New study finds that some plants can adapt to widespread climate change

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While many plant species move to a new location or go extinct as a result of climate change, grasslands clinging to a steep, rocky dale-side in Northern England seem to defy the odds and adapt to long-term changes in temperature and rainfall, according to a new study by scientists from Syracuse University and the University of Sheffield (United Kingdom) published online in the July 7 issue of the Early Edition of the *Proceedings of the National Academy of Sciences* (PNAS).

The experiment on which the study is based is one of the longest-running studies of climate change impacts on natural vegetation and may yield new insights into the effects of global warming on plant ecosystems.

"Contemporary wisdom suggests that climate changes cause plants to move or die," says Jason Fridley, study co-author and assistant professor of biology in The College of Arts and Sciences at SU. "However, our study suggests that if the changes in climate occur slowly enough, some plants have the ability to respond, adapt and thrive in their existing location."

The new findings resulted from the analysis of 13 years of data collected at the Buxton Climate Change Impacts Laboratory (BCCIL) in the United Kingdom by Emeritus Professor J. Philip Grime and colleagues at the University of Sheffield. Established in 1989, BCCIL is a field laboratory of grasslands consisting largely of slow-growing herbs and sub-shrubs, many of which are more than 100 years old. As many as 50 different species of plants per square meter survive the region's hostile

conditions by growing in shallow soil and in the nooks and crannies of limestone outcrops. The data analysis was supported by a grant Fridley obtained from the National Science Foundation.

The 13-year experiment at BCCIL involved subjecting 30 small grassland plots to microclimate manipulation. For example, some plots received 20 percent more water than normal during the summer, while other plots were covered with rain shelters in the summer to simulate drought conditions; heating cables were placed under some plots to simulate winter warming. The grasses in all of the plots were cut to simulate annual sheep grazing. A similar experiment was concurrently conducted on grasslands in Southern England for the first five years. Data collected from the northern and southern sites was the subject of a study published by Grime and colleagues in Science (2000). In the 2000 study, the vegetation in the southern plots was substantially altered by the climate changes, while the Buxton vegetation in the north was virtually unaffected. The southern experiment was dismantled, but Grime continued the experiment on the Buxton plots.

"Based on the results of the five-year experiment, we suspected there was something unique happening in the northern grasslands that enabled the plants to resist simulated climate changes," Fridley says. "We formed two hypotheses—the plants will eventually be affected, but it will take longer due to chronic nutrient shortage; or the grasslands won't change regardless of how long we manipulate the environment. All of our analysis suggested that the grassland ecosystem is stable, despite the climate manipulations."

The new results have yielded more questions than answers; foremost is why are some plants resistant to climate change, while others die, become extinct or migrate to other places? The answers may lie in the nature and behavior of the individual plants within a species.

"Individual plants may die or contract," Fridley says, "but perhaps they are replaced by those of the same species that are more adapted to the environmental changes. The closer we look, the more complex the systems become. There is actually a lot going on, but we may be missing it because we are looking at a broad spectrum of species instead of what is happening at the level of the individual plants within a species."

Source: Syracuse University