Boosting forage for bees in three regions of California almond production

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Background

Almond production relies on robust bee populations, yet bee keepers and researchers have identified lack of diverse nutrient sources as a primary threat to bees. Habitat plantings are increasingly used to boost forage for honey bees, and several interconnected issues remain to be resolved in this approach: (1) Data are lacking on effectiveness of various plant options for supporting bees in the orchard context (2) Bee use of plantings has not been tested across regions, (3) Potential for forage enhancements to impact almond pollination through competition for pollinators has not been explored.

Development of reliable wildflower mixes to support almond pollinators is part of an ongoing **Integrated Crop Pollination project** (ICP). ***icpbees.org***

Goals

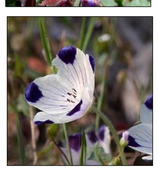
1. Quantify bloom phenology of different wildflower species known to be attractive bees in all three regions of almond production in California
2. Test performance of mixes in alternative planting contexts within the almond farm landscape
3. Measure bee use of mixes and specific flower species before, during, and after almond bloom
4. Quantify competition for pollinator visitation between flower plantings and orchard.

Wildflower Mix

Great valley phacelia
Phacelia ciliata

California blue bell
Phacelia campanularia

Baby blue eyes
Nemophila menziesii



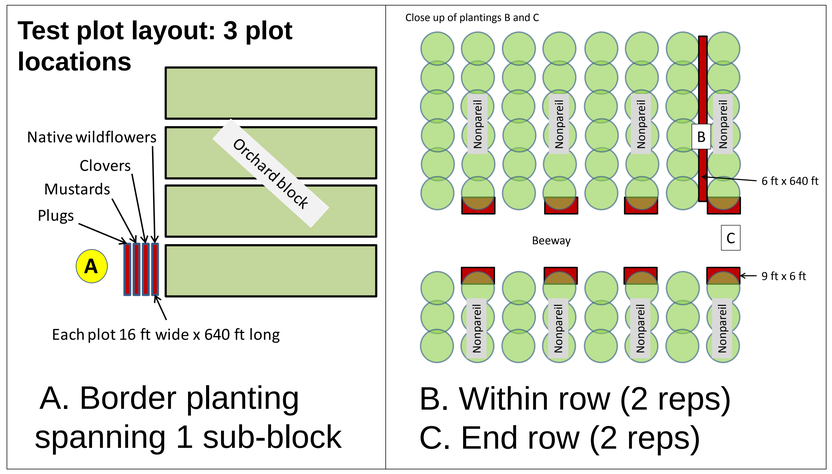
Five spot
Nemophila maculata

California poppy
Eschscholzia californica

Chinese houses
Collinsia heterophylla

We gratefully acknowledge support of the *Almond Board of California*.

Previous results (2013-14)

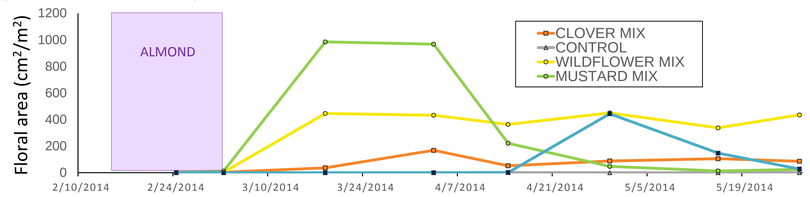


A. Border planting spanning 1 sub-block

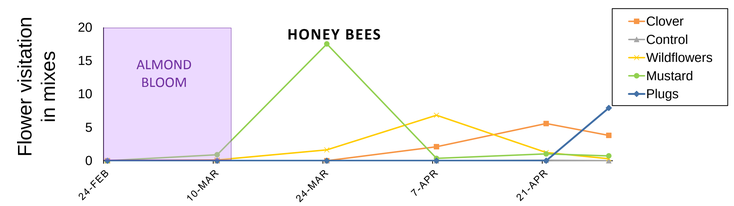
B. Within row (2 reps)
C. End row (2 reps)

Planting locations performed very differently. Only border plantings provided sufficient flower resources.

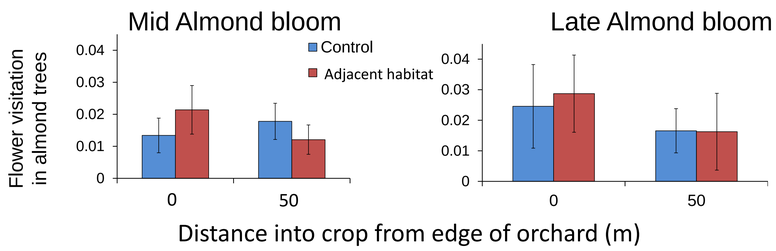
Floral display of all mixes were delayed by fall drought and cold winter. Mustard and wildflower mix bloomed strongly in early spring. Wildflowers and clover persisted longer.



Bee visitation to mixes, pooled over all treatments

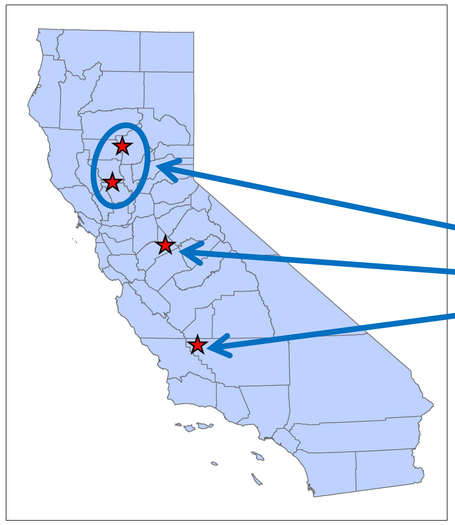


Honey bee visitation to almond orchard adjacent vs. without flower strips. Mixes did not compete with almonds for visits. Note: phenology delayed (above)



This work forms part of ongoing collaboration with PAm.

Ongoing research



Expanding assessment to three regions of almond production

- **Northern**: 5 sites
- **Central**: 3 sites
- **Southern:** 3 sites

Methods

- All sites were planted with wildflower mix October through November 2015
- We will work with PAm to identify nearby sites **in the Northern region** planted with mustard and clover mixes
- We will monitor plant establishment in mid-January 2016 , and floral densities of each species bi-weekly from January through March
- We will monitor bee use of plantings on the same days we assess floral resources
- We will assess the potential for competition in each region and with each floral mix in the northern region, with weekly samples of bee visitation to almond orchards next to habitat compared to orchards without habitat.

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