Introduction

In boreal and temperate forest soil, the main decomposers are the microorganisms that include both fungi and bacteria (Berg 2006). The decomposable components or compounds can be grouped into five categories:1) water soluble, 2) ethanol soluble, 3) cellulose, 4) hemicelluloses and 5) the lignin. Which the group three four and five is the main polymers in plant fiber (Berg 2006). The Nitrogen repression of lignin degradation is common but not always the rule (Berg 2006). Due to quite some numbers of studies about Nitrogen concentration effect on individual microbes has been well studied in the past, studying and identifying the microbes might help us understand more about the variation of decomposing rate we get. The element Manganese is essential for the activity of Mn-peroxidase, (a lignin degrading enzymes with Mn as part of the functioning enzyme) and high Mn level improves the lignin decomposition (Perez 1992\*). Decomposition variation is usually high in forest soil (Keane R. E. 2008; Jurgensen M. 2004). Some studies done in the tropical suggested decay rates of three dominant species were independent of forest age (Xuluc Tolosa and others 2003). I propose to measure the cellulose decomposition rate in two months and the lignin decomposition rate in at least a year.

Hypothesis for:

**Summer Project**

I hypothesize that the cellulose decomposition rate would be higher when concentration of Nitrogen is higher in the microenvironment of the cellulose. Therefore I expect to see significantly higher decomposition in N and N+P fertilized stands in two months period independent of age of 20 and above forest.

**Lignin decomposition Project**

I hypothesize that the lignin decomposition rate would be higher when concentration of Nitrogen is higher in the microenvironment of the cellulose. Therefore I expect to see significantly higher decomposition in N and N+P fertilized stands in two months period independent of age of 20 and above forest.

(Both me and Craig will be working on this project)

Methods **(summer project)**

I want to bury bags of filter paper in each plot in young and old forest stand and compare the weight lost over 2 months period.

I would choose C1 and C2 stands representing young stands and C8 and C9 representing old stands. Nylon bag should be fine to use because it’s easy to seal and 50 micron mesh of nylon is available in the lab. Nylon contains Nitrogen but it should be fine for the two months study of filter paper decomposition. Some studies were done using fiberglass bag of pore size about 2mm instead (Keane R. E. 2008). Twenty bags of filter paper should be buried systematically (whichever that is convenient while other experiment is going on at the same time.) in each plot. The bags should be buried vertically just so it can be in contact with higher Mn concentration soil layer (middle of OA layer). All the bags will be retrieved after two months. The weight (g), dry weight (g), corrected weight (g) and concentrations of Phosphorus and Nitrogen (µg/g) in the filter paper will be measured. The equipment needed involve appropriate scale (measure weight to 0.001g), oven 105°C, oven 450°C, elemental analyzer (for Nitrogen) and ICP-MS (for phosphorus).

Effort made to decrease variation in the result:

1. Burying bags in a vertical direction: just so to make sure it contacts with high Mn element soil layer.
2. Sample size of 20 in each plot (more than what Dan Binkley did, he did 15).
3. Correction for weight loss: to minimize error caused by the unwanted soil while retrieving the bag.
4. Smaller mesh size (smaller than Dan Binkley experiment, he used 1mm).

Methods **(lignin decomposition project)**

Ten pop sticks per locations, ten locations per plot will be systematically buried in 2 stands (Well depends on how many available labor we have 4 would be the best to compare the young and old stand). 10 pop sticks will be pre label by have a labeled flag which the iron wire part hook into a drilled hole in each of the ten pop sticks. Then stick all ten pop sticks vertically into the soil which the top of the will have the iron wire in a circle and a flag on the surface.

Retrieve the pop sticks in at least a year period. Then we can measure the weight lost, through measuring dry weight and calculate the loss on ignition for corrected weight.

Effort made to decrease variation in the result:

1. Really huge sample.

Description of nylon can be found in the following website under PA, polyamide:

<http://www.parmaplast.no/gml/uk/technical/PPmatr.htm#PA,%20Polyamid%20(Nylon)>

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Citation

Berg, B., & Laskowski R. (2006). Advances in Ecological Research Volume 38: Litter decomposition: A guide to carbon and nutrient turnover. San Diego: Elseview Academic Press.

Perez, J., & Jeffries, T. W. (1992). Roles of manganese and organic acid chelators in regulating lignin degradation and biosynthesis of peroxidases by *Phanerochaete chrysosporium*. *Appl. Environ. Microbiol., 58,* 2402-2409.

More citation will be done soon. :p