Temporal patterns of and relationships between floral color and phylogenetics in North American wildflower communities

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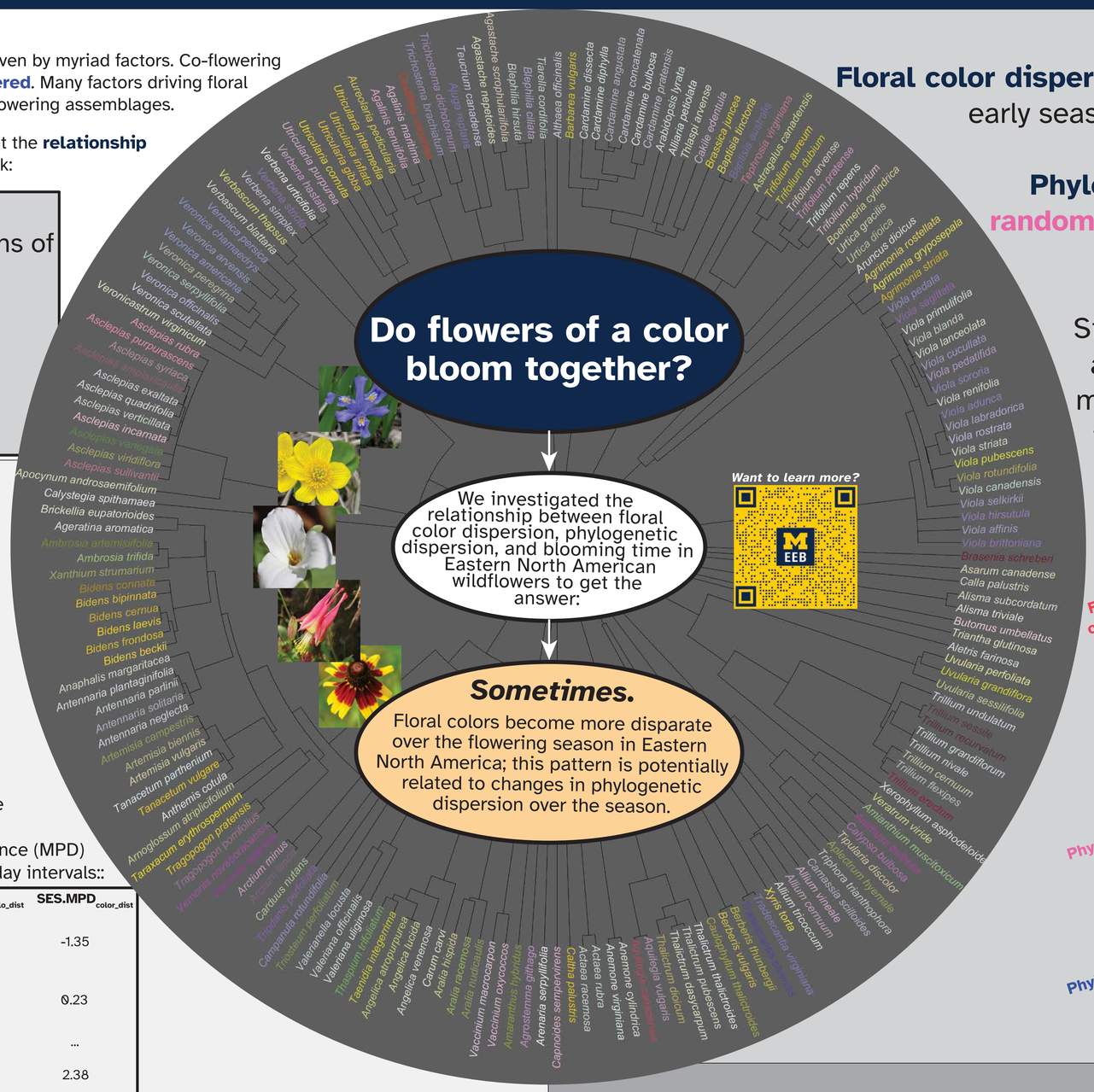
Background

Floral color assemblage in wildflower communities may be driven by myriad factors. Co-flowering assemblages are hypothesized to be **phylogenetically clustered**. Many factors driving floral color may **interact** with the phylogenetic composition of co-flowering assemblages.

As abiotic & biotic factors **vary over the season**, so too might the **relationship** between floral color and phylogenetics in assemblages. We ask:

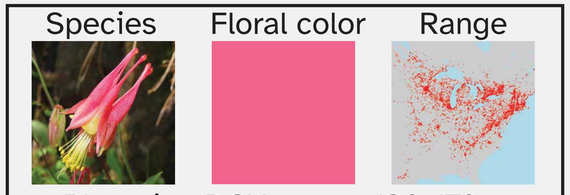
Q1: In common Eastern North American wildflowers, what are the **temporal** patterns of
- **a) phylogenetic** diversity?
- **b) floral color** diversity?

Q2: Is there a **correlation** between floral color dispersion and phylogenetic dispersion?



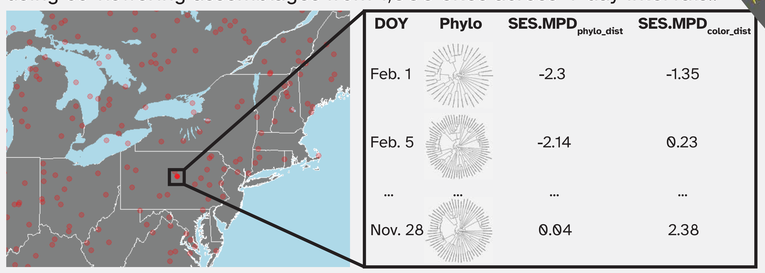
Methods

For 985 species of common **Eastern North American wildflowers**, we collected the following data:



To compare floral colors, we calculated
Floral color dissimilarity$_{sp1,sp2}$ =
Euclidean distance in HSL colorspace

We calculated dispersion metrics using mean pairwise distance (MPD) using co-flowering assemblages from 1,000 sites across 4-day intervals::



DOY	Phylo	SES.MPD$_{phylo_dist}$	SES.MPD$_{color_dist}$
Feb. 1		-2.3	-1.35
Feb. 5		-2.14	0.23
...	...	...	...
Nov. 28		0.04	2.38

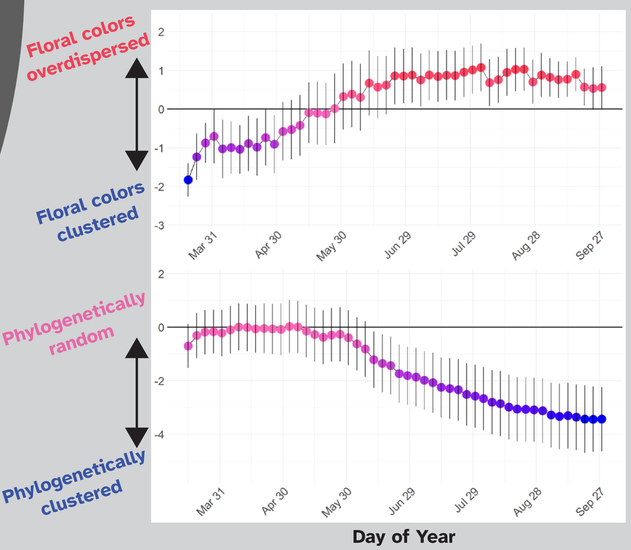
We designed a generalized linear mixed model:
floral color dispersion ~ phylogenetic dispersion + (1 | site) + (1 | day of year) + spatial autocorrelation + temporal autocorrelation

Results: Q1

Floral color dispersion transitions from **clustered** in the early season to **overdispersed** later in the year.

Phylogenetic dispersion transitions from **random** in the early season to **very clustered** later in the year.

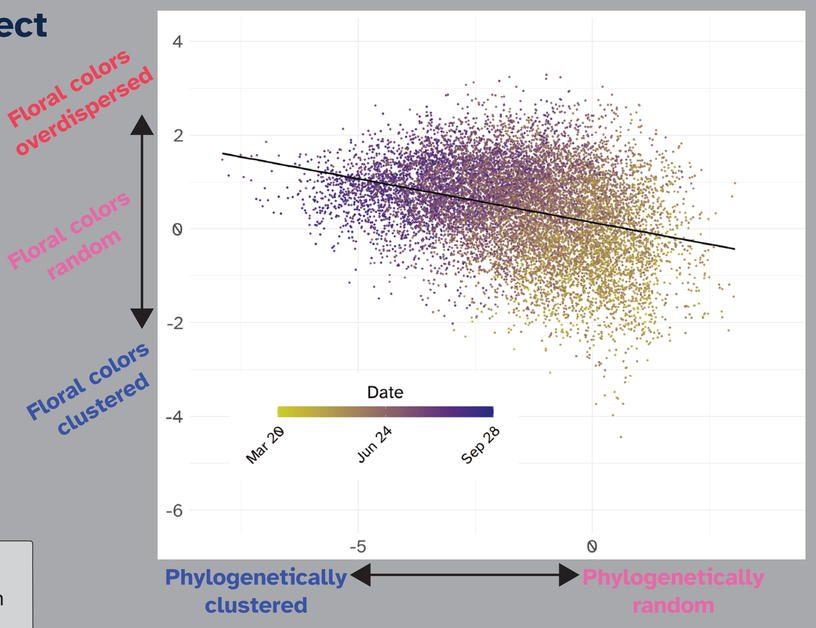
Side by side, it seems that when groups are more **closely related**, they display more **disparate floral colors**. This may indicate diverging floral color between close relatives generates prezygotic isolation and floral color diversity.



Results: Q2

Our mixed model reveals a small, **significant negative effect** of phylogenetic dispersion on floral color dispersion with strong temporal autocorrelation.

Effect size: -0.11
95% CI: [-0.13, -0.10]



Discussion

Q1) Floral color and phylogenetics show **strong temporal patterns** potentially linked to pollinator diversity or seasonal weather. Further research is needed.

Q2) Co-flowering assemblages with more close relatives display more disparate floral colors. **Divergent floral color** between co-flowering close relatives may be key in generating floral color diversity locally and globally. Floral color may also be a key floral trait generating prezygotic isolation.

Future studies should evaluate these patterns at this scale using **pollinator vision.**

Acknowledgements

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