Managed Native Bees for Pollination

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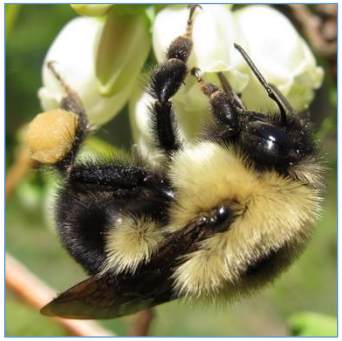
Pollination, a critical ecosystem service

- 88% of flowering plants are animal pollinated
- 75% of crop plants benefit from pollination
- Pollination = 10% of total value of agriculture
  - Apple: 0-75% bee deficit (mean: 8%; one study)
  - VT blueberry: up to 36% yield loss due to bee deficit

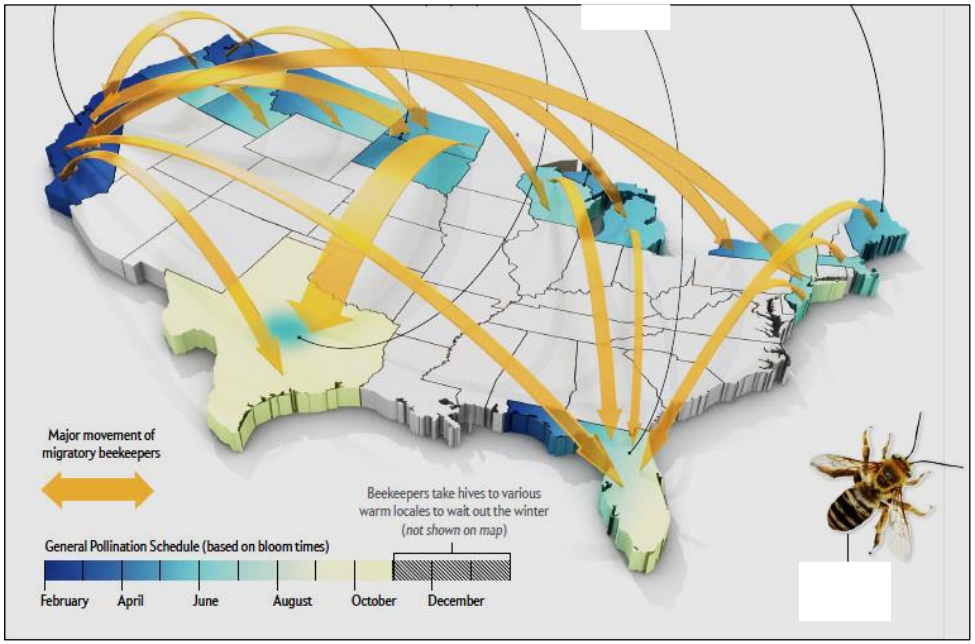




Honey bees

- Essential managed pollinator for US agriculture
- A cost for growers of many pollinator-dependent crops
  - (~$70/ hive rental fee for VT apples)

Migratory pollination

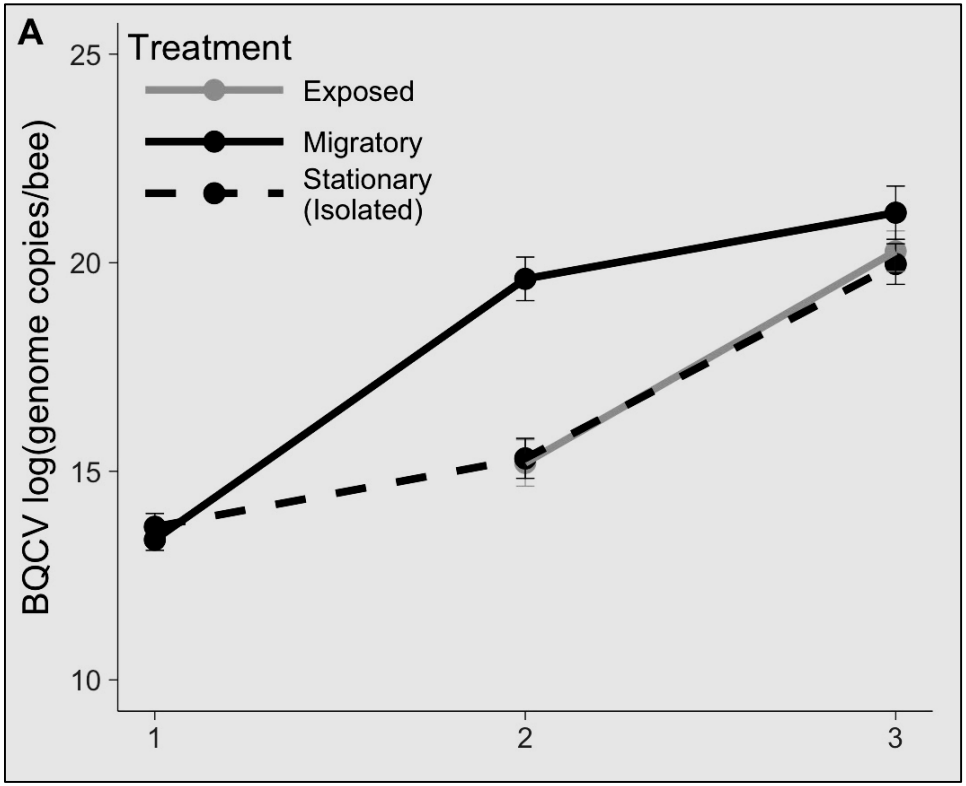
- Annual movement of millions of colonies around continent
- Key crops: almond, clover, blueberry, apple,…



http://bit.ly/2ksw3ew; http://bit.ly/2k37B33

A stressful situation for bees

- Increased disease, pesticide exposure, poor nutrition



Home sick: Effects of Migratory Beekeeping on Honey Bee Disease (experiment.com)

Native bees as *managed* pollinators?

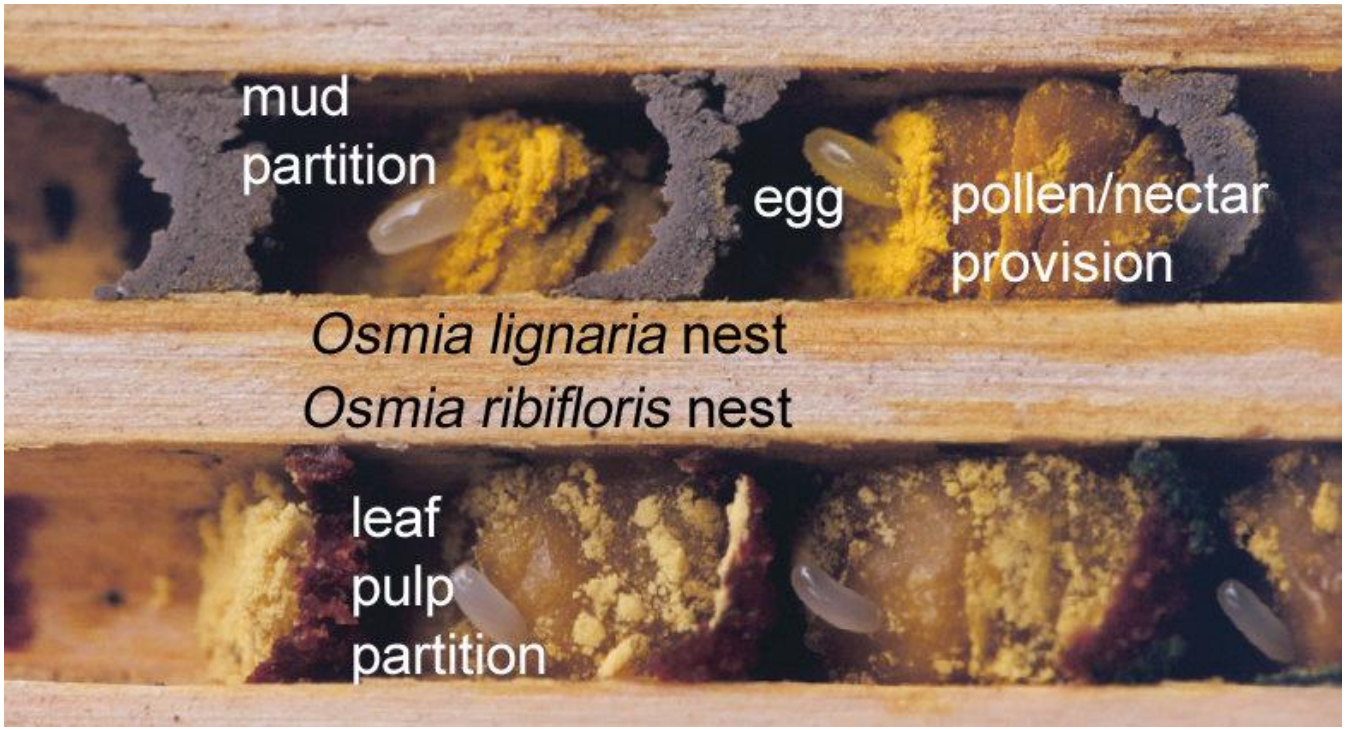
- 20,000 species of bees
- Vital to (crop) pollination, regardless of honey bee presence
- Declines in diversity, abundance, range size

1. Mason bees (*Osmia* species)

- Solitary 'twig nesters' managed in paper straws
- Nests stored in refrigeration over winter
- Good pollinators of apple, blueberry, almond etc.

Nesting

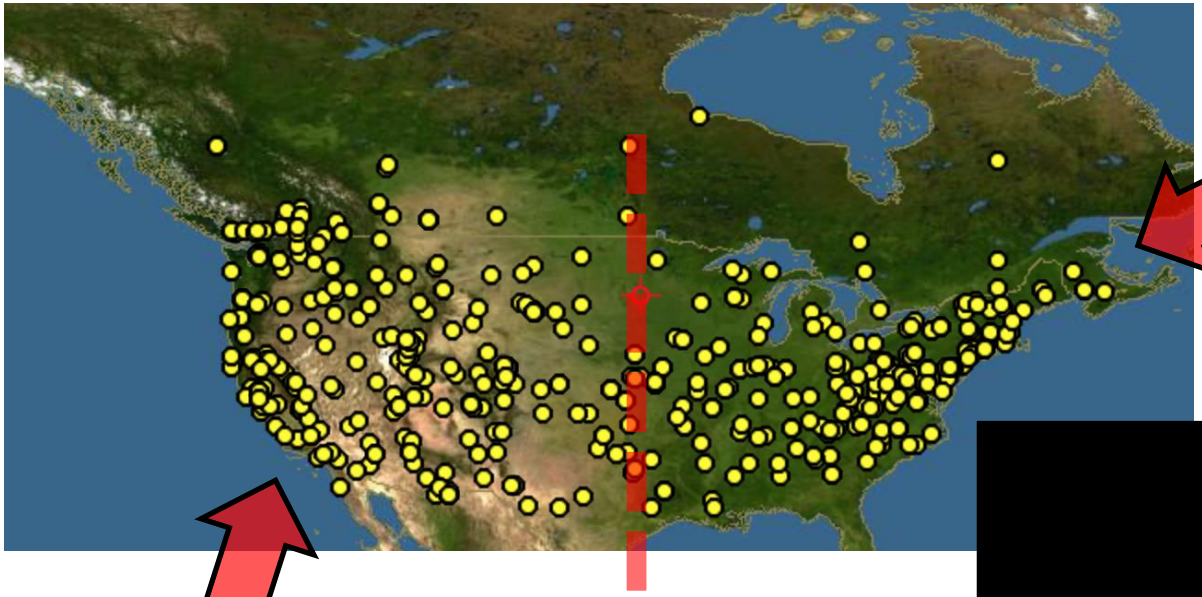
- Nests in hollow stems
- Eggs separated by partitions (mud, leaves)



Mason bees as pollinators

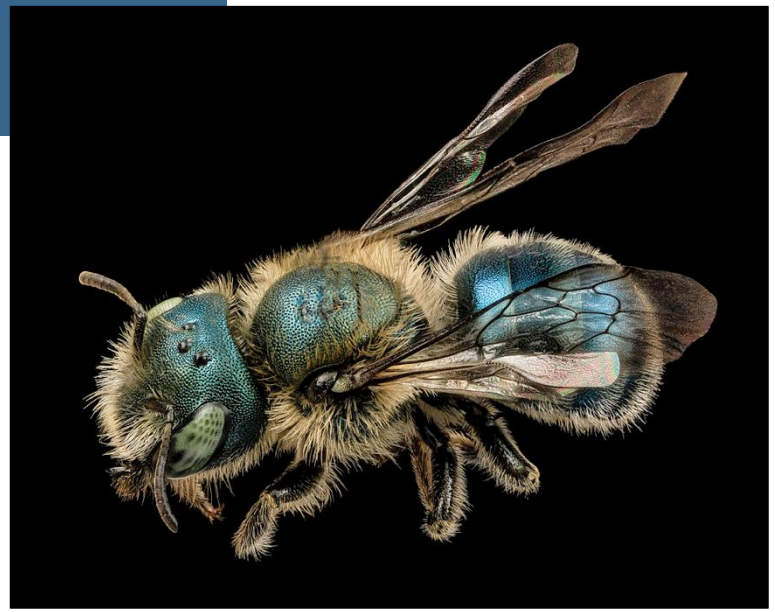
- More effective than honey bees on tree fruits, other crops (but less numerous)
- Activity period can be timed to flowering
- Commercially available *Osmia lignaria*

Should you buy mason bees?



Osmia lignaria ***lignaria***

Osmia lignaria ***propinqua***



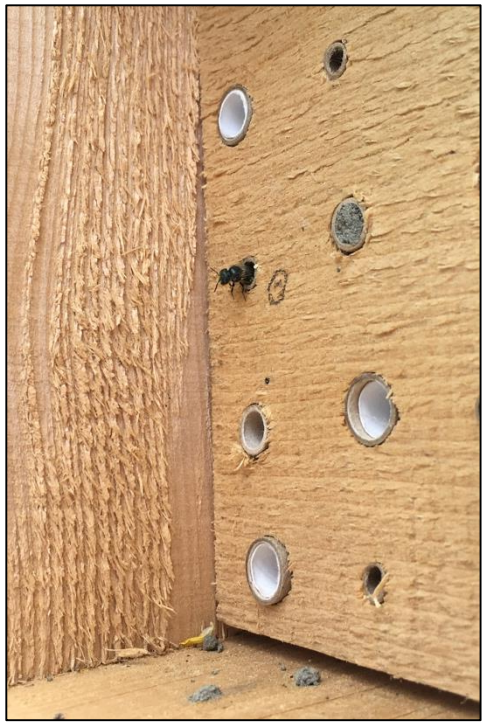
http://bit.ly/2jpvtg9 ; Sam Droege, USFWS

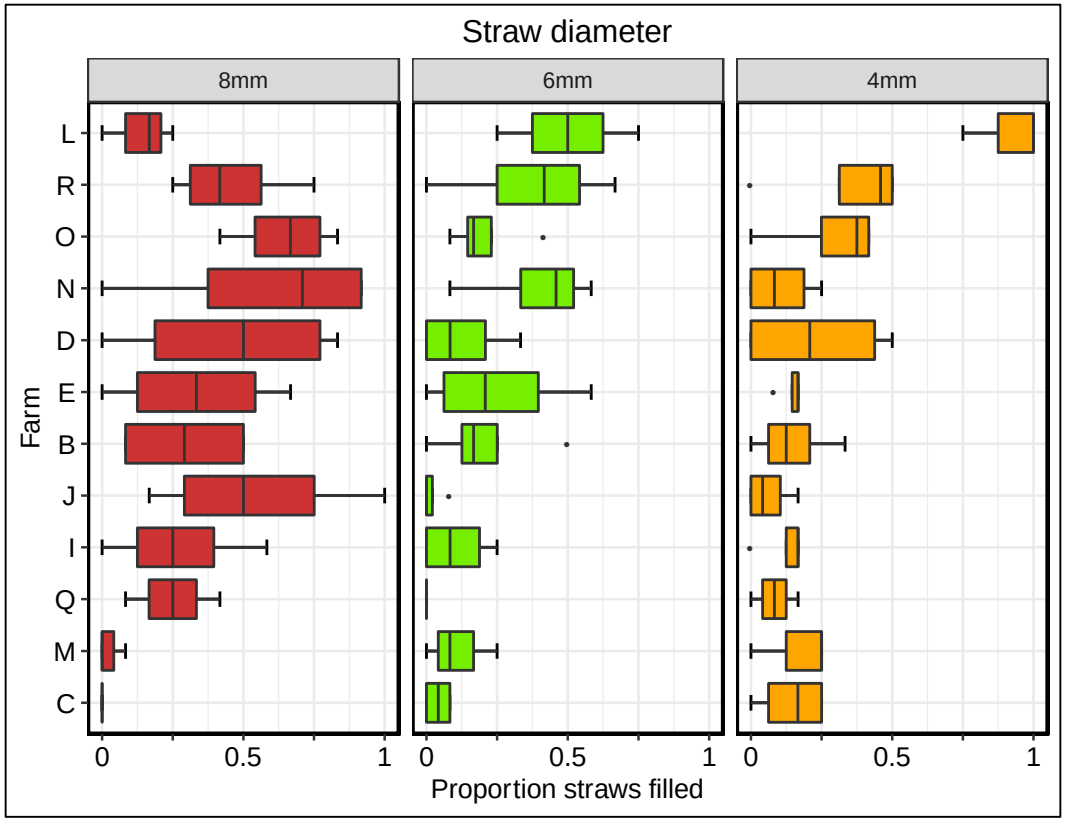
Mason bee pollination in Vermont

- 15+ native *Osmia* species in Vermont
- Could be managed as sustainable pollination tool
- 2017: trap nesting at 20+ sites in VT

Mason bee pollination in Vermont

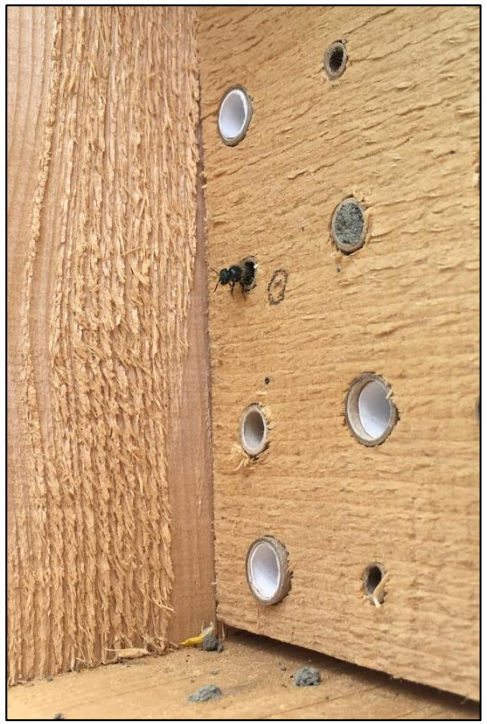
- 2017: trap nesting at 20+ sites in VT
- 2018 (soon!): diversity survey of bees, data collection on crop pollination

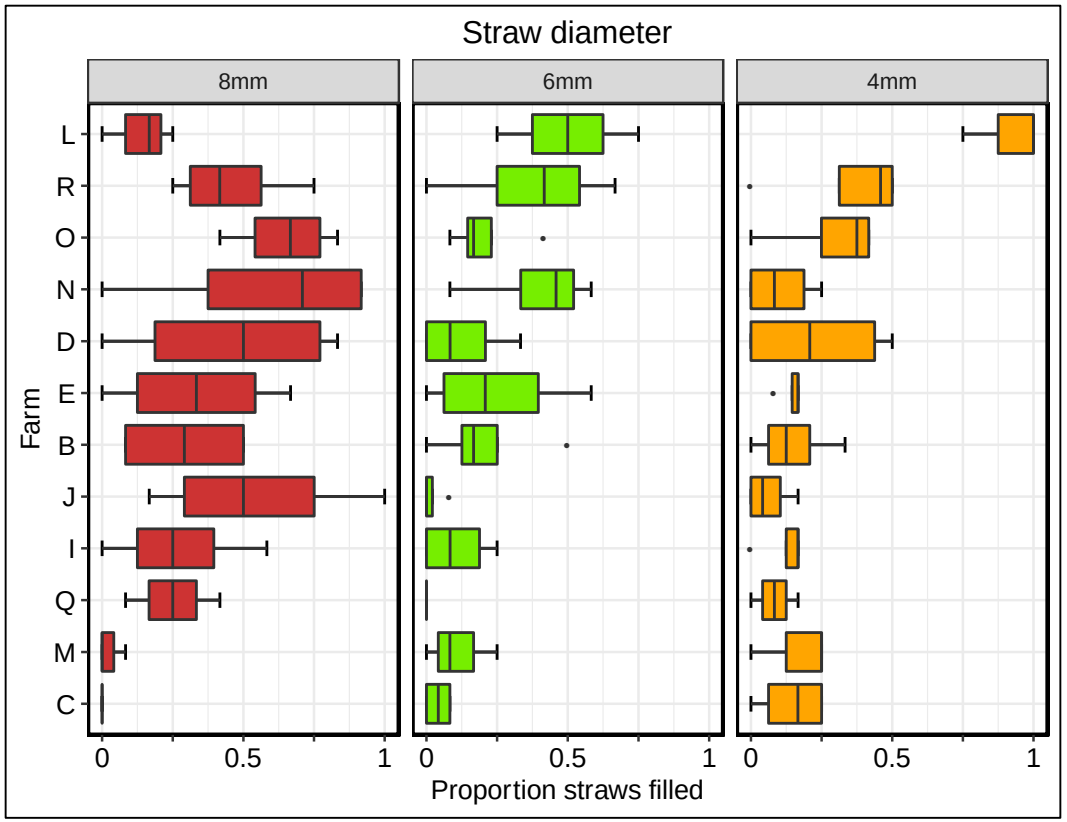




Mason bee pollination in Vermont

- Interested in participating?



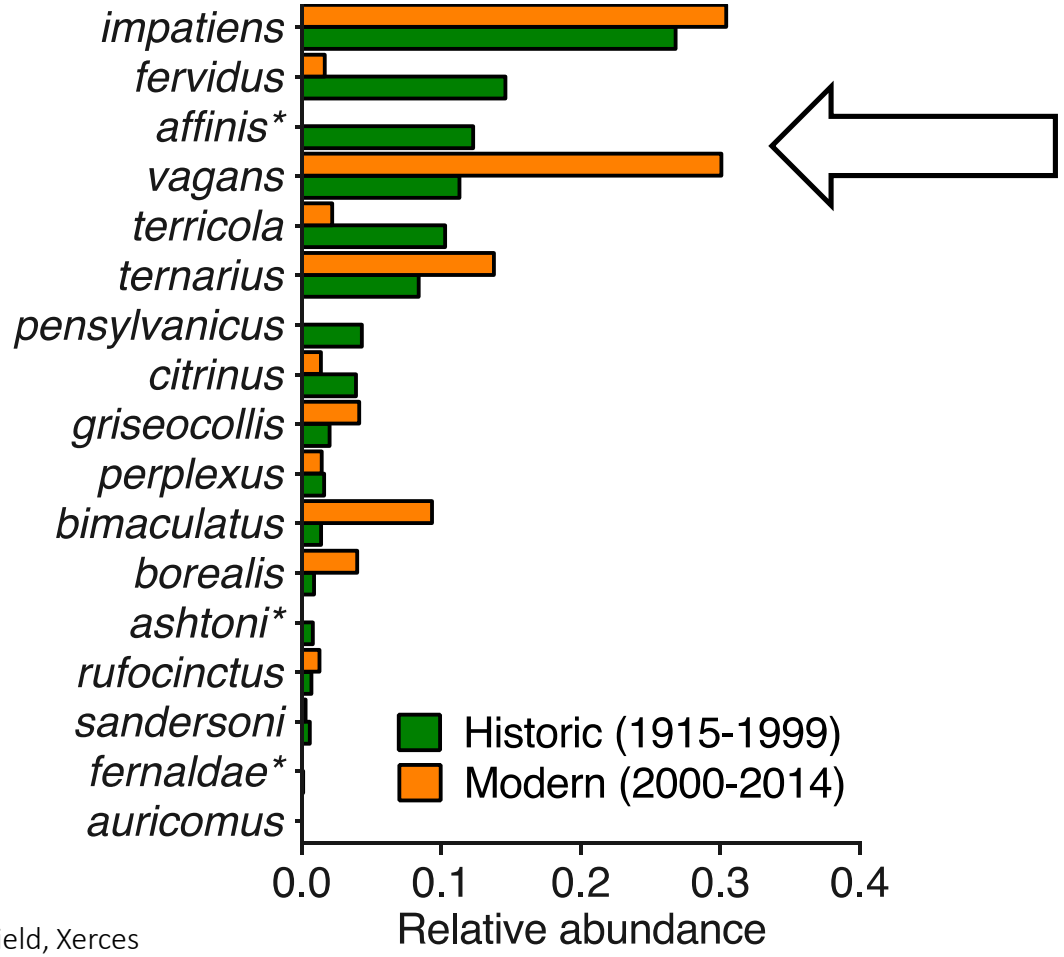


2. Bumble bees(*Bombus* species)

- Commercially available: *B. impatiens, terrestris, huntii…*
- Pollinators in greenhouse, field crops
- Superior to honey bees in apple, some other crops

Bumble bee declines in Vermont

- ~25% loss of historical diversity



Richardson et al unpublished; Rich Hatfield, Xerces

Pollination: just bees and plants?

www.eco.ethz.ch/; http://bit.ly/2kArZJ9

Natural Enemies of mason bees

- Mites
- Parasitoid wasps
- Birds
- Chalk brood (*Ascosphaera*)
- Kleptoparasite bees