Researchers say we can't count on plants forever for CO2 storage

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Rising carbon dioxide levels in the atmosphere will over time lead to nutrient limitations to grassland productivity, according to a study by researchers at the University of Michigan and the University of Minnesota. An article to be published Thursday in the journal *Nature*, which is based on a six-year study—the longest known study of its kind—says that decision-makers need to understand the relationship between fossil fuel emissions and plant productivity and nutrients when they set policy. Grasslands amount to about 30 percent of the arable land surface of the world.

"The results suggest that our ecosystem likely cannot get enough

nutrients under elevated levels of CO_2," said David Ellsworth, associate professor of plant ecophysiology at the University of Michigan School of Natural Resources and Environment. "As a result, we think that the soil will be unable to sustain growth and productivity increases from enriched CO_2 over time."

At Cedar Creek Natural History Area in central Minnesota, the researchers grew 16 native or naturalized plant species in two types of plots. The soil in one plot type was enriched with nitrogen while the soil in the other type was not. The purpose of the study was to document the plant's ability to grow biomass and flourish in a nutrient-poor soil as carbon dioxide levels increased to concentrations likely to be reached in the middle of this century.

The study's results are consistent with previous experimental studies of the interaction between carbon dioxide and nitrogen in agricultural and forest plantation systems, according to Ellsworth. "This suggests that there may be no 'free-lunch' of nitrogen for plants under CO_2 enrichment for this long."

With its wide range of species types and combinations, including mixtures, the study provides a broad test of carbon dioxide and nitrogen interactions under contrasting low and high nitrogen supply rates. It also includes measurements of root biomass. Previous studies have been done with a single or few types of plant species. These studies had greater amounts of nitrogen added and included no below-ground biomass measures.

The article, "Nitrogen limitation constrains sustainability of ecosystem response to CO_2," was written by Peter B. Reich, Sarah E. Hobbie, Tali Lee, David S. Ellsworth, Jason B. West, David Tilman, Johannes M.H. Knops, Shahid Naeem and Jared Trost.

Source: University of Michigan