Effects of Climate Change Across Seasons on Soil Organic Matter, Moisture, pH, and Specific Leaf Area in a Northern Hardwood Forest

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EXPERIMENTAL DESIGN
6 experimental plots (each 11 x 14m) were established at Hubbard Brook Experimental Forest
Acer rubrum dominated forest

• 2 Reference plots
• 2 Plots warmed 5°C in growing season with buried heating cables
• 2 Plots warmed 5°C in growing season and snow removed in winter to induce soil freeze/thaw cycles

Methods:
Soil pH, moisture, and organic matter: 4 samples per plot (n=24 total)
Specific Leaf Area: 3 leaves per plot (n=18 total)

BACKGROUND
• Air temperatures are increasing globally
• Snowpack is decreasing in depth and duration during the winter in high latitude ecosystems as a result of the increasing air temperatures
• Decreasing snowpack increases duration of time that soils are exposed to freezing air temperatures and leads to increased frequency of soil freeze/thaw cycles
• Soil freeze/thaw cycles lead to root injury
• We examined the impacts of these changes in climate on soils and foliage of a northern hardwood forest

RESULTS

GOALS
Determine effects of climate change across seasons on
• Soil pH
• Soil moisture
• Soil organic matter
• Specific leaf area of trees

CONCLUSIONS
Warming soil temperatures in the growing season and soil freeze/thaw cycles in winter lead to:
1) Higher soil pH, which may benefit trees by making soils less acidic
2) Lower soil moisture and soil organic matter, which may harm trees since they rely on water and nutrients from soil
3) Reduced specific leaf area of foliage, which may damage trees as they produce less foliage

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