Old-field communities respond to warming. Old-field plant communities that establish on abandoned agricultural land are an important and widespread element in the human landscape and, due to their annual nature, are expected to respond rapidly to ongoing atmospheric and climatic change. A multi-factor experiment in Oak Ridge, Tennessee, employed open-top chambers to administer treatments of elevated [CO_2] (+300 ppm), air warming (+3 °C), and altered soil moisture in a randomized complete block, split-plot design. Plant communities, consisting of seven common old-field species, including grasses, forbs, and legumes, were established in the chambers. Species-specific responses to the experiment were largely determined by the warming treatment. Warming was detrimental to the foliar cover of legume, *Trifolium pratense*, and C_3 bunchgrass, *Dactylis glomerata*. Conversely, the two late-season species generally adapted to warmer temperature, *Andropogon virginicus* (C_4 grass) and *Solidago canadensis* (herbaceous dicot), had greater foliar cover in warmed plots. Foliar cover of *Dactylis glomerata* was also greater in wet plots than in dry plots. Changes in species compositions such as these may have important ecosystem implications such as changes in the carbon and nitrogen cycles. For example loss of *Trifolium*, a nitrogen fixer, may decrease nitrogen availability in old-fields possibly slowing grassland succession. Accurate assessment of the responses of terrestrial ecosystems to atmospheric and climatic change must incorporate the reality of multiple environmental factors and complex plant community interactions.

Plants in a constructed old-field community are measured to determine their responses to elevated air temperature, CO_2 concentration, and decreased soil moisture.