
Macro-fungi


Plant pathogens

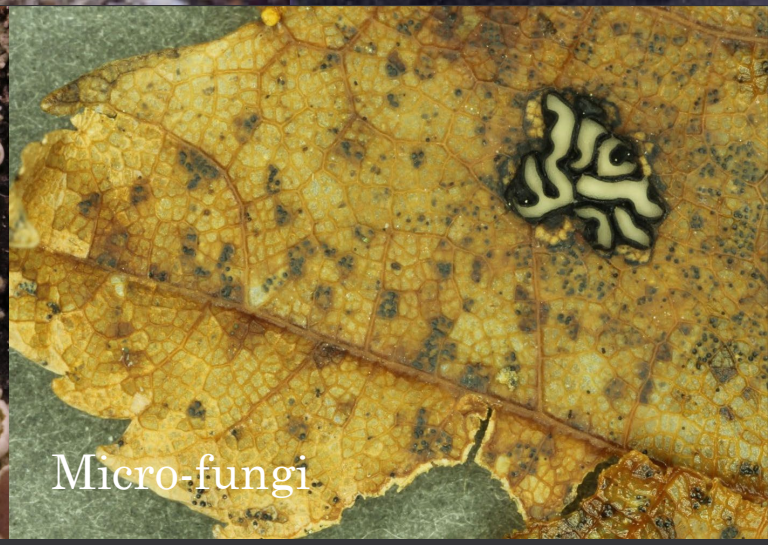

Slime molds


Mycorrhizal fungi

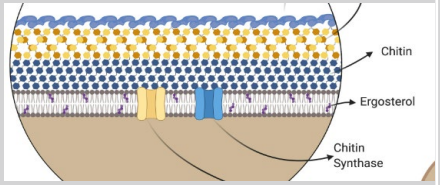
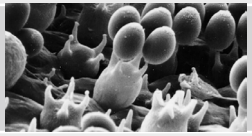
Fungi of Vermont

Jess Rubin and Savannah Ferreira
Fungal Scientific Advisory Group


Lichens


Micro-fungi

What are Fungi:

Fungi	Plants	Animals
Cell wall -Chitin 	Cell wall	No cell wall
Absorptive heterotroph	Autotrophs	Digestive heterotroph
Spore 	Seed 	Zygote
Hyphae 		

Habitat: live freely in soil or water, or form a spectrum of relationships with other organisms

Importance: recycling nutrients, parasites/pathogens, soil stability, sequestering carbon, providing food/shelter for other organisms, and mediating ecosystem stability

Brief history of Mycoliteracy in US

Fungi were known as

- 1700's: Plants
- 1800's: Thallophytes
- 1900's: Fungi

Before 20th Century

- No state heritage program tracking fungi
- Federal Endangered species Act did not recognize Fungi

20th Century

- 1990s West Coast Forest Ecosystem Monitoring Team
- 1996 NEMF & NAMA: Conserving Mycological Diversity

21st Century

- 2012 IUCN Red list ->1st NA Red List Committee formed
  - 48 species to the IUCN Red List

  Today 597 Species (100 > than in Europe)
  - FunDIS: East & West Coast Rare Fungi Challenges

Caloboletus peckii

https://redlist.info/iucn/species_view/223743

Fungal SAG Origin Story

- Estimated 2.2- 3.8 million macrofungi worldwide

- March 2022 following Endangered Species Committee (ESC) discussion formed Bryophyte Scientific Advisory Group (SAG)
- Former assistant VT Botanist Aaron Marcus initiated FSAG to align fungal conservation with NatureServe methodology (Vt Natural Heritage, ESC); VT Agency of Natural Resources to include *Funga* with Flora & Fauna

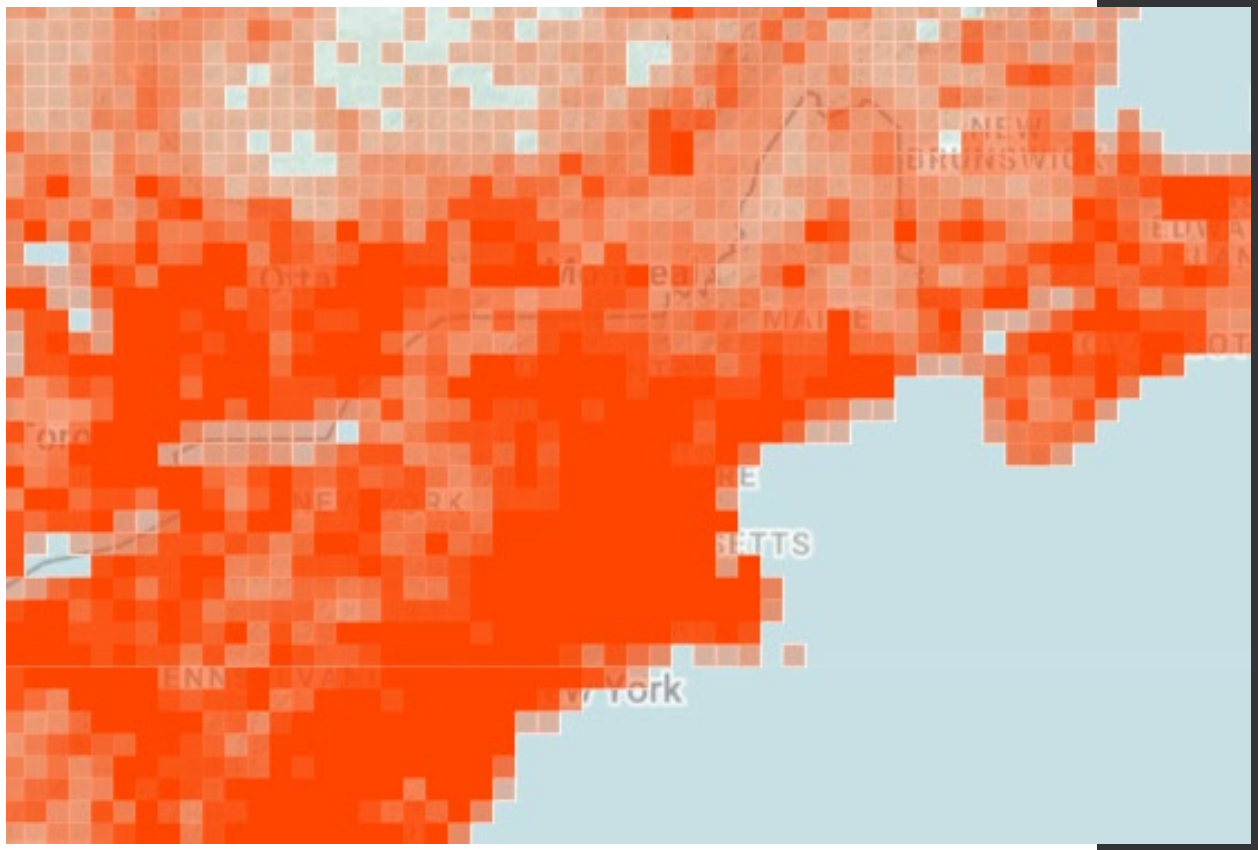
Delimitation of Funga as a valid term for the diversity of fungal communities: the Fauna, Flora & Funga proposal (FF&F) (Kuhar et al. 2018)

Fungal SAG Priorities

1. Baseline Inventory of Known Species
2. Assessment and Review of Existing Species
3. Outreach and Conservation

1. Baseline Inventory

- What does baseline mean?
- What species have historically occurred in VT?
- What species currently occur in VT?
- What species are missing, that are present elsewhere in the Northeast (including NY and Canada)?



Kindom Fungi observations uploaded to INaturalist

MYCOLOGY COLLECTIONS PORTAL

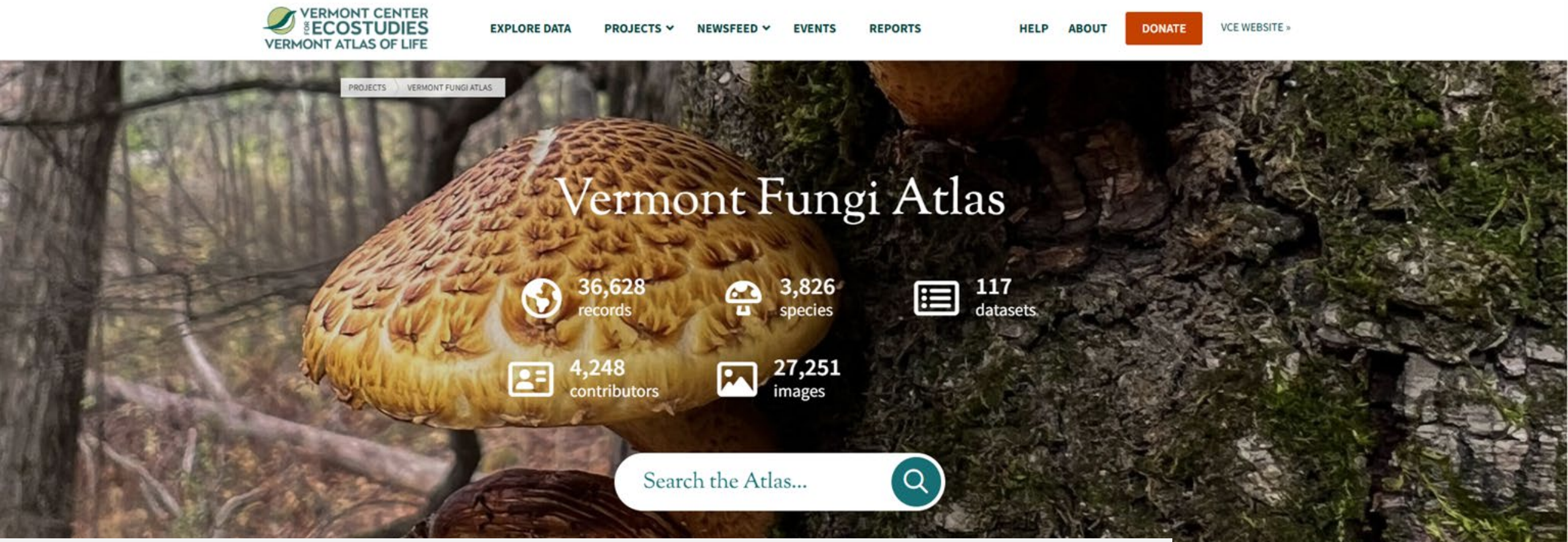
iNat

MUSHROOM OBSERVER

GBIF Global Biodiversity Information Facility

Baseline Inventory: Database Results

https://val.vtecostudies.org/projects/vermont-fungi-atlas/



- 1,165 species were observed and reported in VT (2023)
- 3,826 species (as well as variations and/or subspecies) (2025)

Database Use

Squamanita complex

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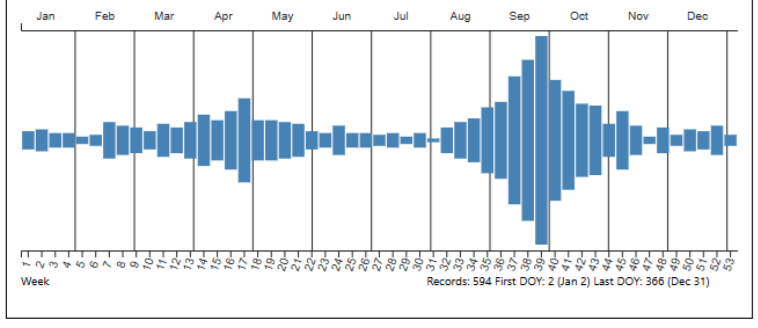
Birch Polypore *SPECIES Fomitopsis betulina (ACCEPTED) <= SPECIES Piptoporus betulinus (SYNONYM) <= SPECIES Polyporus betulinus (SYNONYM)*

(c) Bill MacIndewar, some rights reserved (CC BY-NC), uploaded by Bill MacIndewar

S-Rank: *N/A*
IUCN: *N/A*
VT List: *N/A*

Vermont Fungi Records: *600*
First VTF Record: *01 Oct 1910*
Last VTF Record: *19 Aug 2025*

Phenology | History | iNaturalist



Fomitopsis betulina, commonly known as the **birch polypore**, **birch bracket**, or **razor strop**, is a common bracket fungus and, as the name suggests, grows almost exclusively on birch trees. The brackets burst out from the bark of the tree, and these fruit bodies can last for more than a year.

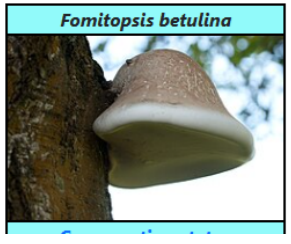
Wikipedia for synonym Piptoporus betulinus
Wikipedia for synonym Polyporus betulinus

About

TAXONOMY

The fungus was originally described by Jean Bulliard in 1788 as *Boletus betulinus*.[2] It was transferred to the genus *Piptoporus* by Petter Karsten in 1881.[3] Molecular phylogenetic studies suggested that the species was more closely related to *Fomitopsis* than to *Piptoporus*,[4][5] and the fungus was reclassified to *Fomitopsis* in 2016.[6]

The specific epithet *betulina* refers to the genus of the host plant (*Betula*).[7] Common names for the fungus include birch bracket,[8] birch polypore, and razorstrop fungus.[9]



DESCRIPTION

The fruit bodies (basidiocarps) are pale, with a smooth greyish-brown top surface, while the creamy white underside has

GENUS *Squamanita* (ACCEPTED)

(c) MushroomHunterHoot, some rights reserved (CC BY-NC), uploaded by MushroomHunterHoot

S-Rank: *N/A*
IUCN: *N/A*
VT List: *N/A*
Vermont Fungi Records: *2*
First VTF Record: *11 Jul 1964*
Last VTF Record: *20 Jul 2024*

2. Assess & Review Existing Species

- What fungi would benefit from State ranks?
- What fungi are currently red listed?
- Assign S-ranks to selected taxa
- Perform dedicated searches for potentially rare species

Natural Community State Ranks

These ranks indicate the relative rarity of natural community types and are assigned by the Vermont Natural Heritage Inventory of Vermont Fish & Wildlife Department.

S1: very rare in the state, generally with fewer than five high quality occurrences

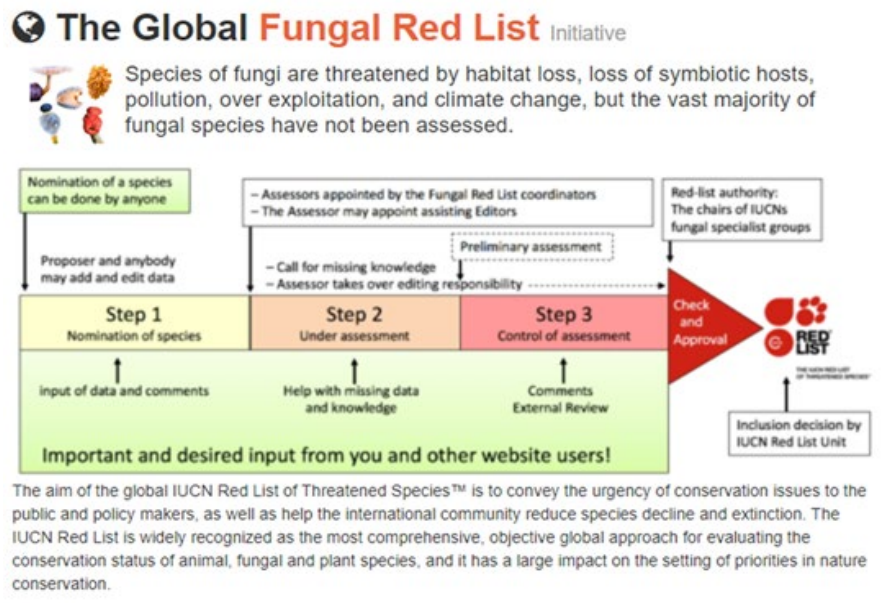
S2: rare in the state, occurring at a small number of sites or occupying a small total area in the state

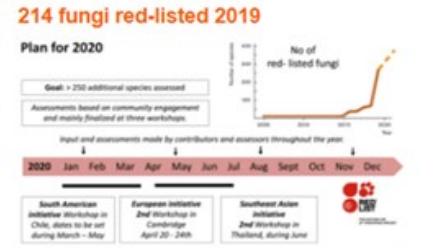
S3: high quality examples are uncommon in the state, but not rare; the community is restricted in distribution for reasons of climate, geology, soils, or other physical factors, or many examples have been severely altered

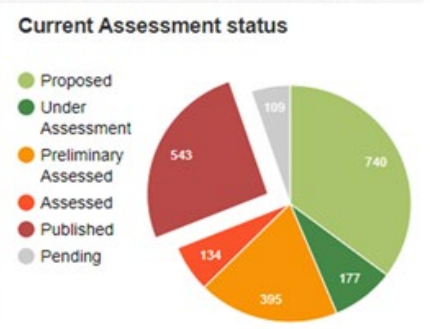
S4: widespread in the state, but the number of high quality examples is low or the total acreage occupied by the community type is relatively small

S5: common and widespread in the state, with high quality examples easily found

G1 or S1	G2 or S2	G3 or S3	G4 or S4	G5 or S5
Very rare (Critically Imperiled)	Rare (Imperiled)	Uncommon (Vulnerable)	Common to uncommon (Apparently secure)	Common (Secure)
At very high risk of extinction or extirpation due to extreme rarity (often 5 or fewer populations or occurrences), very	At high risk of extinction or extirpation due to very restricted range, very few populations (often 20 or fewer)	At moderate risk of extinction or extirpation due to restricted range, relatively few populations or	Locally common or widely scattered to uncommon, but not rare; some cause for long-term concern due to declines or other	Widespread and abundant





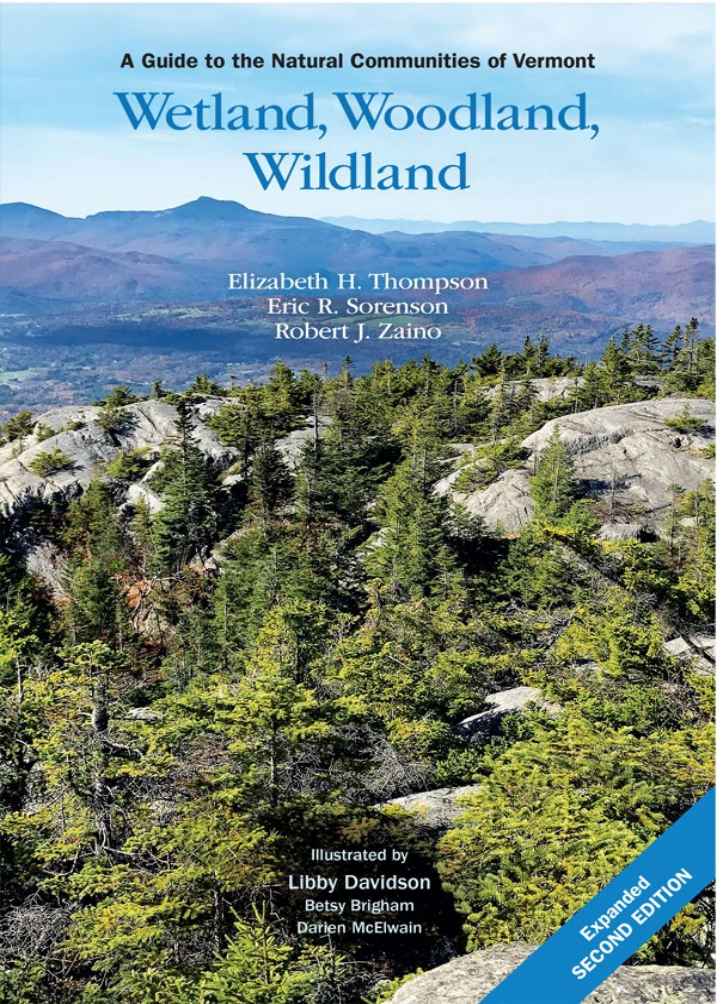


VT FSAG Challenges

- Amidst IUCN protocol, ephemeral nature of fruiting bodies
  - Challenging to legally protect
- Nature Serve uses S Ranks, different than IUCN ranking
- Distinctions of rare vs uncommonly collected
  - Charismatic species are more likely to be observed & recorded
- Coordination with other SAGs in corresponding associations
  - i.e. many plant species showing declines are mycorrhizally dependent

(*Epifagus virginiana*)

Assessment and Review of Existing Species: Natural Communities



<u>Upland natural communities</u>

- Forest and woodlands
- Northern Hardwood forests
- Spruce-Fir, Northern, Oak-Pine
- Open Uplands
- Upland Slopes
- Outcrops & Upland Meadows
- Cliffs & Talus

<u>Wetland natural communities</u>

- Forested Wetlands
- Floodplain forests
- Hardwood swamps
- Softwood swamps
- Seeps & Vernal Pools
- Open & Shrub Wetlands
- Open Peatlands
- Marshes & Sedge Meadows
- Wet Shores
- Shrubs & Swamps

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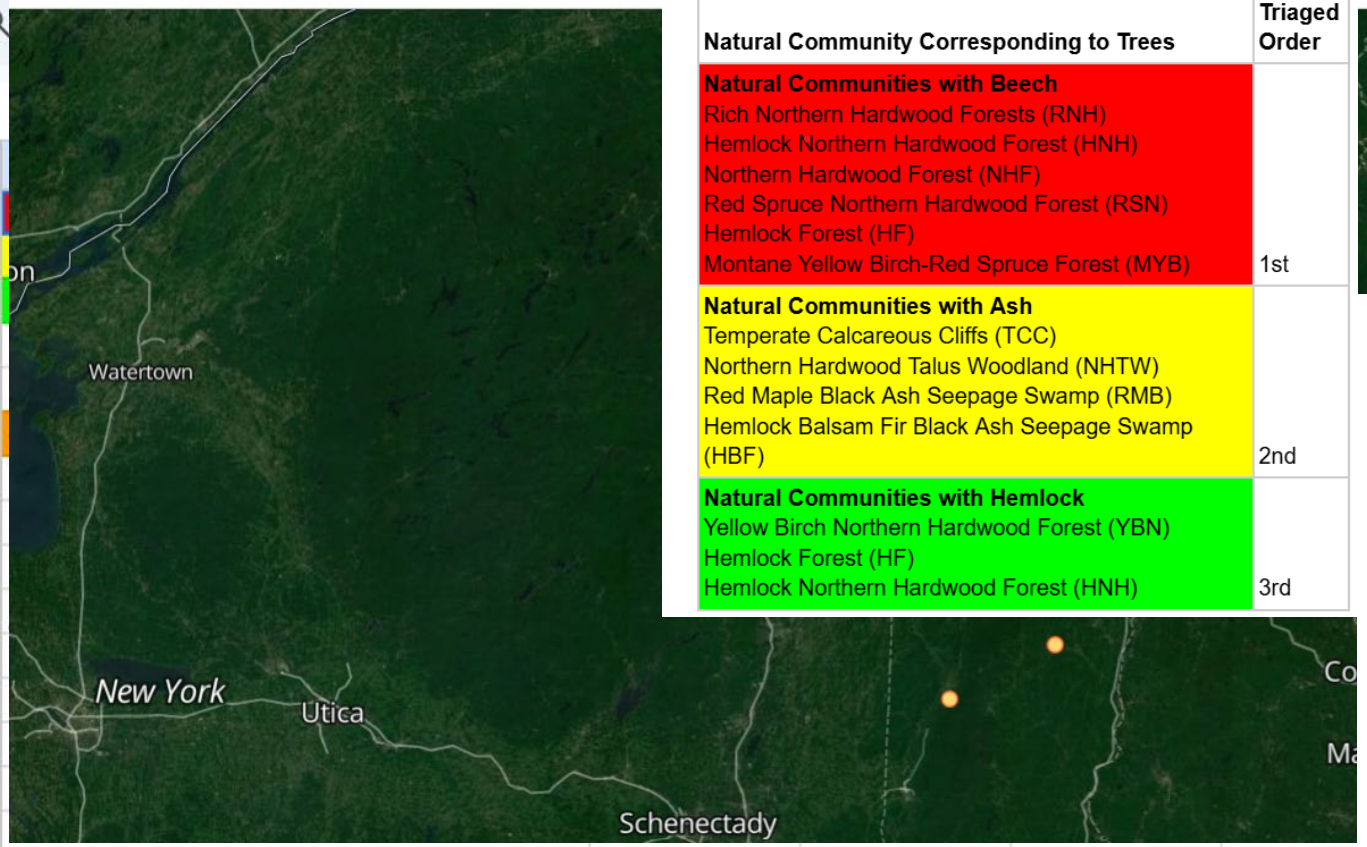
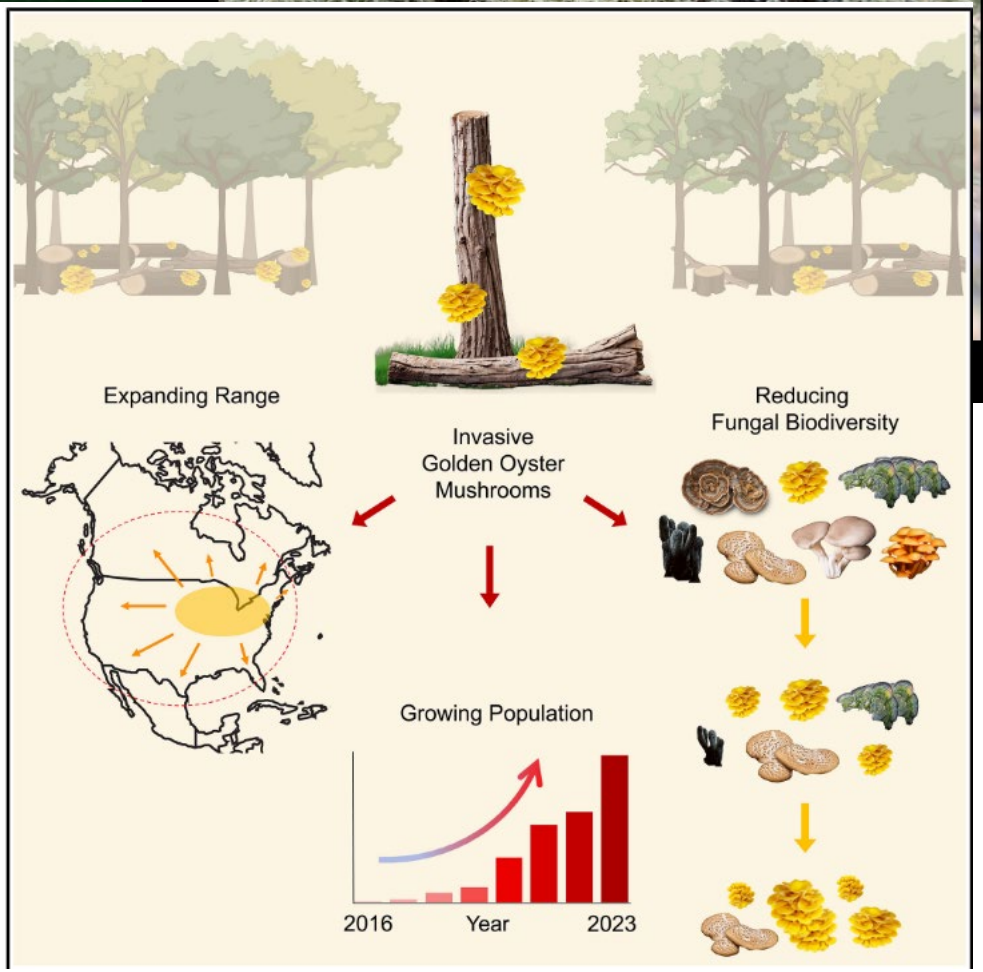
Table 2. Triaged order of NCs based on tree composition and corr

Natural Community Corresponding to Trees	Triaged Order
Natural Communities with Beech Rich Northern Hardwood Forests (RNH) Hemlock Northern Hardwood Forest (HNH) Northern Hardwood Forest (NHF) Red Spruce Northern Hardwood Forest (RSN) Hemlock Forest (HF) Montane Yellow Birch-Red Spruce Forest (MYB)	1st
Natural Communities with Ash Temperate Calcareous Cliffs (TCC) Northern Hardwood Talus Woodland (NHTW) Red Maple Black Ash Seepage Swamp (RMB) Hemlock Balsam Fir Black Ash Seepage Swamp (HBF)	2nd
Natural Communities with Hemlock Yellow Birch Northern Hardwood Forest (YBN) Hemlock Forest (HF) Hemlock Northern Hardwood Forest (HNH)	3rd



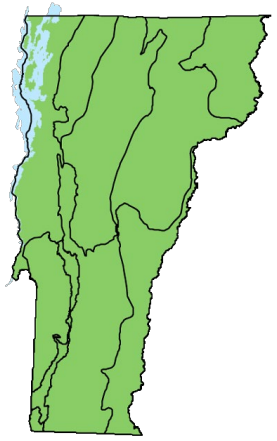
Dry Hemlock Oak Forest | Dry Oak Maple Limestone Forest | Dry Pine Oa



- Bioindicators
- Warning about ‘invasive’ fungi

(Veerabahu et al. 2025)

Assessment and Review of Existing Species: Natural Communities

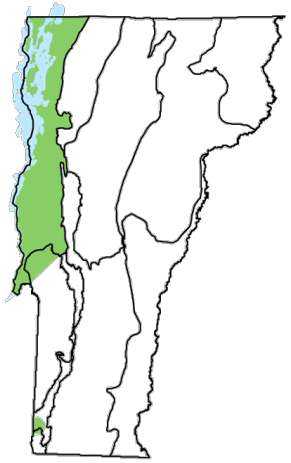


Gifford Woods State Park

- Northern hardwood forest
- 35 Fungi
  - 29 genera
  - 26 species

Woodbury Mountain Wilderness Preserve

- Rich northern hardwood forest & Northern hardwood forest
- 76 Fungi
  - 57 Genera
  - 41 Species



William Woods

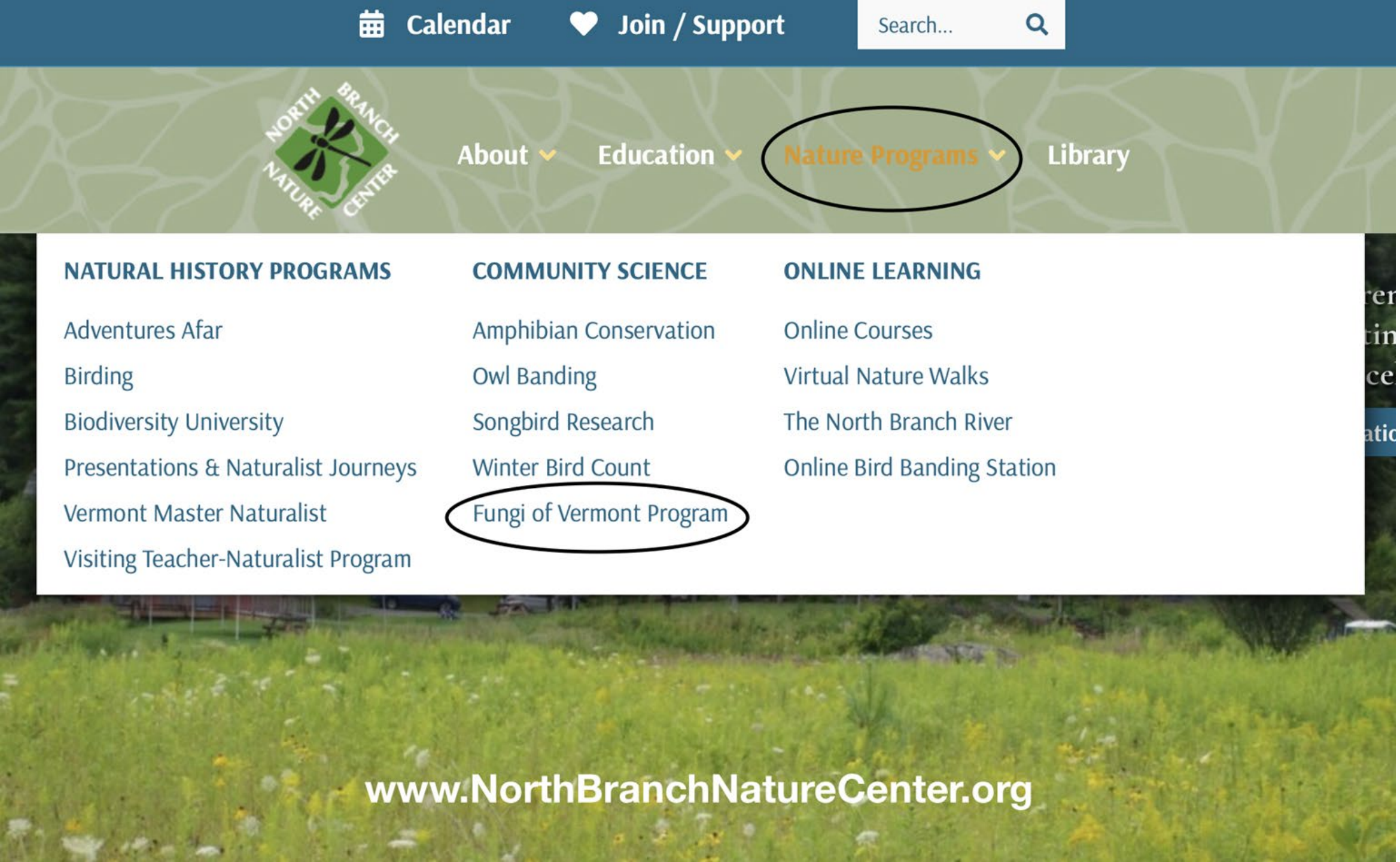
- Mesic clayplain forest
  - 65 Fungi
    - 43 genera
    - 47 species

Coolidge State Forest

- Northern hardwood forest & Hemlock northern hardwood
- 46 Fungi
  - 39 genera
  - 43 species

3. Conservation & Outreach

- Keep ESC informed about RTE fungi and our work
- Maintain the state's database of known fungi
- Submit fungi data to other databases
- Propose T&E listings for fungi when appropriate
- Public outreach and education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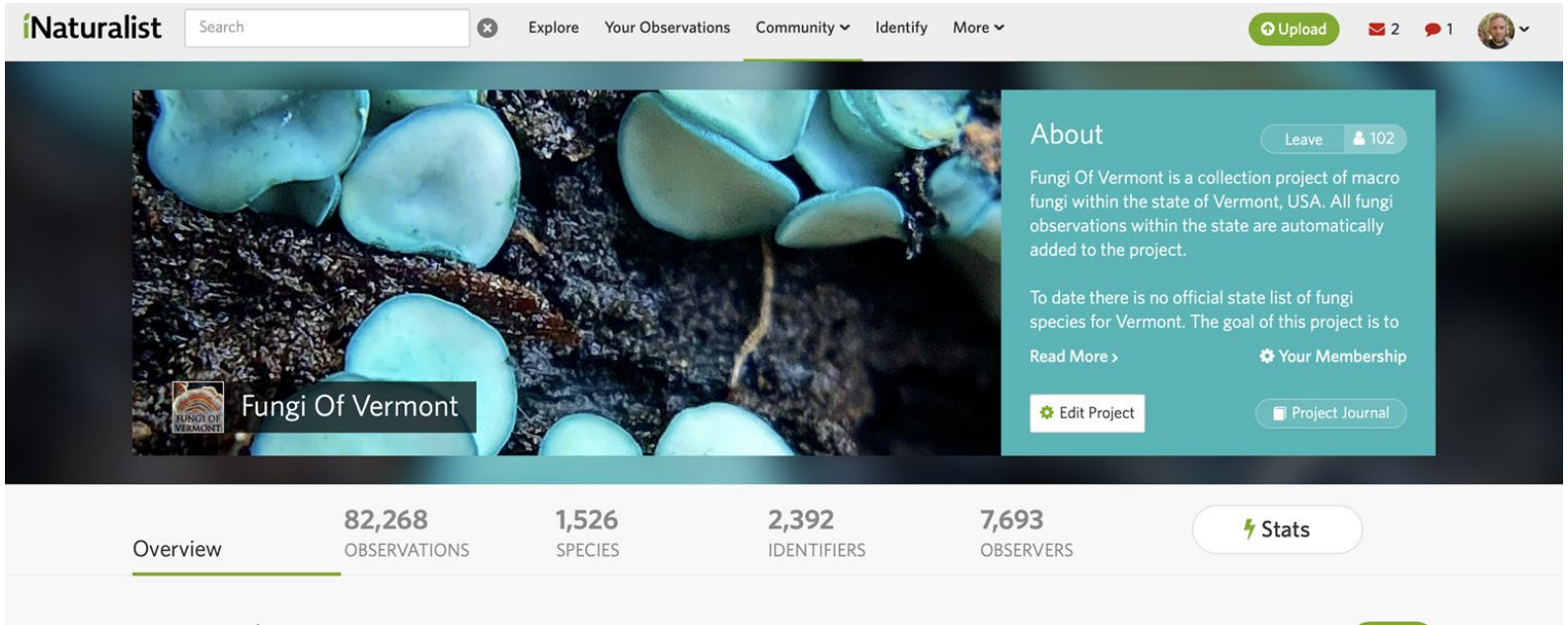
- **3. Best: Preserving Voucher Specimens**

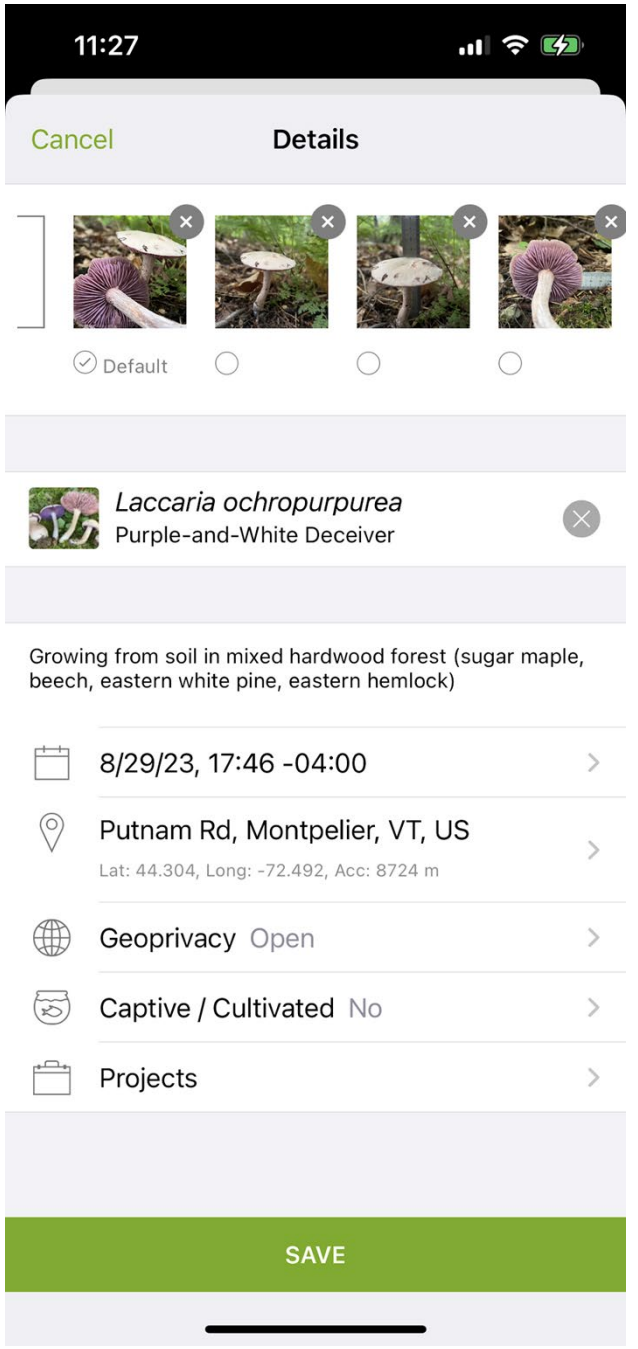




iNaturalist Observations

- Photos are uploaded to the app
- ID's are suggested by software
- 3 Confirmations yield a 'Research Grade' Status
- All fungi observations made within Vermont contribute to the community science initiative





References & Acknowledgements

- Kuhar F, Furci G, Drechsler-Santos ER, Pfister DH (2018) Delimitation of Funga as a valid term for the diversity of fungal communities: the Fauna, Flora & Funga proposal (FF&F). IMA Fungus 9:A71–A74. https://doi.org/10.1007/BF03449441
- Thompson EH ER Sorenson & Zaino, RJ (2019) A Guide to the Natural Communities of Vermont: Wetland, Woodland, Wildland, 2nd edn. Chelsea Green Publishing, White River Junction VT
- Veerabahu A, Banik MT, Lindner DL, et al (2025) Invasive golden oyster mushrooms are disrupting native fungal communities as they spread throughout North America. Curr Biol 35:3994-4002.e4. https://doi.org/10.1016/j.cub.2025.06.049

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Questions?