'Carbon vault' peat suffers greatly from drought, finds study

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Peat being tested at Radboud University. Credit: Bjorn Robroek, Radboud University

Peatlands are affected more by drought than expected. This is

concerning, as these ecosystems are an important ally in the fight against climate change. Following long periods of drought, peat is able to absorb little to no extra carbon (CO_2). Increasing biodiversity also does little to make peat more drought-resilient. These are the conclusions drawn by researchers from Radboud University in a publication appearing today in *Proceedings of the Royal Society B*.

Peat is a vast carbon sink: per square meter, it is able to store more CO_2 than any other ecosystem in the world. The peatlands of the Netherlands, but also those in places such as Scandinavia and the Baltic states, therefore play an important role in the fight against climate change.

However, peat is coming under increasing pressure and is extremely sensitive to the dry summers we are experiencing due to climate change. This is what researchers from the Radboud Institute for Biological and Environmental Sciences have concluded.

"In our lab, under controlled conditions, we first ensured that large blocks of peat were well moistened over a long period of time," explains lead author Bjorn Robroek.

"We then slowly dried the peat out. One-half was exposed to mild drought, with the water level roughly five centimeters lower than the peat itself. The other half was subjected to extreme drought conditions; in this case, the water was twenty centimeters below the peat. This is comparable to a period of three weeks without rain—something that has also become increasingly common in the Netherlands in recent years."

These experiments revealed that peat exposed to mild drought still absorbs a reasonable amount of carbon. Robroek says, "Under extreme drought conditions, however, the peat can hardly take on any more carbon. In the event of an extended period of drought, it even releases the carbon again."

Drought not only affects peatlands, of course. Dry summers have made other ecosystems more fragile, too. However, in the case of grasslands, for example, we now have methods to combat problems caused by drought. Increasing the biodiversity in this kind of ecosystem (by incorporating a greater number of different plants), as in the case of the Future Dikes project, keeps the ecosystem healthy and resilient.

Nevertheless, according to Robroek, when it comes to peatlands, improving biodiversity in this way is of little use in terms of tackling drought. "The different mosses that we tested in our peat experiments do little to nothing to combat drought. That does not mean that biodiversity is not important for peat: it helps with carbon storage, for example. But in the battle against drought, a different approach is needed."

There are little things that consumers can do to protect peat. "Buy peat-free potting substrate and compost, for example," cautions Robroek.

"In the end, however, this is mainly a problem that must be solved at the political level. In the past, the buffer zones alongside rivers often consisted of peatland, but today, much of this is grassland intended for agricultural use. These areas are constantly mowed and plowed and, therefore, hardly retain any water. As a result, water from these floodplains drains more quickly into the rivers, causing flooding."

"Switching over to natural management methods costs time and money but will have huge benefits in the future. Peatlands, even lowland peat areas, will retain considerably more water and offer much better protection. You could compare this to a sponge that gradually releases water back into the landscape. In such places, peat is also the most effective option when it comes to storing carbon."

More information: Bjorn J. M. Robroek et al, More is not always better: peat moss mixtures slightly enhance peatland stability,

Proceedings of the Royal Society B: Biological Sciences (2024). DOI: 10.1098/rspb.2023.2622