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Soil Respiration in Native Tallgrass Prairies under Climate Change: The Role of Above and Belowground Diversity

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Soil Respiration in Native Tallgrass Prairies under Climate Change: The Role of Above and Belowground Diversity

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Understanding how climate change may alter ecosystems' ability to function is crucial to securing the many ecosystem services provided to humans. It is well-established that an ecosystem's capacity to function, and thus the ecosystem services it provides to humans, is positively related to its biodiversity. However, how climate change influences interactions among members of different trophic levels to influence ecosystem functions is not well-understood yet. In this study, we explore how increased soil microbial diversity and plant diversity interact under drought conditions to influence soil carbon respiration in native Tallgrass Prairie ecosystems. Grasslands play an extremely important role in the global carbon cycle, storing more than twice as much carbon in the soil as the atmosphere. Our results show significantly higher soil respiration rates in more diverse plant communities only in the presence of a diverse live soil microbial community, while this positive plant diversity effect disappears in soils lacking a diverse live soil microbial community. Under drought conditions, we found soil respiration rates decreased in the absence of live soil biota relative to well-watered conditions. However, drought conditions had no effect on respiration rates in the presence of a diverse soil microbial community. These results suggest that soil microbes play a key role in maintaining the positive relationship between diversity and ecosystem function, potentially stabilizing ecosystem function and securing the delivery of ecosystem services under climatic stresses.