Climate change effect on release of CO2 from peat far greater than assumed

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Climate change effect on release of CO2 from peat far greater than assumed Drought causes peat to release far more carbon dioxide into the atmosphere than has previously been realised.

Much of the world's peatlands lie in regions predicted to experience increased frequency and severity of drought as a result of climate change- leading to the peat drying out and releasing vast stores of carbon dioxide (CO2) into the atmosphere. It's the very wetness of the peat that has kept the air out, locking in centuries of carbon dioxide that would normally be released from the decomposing plant materials in the peat. Now scientists at Bangor University have discovered that the effect of periods of severe drought lasts far beyond the initial drought itself.

Writing in *Nature* Geosciences, Dr Nathalie Fenner and Professor Chris Freeman of Bangor University explain how the drought causes an increase in the rate of release of CO2 for possibly as long as a decade. It was originally assumed that most of the CO2 was released from the dry peat. Now scientists realise that the release of CO2 continues, and may even increase, when the peat is re-wetted with the arrival of rain. The carbon is lost to the atmosphere as CO2 and methane and to the waters that drain peatlands as dissolved organic carbon (DOC).

"As our global climate and rainfall patterns change, our peatlands may not have sufficient opportunity to recover between these drought-induced episodes of CO2 loss," explains the paper's lead author, Dr Nathalie Fenner. "What we previously perceived as a 'spike' in the rate of carbon loss during drying out, now appears far more prolonged- with a potential peak after the initial drought period is over."

As well as contributing further to climate change, as CO2 is one of the 'greenhouse gasses', the loss of carbon from the peat has other consequences. Dissolved organic carbon in the water as a result of this process, could adversely affect the quality of drinking water. Much of our drinking water comes from these upland sources. The increase of dissolved organic carbon in the water is likely to bring extra problems and expense to the water supply industry because it interferes with the treatment process.

Loss of carbon could ultimately lead to severe degradation of the peatland itself. Occurring on upland regions of the northern hemisphere, the loss of peatland could contribute to an increased frequency of lowland flooding occurrences as the peat acts as a natural 'sponge' for heavy rainfall. There would also be a consequent loss of habitat and species loss as well as a change in the look and feel of our uplands.

"The previous focus of research in this area has been on the drought period, and our own work identified how the release of CO2 occurs," explains Prof Chris Freeman, who leads the Wolfson Peatland Carbon Capture Laboratory at Bangor University. "We were initially surprised at finding that the effects are so prolonged- we think what's happening is microbial and that this activity has been triggered by the introduction of oxygen into previously waterlogged conditions. Once the water returns, conditions have changed and the microbes are further able to thrive until conditions eventually return to normal."

The paper's authors suggest that geo-engineering solutions may have to be considered to preserve the water table and reduce the effects of drought on upland peat.

More information: Drought-induced carbon loss in peatlands Nathalie Fenner Chris Freeman in *Nature Geoscience*, doi:10.1038 NGEO1323

Provided by Bangor University