

DOES DROUGHT & NON-NATIVE COMPETITION AFFECT CALIFORNIA COASTAL

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PRAIRIE PLANTS?



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BACKGROUND

- Coastal prairie restoration is expensive, and outcomes can be variable (Holl and Howarth 2000)
- California is predicted to have more droughts which could affect native plant establishment
- Non-native species can react more negatively to drought (Valliere et al. 2020)

RESEARCH

- How does drought and competition from non-native annuals affect the water use efficiency of native coastal prairie plants?
- How does drought and competition from non-native annuals affect the growth allocation of native coastal prairie plants?
- Will native coastal prairie plants adjust partitioning of biomass due to drought or competition from non-native annuals?

METHODS

- Planted *Bromus carinatus*, *Lupinus nanus*, *Mimulus aurantiacus*, *Sidalcea malviflora* and *Stipa pulchra* in 1-gallon pots at the UC Santa Cruz Jean Langenheim Greenhouses (Nov 2019 – Apr 2020)
- Sowed 5 non-native annuals (*Festuca bromoides*, *Festuca perennis*, *Geranium dissectum*, *Medicago polymorpha*, *Raphanus sativus*) in half of plantings

- Exposed half of plantings (with and without non-native sowings) to episodic drought (no water until stomatal closure, rehydration then drought until death)

FINDINGS

- Drought increased the water use efficiency of non-N-fixing forbs (*Sidalcea malviflora* and *Mimulus aurantiacus*) but did not affect grasses (*Stipa pulchra* and *Bromus carinatus*) or a N-fixing forb (*Lupinus nanus*) (**Fig. 1**)
- Competition with non-native annuals had no effect on water use efficiency (**Fig. 1**)
- Competition from non-native annuals significantly decreased above and marginally decreased below ground biomass of *Sidalcea malviflora* (**Figs. 2 & 3**)

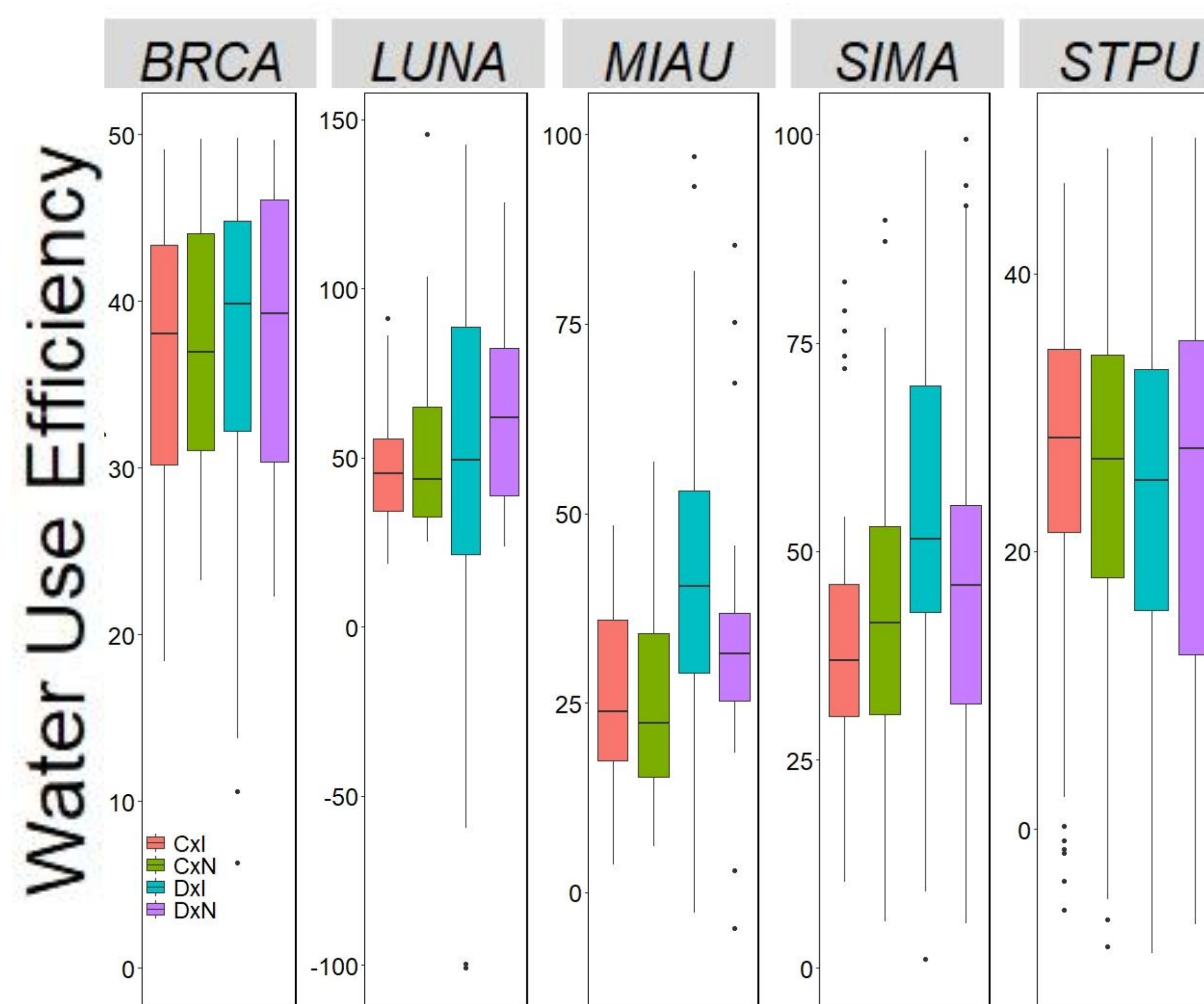


Figure 1. Water use efficiency (assimilation/conductance) of native prairie species. CxN = no drought, no competition, CxI = no drought, with competition, DxN = drought, no competition, DxI = drought, competition

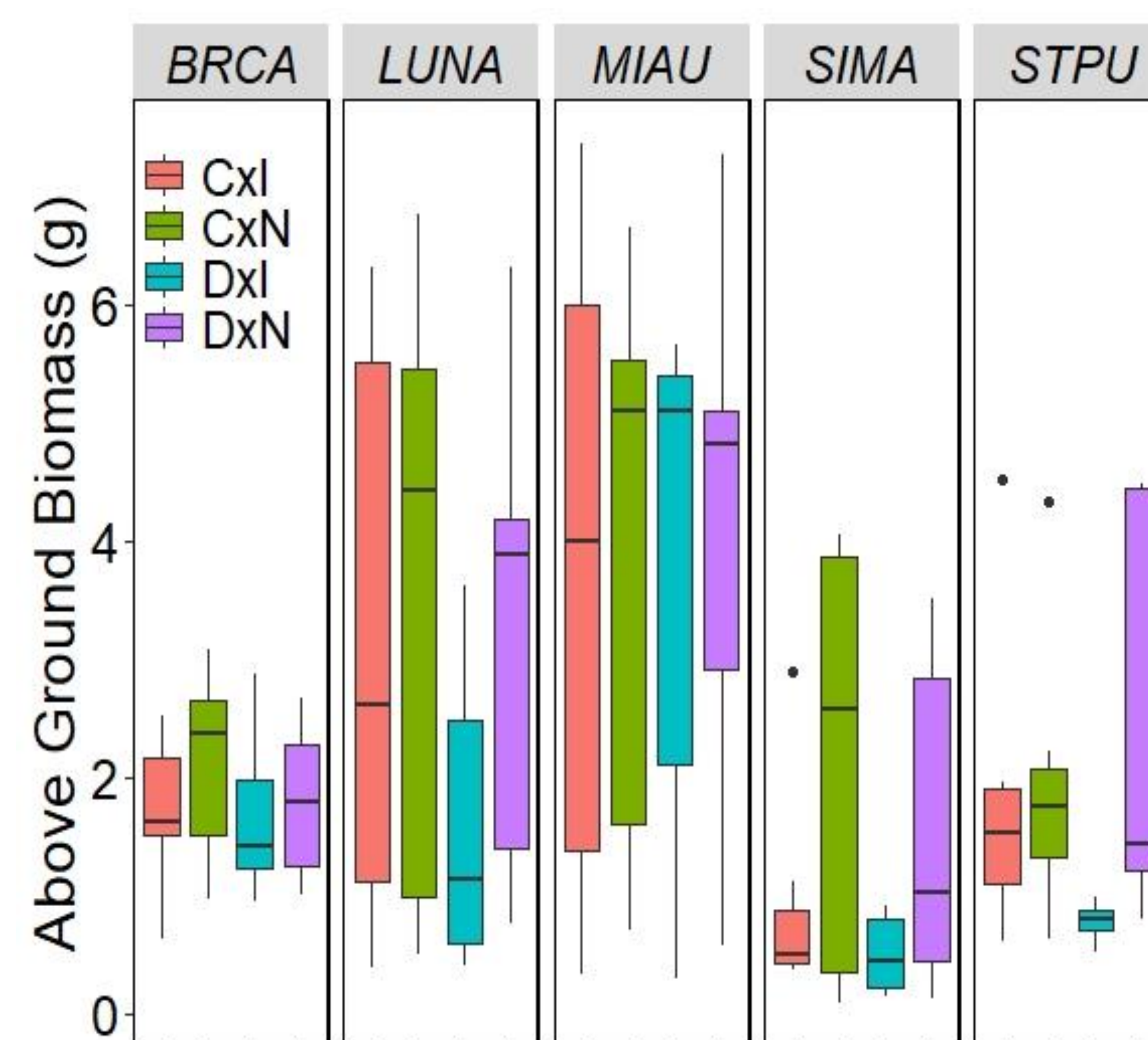


Figure 2. Above ground biomass (leaves and shoots) of native prairie species. CxN = no drought, no competition, CxI = no drought, with competition, DxN = drought, no competition, DxI = drought, competition

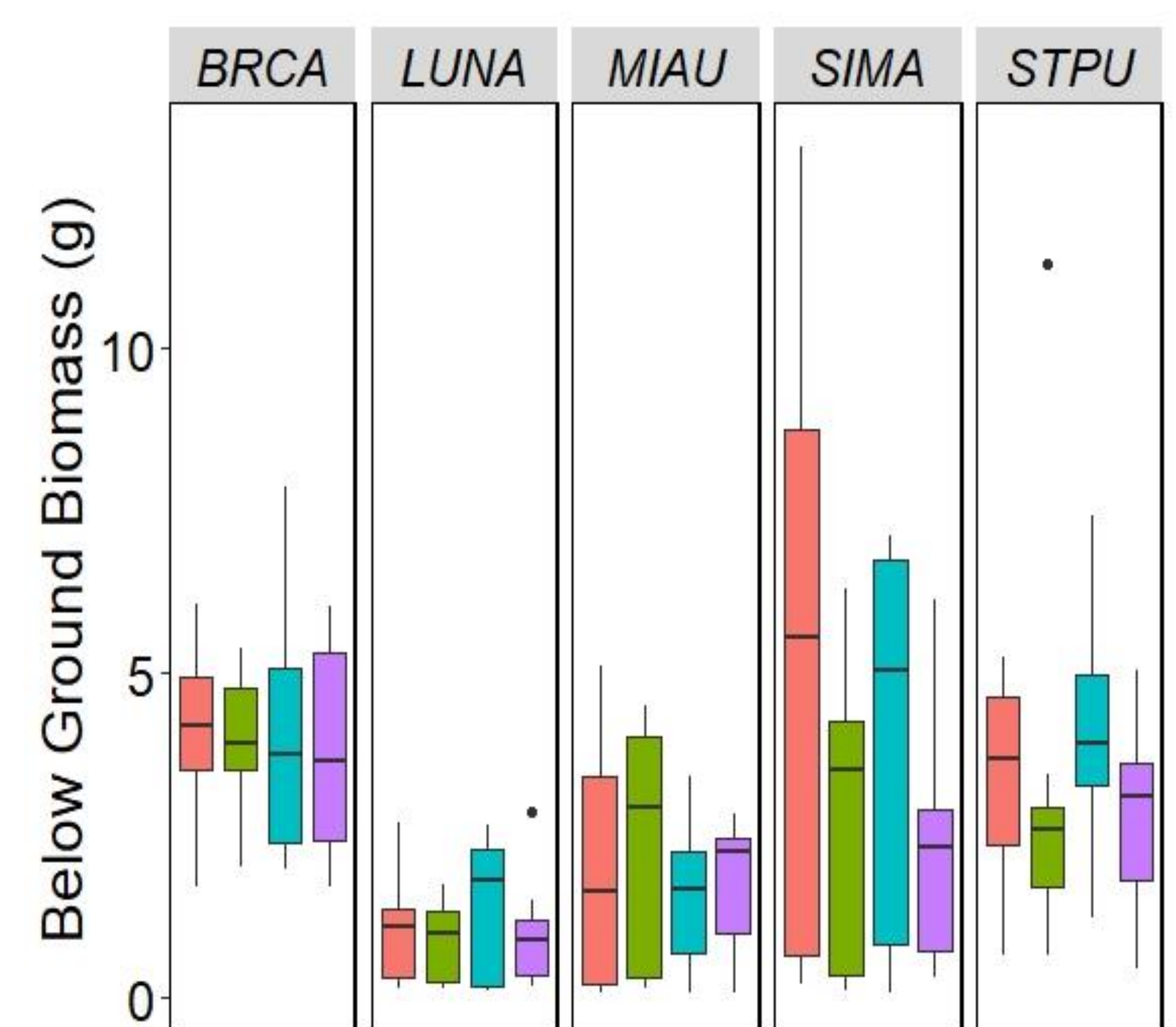


Figure 3. Below ground biomass (roots) of native prairie species. CxN = no drought, no competition, CxI = no drought, with competition, DxN = drought, no competition, DxI = drought, competition

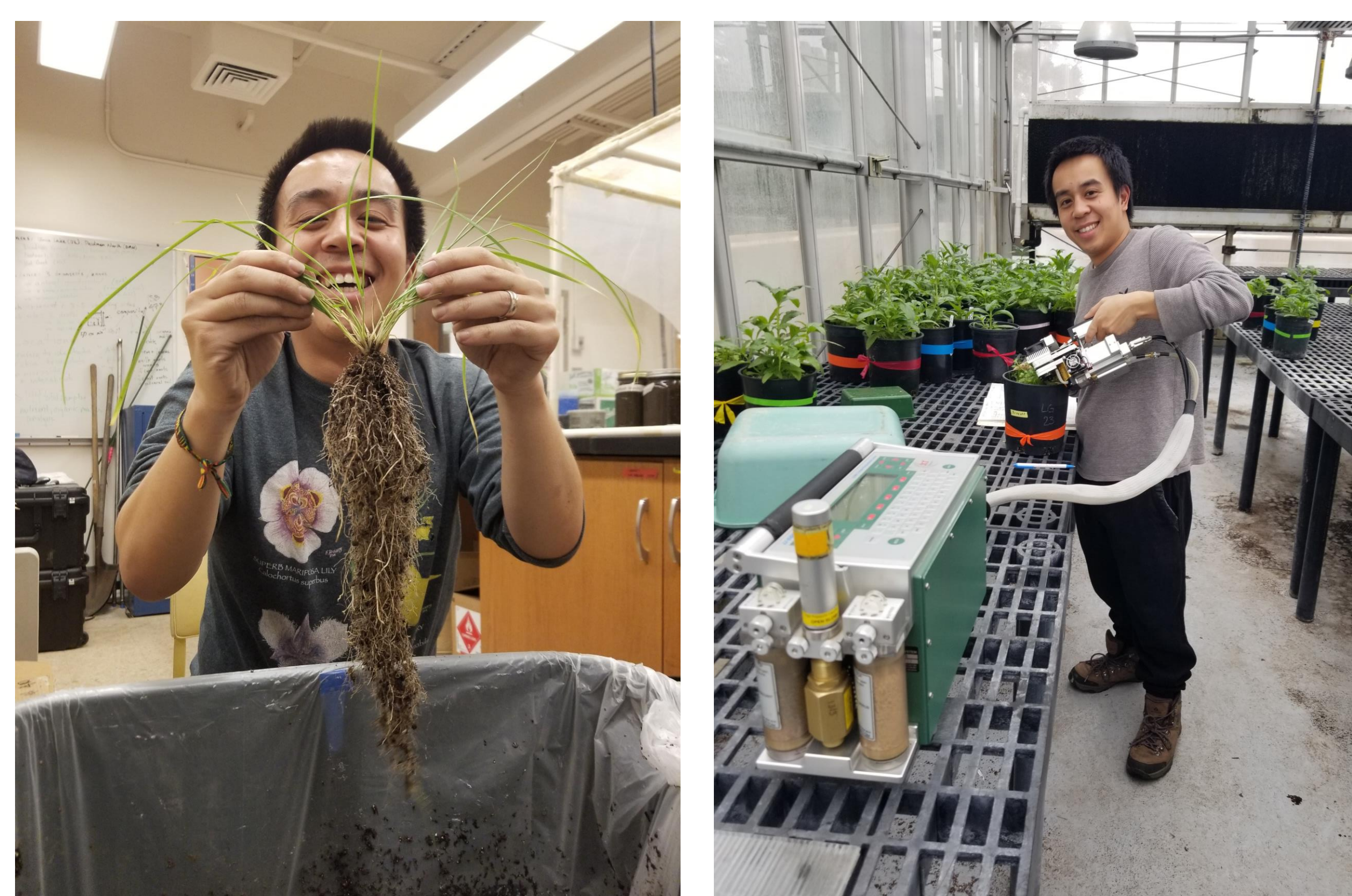


Figure Methods. Assessing biomass of *Stipa pulchra* (left) and taking gas exchange measurements of *Mimulus aurantiacus* (right)

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ONGOING WORK

- Analyze native plant photosynthesis and stomatal conductance and explore potential temporal interactions
- Analyze biomass of individual non-native annual species (*Festuca bromoides*, *Festuca perennis*, *Geranium dissectum*, *Medicago polymorpha*, *Raphanus sativus*)
- Analyze leaf traits (specific leaf area, leaf lobedness, leaf damage, leaf thickness, major vein length per unit area and leaf C:N)
- Analyze phylogenetic effects of competition on physiology and biomass