Soil carbon pools are much larger than most other carbon pools on the planet. Fine root turnover represents the most significant mode of carbon flux from plants into these pools, outstripping the role of leaves and other aboveground litter. In addition to the large scale at which fine roots are contributing to soil carbon pools, there is experimental evidence that carbon derived from dead root biomass is more likely to remain in soil carbon pools than carbon derived from aboveground litter such as that from leaves. Unfortunately, fine root senescence, a critical component of belowground biology is particularly understudied. The control of senescence in fine roots, and the fate of elements and organic molecules they contain during root death, still remains largely unknown. In addition to its contribution to basic biological understanding, better understanding fine root senescence should reduce uncertainty associated with global climate models; including re-uptake of materials in dying leaves into these models has already been shown to increase their accuracy. It is very likely that including the consequences of root senescence will have similar benefits to the accuracy of these models.

We are using experimental manipulations to impose fine root senescence in *Pinus taeda* in a field setting. These include two girdling manipulations and a third control. Each treatment is applied to 4th order roots and the effects of girdling will be assessed on fine roots distal to the site of manipulation. The signal resulting from these treatments will include changes in anatomy, chemical content, and gene expression through time. The impacts of these treatments on the internal anatomy of fine roots and the loss of stored carbohydrates in the form of starch granules will be examined using classical histological approaches. The abundance and identity of C and N containing compounds will be assessed using laser-ablation GC. Finally we will examine differential gene expression profiles among treatments.

To track fine roots through time and access them for manipulations in the field, we have installed 100 30x30cm plastic “root windows” at a site in coastal SC. These windows were installed in summer 2015 and nearly all have been colonized by P. taeda roots by winter 2016. In January 2016 we conducted girdling trials experiments and in early February we collected the treated roots for sectioning and anatomical analysis. We are performing the full experimental manipulations including all treatments across replicated root windows in early March, 2016.