

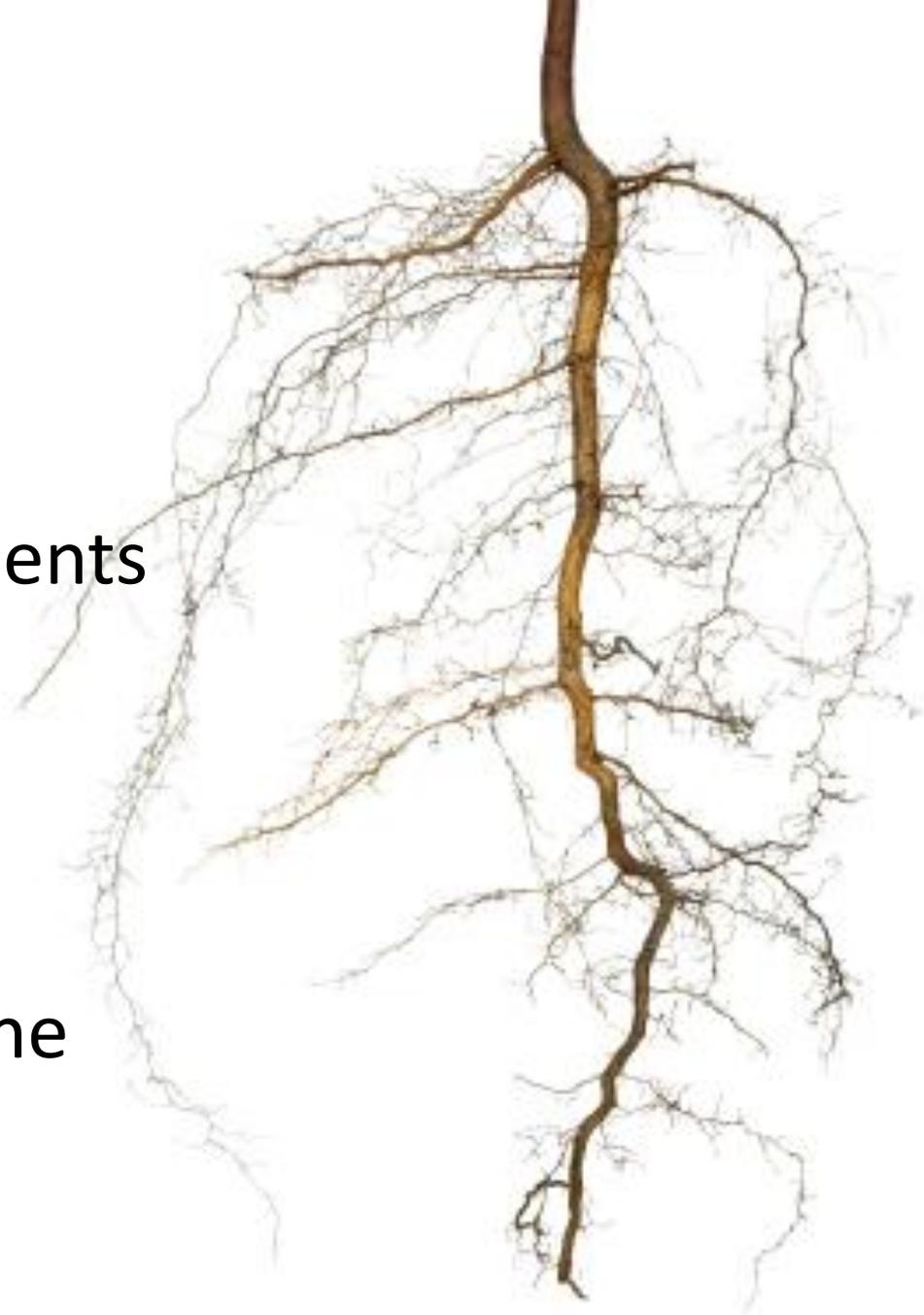
Characterising changes in fungal communities  
during the decomposition of *Abies*  
*balsamea* and *Picea rubens* fine roots

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# Why do we care?

- **Fine roots**
  - < 2 mm diam.
  - absorb water + nutrients
  - ephemeral
  - = huge carbon input
- **Root fungi**
  - Live in/on/around fine roots
  - 3 different types



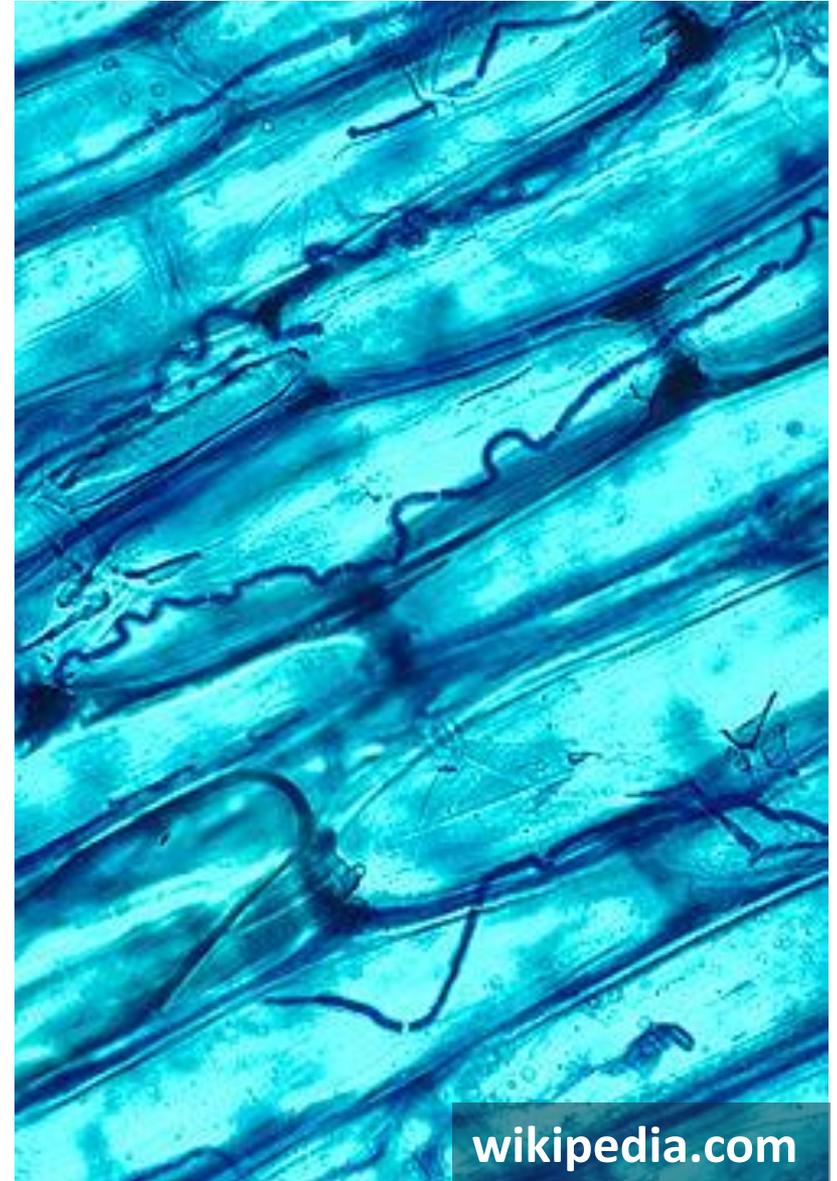
# Ectomycorrhizal Fungi

- Mutualists
  - trade nutrients for tree sugars
  - often *necessary* for optimal tree growth
  - sheath root tip with fungal tissue



# Endophytes

- **Commensalists ?**
  - live between plant cells
  - not well understood
  - cryptic
- **Latent saprotrophs ?**
  - some have pathogenic genes
- Difficult (for me) to photograph!



Some are culturable



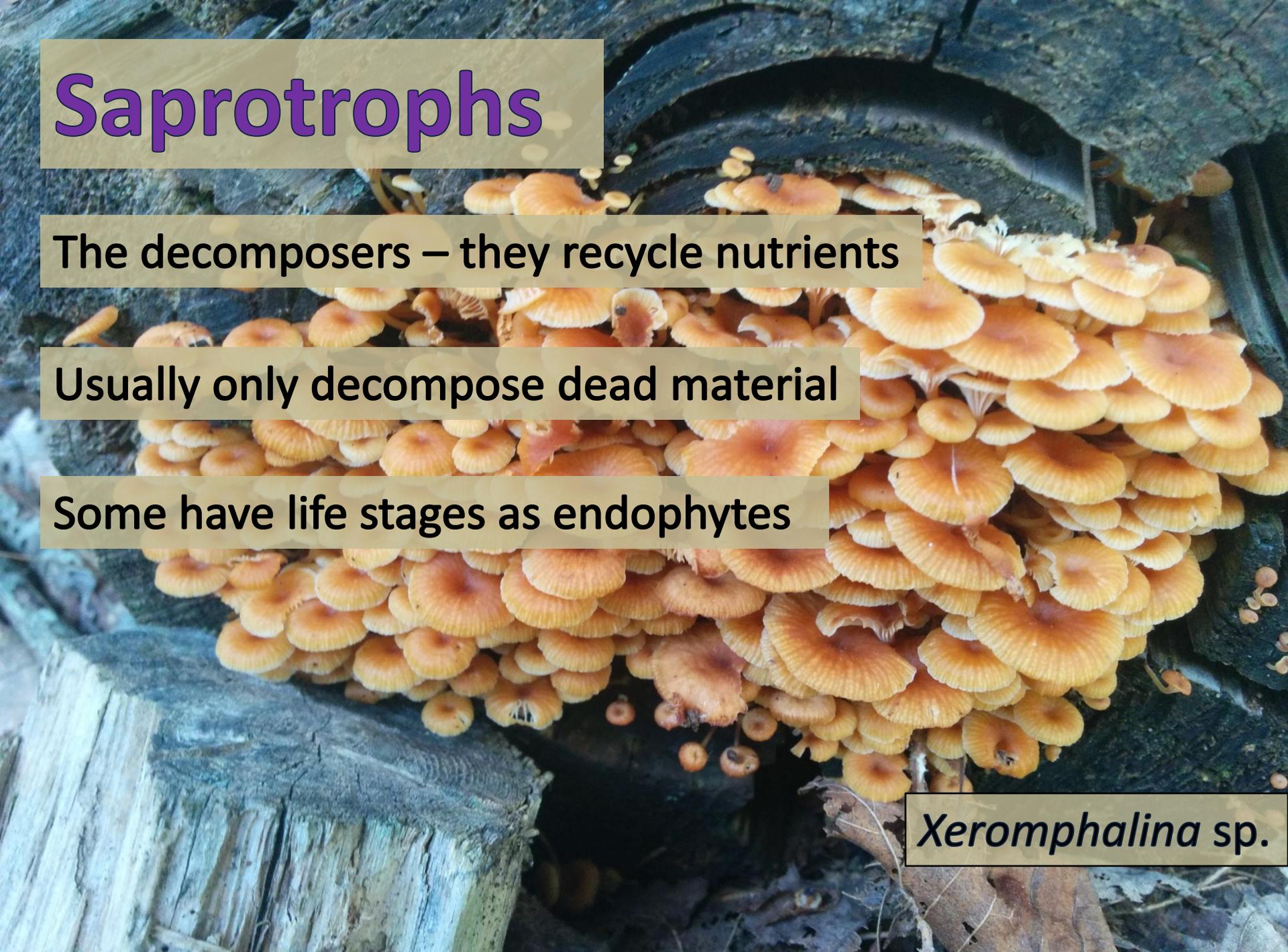
Many are not



<http://web.ethlife.ethz.ch/>

*Phialocephala fortinii*

# Saprotrophs

A large cluster of bright orange, gilled mushrooms, likely Xeromphalina, growing on a piece of weathered wood. The mushrooms are densely packed and have a distinct, ribbed appearance. The wood is dark and textured, providing a natural substrate for the fungi.

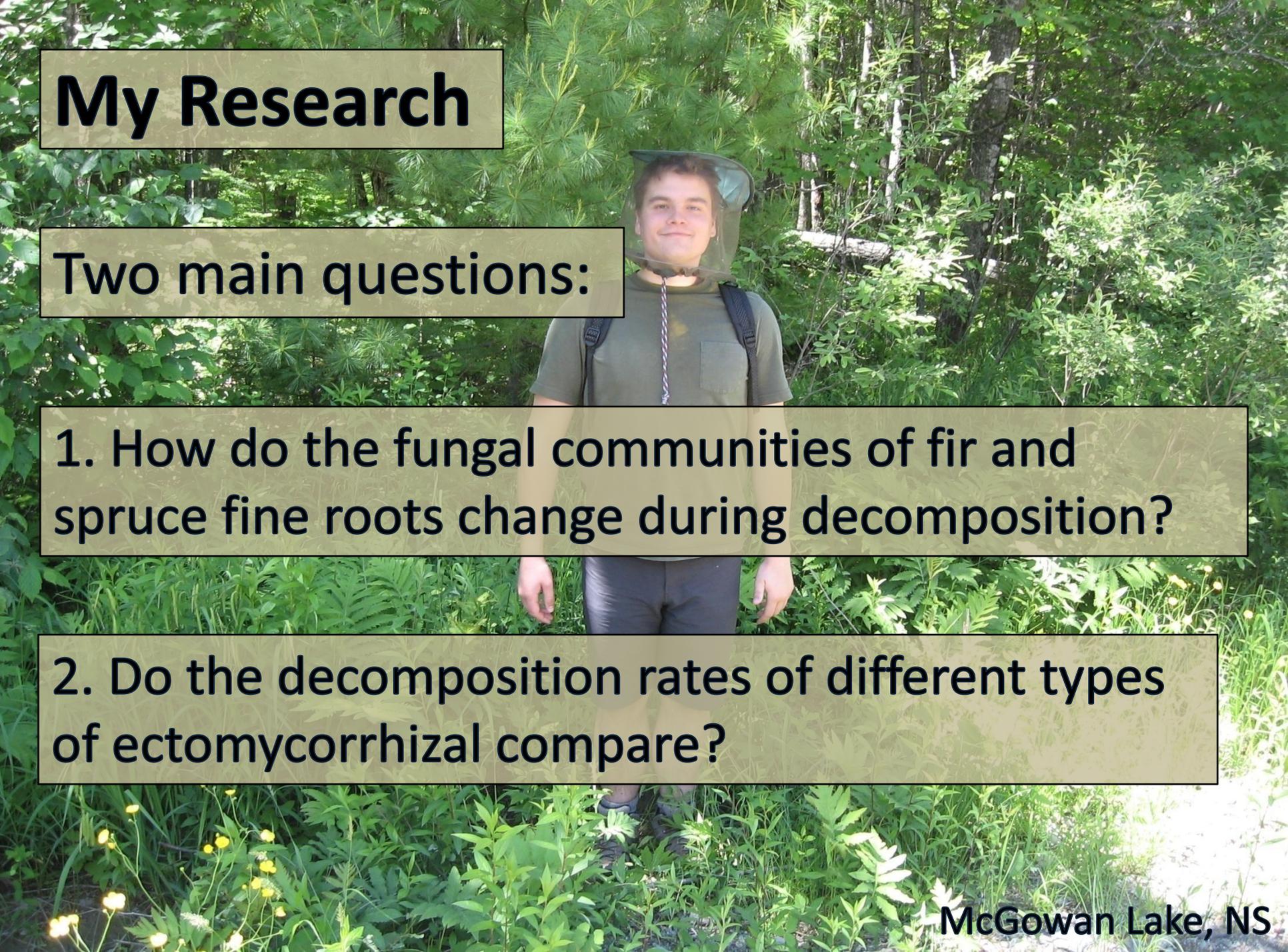
The decomposers – they recycle nutrients

Usually only decompose dead material

Some have life stages as endophytes

*Xeromphalina* sp.

# My Research

A person wearing a full-body protective net suit, including a hood and a face mask, stands in a lush green forest. The person is wearing a dark green t-shirt and dark pants. The background is filled with various types of trees and dense undergrowth, including ferns and yellow wildflowers.

Two main questions:

1. How do the fungal communities of fir and spruce fine roots change during decomposition?

2. Do the decomposition rates of different types of ectomycorrhizal compare?

We found canopy gaps with vast regeneration of red spruce and balsam fir...



Old Annapolis Road, NS

...decapitated them...

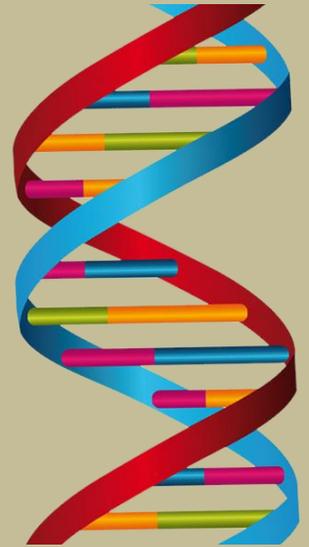


..and collected root systems monthly  
over a 16 month period



# Then brought them to MSVU

Extracted, amplified, and sequenced fungal DNA



+



Visually identified ectomycorrhizal fungi and rated decomposition

# What the data show us

- **Ectomycorrhizal Fungi**
  - some decompose slower than others

*Cenococcum geophilum*



Showed almost no signs of decomposition.  
Probably sequesters large amounts of carbon

Mantle surface of *C. geophilum*



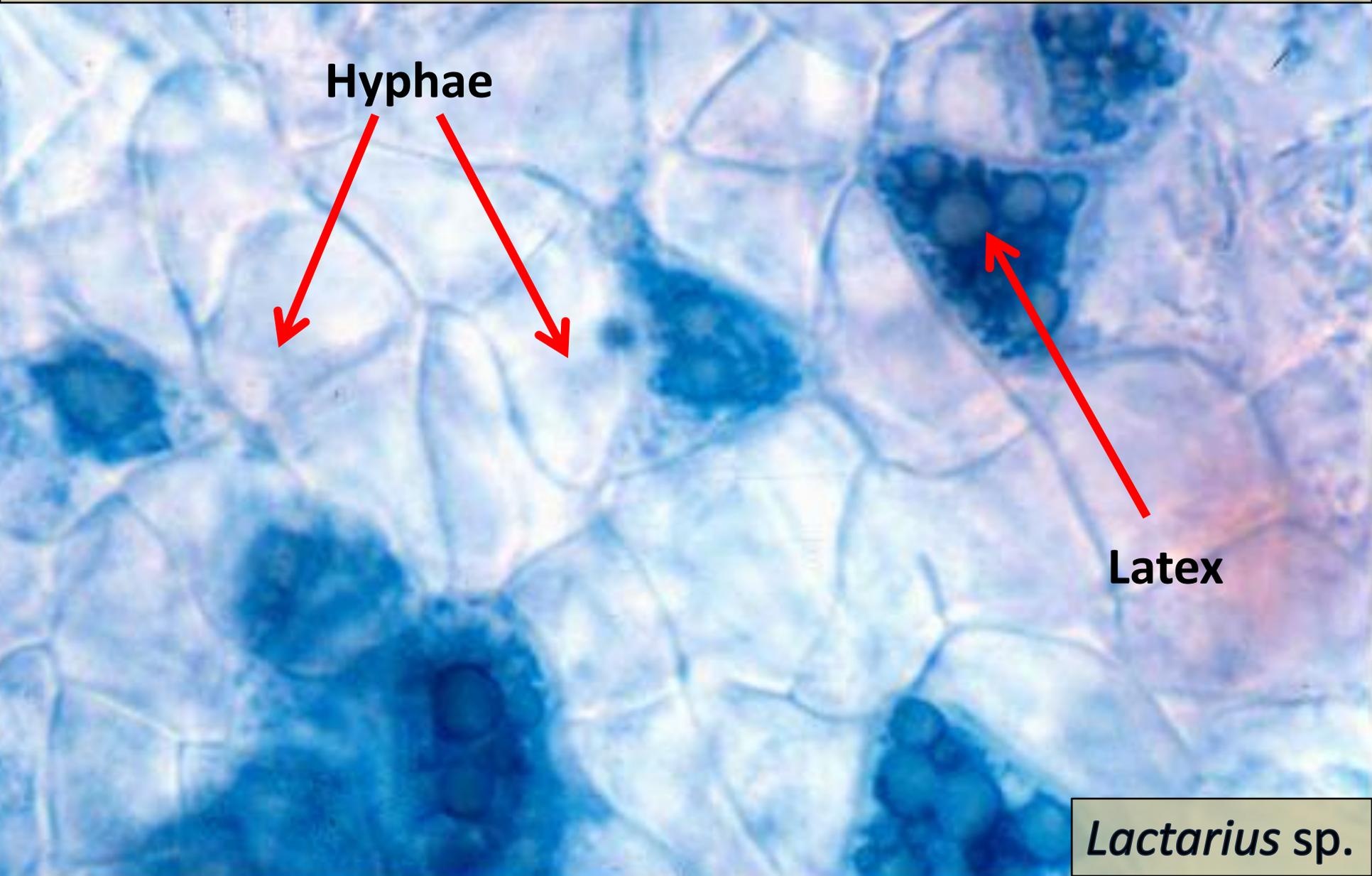
Highly melanised – melanin prevents decomposition

Other fungi showed  
intermediate decomposition



*Russula emitica*

Some fungi contain secondary metabolites (e.g. sesquiterpenes, latex, etc...) that may delay decomposition



**Hyphae**

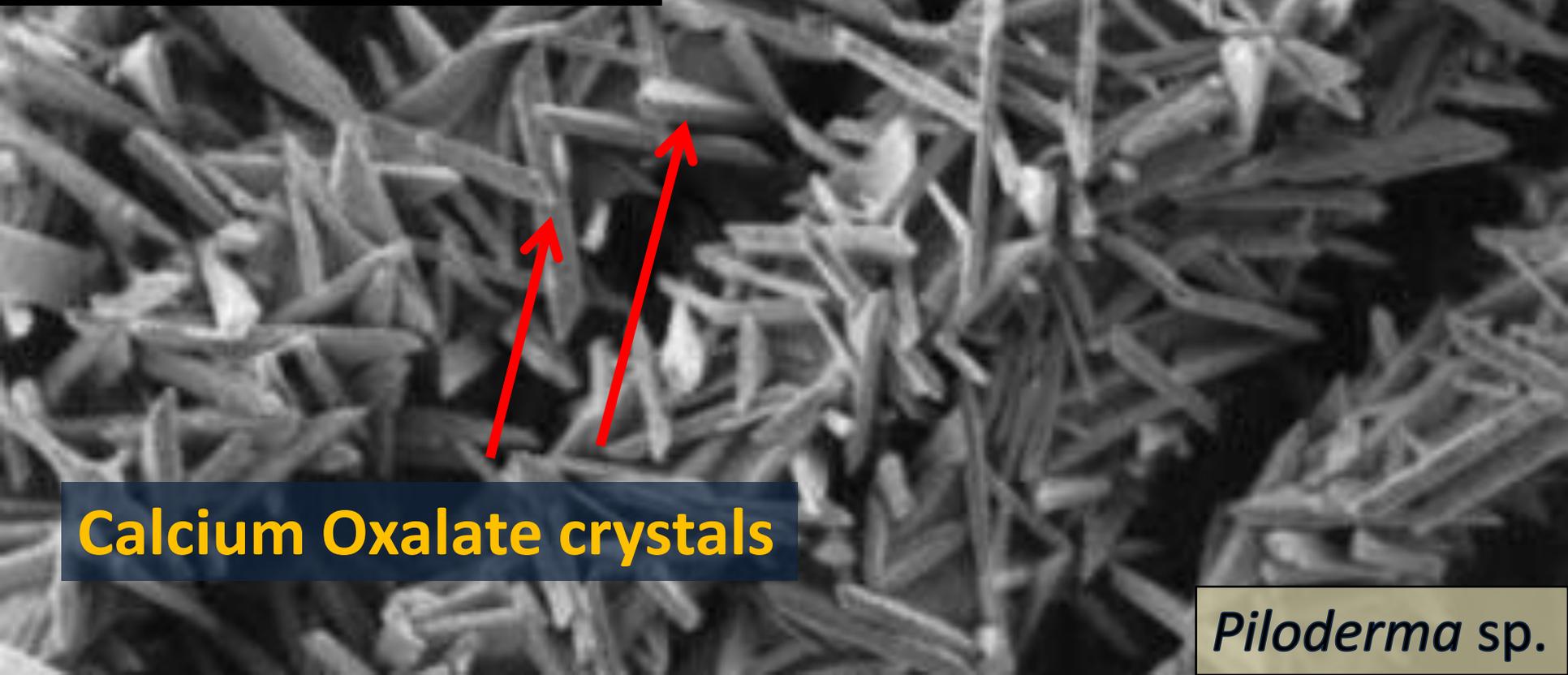
**Latex**

*Lactarius* sp.



[www.mushroomobserver.org](http://www.mushroomobserver.org)

Anti feedant crystals



Calcium Oxalate crystals

*Piloderma* sp.

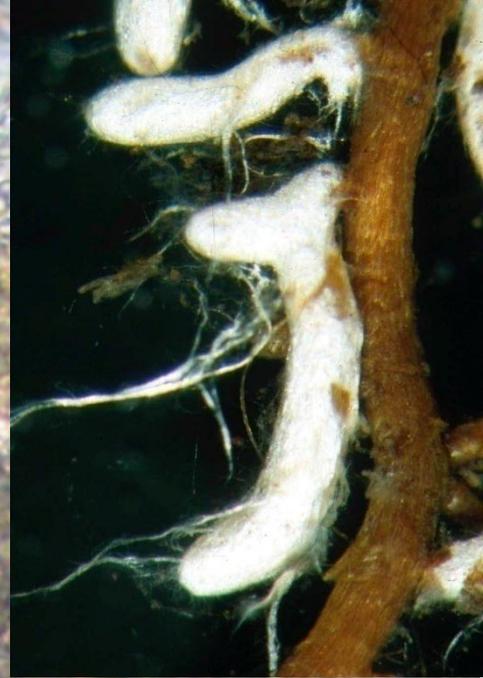
Some ectomycorrhizal fungi decomposed quickly



Deadly to mammals,  
but wimpy to  
microbes / inverts

*Amanita virosa*

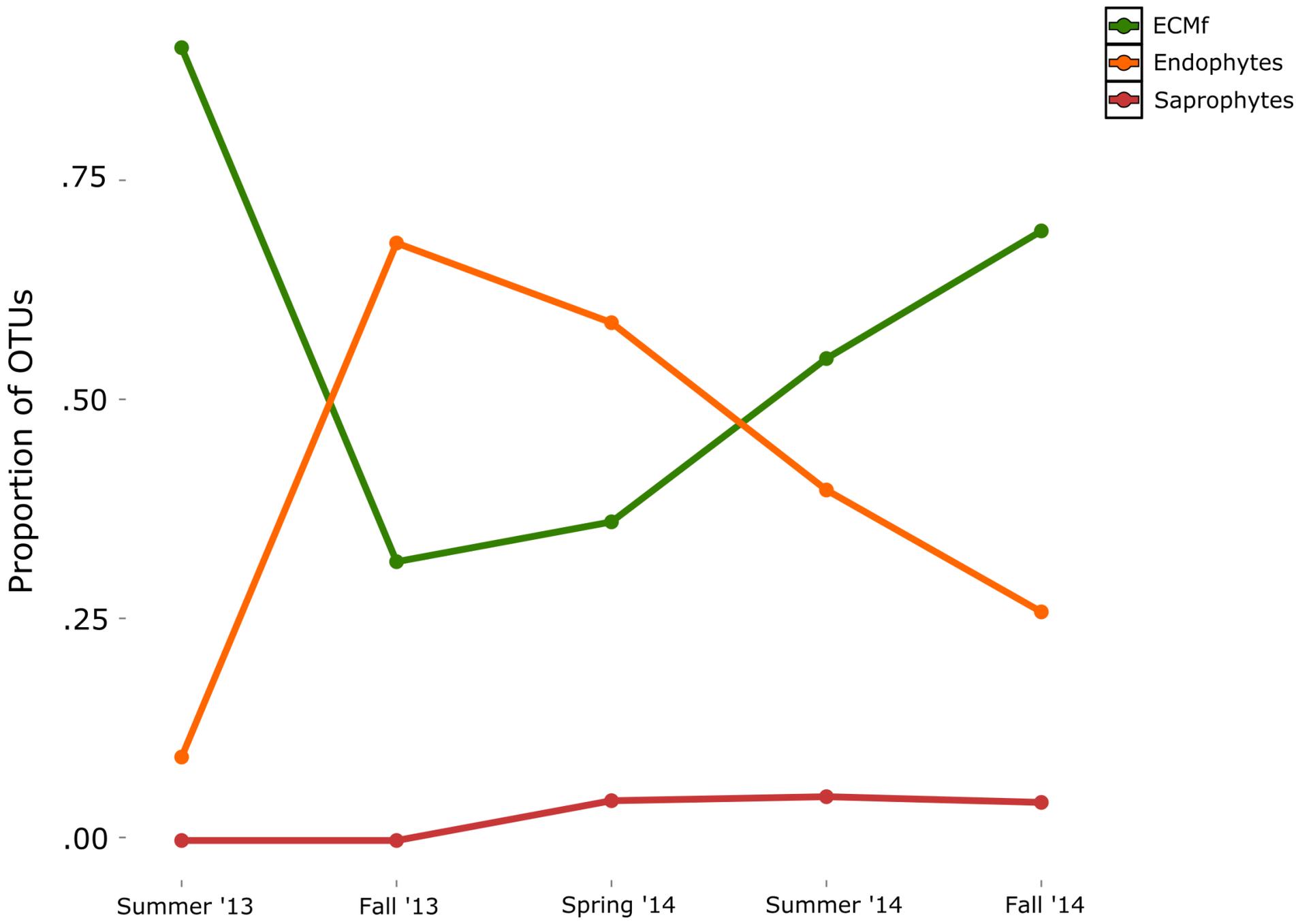
hyphae



*Amanita* sp.

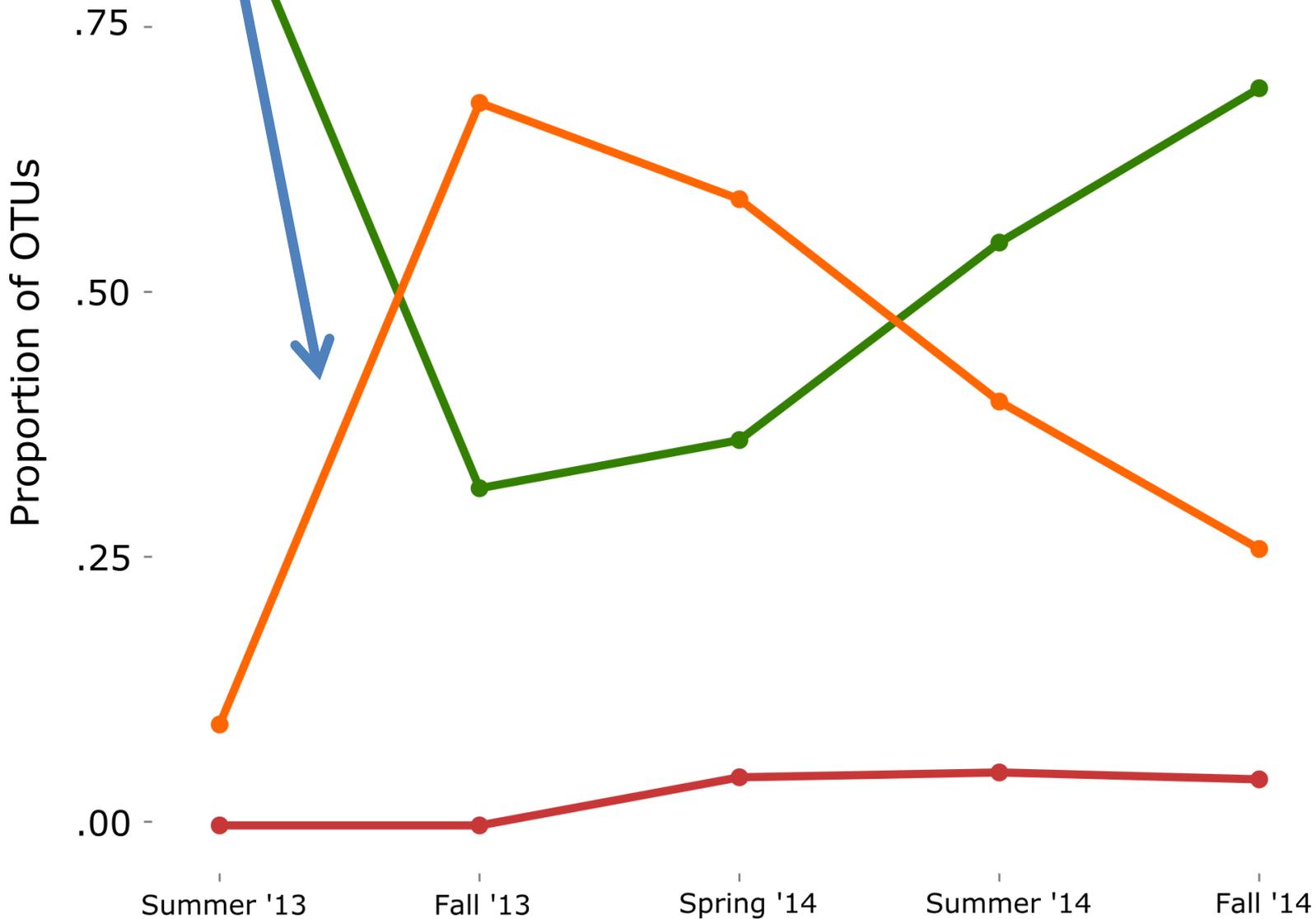
# What the data show us

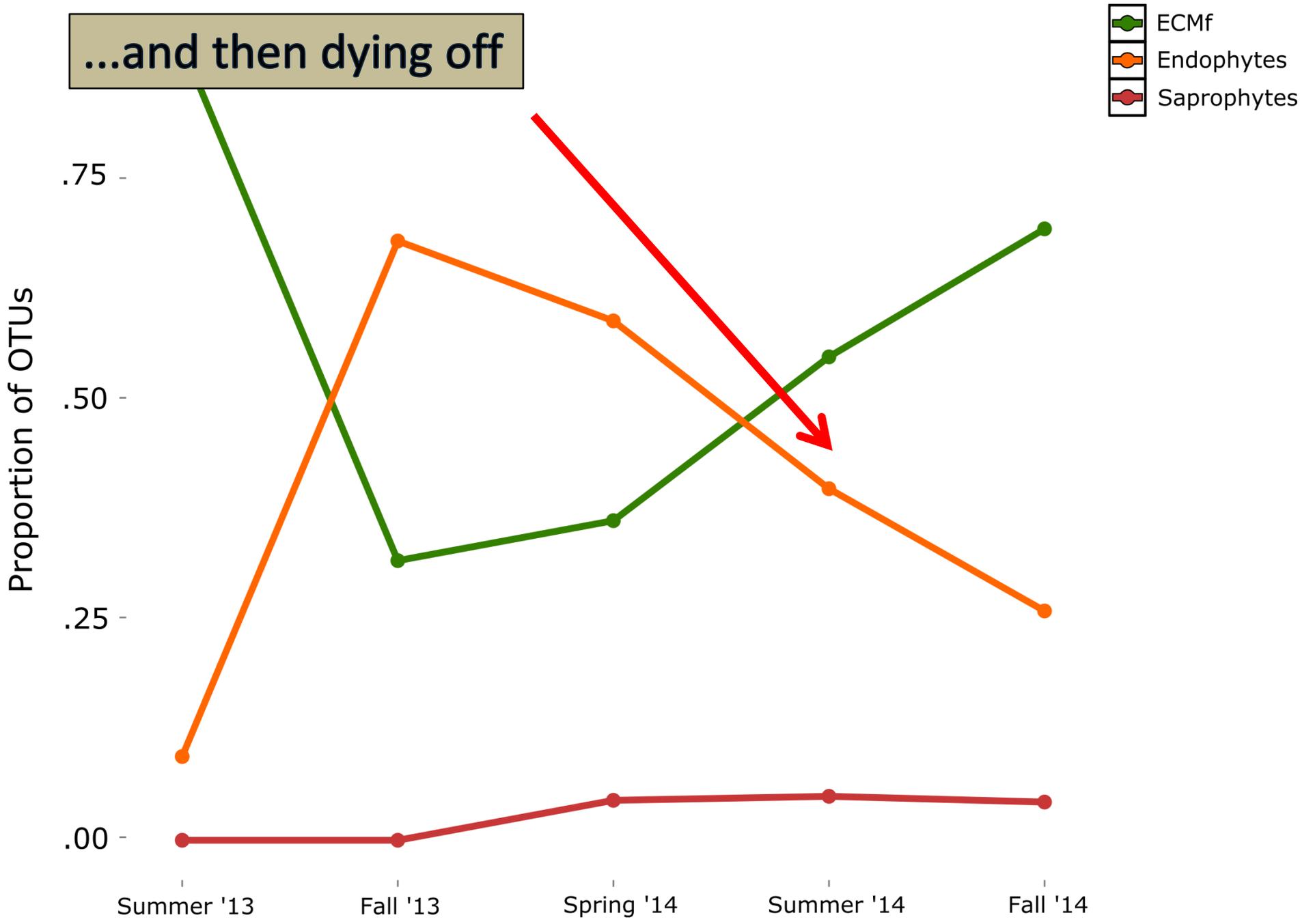
- Ectomycorrhizal Fungi
  - some decompose slower than others
- Endophytes
  - show initial increase in abundance



**We think they're eating labile compounds...**

- ECMf
- Endophytes
- Saprophytes





# What the data show us

- **Ectomycorrhizal Fungi**
  - some decompose slower than others
- **Endophytes**
  - show initial increase in abundance
- **Saprotrophs**
  - almost non-existent for the first 16 months

We thought these fungi would appear quickly...



*Trametes* sp.

...but they were slow to mobilize



*Polyporus squamosus*

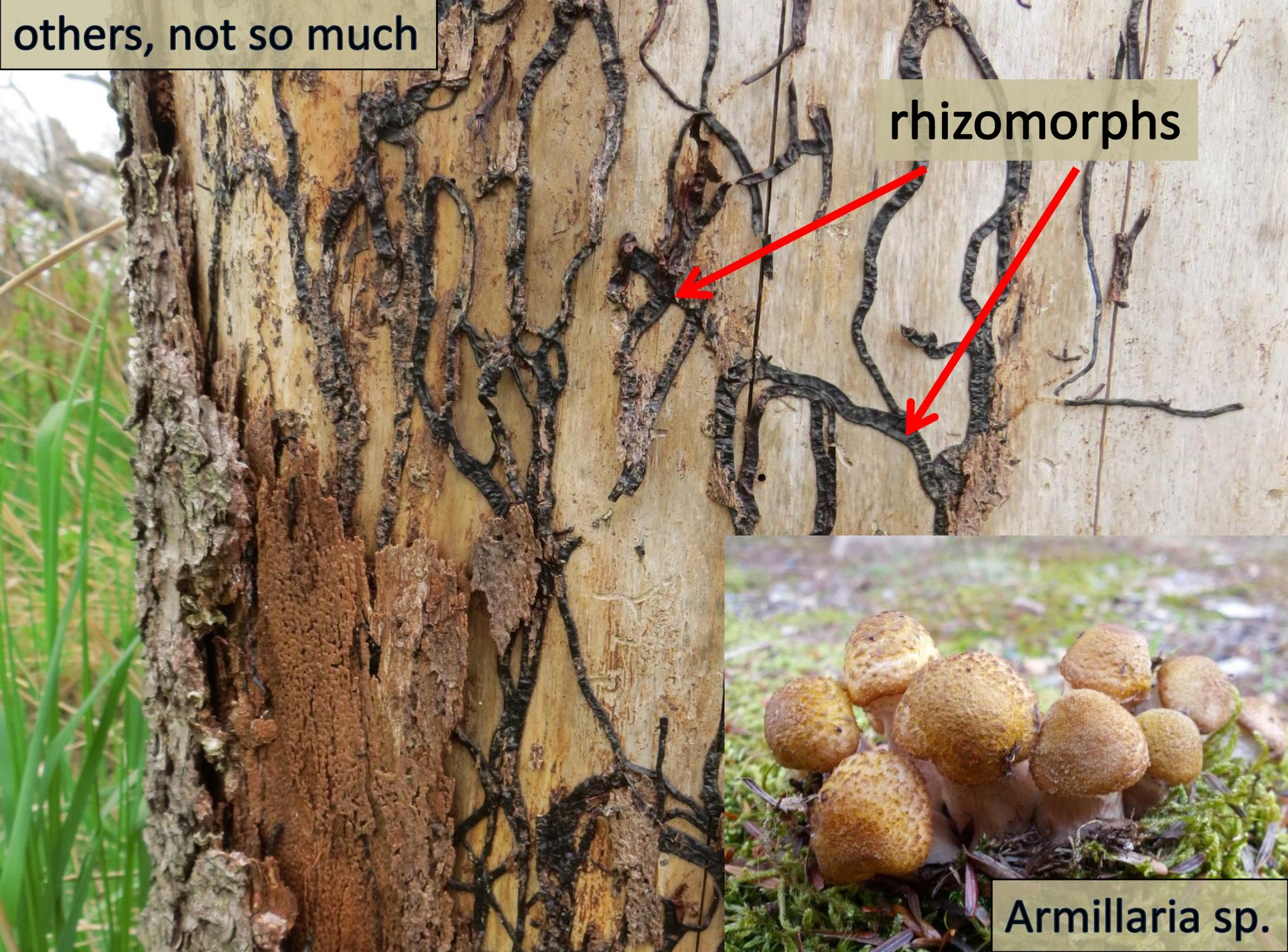
I included them because some are very pretty



*Laetiporus sulphureus*

others, not so much

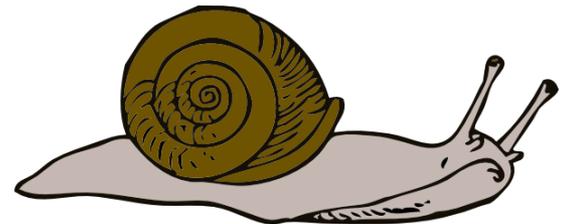
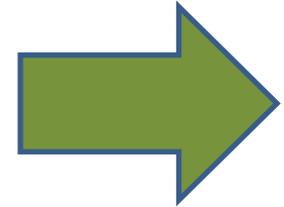
rhizomorphs



Armillaria sp.

# Summary of findings

- **Ectomycorrhizal** fungi
  - vary in decomposition rate
  - *C. geophilum* is tough
- **Endophytes** experience “bump”
  - may be eating former host
- **Saprotrophs** are slow
  - didn’t show up in large numbers



A close-up photograph of a mushroom cap, showing the intricate, parallel ridges of the gills. The gills are a light tan color, with some darker, reddish-brown spots. The background is a soft, out-of-focus green, suggesting a natural outdoor setting. A semi-transparent white rectangular box is centered over the middle of the image, containing the text "Thank you for listening" in a bold, black, sans-serif font.

**Thank you for listening**