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July 2015

**Decomposition of Tea Bags**

**Introduction**

Litter decomposition analysis is an important factor in the grand puzzle that is forest ecological systems research. Whether it is looking at nutrient flux and cycle processes or soil quality, the decomposition question is prevalent throughout. Typically, research methods focus on native litter artificially transplanted and manipulated to determine trends or discrepancies. Some studies have attempted to use non- native litter such as paper or processed wood to eliminate the variables associated with native litter. As with any method, there are tradeoffs to using one or the other.

Recently, a new method of standardizing the measurement of decomposition rates emerged for use on a global scale with a simple analysis that does not require much equipment or training. Called the Tea Bag Index (TBI), this method introduces a way for previously complex data to be collected by nearly anyone anywhere in the world in a consistent manner, which opens the door for easier meta- analysis down the road (Keuskamp et. al., 2013). The use of TBI for the MELNHE project provides opportunities for consistent, repeatable, modifiable, and cheap examinations of decomposition rates on the forest floor. This investigation will utilize the preliminary stages of the TBI protocol to identify nutrient- related trends in decomposition and establish a standard by which decomposition experiments may be easily repeated and expanded for further use.

**Objective**

I will aim to utilize a modified method of the Tea Bag Index protocol developed by Keuskamp et al. (2013) to ask two questions about litter decomposition in the Bartlett Experimental Forest:

1. Will the use of tea as litter be sufficient in identifying short- term trends in decomposition in the hardwood forests, and
2. Will there be a noticeable difference in decomposition rates over nutrient applied plots and/or different aged plots?

**Hypothesis**

Evidence of co- limitation will be found in the comparative rates of decomposition in nitrogen and phosphorus treated plots, with a strong correlation between one of the individual treatments (nitrogen or phosphorus) and the combined treatment (nitrogen and phosphorus). The results of this correlation will then provide insight into how decomposition processes are co- limited: by nitrogen, or phosphorus?

**Methods**

Rather than strictly follow the final TBI protocol, I will replicate their lab trail in the field using green tea exclusively, and not of the same brand. A sample set of tea will be measured using the soak method defined below to establish a starting point from which to measure decomposition rates. I will also measure the mesh size of a small sample of the bags for reference and comparison later. In the field, before burial, I will soak the tea to saturation to standardize the effects of moisture (or lack thereof) on the bags for 30 seconds.

Processing of the tea bags after collection will consist of a low- temperature oven drying and a brief cleaning process (removal of external litter and soil attached to the nylon, etc.) before taking a final mass of each. Results will consist of these masses entered into a spreadsheet and organized by stand and treatment, to generate graphs based on mass loss over time. From there, decisions on repetition and future changes can be made.

The burial locations will be sequential within nitrogen (N), phosphorus (P), nitrogen plus phosphorus (NP), Calcium (Ca), and control (Con) plots in a young, mature, and old growth MELNHE stand (experimental designations C1, C6, and C8, respectively), all in the OE soil horizon. All of the tea bags will be placed into the soil on the same date. Collections will occur at one week, two weeks, four weeks, and 16 weeks. The bags will be placed in groups of four, one tea bag per collection event, at each of the four corners of each treatment plot, approximately 0.5 to 0.75 meters from the corner post.

**Predictions**

I expect the mass loss over all tea bags to be rapid over the short term collections, with subsequent stabilization and little change occurring over the long term collections. This prediction is based on the results of Keuskamp et. al., despite the use of a different brand of tea than described in the TBI protocol. The effects of nutrient treatments on decomposition will be most evident in N treated plots compared to control (Magill & Aber, 1998). It is unknown how Ca treatments will effect decomposition; however, I believe it will not differ much from the control.

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