Evidence exists that plant community diversity influences productivity of individual members and their resistance and resilience during and after perturbations. We simulated drought within the long-term EVENT experimental site in the Ecological-Botanical Garden, University of Bayreuth to understand how *Arrhenatherum elatius* (L.) responds to water stress when grown in three different plant assemblages. The set up consisted of five replications for each factorial combination of drought and plant assemblages differing in functional diversity. Leaf water potential (Ψ_L), leaf gas exchange, natural $\delta^{13}C$, plant biomass and cover were measured. Imposed drought had different effects on *A. elatius*, depending on plant assemblage composition. Severe water stress was however, avoided by slowing down the rate of decline in Ψ_L, and this response was modified by community composition. High Ψ_L was associated with high stomatal conductance and leaf photosynthesis. Biomass production of *A. elatius* increased due to drought stress only in the least diverse assemblage, likely due to increased tillering and competitive advantage against neighbors in the drought-treated plants. Our results indicate that beneficial traits among plant species in a community may be responsible for the enhanced capacity to survive drought stress. Resistance to drought may, therefore, not be linked to species richness, but rather to the nature of interaction that exists between the community members.