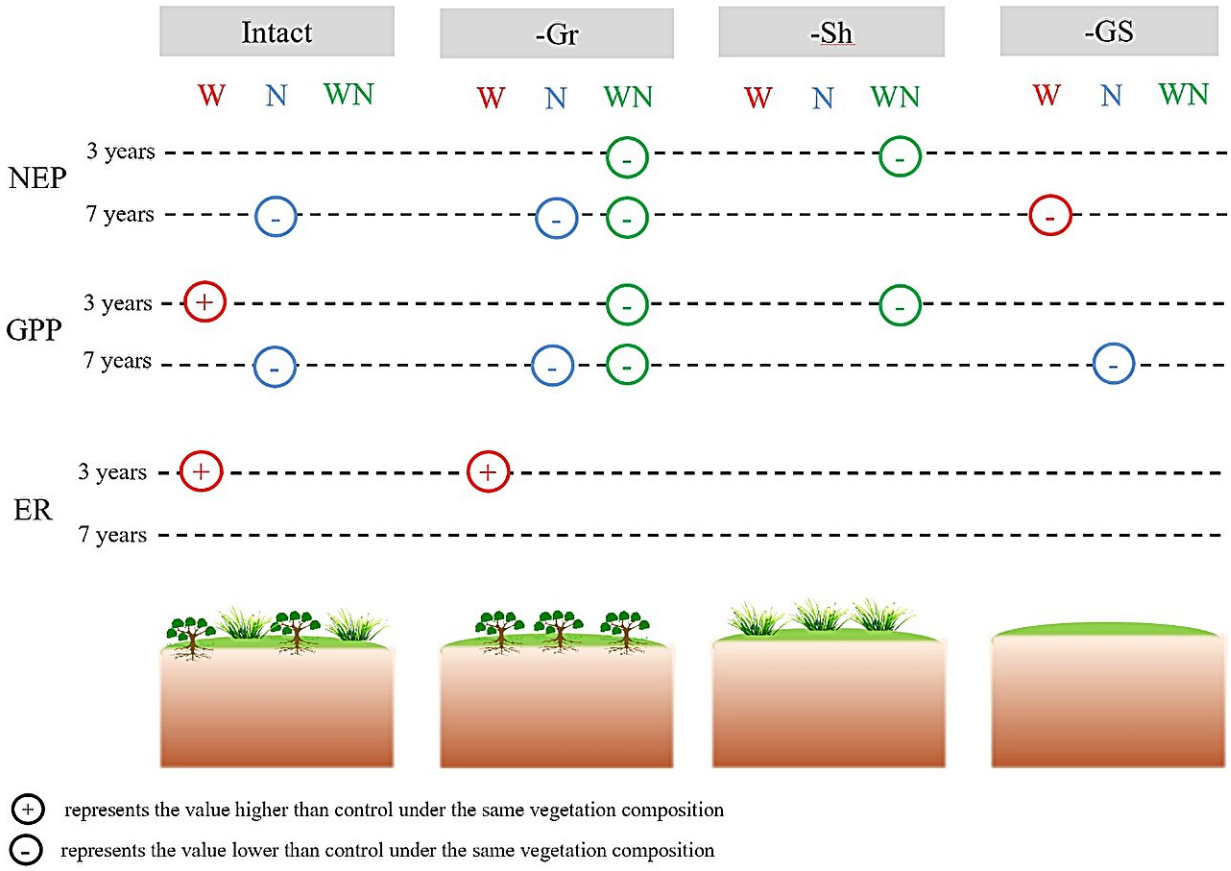
Study shows effects of vegetation composition, warming and nitrogen deposition on peatland carbon sink function

January 10 2024, by Zhang Nannan



The impacts of climate warming and N addition on net ecosystem production (NEP), ecosystem respiration (ER), and gross primary production (GPP) in the bog under different vegetation compositions. Credit: Gong Yu

Peatlands, which contain about one-third of the global soil carbon stock, are important carbon sinks. Their net carbon uptake is equivalent to ~1% of human fossil fuel emissions or 3%–10% of the current net sink of natural terrestrial ecosystems. However, the carbon sink function may be altered under global change.

Global temperature is projected to rise by 2°C–5°C within this century, and nitrogen (N) deposition is predicted to increase two to three times. In addition, vegetation composition is affected by climate change, nutrient availability, and anthropogenic activities. For example, burning and grazing increases the growth of graminoids and decreases the growth of shrubs and bryophytes. Whether and how the carbon sink function of peatlands will respond to the interaction of these changes is unclear.

Researchers from the Wuhan Botanical Garden of the Chinese Academy of Sciences investigated the net carbon dioxide (CO_2) uptake in a peatland under simulated warming, elevated N deposition, and changes in vegetation composition.

The study, titled "Vegetation composition regulates the interaction of warming and nitrogen deposition on net carbon dioxide uptake in a boreal peatland," was published in *Functional Ecology*.

According to the researchers, N addition reduced net CO_2 uptake, suggesting that elevated N deposition may weaken the carbon sink function of peatlands. This negative effect of N addition can be mitigated by warming without a change in vegetation composition.

Nevertheless, taking future climate warming and elevated N deposition into account, the carbon sink function of peatlands would be weakened but not altered under the graminoid-dominated conditions.

Furthermore, vegetation composition was found to be more important

than warming and N deposition in driving the carbon sink function of peatlands.

Therefore, in addition to reducing fossil fuel burning and N fertilization, protecting vegetation composition is also essential to conserve peatlands and maintain their carbon sink function.

More information: Yu Gong et al, Vegetation composition regulates the interaction of warming and nitrogen deposition on net carbon dioxide uptake in a boreal peatland, *Functional Ecology* (2023). DOI: 10.1111/1365-2435.14480

Provided by Chinese Academy of Sciences