**Poster #34**

## Initial Effects of Warming on Water and Solute Yields from a Black Spruce-*Sphagnum* Bog

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The ecology and biogeochemistry of carbon-rich boreal peatland ecosystems is strongly linked to water cycling and transport. Thus, understanding the effects of climate change on peatland hydrology is vital for interpreting biological and biogeochemical responses. The SPRUCE project is a 10-year-long experiment evaluating the response of a northern black spruce-*Sphagnum* bog to elevated temperatures and $CO_2$ concentrations. Ten enclosures (12-m diameter) were built within the S1 bog in northern Minnesota, and were assigned one of five temperature treatments (+0, +2.25, +4.5, +6.75, and +9°C) replicated at either ambient or elevated (+500 ppm) $CO_2$ concentrations. Belowground warming was initiated in June 2014, whole-ecosystem warming began in August 2015, and $CO_2$ addition started in June 2016. Several hydrological processes are measured within each enclosure, including precipitation, transpiration, and near-surface lateral water flux (i.e., outflow). To measure outflow, a subsurface corral was installed around each enclosure, and outflow was allowed to occur naturally through the corral via drains that span the passively draining acrotelm. Water was collected in an externally located basin. The change in water volume in the basin over time was used to estimate outflow, and an autosampler connected to the basin collected flow-weighed water samples for chemistry analyses. These measurements began in summer 2016.

We hypothesized that outflow would decrease under warmer temperatures due to increased evapotranspiration. We also hypothesized that total organic carbon (TOC) concentrations would increase in outflow waters with warming due to accelerated decomposition of surface peats. In 2016, outflow was lower from the warmer enclosures, with the total accumulated flow from the +9°C enclosures approximately a third of the flow from the +0°C enclosures. There were no clear differences in outflow between ambient and elevated $CO_2$ treatments. TOC concentrations in outflow water were variable across temperature treatments and across the growing season, with a general trend of higher concentrations in water flowing from the +9°C treatments (mean = 72.6 mg/L) than the +0°C treatments (mean = 50.5 mg/L). However, due to the lower outflow from the warmer enclosures, TOC fluxes were lower. These initial results suggest that warming is altering water yields, solutes yields, and pathways of flow in the bog, with potentially cascading effects to carbon cycling and downstream ecosystems. Future work will continue to link changes in water yields and flowpaths with ecological and biogeochemical processes for a more complete understanding of the effects of climate change on bog ecosystems.