

MEDIA ALERTS ARCHIVE

August 8, 2005

FIELD TESTED: GRASSLANDS WON'T HELP BUFFER CLIMATE CHANGE AS CARBON DIOXIDE LEVELS RISE

Because grasslands and forests operate in complex feedback loops with both the atmosphere and soil, understanding how ecosystems respond to global changes in climate and element cycling is critical to predicting the range of global environmental changes—and attendant ecosystem responses—likely to occur. In a new study in the premier open access journal PLoS Biology Jeffrey Dukes, Christopher Field, and colleagues treated grassland plots to every possible combination of current or increased levels of four environmental factors—carbon dioxide temperature, precipitation, and nitrogen influx—to simulate likely regional changes over the next 100 years. The results of their long-term experiment reveal that California grasslands, and ecosystems that respond similarly, are not likely to help buffer the rate of climate change by acting as a carbon “sink”—slowing the rise of carbon dioxide levels by storing more carbon in new growth.

The experiments were part of the Jasper Ridge Global Change Experiment (JRGCE), which started on Stanford’s 1,200-acre biological preserve in 1997. Since 1998, this grassland ecosystem has been outfitted with an ecologist’s version of a microclimate controller (complete with carbon dioxide pumps, heaters, and irrigation tubing) and subjected to experimentally controlled atmospheric, climatic, and nutrient conditions. (This study examines the experiment’s first five years.) To quantify the grassland response to these treatments, the authors estimated net primary production, or NPP (the amount of carbon left over after cellular respiration) by measuring shoot and root growth in 36 circular plots scattered across roughly two acres.

The strongest effects on grassland production came from elevated levels of nitrogen (which typically reaches a fertilization limit). Elevated temperature, rainfall, and, surprisingly, carbon dioxide, had minimal impacts. These results suggest that increasing concentrations of atmospheric carbon dioxide are not likely to increase growth of the roots and leaves of plants in this grassland. Why not? One possibility involves phosphorus. High levels of carbon dioxide and nitrogen can reduce phosphorus concentrations or limit its uptake in these plants. Ongoing JRGCE experiments are exploring how this and other factors—such as grazing or shifts in seasonal events—might limit the growth effects of carbon dioxide.

It’s thought that ocean and terrestrial ecosystems have stored nearly half the carbon emissions produced by humans since the industrial revolution. If it turns out that other natural systems also fail to sequester as much carbon as scientists once thought, atmospheric carbon dioxide concentrations will rise even faster than expected—with serious implications for future climate change.

###

Contact:

Paul Ocampo
Public Library of Science
415-624-1224
press@plos.org

This text derived from <http://www.plos.org/news/index.html>