

## **Greenhouse gas balance of blanket peat bog restoration from forestry in the Flow Country, Scotland**

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The Flow country in the far north of Scotland has the largest expanse of blanket peat bog in Europe. With peat depths of up to several metres, this area represents a significant carbon store. Large parts of the Flows were drained for afforestation with non-native conifers during the 1980s, which resulted in considerable damage to the peat, leading to significant carbon loss. To restore the peatland, the Royal Society for the Protection of Birds (RSPB) started in the late 1990s to fell trees and block drains. Over 2200 ha of forestry are felled. The main objective of this study is to measure the impact of forest removal on the budget of three main greenhouse gases, CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. Local variations in fluxes were measured using dark closed chambers. In order to capture abiotic conditions likely to determine microbial activity and therefore CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O production, I record water table depth as well as soil moisture and soil temperature (both measured at 5 and 20 cm deep). These measurements are done in near pristine bog (control plot), in forest (control plot), in recently felled areas and in areas that were felled up to 19 years ago, creating a chronosequence to follow the effects of restoration. Results indicate only small differences in annual CO<sub>2</sub> flux to the atmosphere between sites, with only the 19-year old restored site showing higher fluxes than forest control plots. However some seasonal differences in CO<sub>2</sub> flux between land cover are evident. CH<sub>4</sub> fluxes from forest are significantly lower than from bog and the site restored 17 years ago, and N<sub>2</sub>O fluxes are very low in all sites with no significant differences between sites. Sites where forests were removed recently (< 1 year previously) show a high degree of variability in CH<sub>4</sub> fluxes, indicating potential flux spikes from disturbance. There is a positive correlation between soil temperature and CO<sub>2</sub> and CH<sub>4</sub> flux. Soil moisture varies a lot between bog, restored sites and forest, however there does not seem to be a direct correlation between soil moisture at the surface and CO<sub>2</sub> and CH<sub>4</sub> fluxes. Peatlands store big amounts of carbon, therefore there is a high level of importance to quantify the impact of various restoration techniques used.