email because then she would get in trouble for park board sanctioned foraging. We both agreed this is ridiculous, but here we are. The surest way to be miserable is to argue with reality.

As far as “personal use” and what constitutes a ‘large quantity’ I think it is important to know that most of the plants that are being sought after have a specific season and many folks to forage for food and medicine are often preserving, dehydrating, or freezing what they have gathered for future enjoyment. I was out walking through Theodore Wirth Park on day and found a gentleman gathering stinging nettles with a large clippers. He had three black trash bags filled with nettles. That was about 5 years ago, and trust me, the nettles are still incredibly abundant in that area still.

I would love to see more education, and always say my dream job would be to be a ‘Concierge of the Forest’ to help folks meet and appreciate all the nature we are so fortunate to have around us and break through that ‘green wall’. There is a book I loved called ‘The Nature Fix’ by Florence Williams, and it shares many studies around the world about the benefits of truly experiencing nature for physical and mental health. Some countries promote guided walks in the woods to help support public health. There are so many knowledgeable foragers and herbalist and plant people in this state, and I think there is so much opportunity for creating a community to foster a better relationship between humans and nature.

Thank you for all the efforts in mindfully creating more access and clarity about the foraging rules.

Luisa Cichowski

Hello! My name is Luisa Cichowski and I am a 23 year old resident of St Paul. Thank you for the opportunity to provide comments to the Sustainable Foraging Task Force, and thank you for your work.

I did not grow up in Minnesota nor do I have ancestral ties to this place, but I am beginning to make a home here, after moving to the Twin Cities a year ago. This time of transition in my life has been marked by many challenges, from personal to political to ecological. Shortly after moving to Minnesota, I connected with an herbalist to help me with some health challenges. Throughout this year, plant medicine has been an amazing ally for me, helping me heal my body in a gentle way. My healing experience with plants also sparked my interest to begin foraging on my own, and to learn more about the various plant medicine traditions of the world: including wisdom from my Austrian and Polish heritage, wisdom from Native peoples of Turtle Island, and others. I am still a beginner, but everything I learn brings me into closer connection with the land and even with my own cultural history. Plant medicine lights a path towards holistic alignment with the earth that is healing to everyone involved.

The story I have shared is just one reason why it is important for foraging to remain a right in Minnesota. Without foraging, we all begin to lose connection to the more than human world, and everything that world has to offer us. Finally, I want to end by saying that Treaty Rights should be at the heart of any new laws or discussion related to foraging in the state -- these are fundamental agreements which are too often broken. Broken treaties harm our Native brothers and sisters, and by extension everyone -- because we are all connected. Please keep treaties at the heart of all discussions related to foraging rights, and make sure to honor them.

Once again, thank you for the opportunity to provide comments to the Sustainable Foraging Task Force.

Robin Greenfield

My recommendations are that:

No permit is needed to forage in the state of Minnesota.

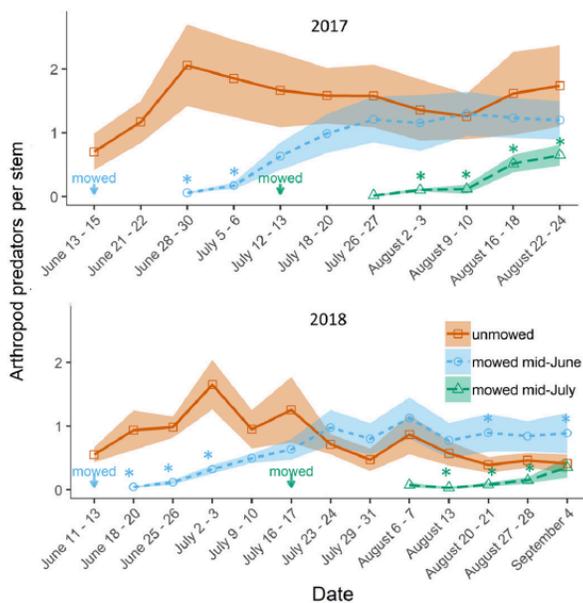
If a permit is created then:

- No permit is required for personal use (which includes trade, barter and gifting) and the permit is only applicable to commercial use of over \$15,000 per year.
- No permit is required for small-scale harvest of plants and mushrooms that fits into the cottage-industry for sales.
- No permit is required for Indigenous people.
- Permits only for protected, critical, or at-risk plant species (similar to how the DNR puts hunting or fishing limits only on specific species).
- Rather than specific quantity limits, adopt Traditional Ecological Knowledge and practices.
- One online permit for all plants foraged for personal use, rather than individual permits for each plant or fungi.
- The permit be free.
- If money is collected for foraging permits, dedicate it to investing in foraging resources. For example, the wild rice license fees go back to the account that helps support the management of wild rice.
- Those involved in the creation of the rules are educated on foraging, both in knowledge and practice.

Research Deep Dive

If you would like to learn more about the science behind ReGrow Milkweed for Monarchs, please have a look at our recent peer-reviewed journal articles.

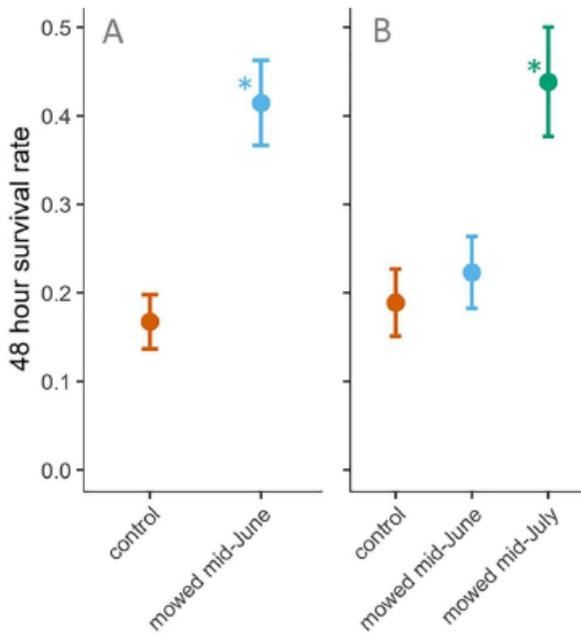
Cutting back milkweed attracts egg laying monarchs and may make milkweed stems safer.



In this study we divided 23 milkweed patches into three sections each. We cut back one section of each patch in June, another section in July, and the last third we left alone as a control. We counted monarch eggs and caterpillars in the plots every week, as well as predatory insects and spiders that might eat monarchs. We found that after both times we cut milkweed stems back (June and July), monarchs laid many times more eggs on the newly regrowing stems than the ones we left alone. There was also a period of several weeks when there were fewer predators on the regrowing milkweed stems. [Read publication here: Haan and Landis 2019 Biological Conservation](#)

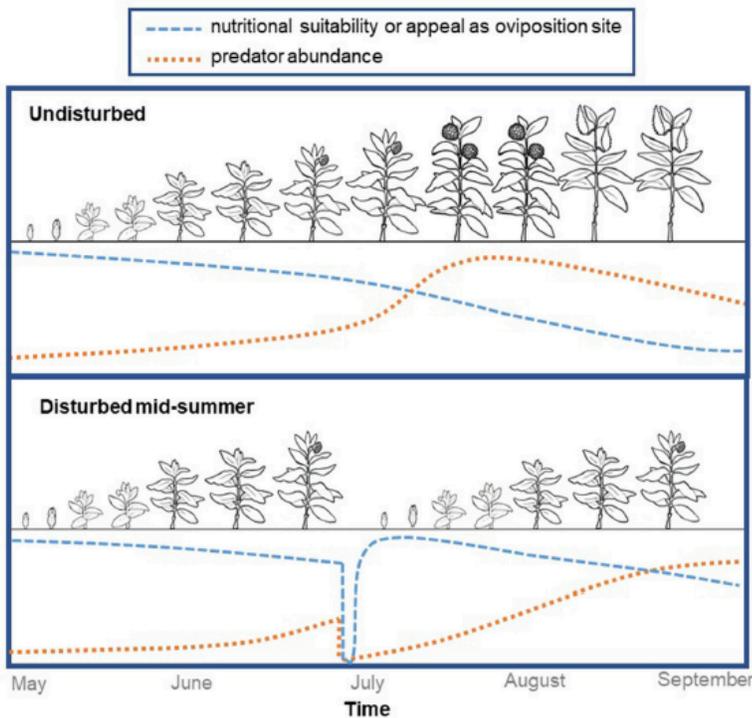
Monarch caterpillars survive at higher rates on regrowing stems than on undisturbed ones.

We divided milkweed patches into three sections (as in the previous experiment), cutting one section back in June, another in July, and leaving the third section alone as a control. Then we put just-hatched caterpillars on milkweeds in each section and monitored their survival. We found they are 2-2.5x more likely to survive their first two days if they are on stems that regrow after being cut back. We also monitored the abundance of wildflowers and pollinator visitors to see how cutting



back milkweed affects them (we used a brush trimmer, so surrounding plants were cut back along with the milkweed). We found both flowers and pollinators are less abundant for a few weeks after cutting, but then they return to the same level as if they had been left alone. Interestingly, some of the plants that were cut back flowered later in the season when they regrew, extending the overall bloom duration. [Read publication here: Haan and Landis 2020 Biological Conservation](#)

We think monarchs may have historically benefitted from mechanical weed control in corn and soy fields in the midwest.



This is an opinion article in which we propose a hypothesis about the past and future importance of disturbance (i.e. cutting back milkweed) to monarchs. Common milkweed was a pesky weed in corn and soy fields until the late 1990s when farmers started using broad spectrum herbicides to control it and other weeds. Before these herbicides became available, growers used mechanical cultivation to suppress weeds. This didn't work for controlling common milkweed, which as we know, quickly regrows after being cut back -- but it *does* mean stems in

crop fields were probably commonly cut back in early summer, providing young stems for monarchs and reduced predator abundance. [Read publication here: Haan & Landis 2019 Frontiers in Ecol Evol](#)

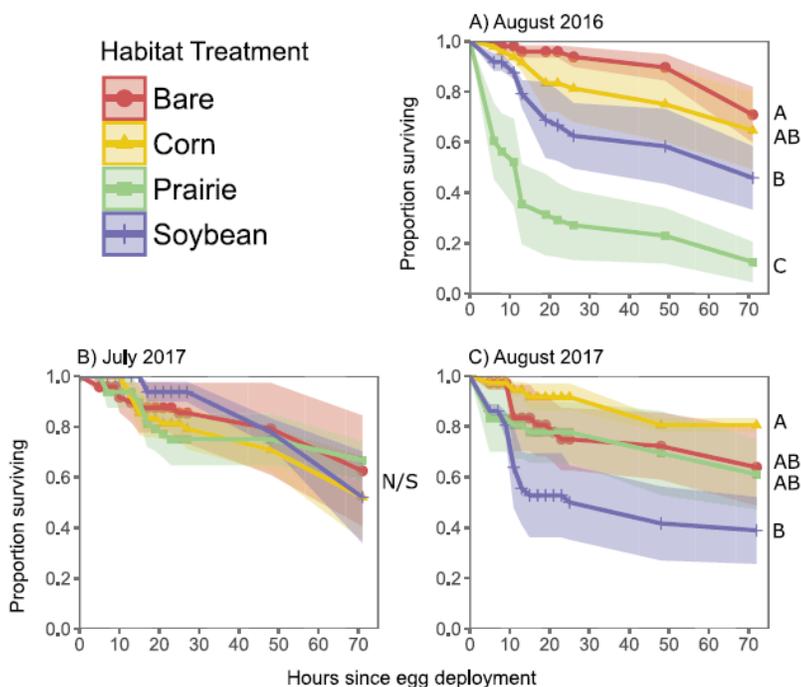
Monarch predators are diverse.



We tested 75 types of insects and spiders to see if they eat monarch eggs and larvae and more than half did!! Ants, spiders, lady beetles, mirid bugs, and a host of others will readily snack on monarchs. In another upcoming article we show that most of this predation occurs at night. [Read the publication here: Hermann et al. 2019, Scientific Reports](#)

[2019, Scientific Reports](#)

Habitat context affects monarch egg laying choices, and most eggs are eaten by predators.



Monarchs lay different numbers of eggs on milkweeds growing surrounded by corn, soy, bare ground, and grasslands, and their choices vary year to year. Some eggs were caged to keep predators out so we could see how important predation is compared to other factors. The majority of monarch eggs are eaten! [Read the publication here: Myers et al. 2019, Environmental Entomology](#)

Related Studies

Strategic mowing of roadside milkweeds increases monarch butterfly oviposition. Samantha M.Knight, D. Ryan Norris, Rachael Derbyshire, D.T. Tyler Flockhart. *Global Ecology and Conservation*.19 (2019), p. e00678. <https://doi.org/10.1016/j.gecco.2019.e00678>

Monarch Butterflies Use Regenerating Milkweeds for Reproduction in Mowed Hayfields in Northern Virginia. John Alcock, Lincoln P. Brower, Ernest H. Williams Jr. The J. of the Lepidopterists' Society, 70(3):177-181 (2016). <https://doi.org/10.18473/107.070.0302>

Enhancing Monarch Butterfly Reproduction by Mowing Fields of Common Milkweed. Sandra J. Fischer. The American Midland Naturalist, 173(2):229-240 (2015). <https://doi.org/10.1674/amid-173-02-229-240.1>

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forest ecology

“Naturalness” in Designated Wilderness: Long-Term Changes in Non-Native Plant Dynamics on Campsites, Boundary Waters, Minnesota

Holly A. Eagleston and Jeffrey L. Marion

Wilderness areas in the United States are preserved for their untrammled naturalness and opportunities for unconfined recreation. The Boundary Waters Canoe Area Wilderness has these qualities, but long-term recreation visitation pressures on campsites can cause significant ecological changes. This article explores changes on campsites, specifically examining non-native plant ecology over 3 decades. The research replicates a 1982 study analyzing vegetation composition and cover on campsites and environmentally paired controls. Camping activities have removed substantial tree cover on campsites, altering their ecological conditions and perceived wilderness character. Over the span of 32 years, the number of non-native plant species found on campsites has not risen, although their mean relative cover has increased significantly and they have spread to more sites. Of the 23 non-native herbs and grasses found on the campsites, only *Cirsium arvense* is considered a noxious weed by the state of Minnesota. Other noninvasive, non-native plants fall into a gray area in the context of “naturalness” for an area protected as Wilderness because they provide some positive ecological services even as they degrade wilderness character. Thus, wilderness managers face a difficult challenge in coping with the long-term impacts of visitor use on wilderness conditions and character.

Keywords: wilderness character, non-native plants, recreation ecology, campsite management, long-term changes

The Wilderness Act of 1964 established the US National Wilderness Preservation System, which has grown to include nearly 108.9 million ac (44.1 million ha), accounting for 17% of all federally owned public land and 5% of the all US lands. Under this legislation, managers are to preserve natural ecosystems that are untrammled and provide opportunities for solitude and unconfined recreation that leave them “unimpaired for future use and enjoyment as wilderness” (16 U.S. §§ 1131–1136). Wilderness management emphasizes natural stewardship (Hendee and Dawson 2002), but as wilderness visitation intensifies and associated resource impacts accumulate, managers are frequently compelled to apply corrective actions.

Recreation visitation may be a threat to wilderness condition and values because of the adverse ecological effects caused by it or done by managers to accommodate it. The introduction and dispersal of non-native plants in wilderness pose a threat because they have direct and indirect ecosystem effects that compromise ecological integrity (Randall 2000, Pickering and Mount 2010). Recreation visitation and non-native plant invasions are intertwined in protected natural areas

because visitors are often the vectors for introducing and dispersing many non-native plants, which occur primarily on trails and recreation sites (Pickering and Hill 2007, Morgan and Carnegie 2009).

One of the tenets of the Wilderness Act is to manage for “naturalness,” but its meaning is open to interpretation. Naturalness can mean an ecosystem lacking intentional human control, a pristine system free of human effects, or an ecosystem where managers actively maintain or restore historical conditions (Cole and Yung 2010). The presence and management of non-native plants in wilderness areas reflect this ambiguity. These plants are often unintentionally introduced and dispersed by wilderness visitors as seeds attached to their equipment or clothing (Marion et al. 1986, Whinam et al. 2005, Pickering and Mount 2010, Ansong and Pickering 2013). The most common non-native plant species on wilderness campsites and trails are also common to suburban lawns, including dandelion (*Taraxacum officinale*), plantain (*Plantago* spp.), and clover (*Trifolium* spp.). Thus, such species are often familiar to visitors as “weeds” and their presence in wilderness may diminish their perceptions of being in pristine wilderness.

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Not all non-native plants have undesirable effects, and a few of these species have characteristics allowing them to be highly invasive. Non-native invaders tend to have traits that enable them to outcompete native plants in disturbed settings. Traits include trampling resistance, fast growth rates, high seed production, and adaptability to a wide range of environments (Alpert et al. 2000, Alpert 2006, Pyšek and Richardson 2010, Van Kleunen et al. 2010). Many non-native species only colonize frequently visited disturbed areas; few can outcompete native plants in undisturbed settings, particularly under shady forest canopies (Marion et al. 2016). Across national parks in Australia, non-natives species were recorded within 20 m of the trail edge, with a rapid decrease in abundance occurring with increasing distance (Ngugi et al. 2014). Dickens and others (2005) found non-native plants only within 1 m (3.28 ft) of portage trails in the US Boundary Waters Canoe Area Wilderness (BWCAW). Morgan and Carnegie (2009) found 32 non-natives species within 328 ft (100 m) of backcountry huts in subalpine zones of the Australian Alps.

Some non-native plants can invade and displace native species, altering system productivity, diversity, and stability. Of particular concern is when non-native invasive species are able to invade undisturbed areas (Marion et al. 1986, Pickering and Hill 2007). Barros and Pickering (2014) reported that 21 non-native plants found in Argentina's Aconcagua Provincial Park spread from recreation sites to undisturbed locations. Land managers are increasingly conducting non-native plant inventories and developing policies to prevent their introduction and dispersal within wilderness areas (Cole and Landres 1996, Randall 2000).

Allen and others (2009) report 20,305 non-native species infestations in a National Park Service (NPS) database, with 3,756 unique species totaling 18 million ac (7.3 million ha) in 216 parks. Regression analyses of variables accounting for variation in non-native species richness revealed kilometers of backcountry trails and park visitation as the most influential factors. Westbrook (1998) notes that the NPS has initiated approximately 448 invasive plant control projects and that units such as Glacier National Park are experiencing great difficulty controlling aggressive invasive species such as spotted knapweed (*Centaurea stoebe*) and leafy spurge (*Euphorbia esula*) that are also invading undisturbed areas of the park.

Study Area

Designated in 1964, the BWCAW is a US Forest Service (USFS)-managed 1,090,000-ac (441,107-ha) area in northeastern Minnesota. Visitors have canoed, portaged, and camped throughout this area for many decades, and managers seek to perpetuate this traditional and historical mode of recreation (Landres et al. 2015). There are more than 1,000 lakes, approximately 80 entry points, 18 hiking trails, and 1,200 mi (1931 km) of canoe trails in the BWCAW. The area receives more than 250,000 visitors each year, and the USFS restricts use through a permit season with entry-point quotas. A central challenge for BWCAW management is interpreting the meanings of naturalness and untrammeled nature for a designated wilderness where recreational activities such as canoeing and camping traditions are an inextricable part of the area's historical and cultural values.

The USFS maintains more than 2,000 campsites in the BWCAW, each with a primitive pit toilet and steel fire grate. A core resource protection objective is to manage these long-term designated campsites to maintain their natural conditions and limit resource impacts. The purpose of this study is to examine long-term

trends for non-native plants on a large sample of BWCAW campsites over a 32-year period. Objectives include evaluating vegetation change on campsites over time, quantifying long-term changes in species richness and non-native plants on campsites and undisturbed control areas, and investigating the BWCAW qualities of wilderness character given the long-term human–environment interactions.

Methods

This study replicates Marion's recreation ecology doctoral study of 96 wilderness campsites and paired control areas (Marion 1984). Campsites were selected through stratified random sampling, in which sites were equally distributed among three use levels and five ecological land types. Since 1982, 10 campsites have been closed and 5 were omitted because their conditions were substantially altered by windthrow or wildfire. Eighty-one sites from the original 1982 study were remeasured in 2014 using the same protocols.

All campsites were located within the USFS Kawishiwi District of the Superior National Forest located near Ely, Minnesota. Study area soils were derived from glacial deposits, covering a thin mantle of glacial-till and lacustrine sediments (Prettyman 1987). The area receives between 66 and 78 cm of precipitation per year, with 40% falling as snow. Primary plant communities include the jack pine forest (*Pinus banksiana*) associated with red pine (*Pinus resinosa*); the Great Lakes pine forest dominated by white pine (*Pinus strobus*) and red pine (*P. resinosa*) associated with paper birch (*Betula papyrifera*); and the northern boreal hardwood-conifer forest dominated by trembling aspen (*Populus tremuloides*), paper birch (*B. papyrifera*), balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), and northern white cedar (*Thuja occidentalis*) (Moyle and Moyle 1977).

Campsite area was measured based on visually obvious trampling-related disturbance to vegetation and organic litter. Campsites included adjacent satellite tenting spots and excluded any internal pockets of undisturbed vegetation. For each campsite, a circular control plot of 538 ft² (50 m²) was also assessed in a nearby undisturbed area. Plot size was determined based on the calculations of a species area curve for the four most common BWCAW plant community types using the nested-plot technique with 12 plot sizes ranging from 10.7 to 3,229.2 ft² (1–300 m²). Each control plot was environmentally similar to the campsite it was paired with; it had the same soil type, ecological land type, aspect, slope, soil depth to bedrock, and distance to water.

Vegetation sampling was completed using a modified quadrat method with whole-area determinations for the campsites and controls. All plants were identified to species and their cover estimates were recorded as 1 = Solitary, 0.5% cover; 2 = Few plants, 1% cover; 3 = Numerous, with cover 2–5%; 4 = Cover 6–25%; 5 = Cover 26–50%; 6 = Cover 51–75%; and 7 = Cover > 75% (after Braun-Blanquet, 1965). The number of trees and seedlings on campsites were tallied and divided by campsite size to obtain density measures (trees/hectare). Coverage values were aggregated by growth habit to obtain campsite cover estimates for tree, shrub, herbaceous, and grass cover. Coverage estimates were assessed for bare soil, exposed bedrock, organic litter, sparse vegetation (5–50% plant cover), and dense vegetation (51–100% plant cover). Relative cover for plants was determined by dividing the species coverage by the percentage of ground vegetation cover for each campsite. Areal coverage in square meters of each plant species was also determined on campsites by multiplying the percentage cover by campsite size. Areal measures of vegetation loss and exposed soil were calculated by

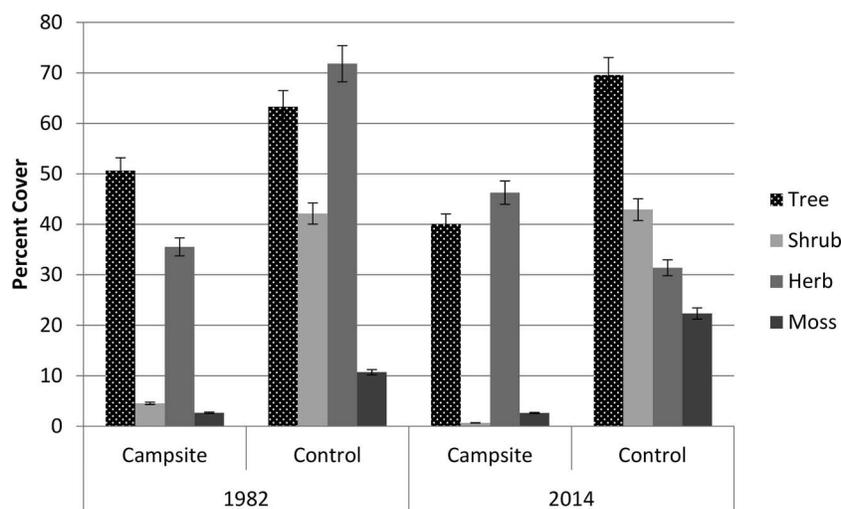


Figure 1. Vegetation cover on campsite and control areas from 1982 to 2014.

Table 1. Effect of tree cover on plant richness and relative cover on campsites in 2014.

Indicator	Campsite tree cover			F ratio	P value
	Low (<26%) (n = 27)	Medium (26–50%) (n = 23)	High (>50%) (n = 31)		
Species richness (n)	17.85 (±4.9)*	16.5 (±3.3)	14.6 (±3.9)	4.41	0.015
Non-native species (n)	5 (±2.0)	4.3 (±2.1)	2.9 (±4.5)	8.01	<0.001
Non-native species, relative cover (%)	3.1 (±2.0)	7.4 (±20.4)	2.8 (±2.5)	1.37	0.260

Note: * Standard deviation.

multiplying percentage cover estimates by campsite size. In 2014, soil loss on campsites and canoe landings was also assessed by measuring depth of soil erosion by comparing the undisturbed areas to bottom of eroded campsite and erosion along the lakeshore at canoe landings. Depths were multiplied over the mapped surface area of disturbance to determine aggregate soil loss.

Longitudinal 1982–2014 comparisons were made and statistically analyzed with paired *t* tests of campsite-to-campsite and control-to-control measurements. To examine current recreation activity impacts, the 2014 campsite values were compared to their paired control values using paired *t* tests, data were tested for normal distribution, and outliers were removed. A one-way analysis of variance (ANOVA) was used to investigate the relative influence of tree cover on vegetative indicators. SAS JMP software was used for all statistical tests.

Results

Open and active use of the campsites over 32 years has caused a marked divergence in the ecological conditions on campsites compared with surrounding control areas. Control areas experienced a significant decrease in herbaceous cover and an increase in tree and shrub cover (Figure 1). Campsites experienced reductions in tree and shrub cover with a corresponding increase in herbaceous cover.

Significant reductions in tree cover occurred from 1982 to 2014. Figure 1 shows mean tree cover on campsites declined by 10.5% from 1982 to 2014 ($P = 0.004$). Tree regeneration is threatened by harvesting of trees by visitors for firewood; 65 trees/ha ($P = 0.031$) were lost on campsites from 1982 to 2014 (Eagleston and Marion 2017). Loss of tree cover and regeneration has led to an increase of sunlight on campsites, allowing herbaceous species to thrive, increasing in cover from 36.2% to 46.5% over 32 years ($P = 0.019$).

Additional environmental dynamics associated with the loss in tree cover were tested with ANOVA after creating three classes of campsite tree cover: low (0–25%), medium (26–50%), and high (51–100%). Campsites with lower tree cover in 2014 had higher species richness and numbers of non-native plants (Table 1). The trend in higher species diversity with low tree cover is also evident over time, with campsites in 2014 showing 4.9 ± 2.6 more species per site than in 1982 ($P = 0.032$).

The number of non-native plant species found on BWCAW campsites has remained the same at 21, although the average number of non-native plants per site has risen from 1.8 to 4.0 (Table 2). Over 32 years, non-native plants have had time to disperse to more campsites. Non-native plants were found on 55 campsites (67.9%) in 1982, expanding to 74 campsites (91.4%) in 2014 (Figure 2). The number of non-native plants stayed the same or decreased on 22 campsites over the 32-year period (Figure 2). However, whereas non-native plants were not found in any control plots in 1982, three non-native species, including *T. officinale*, *Plantago major*, and *Hieracium caespitosum*, were found in control plots in 2014.

Although the number of non-native plant species per campsite has increased with time, the relative cover has not. Neither the mean cover nor relative cover of non-native species changed significantly from 1982 to 2014 (Table 2). The mean cover is the average cover estimate of non-natives for the site; the relative cover adjusts the cover of non-native species to the amount of vegetation cover present on the site.

Visitor activities on campsites perpetuate a disturbed environmental setting where vegetation is trampled and organic litter is pulverized and lost, with eventual exposure of underlying mineral soils (Marion et al. 2016). Introduced European earthworms used as live bait in fishing can also have a large impact on the loss of leaf

Table 2. Non-native species abundance in BWCAW.

Indicator	2014		1982		Mean difference 2014 camp–1982 camp	P value
	Camp	Control	Camp	Control		
Non-native species (<i>n</i>)	21	3	21	0	0	–
Non-native species/site (<i>n</i>)	4.0	0.04	1.8	0	2.2 (±0.3)*	<0.001
Sites with non-natives species (%)	91.4	3.7	67.9	0	23.5	–
Mean plant cover of non-natives/site (%)	7.9	0.03	11.2	0	–3.3 (±2.7)	0.211
Mean relative cover of non-natives/site (%)	16.1	0.05	21.7	0	–5.6 (±4.5)	0.212

Note: * Standard deviation.

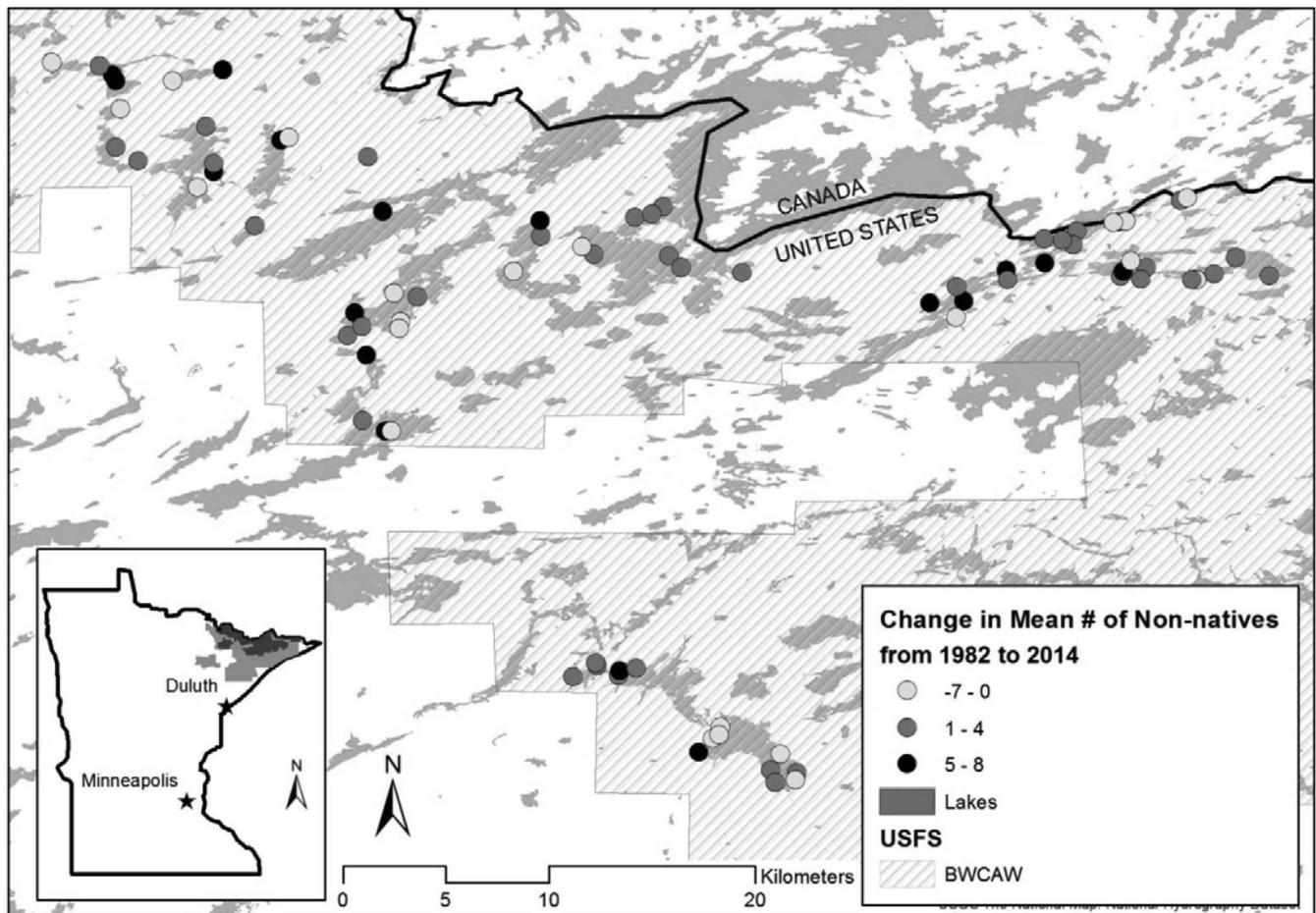


Figure 2. Map illustrating changes in mean number of non-native plants found on BWCAW campsites from 1982 to 2014.

litter, another agent in the exposure of mineral soil (Bohlen et al. 2004, Hale et al. 2005). From 1982 to 2014, campsite organic litter cover declined by 15.4%, exposed soil increased 8.3%, and vegetation cover increased 16.8%. The exposure of soil on campsites often leads to soil erosion, which is considered the most significant and irreversible form of recreation impact (Marion et al. 2016). Mean soil loss on 2014 campsites was estimated at 607 ft³ (17.2 m³). Non-native species made up 16.1% of the vegetation cover, and without them, soil loss likely would have been greater. Reductions in tree and shrub cover (Figure 1) allowed the shade-intolerant herbaceous plants, mostly graminoids that were noted in 2014, to colonize less-trafficked peripheral areas and/or replace more fragile native herbaceous plants. Graminoids have been shown to be significantly more resistant and resilient to trampling pressures than broad-leafed herbaceous species (Cole 1995a). Table 3 shows the change in relative cover for each non-native species from 1982 to

2014. Many species lost relative cover in 2014, including *Agrostis alba* (–18.8%), *Trifolium repens* (–12.3%), *Festuca rubra* (–10.4%), and *P. major* (–7.6%). Relative cover increased for other species, particularly *Bromis inermis* (39.9%). Some non-native species were found at more campsites, but their areal cover in square meters did not change appreciably from 1982 to 2014 (Table 3). For example, *T. officinale* increased from 29 to 64 campsites but relative cover declined 4.9% and areal cover decreased by (522 ft² or 48.5 m²). From the perspective of areal cover, *Trifolium procumbens* increased substantially (6,210 ft² or 577 m²) whereas two species exhibited marked decreases—*T. repens* (–7,405 ft² or –688 m²) and *Phleum pretense* (–2,852 ft² or –265 m²).

Of the non-native species found in BWCAW, the expansion of plants classified as noxious weeds are of particular concern. *Cirsium arvense* is a prohibited noxious weed in the state of Minnesota and is actively controlled by USFS staff (Alexander et al. 2013). Although

Table 3. Changes in cover of non-native species.

Non-native plant species	Difference in cover (%)	Difference in relative cover (%)	Difference in areal cover ft ² (m ²)
Herbs			
<i>Achillea millefolium</i>	6.3	-1.2	0.0
<i>Capsella bursa-pastoris</i>	6.9	-1.9	-37.7 (-3.5)
<i>Cerastium vulgatum</i>	13.3	-4.5	-416.5 (-38.7)
<i>Chenopodium album</i> *	-1.0	-3.5	0.0
<i>Chrysanthemum leucanthemum</i>	20.3	1.2	721.2 (67.0)
<i>Cirsium arvense</i> #	5.3	-3.7	92.6 (8.6)
<i>Hieracium aurantiacum</i>	9.0	5.2	899.8 (83.6)
<i>Hieracium caespitosum</i> **	19.8	2.2	554.3 (51.5)
<i>Plantago major</i>	34.3	-7.6	-603.8 (-56.1)
<i>Polygonum aviculare</i>	5.1	-0.3	68.9 (6.4)
<i>Prunella vulgaris</i>	4.3	-0.9	44.1 (4.1)
<i>Ranunculus acris</i>	2.7	0.6	78.6 (7.3)
<i>Rumex acetosella</i> **	1.2	3.8	130.2 (12.1)
<i>Taraxacum officinale</i>	42.6	-4.9	-522 (-48.5)
<i>Trifolium aureum</i> **	3.7	1.6	55.9 (5.2)
<i>Trifolium pratense</i>	-2.7	-3.0	-52.7 (-4.9)
<i>Trifolium procumbens</i>	1.4	3.5	6,206.4 (576.6)
<i>Trifolium repens</i>	24.4	-12.3	-7,409.9 (-688.4)
Grasses			
<i>Agropyron repens</i>	-0.1	-6.0	-47.4 (-4.4)
<i>Agrostis alba</i>	-0.8	-18.8	-900.9 (-83.7)
<i>Bromis inermis</i>	1.6	39.9	645.8 (60.0)
<i>Festuca rubra</i> *	-2.1	-10.4	-396.1 (-36.8)
<i>Phleum pratense</i>	-6.1	-6.4	-2,849.2 (-264.7)
Mean	9.3	-1.03	-162.5 (-15.1)
Standard error	2.9	2.61	455.3 (42.3)
P value	0.003	0.349	0.362

Note: * Only found in 1982.

** Only found in 2014.

Invasive.

the relative cover decreased from 1982 to 2014, its areal coverage on 81 campsites increased by 93 ft² (8.6 m²). *C. arvense* was found on one campsites in 1982 and in 2014 it was found on six campsites, some up to 14.3 mi (23 km) away from the site it was found on in 1982. *Hieracium aurantiacum* and *H. caespitosum* are both rated as having potential to cause moderate ecological damage and are on the USFS watch list (Alexander et al. 2013). *H. caespitosum* was not found at all in 1982, but in 2014 it covered 549 ft² (51 m²) on 16 campsites. *H. aurantiacum* increased 5.2% in relative cover in 2014, covering 899 ft² (83.6 m²) on 16 campsites.

Discussion

Are Non-Natives in the BWCAW an Ecological Threat?

Although non-native species are not desirable, they are not necessarily detrimental unless they show clear harm to the environment (Sagoff 2005). Loss of species richness, alteration of biogeochemical processes, and undermining ecological integrity are all viable causes of environmental harm (Callaway and Aschehoug 2000, Pysek et al. 2004). Non-native species that are considered truly harmful have been defined as “invasive” when they are capable of transport, colonization, establishment, and self-sustaining and naturalized (Theoharides and Dukes 2007). Their ability to outcompete and replace native plants in undisturbed settings is a key factor of concern. Some invasive plants have the potential to spread over large distances and cause impact to the environment, economy, or health (Richardson et al. 2011).

Only 1 of the 21 non-native species found on BWCAW campsites is considered noxious. The Minnesota Noxious Weed Law (MN Statutes 18.75–18.91) lists Canada thistle, *C. arvense*, as a

noxious weed and calls for the control of maturation and spread of propagating parts. The cover of *C. arvense* increased only by 93 ft² (8.6 m²) on the 81 campsites from 1982 to 2014. It was not found in adjacent off-site control areas.

Trace occurrences of non-native species were found on only 3 of 81 control plots, which are proximate to campsites and receive occasional trampling traffic. In our judgment, these species are not causing ecological harm and none appear able to outcompete native plants in undisturbed settings. Many of the non-natives found on campsites, such as dandelion (*T. officinale*) and clover (*Trifolium* spp.), are shade intolerant; they do best in sunny, disturbed settings. Tree cover has been reduced on campsites over 32 years whereas the control areas have experienced an increase in tree cover as the forest has matured. The disturbance-associated non-native forbs and grasses found on BWCAW campsites are rarely able to survive in shaded off-site areas and have difficulty competing with native plants in offsite settings. The non-native species have not become invasive on campsites either. In 2014, 16.1% of the vegetation cover found on campsites was non-native, and this proportion has fallen from 21.7% since 1982 (Table 2). Trampling pressure from visitors and competition from native grasses are likely the predominant factors limiting the cover of these non-native species.

Although the cover of non-native species has been relatively consistent, there has been an increase in the mean number of non-native species per campsites from 1982 to 2014. The most commonly found non-native species on campsites during both survey years were *P. major*, *T. officinale*, and *T. repens*. These are common lawn weeds that visitors are likely introducing or dispersing from campsites to campsites as seeds on their equipment and clothing (Pickering and Mount 2010). Figure 2 shows that there is not a clear spatial pattern in the change of mean number of non-native species found on campsites. As a Leave No Trace practice, visitors can be asked to check and remove seeds from tents, gear, clothing, and shoes before outdoor trips and before leaving campsites each day (Marion 2014).

We note that non-native plants may also provide some benefits or ecosystem services by protecting wilderness campsites from soil loss. Marion et al. (1986) note that “the presence of these disturbance-associated exotics is fortuitous, as they partially protect the soil from erosion as well as contribute some organic matter that helps maintain the soil structure.” Thus, efforts to eradicate non-natives from campsites would reduce campsites vegetation cover, which aids in binding the soil and lessening water and wind soil loss. Non-native plants may continue to establish and fill in bare ground on campsites, which could further limit soil erosion on campsites. As noted in other studies, non-natives can provide ecological services and may help colonize disturbed areas, creating conditions for native plants to come in (Rai 2013, Rai 2015).

Management of Non-Native Plants in the Context of Wilderness

The Wilderness Act prescribes a goal of maintaining the natural and untrammeled quality of wilderness areas after their establishment. From this study, it is clear that environmental conditions on campsites have markedly changed since the BWCAW’s 1964 designation. What is not clear is whether these changes constitute trampling or degradation of the natural qualities for which the BWCAW was established, which also included the cultural heritage and traditions of canoeing and camping. In the context of non-native plants, managers are faced with the dilemma of whether to remove species that do not belong there or leaving them because they provide useful ecological services that protect campsites soils from erosion.

The meaning of “untrammeled” in the Wilderness Act has been discussed at length (Cole and Yung 2010). The idea of Wilderness is to have areas that are allowed to operate without the forces of man’s manipulation (Zahniser 1963). As Lucas (1973) stated, if the ecological processes are uncontrolled, then the results are desirable. If we forego the notion that recreation sites are “sacrifice sites” and uphold these areas to the same standards as the rest of the wilderness, then in the context of BWCAW, there are two actions that should be considered a “manipulation.” One is the presence of non-native plants and the other is the loss of tree cover. Large numbers of non-native plants were introduced to the area during the logging era and from numerous cabins and resorts that predated wilderness designation (Marion 1984). In the 1982 campsite study substantially greater numbers of non-native plants were found on campsites that had been placed on old logging camps and cabin and resort sites (Marion 1984).

This study found the numbers and relative cover of non-native species to be relatively unchanged over the last 3 decades. What did change was an increase in the mean number of non-native plants found on each campsite in the BWCA (see Table 3 for list of species). However, there is little evidence that non-native plants are able to spread into undisturbed forested settings; they are restricted to disturbed campsites. We conclude that the great majority of these species do not pose a large-scale ecological threat to the Wilderness.

The other manipulation is the loss of tree cover that has occurred on campsites, largely because of the cutting of trees for firewood (Marion 1984). Camping introduces disturbance pressure on woody vegetation when mature trees and saplings are lost from visitor-related damage, root exposure, and felling for firewood. Managers have done limited plantings of native trees on campsites in an effort to replace lost trees. However, with staffing levels at record lows and increasing visitation, trampling pressures, and visitors continuing to fell trees for firewood, the long-term success of replacing trees on campsites is low. Natural tree regeneration on campsites rarely occurs, and only in small pockets of vegetation protected from traffic by rocks or a grouping of mature trees (Marion 1984).

Hendee and Dawson (2002) make the point that wilderness management is an intellectual dilemma in which we try not to influence wilderness. However, the more people learn about and visit wilderness, and the more managers manipulate physical conditions within wilderness, the less wild it becomes. Recreationists appear to be the primary vector for the continued introduction and dispersal of non-native plants to wilderness campsites; therefore, they are a natural focus for resolving problems with the spread of non-native species. More active measures could be taken to minimize the further spread of noxious weeds throughout BWCAW campsites. Leave No Trace practices can address the inspection and removal of seeds from gear, clothing, and footwear and can promote firewood-gathering practices that do not involve woods tools and damage to or felling of trees. Otherwise, campsites will continue to lose their tree cover, contrasting more strongly with the undisturbed forest surrounding BWCAW campsites.

Conclusion

Management of non-native plants poses a dilemma to the values associated with wilderness. Trying to control non-native species means asserting human control over the ecosystem, which conflicts with core wilderness management objectives. However, not doing so leaves traces of human effect because non-natives were primarily introduced by humans. Cole and Yung (2010) state that the emer-

gence of wilderness values of unconfined, unfettered, unrestrained, and untrammeled natural areas places more importance on freedom from human control than being free from human effect. Although the presence of non-natives is “unnatural,” they are a symptom of unintentional manipulation of the environment by the action of people simply visiting wilderness areas; removing them would represent exerting additional human control over the ecosystem. At the same time, the presence of non-natives on campsites provides ecological services by increasing biodiversity and plant cover and stabilizing erosion, thereby increasing campsite sustainability. In the case of the BWCAW, non-native species are providing an ecological service; most are not invasive, do not spread outside of disturbed areas, and were a part of the ecosystem when the Wilderness was first established because of the long history of human exploration, visitation, and commercial activities.

We suggest that the continued loss of campsite trees strongly diminishes the perceived naturalness of campsites. Managers will need to deliberate the acceptability of long-term tree loss on campsites and accept it, increase abatement efforts, enhance their prior treeplanting and protection efforts on campsites, or implement a campsite closure and replacement program when a campsite loses most or all of its trees (Marion 2016). Furthermore, although efforts should be taken to stop the introduction and dispersal of invasive species, we suggest that managers consider accepting the presence of noninvasive non-native plants on campsites. They are rarely able to disperse into offsite areas, and their presence on campsites provides plant cover that lessens soil loss. This recommendation is based on the species pool we have documented in this study. The new standard of what is natural embraces the idea of “novel” ecosystems (Schlaepfer et al. 2011) that recognizes that human interaction with the environment has occurred for many years and being a part of the ecosystem ourselves, by interacting with it, we change irrevocably it. If we embrace the concept of novel ecosystems, and accept them in the context of naturalness and untrammeled in Wilderness areas, then we could have ecosystems with higher functionality and higher resiliency to work in concert with human disturbance.

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Recommendation categories: Minnesota Sustainable Foraging Task Force

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Confirm foraging scope

What's in	Unknown	What's out
<ul style="list-style-type: none">• DNR managed state lands• Personal use• Terrestrial plant species (edible, medicinal)• Aquatic plant species• Mushrooms	<ul style="list-style-type: none">• State lands not managed by DNR• Invasive terrestrial or aquatic plants (like garlic mustard)• Forest products (parts of trees like birch bark, cones, moss, spruce tips)	<ul style="list-style-type: none">• Tribal, Federal, and private lands• Commercial use• Maple syruping and wild rice• Aquatic animal species• Insects

Define personal use

- Rather than specific quantity limits, adopt Traditional Ecological Knowledge and practices (e.g. Honorable Harvest)
- Personal use = No profit motive, no compensation, and no economic or commercial gain.
- Intent of use is a non-business activity.
- Should personal use include or exclude trade, barter, or gifting?
- Is a different category needed (beyond personal or commercial use) for cultural or community gatherings? Is a different category needed for plants sold as medicines to patients?

Determine when a foraging permit is needed

- Permits only for protected, critical, or at-risk plant species (similar to how the DNR puts hunting or fishing limits only on specific species)
- Consider one online permit for all plants foraged for personal use, rather than individual permits for each plant or fungi.
- Use the permitting process to gather data and conduct research for five years.
- Explore permit differences for state residents versus non-residents as is done for hunting and fishing permits.
- Consider a permit process for non-profit and for-profit foraging programs that use public land.
- If money is collected for foraging permits, dedicate it to investing in foraging resources. For example, the wild rice license fees go back to the account that helps support the management of wild rice.

Modify the different rules that apply to state lands

- Preserve existing statutes and rules restricting foraging within the 166 scientific and natural areas.
- Explore modification of statutes and/or rules to unify rules that apply to state parks and state forests
 - [Minnesota Administrative Rules 6100.0900](#) (Environmental Protection) Subpart 2, E states: “Collecting or possessing naturally occurring plants in a fresh state in state parks is prohibited, except that edible fruit and mushrooms may be harvested for personal, noncommercial use.”

Collect data to improve understanding of foraging impacts

- Consider adding questions to existing licensure systems and surveys to learn more about who forages, what they gather, where, and for what purpose.
- Dedicate funding to collect data and research the ecological, cultural, and economic impacts of foraging in Minnesota.
 - Note: LCCMR is a good source for research funding, including small and emerging projects. Next RFP, Jan 2026 (education/outdoor recreation)
- Develop a research plan for gathering needed information to support rules related to foraging.
- If data is not collected through a permitting process, then what is the alternative?

Foraging invasive species

- Should foraging of invasive species be **encouraged** as foragers could play a role in rapid detection, early response, and control or **restricted** to prevent spread of seeds/spores?
- Explore revisions to Minnesota Statutes Chapter 84D Invasive Species to allow transport of invasive species
- Develop a “Forage Freely” list for certain invasive or overpopulated species like garlic mustard, invasive mushrooms, and others.

Education, training, and outreach

- When applicable, apply elements of Minnesota’s fishing, hunting, and trapping framework to foraging, including its model of permissions, seasons, and education.
- Use plain language to provide clear and accessible information that makes it easier for the public to understand existing rules and regulations on Minnesota’s public lands.
- Determine most important focus areas for education, training, and outreach. For example:
 - Uphold tribal sovereignty and distinct treaty rights, including plants species as sacred medicines
 - Conservation
 - Identify different public land types (state parks, forests, WMAs, SNAs etc.) and what rules apply.
 - Personal physical safety (contamination, pesticide exposure, pollutants, heavy metals)
 - What is or isn't safe to eat (plant misidentification)
 - Reduce spread of invasive or overabundant species, including compliance with Noxious Weed Law.
- Determine focus of education. For example:

- General public
 - Law enforcement (To reduce misunderstandings of foraging as trespassing, theft, or suspicious behavior)
 - Others
- Make foraging information available in multiple languages.
- Make foraging information visual by using icons, photos, color-coded symbols to communicate key information, QR codes.
- Consider an agreement or partnership with the University of Minnesota Extension as it pursues a certification for foraging.

Establish regular review cycle of foraging statutes and rules

- Ecosystems, species populations, and environmental conditions change over time due to climate shifts, land use, and other pressures. Regular review ensures that foraging rules stay relevant, evidence-based, and responsive to current conditions—supporting both conservation and access goals. Ensures that conservation attention and any potential limits on foraging are targeted to species truly at risk, rather than applying blanket restrictions.
- Consider the long-term view: what is recommended now may not be correct in the future. Flexibility to adapt to changes in climate, species, ecology

Sustainable Foraging Task Force



Meeting 4: October 21, 2025

Welcome and purpose

- Welcome
- Adoption of previous meeting minutes
- Task Force purpose, duties, operating agreements

Purpose of Task Force

Gather and review information on the impact of foraging on species resilience, ecosystem health, and other aspects of Minnesota's biomes, solicit public input when appropriate, and develop recommendations for foraging guidelines reduced-price foraging permits.

Recommendations must be specific, actionable, and consistent with Indigenous and other cultural practices and traditions.

The task force must submit a written report to the commissioner of natural resources and to the chairs and ranking minority members of the legislative committees with primary jurisdiction over natural resources policy.

The recommendations must detail proposals for changes or additions to statute or rules.

Duties of Task Force

- **gather and review data and information**, including **traditional ecological knowledge**, on the **impact of foraging** on species resilience, ecosystem health, and other aspects of Minnesota's diverse biomes;
- **review existing regulations** governing foraging activities on **state lands**;
- **develop recommendations** for science-based, including traditional ecological knowledge, **foraging guidelines for state lands** that balance public access and foraging opportunities with conservation needs. The recommendations must be in the form of **draft statutory or rule language and must be consistent with Indigenous and other cultural practices and traditions**;
- develop **recommendations for increasing public understanding of sustainable foraging practices** that include safety and ecological considerations;
- **solicit public input**, when appropriate; and
- develop **recommendations for reduced-priced foraging permits**.

Operating agreements

- Say your name before speaking
- If online, cameras on whenever possible
- Come to meetings prepared. Review agenda and materials in advance.
- Take space, make space
- Refrain from side conversations
- Show respect to members and presenters
- Be open-minded and curious about others' opinions, viewpoints, and lived experiences
- Recognize that time or research may be needed before questions are answered
- Focus on the issue, not the people
- Assume good intent but acknowledge harm

Task Force meetings

Meeting	Purpose/focus (<i>italics: tentative or details to be confirmed</i>)
1. August 20, 2025 – noon-2:00pm	Learning: foraging basics
2. September 9, 2025 – 10:00am-noon	Learning: MN and other states' statutes & rules
3. October 8, 2025 – noon-2:00pm	Learning: DNR information; MN foraging history and context
October 20, 2025 – 10:00am-noon	Foraging field trip, Ft. Snelling State Park
4. October 21, 2025 – 10:00am-noon	Learning: traditional foraging practices
Various dates and times in Nov., Dec.	Public listening sessions for input from members of the public
5. November 18, 2025 – 10:00am-noon	Learning: <i>TBD, may include scientific, cultural, interest groups</i> Recommendations: ideas, including those noted in meetings etc.
6. December 2, 2025 – 10:00am-noon	Recommendations: create and discuss; <i>additional learning</i>
7. December 16, 2025 – 10:00am-noon	Recommendations: discuss and refine; <i>additional learning</i>
8. January 6, 2026 – 11:00am-1:00pm	Recommendations: refine
9. January 27, 2027 – 10:00am-noon	Recommendations: finalize
10. February (date and time TBD)	Report: discuss draft

Agenda

- Welcome and purpose
- Agenda and introductions
- Panel: Traditional foraging
- Reactions to field trip
- Discussion: Scope of task force, continued
- Next steps
- Public input
- Adjourn

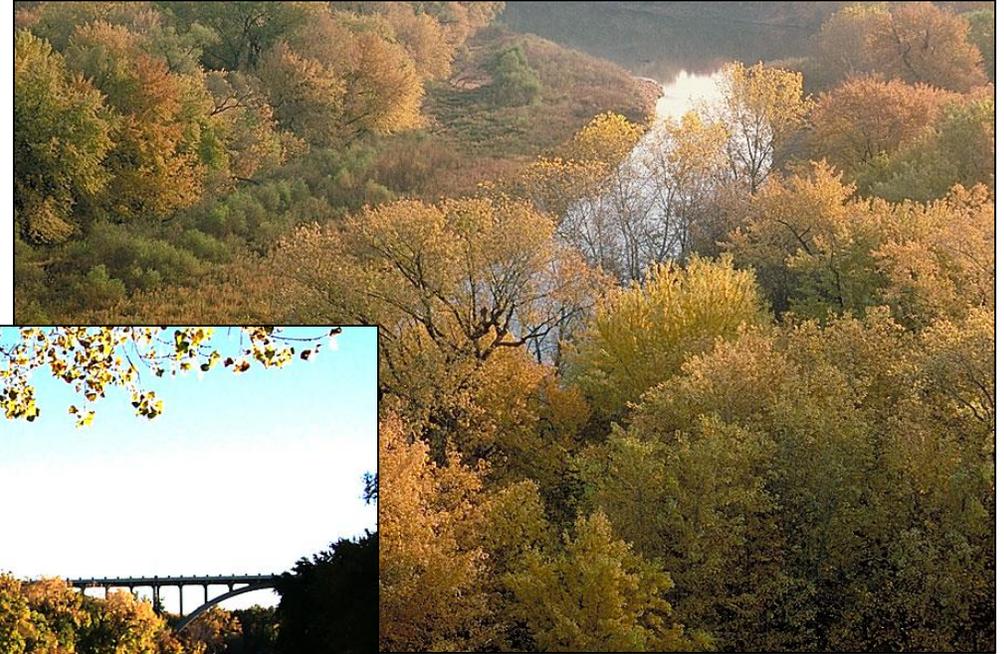
Introductions

- Name and organization



Panel discussion

Field trip reactions



Scope of task force

Decisions from last meeting

- In scope
 - DNR-administered state lands
 - Personal use
 - Terrestrial plant species (edible, medicinal)
 - Mushrooms
- Out of scope
 - Tribal, federal, private lands
 - Commercial use
 - Maple syruping and wild rice
 - Aquatic plant and animal species
 - Insects

Clarification/continued discussion

- State parks vs. state forests
- State lands not administered by DNR
- County-managed state lands
- Forest products (parts of trees)

Next steps

- Public listening sessions
 - 90 minutes
 - Three online, one in person
 - Online: regionally focused (but all testifiers welcome)
 - Task force member role:
 - Help promote
 - Join **one** as an observer
 - Schedule
 - Tuesday 11/18, 1:00-2:30pm, in person (after TF meeting)
 - Wednesday 11/19, 8:30-10am, online. Focus: North
 - Thursday 11/20, 3:00-4:30pm, online. Focus: South
 - Wednesday 12/3, 11:30am-1pm, online. Focus: Central
- Sessions typically include
 - Pre-published questions to help testifiers organize their thoughts
 - Short presentation on TF purpose, efforts so far, etc.
 - Testimonies; individuals are asked to provide name and contact info in case TF wants to follow up
 - Time limits may be longer, depending on attendance
 - Sessions will be recorded

- Welcome! Please introduce yourself:
 - Name
 - Location/region
 - Group/organization/community you represent (if applicable)
- Ground rules
 - Limit comments to 2 minutes (additional information in writing is welcome)
 - Respect and appreciate diversity of thought
 - Focus on ideas, not people
 - If you disagree, disagree respectfully
- Reminder: this meeting is open to the public, livestreamed and being recorded

- Adjourn

Thank you

Sustainable Foraging Task Force



August 20, 2025, meeting

Welcome and purpose

- Purpose of Task Force
- Introductions: facilitators and staff

Agenda

- Welcome, purpose, agenda
- Introductions
- Election of chair and vice chair
- Legislation and Open Meeting Law
- Administrative topics
- Task Force and member responsibilities
- Background information
- Next steps
- Adjourn

Introductions

- Name
- Role or perspective you bring
30-second version

Election of chair and vice chair

- Nominations
 - Per statute, must be a legislator
- Roll call vote
- Remarks from the chair

Enabling legislation (p. 1 of 2)

The Minnesota Sustainable Foraging Task Force was established in 2025 to:

1. gather and review data and information, including traditional ecological knowledge, on the impact of foraging on species resilience, ecosystem health, and other aspects of Minnesota's diverse biomes;
2. review existing regulations governing foraging activities on state lands;
3. develop recommendations for science-based, including traditional ecological knowledge, foraging guidelines for state lands that balance public access and foraging opportunities with conservation needs;
4. develop recommendations for increasing public understanding of sustainable foraging practices that include safety and ecological considerations;
5. solicit public input, when appropriate;
6. and develop recommendations for reduced-priced foraging permits.

Enabling legislation (p. 2 of 2)

- Report due February 28, 2026
 - Submitted to the DNR Commissioner and the relevant legislative committees
 - Recommendations must be “specific and actionable”
 - The report must detail the proposals for changes or additions to statutes or rules to effectuate the task force’s recommendations
- Task Force expires on March 15, 2026

Open Meeting Law (p. 1 of 2)

- The OML requires meetings of governmental bodies to generally be open to the public
- A meeting is open if: proper notice is given in advance of the meeting, the public can attend and observe the meeting, and if relevant meeting documents are available
- OML applies when at least a quorum of the task force is gathered – in person, by telephone, or by interactive technology – and discusses any topic related to official business, whether or not action is taken or considered

Open Meeting Law (p. 2 of 2)

- The law does not apply to smaller groups discussing official business when the group size is less than a quorum
- Avoid discussing official group activities via email, one-way communication between chair/staff and members is permissible
- Open meetings do not require public comment

Administrative topics

- Meetings
- Community input
- Operating agreements

Meetings

- Format
 - Fully onsite
 - Fully online
 - Hybrid
- Frequency, duration, potential days/times
 - Recommendation
 - Every 3 weeks
 - 2 hours
 - Same day/time or alternate between two days/times

Community input

- Goal: balance public input with TF members working collaboratively in meetings
- Invite community members to sign up to speak during each meeting *if relevant to meeting topic*
 - 2-minute limit per speaker; additional input can be shared in writing
 - Number of speakers may be limited
 - Public listening sessions
 - Time limits may be longer
 - Multiple fully online sessions plus 1 or 2 in-person sessions
 - Varying times of day to accommodate range of schedules
 - Detailed notes will be taken for TF members who are unable to attend
 - Written input always welcome (please email Nick Nero, nick.nero@lcc.mn.gov)

Task Force operating agreements

- **State your name before speaking (every time)**
- If online, cameras on whenever possible
- Come to meetings prepared. Review agenda and materials in advance.
- Take space, make space
- Say your name before speaking
- Refrain from side conversations
- Show respect to members and presenters
- Be open-minded and curious about others' opinions, viewpoints, and lived experiences
- Focus on the issue, not the people
- Assume good intent but acknowledge harm

Task Force and member responsibilities

- Task Force
 - End result is a report to the legislature, suggesting to legislators what to consider
 - Focus on what is within the authority of the MN State legislature, or could be recommended to DNR
 - Excludes anything under jurisdiction of federal law, counties or municipalities, etc.
- Member responsibilities
 - Be informed by the website
 - Review materials that will help you formulate ideas and respond to others' suggestions

Background information

- DNR presentation
- Q&A
- Fact sheets

Next steps

- Poll about meeting times
- Email to arrange time for interview (optional but encouraged)
- Review DNR fact sheets
- Stay tuned for more information

Thank you

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Mushroom picking does not impair future harvests – results of a long-term study in Switzerland

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ABSTRACT

Forest fungi not only have important functions within the forest ecosystem, but picking their fruit bodies is also a popular past time, as well as a source of income in many developing and developed countries. The expansion of commercial harvesting in many parts of the world has led to widespread concern about overharvesting and possible damage to fungal resources. In 1975, we started a field research project to investigate the effects of mushroom picking on fruit body occurrence. The three treatments applied were the harvesting techniques picking and cutting, and the concomitant trampling of the forest floor. The results reveal that, contrary to expectations, long-term and systematic harvesting reduces neither the future yields of fruit bodies nor the species richness of wild forest fungi, irrespective of whether the harvesting technique was picking or cutting. Forest floor trampling does, however, reduce fruit body numbers, but our data show no evidence that trampling damaged the soil mycelia in the studied time period.

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1. Introduction

Forest fungi perform important functions within the forest ecosystem. Saprobic species decompose organic matter and ectomycorrhizal species enhance nutrient acquisition, improve stress tolerance and the pathogen resistance of their host trees (Smith and Read, 1997). Picking wild forest mushrooms is a popular pastime and recreational activity. In certain regions of the world, mushroom harvests are also commercially important, especially for rural communities in developing countries, and in some developed countries as well (Boa, 2004). In Eastern Europe the export of forest fungi has emerged as an important income source (Peric and Pinguli, 2001). In the Pacific Northwest of the United States chanterelles have spawned a large commercial harvesting industry over the last two decades (Pilz et al., 2003). The value of total production of chanterelles on the world market is estimated

at about US \$ 1.67 billion (Watling, 1997). The “soil expectation value” for forest fungi (e.g. US dollars/ha/year) is on certain forest sites as high as that for timber (Alexander et al., 2002).

According to a recently published FAO study, 2166 edible species are known worldwide and 470 species have useful medicinal properties (Boa, 2004). Harvesting pressure has increased in many parts of the world (Boa, 2004), and fungal species diversity is claimed to have decreased over the past decades (Arnolds, 1991; Wang and Hall, 2004). This has led to widespread concern about overharvesting and possible damage to fungal resources. Several countries or regions have introduced legal restrictions on the harvesting of edible fungi in natural habitats because they fear that the removal of fruit bodies from the forest, often before spore dispersal, might impair their reproduction. Spores are important for the survival, migration, and distribution of genetic variability and for

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bringing together compatible mating types for sexual reproduction (Dix and Webster, 1995).

Since the 1970s, 19 of the 26 cantons in Switzerland have introduced weight limits or closed seasons. This has caused some controversy, since there is no scientific evidence regarding the effectiveness of such restrictions. We therefore started a research project in 1975 to investigate the impact of harvesting mushrooms on subsequent fruiting. The study was carried out in the fungus reserve Chanéaz, located in a typical mixed forest on the Swiss Central Plateau. In a preliminary analysis, no significant effects of harvesting were detected on 15 species that met the minimum requirements for a statistical analysis (Egli et al., 1990). Consequently, we decided to extend the study to obtain results for more species over a longer period. A second study was started in a subalpine pure Norway spruce forest (Moosboden) to obtain additional data from another prevalent Swiss forest type and popular area for mushroom harvesting. Whereas at Chanéaz we studied the effects of harvesting and harvesting techniques (picking/cutting), the Moosboden study focused on the effects of the concomitant trampling of the forest floor. This focus was chosen because an earlier experiment had shown a strong negative effect of trampling on the fruit body production of a colony of the Yellow Foot Chanterelle, *Cantharellus lutescens* Fr. (Egli and Ayer, 1997).

2. Materials and methods

2.1. Study sites

The study was carried out in two fungus reserves in southwestern Switzerland.

The first, “Chanéaz” (74 ha), established in 1975 in a dominant forest type of the Swiss Central Plateau at 600 m a.s.l., is a mixed old-growth forest with deciduous and coniferous tree species of different ages (mainly *Fagus sylvatica* L., *Quercus robur* L., *Picea abies* (L.) Karst., *Abies alba* Mill., *Pinus silvestris* L., *Pinus strobus* L., and *Larix decidua* Mill.).

The second, “Moosboden” (3 ha), established in 1990 at 1250 m a.s.l., is a pure, uniform Norway spruce forest (*Picea abies* (L.) Karst), reforested 110 years ago.

2.2. Experimental design

Chanéaz. Five 300 m² blocks were divided into three plots of 10 m × 10 m with the treatments “harvesting by picking”, “harvesting by cutting”, and “control”.

Moosboden. Fourteen 13 × 13 m blocks were divided into four 6.5 × 6.5 m plots with the randomly distributed treatments “picking with trampling”, “picking without trampling”, “no picking with trampling”, “no picking without trampling”. The treatment “with trampling” corresponds to normal walking associated with mushroom harvesting, mimicking that of a mushroom picker. The “without trampling” plots were provided with catwalks to avoid soil contact while picking or counting the fruit bodies. The installations were made in April 1990, before starting the experiment.

All observation plots were surrounded by fences to avoid disturbance by mushroom pickers.

2.3. Sampling

All fruit bodies of the epigeous macromycetes of soil-inhabiting species were identified and counted at weekly intervals from May to December (weeks 21–52). Thirty-nine species that form large quantities of very small fruit bodies (e.g. *Mycena* sp., *Strobilurus* sp., *Marasmius* sp.) were excluded to avoid counting difficulties. Moreover, 12 taxonomically critical species were also excluded to avoid possible irregularities due to unclear identification. When first recorded, the fruit bodies were marked with methylene blue on the cap to avoid double counting. In the picking and cutting treatments, only edible fungi were harvested.

Chanéaz. The survey was started in 1977, and continued until 2003. Between 1980 and 1983, only the edible fungi were recorded. These four incomplete years were excluded from the analyses. A total of 436 species were included and 97,700 fruit bodies counted (edible: 103 species/53,863 fruit bodies; non-edible: 333 species/43,837 fruit bodies).

Moosboden. The survey was started in 1990 and ended in 2000. A total of 250 species were included and 50,222 fruit bodies counted (edible: 51 species/10,173 fruit bodies; non-edible: 199 species/40,049 fruit bodies).

A total of 582 species were recorded at the two sites, with 146 species common to both sites. Collections of all the species recorded are deposited in the mycoherbarium of the Swiss Federal Research Institute WSL.

2.4. Analyses

We tested how the treatments did affect species richness and the total number of fruit bodies produced at the levels of species, families and edible and non-edible species. The numbers of fruit bodies produced per year were log transformed to reduce the influence of plots with large numbers of fruit bodies. To avoid problems with zero observations, we added the value 1 to each year sum before calculating the log. The same transformation was used for the number of species after examining the residuals.

We applied two statistical models: 1. To assess the impact of the different treatments by ANOVA, we calculated means over all years since the production of fruit bodies varied greatly from year to year. 2. To evaluate whether the progression over time of a parameter differed with treatment, we applied a repeated measures ANOVA and tested the interaction of treatment and time using Greenhouse–Geisser’s correction. In both models and datasets we included the blocks as a blockfactor. In Chanéaz there was one treatment factor with three steps (control, picking, cutting) and we calculated two contrasts (control vs. mean of picking and cutting; picking vs. cutting). In Moosboden we tested two treatment factors (harvesting, trampling) and their interaction. Since the interactions were not significant (*p*-values clearly above 0.05, only in one case close to this limit), the main effect model was applied. Model assumptions were checked using a graphic residual analysis. We used a quantile–quantile plot to verify normality (normal plot), the Tukey–Anscombe plot to test for homoscedasticity and lack of fit, and a leverage plot for finding dangerous leverage points. In general the assumptions held,

even if there were some outliers. Exclusions of outliers did not change the results noticeably. The analyses were performed with the statistical software R (R Development Core Team, 2004) and the SPSS software (version 12, see <http://www.spss.com>).

3. Results

The present data show that harvesting does not adversely affect the production of fruit bodies (Table 1 and Figs. 1, 2(a)). Edible fungi, which were selectively harvested, did not decrease relative to unharvested non-edible ones with respect to either the abundance of fruit bodies or species richness. No different trends were detected, even over a period of 29 years, in the harvested and non-harvested sites, irrespective of whether the harvesting technique was picking or cutting (Fig. 1). These findings applied for all the fungal species as well as for single species and families.

The concomitant trampling of the forest floor, however, significantly reduced the number of fruit bodies produced (Table 1 and Fig. 2(b)). Based on the statistical analysis it is likely that trampling reduces fruit body production to about 70% of that on untrampled areas. The mean number of fruiting species per year was also significantly lower in trampled plots than in non-trampled ones. Surprisingly, however, the total number of species that fruited over the decade of sampling was about the same in the trampled as in the non-trampled plots (195 and 189, respectively).

4. Discussion

Fruit body and fruiting species numbers were unaffected in our study areas when they were systematically harvested over a period of 29 years. Irregular field observations in other areas also suggest that the impact of harvesting may well be negligible (Jahn and Jahn, 1986; Jansen and

Table 1 – ANOVA table of the effects of harvesting on fruit body production

Treatment		Mean over time			Treatment × time ^a
Subject	Group	Exp(coef) ^b	Conf. int. ^c	p-Value ^d	p-Value
<i>Chanéaz (1977–2003)</i>					
Non-harvesting/harvesting		(Reference: non-harvesting)			(All treatments)
No. of fruit bodies	All species	1.03	0.71–1.48	0.878	0.437
	Edible ^e	1.11	0.78–1.58	0.513	0.261
	Non-edible	0.90	0.65–1.26	0.501	0.679
Species richness	All species	0.97	0.81–1.17	0.746	0.373
	Edible	0.99	0.86–1.15	0.887	0.138
	Non-edible	0.99	0.82–1.19	0.876	0.847
Picking/cutting		(Reference: picking)			
No. of fruit bodies	All species	0.81	0.53–1.23	0.279	
	Edible	0.82	0.54–1.22	0.268	
	Non-edible	0.87	0.59–1.28	0.427	
Species richness	All species	0.94	0.76–1.16	0.503	
	Edible	0.99	0.84–1.17	0.936	
	Non-edible	0.89	0.72–1.11	0.267	
<i>Moosboden (1990–2000)</i>					
Non-harvesting/harvesting		(Reference: non-harvesting)			
No. of fruit bodies	All species	1.13	0.85–1.51	0.380	0.343
	Edible	1.16	0.81–1.67	0.413	0.660
	Non-edible	1.09	0.79–1.52	0.589	0.702
Species richness	All species	1.01	0.91–1.13	0.818	0.395
	Edible	0.97	0.84–1.17	0.657	0.829
	Non-edible	1.03	0.94–1.14	0.514	0.910
Non-trampling/trampling		(Reference: non-trampling)			
No. of fruit bodies	All species	0.72	0.54–0.96	0.028*	0.419
	Edible	0.64	0.45–0.92	0.019*	0.064
	Non-edible	0.78	0.56–1.08	0.135	0.392
Species richness	All species	0.86	0.77–0.96	0.006**	0.377
	Edible	0.87	0.75–1.00	0.050*	0.119
	Non-edible	0.86	0.78–0.95	0.004**	0.478

a Treatment × time interactions of repeated measures compare the progression over time of the respective parameter among the different treatments. At Chanéaz, all three treatments (control, picking, cutting) were compared.

b Exp (coef) = exponent of the regression coefficient. This value is a measure of the treatment effect. It can be directly interpreted as a factor value showing the expected changes in the numbers of fruit bodies or species.

c Conf. int. = confidence interval 2.5%/97.5% of the exp (coef).

d Asterisk indicates p-value < 0.05, double asterisk indicates p-value < 0.01.

e Only edible species were harvested in harvested plots.

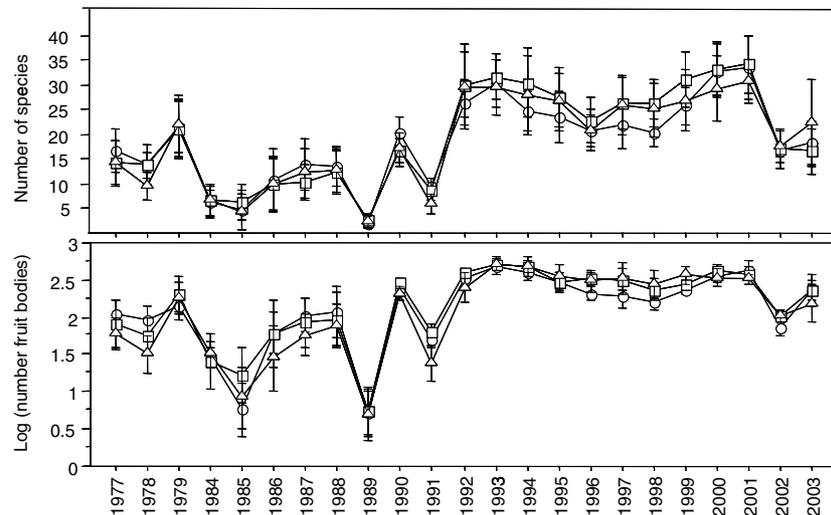


Fig. 1 – Fungal species richness and transformed number of fungal fruit bodies produced in Chanéaz from 1977 to 2003. Fruit bodies of all macromycetes were counted weekly in control plots (circles) and in plots where fruit bodies were harvested by picking (squares) or by cutting (triangles). The values at the top are means of the numbers of fungal species observed per year and those at the bottom are means of log₁₀ transformed annual sums of fruit bodies ($n = 5$; bars show s.e.m.). Data from 1980 to 1983 are missing.

van Dobben, 1987; Arnolds, 1991). Moreover a 13-year study by the Oregon Mycological Society in the Mount Hood region (Oregon, USA) revealed no statistical evidence that picking suppresses the fruiting of the Golden Chanterelle, *Cantharellus formosus* Corner 1966 (Norvell, 1995; Pilz et al., 2003).

Harvesting the fruit bodies entails removing the spores. Theoretically, we would expect removing all fruit bodies and thus the possibility of sexual renewal by spores to lead to a degeneration of these fungi over time. Fungal species vary in how important spores are for their reproduction (Fioré-Donno and Martin, 2001). Some species repeatedly recruit new colonies from spores, whereas others propagate predominantly by vegetative spread. *Laccaria amethystina* Cke., for example, produces colonies and fruit bodies from spores each year (Fioré-Donno and Martin, 2001), but we did not detect a negative impact of harvesting on this species in either study site. It is possible that adequate numbers of spores entered from the neighbouring areas, or that the fruit bodies in the plots released enough spores during the weekly harvesting intervals. Nevertheless, the present experimental design realistically simulates strong harvesting pressure.

On the second study site we showed that trampling of the forest floor associated with mushroom harvesting reduces the number of fruit bodies and fruiting species observed per year, but not the number of species that fruited over the decade of sampling. This means that, in spite of trampling, the mycelia of all the species we sampled seem to persist in the soil, but simply fruited less often and in smaller numbers. We therefore hypothesize that the pre-fruit body primordia formed at the soil surface might be mechanically destroyed by walking on the forest floor, but that the mycelium is not permanently damaged. This is supported by the results of an earlier trampling experiment in a plot with a

colony of the Yellow Foot Chanterelle, *Cantharellus lutescens* Fr. (Egli and Ayer, 1997), where a researcher imitated a mushroom picker and harvested fruit bodies twice a week for 12 years. As a consequence the fungus ceased forming fruit bodies, whereas it regularly fruited in the control plots, which were provided with catwalks to avoid soil contact while harvesting. The treatments were changed twice, once after 6 and once after 11 years. In both cases the fruit bodies appeared again the following year in quantities similar to those before the treatments.

Analysis of the interaction between the treatments trampling and harvesting indicates that, if anything, the combination of harvesting/non-trampling seems to be the most appropriate precondition for producing a maximum number of fruit bodies. Although trampling of the forest floor reduces the number of fruit bodies, this seems of minor importance compared to other factors influencing fruit body formation, as suggested by the large annual variability in fruit body production (Figs. 1 and 2). Good or poor mushroom years seem to be determined mainly by climatic conditions (Agerer, 1985; Kasparavicius, 2001; Straatsma et al., 2001). Air pollution, such as nitrogen deposition in forests, appears also to affect fungal species diversity, as demonstrated in an adjacent study plot at Moosboden (Peter et al., 2001). In this study the input of nitrogen proved to have an immediate and negative impact not only on the fruit body production but also on the below-ground structures of ectomycorrhizal fungi.

Although fungi are difficult to study in the soil, we need to understand their in situ ecology better if scientists are to provide conservationists and policy makers with clear criteria for evaluating measures to protect the biological diversity of forest fungi and to maintain sustainable harvests. Our study shows no evidence that harvesting fruit bodies harms the diversity of fungi residing in forest soils. From the

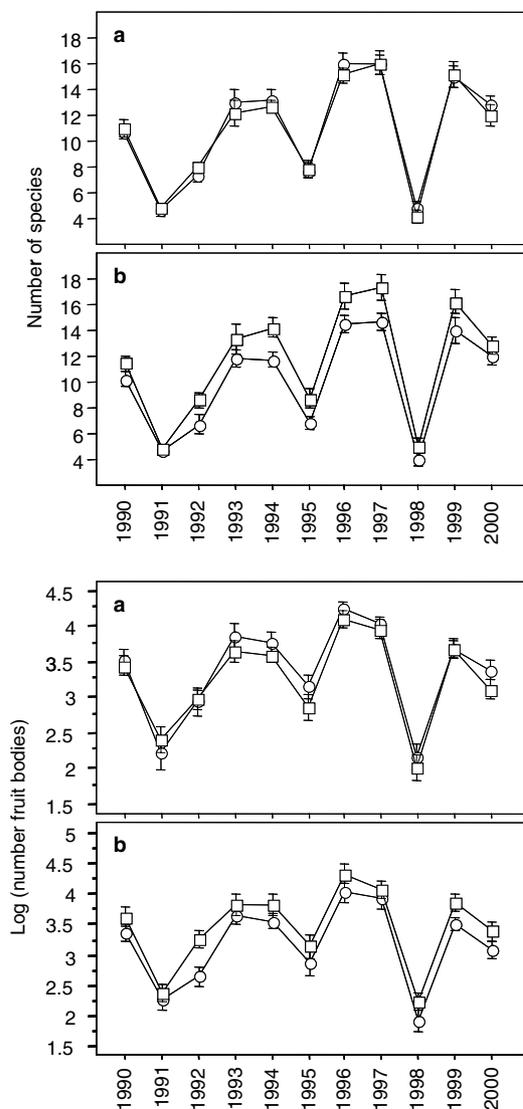


Fig. 2 – Fungal species richness and transformed number of fungal fruit bodies produced in Moosboden from 1990 to 2000. Fruit bodies of all macromycetes were counted weekly (a) in plots with (circles) or without (squares) harvesting of fruit bodies, and (b) in plots with (circles) or without (squares) forest floor trampling. The values in the top figure are means of the numbers of fungal species and those in the bottom one are means of log₁₀ transformed annual sums of fruit bodies (n = 14; bars show s.e.m.; within the 14 blocks the two plots with the same treatments were averaged before calculating the mean and standard error).

anthropocentric perspective, however, both fungal species richness and the yield of edible fungi are impaired by the trampling of the forest floor. It is the fruit bodies of the fungi that we see and use. Fewer are formed after trampling of the forest floor, but they reappear when the sites are left to recover.

Our results raise questions about the usefulness of harvesting restrictions. We do not, however, know how many spores are needed to ensure the survival of fungal species. We are also not yet in a position to prove our hypothesis that

trampling of the forest floor does not harm the mycelia in the soil. We therefore suggest maintaining closed seasons as a precaution to conserve forest fungi. In addition, we should not underestimate the importance of the psychological effects of constraints, for instance in increasing public recognition of forest fungi as a precious natural resource in our forests worthy of protection.

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SYMBIOTIC HARVEST

HUMAN MUSHROOM FORAGING
AND ITS IMPACT ON PUBLIC LAND

Leya Charles





Overview

- Introduction
- Methods
- Results
- Discussion



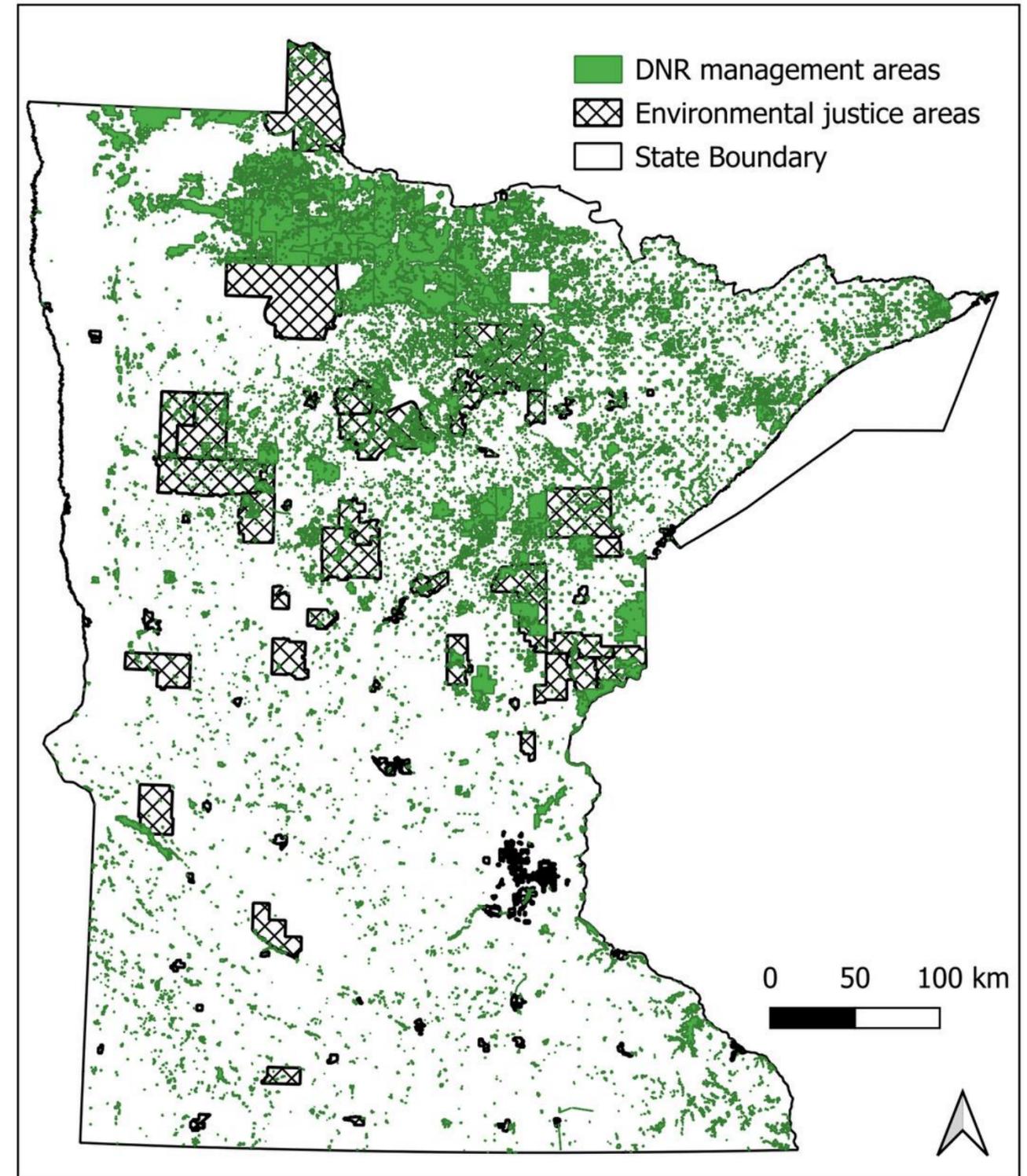
**Foraging
on
Public Land**



Introduction

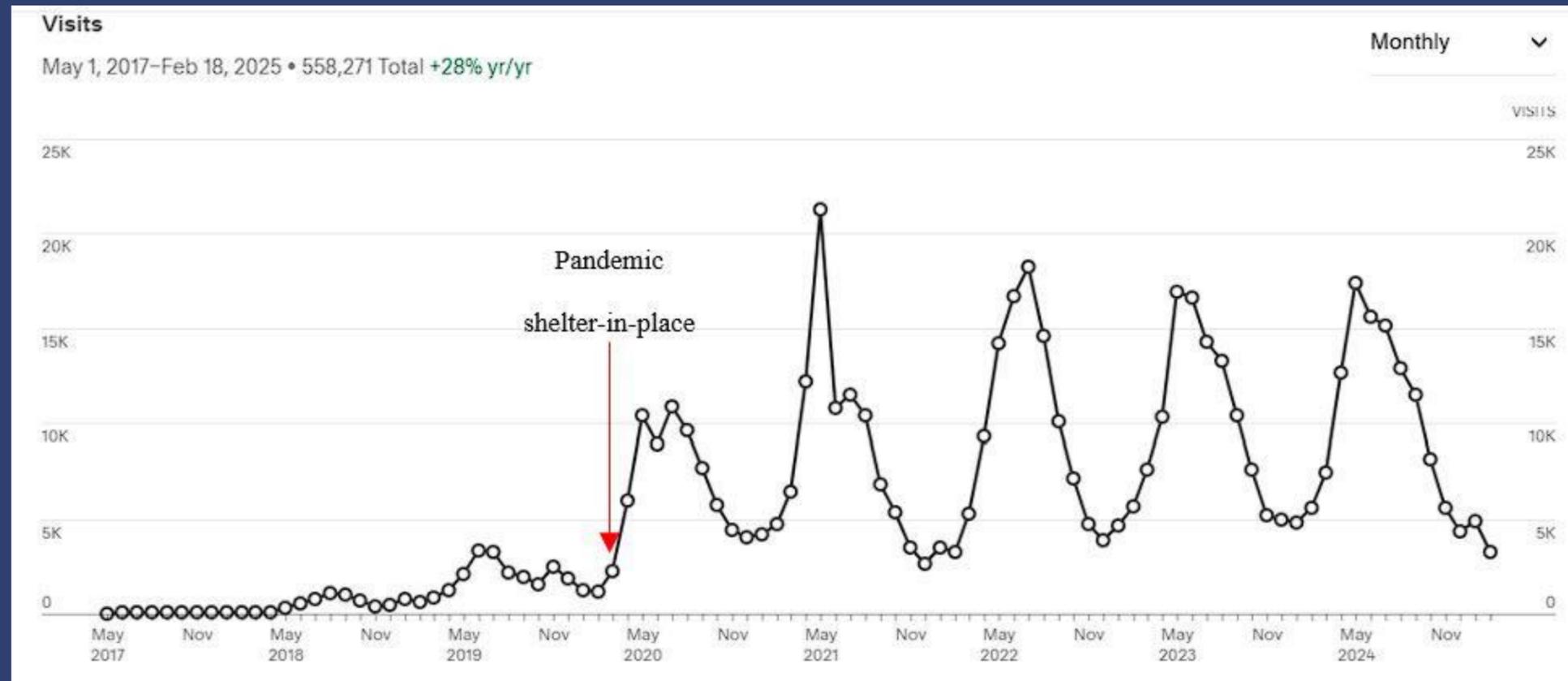
5,777,630 acres of public land

Land of 10,000 lakes





INCREASE IN FORAGING



Ironwood Foraging Co.

Jan 2019 – 3,000 followers

Jan 2025 – 52,000 followers



DNR proposed bag limit
of 1 gallon

Concerns

- Invasive species
- Trampling of plants
- Overharvesting





Is the DNR's claim based in scientific research?

EXPLORE THE IMPACT OF HUMAN FORAGERS

- foot traffic and soil compaction
- fruiting body removal
- harvest methods

Fruiting body
vs.
mycelium





METHODS – LITERATURE REVIEW

- Freezing temps, 1-3 months
- Forest biomes
- Recent 30 years



Peer-reviewed literature



METHODS- INTERVIEWS

- Resides in the Midwest
- 10+ year forager
- 5+ years foraging educator
- Indigenous knowledge holder
- Mycological society president
- Sustainable food systems professional



5 informational interviews



RESULTS

**Human
compaction of
soil off trail**



**Compaction
impacts on
fruiting bodies**

**Human
removal of
fruiting bodies**





RESULTS

Human compaction of soil off-trail

MEASURED

- Number of foot passes
- Campsite use
- Vegetation survival

PARAMETERS

- Penetrometer (pore space/soil compaction)
- Organic matter
- Moisture
- Temperature





RESULTS

Human compaction of soil off-trail

SUMMARY

- >100 foot passes no increase on soil compaction
- >2 years of campsite use no increase on compaction
- Grasses more resilient than shrubs





RESULTS

Compaction impacts on fruiting bodies

MEASURED

- With/without plant roots
- With/out foot traffic

PARAMETERS

- Abundance of hyphae
- Soil porosity
- Number of fruiting bodies

Less roots =
less mycelium





RESULTS

Compaction impacts on fruiting bodies

SUMMARY

- More hyphae in non-compacted soil
- More plant roots = more hyphae
- Foot traffic did not reduce proliferation of fruiting bodies

Less roots =
less mycelium





RESULTS

Human removal of fruiting bodies

MEASURED

- Cutting vs. pulling
- Control vs. foot traffic

PARAMETERS

- Number of fruiting bodies
- Fruiting body weight
- Surveys



RESULTS

Human removal of fruiting bodies

Summary

- No decrease of species
- No decrease of quantity



RESULTS



**Mycelium persists
through seasons**

Interviews

- Traditional knowledge
- Climate change
- Sustainability
- Community



APPENDIX A



People have a scarcity mindset toward nature...and think foragers will destroy it...a land of foragers would have larger budgets for public land, they would be more knowledgeable...they would volunteer at much higher rates to remove invasive species and plant native species on their own time. When we change the paradigm, foraging becomes a necessity for the health of our public lands over the next 300 years – T. Clemens.





Results

Sustainability in harvest

We are not
meant to
forage alone.
– L. Black Elk

- Only gather what you can eat
- Self-limiting
- Climate change & habitat decline





DISCUSSION



Intentional walking



Accountability in community



Future generations

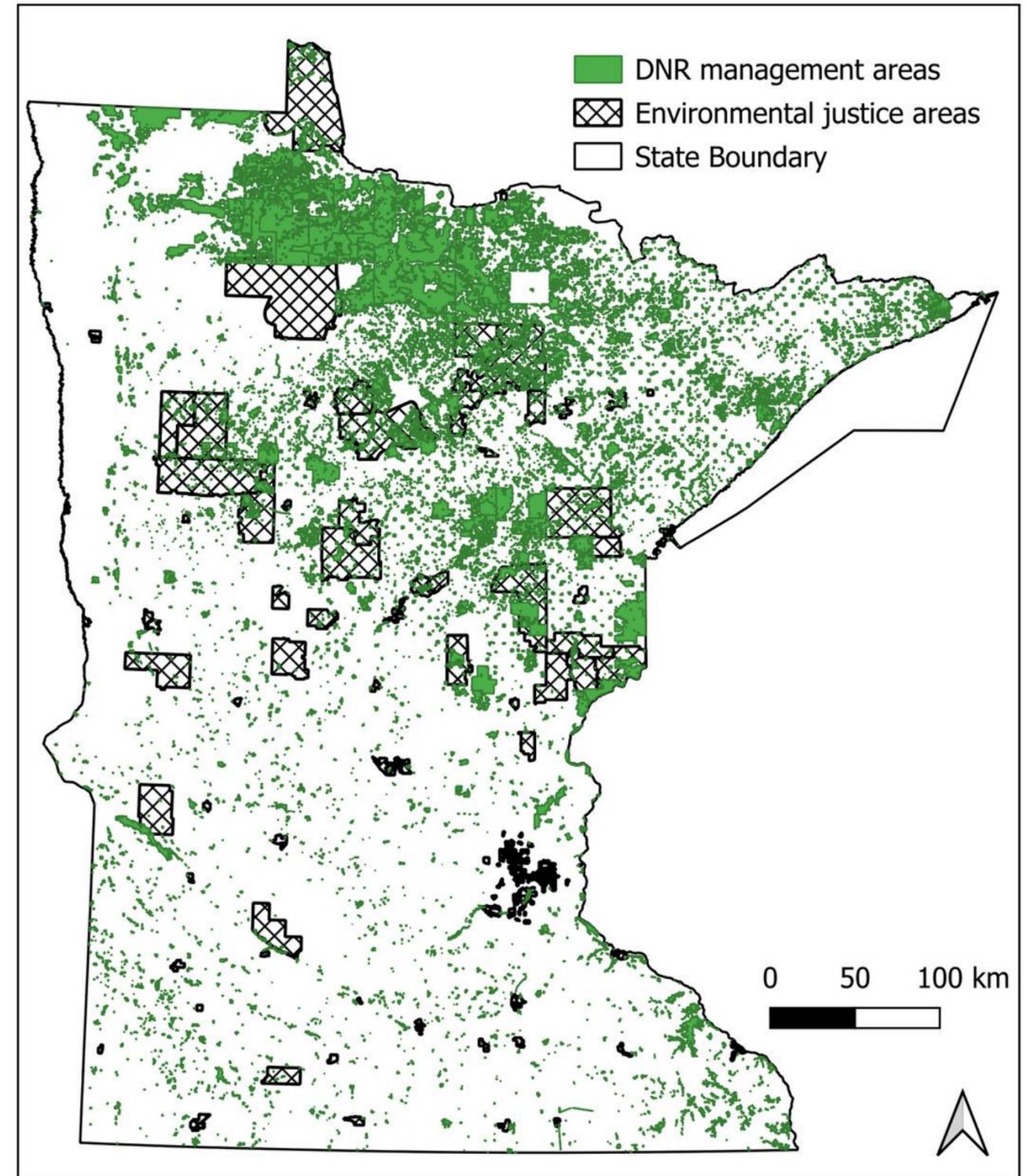


Discussion

5,777,630 acres of public land

76.5% of DNR managed land is within 10 miles of an environmental justice area

**Changing climate
&
traditional knowledge**





CONCLUSION

Is a permitting system needed?

- Education
- Mentorship program
- Volunteer data
- Wildlife use



I do not believe in the mantra of 'leave no trace.' You know that whole concept of leave only footprints, I don't believe that, because in our Lakota philosophy, we actually should be having a net positive impact on the natural world, not just net zero. – L. Black Elk





ACKNOWLEDGEMENTS

This work is dedicated to all the amazing foragers in my life who have inspired the development and work of this project.

Photo credits: Alan Toczydlowski Photography



SYMBIOTIC HARVEST:
HUMAN MUSHROOM FORAGING
AND ITS IMPACT ON PUBLIC LAND

by

Leya Theresa Charles

A professional paper submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Land Resources and Environmental Sciences

MONTANA STATE UNIVERSITY
Bozeman, Montana

May 2025

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I acknowledge the land on which I work and live and play, in which supports and sustains life. I give gratitude to the indigenous people who have stewarded this land for millennia, with the land now known as Minnesota being the traditional homelands of the Dakota and Ojibwe people.

This work is dedicated to all the amazing foragers in my life who have inspired the development and work of the Minnesota Foraging Alliance (MNFA). Wopida to the Prairie Island Indian Community whose members brought motivation early in my career to continue learning about all the plants and medicines in the land and waters around me. To Jesse Belden from Flower Folk Homestead, for her patient teaching that all life is sacred whether plant or fungal. To Peter Martinacco, president of the Minnesota Mycological Society (MMS), for empowering others to take a stand to protect our public land for equitable use by all. To Esther Liu, Nate Johnson, and Lars Lidahl, who shared their expertise in conversations about food sovereignty and food systems that are vital to land stewardship. To Alan and Rachel Zerbski who have helped me foster the simple joys in experiencing nature alongside the academic pursuit of knowledge. To Pete Peterson for their detailed transcription formatting assistance, and Dr. Yuriko Yano for her academic expertise. To Claire Boeke for motivating me during study hall to meet deadlines. Finally, to Timothy Charles, for listening repetitively to my many passionate speeches about foraging, and continuing to maintain a household and partnership through it all.

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GLOSSARY or NOMENCLATURE

Foraging - the human practice of harvesting edible plant material or mushroom fruiting bodies from the wild for consumption.

Trampling - foot travel by humans or animal which can impact either soil compaction or plant recovery; referred to as foot travel in this professional paper.

ABSTRACT

Minnesota has seen an increased interest from 2020-2025 in free, wild food obtained through foraging on public land. Minnesota public land managers are concerned about negative impacts to public land, and as a result have considered restricting harvesting of mushrooms. One concern is that foragers walk off-trail and might negatively impact the forest ecosystem, but there has been little evidence synthesized to inform or validate this concern. Therefore, I examine human effects on soil compaction and mushroom productivity by performing a systematic review of peer-reviewed literature. Eight papers were selected in which field research was conducted in areas with seasonal changes including cold weather similar to Minnesota. An additional 16 papers were used to inform the context and discussion surrounding the main findings. I also interviewed five foragers local to the Midwest region of the United States to gain perspective on how foraging practices are carried out on public land.

Compaction seems to have a positive but non-linear relationship with foot travel, with foot travel of more than 100 passes not causing a significant increase in compaction. Mycelia is found to grow more readily in soil with greater porosity, but human foot traffic did not seem to have a cumulative negative effect on fruiting body productivity. Human removal of fruiting bodies and the methods of mushroom harvest did not alter fruiting body production in subsequent years. Although there is no evidence in the literature that suggests mushrooms decrease due to human harvest, permitting systems could be implemented to use foragers' expertise to gather data and teach sustainable and reciprocal practices to new foragers. When considering the carrying capacity of an area for foragers, it is also important to consider traditional ecological knowledge as well as the historic wildlife uses of that area and how that might be replicated by human interaction of foraging on public lands.

INTRODUCTION

Foraging has been a human practice since time immemorial, spanning cultures, continents, and countries. For readers familiar with grassland ecosystems and grazing animals, the word foraging may hold a different meaning. In this paper, I define the act of foraging as the human practice of harvesting edible plant material or fruiting bodies from the wild for consumption.

Humans have foraged for centuries to provide food for themselves. Much of the practice of foraging has diminished throughout the United States (U.S.) over time due to the rise of the modern industrial food systems that separate consumers from the food source, the privatization of land, and the removal of indigenous people groups from land access (Bellows et al., 2023; Serraj, 2018).

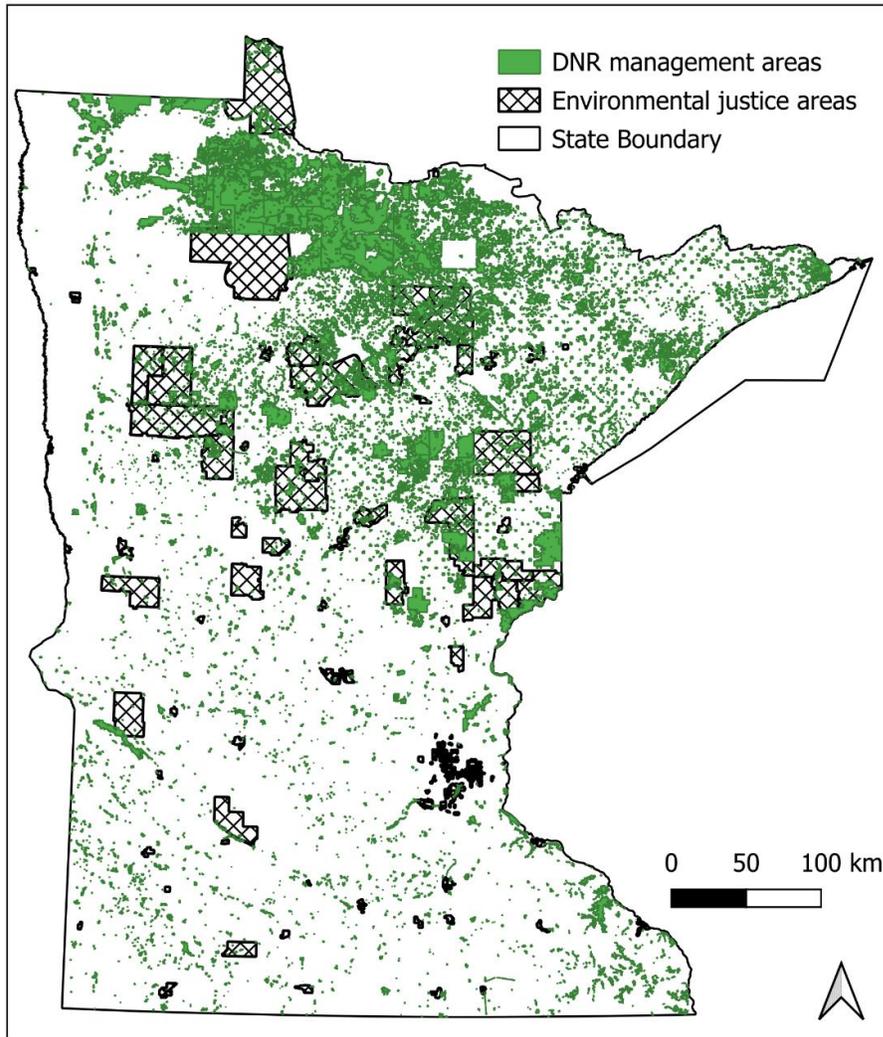
Interest in foraging reemerged during the COVID-19 pandemic and has continued to increase as food prices in the U.S. have risen. When the COVID-19 pandemic led to the global lockdown of 2020, it illuminated the supply chain issues of the U.S. industrial food system, which is reliant upon states or countries far from one's own home (Skalkos, 2022). The lockdown and corresponding supply chain disruption inspired many people to start gardening and spending more time outside, including foraging to compensate for rising food prices and supply shortages (Skalkos, 2022; Yossi Sheffi, 2021). Foraging, previously practiced by a few traditionally minded individuals, indigenous peoples, and immigrants, has now become a popular recreational activity among the masses.

Minnesota has, like so many other states and countries around the world, experienced a surge of interest in outdoor recreation during and after global pandemic shelter-in-place orders. With the outdoors being a safe place to see loved ones or to simply experience some stress relief, the number of visitors to state parks surged in 2020 (Juliot, 2024). In response to this continued increase, Minnesota Governor Walz in 2023 signed a \$10 million budget increase for Explore Minnesota, a state department dedicated to tourism and parks and recreation management for the state (Smith, 2024). The increased interest in getting outdoors, coupled with the rising costs of food following the pandemic, has sparked interest among metropolitan area residents in the free harvesting of local food (Skalkos, 2022).

Additionally, foraging is an essential part of the cultural identity and heritage of many immigrating to Minnesota. According to the U.S. Census Bureau, 8.5% of Minnesota's population consists of foreign-born residents, but in the Twin Cities, this figure increases to 12% of the total population (Bureau, 2023). The majority of these immigrants are from Ukraine, Laos, and Somalia, which each have culturally specific traditions of foraging plants and mushrooms alike (American Immigration Council, 2023). Many of these immigrants live in environmental justice areas. They do not own property, and instead reside in apartments, relying on public land to recreate and practice these traditional methods of gathering food (American Immigration Council, 2023; Martignacco, 2024).

Environmental justice areas are defined by MN R. 116.065, and the areas have the following population makeup: 40% of the residents are people of color, 35% of the households have income at or below 200% of the federal poverty level, and or where 40% of the population has limited English proficiency (Minnesota Legislature, 2024, *Sec. 116.065 MN Statutes*).

The Minnesota Department of Natural Resources (DNR) manages more than 5,777,630 acres of public land available to Minnesotans, and over 76.5 % (4,424,110 acres) are within 10 miles of an environmental justice area (Figure 1).



Made by Leya Charles
3/24/2025
Shapefiles obtained from <https://www.mngeo.state.mn.us/>

Figure 1: Map visualizing DNR managed land and locations of environmental justice areas. This map did not include Tribal Nation boundaries as additional EJ areas, as Tribal members have unique foraging rights due to treaty agreements. However, there is some overlap between the census-identified EJ areas and Tribal Nation areas. (MPCA Environmental Justice - Minnesota Geospatial Commons, 2024; State Administered Lands - DNR Management Units, Minnesota - Minnesota Geospatial Commons, 2025).

The increased interest in foraging can be seen in the surge of followers on the social media accounts of long-time homesteaders and makers. According to Linda Black Elk, Instagram, Tik Tok, and other social media platforms have become a form of oral history telling, passing traditional knowledge and identification information to new foragers (L. Black Elk, personal communication, February 13, 2025). One example of this is the Ironwood Foraging Co. social media profile on Instagram which had 3,000 followers in January of 2019, increasing by more than 17 times to 52,000 in January 2025 (T. Clemens, personal communication, February 6, 2025). Additionally, Alexis Nicole, known by her social media handle as @BlackForager, gained popularity in a viral fashion with over 2 million followers on TikTok as she shared how to find food right outside one's door even in urban environments (Mohtasham & Manoush, 2021).

Environmental educators have noted the same increased interest in their class offerings, allowing both Ironwood Foraging and Four Season Foraging to operate as independent foraging educators in the same metropolitan area in Minnesota. Tim Clemens of Ironwood Foraging Co. notes that he was able to make foraging education his full-time business in April of 2020, with classes filling to capacity quickly (Clemens, personal communication, 2025). In 2020, there were 300 attendees at Ironwood Foraging Co. workshops, but the number increased over sevenfold to 2,268 attendees in 2024, split between 70 workshops and 24 events (T. Clemens, personal communication, February 6, 2025). According to Maria Wesserle from Four Season Foraging, her introduction-to-foraging class and merchandise sale revenue have doubled since 2020 (Figure 2) (M. Wesserle, personal communication, February 18, 2025). Additionally, increased interest in identification education has caused consistent annual increase of the traffic to her

educational foraging blog with consistently high interest during the start of foraging season each year in May (Figure 3; M. Wesslerle, personal communication, February 18, 2025).

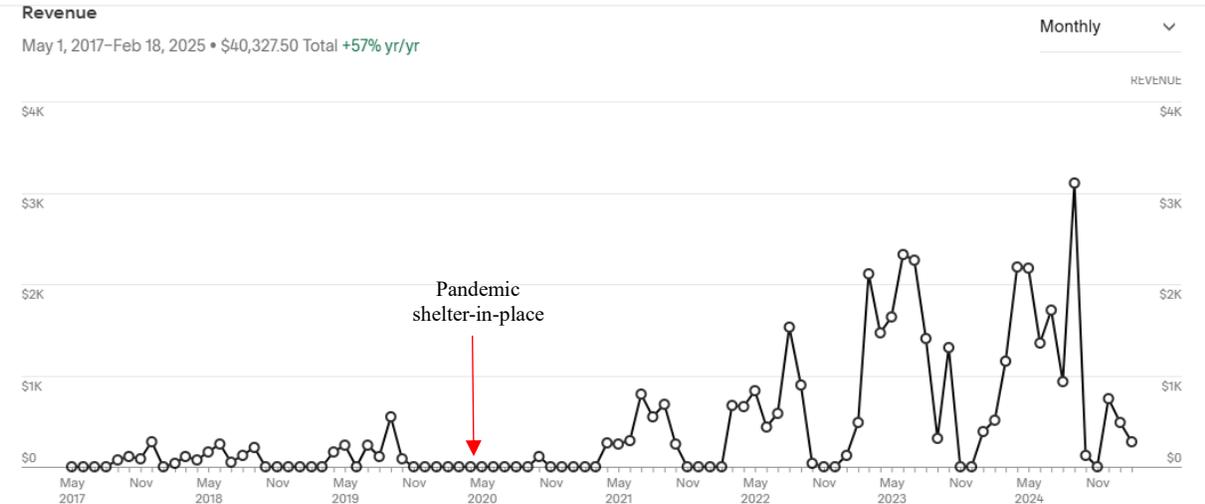


Figure 2: Class and merchandise sale revenue via Four Season Foraging website from 2017-2024 (M. Wesslerle, personal communication, February 18, 2025)

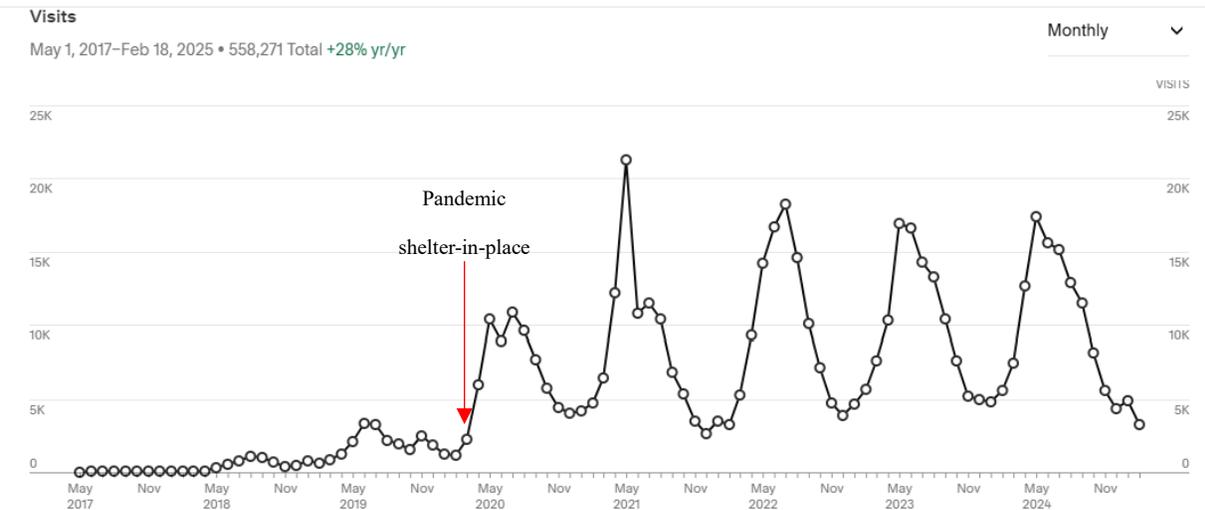


Figure 3: Four Season Foraging blog visits from 2017-2024 (M. Wesslerle, personal communication, February 18, 2025)

Foraging education is especially crucial within the state of Minnesota due to this increased interest in foraging. Different rules for state parks, state forests, county parks, wilderness areas, etc. leave new foragers confused about how to interpret the rules or policy regarding the legality of foraging (Wilsey & Miedtke, 2013). This confusion, coupled with the increased pressure of human recreation on public lands, has led the Minnesota DNR to review and revise its public land use rules for the first time in 30 years (Minnesota Legislature, 2008; Kennedy, 2023; Nelson & Stockton, 2023; Pierce, 2024). This revision of Minn. R. 6100.0900 would limit use by urban residents, indigenous peoples, and immigrants who rely on public land access to practice their cultural heritage (Clemens, 2023; Wesslerle, 2023). Professional land managers express concerns over the spread of invasive species, trampling of native plants, soil compaction, and overharvest by humans, which is causing a decreased food source for wildlife. These are reasons to consider restricting or banning foraging on MN public lands (Martignacco, 2024; Nelson & Stockton, 2023; Pierce, 2024). Foragers are concerned that prohibiting foraging on public land would result in a long-term decrease in biodiversity and undermine sustainable land protection principles (T. Clemens, personal communication, February 6, 2025; L. Black Elk, personal communication, February 13, 2025; P. Martignacco, personal communication, February 6, 2025; A. Toczydlowski, personal communication, February 8, 2025). Foraging educator, Tim Clemens, puts it this way,

“I think foragers are critical to the well-being of forests and every other ecosystem. ...we need incentivized groups of highly motivated citizens to care about very specific areas of land and water and to understand the rhythms of these areas. Pigeonholing nature has led

to a decline in nature literacy and protections. Foraging widens the nature support base and increases nature ethic simultaneously.” - T. Clemens

The DNR’s review of public land rules was expected to occur during 2023, with final policy recommendations to come out in a public comment period in early 2024 (J. Templin, 2023). When the Minnesota Mycological Society (MMS) learned of the consideration that the DNR would restrict or ban foraging on state parkland, the word spread quickly among individual foragers and advocacy groups (Martignacco, 2023). This news of foraging rule changes resulted in viral social media posts from influential foragers, and as a result, comment letters were sent to the DNR requesting a pause on this policy review to allow appropriate public engagement (Alan Bergo, 2023; Clemens, 2023). Representatives from the legislature also became involved, resulting in the lengthened timeline of this public review (*Minnesota Sustainable Foraging Taskforce*, 2025). This review is now underway, but it no longer has a strict timeline as the DNR staff are internally considering the science and land management principles to determine what should be done to protect public land (S. Strommen, personal communication, January 10, 2025).

Foragers across the state have started a new advocacy group known as the Minnesota Foraging Alliance (MNFA). MNFA’s mission, vision, and values strive to recognize foraging as a valid form of recreation on state lands, and as an inherent right of the public in using public land for personal use of food gathering (Minnesota Foraging Alliance (MNFA), 2025). One of the proposed considerations by the DNR is to create a one-gallon bag limit for mushrooms across MN State Parks (Pierce, 2024). Although foragers in MNFA argue that limiting plant gathering or creating a permit system may be warranted, there is no biologically reproductive reasoning to place a limit on mushroom harvest (T. Clemens, personal communication, February 6, 2025; P.

Martignacco, personal communication, February 6, 2025; J. B. Peterson, personal communication, February 16, 2025; A. Toczydlowski, personal communication, February 8, 2025). The main portion of a mushroom organism, the mycelium, lives underground or in decaying wood (Johnson et al., 2016). Mushrooms are self-limiting in nature of harvest, because these are the fruiting bodies of fungi, and harvesting may not harm the regrowth potential or damage mycelia, the main part of the organism (Egli et al., 2006; P. Martignacco, personal communication, February 6, 2025).

Some speculate foragers play a vital role in the spread of mushrooms, as walking through the woods with a basket of harvested fruiting bodies could spread spores along the way. There is currently no quantification of foragers using public lands due to the absence of a permitting system for mushroom foraging in Minnesota (J. Drimel, personal communication, February 4, 2025; Pierce, 2024). The absence of a permitting system leaves land managers to rely on speculation regarding the number of foragers using public land for mushroom harvest. Research needs to be conducted from comparative areas in Minnesota to inform land managers of the potential impacts, whether positive or negative, regarding foraging on public land.

One of the concerns brought about by land managers is the idea that foragers go off-trail to find mushrooms. This off-trail hiking has the potential to disturb or crush native plants, track invasive plant seeds on boots or clothing farther into the woods, and cause compaction, which might harm fruiting body growth in future seasons. A fruiting body is the fleshy and often edible spore-producing structure of a mushroom.

Although it is well known that the presence of mushroom mycelia increases the water holding capacity of substrate, David et al. (2024) and Frene et al. (2024) found increased

compaction caused reduced water-holding capacity or possibly had no effect on the water holding capacity in soil. As land managers consider better water retention in soil in the face of increased precipitation events or pending drought conditions, the potential of hikers causing compaction by going off-trail is worth exploring.

In this paper, I explore the effect of human foragers on mushroom growth and soil compaction. More specifically, I examined the effect of foot traffic and fruiting body removal on mushroom productivity. I expect to find that the influence of human foragers is negligible, as the main portion of the fungi is the mycelial layer underground which goes untouched by human harvest of fruiting bodies.

METHODS

Systematic review of peer-reviewed research

I used Montana State University's academic digital library search to identify peer-reviewed research articles relating to foraging and impacts from foot travel and compaction of soil. I conducted keyword searches on various days between February 3-March 1, 2025. Dr. Y. Yano, soil scientist and instructor on this project, recommended two additional papers not identified in the digital library search.

Keywords used (in combination): soil compaction, mycelium, fruiting body, trampling, hiker trampling, human gathering effects, human disturbance, mushroom, spore dispersal. I selected or eliminated research studies based on the following criteria. Papers were first selected if research was primarily based in Minnesota. There are many mushrooms in Minnesota that foragers gather that grow on wood or standing dead or live trees. In this paper, I focused the selection on the mycorrhizal mushroom species that grow from soil and are found in forested

areas. Papers were eliminated if they studied mushroom compost or focused solely on grasslands. I selected papers that had a focus on hiker/human trampling and eliminated any due to livestock trampling.

Because not enough research was found specific to Minnesota, I broadened the search to research conducted within North America using the same set of keywords. Due to Minnesota weather, soils freeze over the winter period and mycelia are dormant at that time, so I excluded studies in tropical or dry desert areas. Research within North America was limited to short-term studies or studies performed over five years. To search for longer-term research of 10 years or more, my paper selection was again broadened to include other countries. I included research from other states or countries for review if the climate of the studied area was like Minnesota with average freezing temperatures for one to three months of the year. Forest biomes also needed to include species that are comparable to those that grow in Minnesota, such as maples or spruce, to be considered for inclusion in the systematic review. I included Lei (2004), which was conducted in Nevada, even though it fell outside the parameters of habitats that experience 1-3 months of winter, because this paper replicated the findings of three other studies (Cole 1987a, 1987b, 1998) in Montana and was performed more recently within the past 30 years.

For all searches, I selected research studies if they collected data within the last 30 years. One exception was made for the Goeckermann & Bloemendal (1973) due to it being the only paper with research on soil compaction dedicated to habitats within Minnesota.

Many research studies regarding human foot travel do not demonstrate the direct effect on mushroom fruiting body production. Most research evaluated plant growth and response to human foot travel. Therefore, I selected additional studies that evaluated the relationships

between plant roots and mycelium, from the same keyword search and citations in the identified papers. I then used the potential effects of compaction on plants as a surrogate for the effects of compaction on a mycelial network.

The main results in the systematic review were based on the following identified papers. Egli et al. (2006), Ehlers & Hobby (2010), Goeckermann & Bloemendal (1973), Harris et al. (2003), Hoorman et al. (2011), Lei (2004), Marion & Cole (1996), Norvell (1995).

Additionally, I used the papers listed below that were identified through references in the main papers selected for review. Agerer (1985), Collins (2016), Cole & Spildie (1998), Cole (1995), Cole (1987a), Cole (1987b), Frene (2024), Greacen and Sands (1980), Kasparavicius (2001), Leonard et al. (1985), Nadian (1996), Püschel (2024), Straatsma et al. (2001), Thorud & Frissell (1969), Weaver & Dale (1978), Zakaria (2014).

Although we need to exercise caution in interpreting these findings because of the small number of studies relating to mycelial fruiting bodies and soil compaction, these findings nonetheless seem to be largely consistent with the overall understanding of foragers and mycology educators in the Midwest.

Land managers at state agencies creating policies for foraging on public lands have not shared with the public their methods for research or review of science demonstrating and supporting their policy decisions. In this paper, I seek to compile some peer-reviewed science regarding one of the topics of concern to land managers, soil compaction by foot travel, and make that research available to the public.

Personal Informational Interviews

I also conducted small-scale primary research through informational interviews. The goal of the interviews was to document the practices and principles of the foraging community in Minnesota.

Selected interviewees met at least two of the following criteria: resides in the Midwest, career focusing on sustainable food systems, foraging educator for over 5 years, president of a scientific mycological society, experienced forager (categorized as someone who has foraged mushrooms annually for over 10 years), Indigenous knowledge holder of foraging principles.

I contacted 15 different folks who are well-known in the Midwest foraging community and who met the listed criteria. Five participants agreed and were able to conduct interviews and have their answers published.

The five foragers interviewed fell into multiple categories including: two sustainable food system career focuses, three professional foraging educators, two current or past presidents of the Minnesota Mycological Society, three long-time mushroom foragers of 30+ years, one indigenous knowledge holder.

Three interviews were conducted using video chat and transcribed from the meeting recording. Two interviewees responded via written communication. Non-verbatim transcriptions of the interviews are available in Appendix A. All five interviewees responded to identical questions.

RESULTS

Section 1: Relationship between foot traffic and soil compaction

Literature review

Papers that evaluate human foot travel require multiple passes of foot traffic, with soil samples taken periodically between intervals of passes. The number of foot travel passes differs with each unique study, but typically increases by increments of 10 or 50.

In 2004, Lei (2004) studied hiking, biking, and off-road vehicle compaction on soil in Nevada. This study used a 78 kg person wearing hiking boots to perform the foot travel. To evaluate the effect of foot travel, soil samples were collected after 1, 10, 100, and 200 passes by foot. There was a significant increase in soil compaction when evaluating the 1 pass, 10 passes, and 100 passes. However, after 100 passes there was not a significant increase in soil compaction up to 200 passes (Table 1). These findings were consistent with older studies conducted by Cole (1987a, 1987b) in Montana. Lei (2004) replicated the two older experiments and used a heavier person than Marion & Cole (1996), likely showing more negative impacts of foot traffic than the other studies using lighter weight humans.

In a study performed in the Boundary Waters Canoe Area Wilderness (BWCA) in Minnesota during a 1968-1972 period (Goeckermann & Bloemendal, 1973), 33 campsites, located on islands, river side, and mainland, were evaluated for visitor use. Soil samples were collected twice every season for a total of 10 samples for each site throughout the study. Soils were primarily loam, to loamy sand. Sample collection occurred between June 1 and Sept 15, similar to a mushroom foraging window.

They found little change in the depth of organic matter overall, but compaction levels, measured with a penetrometer, steadily increased during the first two years and then leveled off during years three to five. They concluded that, after two years of use, the additional effect of human traffic on soil compaction was minimal. The findings on soil compaction was supported

by no significant changes found for any years in the old (control) sites. They also found that compaction levels increased only in spring when soil moisture levels were relatively high (Table 1), similar to findings by Marion & Cole (1996), who used experimental foot travel plots.

Experimental foot travel plots were divided into transects. Each plot had two controls, and four other transects of 10, 50, 250, or 1,000 passes, respectively. Plots were placed in both forested areas and grassland areas. This experiment was performed once each season in August over the three years of 1986-1988. A 55-65 kg person wearing trail-running shoes was used for foot travel. Measurements were taken before and after foot travel, consistent with the organic matter depth, penetrometer, and moisture content samples of the campsite study. In the experimental foot travel plot results, significant changes in soil compaction were found in the measurements before and after foot travel when soil moisture content was high.

Table 1: Summary of evaluated papers and results for foot traffic and soil compaction

Location	Time period	Disturbance Type	Data collected	Results	Reference
Bob Marshall Wilderness, Montana	3 years, 1981-1984	Foot traffic, 5, 15, 25, 40, 75, 80, 100, 200, 300, 400, 600, 800, 900, 1200, or 1600 passes	Penetrometer (pore space/soil compaction), organic matter, vegetation cover	Insignificant increase in compaction >100 passes. (Compaction has a positive but non-linear relationship with foot travel).	Cole (1987b)
Montana	1 year, 1994-1995	Foot traffic at 25 & 150 passes	vegetation cover and height	Insignificant change in vegetation for 25-150 passes	Cole & Spildie (1998)

Washington, Montana, Colorado, New Hampshire, North Carolina	2 years	Foot traffic, 25, 75, 200, 500 passes	Plant cover measured 2 weeks and again 1 year after foot traffic	No additional decrease in plant recovery rate >75 passes. Grasses more resistant to foot traffic than shrubs, and have a faster recovery rate. Each plant species can tolerate foot traffic but have differing levels of threshold before plant cover decreases.	Cole (1995)
BWCA, Minnesota	5 years, 1968-1972	Campsite use	Penetrometer (pore space/soil compaction), organic matter, moisture, temperature	Compaction increased first 2 years with relationship to soil moisture. Compaction was caused more easily in wetter spring soils. Insignificant compaction effects years 2-5. Insignificant change in organic matter years 1-5.	Goeckermann & Bloemendal (1973)
Kyle Canyon, Nevada	1 year, 2002	Foot traffic, 1, 10, 100, and 200 passes	Penetrometer (pore space), organic matter, moisture, temperature	Compaction increased up to ≤ 100 passes, but no compaction change in 100-200 passes. Human foot traffic caused the	Lei (2004)

				least amount of compaction compared to biking and off-road vehicles.	
White Mountain National Forest, New Hampshire	4 years, 1978-1981	Foot traffic	soil compaction (penetrometer), trail width, soil recovery, vegetation response	Highest reduction in plant survival at ≤ 300 passes. Significant change in plant survival at 100-300 passes. Insignificant change in vegetation survival at ≥ 300 passes.	Leonard et al. (1985)
Water Gap National Recreation Area, Pennsylvania	3 years, 1986-1988	Campsite use	Penetrometer (pore space/soil compaction), organic matter, moisture, temperature	Campsites contained 1/3 less organic matter than control sites. Campsites had significant increase in soil compaction compared to control. Experimental foot travel: significant changes in soil compaction was found when soil moisture content was high.	Marion & Cole (1996)
Bozeman, Montana	1 year, 1973	Foot traffic, 100, 500, 1000 passes	Soil moisture, vegetation	Grasses more resistant to foot traffic than shrubs,	Weaver & Dale (1978)

			cover, soil density, trail width	flat sites more resistant than sloped sites. Hikers are the least compaction causing when compared to horses and motorcycles.	
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Similar to the study by Goeckermann & Bloemendal (1973), a 5-year study was performed in Pennsylvania at the Delaware Water Gap National Recreation Area (Marion & Cole, 1996). Twenty-nine sites were categorized as high use (40-70 nights annually) and low use (3-10 nights). Site dynamics included eight high-use upland sites, seven high-use lowland sites, one low-use upland site, and three low-use lowland sites.

The effect of human traffic on various soil moisture levels was evaluated between June and September by measuring changes in organic matter depth, soil bulk density, and penetration resistance. Each site selected was compared to an undisturbed control site with matching vegetation type and elevation.

Regardless of the elevations, campsites were found to have about 1/3 less organic horizon layer and a significantly greater penetration resistance and bulk density than on undisturbed control sites. Goeckermann & Bloemendal (1973) and Marion & Cole (1996) had similar findings that the initial 2 years of human use caused the most soil compaction (Table 1). These findings are further corroborated by Cole (1995), who found that after 75 passes of foot travel, no additional decrease in plant recovery rate occurred.

Although initial foot traffic increased compaction, plants appeared more resilient with negative effects not appearing until foot traffic exceeded 100 passes. In Montana, Cole & Spildie

(1998) found that foot travel from 25 passes to 150 passes did not correlate with increased plant disturbance. Similarly, in a three-year plant recovery study in a maple- and conifer-dominated forest in New Hampshire, Leonard et al. (1985) found that the negative impact on plant recovery from hiker foot travel was insignificant with less than 100 passes. Although there were negative impacts to plant recovery found in the 100-300 pass range, no change in vegetation recovery was found after 300 passes (Table 1).

These findings show that after the initial effect by some amount of foot travel, additional foot travel will not increase negative effects. Goeckermann & Bloemendal (1973) were not able to get an estimate of passes of foot travel during campsite use like the other controlled studies (Lei, 2004; Marion & Cole 1996). However, there were more than 1,500 visitors to the campsites each year. Marion & Cole (1996) found that bulk density and penetration resistance were significant on campsites compared to control sites. However, both low-use and high-use sites were not found to have significantly more impact with more use (Marion & Cole, 1996). This is corroborated by studies by Lei (2004) and by (Cole, 1987) who states there is a positive but non-linear relationship with human use or foot travel. Goeckermann & Bloemendal (1973) and Marion & Cole (1996) found the levels of significant impact occurred within the first 1-2 years of foot travel or campsite use and leveled off after that. This is particularly important to note when land managers are considering the number of foragers allowed off-trail in a forest ecosystem. This research on the number of passes and its minimal effects may help land managers determine the number of foragers allowed in an area. More foot travel does not mean more compaction, there is a threshold after which compaction effects are insignificant.

Although many of the studies cited here were performed about 30 or more years ago, their findings are still relevant today because the human use of land, and the potential for hiking off trail and causing compaction remain a concern among land managers throughout the years. Because reduced soil pore space due to compaction can lead to less water retention in the soil, it is an important consideration in climates such as Minnesota with predictions of increased wet weather events to consider (DNR, 2025). In studies by Goeckermann & Bloemendal (1973) and Marion & Cole (1996), soil was found to be more compactable when it contains a higher moisture content. The start of the dry season is identified as June 15 in Minnesota, thus, care should be taken when traveling during the wet season as soil is more compactable (Goeckermann & Bloemendal, 1973; Marion & Cole, 1996).

The mode of traffic is also a consideration land managers should factor in, as Lei (2004) estimated just one pass of an off-road vehicle was the equivalent to 10 human passes. Additionally, Weaver & Dale (1978) compared hiker, motorcycle, and horse hoof travel on soil compaction, and hikers were found to have the least compaction effects. Lei (2004), Goeckermann & Bloemendal (1973) and Marion & Cole (1996) did not factor in compaction by deer trails or wildlife use of areas.

In Marion & Cole (1996) and Lei (2004), human impacts of foot travel were more significant when there were 50-100 passes made by a 55-78 kg person. An average whitetail deer weighs 66-79 kg, according to the Minnesota Conservation Federation (2016). With similar weights, it can be argued that deer trails would have similar compaction as the designated walking trails. Therefore, if foragers are traveling on deer trails, their foot traffic is likely contributing less to soil compaction than if traveling off-trail. However, foot shape and size are

different than hoof shape and size, and more research is needed on comparing compaction effects. The awareness and concern for causing environmental impact is dominant in the foraging community, as demonstrated by five informational interviews. This awareness reduces the possibility of compaction or disturbance of areas not managed for continual walking.

Informational interviews

Many foragers actively choose to decrease the impact of their foot travel by using established trampled paths. In all five interviews, foragers stated they walk on designated asphalt or well-used trails while traveling long distances and take care not to damage plants while walking off-trail. One interviewee identified they forage in primarily urban areas, so going off-trail is generally not a concern, with the other four interviewees identifying that walking off-trail is not the primary mode of travel while foraging. When veering off from main trails, they only walk a short distance when they see a spot that looks promising or when they have reached their intended location. One interviewee says they have seen evidence of increased erosion over the years in a deer trail at a state forest on the side of a bluff, but are unsure if this was due to foragers, hunters, or simply hikers using this path more frequently. This interviewee also cited climate change considerations and increased rain events as potentially exacerbating these effects.

As land managers consider visit frequency and use of an area, the evaluation of compaction potential can be an important consideration regarding setting policies, rules, or permitting regarding foraging in forested habitats that require off-trail exploration to find mushrooms.

Mushrooms that foragers are harvesting do not grow in the same spots or habitat throughout the seasons, so repeated use of the same paths and subsequent soil compaction may be minimal. Foragers not returning to the same spots throughout the summer should be considered when estimating the quantity of foot travel that might occur in a given area. Moreover, interviewee J.B. Peterson, a marketing communications manager for Wild Grocery, explains the concept of why it is important to consider the effects of foragers as a group, versus individuals acting in succession.

“It is a very valid concern that an increase in foraging could put things at risk...that is something we need to address and be thoughtful about. However, in that question there is an assumption that all those foragers are acting individually and in succession. That they are going one at a time, one right after the other and therefore that their impacts are in addition to one another. That whatever damage might have occurred from the person before them is compounded upon by the person after. Or that the successive person is harvesting beyond what the person before them did. In my experience, when there is an increase in foragers they are doing that in community or they are doing that in groups. So anecdotally I would argue that the increase in foragers occurs when there are multiple people together. Multiple people together actually strengthens the concern about sustainability practices. As a group, folks are much more conscious and divvy up what each individual is going to take or harvest, dividing up different species of harvest or different areas of travel. In my experience in the increased interest in foraging I have not seen a negatively impacted forest ecosystem, and if anything I think the increased interest in foraging is one of the fastest paths to increased conservation. It like a little coalition

because people who care about conservation and saving what is out there are the people who are interacting with the environment and working to keep the natural world healthy. I'll say it in another way. I think there would need to be a limit on foraging if it was one person going in to harvest one pound and leave the next person to harvest one pound, and so on. If we are talking about a permanent system and a specific region then yes, there is realistically limits for what humans can harvest. But more broadly the increased number of people who learn to care about the forest and learn to care about the wild food in the natural world is a boon to sustainability efforts. The more people who care about those things, the more of a coalition we have for shifting policy and shifting culture.”

- J. B. Peterson

This research could be used in estimating the number of permits to be issued in each area to balance compaction concerns with human utilization of public land for recreation.

Section 2: Compaction effects on fruiting bodies

This next section evaluates the potential effects of soil compaction on recurring growth of mushrooms. How does soil compaction translate to mycelial growth? It is well documented that the presence of soil fungi is beneficial to plants, which in turn benefits mycorrhizal fungi, because the fungi increase soil carbon capture, the water-holding capacity of the soil, and the uptake of nutrients in plants during dry conditions (Collins, 2016; Nadian, 1996; Zakaria, 2014; Püschel, 2024).

Soil compaction can affect the ability of plant roots to penetrate the soil (Greacen and Sands 1980; Frene, 2024). “Soil compaction increases soil bulk density and reduces porosity,

limiting water and nutrient diffusion” which reduces the water and nutrients available for plant uptake (Frene, 2024).

Although it is well documented that soil compaction negatively affects the processes within the soil, such as water infiltration and plant root growth, less is known if this may include the growth of fungal mycelium (Hoorman et al., 2011; University of Minnesota Extension, 2018). Mycelium penetrates soil in a different way than plant roots, not relying heavily on pore space, so compaction may not have an effect (Hoorman et al., 2011). However, it is possible that the decrease of soil oxygen and nutrient availability in compacted soils may hinder proper mycelial growth (Frene, 2024; Hoorman et al, 2011).

Table 2: Summary of evaluated papers and results for compaction impacts on fruiting bodies

Location	Time period	Topic of study	Parameter measured	Results	Reference
Moosboden, southwestern Switzerland	10 years, 1990-2000	Harvesting effect on mushroom productivity with without foot travel	Number of fruiting bodies	Foot traffic did not have a cumulative effect on fruiting bodies.	Egli et al. (2006)
Laboratory	1 year	Compaction effects on the abundance of hyphae without plant root presence	Hyphae presence, soil porosity	More hyphae per gram of soil in non-compacted soil compared to compacted soil.	Harris et al. (2003)

Laboratory	1 year	Compaction effects on the abundance of hyphae and plant root growth	Hyphae presence, soil porosity	More hyphae found growing in samples with plant roots.	Hoorman, et al. (2011)
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Literature review

One of the two sites studied by Egli et al. (2006) investigated whether soil compaction via human foot traffic affects the production of fruiting bodies. This study was conducted for 10 years from 1990-2000 in Moosboden, located in southwestern Switzerland in a forest of Norway spruce. There were four treatments in the study: harvesting fruiting bodies with foot travel, harvesting fruiting bodies without foot travel, no harvesting of fruiting bodies with foot travel, and control with no harvesting of fruiting bodies or foot travel. I define trampling as normal foot travel associated with mushroom picking to mimic that of a forager, and throughout the rest of this literature review will be referred to as foot travel. Plots with no foot travel used boards elevated above the soil so that no soil would be disturbed while picking the fruiting bodies.

A total of 250 fungal species were included and 50,222 fruiting bodies counted (edible: 51 species/10,173 fruiting bodies; nonedible: 199 species/40,049 fruiting bodies). Not all of these species are edible or prized for foragers to gather, however, all are mycorrhizal in the soil and are applicable in this literature review because of the DNR's concerns for wildlife use of mushrooms as well as ecosystem health and diversity of populations in general.

The study found that the foot traffic on the forest floor reduced the number of fruiting bodies within the first season of harvest (Egli et al., 2006). However, neither the total number of species present in the plots nor the number of fruiting bodies in the succeeding years decreased. The total number of species produced in the foot traffic versus controlled plots were not significantly different. Therefore, the results of this 10-year study do not show evidence of mycelium being damaged long-term due to foot travel or soil compaction.

Foot traffic can reduce fruiting body production by 30% when comparing the foot traffic to control sites, but this effect is not cumulative as the mycelium persists in the soil (Egli et al., 2006). The researcher's hypothesis of causes for this reduced fruiting body production per season on foot trafficked plots are that the small fruiting bodies may become crushed by foot traffic in their early stages of growth in the duff leaf litter cover of the forest floor. Meaning that the time of year that a harvester is walking off-trail makes a difference, not the actual compaction of the foot travel making a difference in mycelial growth or fruiting body production.

There are limited studies related to the effects of soil compaction on the growth of mycelium. Plant growth and mycelium are interconnected. In Hoorman, et al. (2011) the abundance of hyphae and root growth in land cultivated with corn is used to evaluate the potential compaction effects on mycelial growth.

Compacted soils contain less mycelium, however most of these studies were performed with tilled soil, which is compacted by heavy farm equipment, and not by simple foot travel (Hoorman et al., 2011). This decrease of mycelium could also be related to the decrease of host plant roots in the compacted soil, as corn is an annual plant, with less roots additionally impacting mycelium growth.

Interactions between soil compaction and plant roots may be related to air and water movement through the soil; mycelia need oxygen in the soil, and plant roots increase porosity in the soil for oxygen movement (Hoorman et al., 2011). Mycelia also need a food source in the soil, which can be supplied by plant roots. With plant root growth decreasing when there is increased soil compaction, this relates to a decreased carbon food source for the mycelia so fewer hyphae are produced in compacted soil because there is less food source (Dance, 2017). When soils were planted with continuous cover crops there were more plant roots and therefore more hyphae growth.

Harris et al. (2003) evaluated the presence, absence, and quantity of the mycelium from the fungus *Rhizoctonia solani*, which is a pathogenic fungus with inedible and insignificant fruiting bodies and has a parasitic relationship with the roots of soybeans or potatoes. Harris et al. (2003), similar to Hoorman et. al. (2011), focused on the evaluation of hyphae which make up the mycelial structure of the mushrooms, however, Harris et al (2003) investigated the effect of compaction without the presence of plant roots (Table 2).

Harris et al. (2003) evaluated the density of soil and the expansion of mycelial network into soil pore spaces of the organic soil layer. Autoclaved sterile soil was inoculated with the mycelium and five days of mycelium growth were allowed. Thin sections of soil were used to visualize hyphae and the soil matrix, with percent pore space calculated. Because autoclaving releases nutrients, the availability of nutrients in each of the soil samples was not thought to be a limiting factor in mycelial growth. They found that there were more hyphae per gram of soil in non-compacted soil compared to compacted soil.

Although mycelia was still present in the densest soil with only 5% pore space, the presence of mycelia was greater in the less dense soils that had more pore space (Harris et al. 2003). This increased presence of mycelia with less dense soil may be partly because the rate of oxygen distribution is 10^4 times faster through air than water (Harris et al. 2003) and because pore space in soil is filled with more air than water, the less dense soil encourages the spread of hyphae into those air-filled pore spaces. Harris et al. (2003) findings seem to indicate that mycelium alone can spread more readily in less compacted soils.

Thorud & Frissell (1969) found that it may take up to six years for soil to reach a non-compacted state once it is compacted. This finding might sound alarming when comparing that it may take only one to three years or about 200 passes, according to the other studies, for soil to become compacted by foot traffic. However, according to Ehlers and Hobby (2010) and Egli et al. (2006), foot traffic compaction does not seem to reduce the mycelial growth or have cumulative effects, resulting in a steady fruiting body production in the following years (Table 1, Table 2). Moreover, Goeckermann & Bloemendal (1973) showed that when a site was closed from human use, that site had plant recovery that was comparable in plant growth to the controlled undisturbed sites within just two years, suggesting a faster recovery from foot-traffic compaction than Thorud & Frissell (1969) had found.

Informational interviews

Five foragers reported in interviews that they visit public land weekly or multiple times a week during the foraging season. Areas visited range from forest service land to urban area parks. All five interviewees stay on established trails for traveling long distances and take care

not to step on plants. They only take what they can eat or process, minimizing unnecessary foot traffic. Four out of five interviewees identified picking up trash or pulling invasive species as a method of reciprocity. One of the five interviewees identified advocacy in public policy as their way to reciprocate with the land.

All five foragers noted that younger more inexperienced foragers tend to take more mushrooms than they can necessarily eat or process at a time due to the excitement of a new hobby. This could increase unnecessary foot traffic. Two interviewees, whose profession is foraging education, teach new foragers how to intentionally walk without breaking plant stems (T. Clemens, personal communication, February 6, 2025; L. Black Elk, personal communication, February 13, 2025). Four interviewees also noted that foraging in community is actually more sustainable and causes less impact. Foragers acting as individuals in succession could cause concern. Foraging in community causes people to hold each other accountable for not taking too much and following intentional walking practices.

In my interviews, I found that four out of the five stated harvesting of fruiting bodies has a positive environmental impact, and no negative impact because foragers pick up trash and pull invasive species. The remaining fifth interviewee said that harvesting fruiting bodies has a neutral impact. All five foragers identified negative impacts to mushrooms are not due to compaction by foot traffic, but rather due to land use change or other anthropogenic factors such as the use of herbicides, urban development of paved trails, and climate change exacerbating flooding, erosion, or increased temperatures.

Section 3: Human removal of fruiting bodies

Literature review

Egli et al. (2006) contained a second site with results from between May and December. The second site is named Chane´az and is in southwestern Switzerland forest with deciduous and coniferous tree species. This study contained the same four plots of varied foot travel and harvesting of fruiting bodies as mentioned previously. This second research site evaluated the effect of harvest method, picking versus cutting the fruiting bodies, on edible mushrooms over 27 years during 1977-2003. A total of 436 species were included and 97,700 fruiting bodies counted (edible: 103 species/53,863 fruit bodies; non-edible: 333 species/43,837 fruit bodies).

Egli et al. (2006) states, “edible fungi, which were selectively harvested, did not decrease relative to unharvested non-edible ones with respect to either the abundance of fruit bodies or species richness.” Their study was performed over 27 years and even in this long-term study no trends were detected as far as the quantity of fruiting bodies in subsequent years, or number of diverse species returning. “Excessive ground trampling during the harvest can affect young mushrooms developing under the duff and reduce total production within a fruiting season; however, it does not appear to have any measurable influence on future production in subsequent fruiting seasons” (Egli et al. 2006). There seems to be no effect on fruiting bodies related to the method of harvesting, whether picking or cutting.

Ehlers & Hobby (2010) evaluated the management of a forest ecosystem on Vancouver Island in British Columbia for the population, growth, and harvest potential of the golden chanterelle (*Cantharellus formosus*). The chanterelle (*Cantharellus cibarius*) is a commonly foraged edible mushroom in Minnesota, and grows throughout North America (T. Clemens, personal communication, February 6, 2025; P. Martignacco, personal communication, February

6, 2025; A. Toczydlowski, personal communication, February 8, 2025). The chanterelle information in Ehlers & Hobby (2010) is thought to be comparable to the growth of the chanterelle in Minnesota, since there are multiple different species of chanterelle in Minnesota. This B.C. forest is managed for non-timber forest products, such as commercial mushroom harvesting. In Minnesota, forests are not managed for the goal of mushroom production because foraging for personal use is what is allowed per policy (Wilsey & Miedtke, 2013).

Ehlers & Hobby (2010) study was done on forests in the Nimpkish Valley, which are dominated by hemlock and fir and experience mild winters. The understory was sparsely vegetated, mostly dominated by ferns and huckleberries. The survey was conducted in 2006 when there was a very hot and dry summer. Harvesting of chanterelles typically begins in July and ends in December. A non-random survey was conducted with 15 participants of foragers and two participants of mushroom buyers in this B.C. community. Harvesters either cut or pulled mushrooms from the ground or used both methods. Survey respondents said they actively harvested from 2–8 hours/day over 2–20 weeks, depending on the season.

This study raises the question of whether removing fruiting bodies affects spore dispersal or production of mushrooms in future seasons. Ehlers & Hobby (2010) found that many foragers believed picking mushrooms spreads the spores around when carried in baskets. The idea of foragers spreading spores by harvesting was consistent with the findings from several of my interviews (T. Clemens, personal communication, February 6, 2025; L. Black Elk, personal communication, February 13, 2025; J. B. Peterson, personal communication, February 16, 2025). These interviewees also stated that picking smaller mushrooms is discouraged. All five of my informational interviews also noted that small mushrooms are allowed to grow, and larger over-

mature mushrooms are allowed to remain in order to spread spores (T. Clemens, personal communication, February 6, 2025; L. Black Elk, personal communication, February 13, 2025; P. Martignacco, personal communication, February 6, 2025; J. B. Peterson, personal communication, February 16, 2025; A. Toczydlowski, personal communication, February 8, 2025).

Half of survey respondents in Ehler & Hobby (2010) stated they were concerned about climate change affecting local mushroom populations. All five informational interviews of mine also stated climate change concerns are a driver of mushroom population fluctuations. Ehlers & Hobby (2010) states logging and fire suppression may contribute to lower populations of chanterelles but does not provide evidence further in the paper to back up that hypothesis. Chanterelles being ectomycorrhizal fungi that have symbiotic associations with trees, Ehlers & Hobby (2010) also states that forests with trees younger than 40 years are not targeted by harvesters as they have fewer mushrooms than older stands of trees. This finding is supported by Hagerman et. al (1999), who found that ectomycorrhizal fungal species richness was greater near the rooting zone of mature trees.

The last study evaluated in this paper is that of a 13-year study in Oregon by Norvell (1995), which aimed to identify the threats to mushroom populations in Oregon. This study was spurred on by the Oregon Mycological Society making claims that overharvesting may be leading to the decrease of chanterelles that harvesters were finding. Hypothesis included the following possible causes of mushroom population decline: air pollution, short timber rotations, clearcutting, depletion of soil litter layers, and over-harvesting.

The study was conducted by volunteer mycologists and conducted in the Mt Hood National Forest in a stand of western hemlock and Douglas-fir. Fruiting bodies harvested were *Cantharallus cibarius*, although there is some future research to determine if the species might have been *Cantharallus Formosus* (Norvell, 1995). Every two weeks fruiting bodies and plants present were identified and recorded. From 1986-1989 baseline data was collected in the established plots, with no fruiting bodies harvested during those three years. Plots were divided into three categories, either control with no fruiting bodies removed, fruiting bodies removed by picking, or fruiting bodies removed by cutting the stems. Fruiting bodies were removed every two weeks during five months when they were one centimeter in diameter, as this size was determined to be small and not yet have dropped significant spores for reproduction.

Fruiting bodies picked were weighed and biomass calculated. In control plots biomass was estimated by harvesting the fruiting bodies at the 10th year of the study and extrapolating that data to the number of fruiting bodies recorded in those plots. Control plots were compared to baseline years to determine that they had comparative and insignificant changes in growth during the study period.

One hundred and four other ectomycorrhizal fruiting bodies besides chanterelles were also identified in this site. Harvesting did not reduce mushroom productivity between the harvested plots and the control plots in the study. Instead, for a few years, the harvested plots produced more fruiting bodies than the control plots. Therefore, it is possible that chanterelle species benefit from some disturbance by humans, but more research is needed to find out if that is true.

Pulling versus cutting the chanterelles did not affect fruiting body abundance in successive years. The study concluded that harvesting of fruiting bodies had no significant negative impact on the quantity of fruiting bodies produced in successive years (Norvell, 1995).

It is challenging to isolate factors controlling mushroom productivity, because multiple factors can interact to affect mushroom productivity. For example, there appear to be years of high chanterelle abundance and low abundance, and it is unknown what the mycelium life span of a mushroom may be. The study also discussed the weather impacts on fruiting body growth, with warmer summer temperatures resulting in more fruiting bodies. Three studies are cited by Norvell (1995) which suggest that abundant mushroom years are determined mainly by weather conditions (Agerer, 1985; Kasparavicius, 2001; Straatsma et al., 2001). Soil compaction occurs when soil particles are pressed together, reducing pore space between them. Heavily compacted soils contain few large pores, less total pore volume and, consequently, a greater density. A compacted soil has a reduced rate of both water infiltration and drainage. This happens because large pores more effectively move water downward through the soil than smaller pores (Hoorman et al., 2011; University of Minnesota Extension, 2018).

Table 3: Summary of evaluated papers and results for human removal of fruiting bodies

Location	Time period	Topic of study	Parameter measured	Results	Reference
Chane´az, southwestern Switzerland	27 years, 1977-2003	Foot traffic: with vs. without & Harvest method: picking vs. cutting	Number of fruiting bodies, species of fruiting bodies	Quantity of fruiting bodies and diversity of fruiting bodies	Egli et al. (2006)

				<p>did not decrease over time in harvested plots. No decrease of either quantity or diversity of fruiting bodies in picked vs. cut plots.</p>	
Vancouver Island, British Columbia	2006	Harvest method: picking vs. cutting	Survey, foragers & mushroom buyers	<p>No difference in quantity of fruiting bodies with differing method of harvest. More fruiting bodies occur in forests with >40 year old trees.</p>	Ehlers & Hobby (2010)
Mt Hood National Forest, Oregon	13 years, 1986-1999	Harvest method: picking vs. cutting	Fruiting body weight	<p>No difference in quantity of fruiting bodies with differing method of harvest. Quantity of</p>	Norvell (1995)

				fruiting bodies did not decrease over time in harvested plots.	
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Informational interviews

None of the five informational interviews were aware of any harvesting situations in Minnesota that have led to a decline of fruiting bodies in the following years. Several stories related to the decreased finding of mushrooms only due to another harvester having collected the fruiting bodies first, and the foragers stated this did not mean there were fewer fruiting bodies that grew. These interviewees identified always finding more fruiting bodies nearby, but they had to search to find a new location.

“There are times when someone else clearly beat me to a patch of morels and I only find a bunch of cut off stumps or someone has harvested a clump of Dryad’s saddle before me. So, the availability of mushrooms to ME has sometimes declined, but only because someone else has harvest them, not because there are fewer mushrooms. Even in these cases I usually still find other mushrooms in the area, maybe further from the path or in a harder to get to place.” - A. Toczydlowski

All five interviews cited climate change considerations of exacerbating flooding and erosion, and habitat destruction as the two biggest impacts to recurring mushroom populations. Other sources of negative impact are stated as invasive species encroachment, mountain bike trails, pipeline installations, and overengineering of trails. “Less mushrooms are signs of changes in the habitat rather than people taking mushrooms.” said Peter Martignacco as he told a story

about chanterelles decreasing at a site, and credited the decreased fruiting bodies found as due to flooding and sedimentation occurring the summer before. He stated fruiting bodies recovered in future years at the same site.

Interviewees also made statements regarding the varied methods they use in harvesting mushrooms, either picking or cutting, depending on the species of mushroom being harvested. All five interviewees identified they will either pull or cut mushrooms, depending on the species, but that mycelium does not stick to the end of the fruiting body so that the disturbance to the mycelium network is minimal. Traditional knowledge has taught foragers sustainable principles in harvesting is to always leave some mushrooms behind and never take the smallest or the largest available.

“A mushroom is just the fruiting body of a much larger structure. Picking a mushroom is like picking an apple off of a tree, right? Picking an apple off of a tree does not hurt the tree, as long as you're doing it respectfully. We try not to disrupt the mycelial structure underneath or behind the bark, and still, even though we are aware, you know — even off of an apple tree, we wouldn't pick every apple. So, we don't pick every single mushroom that we see. We try to leave some so that they can release their spores.”

- L. Black Elk

All interviewees identified the most common issues of harvesting more mushrooms than one can eat occur with those who are young and new to foraging. This underlines the value in education of sustainable harvesting methods.

“On public lands, I have seen some negative impacts of foraging, but whenever people in my experience, are educated on like protocols and the spirit behind foraging in thinking

of these plants as relatives instead of just things that we take, it changes. It totally changes the dynamic, I've seen damaged systems go to repaired systems through foraging.” - L. Black Elk

Two interviewees noted the self-limiting nature of harvesting mushrooms that are only available for a short season and then will not fruit again until the following year. One interviewee additionally noted that it is not possible to overharvest mushrooms from a biological sense, because the main portion of the mushroom is the mycelium underneath the ground. No interviewees were concerned about overharvesting mushrooms from an exploitive sense, only from the concern that they should only pick as many as they can process or consume. Because the main portion of the fungus is the mycelium and lives underground, foragers explain that overharvesting is not a possibility because the mycelium is not harvested (Ehlers & Hobby, 2010).

Three interviewees identified that foraging in groups or community promotes sustainable harvesting practices. Interviewees cited control of invasive non-native species, picking up trash, and education on sustainable foraging as common practices among foragers. Two interviewees noted that foragers in groups tend not to over-harvest a single species, because they divvy up what everyone is gathering thus taking the pressure off one species and diversify what is being gathered. “Gathering, harvesting, foraging in community, I think, is more sustainable than harvesting as individuals,” said Linda Black Elk, “we are not meant to forage alone.”

DISCUSSION

This paper sought to evaluate the impact of foragers' foot traffic on soil compaction and the removal of fruiting bodies on fruiting body productivity in future years. The results show that large amounts of foot traffic do influence soil compaction. This was an expected result, but what is interesting is that after a certain amount of foot traffic, the impact of foot traffic does not increase. Several studies demonstrate that after initial impacts of 200 passes of foot traffic or two years of use, there is no increasing effect on soil compaction, root growth, or mycelial growth (Cole & Spildie, 1998; Egli et al., 2006; Goeckermann & Bloemendal, 1973; Harris et al., 2003; Hoorman et al., 2011; Lei, 2004; Leonard, 1985; Marion & Cole, 1996). This information should be further evaluated in Minnesota forests and incorporated into permitting considerations in determining an appropriate amount of foot traffic, including that of wildlife, to be allowed in a harvesting area. When considering the carrying capacity of an area for foragers, it is also important to consider the historic wildlife uses of that area and how that might be replicated by human interaction of foraging on public lands.

Humans walking off-trail and causing soil disturbance or potential compaction may very well be mimicking the ancestral land use of the area previously filled with the presence of large land animals such as horses, bison, moose, etc. In many cases these land animals have been pushed out of their native habitat due to urbanization and the introduction of standardized hiking trails and therefore the land does not receive its typical disturbance that it might see from the presence of these animals using the land. Some foragers argue that humans moving in and around off-trail is still less disturbance than would have occurred had these animals been present, as humans are not consuming grass or shrubs like large ungulates.

According to two interviewees, the consideration of wildlife use of the land applies to both invasive species spread as well as soil compaction. One forager identified that foragers do not track into the deeper parts of the woods any additional seeds that coyotes, squirrels, birds, or other wildlife don't already transport. Invasive species transportation and crushing of plants are outside the scope of this study, although these were common topics mentioned in the interviews of local foragers so more research should be dedicated to answering these topics.

Egli and Ayer (1997) demonstrate that the highest fruiting body production plots were those that had no foot traffic and had fruiting body harvest. Soil compaction studies suggest that soil is more compactable in wet spring seasons. Coupled with the research done by Egli et. al (2006) that suggests young fruiting bodies may be crushed by early season foot traffic, these findings demonstrate that the time of year for foot travel could influence the yield of that season. This potential crushing of young fruiting bodies under can be discussed as the need for foragers to be knowledgeable about their surroundings, and cautious about weather conditions and time of year to stay on established trails. Better education about time of year and conditions that foraging should be performed would be a more suitable solution than placing restrictive laws or rules on walking and foraging.

“I think the interaction of foragers and the land creates a greater appreciation for and understanding of the land. When a person receives the gift of food from the land, I believe they develop a two-way relationship that causes them to be more mindful of our impact on the ecosystem. For example, if I am out in the woods and find a great patch of berries, I am excited to eat them and take them home. This makes me think ‘wow, what

could I do to get more berries here next year.' I think that receiving something from the land makes it more likely that a person will give back to the land.” - A. Toczydlowski

The findings by Egli et. al (2006), Norvell (1995), and Ehlers & Hobby (2010), do seem to back up the five interviewee’s claims that humans cannot over-harvest mushrooms (Table 3). The removal of fruiting bodies from a plot does not correspond to decreased fruiting body growth in successive years, and in some cases suggests an increased production. It is documented that the method of mushroom harvest, either picking or cutting the stems, also does not affect future fruiting body production (Egli et al., 2006; Norvell, 1995). More research will need to be done to determine if human harvest allows the spreading of spores farther than would be possible without human transport of fruiting bodies, or if that spreading of spores leads to increased mycelium and fruiting body growth in future years.

“I do *not* believe in the mantra of “leave no trace”. You know that whole concept of leave only footprints, I don't believe that, because in our Lakota philosophy, we actually should be having a net positive impact on the natural world, not just net zero.” - L. Black Elk

This literature review highlighted the need for research to be conducted that is specific to Minnesota soils and climate conditions. Limitations in drawing conclusions in this systematic review is that only one study had primary research conducted in Minnesota. However, due to Minnesota’s varied biomes and landscape, the results were thought to be comparable. The research should include foot traffic impacts in differing soil types of deciduous and coniferous dominated forests, as well as harvest impacts for Minnesota specific species of mushrooms. Foragers’ participation would be extremely useful in data collection for the research. Foragers are already spending time in the woods and are passionate about protecting the ecosystems they

collect from. Similar to the Oregon study (Norvell, 1995) which used volunteer mycologists, there are foraging advocacy and education groups such as the Minnesota Mycological Society (MMS) and the Minnesota Foraging Alliance (MNFA) that can provide volunteers to assist with data collection.

Another limitation is that the studies reviewed were conducted for 5-10 years. As some of the researchers identified, ideally a 20-year study would show longer-term trends regarding soil compaction, recovery, and fruiting body growth. Although difficult to obtain funding and consistent volunteers for such a long-term study, this is something that state agencies and or land managers across Minnesota should consider pursuing in partnership with a university in addition to using foragers as research participants.

With more time, I would have sought to conduct further interviews with the remaining 10 people identified. Additional interviews would have increased the number of indigenous knowledge holders, long-time foraging educators, and would have included an additional mycological society president from the Midwest region in the interview documentation. However, the availability of interviewees did not make this possible in the scope of this study.

Due to the increased interest in foraging across the state, as described in the introduction, land managers are starting to think about permitting systems. Other recreational activities such as hunting, fishing, and wild rice harvesting already require permitting systems to manage the carrying capacity of the land and populations. Foragers interviewed are not opposed to permitting systems being put in place for plants. There are many plants that could be harvested from public lands that currently are not allowed and have no permitting system to accommodate. However, upon evaluation of current research, and the response from interviewed foragers, there

is little evidence to support that a mushroom foraging permit is needed. The abundance of fruiting bodies does not seem to be influenced by harvesting in previous years, and foot traffic does not seem to decrease the quantity of fruiting bodies.

Foot traffic off-trail is already allowed on many public lands for hunting, so the quantity of hunting permits would need to be considered in partnership with foraging permits. The discussion here on permitting needs relates to the need for policies and practices regarding personal and recreational foraging and does not apply to commercial or commodification of natural resources which should not be allowed. As two interviewees noted, those who are seeking to harvest for financial gain are not considered foragers seeking land protection practices, but rather considered business people.

Climate change introduces uncertainties and increases potential risks. With predicted increased precipitation, severe weather, and erosion across the state, negative effects can be multiplied. Climate change impacts could be used as a reason why a permitting system, which includes training and recruiting volunteers, is a good idea. Those volunteer scientists will be able to provide data that will help inform practices in response to a changing climate. Foragers are an obvious and easy volunteer basis to recruit from as they are eager to have more public land access and participate in reciprocal relationships with the land.

For millennia, indigenous peoples have cultivated deep understandings of and reciprocal relationships with their ecosystems. The corresponding oral traditions can continue to inform adaptation to environmental shifts as result of a changing climate. Ancestral knowledge, coupled with long-standing practices of sharing knowledge and other goods across vast networks, offer invaluable lessons for our current climate challenges. As Minnesota's climate shifts, we can look

to the wisdom of indigenous communities in regions that experience similar conditions, both historical and contemporary. For instance, when facing drought pressure in Minnesota, the stories and practices of those communities accustomed to arid environments, such as the reciprocal offering of water to plant communities after gathering, as shared by A. Toczydlowski in his interview, can inform our land management strategies for greater resilience.

Restricting off-trail foraging in erosion-prone areas or on saturated ground during heavy rains are tangible applications of traditional ecological knowledge (TEK). Bare ground is susceptible to erosion, especially under extreme rain events. Not walking on ground that is saturated and muddy will prevent soil compaction and further help plant recovery in those areas. Even in one park there may need to be areas where foraging is not allowed due to varied terrain and conditions, however, that does not mean foraging needs to be banned from that entire park. Practices like following deer trails in forests or avoiding single-file walking in grasslands, long observed and shared by indigenous foragers, align with the findings from my systematic review of literature on soil compaction and plant resiliency. By thoughtfully integrating these long-held indigenous principles into land management, such as allowing foraging in designated areas while educating the public about sustainable practices through permitting, we can foster a more reciprocal and resilient relationship with the land.

Climate change effects were not happening at the rapid rate we now see when the land was managed under indigenous people. I do not suggest that foraging practices reverse the impact of climate change, but rather that indigenous practices are applicable and adaptable, perhaps all the more so in the face of anthropogenic climate pressure. We need practices and

policies which adapt to increasing ecological volatility and vulnerability, even if those practices cannot wholly reverse the accelerated change.

Returning foraging to public land provides opportunities for land stewardship and learning. It is a false dichotomy that to preserve nature it must be left alone, because Dakota people have been actively managing the land for millennia. Prescribing burns to allow bison to congregate in an area of a fresh flush of prairie grasses, tending to berry patches to ensure thorny areas are navigable by humans and wildlife as food sources, and many more examples can be shared from indigenous knowledge. The study of indigenous knowledge as applied to climate change impacts is outside the scope of this project, but further evaluation and study of indigenous practices and integration in land management is occurring in other research.

Ultimately, humans have evolved with the land, and our policies need to evolve as well. Overall, findings show that there is an impact from foot travel, although this impact may be just on plant growth and not mycelium. Many foragers seek to minimize any negative impact and seek to increase yield and production throughout an area in their practices. If policies currently do not allow foraging, those should be re-evaluated with scientific evidence. Permitting systems could require foragers to volunteer a certain number of hours in data collection or invasive species or trash removal to ensure a positive impact on the land. Experienced foragers already perform these practices as reciprocity with their harvest. Permitting systems could require new foragers to take a sustainable harvest class to learn reciprocity principles. Permitting system education would be a great way to teach new foragers how to reduce the spread of invasive species by cleaning equipment properly, how to correctly identify plants and/or mushrooms, collect useful data, and how to avoid harvesting too much from an area because of excitement.

Mentorship programs could also be used, requiring first-time permit applicants to go on a foray with an experienced forager to fulfill their training requirement. Mentorship programs would allow for training on foraging to be ongoing, interactive, and not only conducted indoors with PowerPoint slides. It would mitigate the concerns over new foragers taking more than they can reasonably consume, and train more stewards of the land. Promoting foraging on public land provides potential opportunities for data collection and contributions to sustainable land practices.

“People have a scarcity mindset toward nature, mostly due to western esotericism, and think foragers will destroy it...a land of foragers would have larger budgets for public land, they would be more knowledgeable, leading to positive 2nd and 3rd order effects, they would volunteer at much higher rates to remove invasive species and plant native species on their own time. When we change the paradigm, foraging becomes a necessity for the health of our public lands over the next 300 years” (T. Clemens, personal communication, February 6, 2025).

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APPENDICES

APPENDIX A

INFORMATIONAL INTERVIEWS

Interview Method

A set of standard questions to ask that relate to their foraging practices on public land, their sustainable foraging principles, their reciprocity principles, and their anecdotal evidence on the impacts of foragers. Used an audio or video recording that automates a written transcript from the audio to aid in note taking for the final synthesis of the information, or provided the option for written answers to include in an appendix at the end of the thesis.

Context

The answers to these questions will be used in Leya Charles' thesis paper titled "Symbiotic harvest - evaluating the impact of anthropogenic harvest of mycelial fruiting bodies forest ecosystem health on public land." You have the option of providing your name and title along with the answers to your questions, or to remain anonymous. Your answers will be included in an appendix at the end of the paper and cited as "personal communication."

This paper will be published by Montana State University and housed in their ScholarWorks database (<https://scholarworks.montana.edu/>). Please let me know if you have a proprietary conflict regarding answers to the questions that should not be included.

Interview questions

1. Foraging Practices on Public Land

- How often do you forage on public lands, and what areas do you typically visit?
- What types of mushrooms do you primarily forage for, and what methods do you use to identify them?

- Are you familiar with any regulations or guidelines regarding foraging on public lands? If so, how do you ensure that you follow them?
- What tools or techniques do you use when harvesting mushrooms to minimize disturbance to the environment?
- How do you determine how much to harvest from a specific area or patch?

2. Sustainable Foraging Principles

- How do you define "sustainable foraging" in your practice?
- What steps do you take to ensure that your foraging activities do not negatively affect the local mycelial networks or the overall health of the forest ecosystem?
- Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? If so, how do you make these decisions?
- How do you manage your harvesting activities to prevent over-harvesting of any particular species?
- Are there specific foraging seasons or conditions under which you refrain from harvesting, to allow fungi populations to regenerate?

3. Reciprocity Principles

- Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?
- How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think foragers play in maintaining ecosystem health?

- Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?
- Are there any traditional or cultural practices that inform your foraging behavior, especially in relation to stewardship of the land?

4. Anecdotal Evidence on the Impacts of Foragers

- From your perspective, how has foraging impacted the ecosystems you've visited? Have you seen any positive or negative effects over time?
- Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent? Do you think this is due to human harvesting activities?
- Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of over-harvesting in certain locations?
- Have you observed any changes in biodiversity in the areas where you forage, either as a result of human activity or natural changes?
- How do you think the presence of multiple foragers in a forest could affect its ecosystem health? Do you think there is a threshold for sustainable foraging in specific areas?

Transcripts included below are non-verbatim as described in [Incorporating Interview Data – The Writing Center – UW–Madison](#)

Tim Clemens

Ironwood Foraging Co.

Experience: 16 years of foraging

February 6, 2025

1. Foraging Practices on Public Land

How often do you forage on public lands, and what areas do you typically visit?

From late April through October, I forage on public lands multiple times per week. Teaching classes or scouting for these classes accounts for 1-5 weekly visits. Gathering for myself is 1-2 additional visits. The areas I typically visit are Minneapolis Parks, various county and regional parks, Minnesota and Wisconsin State Parks and State Forests, Minnesota Wildlife Management Areas, and US Forest Service land.

What types of mushrooms do you primarily forage for, and what methods do you use to identify them?

I forage for probably 200-300 species, focusing on edible species. Maybe more species, but not less. Everything from the first Gyromitra of April, to the Clitocybe and Flammulina of November. I identify them mostly through peer-to-peer interaction on Facebook, followed by using websites and books to verify. It depends though. When I first started out, I used field guides and in-person experts telling me what something was, which I remembered by rote and then associative learning.

Are you familiar with any regulations or guidelines regarding foraging on public lands? If so, how do you ensure that you follow them?

I am familiar with the guidelines and have my finger to the pulse of many changes. The guidelines are somewhat of a byzantine mosaic when considering all the different land management organizations and crossing state lines, but like any skill you learn it over time.

What tools or techniques do you use when harvesting mushrooms to minimize disturbance to the environment?

I mostly stay on trail or on deer paths. I do “intentional walking” whenever off trail. I teach this in my classes too. It involves an increased visual awareness so we’re not stepping on plants. If that is unavoidable, there is a sort of “shimmy” of the foot on the descent that can help move plant stems so they don’t snap or have a chance to move out of the way. This change is also cultural. Many people think that “bushwhacking” is the only, or best, way to find mushrooms.

How do you determine how much to harvest from a specific area or patch?

I first evaluate land history and trajectory of this spot. Then I quantify the local abundance or lack thereof. I then determine if the plant is native or invasive. Natives are taken much less. Invasives are taken in abundance. I also consider what part of the plant I’m harvesting. Is it a vegetative structure? If so, does it kill the plant? Does it kill the plant but help the colony? Or can the plant afford to part with some. If an item is a fruiting body, I spread the seeds/spores some distance away to offer gratitude.

2. Sustainable Foraging Principles

How do you define sustainable foraging in your practice?

I call it reciprocal conservation. There should be reciprocity between you and whatever you're harvesting. Whenever possible, there should be positive reciprocity, meaning you give more than you take. This can look vastly different depending on species (and their dependents), the person, the times, and setting.

What steps do you take to ensure that your foraging activities do not negatively affect the local mycelial networks or the overall health of the forest ecosystem?

Again, I stick mostly to trails, then deer paths, then intentional walking. I also cut down invasive shrubs and pull invasive herbaceous plants in spots and pick up trash when I find it.

Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? If so, how do you make these decisions?

In my experience, you'll usually find mushrooms at different states of maturity in a patch. I leave undersized mushrooms and over-mature mushrooms in place. As 99% of spores fall within 1 meter of the fruiting body (for terrestrial mushrooms), I often disperse these fruiting bodies into a wider area on suitable host species or substrate. For native plant

fruiting bodies, I will often spit seeds, broadcast, or intentionally plant seeds in suitable habitat.

How do you manage your harvesting activities to prevent overharvesting of any particular species?

Evaluating a site is critical. Not just what's in front of you, but temporally (will this change over time?), socially (what is the harvest pressure?), and then botanically (is this native? Is this ideal habitat? How does this species react to harvest?) with that careful evaluation in place, I decide how to engage with this plant positively.

Are there specific foraging seasons or conditions under which you refrain from harvesting, to allow fungi populations to regenerate?

For fungi, there aren't any seasons I avoid or conditions I avoid. Although, in a burned area, in 3-5 years when the terrestrial mushrooms come back (if they do), that first year back I will help disperse the entire harvest and not take any.

3. Reciprocity Principles

Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?

I always seek to be in positive reciprocity with whatever I'm harvesting. Whether that is harvesting in a good way, refraining from harvest, propagating the species, picking up

trash, invasive species removal, or teaching people how to do this to magnify my effect. I also donate money or in-kind donations to organizations aligned in this goal. Culturally, I will offer tobacco or red osier dogwood bark and kneel to pray in the Ojibwe language in gratitude. Especially for maple and birch syrup, wild rice, oak trees, and hickory groves.

How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think foragers play in maintaining ecosystem health?

In this culture and at this time, I think foragers are critical to the well-being of forests and every other ecosystem. This could be an essay in itself, but my main thrust is that we need incentivized groups of highly motivated citizens to care about very specific areas of land and water and to understand the rhythms of these areas. Pigeonholing nature has led to a decline in nature literacy and protections. Foraging widens the nature support base and increases nature ethic simultaneously.

Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?

The biggest negative changes in population I see are the steady encroachment of invasive species, the overengineering of trails and pavement, and off-label herbicide use killing native species from overspray on public land. I've had a positive impact by relocating native species from proposed trailway and pipeline construction. If there were more people doing what I do, we could make a meaningful positive difference on public land.

Are there any traditional or cultural practices that inform your foraging behavior, especially in relation to stewardship of the land?

My Swedish and Ojibwe heritage, plus my own personal culture, inform my foraging behavior. Concepts like the Swedish “Allemansrätten” and the Ojibwe “Bimaadiziwin”.

1. Anecdotal Evidence on the Impacts of Foragers

From your perspective, how has foraging impacted the ecosystems you’ve visited? Have you seen any positive or negative effects over time?

I have seen no negative impact of my foraging practices since I began in 2009. The negative changes I see are due to the mismanagement of invasive species, which despite my best efforts, have encroached on all my metro area foraging spots. My victories are when native species I’ve planted, or transplanted, produce seed or clones.

Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent? Do you think this is due to human harvesting activities?

Mushroom availability has stayed very level. Perhaps interesting to note is that in my decade of foraging mushrooms, half of that has been severe drought. Human harvest pressure, while more noticeable in the closest metro area public land (Afton State Park and Lebanon Hills Regional Park, for instance). The biggest negative impacts I’ve seen are two mountain bike trails in Battle Creek Regional Park and Theodore Wirth Regional Park, which have destroyed mushroom patches and led to intense invasion by invasive species.

Also a gas pipeline laid under Lebanon Hills Regional Park led to a massive and unchecked influx of invasive species.

Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of over-harvesting in certain locations?

I think generally other foragers are mindful and more than that are open to improving. However, there is a subset of people harvesting for financial gain and these people sometimes lack a nature ethic, damaging populations. Even when someone is harvesting for personal use, they may lack the knowledge required to harvest sustainably. There must be greater outreach to help people be better foragers. I encountered a group of latino women in 2019 harvesting Cinnamon Fern fiddleheads in Reservoir Woods Park. It is illegal to do this. They were also harvesting unsustainably by taking every frond from each cluster. The Hmong community also is very worried about overharvest (according to a town hall meeting with Senator Pha in 2024) as there are people who overharvest Solomon's Seal, brack fern, and ostrich fern. Ramps are overharvested in the metro area across all foraging groups (but mostly due to destruction of habitat). Most of this problem will be solved by better education, which will take generations.

Have you observed any changes in biodiversity in the areas where you forage, either as a result of human activity or natural changes?

Drastic increase of invasive species in the metro area. Mostly caused by MNDOT, development, mismanagement of public lands, low-funding, low-prioritization, etc.

How do you think the presence of multiple foragers in a forest could affect its ecosystem health?

Do you think there is a threshold for sustainable foraging in specific areas?

I like to describe it this way: the best candlemakers couldn't have made the light bulb. The paradigm had to fundamentally change first with the creation of electricity and the infrastructure to supply it. In that same way, people have a scarcity mindset toward nature, mostly due to western esotericism, and think foragers will destroy it. Yes, that's possible, but it's also candlemaker mentality. A land of foragers would have larger budgets for public land, they would be more knowledgeable leading to positive 2nd and 3rd order effects, they would volunteer at much higher rates to remove invasive species and plant natives (on their own too!). When we change the paradigm, foraging becomes a necessity for the health of our public lands over the next 300 years.

Alan Toczydlowski

Research Professional, Department of Forest Resources, UMN

Experience: 30+ years of foraging

February 7, 2025

1. Foraging Practices on Public Land

How often do you forage on public lands, and what areas do you typically visit?

In the spring, summer, and fall I forage on public lands probably once per week on average, but will often forage 3-4 times per week when certain mushrooms or fruits are in season. I

mostly forage in the metro area so I utilize county and city parks a lot. I also forage on state forest land when I'm traveling in greater Minnesota.

What types of mushrooms do you primarily forage for, and what methods do you use to identify them?

I have personally identified, harvested, and consumed more than 25 species species of mushrooms including Honey mushroom, Giant puffball, Golden chanterelle, Dryad saddle, Shrimp of the woods, Hen of the woods, Sweet tooth (hedgehog) mushroom, Purple-gilled laccaria, Chicken of the woods, Black morel, Yellow morel, Half-free morel, Golden oyster mushroom, oyster mushroom, Hemileccium subglabripes, Lobster mushroom, Entoloma abortivum (un-aborted), Shaggy mane mushroom, Black trumpet mushroom, Leccinum scabrum, Elm oysters, Blewits, Yellowfoot chanterelle, Chaga, Bear's Head Hericium, and Late fall oysters. I intentionally seek out and harvest the greatest quantities of chanterelles, morels, hen of the woods, chicken of the woods, honey mushroom, and purple laccaria. I use several field guides and mushroom books in tandem to identify new mushrooms, however I commonly am introduced to a species in a foraging class before seeking it out on my own.

Are you familiar with any regulations or guidelines regarding foraging on public lands? If so, how do you ensure that you follow them?

I know there are regulations and restrictions on most public land and I have a general idea which places don't allow collection of plants and/or mushrooms. My first resource I check

for a new location is Google. I also have used the DNR website and its pages for specific areas.

What tools or techniques do you use when harvesting mushrooms to minimize disturbance to the environment?

I usually stay on designated or well-used walking paths until I see mushrooms, then I will leave the path to look for more. When off trail, I am careful to not step on sensitive (native) plants. I will also commonly remove invasive plants as I am foraging.

How do you determine how much to harvest from a specific area or patch?

I am not concerned about harvesting too many mushrooms from any given area from a biological (reproductive) perspective. I consider other foragers and intentionally leave some behind for them. Typically, I harvest as many mushrooms as I know I can eat or preserve without wasting any. Many mushrooms are difficult to spot so I know even if I take every fruiting body I see, there are others that I am leaving behind.

2. Sustainable Foraging Principles

How do you define "sustainable foraging" in your practice?

I consider my harvest to be sustainable when I have no doubt that I can come back next year and expect to find just as many if not more of the species I am harvesting.

What steps do you take to ensure that your foraging activities do not negatively affect the local mycelial networks or the overall health of the forest ecosystem?

I am careful not to damage native plants when foraging. I remove invasive species from the places I forage. I only pick mushrooms that are in prime condition and only take what I'm sure I will use to not waste any.

Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? If so, how do you make these decisions?

I typically only harvest mushrooms that are in prime condition. I leave the ones that are too small to eat as well as the ones that are on the older side. With large fruiting bodies such as chicken of the woods, I will take the parts in the best condition and leave the more mature, tougher parts behind. I also don't usually pick mushrooms until I see several of them to ensure I will have enough to make it worth cooking. This way I'm not picking one or two only to toss them because I didn't get enough for a meal.

How do you manage your harvesting activities to prevent overharvesting of any particular species?

The only fungi I have concern about overharvesting is chaga because it is a slow-growing fungi. I don't harvest a lot of chaga, and I typically only take a portion of each one I find when I do harvest.

Are there specific foraging seasons or conditions under which you refrain from harvesting, to allow fungi populations to regenerate?

I mostly harvest mushrooms in wet seasons when they are abundant. During times of drought, I don't harvest much because it's generally not worth my time to search a large area and only find a few mushrooms. I guess this allows the few mushrooms to release spores, but I do it more from an efficiency perspective than an ecological perspective.

3. Reciprocity Principles

Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?

My most impactful actions are the removal of invasive species and trash from the areas I forage. I have considered carrying water for the plants I forage in the dry season, but haven't actually done this yet. I always express my gratitude mentally to the plants, fungi, and forest when foraging.

How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think foragers play in maintaining ecosystem health?

I think the interaction of foragers and the land creates a greater appreciation for and understanding of the land. When a person receives the gift of food from the land, I believe they develop a two-way relationship that causes them to be more mindful of our impact on the ecosystem. For example, if I am out in the woods and find a great patch of berries, I

am excited to eat them and take them home. This makes me think “wow, what could I do to get more berries here next year”. I think that receiving something from the land makes it more likely that a person will give back to the land.

Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?

I have not personally noticed changes in fungal communities other than weather related population cycles. I have seen places where there is a direct link to abundance of mushrooms and lack of invasive species. For example, in a popular park in the metro area, I noticed that the trees that produce good flushes of morels have a circle of cleared garlic mustard around them. Neighboring trees that don't produce morels are thick with garlic mustard. While the direct impacts like this are important, I also think that foragers develop a greater care for the land and are likely to support and develop policy that positively affects natural areas where they might forage.

Are there any traditional or cultural practices that inform your foraging behavior, especially in relation to stewardship of the land?

As a child, I was raised to respect the land and its inhabitants. As an adult I have been more involved with Native communities and exposed to their practices of giving back and expressing gratitude towards the land. Literary works like Robin Wall-Kimmerer's have also been influential in my perception of the land.

4. Anecdotal Evidence on the Impacts of Foragers

From your perspective, how has foraging impacted the ecosystems you've visited? Have you seen any positive or negative effects over time?

As mentioned above, I have noticed the removal of invasive species in popular foraging areas. I have also unfortunately noticed the decline of an already tiny population of ramps in a couple metro area parks. I think most people's foraging activities are neutral and don't greatly affect the environment positively or negatively.

Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent? Do you think this is due to human harvesting activities?

There are times when someone else clearly beat me to a patch of morels and I only find a bunch of cut off stumps or someone has harvested a clump of Dryad's saddle before me. So, the availability of mushrooms to myself as an individual has sometimes declined, but only because someone else has harvested them, not because there are fewer mushrooms. Even in these cases I usually still find other mushrooms in the area, maybe further from the path or in a harder to get to place.

Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of over-harvesting in certain locations?

I have noticed the decline of an already minimal population of ramps along the Mississippi River in the metro area, but I do think that most foragers are aware of their impacts on the land and are mindful of sustainability.

Have you observed any changes in biodiversity in the areas where you forage, either as a result of human activity or natural changes?

Many parks in the metro area are choked with garlic mustard and buckthorn. However, lots of these areas are also receiving management to remove the invasive species. The efforts to remove invasives are much more obvious than the spread may be in other areas.

How do you think the presence of multiple foragers in a forest could affect its ecosystem health?

Do you think there is a threshold for sustainable foraging in specific areas?

Yes, I think multiple foragers have a greater chance of producing a positive change in forests. It's easier to accomplish change with more hands involved. When foraging things like fruits, nuts, and mushrooms I think the threshold is the amount of food produced. When the berries are gone, you can't harvest more, but they will be back next season. When harvesting plants (leaves, roots, flowers, etc.) there is a limit to what can be harvested, but if done right it can be sustained for many people. If I pinch off the top of a hyssop plant at the right time, it will produce twice as many flowers allowing for both greater harvest and greater reproduction later. So yes, there is a threshold to sustainable harvest for a given area, but I think it is pretty high, especially if each forager has that in mind.

JB Douglas

Marketing communications manager, Wild Grocery & freelance work in wild food space

Experience: 6 years foraging

February 16, 2025

1. Foraging Practices on Public Land

How often do you forage on public lands, and what areas do you typically visit?

Fairly frequently I'm foraging in public spaces. Often from spots that are the edge of a park or a tree lawn, urban spaces, or the side of a road. I am respectful of the rules that are set up and do not go out to forage in spaces that do not allow it.

What types of mushrooms do you primarily forage for, and what methods do you use to identify them?

Pheasant backs, chanterelles, chicken, maitake, wood ear, amber jelly roll, morel, black trumpet, puffballs, shaggy mane or ink caps. There are also some species I harvest for crafting purposes but not for eating.

Only harvest ones that are really easy to identify, and really hard to mess up. I rely on experience and knowledge from books, video, social media, friends, teachers who are more experienced mycologists than myself, also some training from mushroom mountain company.

Are you familiar with any regulations or guidelines regarding foraging on public lands? If so, how do you ensure that you follow them?

I live in Cleveland, Ohio. I completed a masters degree project about the legality of foraging of mushrooms in the state of Ohio. It details what those regulations look like, and how they are different from state to state and park to park. The unenforceability of the

regulations and how gray they are is confusing for people. I bring more nuance to the conversation than many people do. In the Cleveland Metro Parks where I frequent for pleasure and daily walks, it is strictly forbidden to take anything at all. Therefore in those areas I am careful to not pull plants by the root, cut plants, or go there specifically with the intent of foraging. However, I do still harvest to a small degree things like berries or a large log of chicken of the woods in the summer. In those instances, there are many many pounds of food, and I will only harvest what I can eat for dinner that night. The rules need to be more inclusive and thoughtful about including foragers and indigenous people in the regulations. There is broad community support in the Cleveland community to defend this position of why occasional foraging should be allowed in the parks.

What tools or techniques do you use when harvesting mushrooms to minimize disturbance to the environment?

I am often lacking the knife, so I will pull a mushroom up if it is safe to do so. Mycelium does not stick to the fruiting bodies. I'll hand-harvest whatever I can and throw it into my pockets, bag, or fanny pack.

How do you determine how much to harvest from a specific area or patch?

There are several ways to evaluate this. One is the assessment of abundance. In my experience I've seen enough mushroom patches and often go back to the same places several years in a row. So I have an idea of what is a lot for that particular area, or what

feels like a large flush. I also don't harvest anything unless I have an idea of what I am going to use it for immediately. Some people get into the habit of collecting for the pantry of items that get consumed later, because the act of foraging is more stimulating than the actual utilization of it later. But for me personally I only collect what I know I can utilize within that season, such as enough for one jar of pickles. However, there are times when there are fall flushes of abundance where storage of mushrooms makes sense so they don't go to waste. Examples of that are amber jelly rolls or golden oysters that proliferate and many people consider them an invasive species that outcompetes native mushrooms. I take higher percentages of those because I know there will be a lot more of them quickly and these species have no trouble spreading in abundance.

You cannot apply a quantitative metric to it, or you lose the nuance of experience in knowing how much is too much to harvest in an area. It comes down to knowing the context they are in, knowing the nature of the species, and noticing those patterns over time.

2. Sustainable Foraging Principles

How do you define "sustainable foraging" in your practice?

I don't have a condensed answer for this because this is what my Masters project looked at. My research was about sustainable food systems as it related to the foraging community in North America. When folks talk about the concept of sustainability there are three generalized pillars people tend to agree on. No matter what the definition of sustainability looks like, it should be socially sustainable, economically sustainable, and environmentally sustainable. These are broad concepts we can break down into about 1,000 different pieces.

To me, what makes it sustainable is that I'm harvesting in a way that supports or proliferates or reinforces a population or species that are native or beneficial to the ecosystem they grow in. It is also important that I am helping to cull, mitigate, or temper the proliferation of species that can be invasive or detrimental to the overall ecosystem. Sustainability also includes the thought about the cultural practice of how the mushroom is used. For example, puffball mushrooms proliferate easily. I could harvest 10 lbs of puffball and not make a dent in the quantity of puffball mushrooms in the forest. However, if those 10 lbs of mushroom aren't being consumed, then that is not a sustainable practice to be harvesting unless they are being used. That is not socially sustainable. There needs to be a reflection or acknowledgement of how the person is interacting with the mushroom, consuming or using it, and that needs to play a part in the sustainability conversation while still allowing the key driver to be focused on biodiversity and environmental sustainability.

What steps do you take to ensure that your foraging activities do not negatively affect the local mycelial networks or the overall health of the forest ecosystem?

Most of the species I am interested in are harvested off of deadwood or sticks that have fallen. Such as chicken of the woods, hen of the woods, etc. I know when that season for those woody mushrooms is going to be and keep a knife handy with me during that season, because otherwise it would be cumbersome and frustrating to try to harvest those species with my hands. If I am harvesting mushrooms from those that grow terrestrially in the soil, I am more focused on the gentle pull. It doesn't cross my mind to not disturb the mycelial layer because the mycelium does not stick to or is affected by harvesting.

Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? If so, how do you make these decisions?

When I was a more novice forager, I wasn't able to see the full scale of what this particular mushroom looks like over the course of the season, so I was less discerning about when to harvest or perhaps took mushrooms that were too old.

As I've grown in experience, I've been able to narrow down and be selective that just because there is a beautiful chicken of the woods in front of me right now doesn't mean I have to harvest it. It is species by species specific in needing to understand the maturity level of that mushroom and what that mushroom looks like from younger, to mature, to past prime. Some in fact I only want at one stage where I know it's going to be what I like culinarily. So I have narrowed the scope into what I want, and what is best for the species. Definitely leave older mushrooms behind to mature or disperse spores, and don't take the first mushroom you see. Similar to the Robin Wall Kimmer quote – don't harvest the first you see because it might be the last. I think as a novice forager it's really hard to not be so excited that you have just positively identified a mushroom for the first time and want to grab it. Then you get home and realize that might not have been the best choice for the population or how you like to cook it. Some of this experience comes with learning from more experienced people, and being out there more and more and doing more observing than harvesting.

How do you manage your harvesting activities to prevent over-harvesting of any particular species?

As mentioned in an earlier question, I'm trying to limit harvest to what I know I can use myself. And again, I don't love to quantify the amount. I tend to only harvest a small percentage of the abundance. Example being if I go into the woods in the spring and notice two little pops of a pheasant back, I don't need to leave with the only pheasant backs in the forest at the time because I know there will be more throughout the season. Like I said, that is harder to temper when you are young and excited about it. Now I have learned that when I see more I know there is enough in this forest that it can support me, and as I harvest to consume a few I am further engaging and spreading those spores about.

Are there specific foraging seasons or conditions under which you refrain from harvesting, to allow fungi populations to regenerate?

I don't know how to answer this question. I'm only going in looking for those few common species that I know that I'm not concerned about proliferating, and not concerned about damaging the environment, so no. There aren't any specific conditions I avoid.

3. Reciprocity Principles

Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?

Yes! I always make sure to put the mushrooms in a basket or open sourced mesh bag, or even carry them around in my hand to allow spore dispersal as a way to give back.

I grew up in a conservative evangelical home and that is not where I have landed as an adult, however I'm learning to find my place and what it looks like to pray when in the forest. I sing, find new hymns, and it feels like having a conversation with what is there. I practice a moment of silence or meditation to practice gratitude before foraging. This has become an important part of the foraging practice for me.

In a more practical sense, on a plant related topic, Ohio has a lot of paw paw plants that won't fruit and are just clonal patches. So I collect the seeds of fruiting plants and carry these around to different patches to the areas that don't fruit to spread the fruiting trees around, and produce more fruit in the forests. I practice nibbling or trail snacking when collecting berries or other fruits in order to disperse seeds around.

In a different way of practicing reciprocity, I always teach other people how to give back to the forest as an active way of reciprocity with the natural world. Teaching and sharing knowledge I believe is a form of reciprocity.

How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think foragers play in maintaining ecosystem health?

There is a myth that humans and the natural world are separate or exist differently from each other. We are of nature. We are a part of it. We evolved together. We have lost a lot of the knowledge over many years and as humans have killed off entire populations of people

that were managing land stewardship and know this to be true, which has caused land managers to further distance ourselves from the integration of humans as nature. Even in supposed “untouched” nature preserves there are still humans in there managing things. I like to start educating people by helping people understand that shift, and break down that assumption that humans are somehow not a part of the nature space.

Foragers are super important because foragers are actively observing and noticing more, have potential to take actions to reduce destructive patterns or invasive species and can simulate species that are beneficial to those native systems.

Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?

I see more changes from weather and climate change and biodiversity loss. That occurs far more than impacts from other foragers. Of course there is the possibility of increased uneducated foragers could be negative to the ecosystem, however in my experience foragers are so well intentioned and well informed and act with reciprocity that foragers are adding either positive benefit or at least a neutral impact.

One example is foragers creating less crowding of trees in paw paw patches to create more fruit. Trimming of overgrowth in crowded urban forest spaces allows more sunlight to produce more fruit. Another example is where I grew up in California. I’ve watched this pond surrounded by oak forest for about 20 years now where the lack of human intervention and the lack of harvesting has resulted in a reduction in biodiversity. Everywhere around the pond there is a proliferation of Himalayan blackberries and cattails that have not been

managed properly. Of course I cannot imagine what it would be like if there were foragers in there, however I have seen where even beavers have now lost habitat because of the blackberry encroachment there are no longer paths and it is impossible to access the pond. I have a strong vision of what it looks like when foragers are more active land managers and a part of the natural world, where intervention does not damage things. And reciprocity is at the core of that.

Are there any traditional or cultural practices that inform your foraging behavior, especially in relation to stewardship of the land?

Something one of our fellow foraging experts teaches, is that the most intimate thing you can do is to put something into your mouth. Into your body. Where it literally becomes a part of you. And that is a beautiful example of the intimate relationship that foragers have with nature and the stewardship of it. It is a way of thinking that is not shared by the general population. The approach that foragers have to what is around you and what are you choosing to make a part of you? When I'm able to share that mindset or experience with different individuals, that becomes part of that forager culture. Because I would argue that foragers have their own culture. There are huge overlaps with indigenous north american culture, but they are not the same and I want to take care to not conflate the two. Foragers have these ingredients that come each with their own different techniques of how to prepare them, or we have our own songs and texts that we consider core to what we as foragers do and think about. There are people and leaders in the forager gatherings that are considered

elders in the community, and different vocabulary or ways of chatting with one another. The part of becoming a forager also is learning these North American cultural practices of foraging.

4. Anecdotal Evidence on the Impacts of Foragers

From your perspective, how has foraging impacted the ecosystems you've visited? Have you seen any positive or negative effects over time?

I think there are very few if any negative effects. Once I stumbled upon a log where somebody took all of the mushrooms and thought, well this person could learn a little bit more. However, I'm not presently concerned about the proliferation of mushrooms in the united states. The biggest change I've seen on an individual environment is that example of the Himalayan blackberries and the pond in california which is not being managed by foragers. That pond has also been experiencing a higher frequency of algal blooms.

Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent? Do you think this is due to human harvesting activities?

I do not have the experience of noticing patterns of over harvesting. I see mistakes in novice foragers, but for the most part I don't know a single forager who is not very mindful or very assertive about sustainable practices.

Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of over-harvesting in certain locations?

I think the fear of sustainability in some cases becomes a barrier to entry of foraging. I have never been to a foraging class where sustainability has not been talked about. Classes always talk about it. I have the widest foraging cookbook collection in the country, and there is not a single book that doesn't mention the concern of overharvest or sustainable foraging practices. For example, recently I was at a gathering in Cleveland and someone I met said they would really like to get into foraging, but they were so scared about doing it unsustainably that they haven't even started to forage. So that paranoia that foragers have in their community of sustainable practices can sometimes be a barrier to entry. The fear of being sustainable has definitely out-scaled the reality of that being a true concern. There are certainly individuals who make the headlines such as the overharvesting of ramps, or the harvesting of matsutake before it's mature, which was done largely by people not within the foraging community but rather businessmen. However I do not know any foragers who are harvesting thousands of ramps at scale. That is a sign they are not in our community, and we do not call them foragers.

Have you observed any changes in biodiversity in the areas where you forage, either as a result of human activity or natural changes?

Only seen changes as a result of natural changes. I've seen longer, drier seasons and temperatures increase overtime. Especially when I'm thinking about California where there has been fewer diverse species and more encroachment of invasive species that proliferate very rapidly and choke out other species. I've also seen in California the weather has transformed enough in the last 20 years that fig trees have popped up much

more quickly and spread much more rapidly. They grow large, and fast. I can think of a particular riverbank where there used to be so many different plants growing and now it is just one big fig tree because everything else is so shaded. Also, again that pond with Himalayan blackberries. The beavers, cranes, and deer cannot access because there are branches that have taken over the paths. That pond has algae blooms happening more frequently.

I also think of how it is well documented that places that have more biodiversity are also where humans are recorded to have the most diverse diets. There is certainly direct engagement in what humans are eating and the tracking of biodiversity loss. In this region we have a broken relationship with the natural world.

How do you think the presence of multiple foragers in a forest could affect its ecosystem health?

Do you think there is a threshold for sustainable foraging in specific areas?

This is a valid concern that an increase of foragers could be putting individual species at risk. That is something we need to address and be thoughtful about. However, in that question there is an assumption that the foragers are acting individually in that they are acting in succession. That they are going into the woods one at a time, and when one leaves another comes and goes after another to add to any damage or harvesting beyond what the person before them did. However, when there is an increase in foragers they are generally doing that in community or in groups. When there are multiple people together it actually strengthens the practice of being sustainable. In those scenarios, some foragers are foraging for one species, and other people foraging for another species. There is then

a larger coalition of people who care about keeping the natural world healthy, and keep each other in check. More people together strengthens the concern about sustainability and I've seen that being practiced in a group where they are more conscious of who is going to take what. I think the increased interest in foraging is one of the fastest paths to an increased coalition of sustainable land managers. People who care about conserving and saving food also care about keeping the natural world healthy. To say it in another way, I think there would need to be a limit on foraging if it was the scenario of one person going in and harvesting one pound and leaving the next person to go in and harvest one pound, and so on. If we are talking about a permanent system in a specific region then yeah, there are realistically limits for what we can do in those scenarios. But more broadly, an increased number of people that learn to care about the forest and learn to care about the wild foods in the natural world is a boon to sustainability efforts. The more people that care about those things, the stronger coalition we have for shifting policy and shifting culture.

Peter Martignacco

Minnesota Mycological Society (MMS) president

Experience: 30+ years

February 6, 2025

1. Foraging Practices on Public Land

How often do you forage on public lands, and what areas do you typically visit?

I forage on public lands about 20 times per year or season, with significant parts on state park land, state forest land, and the rest is mixed use. I also utilize urban areas which are owned by the public but not entirely thought of as public lands.

What types of mushrooms do you primarily forage for, and what methods do you use to identify them?

Typically I focus on foraging edible culinary species, and may collect other species for ID purposes only. If there is a species I am not 100% familiar with, I use books and the internet, as well as friends and associates who are more knowledgeable than I am.

How did you become knowledgeable in foraging for mushrooms?

I have been a lifelong hunter and fisherman. I have always enjoyed berry picking, and had an interest in foraging mushrooms but no one really to learn from growing up since my mother was afraid of mushrooms – myco-phobic you could say. It wasn't until I met my now wife and one of her close family friends was a forager. That brought foraging to my mind again and I took a community education class, where the teacher was a former president of the Minnesota Mycological Society (MMS). So I joined the MMS and continued my education of mushrooms. They helped me learn how to use books for identification and made friends and spent a lot of time with them, folks who are very knowledgeable and I learned from them.

Are you familiar with any regulations or guidelines regarding foraging on public lands? If so, how do you ensure that you follow them?

I am involved with some advocacy through the Minnesota Foraging Alliance (MNFA) regarding regulations and guidelines on foraging on public lands. I work to follow any regulations, and also work to change them when I feel they are not backed by data or science or are biologically justifiable. MNFA coalition partners are working on how to protect the right to forage responsibly and safely on public land through regulation, policy, and law.

What tools or techniques do you use when harvesting mushrooms to minimize disturbance to the environment?

Generally stay on game trails, avoid bucking brush, which is what old people like me call bushwhacking. I avoid woods that are too thick. I walk as much as possible in ways to not crush plants or disturb them. If it's too thick I just avoid going into those woods. I stay on the established trails if those are available when walking any distance in a park, and just go into the woods for small distances to look around, then come back to the trail to continue walking to a different patch or go further.

I used to cut most of my mushrooms. Some mushrooms I do cut more, such as morels where there are crevice's dirt can get stuck in and hard to clean. Boletes I pull out of ground rather than cut. Chanterelles pull out and trim. Chicken of the woods I trim and cut. Pull up ruffola or hen of the woods. Some research I have read about cutting a mushroom shows that since the stem is still connected to the mycelia, it actually exposes the entire mushroom

to disease. Therefore it is actually better in some species to remove the entire mushroom. Mushrooms typically don't carry mycelium with them when you remove them. One example is in northern Minnesota, chanterelles grow in moss, so you have to pull the whole thing up in order to get the stem and most of the mushroom but you can pat the moss back in place. The research I have read shows there is no particular advantage to either method of cutting or pulling for mushroom conservation.

How do you determine how much to harvest from a specific area or patch?

When I harvest I'm always looking at the condition of what I'm harvesting. If the mushroom is very small and immature, I don't harvest it. You might as well leave it to grow. For those mushrooms that are overmature, harvesting those is generally not productive from a foraging standpoint of collecting food. You should always only harvest what you are in a position to use. The quantity you have the time and willingness to want to process. Therefore my guidance on how much to harvest is really about what I know I'm going to utilize and what I have time to process. I don't take young mushrooms. I don't take old mushrooms. I'm not vacuuming the woods scouring for every last mushroom. I'm just harvesting here and harvesting there. I always know I leave some behind. In my enthusiasm when I was younger and newer to foraging, there were times where I can look back and see I perhaps took more than was appropriate. In the sense that I had to search out and find something to do with the mushrooms and I wasn't in a good place to process all of them. Now that never happens as I have learned and have a greater appreciation for all the work that goes into processing them. I always tell a story about a woman I showed how

to positively identify hen of the woods. She called me one day, just livid, swearing at me, and I asked what was wrong. She said she was out picking hen of the woods and found the seven of them. "Oh that is great!" I said. "No it is NOT!" she said. She said she was up until 3 in the morning cleaning them, and was very upset. I told her there is a solution for that – don't pick them all. "But I was so excited," she said. I told her I understand, but if you don't want to be awake until 3 in the morning then it is not sustainable to pick them all. These mushrooms are very tedious to clean, although they do grow in great quantities, so that is my word of advice. You need to make sure you have the time to properly process what you pick.

2. Sustainable Foraging Principles

How do you define "sustainable foraging" in your practice?

Make sure you will utilize all the harvest. Leave mushrooms that are not in edible or perfect condition. There is no reason to harvest those. If that is all you find, then keep looking. That is why you are out mushroom hunting – to look. Take care you are not damaging the environment. That you aren't overly disturbing plant life. Be careful where you are walking. From a biological standpoint there is no concern on overharvesting mushrooms. Don't harvest too many, there is a reason from a relationship with other foragers to leave some behind and not to act greedy about it.

What steps do you take to ensure that your foraging activities do not negatively affect the local mycelial networks or the overall health of the forest ecosystem?

Don't collect species that are uncommon. As a forager my goal is to pick things to eat. So if there are only two of a mushroom I won't pick them unless I confirm there is more. Two mushrooms don't make up a meal. You cannot make a whole meal out of it. Not even a side dish. Like mica caps. They are so small and thin it isn't even worth harvesting, even though they do grow in abundance. When you have three cups of mica cap in a frying pan, it cooks down to like a half cup so that just isn't worth it.

Or inky caps you have to do something with them right away before they go bad, so unsustainable because it just isn't worth it. Or black trumpets. What am I going to do with 10 black trumpets? That is not enough to even taste. So don't pick it. A very practical approach. Foragers at a basic level are going out to find things to eat. If there is a drought and all you get are a few dozen chanterelles, that isn't worth it because that isn't considered very common in that area. They can be quite plentiful other times in abundance. That is my viewpoint on sustainability.

Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? If so, how do you make these decisions?

*Yeah, we already talked about how I do that. There are times where people are new foragers and will go out and pick every *Russula* that is in the woods. Experienced foragers will ask why did you do that? What are you going to do with that? The answer is nothing because they aren't edible. So don't pick anything unless you are 100% certain you know what to*

do with it. It is legitimate criticism for some people that are new, they will pick something hoping it is something good and come home to ID it and find out it is not. So, just pick one of something to ID or take photos of it. In all fairness there is nothing wrong with picking one or two of something to ID. Then you go back and get more if you find it is something good. We as foragers have a responsibility to be respectful. As a hunter and fisherman I have a responsibility to be respectful of the fish and game harvest limits. I need to be respectful of plants, and mushrooms as well.

I do take steps to not excessively compact soil, don't walk on soil that is wet or muddy for example if off trail. Obviously I don't go out there with garden rakes or shovels to harvest mushrooms. In the pacific northwest there are instances where folks will go out with rakes or shovels and folks who are un-respectful foragers will rake pine duff to expose mushrooms – which is illegal. I don't consider those people foragers. They are businessmen. Foraging regulations should be set with the concept of people, and make sure that people comply. It's not a matter of just enforcement, but encouraging and educating people so they want to comply.

I wish there was more information and actual science on dispersion of spores. Many european regulations require (in mountainous terrain) to use backpacks with baskets and non-solid bottom. The whole reason is to encourage spore distribution. This is poorly studied, but it sure doesn't hurt. I do most of my foraging with woven baskets, not grass baskets, something that if you poured water in it, it would just go through. Grass baskets are too tightly wound and don't properly disperse spores, even though they are beautiful baskets. I discourage others from using plastic bags for different reasons than spore

dispersal. Because plastic. I have no reason to believe that spore dispersal by humans is a direct benefit to mushrooms, due to other wildlife spreading spores.

At the same time mushrooms produce such huge quantities of spores. Science is unsure how statistically viable one spore is – because you are already spreading thousands of spores.

I just don't see a lot of evidence that mushrooms are spreading out from where they normally would because of humans spreading spores in a basket.

Certain forest types in Minnesota have less mycelial networks and mycorrhizal benefits because of the practices that were carried out when the state was clear cut, severely burned to a crisp to the rock layer, and any mycelial layer that survived clear cutting didn't survive the fires. The new forest that then inhabited wasn't what the mushrooms were used to. Example: pine forests being replaced with popple. Pine plantations have a lot of mushrooms in them. Popple not so much. So for this reason, habitat destruction is much more harmful to mushrooms than humans picking mushrooms.

How do you manage your harvesting activities to prevent overharvesting of any particular species?

I have a problem with how this question is worded. This question assumes that overharvesting is possible. There is a question scientifically if that is even possible with mushrooms. With certain species like chaga that may be more of a problem, but at least the science doesn't reflect that for other species. As a president of a state mycological society, I have conversations and partnerships with people in other states as well as internationally in the academic field. Folks that study mushroom conservation. Most say that it is not

possible to overharvest mushrooms. When humans go out mushroom picking, we aren't that good at finding them as a human species compared to other wildlife, and we just aren't going to be able to find all the mushrooms. There are too many in an area. Some people emotionally feel like there is such a thing as overharvesting mushrooms so that should also be respected. So from a biological standpoint there is no concern with overharvesting, but from a social standpoint there might be, like we talked about before with picking too many to process. For folks who have not spent time looking at and studying mycology the concept of overharvest they might jump on as a valid reason to prevent foraging in an area. But it is not a concern that should drive regulation because the science does not support it.

Similarly to what I describe above by not picking just a few because it is not worth it for dinner, foraging is self-limiting. If I go out and pick in an area and come back in a few days there will be more, but fewer to pick. So, you go on and search for somewhere else. If someone is already harvested there you might be upset, but it drives you to find a new place and oftentimes that newer spot may be even better. There is no one secret spot in the wood to find mushrooms, I can tell you that from my years of experience. There is always a better spot. There isn't just one spot.

Are there specific foraging seasons or conditions under which you refrain from harvesting, to allow fungi populations to regenerate?

Legitimate criticism for people who are just starting out is that they pick more quantity than is appropriate because they don't know exactly what it is and they are just hoping it's something good. If you don't know what it is, pick a couple for ID, but leave the rest. If you

find out it's something good, go back and get more. That isn't good stewardship. As foragers we have a responsibility to be respectful as a hunter and fisherman, be respectful of the plants and mushrooms as well.

That being said, mushroom foraging is self-limiting. During drought conditions there aren't any mushrooms to look for, so people aren't out there looking for them. Foragers know the seasons when mushrooms are ready and they aren't out there picking them when it's off season.

3. Reciprocity Principles

Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?

Yeah, I pull invasive species, clean up the woods from trash, and be mindful of the gifts the forest is providing. As more time has passed I've put more time and energy into protecting and advocating for the forest. It's in my heart to give that back to the forest and all the wonderful places. Sorry I got choked up a bit. Forests need to be protected by people, who are abusing or ignoring them. They deserve to be cherished. In order for them to be protected, people need to engage with them. I feel privileged to be able to recreate in all these wonderful outdoor places in MN and to share them with others. I feel like I need to be helping protect them. And that is my way of advocating for law and policy to protect them, that I give back. So my reciprocity is a little bit different from others in that standpoint. My time and energy is a way of reciprocity.

How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think foragers play in maintaining ecosystem health?

Foragers play a great role, they are interacting with the forests and ecosystems. Hikers are more goal oriented. Foragers develop a much more close connection with the ecosystem because they are involved in more of it and connected to more of it. They are paying attention to more of it.

Someone at the DNR roundtable said mushroom hunters are more engaged in the forest around them than hunters are. I agree with that. Foragers are looking at all things, focused on the ecosystem as a whole, rather than someone walking through looking for one species of game or bird, a deer or grouse. Foragers are concerned with the ecosystem as a whole. Foragers are in a position to monitor and provide information about forest, forest ecosystems, and how to maintain those ecosystems.

Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?

I have seen changes in the forest ecosystem in age and species progression. I go back to the same spots over time. I notice there are areas where the mycorrhizal species of mushrooms are less common than they were, but my gut tells me from observation its ecosystem changes that drive less mushrooms and not foragers.

For example, I have a spot where I picked a lot of black trumpets. One year I went to the spot. I usually pick about 3-4 baskets full of black trumpet in this spot. However, that year there were none. Not a single one. Not a little one. Not an old one. Not one. I have no idea

what was going on there. There was nothing growing there, not other mycorrhizal species either. I went to every tree and moss pile and there was nothing growing. It was very very odd. But, also very very dry. From my experience I know that when it is dry there are no black trumpets, and we have had a couple seasons now of drought so I suspect it is more related to climate change than anything else. If it was related to foragers, I would have found stumps of mushrooms, or some little ones or dried up ones or something that a forager left behind. It was the most bizarre thing I have ever seen to not find a single one that grew that season.

Another example is there is a spot near the Kettle River where I picked a lot of chanterelles for years. However then there was a big flood, and silt and sand dropped out all over the terrain. For a few years after that there were no chanterelles that grew in that area. That was about 10 years ago now, and I have seen the chanterelles recover substantially, but not to the same amount of flushing that they used to be. I have seen similar things with morel patches where the flooding over the course of a couple years of floods submerges the trees that the morels are partnered with and the river causes a lot of erosion and in the years subsequent to that there are no morels because the trees have washed away.

So from that standpoint there are a variety of natural causes that can be exacerbated by climate change that affect mushroom growth. But I just haven't seen personally anywhere I can point to and say that spot had too many people there picking, or clearly make the connection that a lack of mushroom return was due to human harvesters. In fact, there might be less mushrooms you find because more people are out there picking them, but it

just spurs you on to find a new spot. That doesn't mean there are less mushrooms. They are out there.

Are there any traditional or cultural practices that inform your foraging behavior, especially in relation to stewardship of the land?

There was no foraging tradition in my family. My cultural practices are more revolved around hunting, and that absolutely shares the same viewpoint and sensibility of engaging and respecting the outdoors and the ecosystem. I have gotten to know others who have greater cultural connections to and traditions revolving around foraging in the indigenous community. I have learned some of those and appreciated them.

4. Anecdotal Evidence on the Impacts of Foragers

From your perspective, how has foraging impacted the ecosystems you've visited? Have you seen any positive or negative effects over time?

I have seen a place that was ravaged by people. Chanterelle spot I was driving past and went to go check on, but it looked like a herd of elephants went through, it was so trampled, very disturbing. Only time I've ever seen that.

Occasionally seen evidence of someone's walking path because they walked through a path of ferns. Even if you are careful with ferns, you can see evidence a couple days later of someone walking through with a small path or broken fronds. However, if that happens infrequently, maybe see it just once a year. However, I am not sure if this was from foragers,

or just hikers. Also, unsure if that is actually impacting mushroom growth or just the ecosystem in general. I have also seen evidence of folks following game trails along a bluff edge and seeing some erosion there, but not sure if those are foragers or just hikers. This is something we need to be aware of and conscious of, and when I find places like that I tend to walk somewhere else.

Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent? Do you think this is due to human harvesting activities?

There is a state park that is well known and frequented by foragers. It is a good place to forage mushrooms. Folks have said that they see less mushrooms there now, but it isn't because the availability of mushrooms is less but rather that someone has already picked them. You see evidence of stumps of mushrooms already picked. Less mushrooms are signs of changes in the habitat rather than people taking mushrooms. Foragers often run into other foragers in this particular park and yeah, 20 years ago that didn't happen as much. However, people need to get out of the scarcity mindset. Keep a mindset that there are unlimited resources out there. Well not limitless, but there are resources that are far more available and utilized than you think. If you go somewhere and there is no more of what you are looking for, just keep walking. I mean, if they are fruiting. If they are not fruiting, good luck. The guy there before you didn't find them either then.

For an example of how mushrooms are self-limiting I have a spot where I have never gone more than 50 yards off the road for hundreds of porcini. One person went on Tuesday, and then someone else came back on Thursday, and the following Tuesday it was all over. I

know these people because I already had enough so I told them to go there. Great example of self-limiting. Couldn't overharvest if I wanted to! Virtually endless amount of mushrooms until they were overmature and done. Keep in mind this area is many square miles of habitat. It is just hard to get your head around how prolific some mushrooms can be. I had five dehydrators going and didn't even scratch the surface of what was out there. Mushrooms are self-limiting because they have a short season and window of when they are good. But there, I couldn't overharvest even if I wanted to. It was virtually endless. Nobody could pick them all.

Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of over-harvesting in certain locations?

Yeah, other foragers are mindful of sustainability. Folks become more mindful as they become more experienced. Like my friend who picked seven hen of the woods. She doesn't do that anymore. She picks one or two.

Another example is I used to fish on Lake of the Woods. For many years it was truly outstanding and DNR had special limits to encourage folks to come there. DNR actually purchased all the commercial fishing licenses so the walleye populations exploded. This encouraged vacation destinations for tourism. We went up there and caught a lot of big fish. We would say, "oh we aren't going to keep any fish over such and such a length," and as each year went by that length kept shortening. Over time you don't need to bring home big fish. You've caught big fish before and the size doesn't matter, it is more about the fun and the food. I'd rather put the big fish back in the lake to make more fish. You become

mindful of what you are doing. Similarly with mushroom hunting, when you first start out you go a little crazy when there is unbelievable fruiting, and then you learn “Oh, I don’t need that much.”

An example of self-limiting is folks that go out to a place several times a week because they live near there. But what is available is strictly dependent on the weather and not on people over-harvesting. Many species are one flush and then done for a particular area.

Have you observed any changes in biodiversity in the areas where you forage, either as a result of human activity or natural changes?

I have seen many changes in biodiversity but not sure how much is due to human activity. Mostly due to climate conditions or weather events. When in parks near metro areas you get covered in burrs. When you go back farther into the woods, there are no burrs. Because there aren’t humans walking through there to carry the burrs with them. However, there are plenty of wildlife who carry burrs with them so I seriously think the idea of a forager bringing invasive species with them is a bit of a red herring situation. Of course you need to be careful, and clean off your boots, but foragers are not some special vector to carry invasive species, there have already been mechanisms to make that happen. Humans are not the only way stuff gets spread around. There is an area up north I go where there are no burrs in the woods, and over the years as foragers have increased in the woods there are still no burrs. You would think if it was due to human transport they would have made it there by now. How much spreading is due to animals? How much spreading is due to birds? How much spreading is due to people? I don’t know. That is a good research

question. I mean when you look at emerald ash borer or dutch elm disease there are examples of humans spreading things much farther than nature might make possible on a slower timescale. We need some real evidence to back up if humans are causing extra transport of invasive species. We need to not ignore this concern, but we need evidence.

Another example of self-limiting is if people go to a spot two or three years in a row, and then they go to a spot and don't find anything for two or three years in a row, they are going to not go back and go to a different spot. It isn't worth their time to keep going back there. Then the mushrooms recover. Why would I add extra effort to check a spot if it isn't going to be beneficial to me. It is self-limiting.

How do you think the presence of multiple foragers in a forest could affect its ecosystem health? Do you think there is a threshold for sustainable foraging in specific areas?

Another story is an area where Russian folks go to harvest porcini and the woods are just crawling with people. However my friend who goes uses the tactic of finding the spots where people stop to trim their mushrooms, and find the mushrooms people drop or miss. And she ends up with a nice basketful. There is enough for everyone. When the conditions are right, it's impossible for foragers to overharvest or come near to taking them all. I know a mycologist who is on the international mushroom conservation committee. He said that in most situations, in most habitats, it is functionally not possible to harvest everything. And even if you would harvest everything, and I mean every last fruiting body, the mycelium are still there. Still living. Still thriving. Still going to put out their fruit when they have the energy and things are right.

You know, our American tradition is we treat everything as if it's endless. Limitless. Then we learned that is not so. So even with mushrooms sure there is a limit, but there are some species that are far more available to utilize than anyone ever appreciates. I am just constantly taken aback by the bounty in the forest. And if you bring people into the woods when they have this limited scarcity resource mindset, they would have trouble reconciling to know that there is so much waiting on the ground to appear when the conditions are right. It's truly magical.

Linda Black Elk

Community Engagement and Education Director at NATIFS

Experience: 30+ years

February 16, 2025

1. Foraging Practices on Public Land

How often do you forage in public land and what areas do you typically visit?

Okay, so foraging on public lands, like once a week, if not more than that, at certain times of year. In our family, we really believe that food sovereignty requires us to do something every day toward food sovereignty. And so that means we are constantly going out and gathering or processing, you know, even if it's just communing with the plants and with the land, we feel like that's important for food sovereignty. So we are probably out there doing some type of foraging at least once a week, if not more than that. We do visit a lot of different types of public lands, you know, city parks, the occasional State Park, and we do also ask landowners for permission to go on to their

land. So we go to private lands as well, but all kinds of public lands, state forests, state and national grasslands.

What types of mushrooms do you primarily forage for, and how do you identify them?

I am a member of a family of indigenous people. We focus on not only edible and medicinal mushrooms, but also mushrooms that are otherwise culturally important. So, for example, chaga, which we do forage sustainably, is not just – for my husband's people, they're not just medicinal, but they are also used almost as a spice, and they are used ceremonially as well. So we forage that very sustainably and carefully. So yeah, I mean we do forage a lot of different mushrooms, but we also forage morels and other things that a lot of people know of. We have our very productive, specific spot for field mushrooms which we love and I would say probably in our family and in my husband's tribe and for our kids, probably the most important mushroom to them is one that people don't think about.

*In Dakota and Lakota, it's called Chanakba, which means the tree's ear. I think the scientific name is *Hypsizygus ulmarius*. And I think they call it the Elm oyster. Some people call it that, and it specifically grows on boxelder maple trees, so that's really interesting because the boxelder maples are so important culturally as well, and we know that boxelder maples need a really healthy primarily high water table riparian system in order to flourish. And that means, you know, if the boxelders are flourishing, then we get lots of good mushrooms as well; lots of good Chanakba. So that's very important to our family. And I mean, there's all kinds of other*

mushrooms that we forage for medicine, like if we find Lion's Mane, we feel really lucky. If

we find Reishi, we feel really lucky.

One thing that we say is that the range of the Oceti Sakowin people is very large.

So we do end up travelling quite far just to gather specific mushrooms so that our family and community, who don't follow those trade routes anymore, and don't have the opportunity to travel or forage as much anymore— so that they are exposed to those mushrooms and know that they're still out there. That's become very important to us; foraging even far away on public lands out of Minnesota is important, so that we can have access to certain species.

When you're foraging mushrooms, what tools or techniques do you use when harvesting?

We follow a lot of different protocols. We always feel like reciprocity is super important, so we'll practice reciprocity in terms of songs and prayers. And we will also practice little offerings sometimes of other plants, a spiritual reciprocity, but also service – sort of a fertilizer. So we'll do various plant mixtures that we offer.

Another protocol we follow is not to take too many like we're very aware that a mushroom is just the fruiting body of a much larger structure. And so it'd be like picking an apple off of a tree, right? Picking an apple off of a tree does not hurt the tree, as long as you're doing it respectfully. I mean, I'm sure someone could try to hurt the tree if they wanted. But you know, there's a good, respectful way, and we make sure to do that. We try not to disrupt the mycelial structure underneath or behind the bark, and still, even though we are aware, you

know — even off of an apple tree, we wouldn't pick every apple. So we don't pick every single mushroom that we see. We try to leave a couple so that they can release their spores. When it comes to something like chaga, which you're pulling off of a tree, we do not like to saw chaga off. Instead, we pull it off so that we're not accidentally cutting into the tree's tissues, the xylem or the phloem. We always make sure to leave plenty, plenty, plenty of the chaga on the tree.

And then the other protocol that we follow is that we want to try to leave some for other community members. So even if it's something we know we will eat, we will still only take half or less than half depending on how much there is of something. Because we want other community members to be able to harvest. But also to come receive that education, you know like, I remember actually there was a spot that I had found where there were a bunch of chanterelles, which is another native mushroom that we harvest. And I wanted to use that for a walk – a mushroom and plant walk. And when I went back there, every single one of them was gone. Every single one. There weren't even two, so that I could show people what a chanterelle looked like, you know? And so, I always make sure to leave a few just in case someone is trying to use that patch for educational purposes.

How do you determine how much to harvest from a specific area or patch?

Yeah. We just try to think about the future. We try to think about whoever else might come that way, and if people are using that spot for education. But other than that, we, like, let our hearts guide us and we're like, OK, like we can stop now and you know, like honestly, I can eat a lot of mushrooms, but even I can't eat every mushroom. Why be greedy? And

then my friend Sam Thayer said something to me once, because, the thing is I grew up experiencing poverty, and so did my husband. And so we both in many ways have a poverty mindset. And when we get out there and we see something delicious that we love, our instinct is to be like, okay take it all and then hoard it, you know. Like take it home and don't eat it until we absolutely need it. You know, save it for a rainy day kind of thing. And Sam said don't do that, because they'll always be there the next year and it really is better to cycle out the mushrooms that you have at home, like it's better to cycle them out than to keep one thing of mushrooms for years at a time. 'Cause they do lose flavor and medicinal properties as well, over time. Yeah, so we try very hard to cycle through them even though our instinct is to hoard everything.

2. Sustainable Foraging Principles

How do you define sustainable foraging in your practice?

So I do not believe in the mantra of “leave no trace”. You know that whole “leave only footprints” thing, I don't believe that because in our philosophy, we actually should be having a net positive impact on the natural world, not just net zero, right? We want to actually have a positive impact. So that means, you know, foragers should always develop relationships with whatever they're foraging and look at them as relatives who are making a sacrifice for us and for the greater good. Because that's really what's happening. And so we really feel like one of the best ways to do this, sort of a rule that we follow, is that if a mushroom will do better if we harvest one and then sort of throw it around to spread the

spores around, we will do that we will take one of the mushrooms and you know, throw it up against a tree, or mash it up and spread it around.

We, you know, different mushrooms, like different things, just like people, right? We all have our own preferences on how we want to be treated, and so we try to learn that about each mushroom. And then make sure that we're sort of following those protocols and if that includes leaving it alone for a while and you know, coming back some other time to see if you know they're more receptive to giving, then that's fine too. But yeah, so that's just a big rule that we follow is that we want a net positive impact. Not net zero.

Do you leave certain mushrooms or fruiting bodies behind to allow them to mature or disperse spores? And if so, how do you make those decisions?

Yeah, we usually try to leave some of the oldest that we see and some and some of the youngest as well, and mostly only harvest what's in the middle.

How do you manage your harvesting activities to prevent any overharvesting of a particular species?

Yeah. I kind of touched on this too. So yeah, we just, we just make sure that we when we when one thing that we try to do is when we go to an area we don't want it to look completely different than when we got there. I mean, you know, there are cases when you know, we're foraging certain things, usually not mushrooms actually. Aerating the soil and digging up the soil and things like that are a good thing and pruning is a good thing you know. But when it comes to mushrooms, we are a bit more careful.

We try to make sure to leave plenty of the older specimens that are already dispersing their spores and then we try to leave the younger ones, because that's a whole other time period of spore release. So. So yeah, we just try to try to do that, be conscientious and not take too much.

Are there any foraging seasons or conditions that you wouldn't harvest mushrooms?

You know, that's a really good question. I think we take it day by day and time by time. You know, time period by time period. But you know if it's too wet outside, we're usually not harvesting. And if it's too dry outside, we're usually not harvesting. So I would say with those extreme conditions, we try to let the mushrooms rest.

3. Reciprocity Principles

Do you follow any principles of reciprocity when foraging? For example, do you leave something behind, give back to the forest, or practice other forms of exchange?

I think I covered that pretty well earlier.

How do you perceive the relationship between foraging and the well-being of the forest ecosystem? What role do you think forgers play in maintaining ecosystem health?

I don't know how many I could give, but I could give you so many examples of plants that benefit from interaction with humans specifically. We are not separate from the ecosystem, and horrible things happen when we try to think of ourselves as, you know, having

dominion over the natural world or as being separate from the natural world. I really feel like terrible things happen when we have those behaviors, which I think are very individualistic and capitalist. I am a firm believer that we are a part of the system and that we can, as I said earlier, have a net positive impact on it. And so as I move through the world, I think about that constantly. I think about OK, you know, because I think of plants as my relatives, and I've tried to get to know them. Sweet grass for instance. Hierochloe odorata really actually likes to be thinned out. Like, really thinned out, you know? And if you let the roots just spread and spread and spread by their rhizomes, it can actually choke itself out of an area and it will stop growing there. And I think you know we can talk about wolves in Yellowstone and all kinds of stuff like whenever we have removed a species including ourselves from an area, bad things happen and things get overgrown.

You know, foragers are basically replicating that tradition since the beginning of time, checks and balances. Within the natural world, we also serve as agents of propagation and agents of dispersal. You know another plant that comes to mind is the camas, the edible blue camas up in the northwest. You know, I remember learning from some elders up there when they dig up the camas bulbs, which are corns, they will flick off the little baby corns around the bottom back into the holes where they're digging. And it actually keeps those stands very healthy. It helps to aerate the soil and loosen the soil up through their digging. I mean there are just so many benefits and there are cases and very visible cases where there used to be huge fields of camas but when people were forbidden from harvesting there, those fields died out.

A lot of elders will put it differently. They'll say the plants miss us when we're not around. And I think that that's very true. The plants and the mushrooms, I think miss us when we're not around because just as we have evolved, you know, in relationship with them, they've evolved in relationship with us and and you know we coexist. And so it would be just like taking someone important to you out of your life, you know. So yeah, I think foragers are, you know, serving as relatives to the plants and we're good to them 'cause, we want more of them next year.

Have you observed any changes in the forest or fungal populations as a result of your foraging practices? How do you think foraging, if done sustainably, could contribute to forest health?

This is a great question. We actually have a very good example of this. So this goes back to the chanakba, the elm oyster mushroom. So we were taught that basically people can serve as almost, I would say agents of propagation or maybe spore dispersal in that when you tap the trees for sap in the spring, you're actually creating a little place for the mushroom to take root. So it's almost like mushroom farming. The first year on the campus of United Tribes Technical College, the first year that we tapped trees. No, we actually got there in the fall and when we would normally be harvesting those mushrooms, we could not find a single one of those mushrooms on the United Tribes campus, even though there were like 100 boxelder maple trees. And we thought that was weird.

Well, the next spring we actually without even thinking about it, we thought, hey, we should do a sugarbush. It was the first sugarbush on the United Tribes campus ever. And so we did that. We tapped all those trees sustainably and got a really good harvest of sap. Cooked

it down into syrup and everyone was just, like, super thrilled. And that fall, we went back to those trees to look for mushrooms, and we got a massive harvest just in one season. So that was crazy to us because just from one year to the next, I think that we got like 60 lbs of mushrooms. And that was leaving a lot of them from those trees that year.

And then for many years after that, it was the same cycle, the same cycle of tapping those trees and then harvesting mushrooms in the fall. And so, you know, we were able to see that. And it also got the community so involved in this cycle. Which I think is so great.

So yeah, I think that we can have where the trees are super healthy as well because we made sure that they were healthy so that we could continue to get syrup, right. So, it's just that's one example where I feel like we had a positive impact on both.

4. Anecdotal Evidence on the Impacts of Foragers

From your perspective, how has foraging impacted the ecosystems you visited? Have you seen any positive or negative effects over time?

So, I have seen negative impacts in places. Honestly, I guess the way to put it is that I feel like people, when they are told they cannot forage in an area or they are not provided education on how to forage sustainably, they get, not greed so much as it's desperation, especially when we're talking about indigenous people who maybe have heard about a particular plant being important and they so desperately want to develop a relationship with that mushroom or that plant again, but and so they'll find some and they'll be like, "Oh my God, this is the mushroom my grandma picked. This is the one she talked about. Let's pick all of it." It's true of plants too. And they just, you know, they don't even know

what they're going to do with it. They just know that they need it. Like literally need it in their soul, but no one's talked to them about sustainability because so much of that knowledge was forcibly, you know, cut off because of boarding schools. Because colonization is suddenly colonialism. And so I have seen on private lands, on public lands, other places I have seen some negative impacts of foraging. But whenever people, in my experience, are educated on protocols and the spirit behind foraging, thinking of these plants as relatives instead of just things that we take, it changes. It totally changes the dynamic, I've seen damaged systems go to repaired systems through foraging.

Have you noticed changes in the availability of certain mushroom species in areas where foraging is frequent?

Yes, absolutely. And so the elm oyster touched on that some but also we noticed that. Give two quick examples: One is like some of our morel spots where we will go and harvest and then we will take some of the older ones and we will put them in some water and then pour the water around everywhere. We have actually been able to increase our harvest by doing that, like big-time, like double and triple year after year. Because we put some of the older mushrooms into water and then dispersed the spores that way. That has worked wonders for us, and that was the tip that we actually got from an elder out east, a Cherokee elder. So that is amazing.

So that's one. And then the other one is- I didn't know this was true, but field mushrooms like the Pink Gilled field mushrooms, we really like those and we found a whole bunch of them in a particular spot. We talked to an elder about it and he was from Cheyenne River.

His last name was Brown Wolf, but I can't remember his first name. And he said, whenever you find those, you should take a few of them and step on them and then smear them into the ground. And we thought, oh, that's kind of interesting, you know. But it was just something that he had been taught and we started doing that and noticing that you know it like they increased big-time in those areas.

Do you think other foragers are generally mindful of sustainability, or have you noticed patterns of overharvesting?

Anyone that I would personally call a forager is incredibly mindful. I can't state that enough. People who I would call actual foragers, gatherers even, are so mindful and so conscientious and almost paranoid about having a positive impact. Now that is not to say that there are not people out there who I probably would not call foragers or gatherers who have a negative impact based on, you know, there are some business people who I think go out and overharvest and don't think about the future of the plant. They just think about maybe how much money they can make at a particular time and they get sort of worried that, hey, these mushrooms might not be here for next year. Self-fulfilling prophecy 'cause then they'll take everything and they'll be really disrespectful and then there won't be any mushrooms there next time. But I don't think I would call them foragers. I think I might call them business people.

Have you observed any changes in biodiversity in the areas where you forage as a result of human activity or natural changes?

Hmm. I mean, I have plenty of examples that are not about mushrooms. But I don't know if I can specifically say that about mushrooms. You know 'cause, when you prune or pull up certain plants or you know, maybe even take off part of the canopy so that the sun shines through to the ground, to the soil, you get a different profile next time because you have allowed you know the seed bank to release to receive some sunlight, right? I don't know if I can really think of that being true like that, I've observed that with mushrooms, but I would assume that it's true. I would assume that through my activities of foraging sustainably and practicing reciprocity and aerating the soil, but also gently compacting the soil in some areas, I'm probably making changes and I believe that they are positive changes because my feet are really no different than the hooves of animals that have been there for millennia, for forever. You know, my harvesting is really no different than grazing by animals. So yeah, I haven't observed that specifically with mushrooms, but I believe it's true.

How do you think the presence of multiple foragers in a forest or prairie could affect its ecosystem health? Do you think there's a threshold for sustainable foraging in a certain area?

I think there's probably a threshold and it's probably a lot because you know again, I have to go back to the fact that people do not. My husband and I watch that show "Alone" sometimes and we think it's so funny that people think that show is about man-versus-nature. It is not man-versus-nature. It's like man-versus-self, you know that show is called "Alone" for a reason. Because we are not meant to forage alone. We are not meant to survive alone. We're not meant to build the shelter and try to feed ourselves at

the same time. We're supposed to be doing that as a community or part of the community is helping us build the shelter while the other part is gathering food so that we can build our shelter.

It's amazing how important that is and the plants and the mushrooms have adapted along with us as they are their own communities. And so you know that like I said, that threshold is pretty high because there have historically been so many people out there gathering and foraging. And I really think that's honestly better because it also means that there's some people who will be gathering the morels, but there are other people who will be gathering [other things]. But look, I found this huge stand of, you know, some other spring mushroom that they'll be gathering, you know, so that sort of takes the pressure off of the morels. So yeah, like gathering, harvesting, foraging in community, I think, is more sustainable than harvesting as individuals.

APPENDIX B

MINNESOTA FORAGING ALLIANCE (MNFA) MISSION, VISION, VALUES



Minnesota Foraging Alliance

Mission:

To protect access to public lands for responsible and sustainable foraging by all Minnesotans.

To educate and advocate for responsible foraging practices that are preserved in shared knowledge, protected in legislation, and stewarded by us all.

Vision:

Working towards a future where responsible foraging practices are widely recognized as valuable and beneficial, protected by law, to deeply connect us to the lands we share.

Values:

Conservation: Foraging and sustainable land management are not at odds with each other, but rather complement each other. This has been modeled by the millenia that Dakota and Ojibwe people have been stewarding the land of Minnesota. The land evolved with human interaction, and cannot restore itself without that same reciprocal relationship. Not just in Minnesota but across the world, these traditional practices continue to deeply connect all of us to the land and its nourishment.

Connection: Gathering wild food brings a deep connection to land and people. Food brings people together in seeing year after year how the land provides nutrition for families and inspires care for future generations of humans and protection of the land.

Equality: Every person has the right to responsibly access wild foods on public lands.

Tradition: Practicing the ancient land stewardship practices of foraging is essential in respecting and modeling the original land stewards, the Dakota and Ojibwe people. Further, the traditional hunting, fishing, and foraging practices of many migrants both recent and generational should be supported for future generations.



Foraging and Harvesting on State Land

State Land Designation	What Can You Forage?
<p>State Forests, Forest lands under the authority of the commissioner (Division of Forestry)</p>	<p>You need a special product permit to do the following in state forests:</p> <ul style="list-style-type: none"> • Harvest Christmas trees, decorative tops, or boughs. • Harvest decorative forest products, such as birch sticks, branches, bark, red-osier dogwood, etc. • Tap trees for maple syrup for personal use or sale, regardless of amount. • Cut or remove any trees or plants for any reason, such as: birch bark, diamond willow sticks, burls, trees or shrubs, fiddlehead ferns, Solomon’s seal, flowers, etc. • Remove wood from state land boundaries. • Collect a large amount of berries, mushrooms, cones, or dead fuelwood for personal use or sale. <p>No special product permit needed to collect:</p> <ul style="list-style-type: none"> • Small amounts of berries, mushrooms, or cones from a state forest, for personal use, such as the amount you or your household may consume within the week. • Dead fuelwood for fires while recreating in a state forest. <p>To get your special product permit, visit or call ahead to the DNR Forestry office closest to the state forest where you want to harvest: Forestry Office Locator</p> <p>To learn more, please visit our website: Harvesting on state forest lands</p>
<p>State Parks, State Waysides, State Recreation Areas, State Monuments, State Historic Sites, Forest Recreation Areas (Division of Parks and Trails)</p>	<p>You can only harvest edible fruit and mushrooms for personal use; no permit is needed.</p> <p>Picking a handful of berries to go with breakfast is allowed, as is harvesting a few mushrooms for dinner.</p> <p>To learn more, please visit our website: Harvesting plants</p>

State Land Designation	What Can You Forage?
<p>State Trails (Division of Parks and Trails)</p>	<p>You can only harvest edible fruit for personal use; no permit is needed.</p> <p>To learn more, please visit our website: Harvesting plants</p>
<p>Wildlife Management Areas (Division of Fish and Wildlife)</p>	<p>You can only harvest edible fruits, seeds, and decorative portions of plants for personal use; no permit is needed.</p> <p>All WMAs are open to the harvest of wild rice, except as specifically closed by posting or rule.</p> <p>A person may not harvest wild ginseng within any WMA without first obtaining a permit from a state wildlife manager.</p> <p>Contact the Area Wildlife office of the WMA you want to visit if you have questions about foraging: Wildlife Management Areas</p>
<p>Aquatic Management Areas (Division of Fish and Wildlife)</p>	<p>You can only harvest edible fruits, seeds, and mushrooms for personal use; no permit is needed.</p> <p>Contact the Area Office of the AMA you want to visit if you have questions about foraging: Aquatic Management Areas</p>
<p>Scientific and Natural Areas (Division of Ecological and Water Resources)</p>	<p>Berry picking is allowed at eight specific SNAs, and mushroom picking is only allowed at one:</p> <ul style="list-style-type: none"> • Badoura Jack Pine Woodland SNA • Hovland Woods SNA • La Salle Lake SNA • Lutsen SNA • Moose Mountain SNA • Myhr Creek Ridge SNA • Prairie Bush Clover SNA (also includes mushrooms) • Spring Beauty Northern Hardwoods SNA <p>All berry and mushroom picking is for personal use only; no permit is needed.</p> <p>To learn more, please visit our website: SNA things to do and rules</p>

Foraging and Harvesting on State Land

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<p>Wildlife Management Areas (Division of Fish and Wildlife)</p>	<p>You can only harvest edible fruits, seeds, and decorative portions of plants for personal use; no permit is needed.</p> <p>All WMAs are open to the harvest of wild rice, except as specifically closed by posting or rule.</p> <p>A person may not harvest wild ginseng within any WMA without first obtaining a permit from a state wildlife manager.</p> <p>Contact the Area Wildlife office of the WMA you want to visit if you have questions about foraging: Wildlife Management Areas</p>
<p>Aquatic Management Areas (Division of Fish and Wildlife)</p>	<p>You can only harvest edible fruits, seeds, and mushrooms for personal use; no permit is needed.</p> <p>Contact the Area Office of the AMA you want to visit if you have questions about foraging: Aquatic Management Areas</p>
<p>Scientific and Natural Areas (Division of Ecological and Water Resources)</p>	<p>Berry picking is allowed at eight specific SNAs, and mushroom picking is only allowed at one:</p> <ul style="list-style-type: none"> • Badoura Jack Pine Woodland SNA • Hovland Woods SNA • La Salle Lake SNA • Lutsen SNA • Moose Mountain SNA • Myhr Creek Ridge SNA • Prairie Bush Clover SNA (also includes mushrooms) • Spring Beauty Northern Hardwoods SNA <p>All berry and mushroom picking is for personal use only; no permit is needed.</p> <p>To learn more, please visit our website: SNA things to do and rules</p>

Hi,

My name is Amy Rice, I am a Director at the Zumbro Education District in Kasson, MN where we have our Setting 4 programming. By training, I am also a Board Certified Behavior Analyst and have extensive experience with high, challenging, and aggressive behavior. In Setting 4, seclusion is absolutely a tool needed to use ONLY in emergency situations to keep staff and students safe. Seclusion is not used in response to behaviors as a traditional "punishment", but it is used when safety of others is at risk. We see students de-escalate quicker in seclusion than blocking alone or even a hold. Students are also not required to be 100% calm to end seclusion, but often times are still upset, but not aggressing toward others. As soon as we know the student is not a danger to others, the door is unlocked.

When dealing with the behaviors we see at Setting 4, I know we would have more student and staff injuries if seclusion was not an option. Our parents know and trust us that we are using seclusion with the utmost professionalism and know the safety risks of not using it, and this truly keeps staff and students safe on the very high, dangerous behaviors.

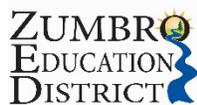
Seclusion absolutely should be an option at Setting 4, and I would also support this in a Setting 3 EBD room as well.

Please do not hesitate to reach out with further questions regarding this issue.

Thank you!

Amy Rice, MS, BCBA

Director of Student Support Services



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Original article

Urban non-timber forest products stewardship practices among foragers in Seattle, Washington (USA)

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ABSTRACT

Our research seeks to expand the concept of urban environmental stewardship to include the everyday stewardship practices of urban nontimber forest products foragers. Ethnographic data from 58 urban foragers and 18 land stewards in the city of Seattle (USA) revealed that foragers reported using a variety of practices to enhance and minimize negative desirable species and their habitats. Many of these practices were identical to those practiced by restoration volunteers in formal programs and align with Seattle Parks Department management objectives. Foragers actively sought to learn more about what practices are sustainable; many mentored others in sustainable harvesting practices. Most foragers emphasized the importance of treating plants and their environment with respect. The land stewards voiced some concerns about foraging in city parks, but most were cautiously supportive of opening up the parks to foragers. The study results suggest that an opportunity exists for park managers to develop alliances with foragers so as to leverage foragers' everyday stewardship practices and accomplish some of their park restoration objectives. Doing so will require park managers to acknowledge the positive contributions that humans can make to novel ecosystems and foragers to develop or strengthen self-regulation norms.

1. Introduction

Community participation in environmental stewardship has emerged as an important strategy to expand and sustain the ecosystem services provided by nature in cities (e.g. improved air quality, storm water management, micro-climate regulation and wildlife habitat) (Romolini et al., 2012). Urban environmental stewardship includes a range of voluntary actions taken to conserve, manage, monitor, advocate for, and educate about local environments (e.g. restoration of forested parks, tree planting campaigns, and community gardens) (Campbell and Wiesen, 2011). With declining city budgets, urban stewardship offers a cost-effective means to address ecosystem needs and recovery (Sanderson and Huron, 2011; Wolf et al., 2013). Stewardship also embodies a nature-society relationship centered on caretaking and reciprocity (Campbell and Wiesen, 2011). A growing body of evidence demonstrates social and psychological benefits incurred through participating in urban stewardship including improved mental and physical health (Pillemer et al., 2010), and enhanced social

cohesion and resilience (McMillen et al., 2016). These reciprocal benefits motivate participation and sustain volunteer's commitment to stewardship actions (Asah and Blahna, 2013; Moskell and Allred 2013).

Research in urban environmental stewardship has focused on formal volunteer efforts, carried out under the auspices of city governments and civil society groups (Connolly et al., 2013; Romolini et al., 2013). A presumption often exists that stewardship does not emerge from individuals working in isolation from official institutions and structures (Fisher et al., 2012). However, studies focused on the diverse ways people engage with nature in cities, suggest that the informal practices people carry out as part of their everyday lives may play an important and positive role in environmental stewardship (Gobster, 2007; Head and Atchison, 2009). Because these informal, everyday practices take place outside of organized programs, such as park clean-up days or "friends of the park" activities, they often go unrecognized (Smith et al., 2010; Martinez et al., 2011).

Use of informal environmental stewardship practices as a management tool could have important benefits for urban conservation.

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Informal stewardship has demonstrated significance within low-income and underserved communities (Smith et al., 2010; Martinez et al., 2011; Jupp, 2012) whose members may face challenges participating in formal volunteer initiatives (Hobbs and White, 2016). Informal practices can take place in different types of urban spaces than formal volunteering and thus offer opportunities to expand the scope and geographies of urban stewardship (Hurley et al., 2008; Smith et al., 2010). Additionally, paying attention to informal stewardship practices can highlight previously invisible values, skills and capacities within local communities, offering opportunities to enhance resident's engagement with the natural world (Jupp, 2012; Krasny and Tidball, 2012).

This paper seeks to broaden the conversation about urban environmental stewardship by examining its intersection with everyday practices of urban nontimber forest products (NTFP) foraging. We define urban foraging as the harvest of non-timber forest products (NTFPs) such as wild berries, mushrooms, herbs, fallen branches, and tree fruits in city environments for food, medicine, fuel, craft materials, and other cultural uses. Humans have harvested NTFPs since time immemorial but foraging has only recently been recognized as an activity occurring in cities. Over the past decade, scientists have documented foraging practices in Baltimore (Jahnige, 2002), Charleston (Hurley et al., 2008; Hurley and Halfacre, 2010; Grabbatin et al., 2011), Philadelphia (Hurley et al., 2015), New York (McLain et al., 2013), and Seattle (Poe et al., 2013, 2014). In US cities, much of this activity takes place in parks and green spaces where foraging is commonly prohibited owing to concerns that it may negatively impact ecosystems (McLain et al., 2012; Poe et al., 2013). However, empirical evidence of the ecological impacts of urban foraging—either positive or negative—is limited. Moreover, exploratory research on urban foraging suggests that foragers may engage in activities similar to those employed by restoration and other vegetation management programs, such as removing invasive species; and transplanting and pruning native species (Jahnige 2002; McLain et al., 2013). Terada et al. (2010) examined the use of volunteers to replicate the traditional practice of foraging poles for firewood as a means for restoring Tokyo's *satoyama* forests. A limitation of this formal stewardship program was that the scale at which pole harvesting needed to occur far exceeded the capacity of volunteer-based programs. Terada et al. concluded that treating the *satoyama* as a working forest by permitting pole harvesting for personal or commercial use would be a useful complement to reliance on formal volunteer programs for achieving restoration goals.

Here we explore the potential for incorporating informal urban foraging activities into urban forest restoration programs using foraging and stewardship policies in Seattle, USA as a case example. Drawing on data collected during ethnographic research conducted in 2010 and 2011, we seek to answer three questions:

- 1.) What stewardship practices and norms are associated with foraging in Seattle?
- 2.) In what ways do those practices and norms complement or conflict with the Seattle Park and Recreation Department's management objectives, including its formal stewardship programs?
- 3.) What are key challenges to embracing urban foraging as a legitimate activity in urban green spaces, and what are the prospects for overcoming those challenges?

Although our research focuses on foraging practices in Seattle, the findings have broad applicability to other cities dependent on formal and informal public-private partnerships to achieve ecological restoration goals.

2. Methods

The study took place in Seattle, the largest city (pop. 608,660) in Washington State, and the economic center for the Puget Sound Region's 4.2 million inhabitants (U.S. Census, 2010). The region's

moist, temperate climate provides favorable growing conditions for numerous plants and fungi as well as the possibility for humans to gather NTFPs year-round. Foraging is a popular activity among Seattleites: a study of Seattle area residents found that 26 percent gathered or collected products in nature settings as a form of recreation (City of Seattle, 2014).

Data for our study were collected through semi-structured interviews with 58 urban foragers and 18 land stewards, including 13 paid land managers and five volunteers who organize stewardship activities for park agencies or non-governmental organizations. The interview data were triangulated with participant observations of more than 80 organized foraging and stewardship activities, including guided foraging walks, forest and urban orchard steward work parties, wild mushroom forays, and urban forest commission meetings. Purposive snowball sampling was used to select foragers with an eye toward maximizing the range of variation in products harvested, foraging experience, and residence within Seattle. Foragers were asked to describe which species they collected, efforts they made to improve the productivity and habitat of gathered species, their involvement with formal stewardship groups, and their perspectives on how well city policies address foragers' needs and values. Land stewards were asked to describe the ecological impacts of foraging that they had observed and their perspectives on the challenges and opportunities associated with recognizing foraging as a legitimate activity in city parks. The data were coded using AtlasTI. Analysis of the forager interviews entailed coding and analyzing the data thematically so as to identify stewardship practices, norms, and ethics. Additionally, data from foragers and land stewards were analyzed to identify the range of views regarding the potential for using foraging as a tool to support park management and restoration goals.

3. Results

3.1. Characteristics of foragers who participated in the study

The foragers in our study ranged in age from 23 to 83 years old with an average age of 44. Thirty-six were women and 22 were men. The majority (50) self-identified as White, Caucasian, Euro-American, or European. Two self-identified as Asian, two as Native American/White, one as Asian/White, one as White/Latino, and one as African-American. Most were highly educated with 44 having completed four or more years of higher education. The foragers were evenly distributed across income categories. Some had started to gather within the previous year, others had more than 60 years of experience; the average number of years of experience foraging was 24. Many harvested small quantities for personal use; however, roughly half earned some income from foraging, providing services such as guided foraging walks and the sale of value-added products. Products harvested were used for food, medicine, arts and crafts, fuel, and construction wood. Most harvested from multiple land use/habitat types, with parks, forests, and yards being the most common foraging sites. A total of 433 species of plants and 53 species of fungi were gathered, including 195 native plant species.

3.2. Foraging practices and stewardship

Three aspects of stewardship emerged from interviews with foragers about their harvesting practices in Seattle. One aspect had to do with the biophysical impact on plants, fungi and their habitat. A second aspect focused on the importance of knowledge acquisition and sharing in shaping foragers' understandings of how their actions affect plants. The third aspect concerned the ethics that influence how foragers interact with plants and the circumstances under which they consider plants or fungi "fair game" for harvesting. Table 1 summarizes key elements of the three aspects of foraging-related stewardship, including specific practices and examples of species affected.

Foragers used a variety of harvesting practices that fit the EPA's

Table 1
Stewardship practices carried out by urban foragers in Seattle, WA.

Stewardship aspect and specific practices
1. Minimizing negative impacts to individual organisms and populations <ul style="list-style-type: none"> ● Informal area “closures”/rotations (Ex: Not harvesting in restoration areas because they are “young” systems; avoiding natural areas that are small in size) ● Timing harvest to reduce impacts on individual plants (Ex: Peeling madrone bark in August when it is peeling anyway) ● Selective harvest to ensure long-term viability of the organism or population (Ex: Minimal or no harvest if resource is scarce; application of 1-in-10 rule or 1-in-3 rule (harvesting only a tenth or a third of what is there) for more abundant species) ● Harvesting in ways that won't harm plants/fungi (Ex: Using a knife to cut off polypores, rather than pulling them off)
2. Minimizing negative impacts to habitat <ul style="list-style-type: none"> ● Leaving some of the product for wildlife, birds, or other humans ● Limiting soil disturbance through use of special tools ● Stepping carefully when off-trail to minimize trampling
3. Species enhancement (improving reproduction and health of harvested species) <ul style="list-style-type: none"> ● Scattering seeds or spores ● Removing rotten and fallen fruit to minimize pests ● Transplanting ● Dividing and spreading bulbs ● Pruning diseased/dead parts of plants ● Weeding ● Mulching
4. Habitat enhancement <ul style="list-style-type: none"> ● Removing invasive species ● Picking up trash ● Improving trails
5. Knowledge acquisition and sharing <ul style="list-style-type: none"> ● Seeking knowledge from others about how to harvest sustainably ● Mentoring others in sustainable harvesting practices ● Generating community interest in plant or tree care ● Sharing recipes and products from gathered foods
6. Ethics of care <ul style="list-style-type: none"> ● Focusing on mindfulness and reciprocity ● Spending time with the plant, seeking its permission before harvesting

(2005, p. 1) definition of environmental stewardship as consisting of individuals or groups actively taking “responsibility to improve environmental quality and achieve sustainable results.” To ensure a sustainable harvest, foragers used practices that aimed to minimize long-term detrimental ecological effects of harvesting and/or improve the well being of individual organisms, populations, or habitats. Within the impact minimization category, stewardship practices either aimed to reduce harm to individual plants and populations and/or broader negative ecological impacts. To minimize negative impacts on specific organisms and populations (Table 1, categories 1 and 2), foragers engaged in a practices such as deliberately choosing not to harvest in certain areas for ecological reasons, timing harvests to coincide with periods when plants were unlikely to be damaged by harvesting actions, or harvesting only plants or fungi present in abundance. To reduce negative ecological impacts, foragers engaged in practices such as being careful not to step on at-risk species when walking through an area or using special tools when removing bulbs.

Enhancement-oriented stewardship practices fell into two categories (Table 1, categories 3 and 4): those aimed at improving the health of individual organisms or populations and those directed at improving the foraged species' habitat. Techniques used included activities such as spreading seeds to new areas, splitting and spreading bulbs, and removing weedy species from around more desirable plants. Habitat improvement practices included activities such as removing invasive species and picking up trash. Nearly all of the foragers (50) described using practices to minimize negative impacts on or enhance a harvested species or its habitat. Most foragers (41) listed techniques aimed at minimizing negative impacts to plants. Twenty-four foragers used techniques for improving plant well being, 20 engaged in habitat improvement practices, and 18 described harvesting so as to minimize broader ecological impacts. The majority of foragers (44) used at least one practice that minimized impacts to plants or their habitat, 34 used

at least one improvement-oriented practice, and 26 used at least one impact minimization and one improvement practice.

Acquiring and sharing ecological knowledge so as to be able to distinguish which practices are ecologically harmful was another important aspect of foraging stewardship. Foragers learned about plants and fungi in a variety of ways, including from field guides, internet websites, and blogs; through mentoring relationships with relatives or friends; by sharing knowledge with other foragers in the field; through participating in professional networks (e.g., herbalist guilds, landscaper associations) and foraging or craft-making associations (e.g., amateur mycological societies and basket weaver guilds); and by taking formal and informal classes. Nineteen of the interviewees participated in formal stewardship groups, with plant care or restoration-oriented groups being the most common (13 foragers), followed by food forest or fruit tree rehabilitation (7 foragers), and trail improvement groups (1 forager). Two participated in both formal restoration and food forest groups.

Several of the foragers taught wildcrafting or herbal healing classes; others conducted nature walks and foraging tours. Instructors emphasized the importance of imparting to their students the need for responsibility toward plants. A forager who runs a wildcrafting business and teaches wildcrafting, summarized her approach as follows:

[Foraging] can go either way, I mean harvesting can tend and prune...just like your garden. You can care for the environment if you're harvesting in a proper way, and then, on the other hand, I always say to my students, “When you harvest, it shouldn't look like you've been here when you leave.” And if it looks like you've been there, then you're being destructive.

Teaching responsible harvesting also took place in less formal settings, such as parents mentoring their children in foraging etiquette. One forager drew attention to the role of informal encounters with passers-by as opportunities for teaching sustainable harvesting practices:

[I]f I'm harvesting something, you know, people are usually curious, so I'll spend a few minutes sharing knowledge or information with people, both about either wild edibles, herbal medicine, and sustainable harvesting practices, which I really think in engaging the community in wild harvesting in parks, for example, the education about sustainable harvesting practices is a critical component that needs to be there. And not only educating the public, but educating the park services.

This last statement about park employees needing education about sustainable harvesting practices was a common theme in the interviews with foragers.

3.2.1. Ethics of care

A third theme emerging from the interviews was the notion that stewardship includes having a mindset that it is important to harvest in ways that demonstrate respect for other species, other humans, and the environment. Caring for the environment is, in part, self-serving for foragers. One forager articulated the self-interest rationale, stating, “One primary reason [for harvesting carefully] is I'm going to come back to this place in the future so I don't want to damage it for myself.” Another forager pointed out that self-interest serves as an incentive to use resource enhancement practices and limit the quantities harvested:

I think there's a lot of ethics that have to go into not trashing, not overharvesting. And you want to do that even if it's your own little patch, you'd want to make sure you don't overharvest because then it doesn't come back. And then you basically, if anything you want to encourage its growth and expansion.

However, as reflected in the following statement by another forager, motivations for taking care of foraged plants can also transcend individual self-interest:

Table 2
Excerpts from foraging interviews illustrating the ethics of care.

Forager	Language of care
JM016	When I harvest, I usually feel guilty if I don't do some kind of reparations or make amends; I definitely ask the plant if I should harvest it.
LSU01	I want to make sure I'm not harming the plant or any species near it.
LSU02	Yeah, it's really important if you wanna keep coming back; to kind of nurture your spot.
LSU03	We really believe that being participants in nature nurtures that connection but along with that comes the responsibility [of] what our harvesting effects have not only on the next year but generations to come.
LSU04	My main reason for making products is to provide education, not necessarily that I want that to be my main business. I'd rather teach people to harvest and collect and responsibly collect their own food and medicine.
LSU06	And I'm really careful when I go in there. I'm not going to take everything that's there, just because the plants need to be able to recover, and if you kill them then you're not going to get anything. So, judiciously gathering.
MP06	...if people don't know what they're doing and don't respect the area where things are growing that they could wipe out, you know, a fragile environment.
JM07	I'm always taking into account the impacts on the rest of the community, both the ecological community and the human community as well. I don't want my urban foraging to have a negative impact.
JM10	I don't want to disturb anything to any great extent other than pick things so that they're able to grow back and it's not disturbing the area.
LSU13	And then of course there's ethics to that, in the sense that if you overharvest then you will wipe out a stand, and then it makes it so that nobody gets any. So you got to be careful with that kind of stuff.
MP02	...know your place and [that] you're connected in a web of life that has a lot to give you but you should also respect and seek to maintain.
MP04	And so I feel like, at least the foragers I know, I feel like it's a pretty educated group in how do you care for the wild and make sure that it's sustainable how you're doing it.
MP18	We try not to bother nature too much. Just walk around. Usually, mushrooms that are in that place will be there all the time.
MP03	Ethical harvesting just makes sense to me, and I kind of take it for granted because it's always made sense. If you want something you have to kind of treat it gently so that it comes back if you want more.
LSU08	So it's like caretaking, being conscious of what is going to be sustainable
LSU09	Yeah, I try to spread some plants to the right habitat. I think that's a good thing to do. Especially when you've got a void.
LSU11	And plus it kind of goes back to my sustainability. If I see twenty of something I will take one. So there has to be enough sustainability. There has to be enough of the plant for me to harvest.
LSU17	Well, I don't really take the whole plant because I want it to be able to regenerate itself...So, I'll always leave some behind, you know, enough so that it can grow again.
LSU21	You, you know, show no trace of you being there and then you plant the seed so that there's future generations of that plant growing in that area. I think it's very important for us to be mindful of our impact on those communities.

I'm always taking into account the impacts on the rest of the community, both the ecological community and the human community as well. I don't want my urban foraging to have a negative impact.

For some foragers, an ethics of care for the land involves learning to give back to the land. One forager articulated this as follows: "You try to look at an area and see, try to think about what might be sustainable and also what might help improve the area." When talking about their harvesting practices, many foragers used phrases that reflected a "caring" mode of engagement with nature. Excerpts from foragers' interviews (Table 2) illustrate the extent to which the language of care infused foragers' descriptions of their activities.

A species' status as invasive or non-invasive influenced foragers' stewardship practices. Most foragers expressed few qualms about harvesting Himalayan blackberry (*Rubus armeniacus* Focke), Japanese knotweed (*Polygonum cuspidatum* Siebold & Zucc.), or nettles (*Urtica dioica* L.), all of which the Parks Department considers invasive species and targets for eradication. Because such species are abundant and tolerant of high levels of harvest, foragers believed that harvesting them would have little negative ecological impact. Indeed, some foragers stated that removing them was a public service. One forager's comments about pulling blackberry roots exemplifies this view of invasive species:

I have no problem pulling blackberry (*R. armeniacus*) roots because I'm like, 'Y'all don't belong here, you're taking over everything else'...and it's almost like you're helping to maintain that area, you're helping the other native plants in the area to be able to grow and thrive.

Foragers used a similar rationale to justify harvesting fruits and nuts from exotic tree species. Several foragers considered harvesting fruits to be a form of stewardship that supported the Parks' management objectives since it enhanced park aesthetics and safety while reducing the likelihood that fallen fruit would serve as vectors for pests and diseases that could harm the trees.

Foragers' views about harvesting native species were complex as some native species are invasive and crowd out other native species that

foragers (and park managers) wish to encourage. Of the 51 foragers who provided input on how nativity affected their harvesting activities, roughly one-third (16) said they were less likely to harvest native species and took greater care when harvesting them. Another third (15) harvested native species more carefully, but expressed strong misgivings about using nativity as a harvesting decision factor. The remaining foragers (20) said they treated non-native species the same way they treated native species. These foragers argued that harvesting decisions should be based on a species' abundance, both on-site and regionally, its reproductive and growth characteristics, and its functionality within the ecosystem, rather than its native status.

Most foragers were positively disposed toward the Parks' forest restoration program. Of the 46 foragers who provided input on restoration project impacts on their activities, more than half (27) thought that such projects were beneficial or would be beneficial for harvesting in the long term. Benefits cited included: increased ease of access in areas where trails had been constructed, better visibility of mushrooms and understory plants in areas where ivy had been removed, and an anticipated increase over the long term in native plant species valued by foragers. Thirteen foragers reported that restoration activities had reduced their access to foraging sites. However, nine of these foragers expected their access to increase as the restored areas matured. The Parks' aggressive stance on eradicating *R. armeniacus* was the major aspect of the restoration program that foragers disagreed with. Several foragers were in favor of a more nuanced approach that would allow community groups to manage blackberry patches in nearby parks more intensively in place of eradication. Also of concern to many foragers was the potential exposure to toxins from the Parks' use of herbicides in restoration efforts (e.g., treatment of *P. cuspidatum* with herbicides).

The practices described in the previous section suggest that urban foraging has potential to have a positive impact on ecological systems in city parks. However, it is also important to understand the extent to which it might have negative impacts. When we asked the land stewards to describe the kinds of urban foraging that they had encountered, they described foraging in city parks as relatively uncommon and small in scale. Berries were the most common product they had seen being harvested in parks, followed by mushrooms, fruit, edible greens, and

nuts. Two land stewards cited examples of foraging practices they had seen that they considered damaging. One park employee described having seen “whole sections” of *Gaultheria shallon* Pursh, a plant whose leaves are used in floral arrangements, clipped by foragers. However, he qualified his description stating that such behavior is “not as common—thank God—as it could be.” To put this example in context, it is useful to know that *G. shallon* is a very fast-growing species that is highly tolerant of intense harvesting, and which professional foresters in the Pacific Northwest have actively sought—unsuccessfully—to eradicate for decades (Fraser et al., 1993). A long-time volunteer in the Forest Steward program provided a second example, stating that sometimes people took native plants from the park in which he did restoration projects. Several land stewards voiced concerns that foragers going off-trail might trample sensitive species or compact the soil; others stated that foraging of native berry bushes was potentially damaging as it could inhibit their natural regeneration and might reduce food for birds and wildlife. Despite their concerns, most of the land stewards condoned berry picking, as well as harvesting of other products such as wild mushrooms, fruits, and nuts. Thirteen land stewards admitted to foraging in city parks themselves. Even the land stewards with staunch anti-forager views sampled berries while working and encouraged other volunteers to do so as well.

3.3. Land stewards' views about expanding opportunities for foraging in Seattle's parks

All but two of the land stewards we interviewed were cautiously supportive of allowing low-level foraging in city parks or natural areas. Many land stewards thought that foragers could provide a service by doing land care work that the Parks Department lacks the resources to do. Types of work mentioned included harvesting fruit that would otherwise fall on the ground and serve as a vector for pests and disease, rehabilitating fruit trees suffering from years of neglect, and providing educational programs on native and edible plants and fungi. Land stewards also felt that allowing foraging would help the Parks Department promote its local food systems and food security goals. Most formal stewards envisioned this happening primarily through expanding foraging opportunities associated with the rehabilitation of the park system's existing stock of exotic fruit trees, as well as some additional fruit tree plantings. However, a few had a broader vision in which food production—including foraging—would eventually become integrated into forest restoration management strategies. Enhancing foraging opportunities was also viewed as a means by which the Parks Department could support the city's environmental justice goals. Specifically, some land stewards believed that by allowing foraging, the park system would see more use by first generation immigrants interested in maintaining homeland gathering traditions, as well as by Native Americans interested in maintaining or renewing their cultural traditions. Land stewards also viewed foraging as a potential environmental education tool that the Parks Department could use to further its goals of strengthening human connections with nature. Finally, land stewards saw foraging, with its potential to link local food systems, environmental sustainability, stewardship, health, and cultural traditions, as a potential means to strengthen the city's multi-functional ecosystem services approach to urban forest management.

Two of the land stewards interviewed strongly opposed relaxing the prohibition on foraging in parks. Both cited the long-standing “leave-no-trace” tradition of American parks as a justification for not legalizing foraging. They also believed that opening the parks to foraging was a “slippery slope” that would, in their view, lead to commercial harvesters destroying the resource. Other objections they raised included the risk of liability claims if foragers were to injure themselves while foraging in the parks, potential negative impacts on wildlife and vegetation, and incompatibility with a state law prohibiting private profit-making from the use of park resources. Land stewards supportive of urban foraging also raised some of these concerns. However, the

supportive land stewards expressed cautious optimism about being able to come up with workable solutions to these challenges.

4. Discussion

4.1. Urban forest management and formal stewardship in Seattle

Concerns about the long-term health of Seattle's urban forest during the 1990s led to the development of an Urban Forest Management Plan in 2007 (City of Seattle, 2007). The plan laid out a framework for increasing Seattle's canopy cover to more than 30 percent aggregated across the city by 2037. The plan was revised in 2013 to articulate a new vision of trees as “a shared community resource and as part of the natural urban ecology” (City of Seattle, 2013, p. 10). The revised plan's title, Urban Forest Stewardship Plan, reflects the Seattle Urban Forest Commission's belief that an environmental stewardship ethic should guide the city's efforts to improve Seattle's urban forest. The Stewardship Plan emphasizes the importance of individual and neighborhood actions for sustaining the urban forest and draws attention to the need to get “individuals, communities, and institutions to change their values, behaviors, and their attitudes about urban trees” (City of Seattle, 2013, p. 18). The Stewardship Plan includes food production and urban foraging among the functions and benefits of a healthy urban forest. The plan describes urban foraging as important because it “maintains traditions and social ties while deepening connections with nature”, “offers positive physical and mental health benefits”, and allows foragers to pursue food and health sovereignty and justice goals (City of Seattle, 2013, p. 33).

Seattle's extensive city park system, which includes developed parks and parks managed as natural areas, is a key component of the city's urban forest. The Seattle Parks and Recreation Department (hereafter referred to as Parks Department) has a dual mission of providing opportunities for park visitors “to play, learn, contemplate and build community” and promoting “responsible stewardship of the land” (City of Seattle, 2011, p. iii). Key strategies by which the Parks Department seeks to accomplish its mission include forest restoration and environmental education (City of Seattle, 2011). To meet its forest restoration goals, the department initiated the Green Seattle Partnership, a public-private partnership that recruits and trains volunteers to restore forested habitats in Seattle's park system. Forest Stewards are trained to direct other volunteers to remove invasive species, plant trees, and maintain native understory vegetation (City of Seattle, 2013). To mesh the Parks' environmental stewardship activities with its community food security goals, the Parks Urban Food System program partnered in 2010 with City Fruit, a local group whose mission includes restoring and expanding the fruit tree component of Seattle's urban forest. Through City Fruit, Seattle Parks implements an Urban Orchards Stewards program modeled after the Forest Steward program. The Urban Orchards Stewards program trains volunteers to rehabilitate neglected fruit and nut trees in city parks and seeks to improve public and private access to fresh fruit through providing tree care training, organizing a city-wide fruit harvest, and delivering harvested fruit to food banks. Seattle Parks also taps into formal stewardship programs to conduct inventory and monitoring. The land stewards who participated in our study identified volunteer recruitment and retention, particularly among low-income and minority communities, as key challenges in implementing the Parks' formal stewardship programs, challenges consistent with national trends in urban stewardship (Fisher et al., 2012). Practitioners have characterized formal stewardship in Seattle as multi-layered, with individuals acting on the basis of values (e.g. environmental ethics, personal ethics, and concern for community) and organizations pursuing goals (e.g. environmental improvement and community building) (Romolini et al., 2012).

Our field observations and interviews with foragers in Seattle indicated that contrary to many land managers' pre-conceptions (Hurley et al., 2015), many foragers engaged in practices that fit common

Table 3
Foraging practices which are aligned with the Parks Department's objectives.

Removal of products that reduce the Parks' maintenance costs
● Examples: harvesting fallen nuts in playfields, harvesting fruits that would otherwise rot, attracting pests and creating safety hazards
Removal of species the Parks Department categorizes as undesirable
● Examples: <i>R. armeniacus</i> , <i>Hedera helix</i> L.
Removal of plant material slated for removal by park crews
● Examples: Harvesting downed wood or pruned branches that the Parks Department would otherwise need to haul away
Encouragement of species the Parks Department perceives as desirable
● Examples: Seeding of native plants, live-stick planting of native plants
Foraging activities that further the Parks Department's environmental education objectives
● Example: Leading edible plant walks

definitions of stewardship. Not only did most foragers take steps to minimize damage to the plants they harvest and the ecosystems they work within, but they also sought to enhance the health of plants and their habitats. They did so using diverse practices, many of which are identical to practices recommended in formal stewardship programs. However, the concept of stewardship as articulated by the foragers in our study integrates physical practices, knowledge drawn from both scientific and experiential knowledge traditions, and an ethics of care. This multi-dimensional concept of stewardship matches that described for rural NTFP harvesters in the southeastern (Emery, 2001) and northeastern United States (Baumflek et al., 2010). From a practical standpoint, our findings suggest that, in aggregate, urban foragers' everyday informal stewardship activities could complement the work carried out by formal stewardship groups and the Parks Department's professional staff (Table 3). However, to realize the full potential of the benefits associated with informal foraging-based stewardship, two major challenges will need to be overcome.

Perhaps the greatest challenge will be overcoming the “leave-no-trace” paradigm among park professionals and moving beyond the Parks Department's current focus on restoring native species and removing non-native species. This paradigm does not adequately take into consideration the socio-ecological functions that exotic species may have in novel ecosystems (Kowarik, 2011), such as green spaces in dense urban areas. Our interviews with land stewards suggest that this may be less of a challenge than it would have been a decade ago. A move away from the “leave-no-trace” norm governing park use is already occurring within the Seattle Parks Department, fueled in part by the city's influential urban agriculture movement. Also promising is the shift within the fields of ecology, forestry, and urban planning toward seeing cities as socio-ecological systems, with humans considered integral—and positive—components of urban green spaces (Pincetl, 2015). In Seattle, the opportunities for the Parks Department to engage with foraging in a positive way are doubly enhanced by the already blurry distinction between land stewards and foragers. As revealed in our interviews, many land stewards forage and many foragers participate in formal stewardship programs. This blurriness between stakeholder categories holds promise for facilitating the building of stronger links between formal and informal stewardship traditions. Doing so however, will require identifying the areas where foraging and park management objectives are aligned and where they are incompatible. Accomplishing these tasks also will require developing urban forest governance processes that involve foragers in decisions about urban green space management. In some cases trade-offs may need to be made between species which are of value to foragers, but which the Parks Department considers detrimental. The Himalayan blackberry is a classic example of a species for which the interests of foragers and the Parks Department are widely divergent. However, eradication is not the only way to manage invasive species, and experiments with new management institutions, such as community-managed *R. armeniacus* or *U. diotica* patches (perhaps using an “adopt-a-patch” approach) offer promise for win-win solutions.

A second challenge is how to ensure that foraging is done at scales and using practices that are sustainable in the context of a densely populated urban area with limited green space used for many purposes. A concern voiced by foragers and land stewards alike was that if foraging becomes a mainstream activity, new foragers might lack the extensive knowledge that long-term foragers have of local ecosystems. If social mechanisms for transmitting knowledge about low-impact practices and imparting sustainable land care ethics are not in place, there is a risk that foraging will occur in ways that are ecologically harmful. Until studies that document the long-term impact of foraging have been done, however, the level of risk that foraging poses to urban species or habitats is unknown. A promising model for managing that risk is a wild mushroom monitoring project established by a coalition of commercial mushroom harvesters and environmental justice groups in the early 2000s in central Oregon (Fernandez-Gimenez et al., 2008). The project used a field-based, community-designed “ethics of care” approach to a community outreach program aimed at educating harvesters about sustainable harvesting techniques and low-impact use of the woods. Another model is the use of voluntary forager codes, an approach that is being used in England's New Forest, a national park within easy access of London that receives some 13 million visitors per year (<http://www.forestry.gov.uk/forestry/INFD-6E3GAZ>). The voluntary foragers' code model also has been implemented in Scotland to govern the harvest of wild mushrooms (Dyke and Emery, 2010). The overlap that already exists between informal and formal stewards in Seattle provides a foundation for partnerships that have potential to develop ecologically viable approaches to a forager-friendly park system. Indeed, the collaborations that have emerged in Seattle around urban orchards and food forests during the past five years point to the likelihood of successful compromises.

5. Conclusion

The foragers who participated in this study emphasized the importance of stewardship practices involving caring for plants in a holistic way, including non-native plants. This approach contrasts with much of the ecological literature on stewardship and many formal stewardship programs that emphasize native species restoration and invasive and exotic species removal. The restoration/removal approach is a leftover from 20th century ecology, which focused on understanding native tree and plant structure in wildland settings (Choi, 2007). In densely populated urban areas, ecological structures and functions have been so greatly altered that scientists are now thinking of them as novel ecosystems with new and enduring structures and functions (Kowarik, 2011). In such environments, a restoration approach driven by species' origins is unlikely to be successful in the long run. Instead, it is important to focus on the ecological services that novel ecosystems already do or could provide, and acknowledge the positive contributions that humans can make to those ecosystems (Pincetl, 2015). The long term sustained commitment of many foragers can support stewardship programs. By embracing foraging, the Parks Department has the opportunity to capitalize on foragers' extensive local ecological knowledge, using it to inform more formal stewardship practices and support holistic urban natural areas management.

Acknowledgements

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Minnesota Sustainable Foraging Task Force

Centennial Office Building
St. Paul, MN 55155
Phone: 651-296-0099
www.lcc.mn.gov/foraging/

Date: December 2, 2025
To: Minnesota Sustainable Foraging Task Force
From: Nick Nero, Research Analyst
RE: Wisconsin and Washington County, MN Foraging Information

Wisconsin Laws and Regulations

For State lands in general:

[NR 45.04\(1s\)](#) Collecting. Except as specifically provided in this subsection, a person may collect any of the following materials for noncommercial use:

1. Edible fruits, edible nuts, wild mushrooms, wild asparagus, and watercress may be collected by hand for the purpose of personal consumption by the collector.
2. Herbaceous plant species that are listed as prohibited plant invasive species under s. [NR 40.04 \(2\) \(b\)](#), listed as restricted plant invasive species under s. [NR 40.05 \(2\) \(b\)](#), or considered non-restricted invasive species under s. [NR 40.03 \(1\)](#), may be removed without written permission or a permit issued under this chapter.

Note: A list of non-restricted invasive species is available on the department's website at <https://dnr.wisconsin.gov/topic/Invasives/what.html>. Possession, movement, and proper disposal of invasive species is regulated under ch. [NR 40](#) and an invasive species permit issued under that chapter may be required unless the invasive plants are left or disposed of onsite.

4. Except for edible fruits, edible nuts, and edible seeds collected for personal consumption under this paragraph, a person wishing to collect seeds from herbaceous plants, including grasses and wildflowers, or seeds or nuts from woody plants, or both, on department lands shall apply for and obtain a seed collecting permit from the department.

Note: The seed collecting permit application form is available at <https://dnr.wi.gov/files/PDF/forms/1700/1700-039.pdf>.

For State Natural Areas (SNA) in particular:

23.28 State natural areas; designated state natural areas.

3) PROTECTION OF NATURAL VALUES; RESEARCH NATURAL AREAS. The department shall not permit any use of a designated state natural area which is inconsistent with or injurious to its natural values.

NR 45.13 Specific property rules. (1) STATE NATURAL AREAS — GENERAL. Within the boundaries of state natural areas posted with appropriate signs:

(c) No person may destroy, remove or attempt to remove any plant or plant part, without permission from the department except as provided for in s. [NR 45.04\(1s\)](#)

Washington County Foraging Permit Confirmation Email:

Thank you for obtaining your 2025 Foraging Permit for Washington County Parks. Please follow the guidelines below and visit our website to obtain additional information on foraging as a recreational activity, including safety precautions, tips, and tricks. Please contact Parks staff if you have any questions.

- For your safety and to protect plant habitats, **only forage in areas that are clearly marked as allowed.**
- **You are responsible for correctly identifying plants.** Some poisonous plants look similar to edible ones, so be careful!
- **Know the right season to harvest each plant or mushroom.** Picking at the right time helps keep the plants healthy and ensures they are safe and good to eat.
- **Only take what you plan to use.** Leave some behind for wildlife and to allow the plants and fungi to grow back for future seasons.
- **Use the proper tools** and harvest in a way that causes as little harm to the environment as possible.
- **Do not dig up roots.** You may only collect fungi, berries, nuts, seeds, flowers, and leaves. Avoid disturbing the soil to help prevent the spread of invasive species.

<https://www.washingtoncountymn.gov/3798/Foraging>

What is foraging?

Foraging means collecting wild resources such as plants, fungi, nuts, and berries. Centuries ago to today, people practice foraging as a way to get food and find medicine. Foraging remains a valuable practice across cultures to connect with nature and be self-sufficient.

[Washington County Parks Ordinance #218 \(PDF\)](#)

All foraging activities must conform to [Parks Ordinance #218, Chapter V, Section 1 – Natural Resources \(PDF\)](#) on page 17:

“It shall be unlawful for any person to forage or gather flora without a use permit, including but not limited to fungi, berries, nuts, seeds, and oil. Foraging activities must be for personal use and in designated areas.”

[Apply for a foraging permit](#)

If you are interested in foraging in Washington County Parks, you will need to apply for a free foraging permit.

- Permit is free.
- Available annually April through October during normal park hours (6 a.m. - 10 p.m.).
- Apply online or in-person at a park office.
- Applicants must apply every year.

Where you can forage

Each park has specific foraging areas. These designated areas help protect nature and keep people safe. Some parts of the parks are off-limits because of land restoration or maintenance activities like mowing, spraying, or controlled burns. These may change from year to year. Check the latest foraging area map before you go.

- **Lake Elmo Park Reserve:** Designated areas include parkland east of the main entrance road to Lake Elmo and the park boundary, and south of the Nordic Center to the park boundary. The one excluded area is a farm field. [See image of LEPR map \(JPG\)](#).
- **Cottage Grove Ravine Regional Park:** Designated foraging areas include parkland south of the main entrance road, then east of the of Ravine Landing building and

parking lot to the park boundary. The natural area between the playground and kayak launch is also included. [See image of CGRRP map \(JPG\)](#).

- **Pine Point Regional Park:** Everything north of the Gateway State Trail is a designated foraging area. [See image of PPRP map \(JPG\)](#).
- **St. Croix Bluffs Regional Park:** Designated foraging areas include parkland south of the main entrance road and boat launch to the park boundary. [See image of SCBRP map \(JPG\)](#).
- **Square Lake Park:** The whole park is open to foraging. [See image of SLP map \(JPG\)](#).

Where you *cannot* forage

- **Big Marine Park Reserve:** No foraging is permitted at this time due to upcoming projects and plant surveys.
- **Long Lake Conservation Area:** No foraging is permitted at this time.

Safety reminder

Be aware of tick exposure while foraging. [Read more about ticks](#).



REGULATED SPECIES

Category	Common Name	Scientific name	NR40 Regulated	NR40 Added	Habitat
Plant	Amur cork tree	<u>Phellodendron amurense</u>	Prohibited	5/1/2015	T
Plant	Amur honeysuckle	<u>Lonicera maackii</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Amur maple	<u>Acer tataricum subsp. ginnala</u>	Restricted	5/1/2015	T
Plant	Anchored water hyacinth	<u>Eichhornia azurea</u>	Prohibited	5/1/2015	A, W
Plant	Aquatic forget-me-not	<u>Myosotis scorpioides</u>	Restricted	5/1/2015	W, T
Plant	Asian loeseneri bittersweet	<u>Celastrus loeseneri</u>	Prohibited	5/1/2015	T
Plant	Asian marshweed	<u>Limnophila sessiliflora</u>	Prohibited	5/1/2015	A, W
Plant	Australian swamp crop or New Zealand pygmyweed	<u>Crassula helmsii</u>	Prohibited	9/1/2009	A
Plant	Autumn olive	<u>Elaeagnus umbellata</u>	Restricted	9/1/2009	T
Plant	Balfour's touch-me-not	<u>Impatiens balfourii</u>	Restricted	5/1/2015	W, T
Plant	Bell's or showy bush honeysuckle	<u>Lonicera x bella</u>	Restricted	9/1/2009	W, T
Plant	Bishop's goutweed	<u>Aegopodium podagraria</u>	Restricted	5/1/2015	T
Plant	Black (European) alder	<u>Alnus glutinosa</u>	Restricted	5/1/2015	T
Plant	Black knapweed	<u>Centaurea nigra</u>	Restricted	5/1/2015	T
Plant	Black locust	<u>Robinia pseudoacacia</u>	Restricted	5/1/2015	T
Plant	Black or Louise's swallow-wort	<u>Vincetoxicum nigrum</u> or <u>Cynanchum louiseae</u>	Prohibited/Restricted	9/1/2009	T
Plant	Bohemian knotweed	<u>Fallopia x bohemicum</u> or <u>F. x bohémica</u> or <u>Polygonum x bohemicum</u>	Prohibited	5/1/2015	W, T
Plant	Brittle naiad, or lesser, bushy, slender, spiny or minor naiad or water nymph	<u>Najas minor</u>	Prohibited	9/1/2009	A
Plant	Brown knapweed	<u>Centaurea jacea</u>	Restricted	5/1/2015	T
Plant	Burning bush	<u>Euonymus alatus</u>	Restricted	5/1/2015	T
Plant	Butterfly dock	<u>Petasites hybridus</u>	Prohibited	5/1/2015	W, T
Plant	Canada thistle	<u>Cirsium arvense</u>	Restricted	9/1/2009	W, T
Plant	Celandine	<u>Chelidonium majus</u>	Restricted	9/1/2009	T
Plant	Chinese wisteria	<u>Wisteria sinensis</u>	Prohibited	5/1/2015	T
Plant	Chinese yam	<u>Dioscorea batatas</u> or <u>D. polystacha</u>	Prohibited	5/1/2015	W, T
Plant	Colt's foot	<u>Tussilago farfara</u>	Prohibited	5/1/2015	W, T
Plant	Common barberry	<u>Berberis vulgaris</u>	Prohibited	5/1/2015	T
Plant	Common buckthorn	<u>Rhamnus cathartica</u>	Restricted	9/1/2009	W, T
Plant	Common teasel	<u>Dipsacus sylvestris</u> or <u>D. fullonum</u>	Restricted	9/1/2009	W, T
Plant	Creeping bellflower	<u>Campanula rapunculoides</u>	Restricted	9/1/2009	T



Plant	Crown vetch	<u>Coronilla varia</u>	Restricted	5/1/2015	T
Plant	Curly-leaf pondweed	<u>Potamogeton crispus</u>	Restricted	9/1/2009	A
Plant	Cut-leaved teasel	<u>Dipsacus laciniatus</u>	Restricted	9/1/2009	W, T
Plant	Cypress spurge	<u>Euphorbia cyparissias</u>	Restricted	9/1/2009	T
Plant	Dalmatian toadflax	<u>Linaria dalmatica</u>	Prohibited/Restricted	5/1/2015	T
Plant	Dame's rocket	<u>Hesperis matronalis</u>	Restricted	9/1/2009	W, T
Plant	Diffuse knapweed	<u>Centaurea diffusa</u>	Prohibited	5/1/2015	T
Plant	Ducklettuce	<u>Ottelia alismoides</u>	Prohibited	5/1/2015	A
Plant	Egeria	<u>Egeria densa</u>	Prohibited	9/1/2009	A
Plant	Eurasian watermilfoil	<u>Myriophyllum spicatum</u>	Restricted	9/1/2009	A
Plant	European frogbit	<u>Hydrocharis morsus-ranae</u>	Prohibited	9/1/2009	A
Plant	European marsh thistle	<u>Cirsium palustre</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Fanwort, Carolina Fanwort	<u>Cabomba caroliniana</u>	Prohibited	9/1/2009	A
Plant	Field scabiosa	<u>Knautia arvensis</u>	Restricted	5/1/2015	T
Plant	Fiveleaf akebia or Chocolate vine	<u>Akebia quinata</u>	Prohibited	5/1/2015	T
Plant	Floating marsh pennywort	<u>Hydrocotyle ranunculoides</u>	Prohibited	5/1/2015	A
Plant	Flowering rush	<u>Butomus umbellatus</u>	Restricted	9/1/2009	A, W
Plant	Garden heliotrope or Valerian	<u>Valeriana officinalis</u>	Restricted	5/1/2015	W, T
Plant	Garden yellow loosestrife	<u>Lysimachia vulgaris</u>	Restricted	5/1/2015	W, T
Plant	Garlic mustard	<u>Alliaria petiolata</u>	Restricted	9/1/2009	W, T
Plant	Giant hogweed	<u>Heracleum mantegazzianum</u>	Prohibited	9/1/2009	W, T
Plant	Giant knotweed	<u>Fallopia sachalinensis or Polygonum sachalinense</u>	Prohibited	9/1/2009	W, T
Plant	Giant reed	<u>Arundo donax</u>	Prohibited	5/1/2015	A, W
Plant	Giant salvinia	<u>Salvinia herzogii</u>	Prohibited	5/1/2015	A, W
Plant	Giant salvinia	<u>Salvinia molesta</u>	Prohibited	5/1/2015	A, W
Plant	Glossy buckthorn	<u>Rhamnus frangula or Frangula alnus</u>	Restricted	9/1/2009	W, T
Plant	Graceful cattail	<u>Typha laxmannii</u>	Prohibited	5/1/2015	A, W
Plant	Grecian foxglove	<u>Digitalis lanata</u>	Prohibited	5/1/2015	T
Plant	Hairy willow herb	<u>Epilobium hirsutum</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Hawaii arrowhead	<u>Sagittaria sagittifolia</u>	Prohibited	5/1/2015	A, W
Plant	Helleborine orchid	<u>Epipactis helleborine</u>	Restricted	9/1/2009	T
Plant	Hemp nettle, brittlestem hemp nettle	<u>Galeopsis tetrahit</u>	Restricted	9/1/2009	T
Plant	Hill mustard	<u>Bunias orientalis</u>	Prohibited/Restricted	9/1/2009	T
Plant	Himalayan blackberry	<u>Rubus armeniacus</u>	Prohibited	5/1/2015	T
Plant	Hound's tongue	<u>Cynoglossum officinale</u>	Restricted	9/1/2009	T
Plant	Hybrid cattail	<u>Typha x glauca</u>	Restricted	9/1/2009	W, T
Plant	Hydrilla	<u>Hydrilla verticillata</u>	Prohibited	9/1/2009	A
Plant	Indian Swampweed	<u>Hygrophila polysperma</u>	Prohibited	5/1/2015	A
Plant	Indian yam	<u>Dioscorea oppositifolia</u>	Prohibited	9/1/2009	W, T
Plant	Japanese barberry	<u>Berberis thunbergii</u>	Restricted	5/1/2015	T
Plant	Japanese chaff flower	<u>Achyranthes japonica</u>	Prohibited	5/1/2015	T
Plant	Japanese hedge parsley or erect hedge parsley	<u>Torilis japonica</u>	Prohibited/Restricted	9/1/2009	T



Plant	Japanese honeysuckle	<u>Lonicera japonica</u>	Prohibited	9/1/2009	W, T
Plant	Japanese hops	<u>Humulus japonicus</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Japanese knotweed	<u>Fallopia japonica or Polygonum cuspidatum</u>	Restricted	9/1/2009	W, T
Plant	Japanese stilt grass	<u>Microstegium vimineum</u>	Prohibited	9/1/2009	W, T
Plant	Japanese wisteria	<u>Wisteria floribunda</u>	Prohibited	5/1/2015	T
Plant	Java waterdropwort or Vietnamese parsley	<u>Oenanthe javanica</u>	Prohibited	5/1/2015	A, W
Plant	Johnsongrass	<u>Sorghum halepense</u>	Prohibited	5/1/2015	T
Plant	Kudzu	<u>Pueraria montana or P. lobata</u>	Prohibited	9/1/2009	T
Plant	Leafy spurge	<u>Euphorbia esula</u>	Restricted	9/1/2009	T
Plant	Lesser celandine	<u>Ranunculus ficaria</u>	Prohibited	5/1/2015	W, T
Plant	Lyme grass or sand ryegrass	<u>Leymus arenarius or Elymus arenarius</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Medusahead	<u>Taeniatherum caput-medusae</u>	Prohibited	5/1/2015	T
Plant	Mile-a-minute vine	<u>Polygonum perfoliatum or Persicaria perfoliata</u>	Prohibited	9/1/2009	W, T
Plant	Moneywort	<u>Lysimachia nummularia (or L. nummularia)</u>	Restricted	5/1/2015	W, T
Plant	Morrow's honeysuckle	<u>Lonicera morrowii</u>	Restricted	9/1/2009	W, T
Plant	Mosquito fern	<u>Azolla pinnata</u>	Prohibited	5/1/2015	A, W
Plant	Mudmat	<u>Glossostigma cleistanthum</u>	Prohibited	5/1/2015	A, W
Plant	Multiflora rose	<u>Rosa multiflora</u>	Restricted	9/1/2009	T
Plant	Musk thistle or Nodding thistle	<u>Carduus nutans</u>	Restricted	9/1/2009	T
Plant	Narrow-leaf bittercress	<u>Cardamine impatiens</u>	Prohibited	5/1/2015	W, T
Plant	Narrow-leaf cattail	<u>Typha angustifolia</u>	Restricted	9/1/2009	W, T
Plant	Oriental bittersweet	<u>Celastrus orbiculatus</u>	Restricted	9/1/2009	T
Plant	Oxygen-weed, African elodea or African waterweed	<u>Lagarosiphon major</u>	Prohibited	9/1/2009	A
Plant	Pale or European swallow-wort	<u>Vincetoxicum rossicum or Cynanchum rossicum</u>	Prohibited	9/1/2009	T
Plant	Parrot feather	<u>Myriophyllum aquaticum</u>	Prohibited	9/1/2009	A
Plant	Perennial or broadleaved pepperweed	<u>Lepidium latifolium</u>	Prohibited	9/1/2009	T
Plant	Phragmites or Common reed non-native ecotype	<u>Phragmites australis non-native ecotype</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Plumeless thistle	<u>Carduus acanthoides</u>	Restricted	9/1/2009	T
Plant	Poison hemlock	<u>Conium maculatum</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Policeman's helmet	<u>Impatiens glandulifera</u>	Prohibited	5/1/2015	W, T
Plant	Porcelain berry	<u>Ampelopsis brevipedunculata</u>	Prohibited	9/1/2009	W, T
Plant	Princess tree	<u>Paulownia tomentosa</u>	Prohibited	9/1/2009	T
Plant	Purple loosestrife	<u>Lythrum salicaria</u>	Restricted	9/1/2009	W, T
Plant	Queen of the meadow	<u>Filipendula ulmaria</u>	Restricted	5/1/2015	W, T
Plant	ribbon grass or gardener's garters and other ornamental variegated varieties and cultivars.	<u>Phalaris arundinacea var. picta</u>	Restricted	5/1/2015	W, T
Plant	Rose acacia or Bristly locust	<u>Robinia hispida</u>	Restricted	5/1/2015	T
Plant	Russian knapweed	<u>Centaurea repens</u>	Prohibited	5/1/2015	T
Plant	Russian olive	<u>Elaeagnus angustifolia</u>	Restricted	9/1/2009	T



Plant	Sacred Lotus	<u>Nelumbo nucifera</u>	Prohibited	5/1/2015	A
Plant	Sawtooth oak	<u>Quercus acutissima</u>	Prohibited	9/1/2009	T
Plant	Scarlet pimpernel or Burnet saxifrage	<u>Pimpinella saxifraga</u>	Restricted	5/1/2015	W, T
Plant	Scotch broom	<u>Cytisus scoparius</u>	Prohibited	9/1/2009	T
Plant	Seaside goldenrod	<u>Solidago sempervirens</u>	Prohibited/Restricted	5/1/2015	T
Plant	Sericea or Chinese lespedeza	<u>Lespedeza cuneata or L. sericea</u>	Prohibited	9/1/2009	T
Plant	Siberian elm	<u>Ulmus pumila</u>	Restricted	5/1/2015	T
Plant	Siberian peashrub	<u>Caragana arborescens</u>	Restricted	5/1/2015	T
Plant	Southern cattail	<u>Typha domingensis</u>	Prohibited	5/1/2015	A, W
Plant	Spiny naiad	<u>Najas marina</u>	Restricted	5/1/2015	A, W
Plant	Spotted knapweed	<u>Centaurea biebersteinii, C. maculosa or C. stoebe</u>	Restricted	9/1/2009	T
Plant	Spreading hedge parsley	<u>Torilis arvensis</u>	Prohibited	9/1/2009	T
Plant	Tall or reed mannagrass	<u>Glyceria maxima</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Tansy	<u>Tanacetum vulgare</u>	Restricted	9/1/2009	T
Plant	Tartarian honeysuckle	<u>Lonicera tatarica</u>	Restricted	9/1/2009	W, T
Plant	Tree of heaven	<u>Ailanthus altissima</u>	Restricted	9/1/2009	T
Plant	Tyrol knapweed	<u>Centaurea nigrescens</u>	Restricted	5/1/2015	T
Plant	Wanded loosestrife	<u>Lythrum virgatum</u>	Prohibited	5/1/2015	A, W
Plant	Water chestnut	<u>Trapa natans</u>	Prohibited	9/1/2009	A
Plant	Water hyacinth, floating	<u>Eichhornia crassipes</u>	Prohibited	5/1/2015	A, W
Plant	Water lettuce	<u>Pistia stratiotes</u>	Prohibited	5/1/2015	A, W
Plant	Water Soldiers	<u>Stratiotes aloides</u>	Prohibited	5/1/2015	A, W
Plant	Water spinach, swamp morning-glory	<u>Ipomoea aquatica</u>	Prohibited	5/1/2015	A, W
Plant	Wavy leaf basket grass	<u>Oplismenus hirtellus ssp. undulatifolius</u>	Prohibited	5/1/2015	T
Plant	White bedstraw	<u>Galium mollugo</u>	Restricted	5/1/2015	T
Plant	White mulberry	<u>Morus alba</u>	Restricted	5/1/2015	T
Plant	White poplar	<u>Populus alba</u>	Restricted	5/1/2015	T
Plant	Wild chervil	<u>Anthriscus sylvestris</u>	Prohibited/Restricted	9/1/2009	W, T
Plant	Wild parsnip	<u>Pastinaca sativa</u>	Restricted	9/1/2009	T
Plant	Wineberry or wine raspberry	<u>Rubus phoenicolasius</u>	Prohibited	9/1/2009	T
Plant	Woodland forget-me-not	<u>Myosotis sylvatica (or M. sylvaticum)</u>	Restricted	5/1/2015	T
Plant	Wormwood	<u>Artemisia absinthium</u>	Restricted	5/1/2015	T
Plant	Yellow floating heart	<u>Nymphoides peltata</u>	Prohibited	9/1/2009	A
Plant	Yellow iris	<u>Iris pseudacorus</u>	Restricted	5/1/2015	A, W, T
Plant	Yellow star thistle	<u>Centaurea solstitialis</u>	Prohibited	9/1/2009	T
Other	Cylindro (cyanobacteria)	<u>Cylindrospermopsis raciborskii</u>	Prohibited	9/1/2009	A
Other	Didymo or rock snot	<u>Didymosphenia geminata</u>	Prohibited	9/1/2009	A
Other	Golden alga	<u>Prymnesium parvum</u>	Prohibited	9/1/2009	A
Other	Killer algae	<u>Caulerpa taxifolia</u>	Prohibited	5/1/2015	A
Other	Novel cyanobacterial epiphyte of the order Stigonematales linked with avian vacuolar myelinopathy	<u>Stigonematales spp.</u>	Prohibited	9/1/2009	A



Other	Starry stonewort (alga)	<u>Nitellopsis obtusa</u>	Prohibited	9/1/2009	A
Other	Ulva species, including species previously known as Enteromorpha species	<u>Ulva (Enteromorpha) species</u>	Prohibited	9/1/2009	A
Other	White-nose syndrome fungal pathogen	<u>Pseudogymnoascus destructans</u>	Prohibited	6/1/2011	T
Animal	Alewife	<u>Alosa pseudoharengus</u>	Restricted	9/1/2009	A
Animal	Arctic char (2)	<u>Salvelinus alpinus</u>	Restricted	9/1/2009	A
Animal	Asian clam	<u>Corbicula fluminea</u>	Prohibited	9/1/2009	A
Animal	Asian longhorned beetle	<u>Anoplophora glabripennis</u>	Prohibited	9/1/2009	T
Animal	Atlantic salmon (2)	<u>Salmo salar</u>	Restricted	9/1/2009	A
Animal	Banded mystery snail	<u>Viviparus georgianus</u>	Restricted	5/1/2015	A
Animal	Bighead carp	<u>Hypophthalmichthys nobilis</u>	Prohibited	9/1/2009	A
Animal	Bitterling (3)	<u>Rhodeus spp.</u>	Restricted	9/1/2009	A
Animal	Black carp	<u>Mylopharyngodon piceus</u>	Prohibited	9/1/2009	A
Animal	Bloody shrimp	<u>Hemimysis anomala</u>	Prohibited	9/1/2009	A
Animal	Brown trout (2)	<u>Salmo trutta</u>	Restricted	9/1/2009	A
Animal	Chinese hi-fin banded shark (3)	<u>Myxocyprinus asiaticus</u>	Restricted	9/1/2009	A
Animal	Chinese mitten crabs	<u>Eriocheir sinensi</u>	Prohibited	9/1/2009	A
Animal	Chinese mystery snail	<u>Cipangopaludina chinensis</u>	Restricted	9/1/2009	A
Animal	Chinook salmon (2)	<u>Oncorhynchus tshawytscha</u>	Restricted	9/1/2009	A
Animal	Coho salmon (2)	<u>Oncorhynchus kisutch</u>	Restricted	9/1/2009	A
Animal	Common carp	<u>Cyprinus carpio</u>	Restricted	9/1/2009	A
Animal	Crayfish - non-native	<u>Crayfish</u>	Prohibited	9/1/2009	A, W
Animal	Eastern mosquitofish	<u>Gambusia holbrooki</u>	Restricted	9/1/2009	A
Animal	Emerald ash borer	<u>Agrilus planipennis</u>	Restricted	9/1/2009	T
Animal	European valve snail	<u>Valvata piscinalis</u>	Restricted	5/1/2015	A
Animal	Faucet snail	<u>Bithynia tentaculata</u>	Prohibited	9/1/2009	A
Animal	Feral domestic swine	<u>Sus domestica</u>	Prohibited	9/1/2009	T
Animal	Fishhook water flea	<u>Cercopagis pengoi</u>	Prohibited	9/1/2009	A
Animal	Golden mussel	<u>Limnoperna fortunei</u>	Prohibited	5/1/2015	A
Animal	Goldfish *(3)	<u>Carassius auratus</u>	Restricted	9/1/2009	A
Animal	Grass carp	<u>Ctenopharyngodon idella</u>	Prohibited	9/1/2009	A
Animal	Hemlock woolly adelgid	<u>Adelges tsugae</u>	Prohibited	9/1/2009	T
Animal	Ide (3)	<u>Leuciscus idus</u>	Restricted	9/1/2009	A
Animal	Japanese trapdoor snail or Japanese mystery snail	<u>Cipangopaludina japonica</u>	Restricted	5/1/2015	A
Animal	Jumping worm	<u>Amyntas or Amyntus species</u>	Restricted	9/1/2009	T
Animal	Killer Shrimp	<u>Dikergammarus villosus</u>	Prohibited	5/1/2015	A
Animal	Koi carp *(3)	<u>Cyprinus rubrofuscus</u>	Restricted	9/1/2009	A
Animal	Malaysian trumpet snail	<u>Melanoides tuberculata</u>	Prohibited	5/1/2015	A
Animal	Monk or Quaker parakeet or parrot	<u>Myiopsitta monachus</u>	Prohibited	9/1/2009	T
Animal	Mountain Pine Beetle	<u>Dendroctonus ponderosae</u>	Prohibited	5/1/2015	T
Animal	New Zealand mud snail	<u>Potamopyrgus antipodarum</u>	Prohibited	9/1/2009	A
Animal	Nutria	<u>Myocastor coypus</u>	Prohibited	5/1/2015	A, W, T



Animal	Pink salmon (2)	<u>Oncorhynchus gorbuscha</u>	Restricted	9/1/2009	A
Animal	Quagga mussel	<u>Dreissena rostriformis</u>	Prohibited	9/1/2009	A
Animal	Rainbow smelt	<u>Osmerus mordax</u>	Restricted	9/1/2009	A
Animal	Rainbow trout (2)	<u>Oncorhynchus mykiss</u>	Restricted	9/1/2009	A
Animal	Red shiner	<u>Cyprinella lutrensis</u>	Prohibited	9/1/2009	A
Animal	Redear sunfish (2)	<u>Lepomis microlophus</u>	Restricted	9/1/2009	A
Animal	Round goby	<u>Neogobius melanostomus</u>	Restricted	9/1/2009	A
Animal	Rudd	<u>Scardinius erythrophthalmus</u>	Prohibited	9/1/2009	A
Animal	Ruffe	<u>Gymnocephalus cernuus</u>	Restricted	9/1/2009	A
Animal	Russian boar & other wild swine	<u>Sus scrofa</u>	Prohibited	9/1/2009	T
Animal	Rusty crayfish (non-native established)	<u>Orconectes rusticus</u>	Restricted	9/1/2009	A, W
Animal	Sea lamprey	<u>Petromyzon marinus</u>	Restricted	9/1/2009	A
Animal	Silver carp	<u>Hypophthalmichthys molitrix</u>	Prohibited	9/1/2009	A
Animal	Snakehead family	<u>Channidae</u>	Prohibited	9/1/2009	A
Animal	Spiny water flea	<u>Bythotrephes cederstroemi</u>	Prohibited	9/1/2009	A
Animal	Spongy moth, North American or European subspecies	<u>Lymantria dispar dispar</u>	Restricted	9/1/2009	T
Animal	Spongy moth, subspecies with flight-capable females	<u>Lymantria dispar asiatica</u> or <u>L. dispar japonica</u>	Prohibited	9/1/2009	T
Animal	Sterlet (3)	<u>Acipenser ruthenus</u>	Restricted	9/1/2009	A
Animal	Sudden oak death pathogen	<u>Phytophthora ramorum</u>	Prohibited	9/1/2009	T
Animal	Tench	<u>Tinca tinca</u>	Prohibited	9/1/2009	A
Animal	Thousand cankers disease of walnut	<u>Geosmithia morbida</u>	Prohibited	5/1/2015	T
Animal	Three-spine stickleback	<u>Gasterosteus aculeatus</u>	Restricted	9/1/2009	A
Animal	Tiger trout (2)	<u>Salvelinus fontinalis</u> x <u>Salmo trutta</u>	Restricted	9/1/2009	A
Animal	Tilapia	<u>Tilapia spp.</u>	Restricted	9/1/2009	A
Animal	Tubenose Goby	<u>Proterorhinus marmoratus</u>	Restricted	9/1/2009	A
Animal	Walnut twig beetle	<u>Pityophthorus juglandis</u>	Prohibited	5/1/2015	T
Animal	Water flea	<u>Daphnia lumholtzi</u>	Prohibited	9/1/2009	A
Animal	Weather loach (3)	<u>Misgurnus anguillicaudatus</u>	Restricted	9/1/2009	A
Animal	Western mosquitofish	<u>Gambusia affinis</u>	Restricted	9/1/2009	A
Animal	White perch	<u>Morone americana</u>	Restricted	9/1/2009	A
Animal	Zander	<u>Sander lucioperca</u>	Prohibited	9/1/2009	A
Animal	Zebra mussel	<u>Dreissena polymorpha</u>	Restricted	9/1/2009	A

Sustainable Foraging Task Force Testimony

Boozhoo. My name is Leanna Goose, and I am from Leech Lake. Miigwech to the task force for the opportunity to share.

“Sustainable foraging” is a good way to begin framing this work, but I would encourage your team to take it a step further, and begin considering what **regenerative foraging looks like** and how policy that comes from this task force can make that happen. Sustainable means maintaining things at a healthy enough rate that they stay the same or don’t degrade.

Regenerative means doing things in a way that not only protects what is there but leaves things better than we found them. My ancestors looked seven generations ahead, and I think that incorporating that type of thinking into policy-making spaces like these needs to happen.

I want to share some teachings from our Anishinaabe culture, in the hope that they are helpful. First, we are taught that we don’t take the first of anything we see in case that is the only one left, and never take all of what a plant has to offer, and we always leave some behind for the next person or being who may need it. We also offer our thanks to these relatives for their gifts. Offering thanks acknowledges that the plants, animals, and waters bring us life and creates a relationship of respect. These teachings allow for plants to stay healthy and ensure the supply can recover over time.

When looking for chaga with classmates in our woodland plants class, our teacher taught us that we should never take the entire growth. Leaving a good portion behind allows that medicine to regrow. This is not only sustainable, but regenerative—because it can recover and regrow if harvested correctly and be there for the next person who may need it.

When harvesting manoomin, my father taught us to put a handful of seeds back into the water. That act ensures some of the plant returns to the lake, providing for the next year and future generations. It honors the understanding that we are responsible for those who come after us.

When picking sage, we gather above the roots and never pull out the whole plant. We sprinkle any seeds that are on the plant back onto the ground, ensuring they can grow into next year's harvest. An elder told me that spreading those seeds is a good practice in traditional harvesting.

When picking blueberries, if we do not find enough, we simply do not pick at all in that area. There have been a few years in a row where we do not find enough. We know the other animals are hungry, and we see their habitats and food sources shrinking. Sometimes our trips in the woods are anishaa or the ojibwe word for just for fun and that's ok. We try to think not only of ourselves but of all other beings who may need those berries to survive. Protecting our wild spaces not only for humans but nindanawemaginadog or all of our relatives is important in this moment and I hope this task force considers that too.

These same values guide us when harvesting maple syrup. Things start by showing gratitude. I can remember following in my dad's footsteps through the deep snow and offering aasemaa to every tree before we tapped. The tree was about to give us a gift, and for that we must be thankful. We take our taps out each year so the trees have time to heal and continue offering their gifts. I saw a piece of legislation introduced that would have allowed people to leave taps and tubes in year-round, but this would leave the trees unable to heal and vulnerable to disease and is not good practice if we want them to remain healthy. The trees are already struggling with the changing of the climate and it is predicted that the sugar maple may be gone in 100 years from MN if nothing changes.

<https://b105country.com/minnesota-dnr-we-could-lose-maple-trees-in-100-years-due-to-climate-change/>:

In our community, many people chose not to tap at all one season because the winter was off and the trees were clearly stressed. It was difficult—because it felt like our cultural traditions were at risk due to climate change—but it also felt good to know we were standing together to protect the health of the maple trees, knowing they have cared for our people for generations.

I tell my kids in the sugar bush that these trees gave syrup to my dad, they gave syrup to me, and they can continue to give syrup to them too—if *we take care of them*. I would like to see part of this task force's work ensuring that these natural spaces remain healthy so our children and grandchildren can continue to enjoy their connections with the land and the gifts it offers. Protecting the places where we harvest wild rice, maple syrup, blueberries, and medicines is of the utmost importance. These are gifts that most Minnesotans enjoy as well. Ensuring that foraging is done respectfully and in a good way can be guided by the wisdom of my ancestors and the First Nations people of this land and I encourage you to bring in Indigenous wisdom to lead the way. Incorporating traditional Indigenous knowledge, we can ensure that these traditions remain for our children to enjoy.

I encourage this task force to use every tool available to protect our wild spaces and to push back against extractive threats that could leave behind a legacy of contamination for our children to face. On Leech Lake, we are already feeling the impacts of extraction on our life sources. PFAS have been found in our waters and in the groundwater at my children's school, our fish, and our deer. These findings show how deeply interconnected and vulnerable our waters and ecosystems are, and how urgent protection is needed. Our choices are impacting our children at this moment and we must do better for them.

I also want to emphasize the critical difference between foraging and treaty rights. Whatever policies or recommendations come from this task force should **not** apply to the Anishinaabeg within the ceded territories. **In Minnesota, Chippewa tribes retained usufructuary rights to hunt, fish, and gather on ceded territories through treaties like the 1837 and 1854 agreements. These treaty rights, which allow tribes to use the land for their sustenance, were challenged but ultimately upheld by the U.S. Supreme Court, notably in the *Minnesota v. Mille Lacs Band of Chippewa Indians* case.** These territories are places where our ancestors **reserved** the rights to hunt, fish, and gather. These are not rights granted by the United States, but rights we inherently hold so that our people can continue to survive and thrive. These rights are guaranteed and must be upheld as the supreme law of the land under Article VI of the U.S. Constitution.

The ceded territories in Minnesota hold immense life, beauty, and cultural meaning. Protecting these areas protects our identity, our traditions, and our connection to the land. Foraging is what the average person does in the woods. What our people do is a way of life—a relationship and responsibility that feeds us physically, culturally, and spiritually. I grew up following in my dad’s footsteps, relying on the woods and waters to take care of us. That was not “foraging”; that was how food was put on our table. Many of our people continue to rely on these relationships today.

The profits of extractive industries must never be placed above the culture, survival, and well-being of our people. At this moment, protecting our ceded territories and honoring treaty rights must remain a priority. When the ceded territories are safeguarded from extraction, our medicines can continue to heal our people. It means that manoomin can still provide for our children through the harsh Minnesota winters. It also means that not only the Anishinaabeg but all Minnesotans can continue to enjoy these lands and waters, which are gifts to all who live here.

Mining proposed within the ceded territories threatens to decimate manoomin, contaminate the wetlands where our medicines grow, and permanently alter our waters—leaving behind a legacy of pollution for our children to deal with. These impacts cannot be undone. Most plants absorb contaminants through their root systems just as they absorb nutrients. When the land and waters are contaminated, our plants become contaminated—and in turn, so do our bodies. For example, we cannot remove PFAS from the cedar trees, the deer, or the fish once they have been exposed, and no one has figured out how to remove them from our bodies either. Recent studies show that because PFAS can transfer from a mother to her baby, nearly all babies are born with these chemicals in their body. Once that contamination enters our medicines and foods there is no going back.

I urge this task force to use its powers to push back against extraction and prevent these environmental disasters before they begin.

Miigwech, Leanna Goose–Rise and Repair Alliance Organizer–Letter is on behalf of myself.

I also encourage you to think not only about sustainable foraging, but about what **regenerative foraging** could look like. Incorporating Traditional Indigenous Knowledge within this task force is critical, and I hope my words help bring that perspective forward.

Miigwech for listening, and miigwech for the work you are doing to protect these places and the beings we depend on.