

Effect of brush mastication and prescribed fire
on mycorrhizas and hypogeous fungi
in mixed hardwood chaparral

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Whiskeytown National Recreation Area

dense, fire-prone chaparral

1. Brush mastication reduces ladder fuels, but leaves a dense layer of chipped debris.
2. Burning debris heats the soil hotter than with ladder fuels.
3. Upper layers of soil contain roots of woody plants that form mycorrhizas, symbiotic associations of fungi and roots.
4. Many mycorrhizal fungi are hypogeous, producing fruiting bodies below ground.

Questions at WNRA

What will be the effects of
brush mastication + burning on:

- **mycorrhizal species** richness and communities?
- **hypogeous fungal fruiting bodies** — species richness and abundance?

Whiskeytown National Recreation Area





Brush Mastication Research Project

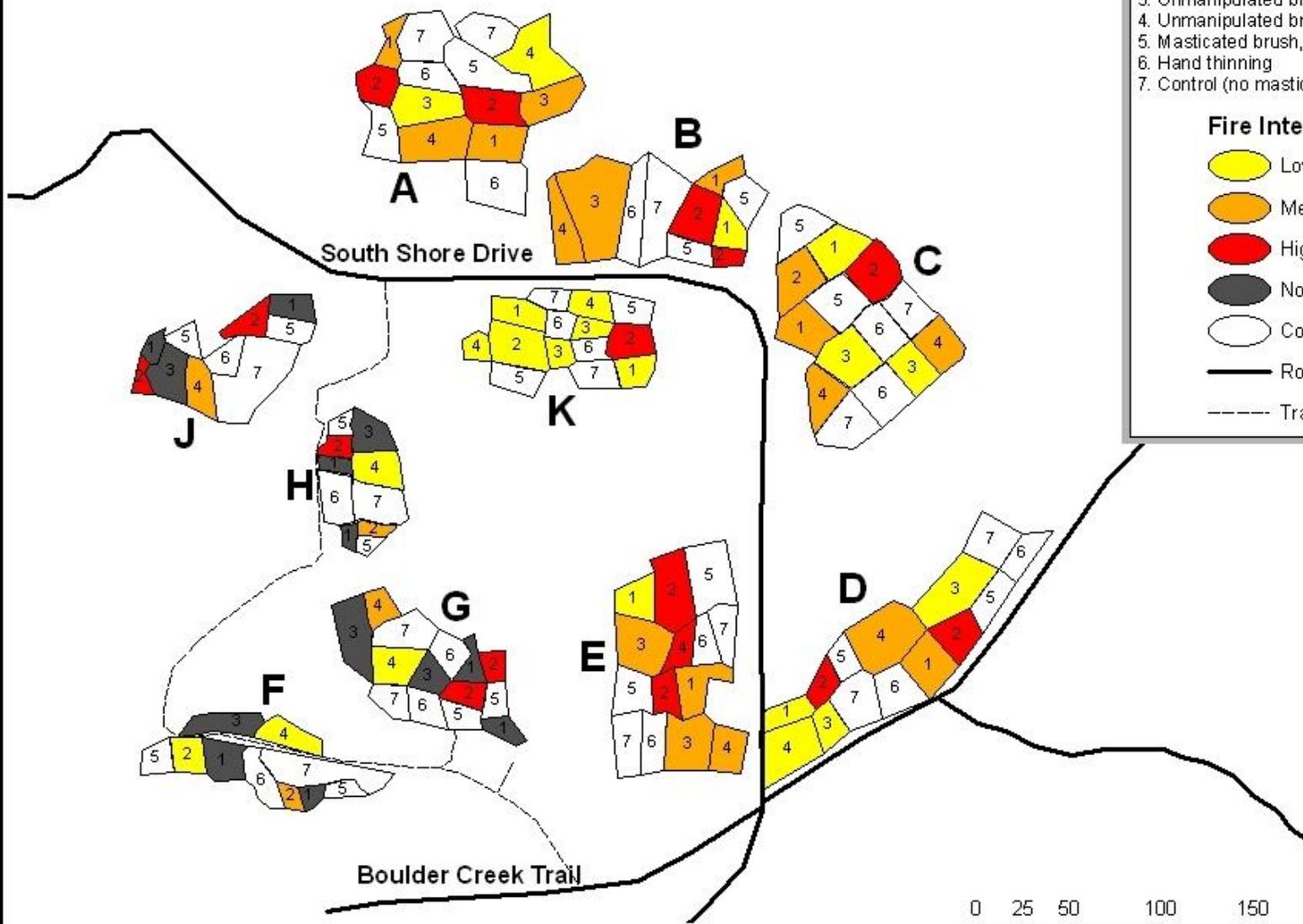
TREATMENTS:

1. Masticated brush burned in the fall
2. Masticated brush burned in the spring
3. Unmanipulated brush burned in the fall
4. Unmanipulated brush burned in the spring
5. Masticated brush, no burn
6. Hand thinning
7. Control (no mastication, burning, or thinning)

Fire Intensity

- Low (<60 C)
- Medium (60-300 C)
- High (>300 C)
- Not Treated
- Control

— Roads
- - - Trails



Methods

Brush masticated 2003 (low-ground pressure, rubber-track brush masticator).

Burned 5 months later in spring 2004.

Sampling of roots and mycorrhizas: 2006 and 2007. Soil corer, cores divided into upper (0-10 cm) and lower (10-20 cm) samples.

Mycorrhizas sorted, described microscopically; DNA sequenced.

Hypogeous fungi: Litter raked away; soil loosened to expose fungal fruiting bodies; identified, DNA sequenced.







INCHES

LIVING CULTURES

CAROLINA

PRESERVED MATERIALS

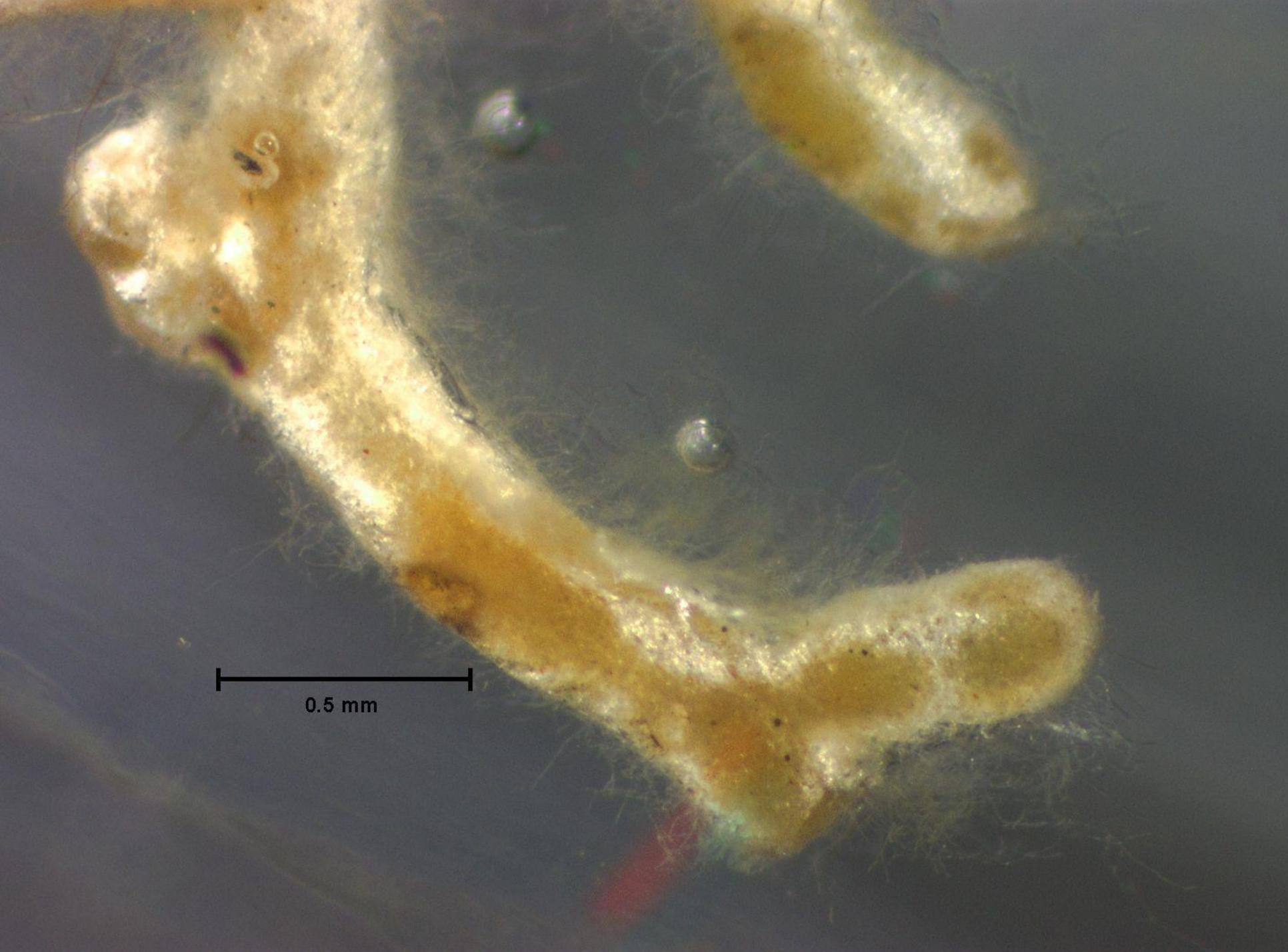
METRIC

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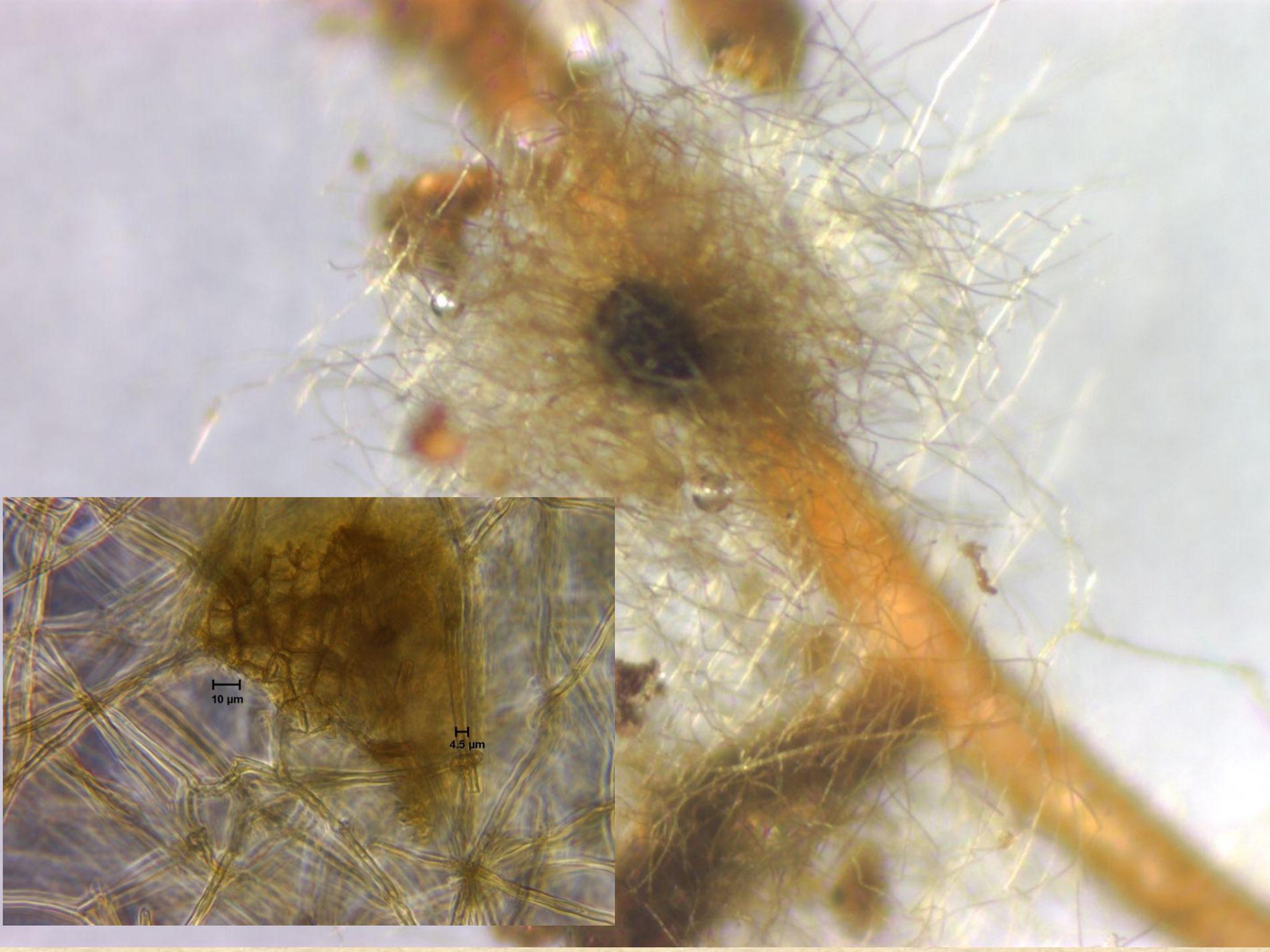
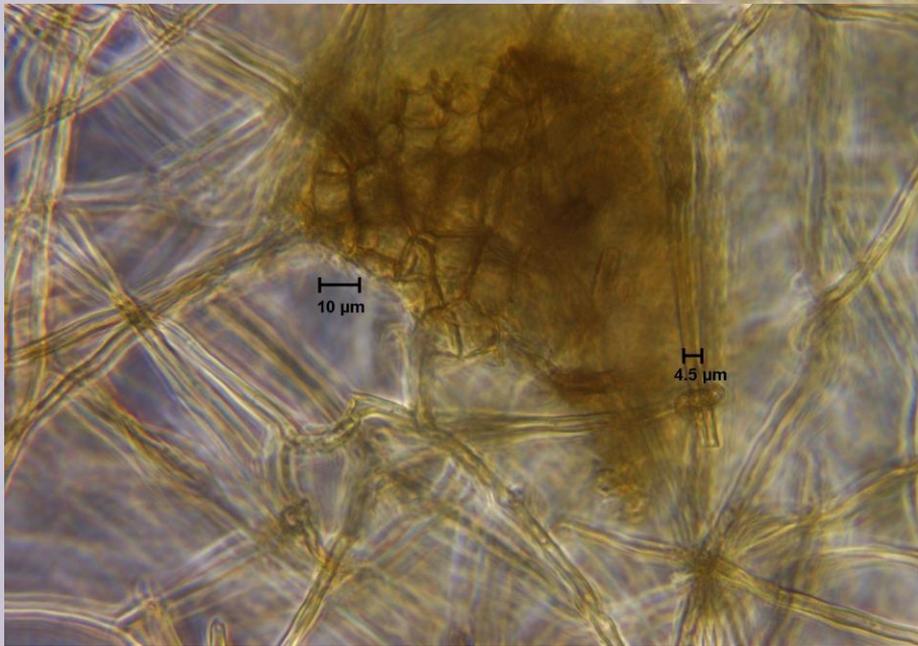


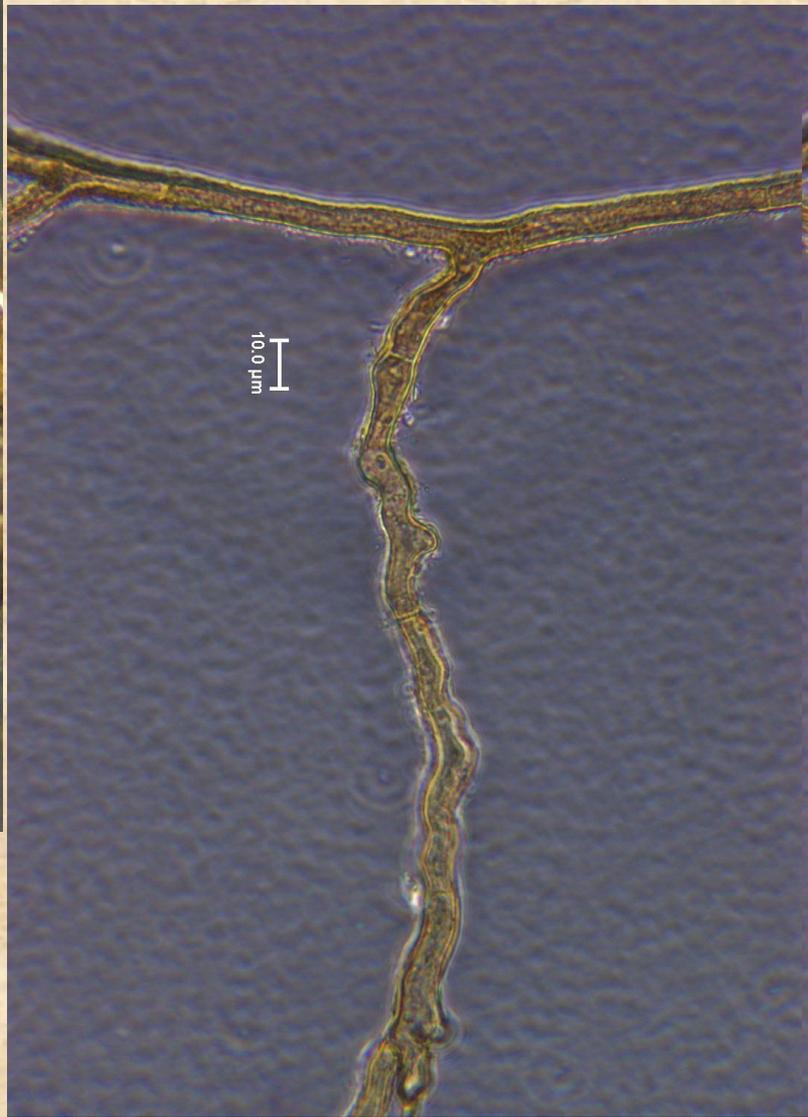


Morphotyping:
describing ectomycorrhizal
fungi by morphological
characters.



0.5 mm

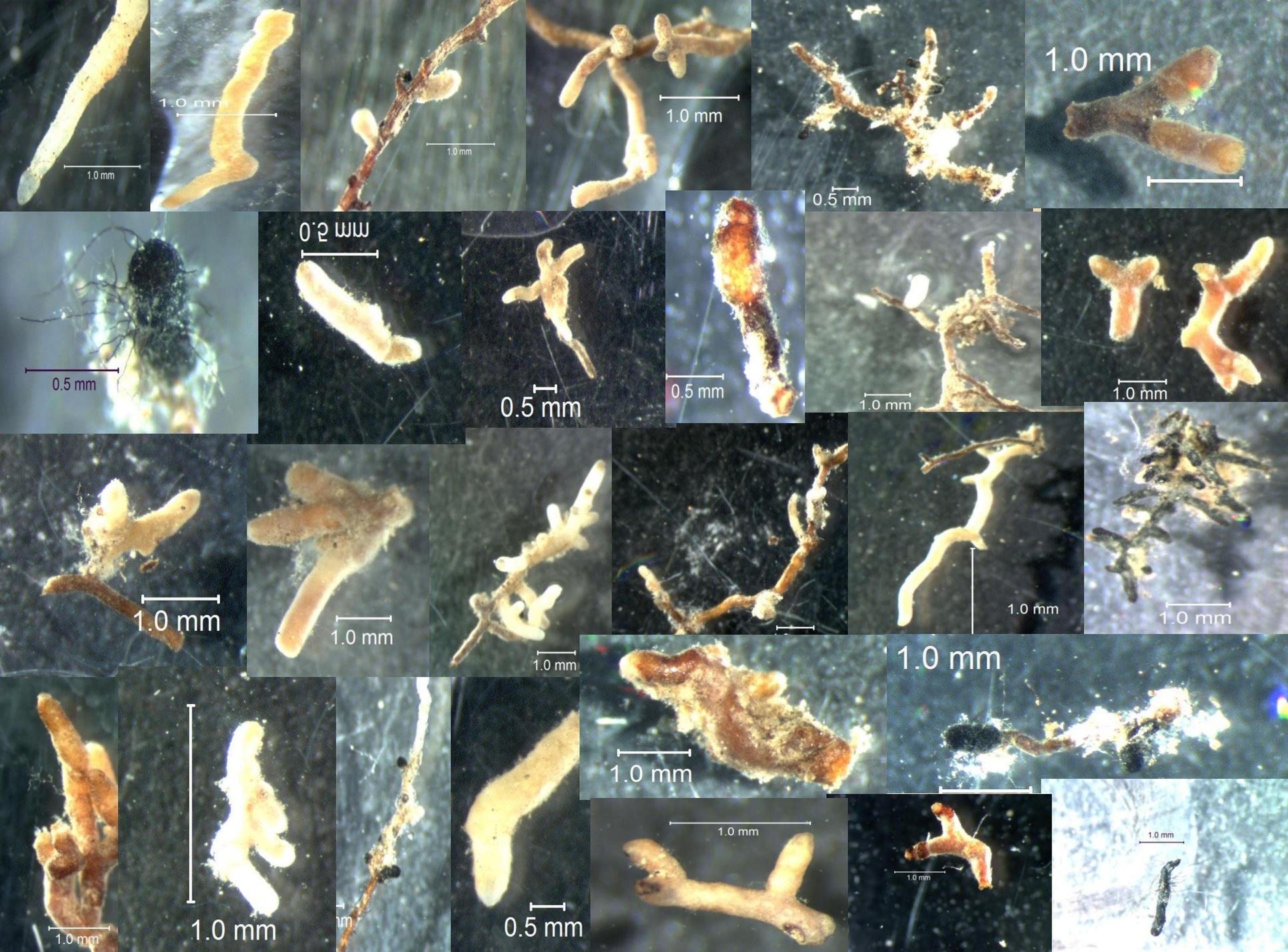




Molecular methods to identify mycorrhizas

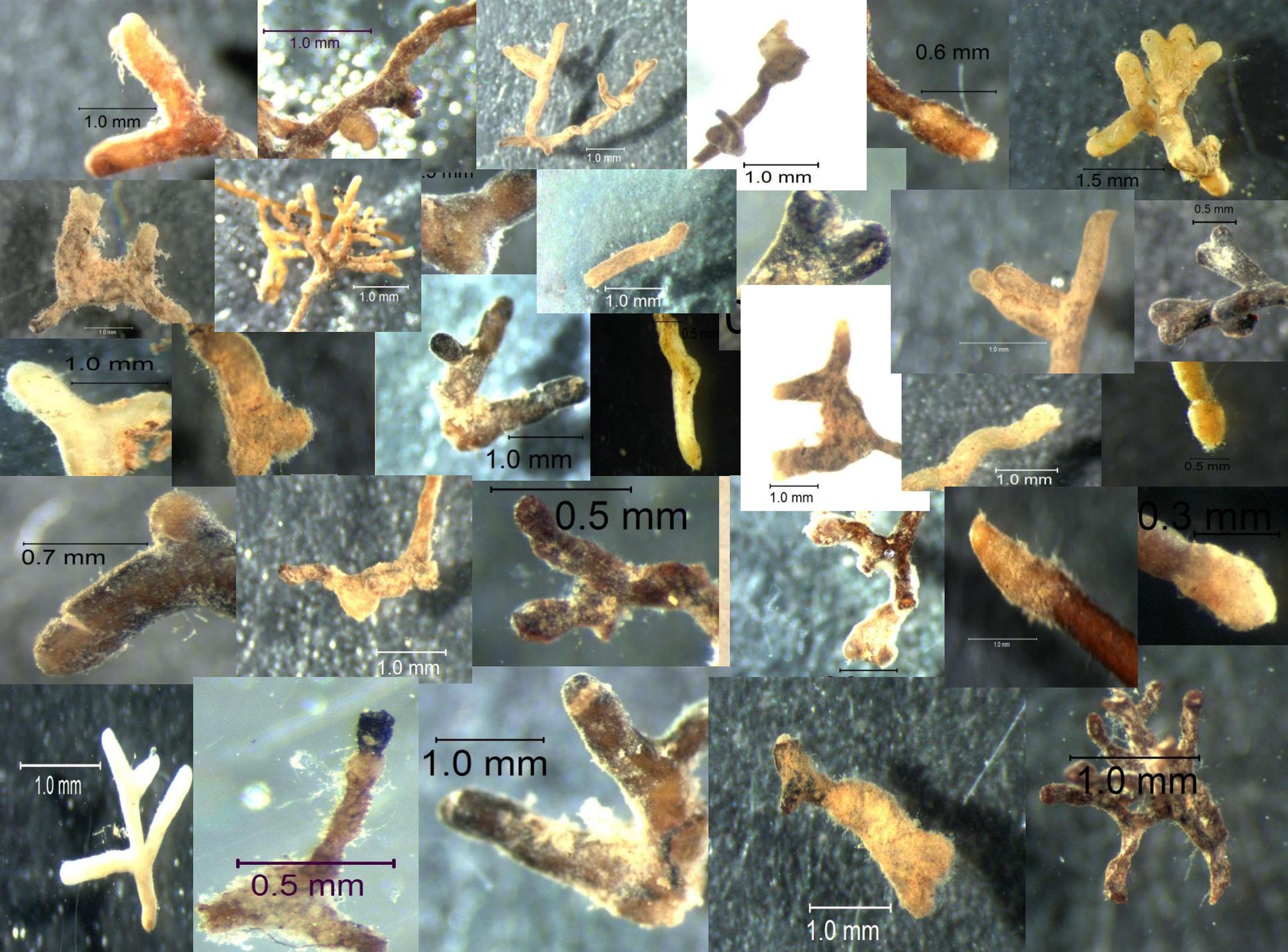
1. Extract DNA
2. Copy short piece of DNA
3. Sequence
4. Compare to online database of known mushrooms



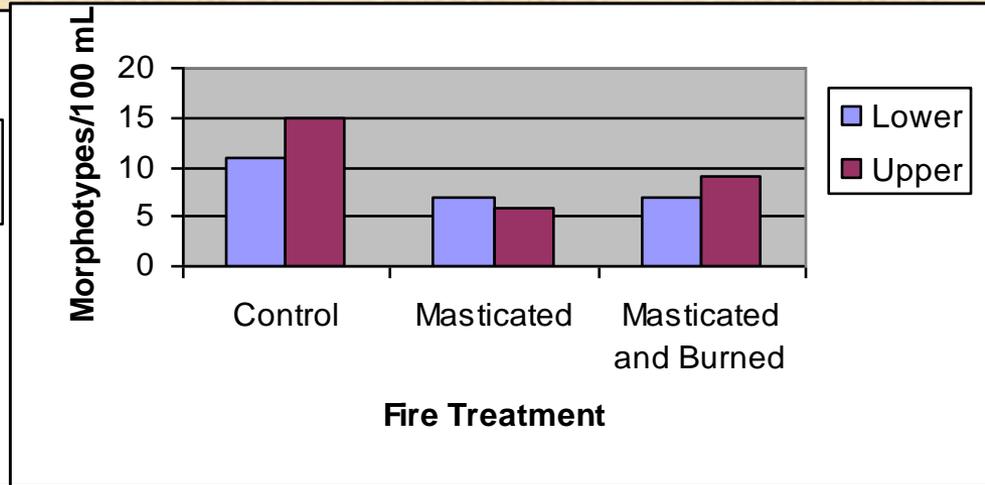
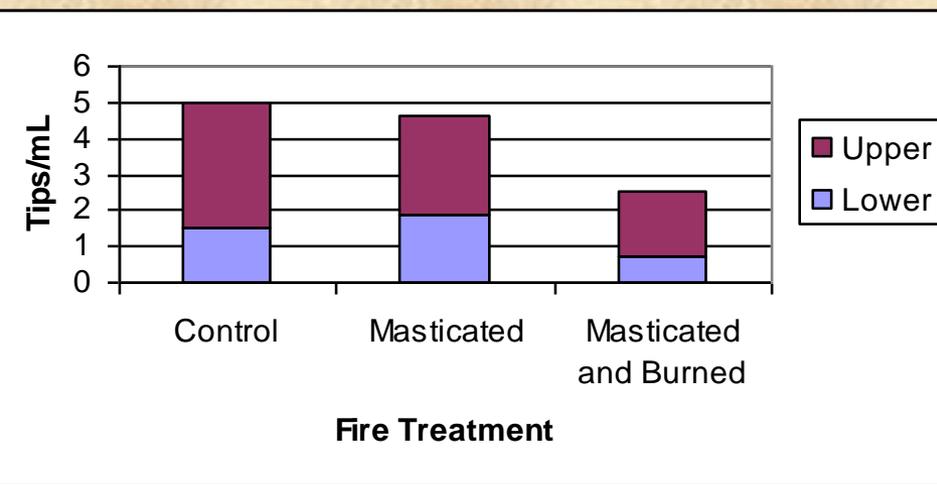












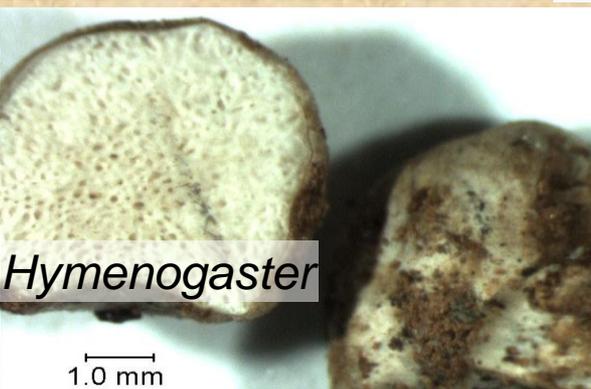
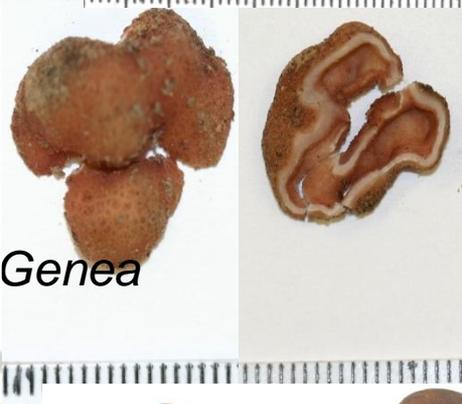
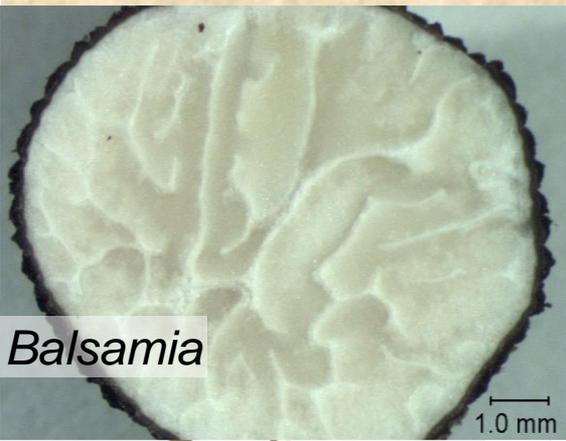
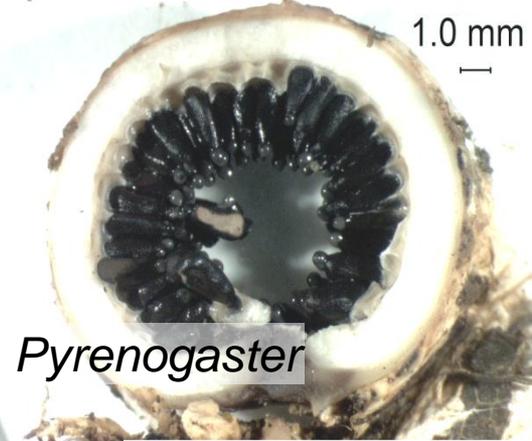
- Mycorrhizas slightly more abundant in control plots
- Ratio of tips (upper to lower layers) in masticated plots differed from control and burned plots.

- Mycorrhizal diversity greatest in control plots, followed by masticated-burned plots, least in masticated plots.
- Upper and lower soil layers did not differ in mycorrhizal diversity.
- Controls differed from treated plots.
- Masticated plots, unburned or burned, did not differ from one another.

Tuber candidum



Hypogeous fungi associated with fuel reduction treatments



Preliminary conclusions

Mycorrhizas:

- Species richness decreased following mastication, and remained low following burning.
- Abundance did not vary among treatments.
- Species occurred in overlapping sets on untreated, masticated, and masticated-burned plots, with greatest species richness on untreated plots.

Preliminary conclusions

Hypogeous fungi:

- Species richness increased following mastication, but decreased with burning of masticated debris.
- Fruiting bodies differed on masticated, and masticated-burned, and untreated plots, with greatest species richness on masticated plots.

Real take-home lessons

- What matters to the fungi is the health of the host trees.
- Neither fire nor brush mastication is immediately fatal to fungi.
- Patchiness promotes survival of fungi.
- Brush mastication + burning may not lead to fuel reduction.

Acknowledgements

Research funded by

- Joint Fire Science Program 05-2-1-87
(Department of Interior)
- National Science Foundation Grant DEB 0516229