



*Agapostemon* sp.



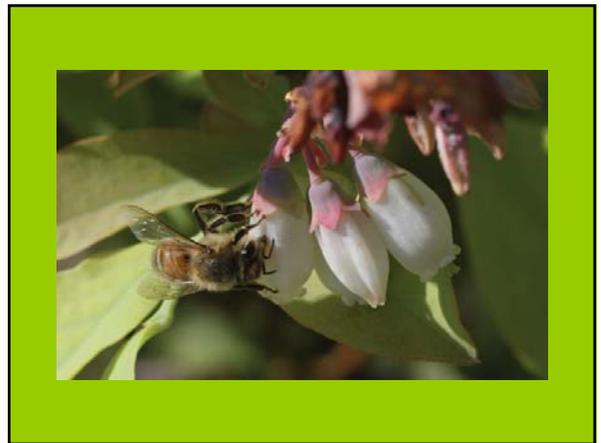
*Osmia* sp.



*Habropoda laboriosa* ?

Photos by Dan Eiser





*Cucurbita* spp.

- Acorn Squash  
*Cucurbita pepo*
- Sweet Potato Pumpkin  
*Cucurbita mixta*
- New England Pie Pumpkin  
*Cucurbita pepo*
- Winter Squash Autumn Cup  
*Cucurbita pepo*





*Peponapis spp.*: Squash bee



- Cucumber
- Cantaloupe
- Watermelon

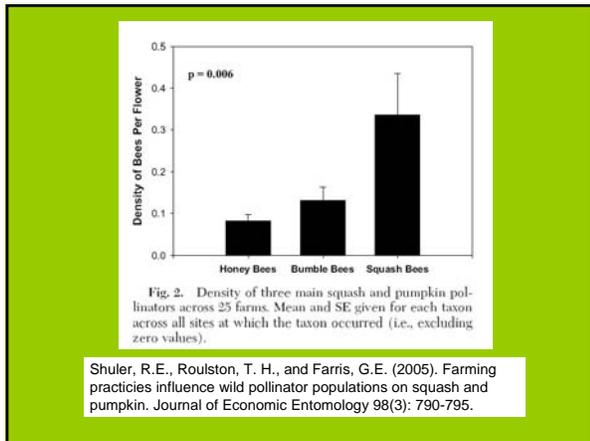




Winfree, R., Williams, N. M., Dushoff, J., and Kremen, C. (2007). Native bees provide insurance against ongoing honey bee losses. *Ecology Letters* 10: 1105-1113.



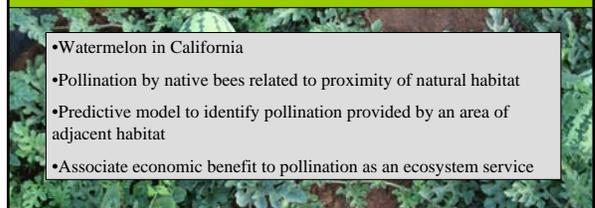
- Watermelon in New Jersey and Pennsylvania
- Importance of native bees stronger than in Kremen et al. California study
- Calculated native bees could provide full pollination at >90% of their locations if the honey bee was absent



Shuler, R.E., Roulston, T. H., and Farris, G.E. (2005). Farming practices influence wild pollinator populations on squash and pumpkin. *Journal of Economic Entomology* 98(3): 790-795.



Kremen, C., Williams, N. M., Bugg, R. L., Fay, J. P., Thorp, R. W. (2004). The area requirements of an ecosystem service: crop pollination by native bee communities in California. *Ecology Letters* 7: 1109-1119.



- Watermelon in California
- Pollination by native bees related to proximity of natural habitat
- Predictive model to identify pollination provided by an area of adjacent habitat
- Associate economic benefit to pollination as an ecosystem service





- Nutrition from diverse sources of pollen critical for honey bee health
- Monoculture landscapes implicated as a factor in CCD
- Nectar sources needed after main spring honey flow is over

- Buckwheat** - honey bees and bumble bees before noon
- Yellow clover** - mostly honey bees, some bumble bees
- White clover** - bumble bees and honey bees
- Vetch** – bumble bees
- Monarda** - “lemon mint” bumble bees
- Partridge pea** – bumble bees and some honey bees, early morning
- Daisies, Black-eye-susan's and similar** – small native bees
- Sweet William (Dianthus)** - Nothing
- Cosmos** – all types of bees



Partridge pea: *Chamaecrista fasciculata*

**Benefits:**

- Conservation funding
- Wildlife food plots
- Cover crops - nitrogen, soil health, etc.
- Scenery for farm tours
- Cut flowers
- Pollination



**Questions?**

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