



# Fitness and morphological variation in native, non-native, and hybrid *Echinacea* seedlings

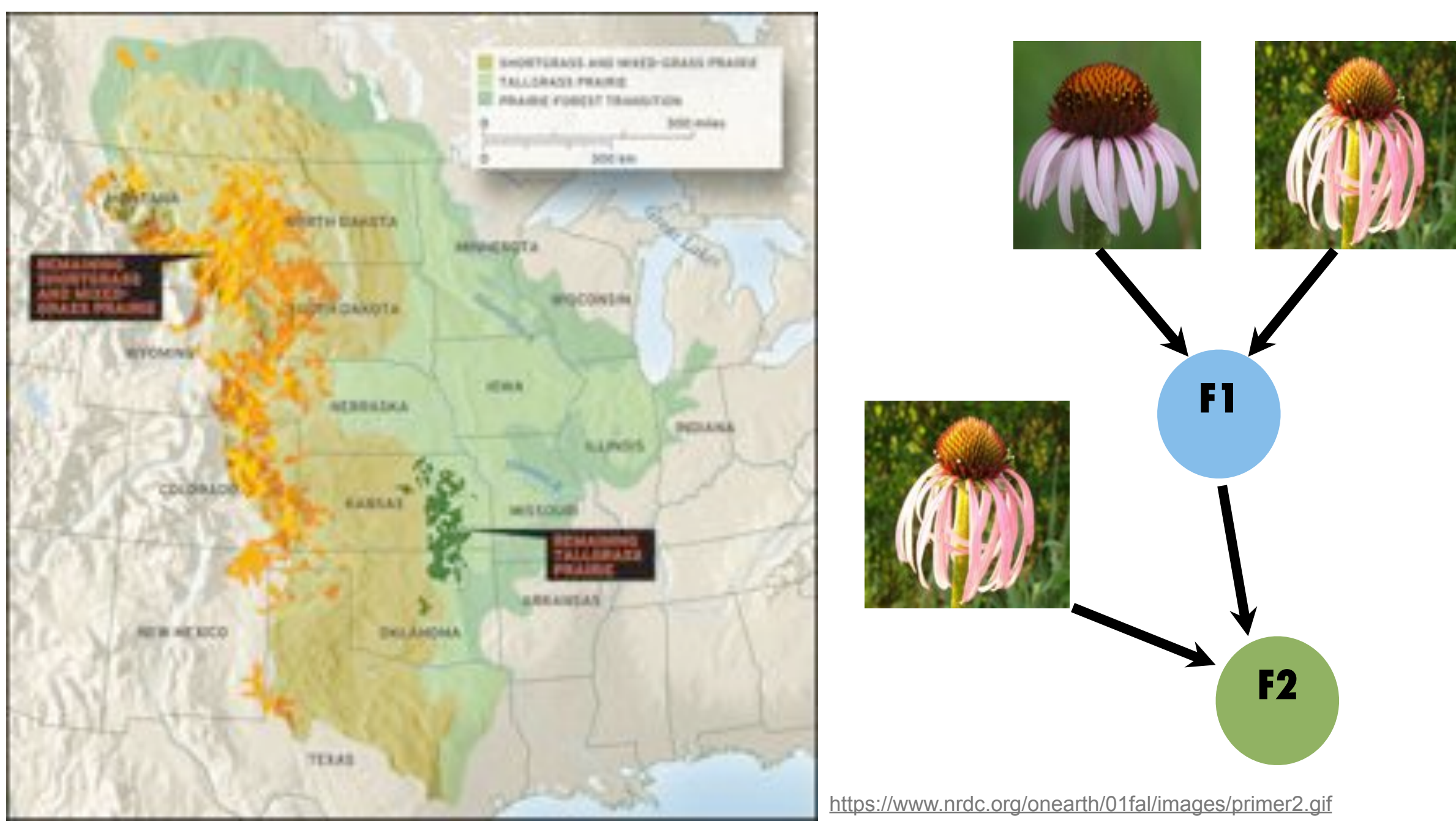
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## INTRODUCTION

*Echinacea angustifolia* is a perennial purple coneflower, native to MN, that is experiencing population declines in response to habitat loss and fragmentation. Recently, a non-native species, *E. pallida*, was introduced into prairie remnants in Kensington, MN. Hybridization and introgression by non-native species with native flora may be destructive to the genetic integrity of native populations. Adverse effects may include changes in morphological and phenotypic traits.



## HYPOTHESIS

The F1 generation from the four crosses will exhibit variation in survival, emergence, cotyledon characteristics, and first true leaf early in seedling growth.

### PRE-GERMINATION

### GERMINATED ACHENES

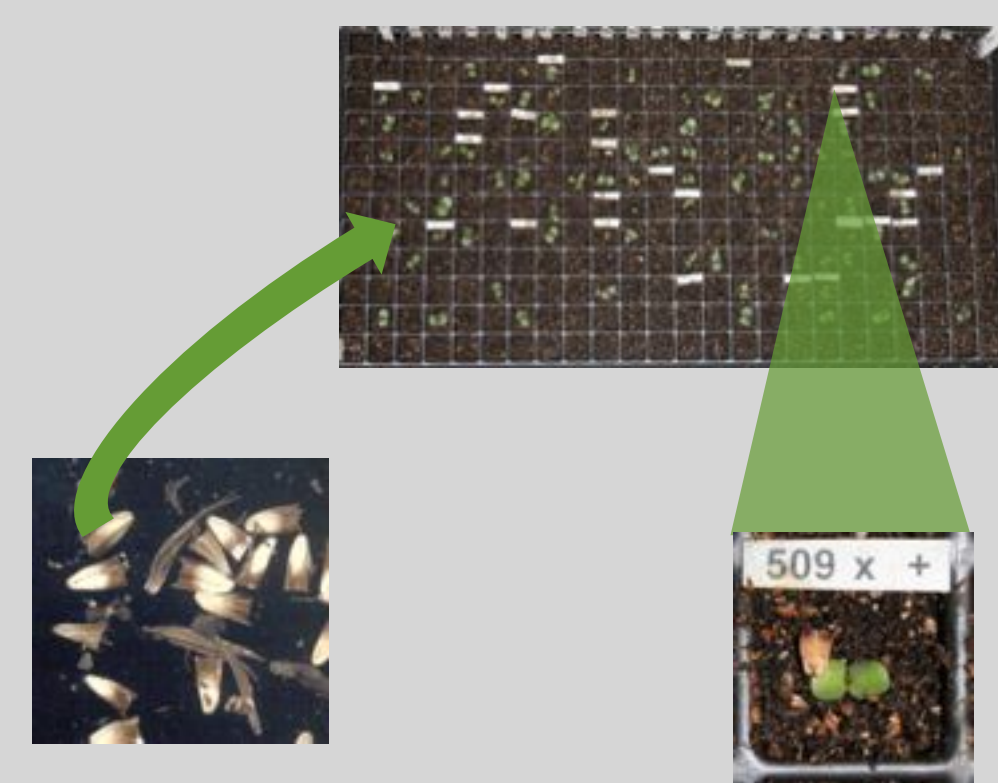
### PLANTED ACHENES

### MEASUREMENTS

### ANALYSIS

## METHODS

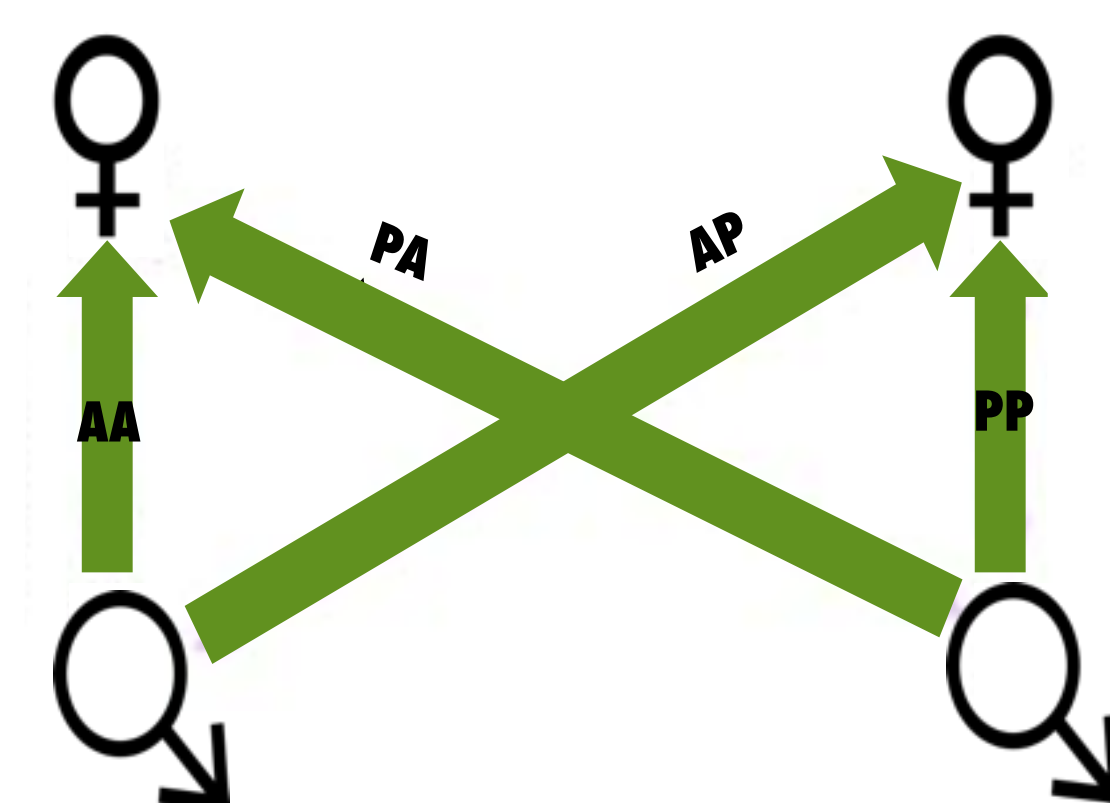
- Kensington, MN
- Part of a previous experiment
- 515 Achenes
- 4 cross types



NATIVE



NON-NATIVE



## RESULTS

A)

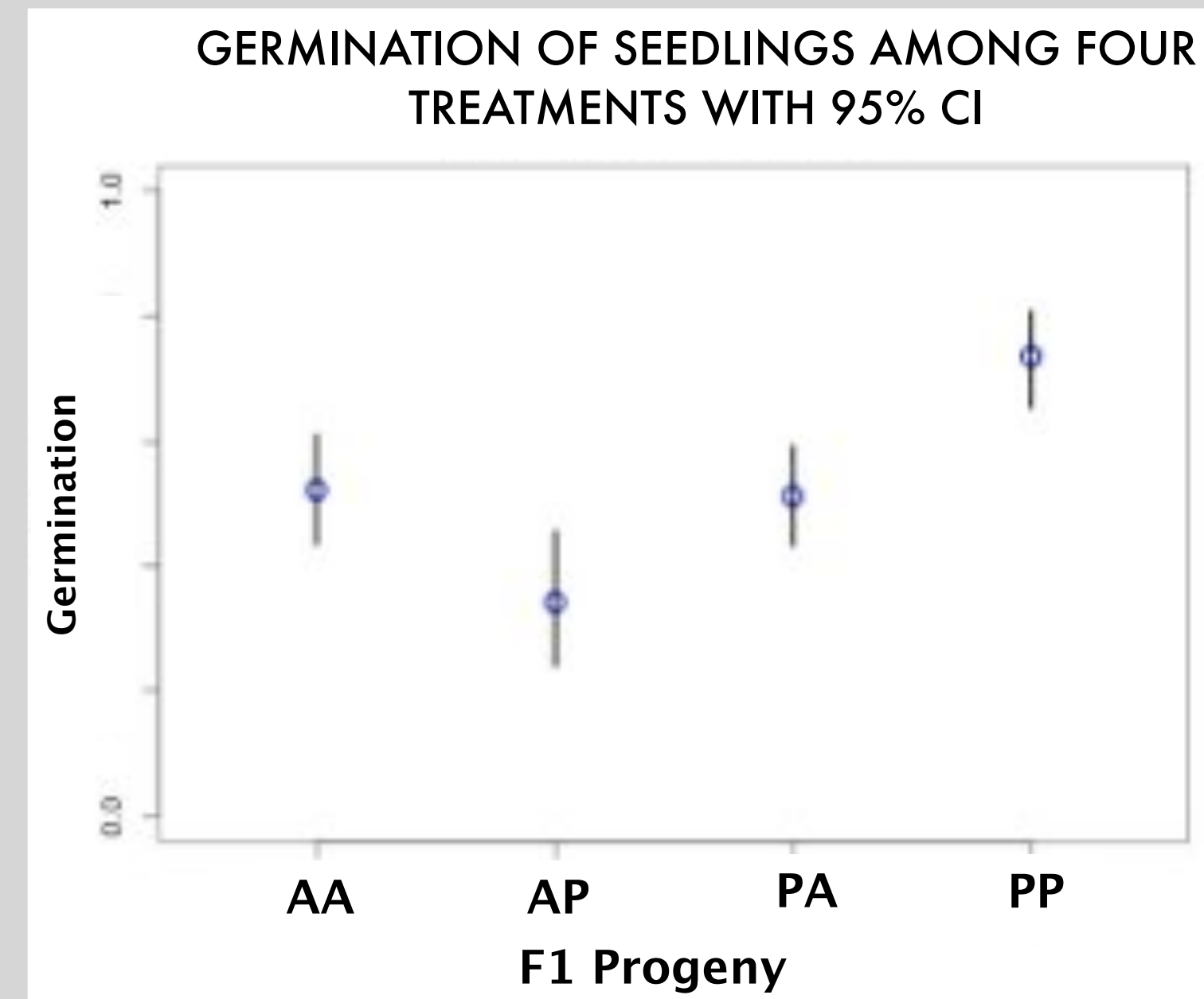


Figure 1. Total emergence of each of the four cross types (n=515, p<0.001). Total emergence included seedlings that emerged at any point in the experiment.

B)

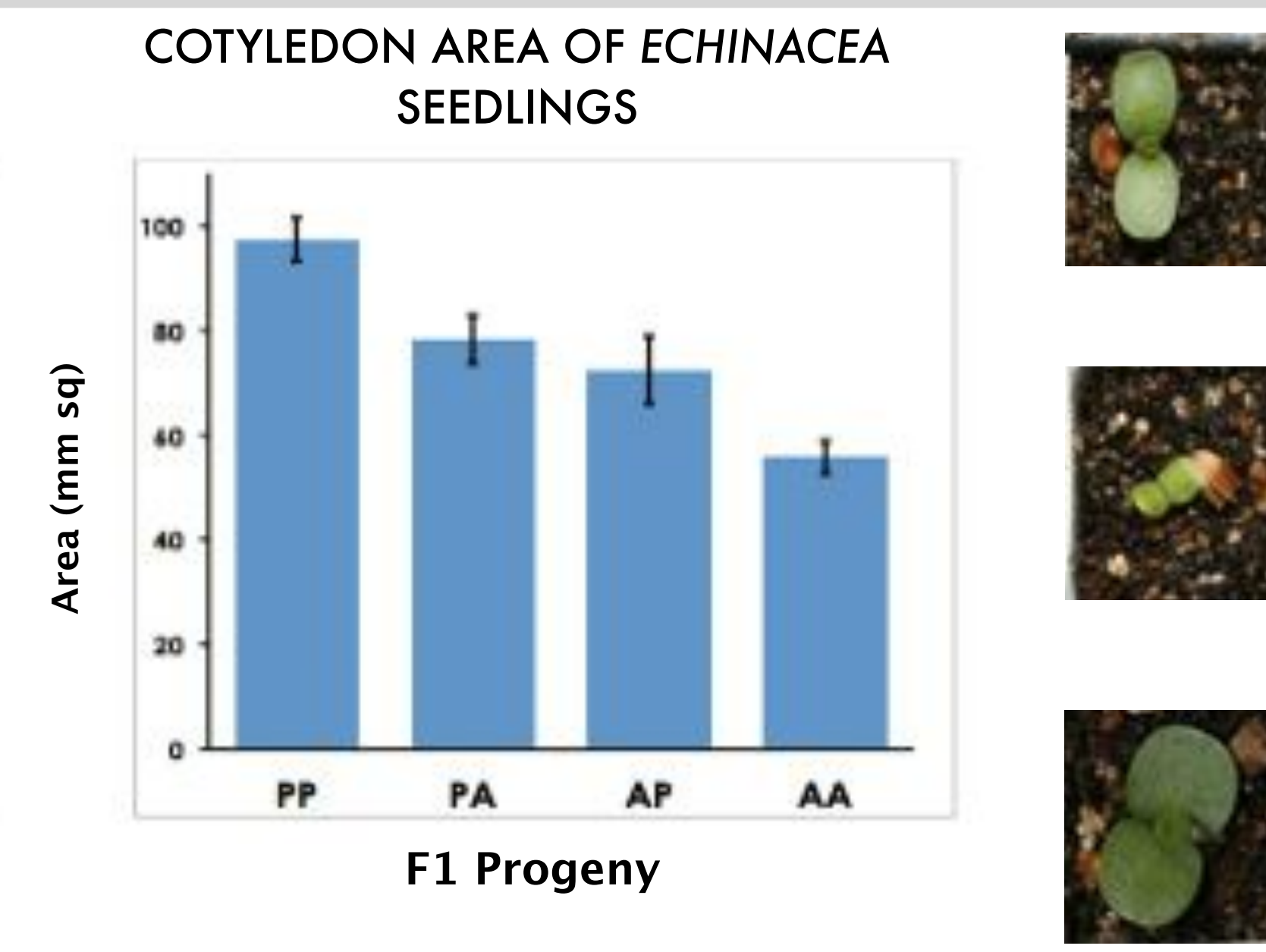


Figure 2. Mean cotyledon area of each of the four cross types (p<0.0001). Graphs for other cotyledon measurements showed similar results.

C)

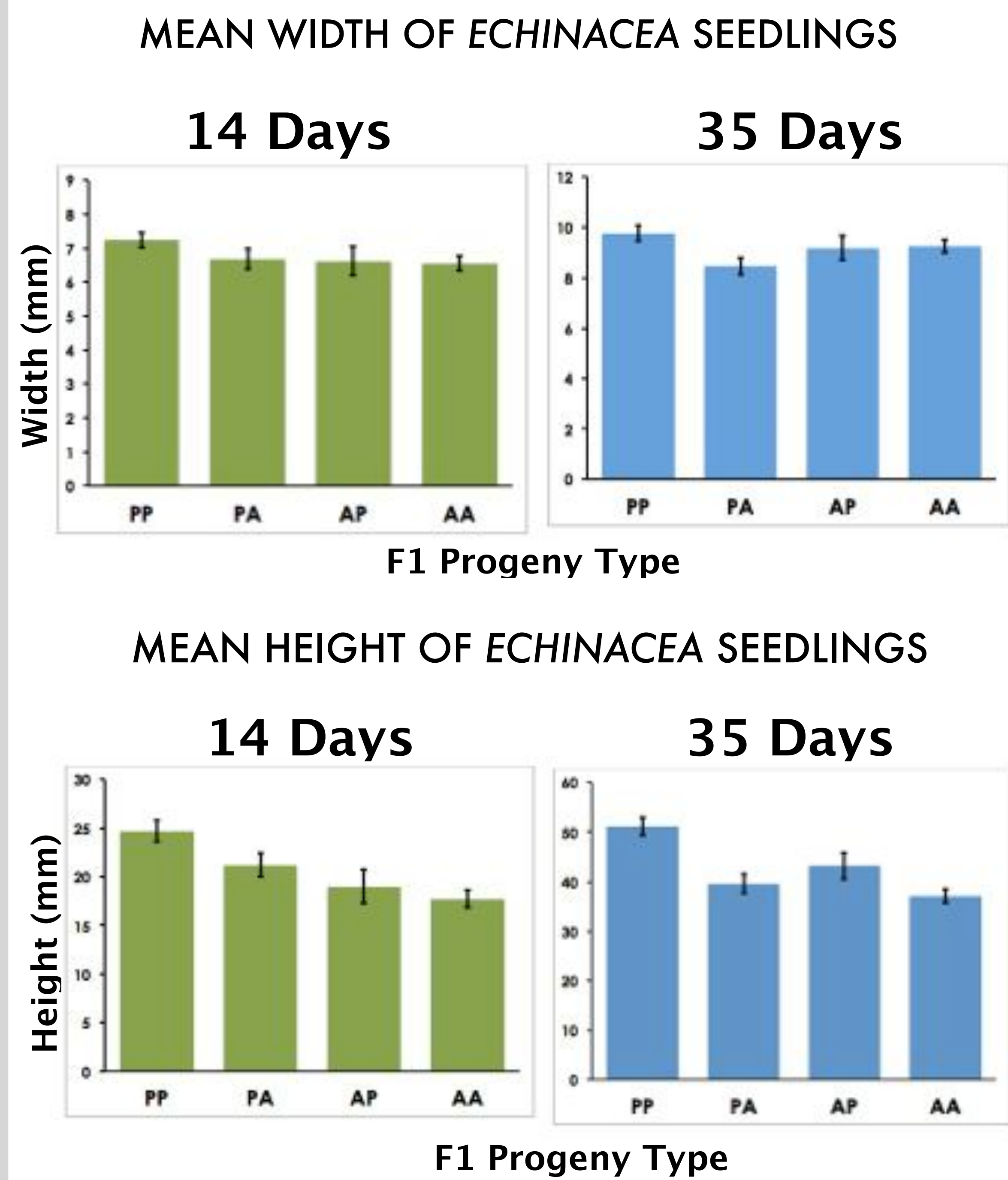


Figure 3. Mean heights and widths of first true leaf of F1 progeny at two ages based on a linear model in ANOVA (n=276 or 278). **Top** Mean width of seedlings at 14-days-old (p = 0.01983 ) and 35-days old ( p < 0.001 ). **Bottom** Mean height of seedlings at 14-days-old ( p < 0.001 ) and 35-days-old ( p < 0.001 ).

## DISCUSSION

- No apparent difference between exchange of maternal or paternal characteristics
- Different crosses show differences in morphology
- PP may be a good competitor
- Potential for introgression
- Applies to early growth

NON-NATIVE → NATIVE

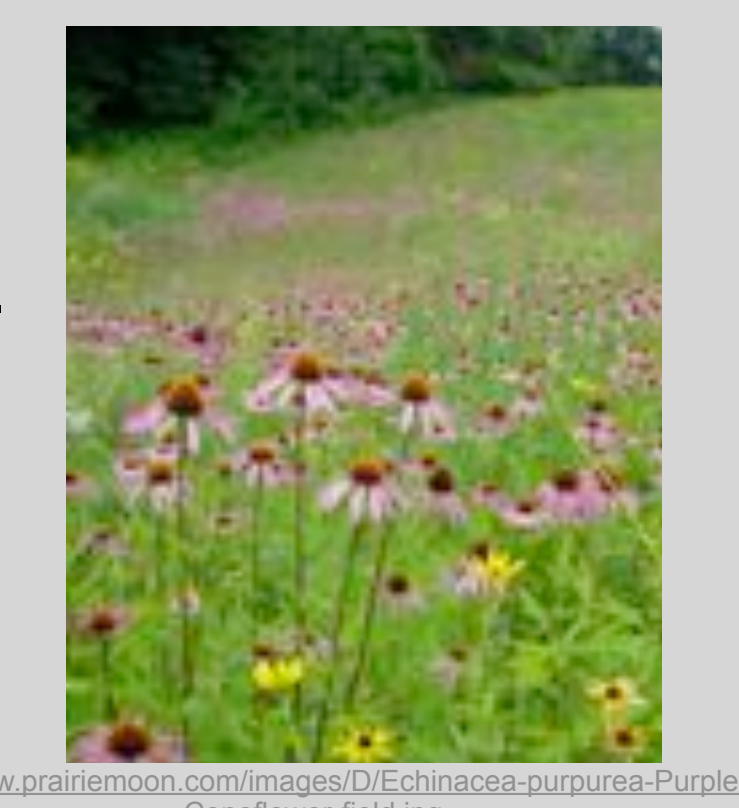
## FUTURE STUDIES

- Planted summer 2013
- Track growth and survival of individual plants
- Measure differences in morphology and survival from early growth to maturity
- Additional morphological characteristics:
  - Ray Length
  - Trichome abundance
  - Flower color
  - Flowering time



## CONSERVATION IMPLICATIONS

- Can be applied to other habitat types
- Good model species
- Interconnectedness of habitat size, non-native species, and hybridization
- Competition is a major effect of non-native introductions, strengthened by fragmentation



## REFERENCES

Rhymer, J. M., & Simberloff, D. (1996). Extinction by hybridization and introgression. *Annual Review of Ecology and Systematics*, 83-109.

Ramirez-Rodríguez, R., Tovar-Sánchez, E., Jimenez Ramirez, J., Vega Flores, K., & Rodríguez, V. (2011). Introgressive hybridization between *Brahea dulcis* and *Brahea nitida* (Arecaceae) in Mexico: evidence from morphological and PCR-RAPD patterns. *Botany*, 89(8), 545-557.

Wagenius, S. (2006). Scale dependence of reproductive failure in fragmented *Echinacea* populations. *Ecology*, 87(4), 931-941.

## ACKNOWLEDGMENTS

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