PROJECT ABSTRACT

Title of proposal: **Evaluating changes in soil carbon cycling in reed canary grass invaded soils subject to elevated atmospheric $CO_2$ and increased soil nitrogen**

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Invasion by reed canary grass (Phalaris arundinacea L.), rising atmospheric CO2 levels, and altered soil nitrogen availability are important factors affecting ecosystems in the Midwestern U.S. The overarching goal of the research proposed here is to increase our understanding of mechanisms controlling C-storage under long-term environmental change. In particular, we ask: why and how does carbon utilization by microorganisms change in the face of elevated CO2, N availability, and invasion by exotic plant species, and what are the potential long term carbon-storage consequences of a shift in microbial community composition or activity in invaded soils?

Our specific objectives are:

Quantify changes in rhizosphere and bulk soil microbial community structure (lipid profile) and function (enzyme activity) in soil dominated by native vegetation, soil invaded by reed canary grass, and soil restored to native vegetation.

Quantify changes in rhizosphere and bulk soil microbial community structure and function under elevated and ambient $CO_2$ and nitrogen concentrations (in controlled greenhouse facility).

Quantify differences in decomposition (litter mass loss, enzyme activity, incorporation into microbial biomass) of invasive and native species litter grown under elevated and ambient $CO_2$ concentrations.

Estimate changes in carbon cycle pools and fluxes (total C, DOC, microbial biomass C) associated with microbial community shifts.

Investigate the rate and degree of incorporation of microbial cell materials (amino sugars) into stable carbon pools under conditions of elevated $CO_2$ and nitrogen availability.

Our chosen site has the following vegetation types: monoculture of reed canary grass, no reed canary grass, and reed canary grass-removal sites. The site is located in Greene Prairie (owned and managed by the University of Wisconsin Arboretum) in Madison, WI, and consists of sedge meadow wetlands that have been increasingly dominated by reed canary grass.

We will use lipid and enzyme activity analyses as well as soil process measures (e.g. litter mass loss, nitrogen mineralization) to examine changes in soil microbial community composition, function, and activities in field and greenhouse soils dominated by invasive versus native vegetation. In the greenhouse experiment, the stable isotope signal from elevated CO2 will be used to trace the flow and fate of carbon within the soil community.

Our results will increase general understanding of the impact of invasive species on soil carbon cycling, and will be used to develop management strategies for reed canary grass. Deliverables include at least one published manuscript, and development of an outreach presentation.