Center for Environmental Sciences and Engineering
University of Connecticut

Understanding Climate Change

Ecological Effects of Rainfall Changes on Tallgrass Prairie

By the end of the 20th century, the combustion of fossil fuels had changed the composition of the atmosphere and was affecting the climate—not only by raising temperatures worldwide but also by changing patterns of precipitation.

For decades, scientists have observed a trend toward an increasing number of very heavy rainfalls in the contiguous United States. The explanation is that a warmer atmosphere increases the rate of evaporation and holds more water vapor. Together, these factors keep more moisture in the atmosphere, which in turn produces stronger rainfalls.

A summer storm approaches bison grazing on tallgrass prairie in northeastern Kansas

We do not know how plants will respond to these changing rainfall patterns. In ecosystems where water is limited, such as the grasslands of the eastern Central Plains, we expect that altered rainfall patterns will have a significant effect. Climate models predict that rainfalls will be stronger but less frequent in this region. The longer dry periods between rainfalls will reduce the amount of water available to plants.

This project examines how predicted changes in the timing and intensity of precipitation may affect plants in the tallgrass prairie. Understanding this response to climate change is important because grasslands cover 40 percent of the world's land surface, feed the world's wild herbivores and livestock, and remove greenhouse gases from the atmosphere.

Research on global change often requires the integration of several disciplines to answer complex questions about earth systems. Investigating grassland responses to changes in rainfall combines the disciplines of ecology and climatology. Ecology, which is based on the theory of natural selection, examines the patterns and processes in nature. Climatology, which has at its core physics and fluid dynamics, explores the physical state of the atmosphere. The model used in this project combines the two disciplines by simulating various physiological, biological, chemical, and physical interactions between the atmosphere and the biosphere.

The results of this research may be used to determine the future of an important ecosystem. It is essential that we study the potential biological impacts of climate change today so that we can anticipate, address, and avoid problems in the future.

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