



## **Sustained impact of drought on wet shrublands mediated by soil physical changes**

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Projected warming, and increasingly frequent extreme events such as drought, may substantially enhance soil organic matter decomposition in wet organic soils, contributing to the positive feedback between the terrestrial carbon cycle and climate change. Evidence suggests that, as wet organic soils contain large organic C stocks, acclimation to warming might occur more slowly in comparison to mineral soils. The long-term response of wet organic soils to drought remains however uncertain. Ecosystems with organo-mineral soils might be more vulnerable to drought events than peatlands, because of a limited soil moisture pool being available to buffer drying events. We investigated the long-term (14 years) impact of warming and repeated summer droughts on soil respiration from podzolic (organo-mineral) soils in a wet shrubland, using a whole-ecosystem climate-change experiment in North Wales, UK. The experimental drought aimed to emulate the UK summer drought of 1995, considered to be the most recent significant drought year prior to treatment initiation. The impact of drought (average respiration stimulation of 22 % for all seasons and years) was enhanced over the years, which was linked to major changes in soil structure that led to a 54 % reduction in water holding capacity. Bryophyte abundance was found to buffer soil moisture losses. After a bryophyte expansion in 2005 the impact of warming on soil efflux was attenuated; this suggests that bryophytes might have a key role in the resilience these soils to warming despite their relatively small contribution to total aboveground biomass. Plant productivity was very resilient to warming or drought, indicating that the increases in soil respiration have not been balanced by increases in C inputs to soil. The results indicate the potentially critical role that changes in sub-dominant vegetation and in soil physical properties may have in determining climate change impacts on soil C dynamics.