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Dear Paul,
Thank you again for a wonderful visit to our Department at Western last week. As discussed, I have flushed-out some details for proposed sampling of soil fauna (microarthropods) at SPRUCE. I am very excited about this opportunity and this potential collaboration.
Yours sincerely,

Zoë Lindo

Proposal: Soil fauna biodiversity sampling at SPRUCE

Collaborator PI: Dr. Zoë Lindo, Department of Biology, University of Western Ontario, London, Ontario, Canada

Introduction: Belowground (soil) biodiversity is central to ecosystem-level function, multifunctionality and ecosystem services (Bradford et al., 2014; Wagg et al., 2014). As primary and secondary decomposers, the activity of soil fauna is particularly important for soil carbon and nitrogen dynamics. Thus understanding the ecology of belowground biodiversity is an important first step in predicting how ecosystem-level processes will change under future climate scenarios.

How belowground faunal communities will respond to global environmental change scenarios is generally unknown, but it has been shown that warming increases fauna biomass as long as moisture conditions remain favourable (Lindo et al., 2012). My most recent research demonstrates that warming is the primary driver of these shifts in soil fauna communities, with the strongest effect among the smaller-bodied, non-sexually reproducing species leading to a community downsizing (Lindo, in submission). These warming-induced changes in belowground fauna are expected to have cascading effects on microbial populations that are shown to affect rates of decomposition and carbon release (Staddon et al., 2010).

Proposed sampling design: Sampling will be performed for all experimental chambers including ambient plots (Amb + 5 temperatures x 2 CO_2 treatments) for a total of 12 plots. Sampling will be

performed once per year starting in September 2015 using core sampling (5.5 cm diameter, 5 cm depth) at three locations within a *Spahgnum*-dominated area of the B zone for a total of 36 samples each year. A reserved permanent plot (selected shared use) would be ideal to prevent this sampling from impacting other research. Samples would be extracted for microarthropods (mites and springtails) on-site or in nearby facilities using lightweight portable Tullgren funnels. These funnels have low power requirements (40w lightbulbs), but require space where they can hang without being disturbed (see photo). Fauna samples would be exported to Canada with the appropriate permits for preserved 'insect' specimens in 75% ethanol (<10 ml each sample). Moss samples collected would be weighed to standardize the richness and abundance measurements, and returned to the field sites for composting, or disposed as biohazard material.

Links to other research: The sampling performed at SPRUCE will contribute to the overall SPRUCE datasets and response of the S1 Bog under climate warming and elevated CO_2. This work will also be compared with three other studies performed by Dr. Lindo. In 2012 – 2014 a climate change mesocosm experiment generated the data cited above demonstrating community downsizing. In summer 2015, Dr. Lindo will begin sampling from a terrestrial Boreal forest site under ground warming and elevated CO_2 in central Quebec, Canada. Lastly, and of most relevance, the SPRUCE sampling will be compared to a field experiment (BRACE) initiated by Drs. Lindo and Branfireun at Western. The BRACE (**B**iological **R**esponse to **A C**hanging **E**nvironment) project is a full-factorial elevated CO_2 and ground warming experiment initiated in 2015 at two peatland sites (poor and intermediate fen) near White River, Ontario. The BRACE experimental design is closely aligned to SPRUCE conditions (single temperature point at 6.75°C; 750-900 ppm CO_2), and efforts are being made to coordinate sampling methodologies and protocols between these two studies. BRACE will also part of global soil experiment network as proposed by Torn et al.

References

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Portable soil fauna extractors called Berlese funnels work by creating a temperature / moisture gradient on soil samples; fauna actively move lower in the soil profile to be collected in 75% Ethanol at the bottom of the funnel. Temperature / moisture gradients are created using 40w incandescent lightbulbs.