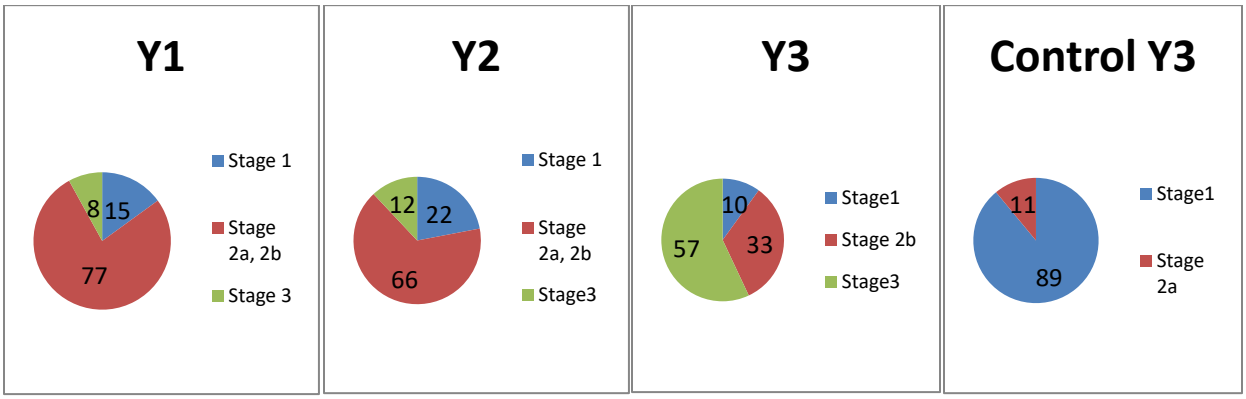
CUSP Fungal Degradation Investigation: report for FRRT, 2017

In late 2014 CUSP began investigating native wood rotting mushrooms by collecting wild strains and culturing them on woodchip media and wood chips. This investigation is being conducted to study the possibilities that the techniques of myco-remediation offer promise as a tool for forest management practitioners. Now in its third year, the results show a marked degradation of one of the most resilient molecules in the forest: cellulose.

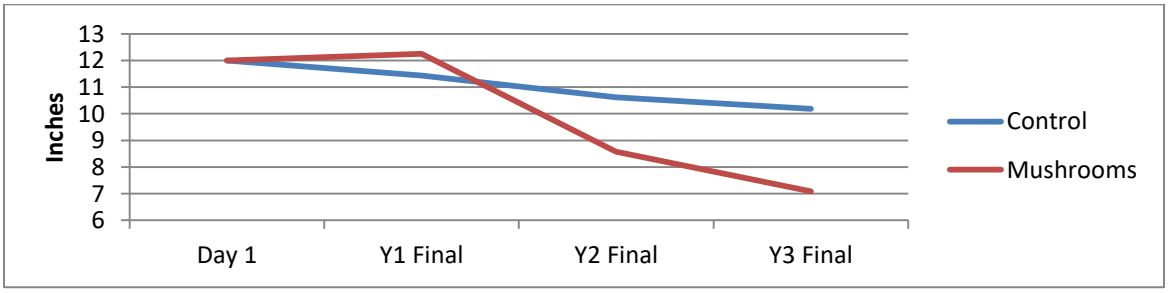
The plots are located in the wild and monitored monthly. This investigation seeks to create a baseline guide for these types of treatments and to document the rates of inoculation, rates of spread, and efficiency of degradation over time.

For the purposes of this project, chips are defined into 4 stages: 1) raw wood chips. 2) Chips involved with mycelium in an initial and a mature stage (2a, 2b). 3) Compost. 4) Post-compost- which is a polymer-like, highly plastic form created by subsequent bacterial and insect decay of the compost. Currently, Stage 4 represents <1% of the test beds and is not included in the following charts.

Conversion rates of wood chips into compost by volume, by season (measured at seasons end):



Wood chip Bed depth



Decomposition occurs below the moisture horizon. Incomplete data exists on moisture horizon depth in mushroom vs. control and this is data we will be collecting in the new test site inoculated on Sept. 30, 2017. However, data indicates that moisture content below the horizon varies greatly, with mushroom infected chips holding over 59% moisture (on avg), compared to 38% for raw wood chips. This suggests that mushroom piles would have greater resistance to ignition than a similar wood chip pile, but this is an area for further investigation.

Nutrient Composition of the Compost:

Mushroom respiration is similar to animals in that O2 is inhaled and CO2 is exhaled. This converts a substantial amount of the carbon in the cellulose into atmospheric CO2. This leads to the characterization of fungal enzymatic decay as: “cold fire”. Where this process differs greatly from fire is that fire will destroy nearly all organic nitrogen when it de-constructs the wood. Oyster mushrooms (Pleurotus sp.) fortify organic Nitrogen both through symbiosis with Nitrogen fixing bacteria, and also by predation of nematodes which they capture and digest when nitrogen is scarce.

Our compost shows a five-fold decrease in the carbon to nitrogen ratio(C:N) from the parent material; from 169:1, to 34:1. This is a useable ratio for plant uptake, and they will be the end benefactors of this nutrient cycle. Not only does this process increase available Nitrogen to the forest floor, it increases the availability of phosphorus (2.7X) and potassium (2.9X); the other 2 macro nutrients required for plant growth. The pH of the finished material in neutral (pH 7.01).This is compared to pH5 to pH4 for natural forest litter compost. This indicates increased bio availability of nutrients; Phosphates and micro nutrients in particular.

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Raw woodchips on top of Stage 2 chips.

Stage 3 woodchips (Compost)

Cooperating Partners:

Coalition for the Upper South Platte
Denver Mountain Parks
Denver Botanic Gardens- Sam Mitchell Herbarium of Fungi

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