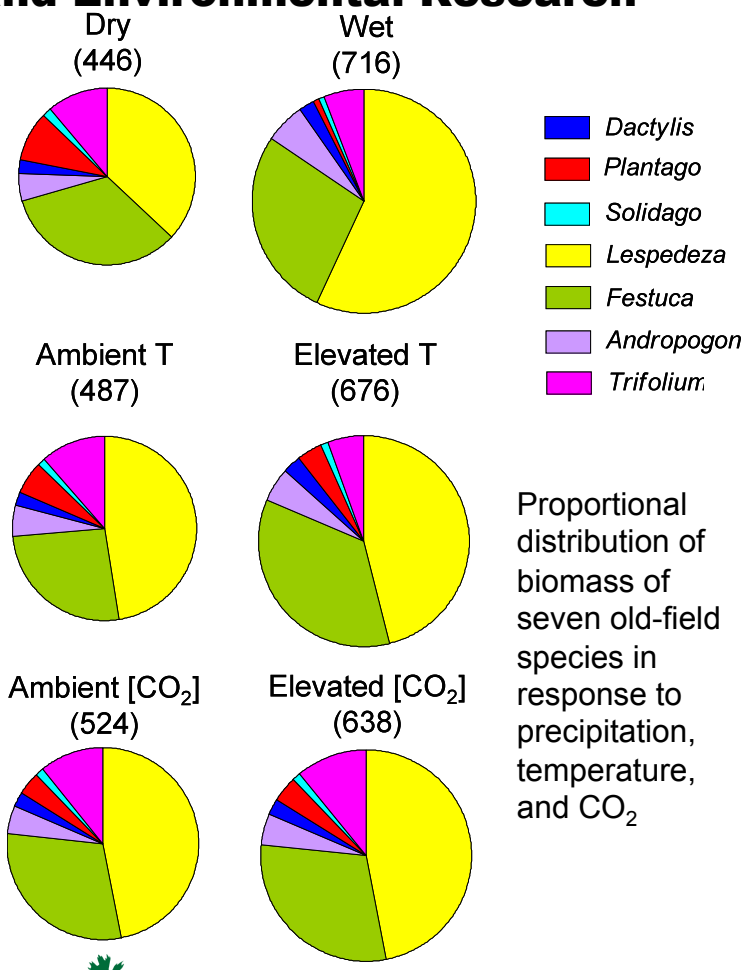
Climate change effects on plant biomass alter dominance patterns and community evenness in an experimental old-field ecosystem

Contact: Richard Norby, 865-576-5261, norbyrj@ornl.gov

Funding: DOE Office of Science, Biological and Environmental Research

- In a constructed old-field community, plant community biomass increased with elevated atmospheric [CO_2], warming, and precipitation.
- Plant species differed in their response to the treatments leading to shifts in plant community composition.
- Community-level biomass responses strongly depended on the response of *Lespedeza cuneata*, a dominant nitrogen fixing species in the community.
- Interactions of multiple climate change factors and the traits of component species impact plant community biomass.
- Altered plant dominance patterns will be an important part of whole plant community responses to climate change.



Proportional distribution of biomass of seven old-field species in response to precipitation, temperature, and CO_2

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Climate change effects on plant biomass alter dominance patterns and community evenness in an experimental old-field ecosystem

Contact: Richard Norby, 865-576-5261, norbyrj@ornl.gov
Funding: DOE Office of Science, Biological and Environmental Research

Abstract:

To better understand how climate change will alter both individual plant species and community biomass we manipulated atmospheric [CO_2], air temperature and precipitation in a constructed old-field ecosystem. We compared the responses of dominant and subdominant species to our treatments, and explored how changes in plant dominance patterns alter community evenness over two years. Our study resulted in four major findings: 1) All treatments, elevated [CO_2], warming, and increased precipitation increased plant biomass and the effects were additive, 2) Plant species differed in their response to the treatments, resulting in shifts in the proportional biomass of individual species, which altered the plant community composition; however, the plant community response was largely driven by the positive water responses of *Lespedeza*, the most dominant species in the community, 3) Precipitation explained most of the variation in plant community composition among treatments, and 4) Changes in precipitation caused a shift in the dominant species proportional biomass that resulted in higher community evenness in the dry relative to wet treatments. Our data suggest that changes in plant dominance patterns and community evenness are an important part of community responses to climatic change, and generally, that such compositional shifts can alter ecosystem biomass production and nutrient inputs.

Citation:

Kardol P, Campany CE, Souza L, Norby RJ, Weltzin JF, Classen AT. Climate change effects on plant biomass alter dominance patterns and community evenness in an experimental old-field ecosystem. *Global Change Biology* 16:2676-2687