

## Utilizing pathways of invader dominance to identify natives of concern

Marina LaForgia California Invasive Plant Council Symposium October 28, 2021



## High within and between year variability



## **Invasive Grasses**

Bromus hordeaceus

Lolium multiflorum

Taeniatherum

caput-medusae

Avena fatua





Diaz et al. 2016



- Can we use functional traits to predict which species are most affected by invasive grasses?
- How can we use this information to prioritize management strategies?





- Native forbs increased in the seed bank despite no aboveground change
- Invasive grasses declined in aboveground cover and in seed bank abundance

LaForgia et al. 2018 (Ecology)



- High SLA (resource acquisitive) forbs decreased aboveground but increased belowground
- Low SLA (resource conservative) forbs did not significantly change aboveground but tripled belowground









- Why did native annual forbs increase so much in response to drought?
- Could they be responding to decreased grass competition?





## Serpentine Grasslands

#### • High in heavy metals

- Low in essential plant nutrients
- Refuge for native species
  - 255 endemic species, 192 of which are classified as rare or threatened
  - 14.7% of endemic species in California persist on serpentine



#### **Acquisitive Natives**

(High SLA, high RGR, low WUE)

### **Conservative Natives**

(Low SLA, low RGR, high WUE)



Agoseris heterophylla

Lasthenia californica

Plantago erecta

Clarkia purpurea

Calycadenia pauciflora Hemizonia congesta

#### Shelter plots

#### Watered Plots

#### **Control Plots**





Tracked germination (g), mortality (m), seed set (F) and seed carryover (s) in the soil to estimate per capita population growth rates ( $\lambda$ ) of each species

$$\lambda = s(1-g) + g(1-m)F$$



- Acquisitive natives experienced lower population growth rates with grass competition, especially under drought
- Conservative natives were less affected by grass competition



# Interactive effects of rainfall and invasive competition

- Natives are resilient to precipitation variability without invasive grass
- Interactions with grasses limit all native forbs, with stronger effects on those with resource acquisitive traits, especially under drought
- Grass makes drought worse for acquisitives and increased watering less good for conservatives

LaForgia et al. (2020) Ecology



## Effects of litter vs competition on native forbs



## Per capita population growth rates



- Litter decreased growth rates of all forbs, but with stronger effects on acquisitives
- Live grass decreased growth rates of acquisitives but had no effect on conservatives



Grasses dominate over resource acquisitive natives through both live competition and litter, but with stronger effects of litter

Litter allows grasses to dominate over more resource conservative forbs

Without invasive grasses, many of these natives can cope with extreme climate variability

## **Management Implications**

- Primary pathway of dominance is through litter, if we remove litter, natives have a better chance of recovering
- Litter removal will help all forbs, but to aid resource acquisitive forbs, live grass biomass has to be managed as well















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