



# Quantifying the impacts of invasive plants on imperiled flora: A review

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# What is a rare plant?

**A plant that is uncommon or scarce**

- X Few individuals within populations
- X Few populations across the landscape
- X Both

# What threatens rare plants?

## Development

- X Urbanization
- X Energy development
- X Infrastructure expansion



## Invasive species

- X Competition
- X Altered fire regimes
- X Changes in nutrient cycling



## Climate change

- X Changes to local conditions
- X Drought
- X Sea level rise





# Invasive plants





A white Ortho Heavy Duty Sprayer is positioned on the left side of the frame. In the center, a rectangular plot of sandy ground is defined by a white PVC pipe frame and wooden stakes. The ground is mostly bare with some sparse, dry vegetation. The text "How often do we measure impacts of invasive plants?" is overlaid in white on the image.

**How often do we measure  
impacts of invasive plants?**

# Review methods

- X Web of Science search
  - o ALL = ("plant conservation" OR "endangered species" OR "threatened species" OR "rare species" OR "non-native competition" OR "invasive plants" OR "non-native plants" OR "decline" OR "reproductive effort" OR "rare plants" OR "invasive species") AND ALL = ("rare plant" OR "rare plants" OR "rare plant species" OR "impacts of invasive plants" OR "exotic plants")

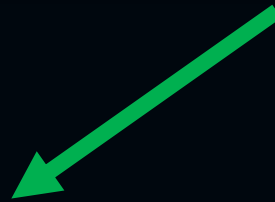
# Review methods

- X Web of Science search
  - 1,378 articles
- X Refine by topic
  - 1,204 articles
- X Refine by title
  - 146 articles
- X Refine by abstract
  - 12 articles
- X Madroño & Conservation Biology search
  - 5 articles

**Total = 17 articles**

# Documented impacts

Negative	Neutral	Positive
15	1	1



Protection from herbivores



# Documented impacts

Negative	Neutral	Positive
15	1	1

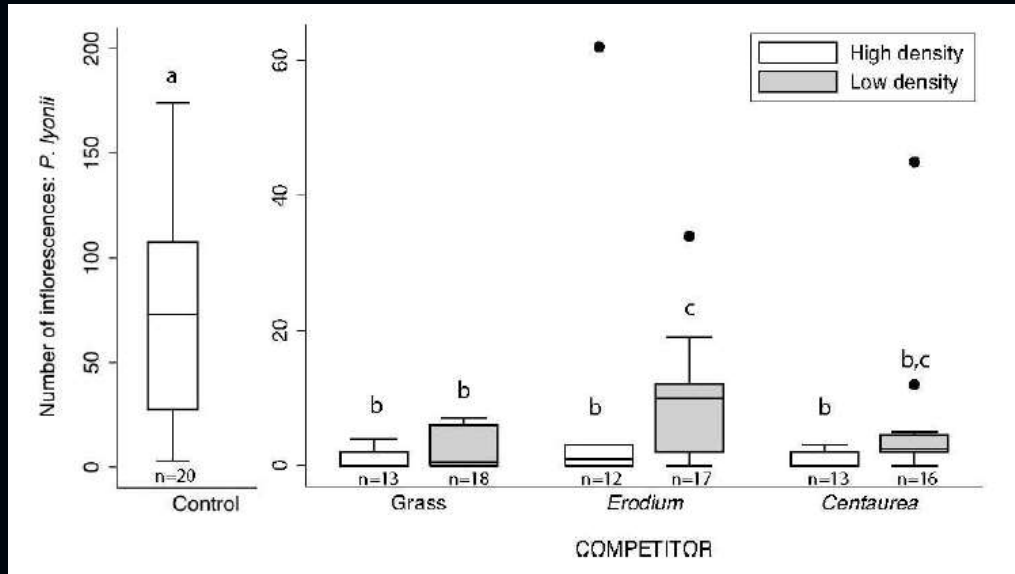
Annual forb	Perennial herb	Perennial shrub	Multi-taxa
3	12	1	1

# Negative impacts

- X Competition (9)
- X Hybridization (1)
- X Pollination/reproduction (2)
- X Shading (1)
- X Uncertain mechanism (2)

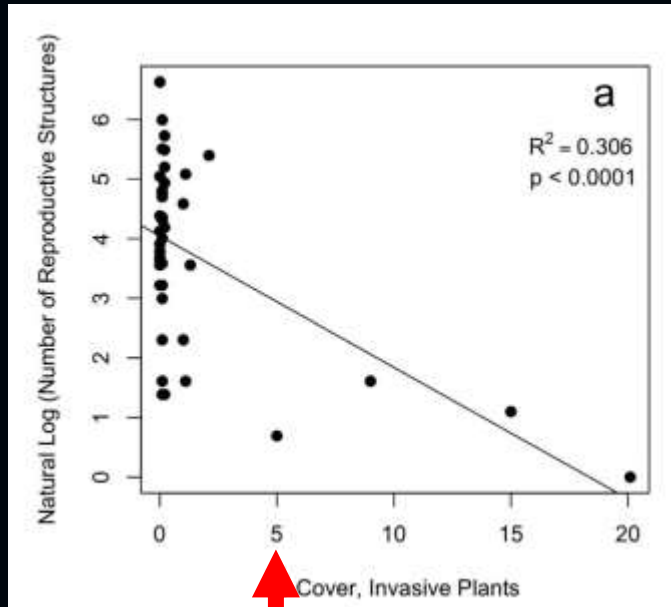
# Competition

- X *Pentachaeta lyonii* (Lyon's pentachaeta)
  - Federally & CA state endangered



# Competition

- X *Astragalus tricarinatus* (triple ribbed milk vetch)
- Federally endangered



Heintz, JGC, LC Sweet, CW Barrows. 2018. Microhabitat characteristics and impacts of invasive species for the triple-ribbed milkvetch (*Astragalus tricarinatus* [Fabaceae]) in the San Bernardino Mountains, California. *Madroño* 65: 175-183.



# Hybridization

X *Oenothera wolfii* (Wolf's evening primrose): CNPS 1B.1

X *Oenothera glazioviana*: Horticultural primrose of uncertain origins

X 5/7 populations showed evidence of introgression



# Pollination & Reproduction

X *Cirsium pitcheri* (Pitcher's thistle)

Federally threatened

X Invasives attracted more pollinators at the plot level

X Fewer pollinators visited

*C. pitcher* in the presence of invaders



# Pollination & Reproduction

X *Chloropyron maritimum* ssp. *maritimum*  
(salt marsh bird's beak)

- Federally and CA state endangered

X *Parapholis incurva* (sickle grass)  
acted as a "pseudohost"



Fellows, Meghan QN, and Joy B. Zedler. "Effects of the non-native grass, *Parapholis incurva* (Poaceae), on the rare and endangered non-parasitic, *Cerastium maximum* subsp. *maritimum* (Scrophulariaceae)." *Madroño* 52.2 (2005): 91-99.

# Invasive pollinators

- ✗ *Arctomecon humilis*
  - Federally endangered
- ✗ Altered pollinator community  
leads to decreased
- ✗ Decline and potential  
extirpation of native pollinators



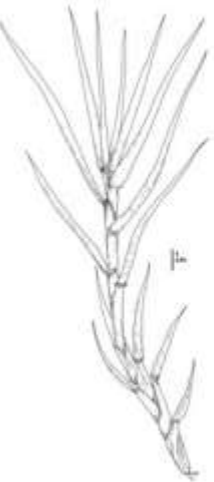
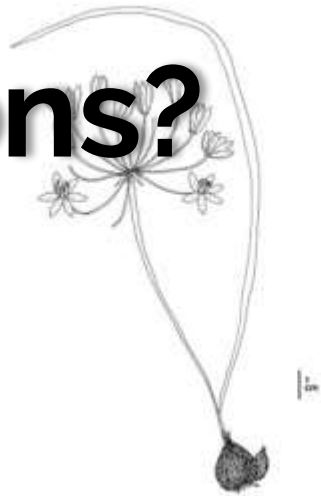
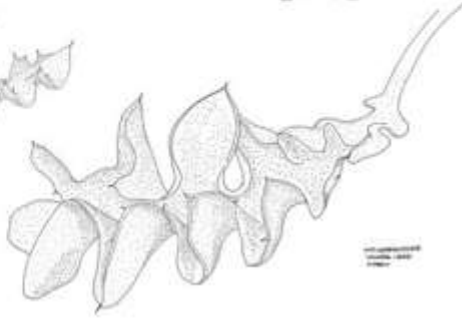
Portman, Zachary M., et al. "Local extinction of a rare plant pollinator in Southern Utah (USA) associated with invasion by Africanized honey bees." *Biological Invasions* 20.3 (2018): 593-606.



# Recommendations

- X More quantitative research
- X Look for synergistic potential with other impacts
  - o Climate change
  - o Herbivory
  - o Invasive fauna
- X Design management plans to mitigate impacts

# Questions?



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