Can we condition plants to increase stress tolerance and improve restoration success?

Justin Valliere, Jacqueline Zhang, Rasoul Sharifi , and Phil Rundel

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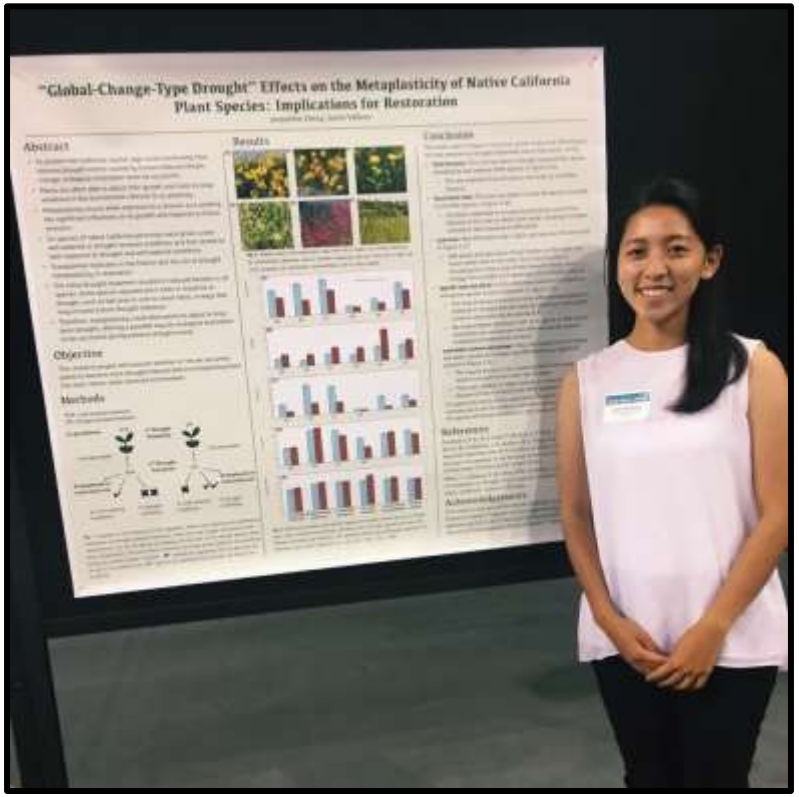
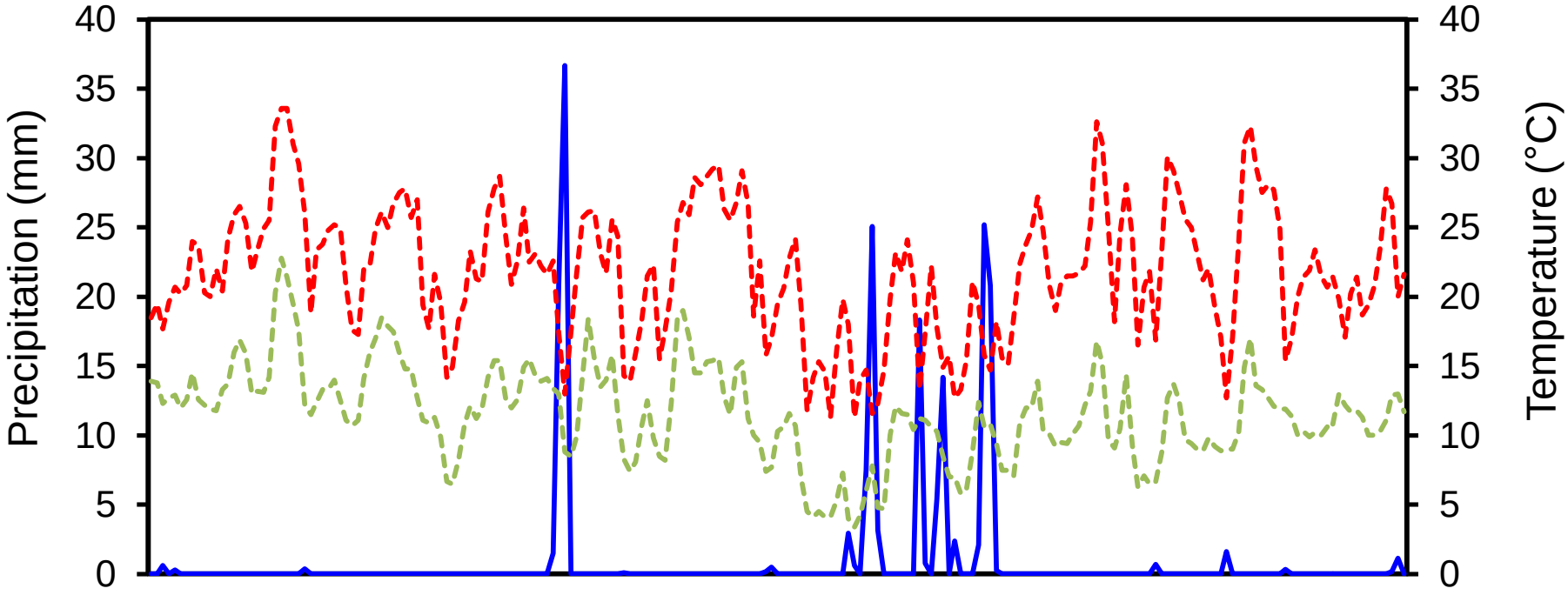
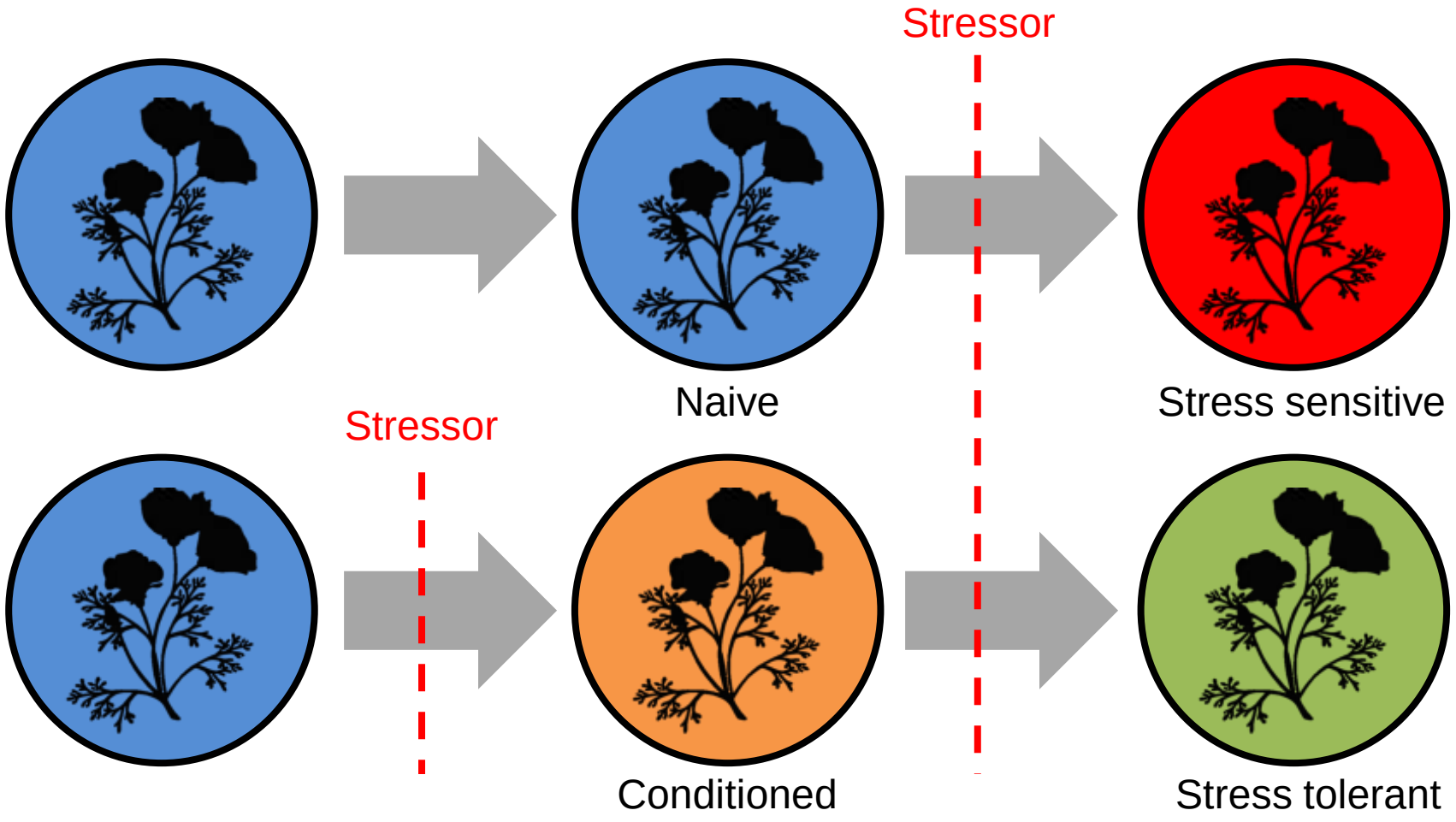


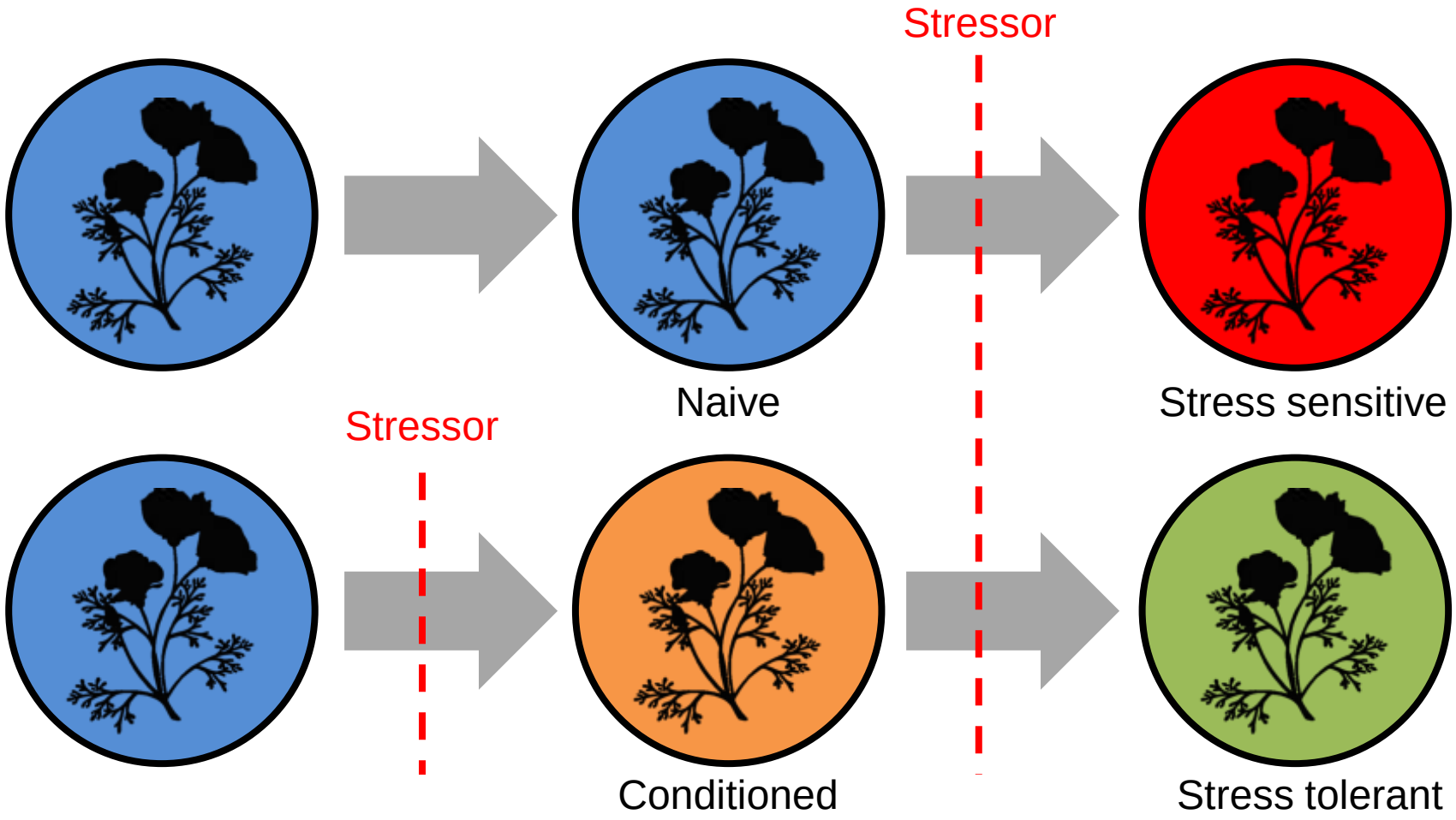
Plants experience a wide range of environmental conditions over their lifetime



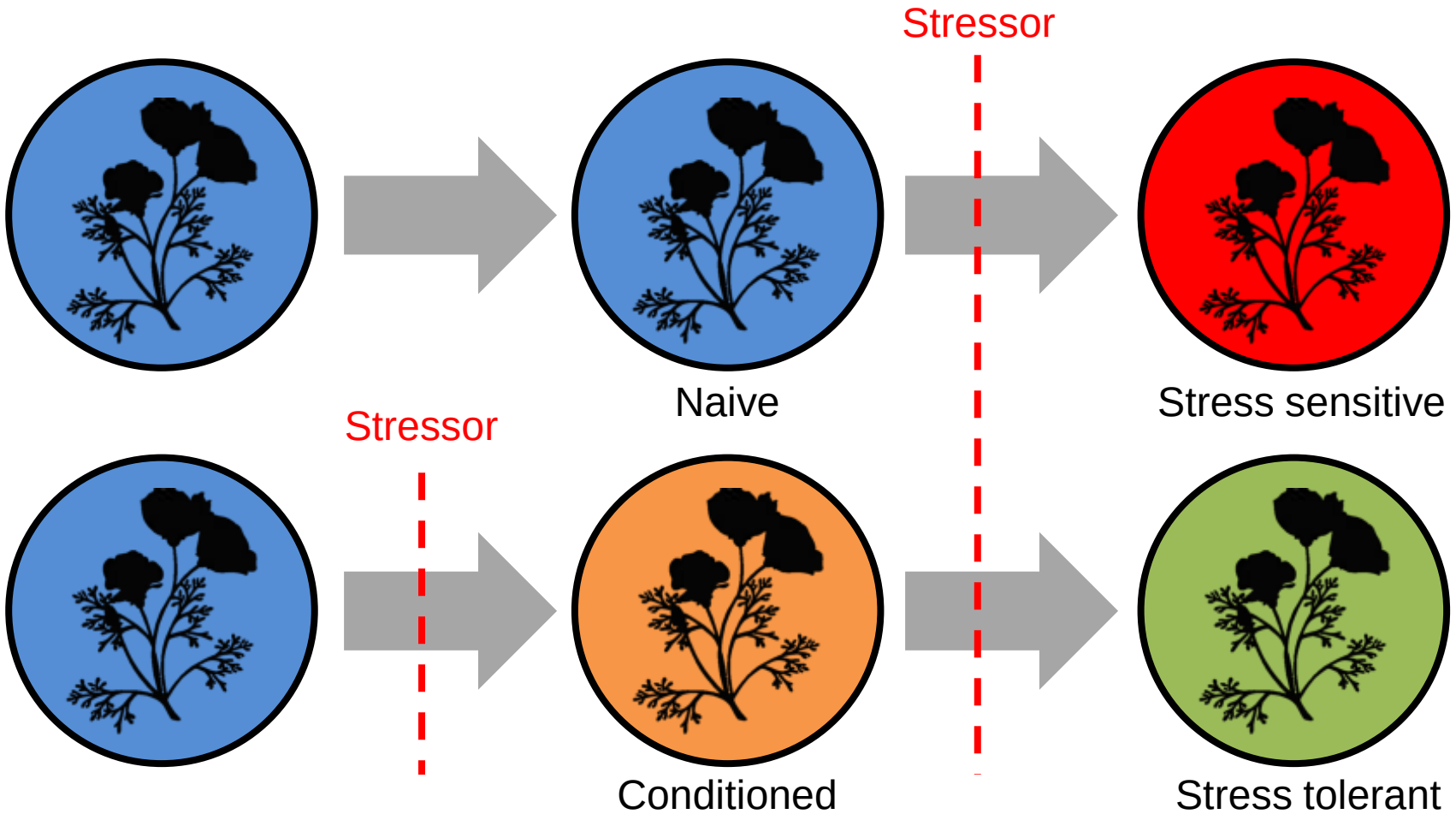
Exposure to a stressor can alter a plant's response to future stress events



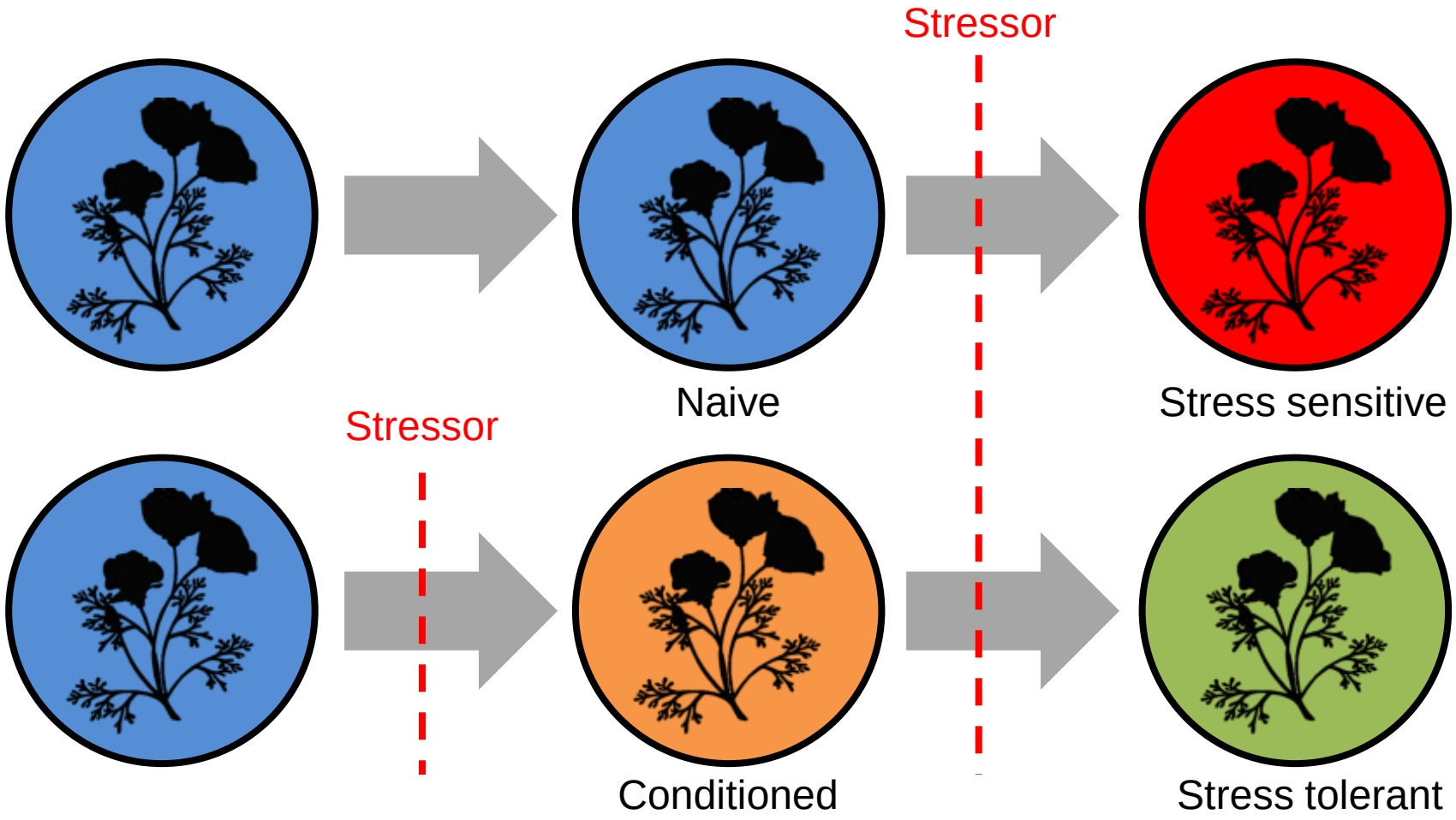
“Metaplasticity”



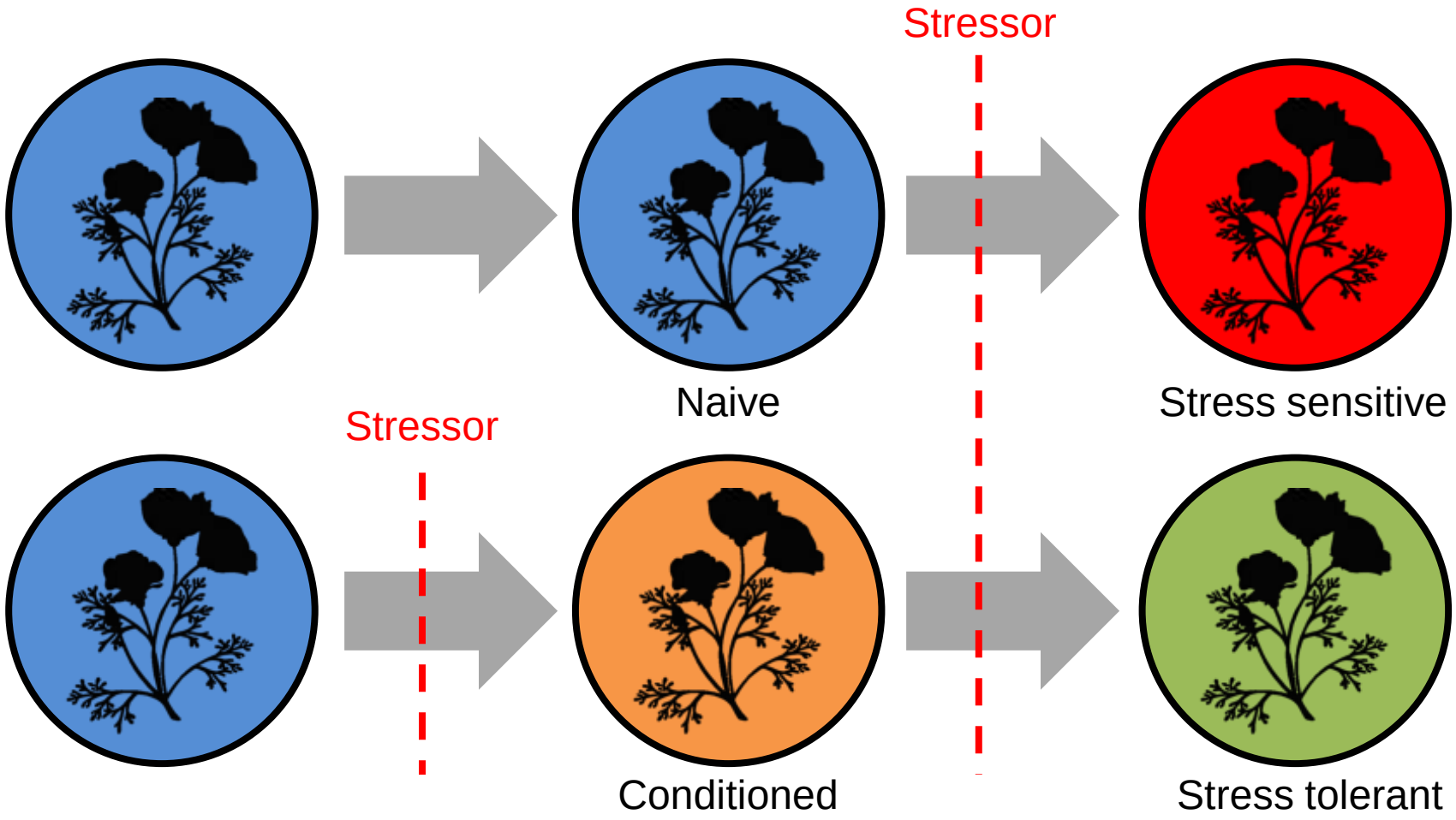
“Ecological Stress Memory”

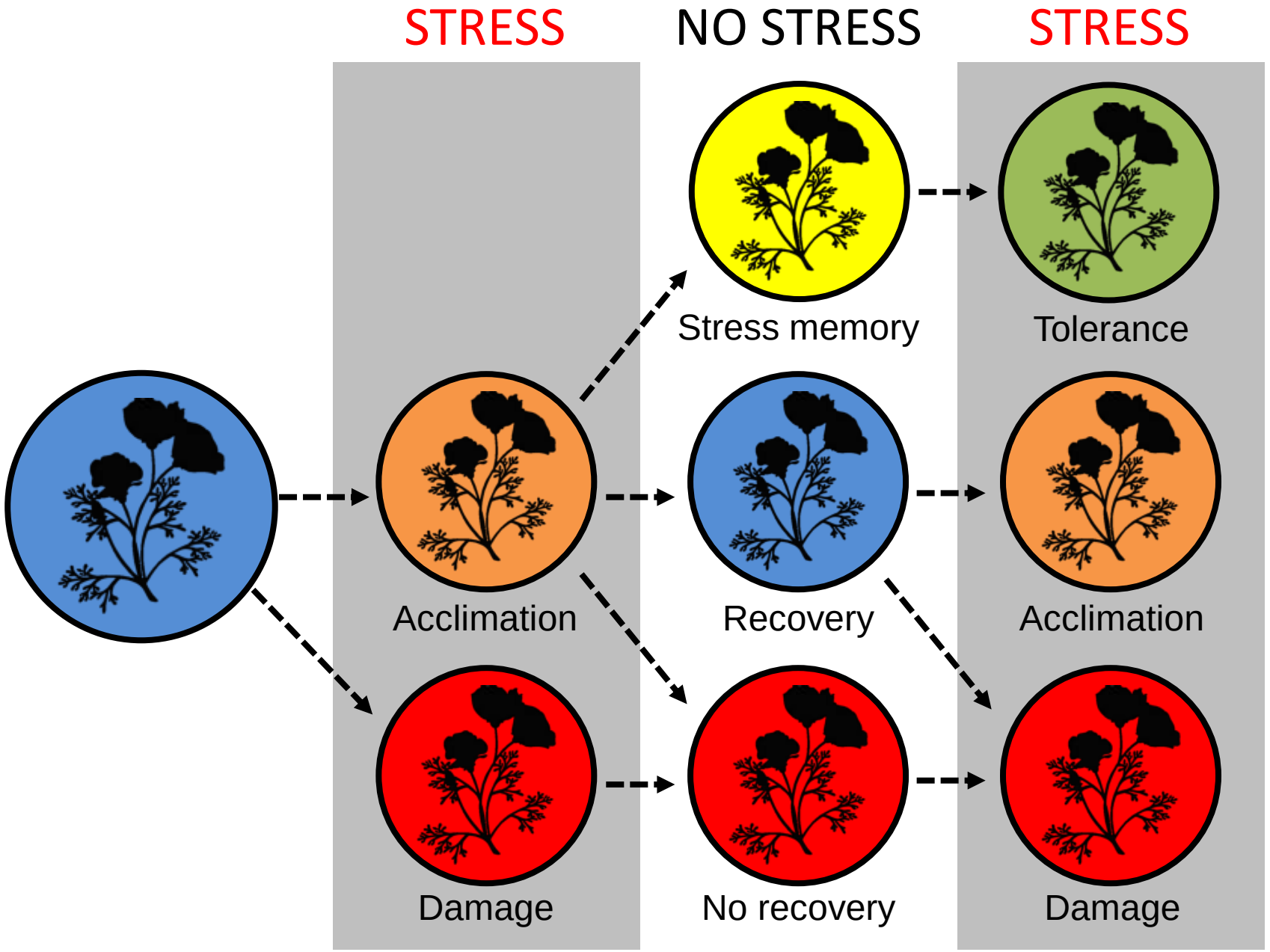


“Stress Priming/Conditioning”



“Hardening off”




STRESS
NO STRESS
STRESS
Stress memory
Tolerance
Acclimation
Recovery
Acclimation
Damage
No recovery
Damage

Can we condition plants to increase drought tolerance and improve restoration success?

Deerweed
Acmispon glaber

California Brittlebush
Encelia californica

California Poppy
Eschscholzia californica

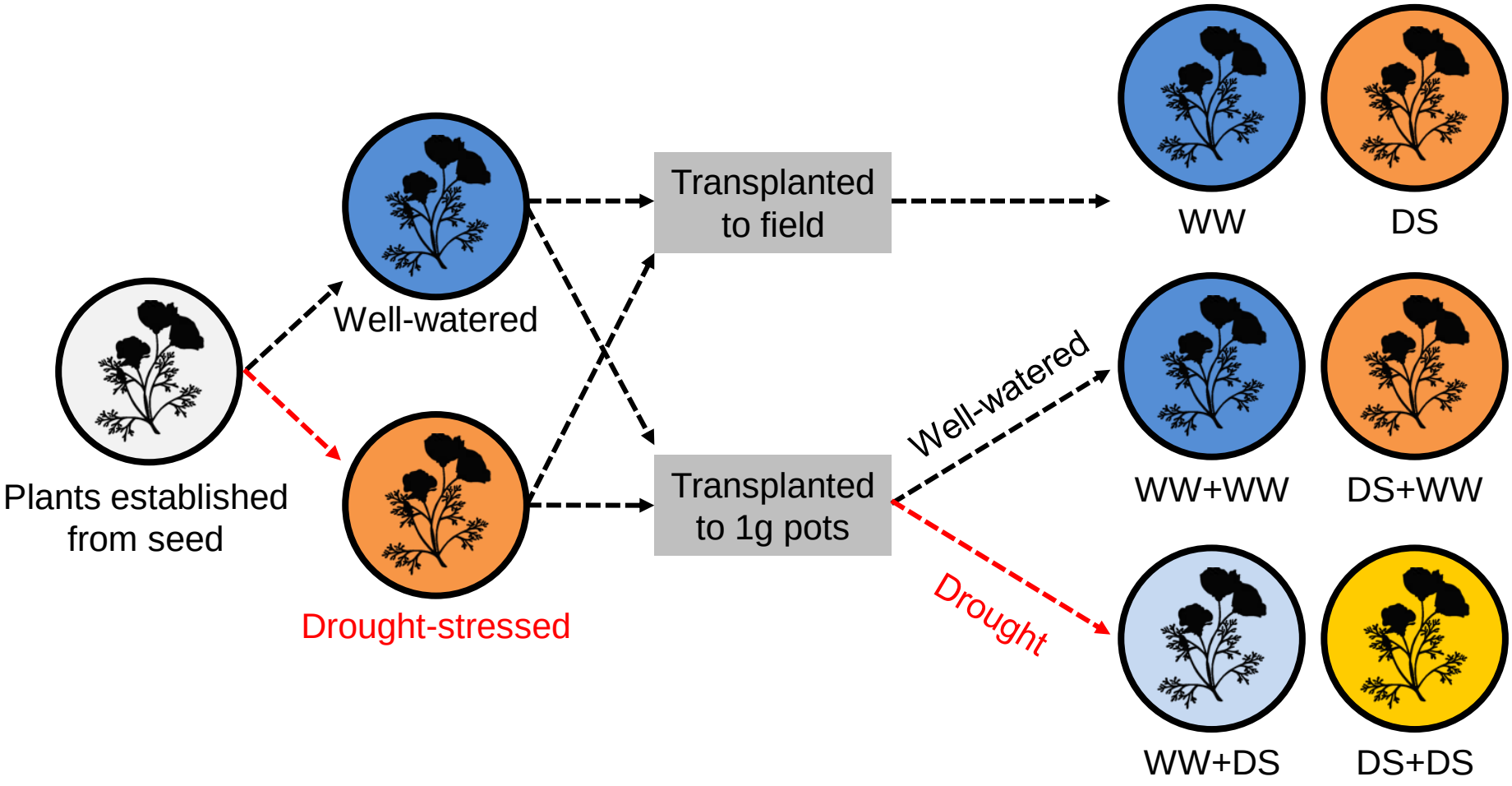
Gumweed
Grindelia camporum

Scarlet Bugler
Penstemon centranthifolius

Purple Sage
Salvia leucophylla

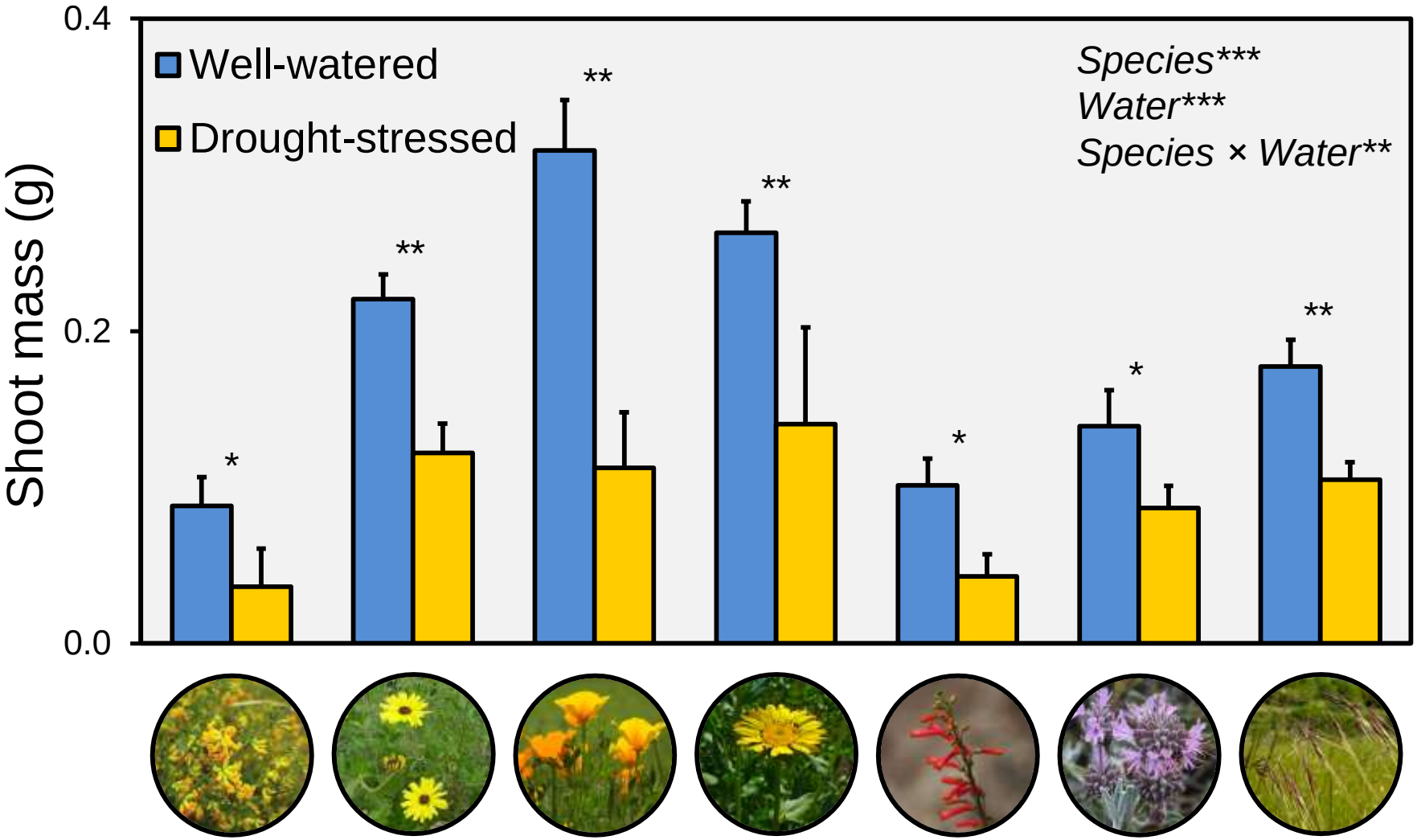
Purple Needlegrass
Stipa pulchra

Experimental Design



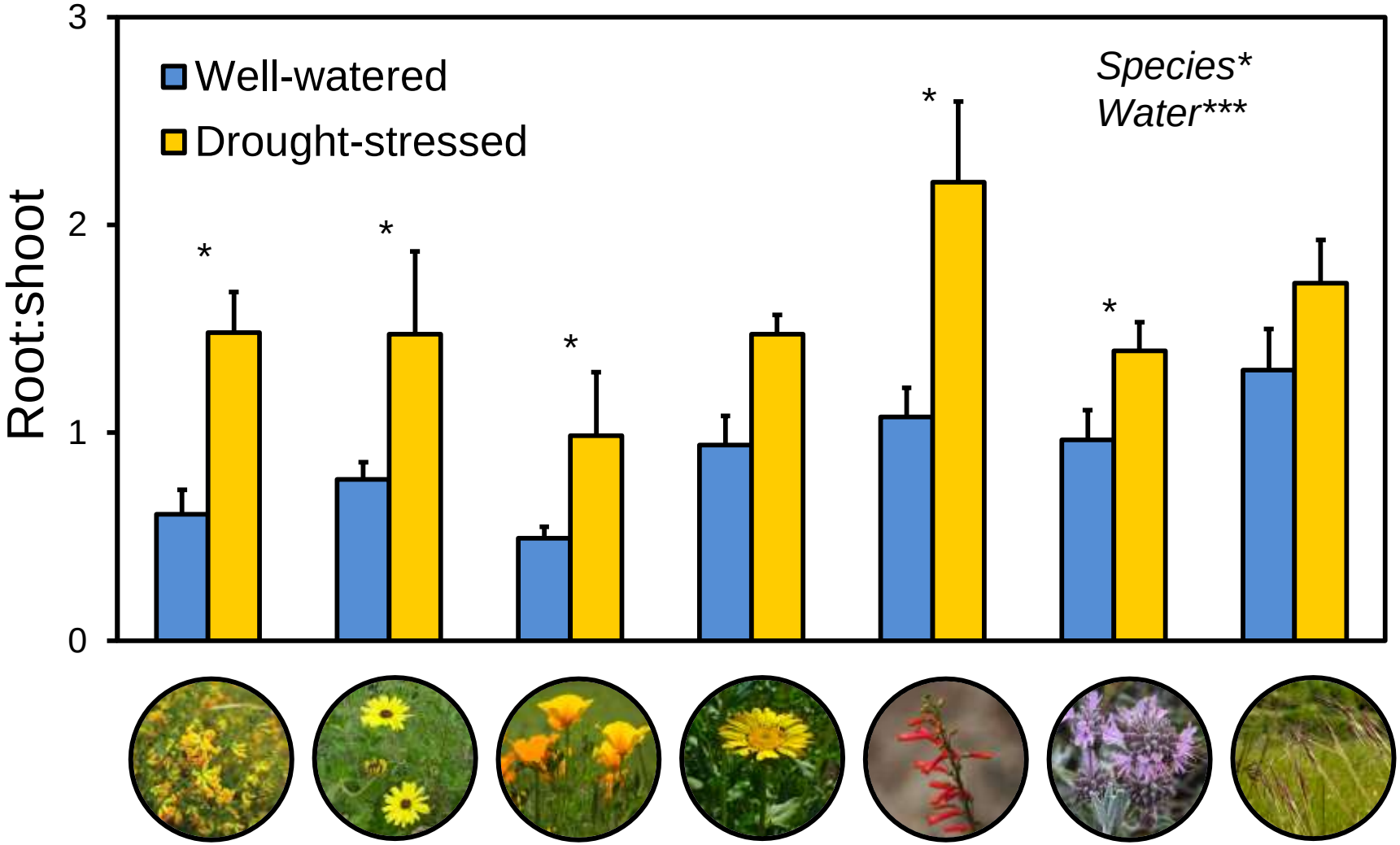
Initial Effects of Drought

↓ Shoot Biomass



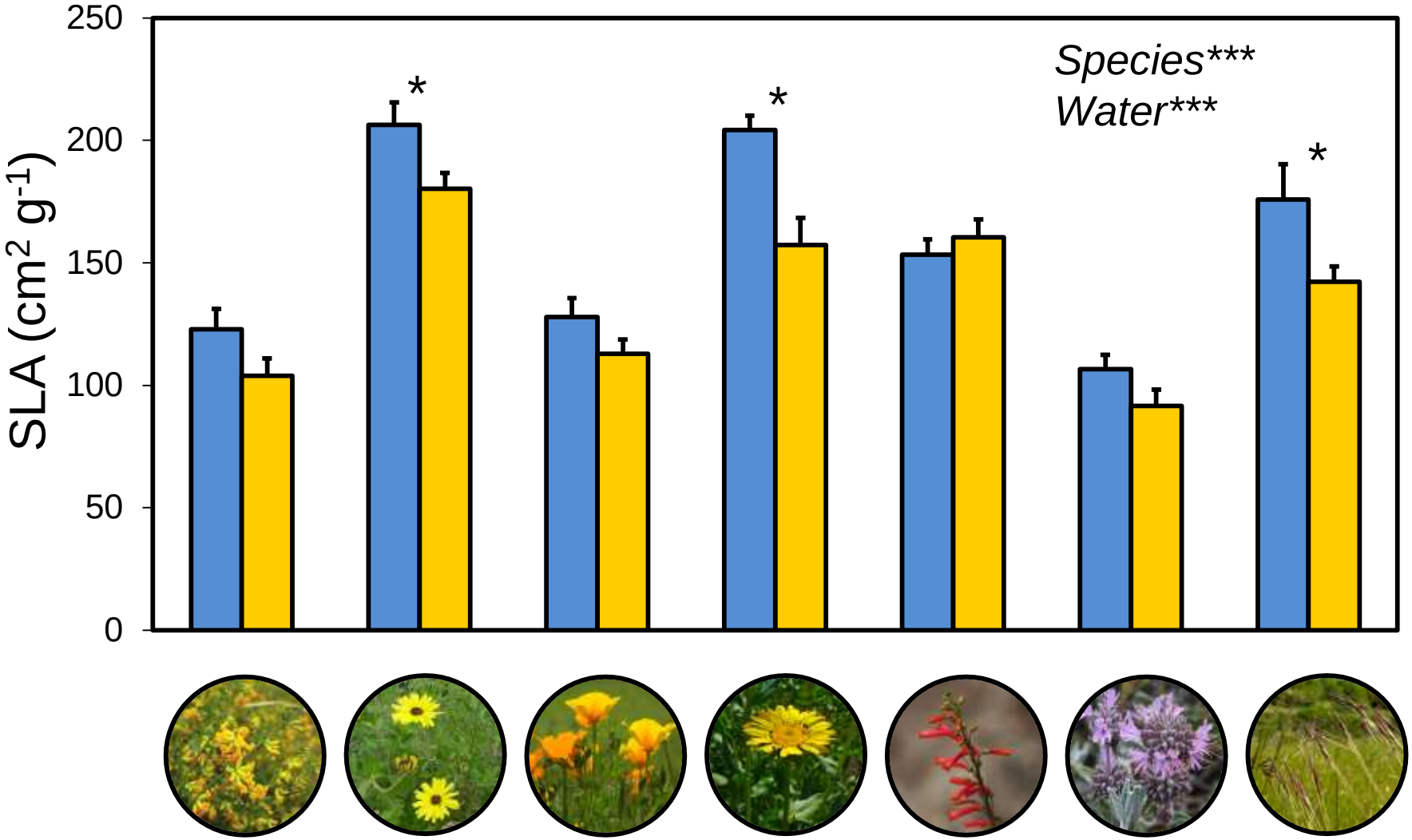
Initial Effects of Drought

↑ Root:shoot



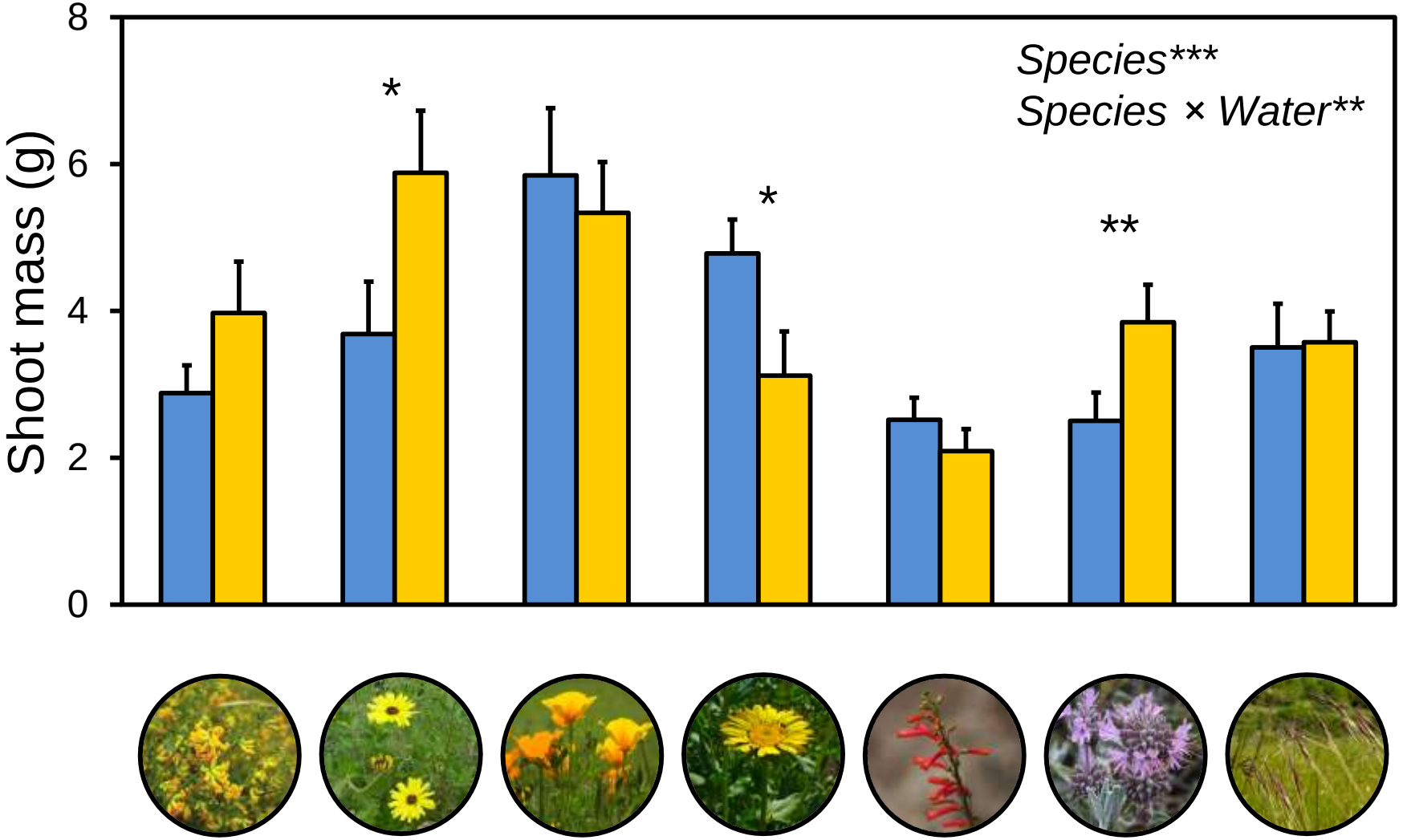
Initial Effects of Drought

↑ SLA



Performance in the field

Responses highly species-specific



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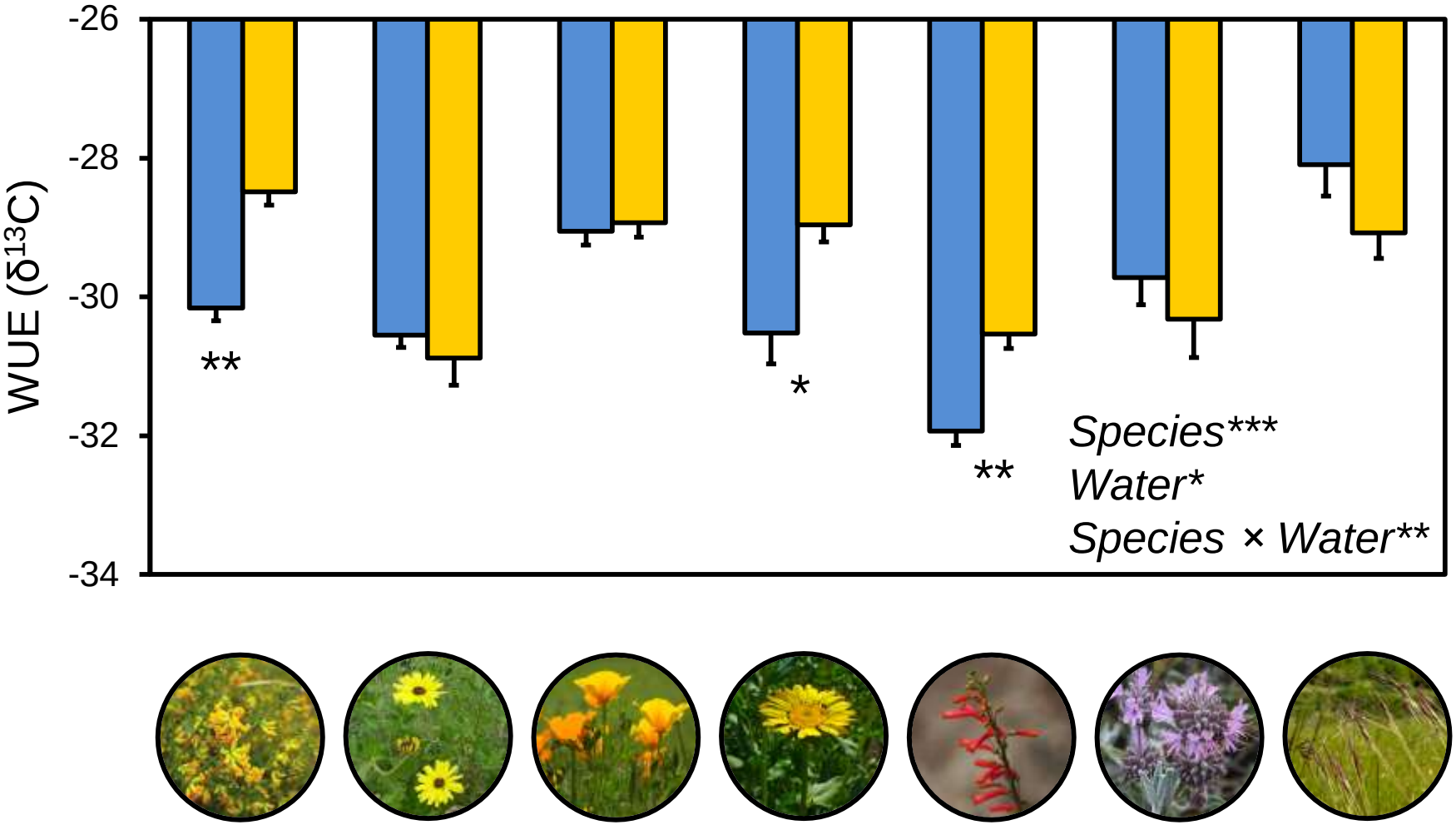


How does experimental defoliation prior to transplanting influence plant performance?

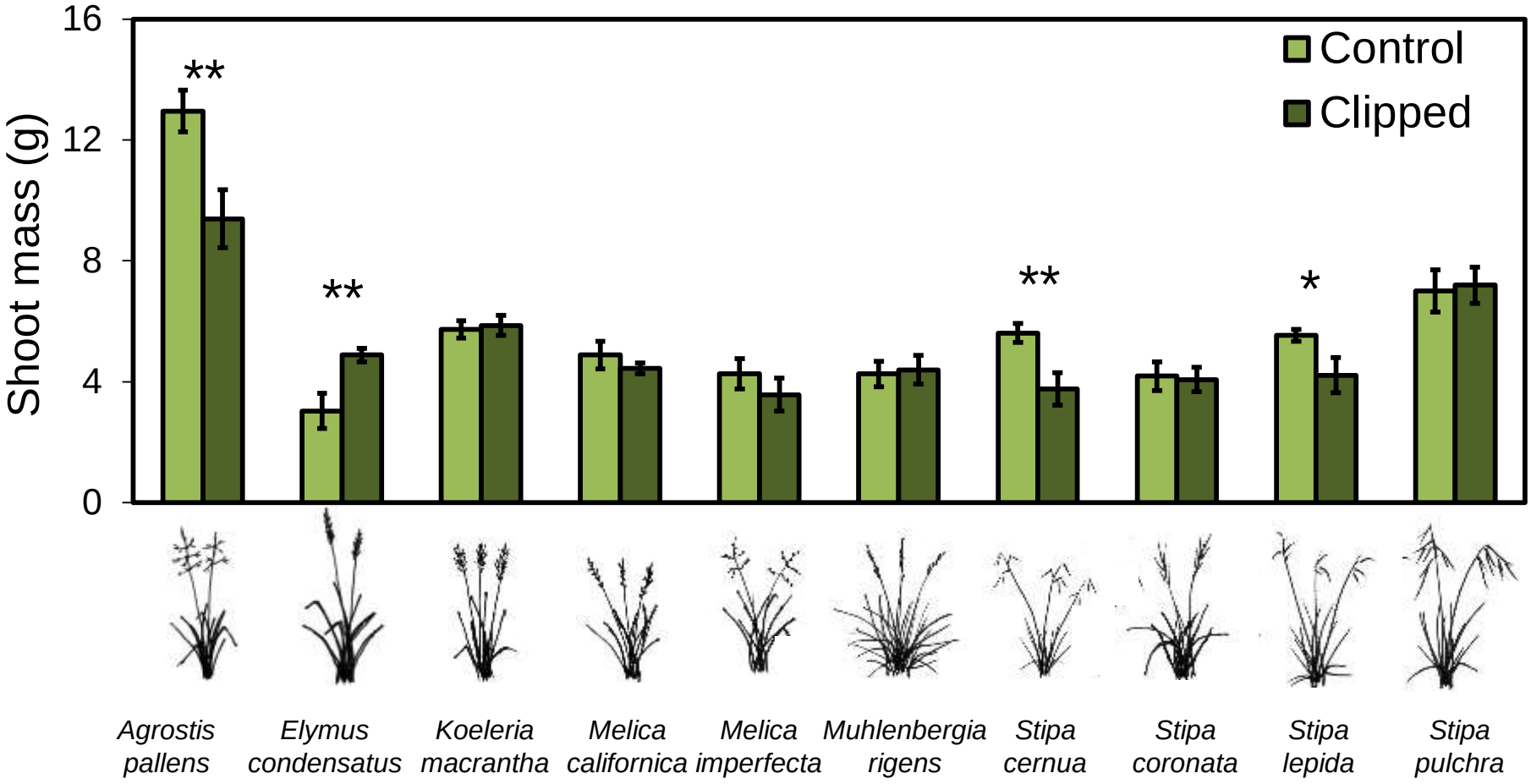
Experiment 1

- Ten native perennial grasses
- Clipped vs. control

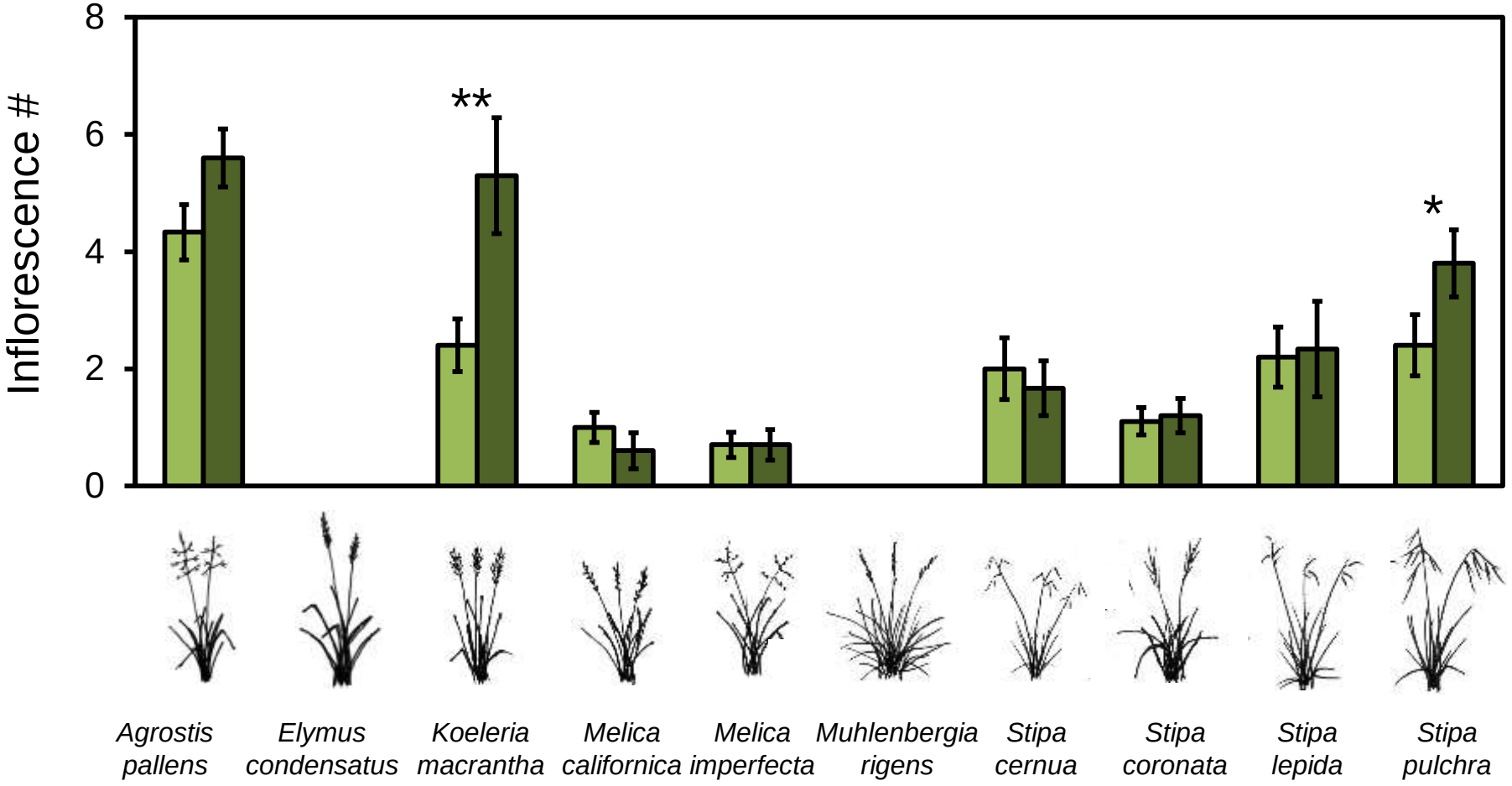
Experiment 2

- *Stipa pulchra*
- Clipped vs. control
- Exposed vs. caged

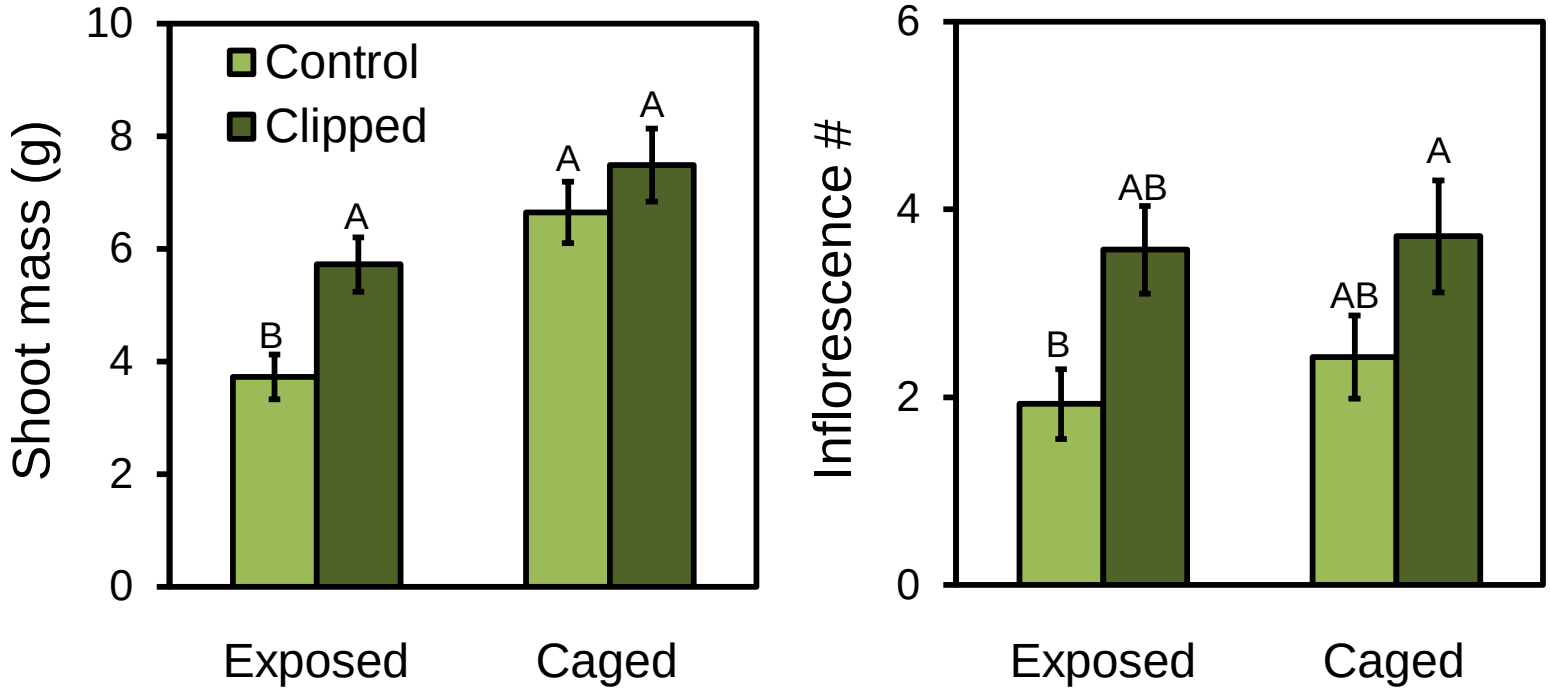
Minimal effects of clipping



Minimal effects of clipping



Benefits of clipping may depend on exposure to herbivores?



Can we condition plants to increase stress tolerance and improve restoration success?

- Maybe in some cases/species
- May depend on timing and severity of treatments
- Pilot studies may be useful to determine plant sensitivity
- Economic considerations (mortality)?