Boosting forage for bees in regions of almond production

Neal M. Williams, Kimiora L. Ward, Staci N. Cibotti

Department of Entomology and Nematology, University of California - Davis

Background

Almond production relies on robust bee populations, yet bee keepers and researchers identify the lack of diverse nutrient sources as a primary threat to bees. Habitat plantings are used to boost forage resources for honey bees; however, several interconnected issues remain to be resolved in this approach. (1) Few data exist on the effectiveness of various plant options for supporting bees in the orchard context. (2) Bee use of plantings has not been thoroughly tested in northern regions of almond production. (3) Potential for habitat plantings to impact almond pollination through competition or facilitation of pollinators has not been explored.

Goals

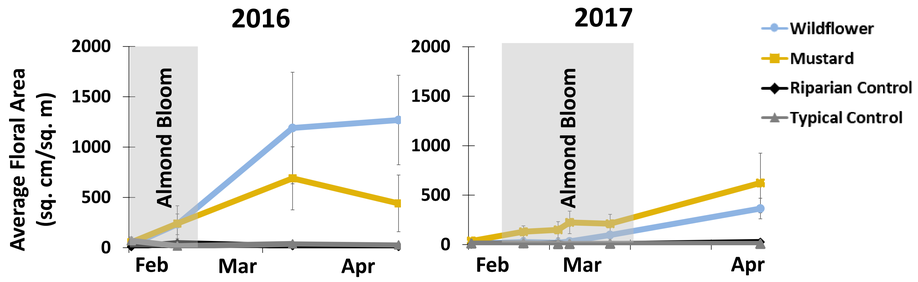
1. Quantify bloom timing of wildflower and mustard forage plantings in Central and Northern California regions of almond production.
2. Measure honey bee and wild bee use of forage plantings before, during, and after almond bloom.
3. Quantify competition for pollinator visitation between flower plantings and orchard.

Summary

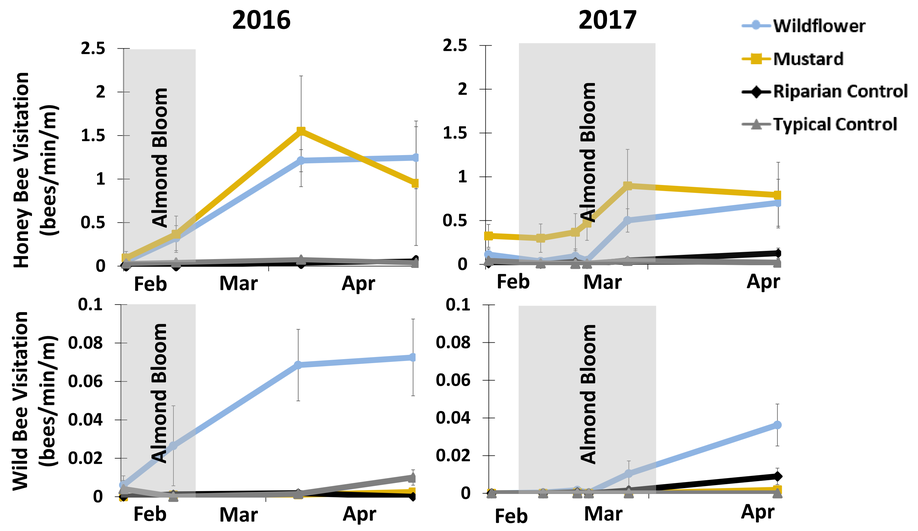
1. Wildflower and mustard plantings outperformed control borders and provided resources to bees during and after almond bloom without detracting from visitation to the orchard.
2. Annually reseeded mustard plots had higher floral resources and honey bee use than wildflowers in the second year. Fall wildflower reseeding may improve performance.
3. Mustard-enhanced orchards had the highest rates of bee visitation to almond, but no increase in nut set, while wildflower-enhanced orchards had higher nut set in the orchard interior.
4. Annually reseeded wildflower plantings may be the top strategy for improved honey bee pollination in the presence of wild bees.

Results

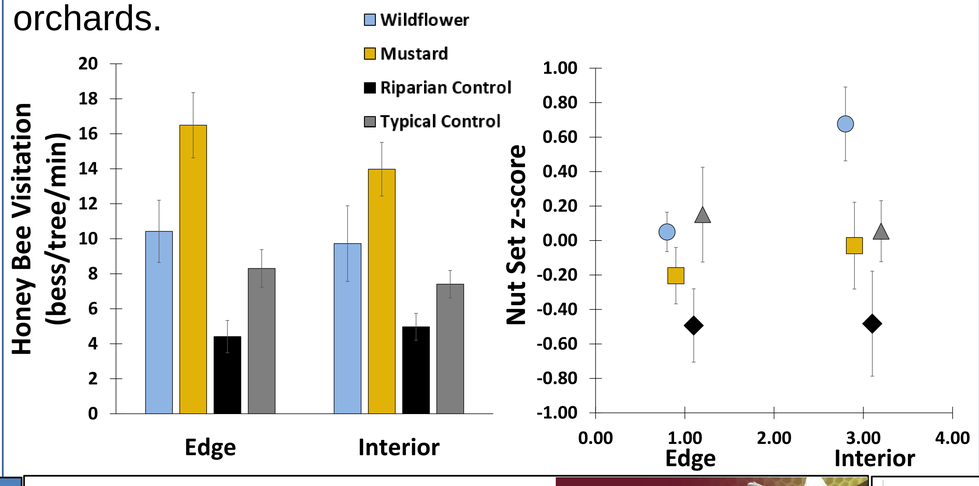
Floral display of mustard and wildflower plots coincided with almond bloom and extended floral resources for bees.



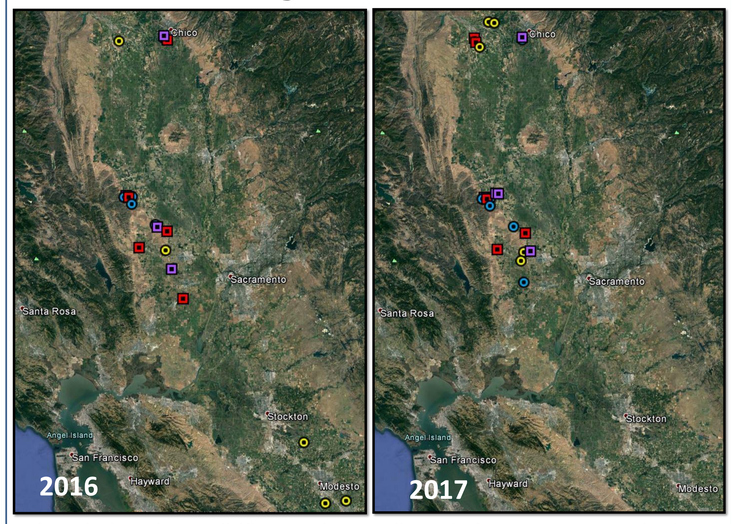
Bees visited forage plots significantly more than unplanted orchard borders.



Honey bee visitation to almond orchards was improved by habitat plantings. Increased visitation improved **nut set** in wildflower-enhanced orchards, but not in mustard-enhanced orchards.



Study Locations



Blue circles show wildflower sites, yellow circles PAm mustard mix sites, red squares typical controls, and purple squares riparian controls.

Methods

- Sites planted with wildflower mix October - November 2015. Mustard sites annually reseeded fall 2015 and 2016
- Monitored floral densities of each forage plant species bi-weekly from Feb - April
- Monitored bee use of plantings on the same days we assessed floral resources
- Assessed the potential for competition during almond bloom with weekly samples of bee visitation to forage-enhanced orchards compared to control orchards
- Quantified nut set from trees on edge and interior of orchards adjacent forage plantings and control borders

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