Best Practices for Blueberry Pollination

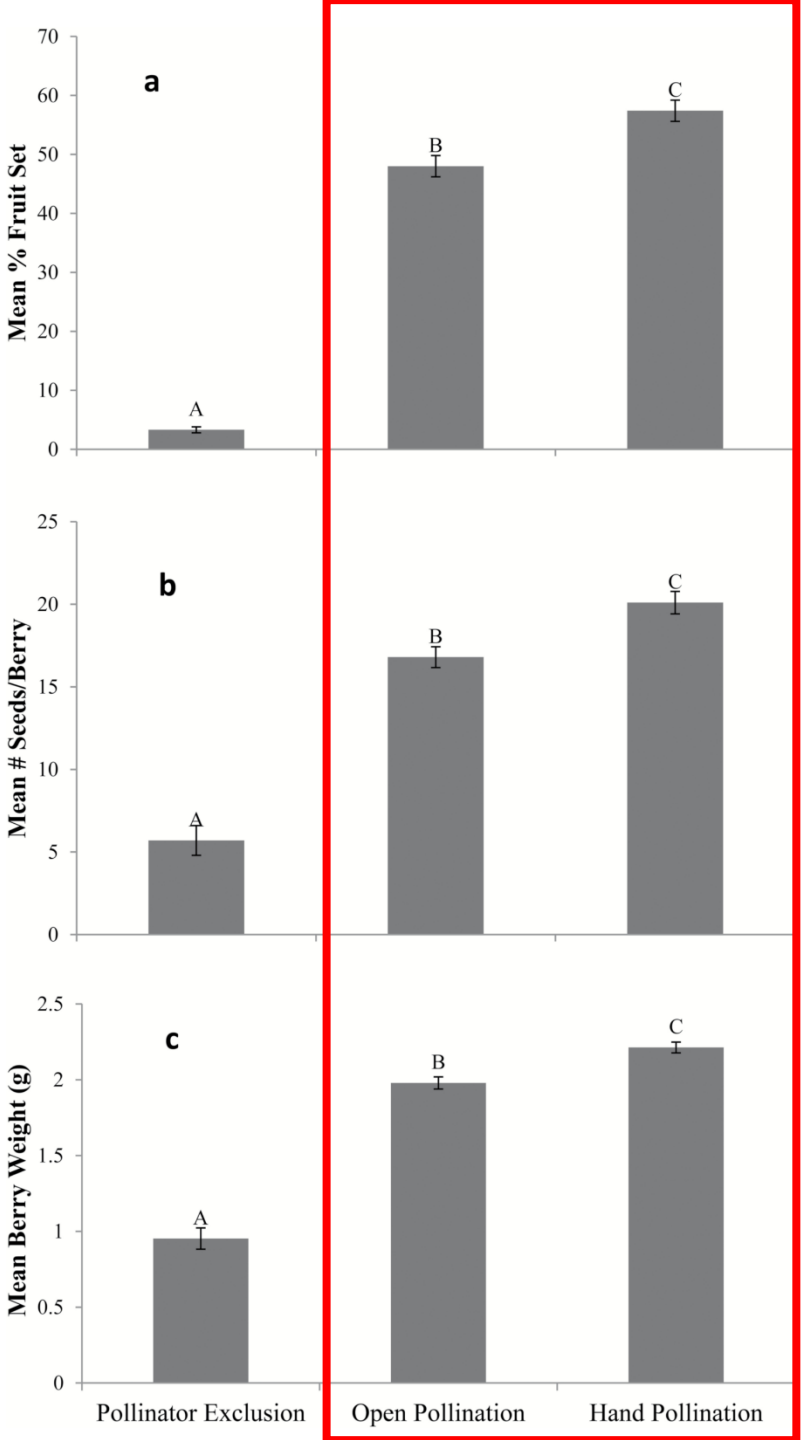
Dr. Rachel Mallinger

UF Entomology and Nematology

Talk outline

- The problem
- The plant
- The pollinators
- Factors affecting pollination and solutions
- Future research

Thank you!



The problem

- Study done on 16 farms in north-central Florida
- Fruit set and weight measured on Emerald
- 16.5% more fruit set with hand pollination than bee pollination
- Growers not achieving maximum/optimal fruit set

Campbell et al. 2018

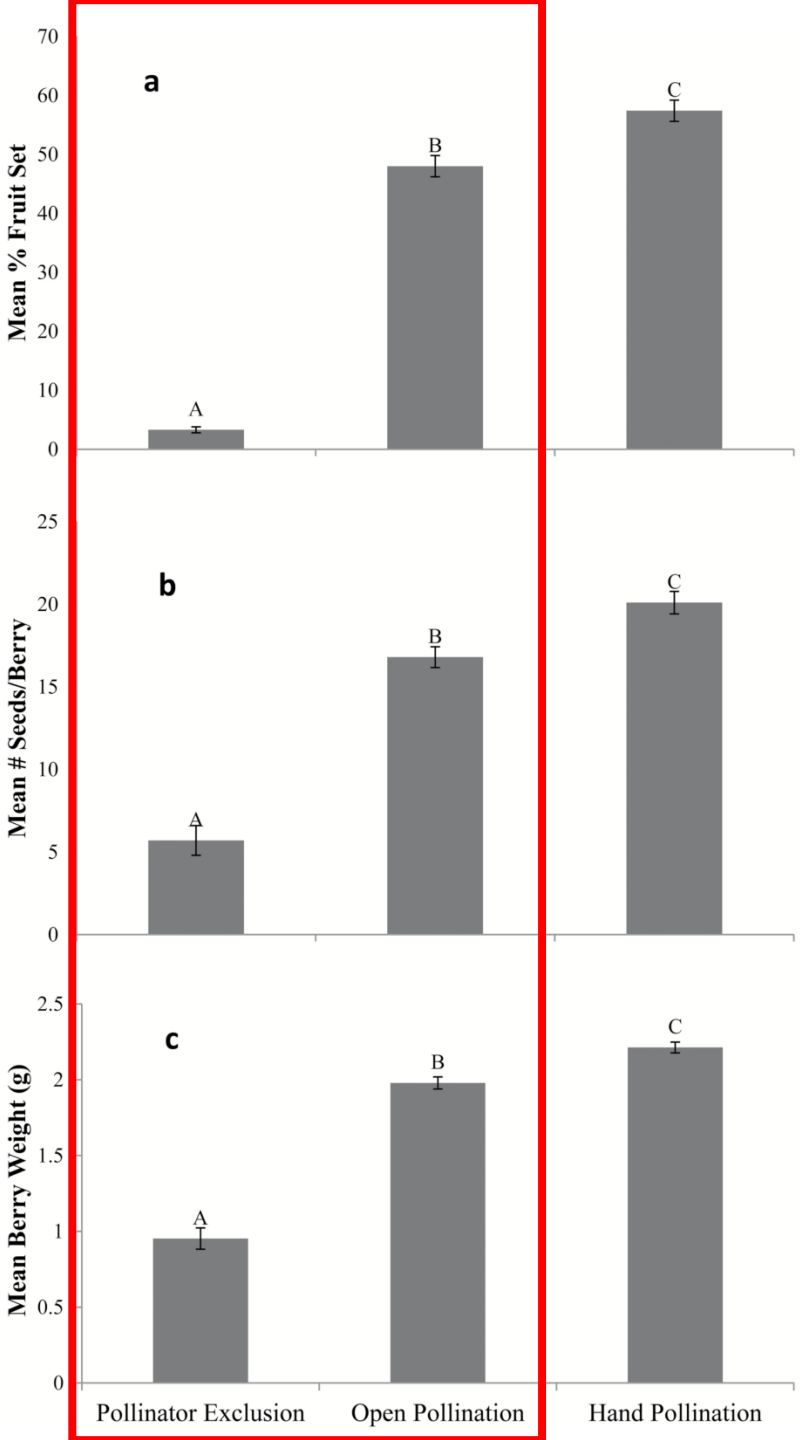
The plant

- Ranked 3 out of 4: Highly dependent on insect pollinators
- Insects stimulate pollen release, move pollen within and across flowers

The plant

Variation in pollinator-dependence across cultivars

- Self-compatibility
  - Cultivars with low self-compatibility need pollen transfer across cultivars
  - Cultivars with high self-compatibility may still need insects to release and transfer pollen within flowers!



The plant

- Very low fruit set (~5%) without pollinators
- Smaller fruit with fewer seeds

Campbell et al. 2018

The Pollinators

- Managed honey bees
- Managed bumble bees
- Wild bees




The Pollinators

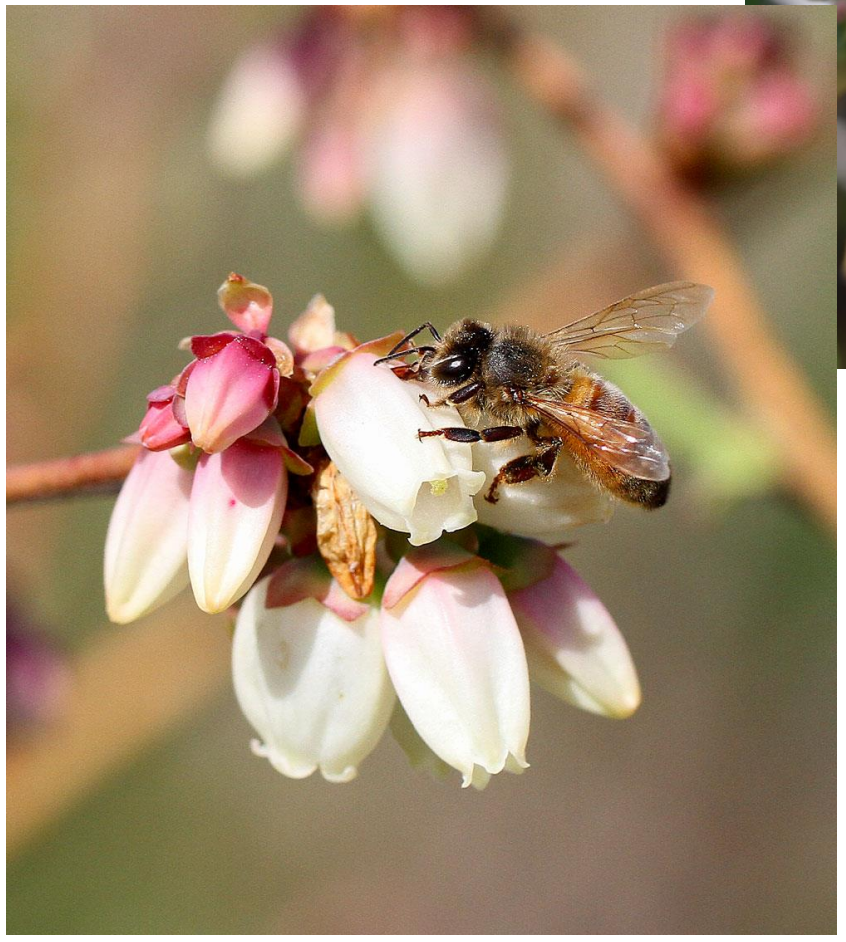
Managed honey bees

Pros:

1. Abundant and available

Cons:

1. Sensitive to cool weather
2. Not buzz pollinators
3. Nectar robbing
4. Generalists
5. Hive quality variable



The Pollinators

Managed bumble bees

Pros:

1. Available
2. Active in cooler weather
3. Buzz pollinate
4. Don’t rob nectar
5. Fast and efficient

Cons:

1. Limited number of suppliers
2. Colony quality variable
3. Expensive

The Pollinators

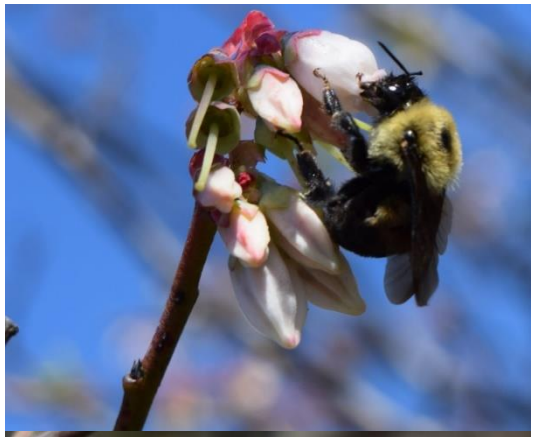
Wild bees: Bumble bees, carpenter bees, SE blueberry bee

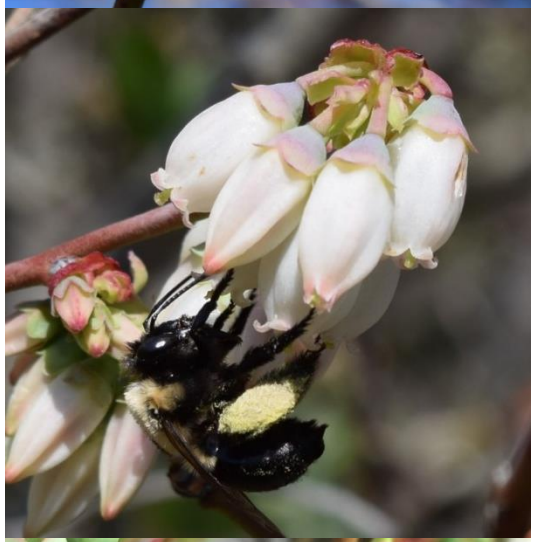
Pros:

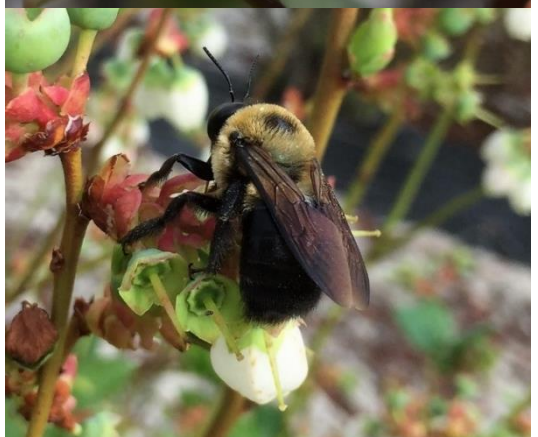
1. Free
2. Some very effective (bumble bees, SE blueberry bee)
3. Some specialists on blueberry (SE blueberry bee)

Cons:

1. Emerge later than commercial blueberry bloom
2. Some nectar robbers (carpenter bees)
3. Abundance variable and less predicable







The Pollinators

Campbell et al. 2018: 4,836 individual bees visiting blueberries

- 86.7% honey bees
- 8.3% bumble bees
- 3.7% SE blueberry bees
- 1.3% carpenter bees




Factors affecting pollination

- Planting design/arrangement
- Too few pollinators
- Pollinator foraging behaviors
- Weather

Factors affecting pollination

Planting design/arrangement

- Single cultivar blocks
- Large blocks

Solutions

- At least 2 cultivars with overlapping bloom period in same area
- No more than 8 rows per cultivar in a single block (MSU guidelines)
- Smaller blocks with wooded edge, other habitat
- Distribute managed bees in large blocks

Factors affecting pollination

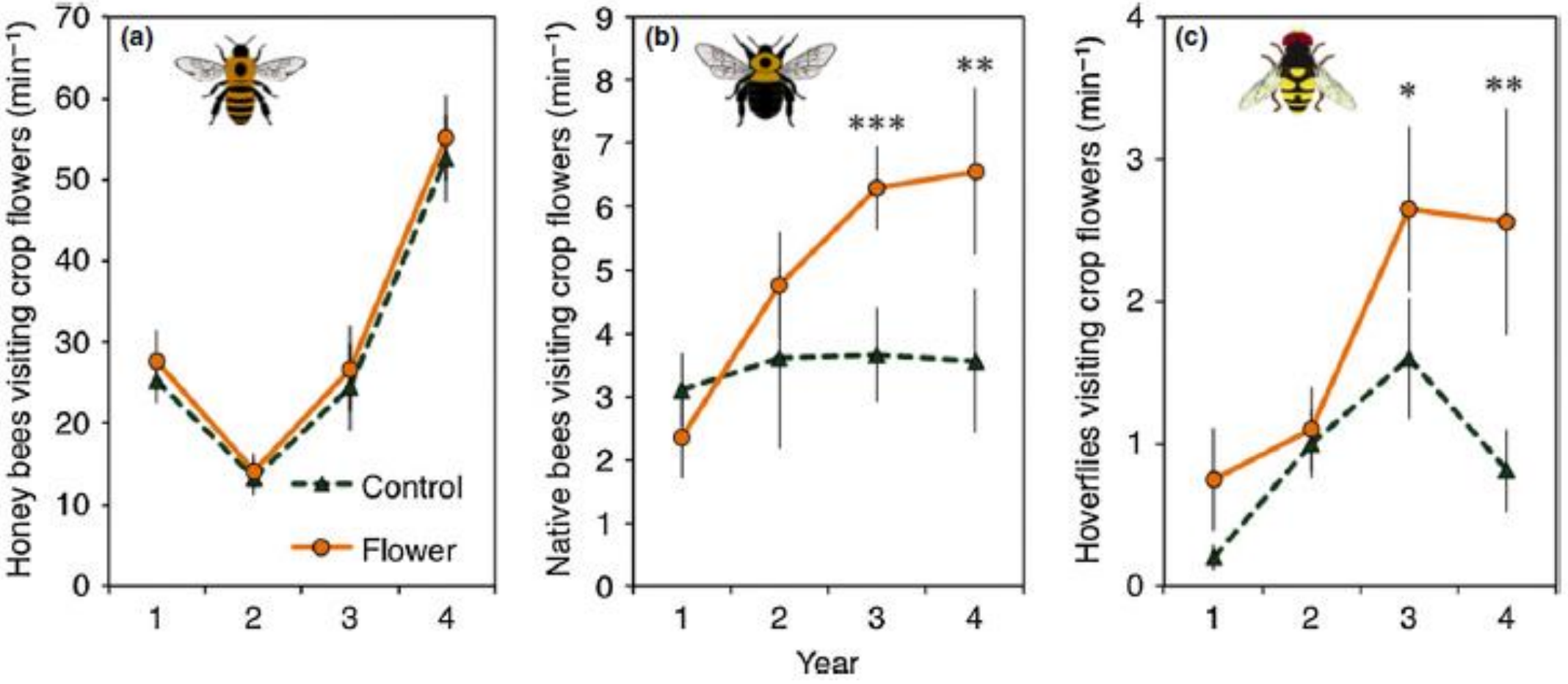
Too few pollinators

- Not enough managed bees
- Low abundance of wild bees
- At least 4 honey bees counted per blueberry bush in good weather

Solutions

- Increase managed bee stocking density
- At least 4 honey bee hives per acre
- 1 quad of managed bumble bees per acre along with honey bees
- More than 4 hives/acre for high-density plantings
- Providing resources for wild bees?

Factors affecting pollination



Blaauw et al. 2014

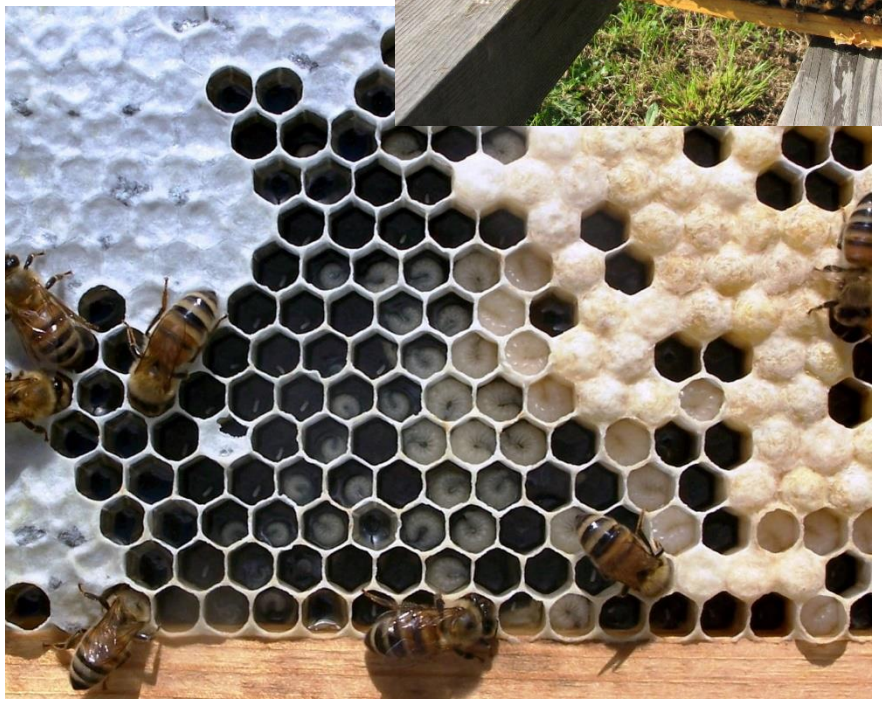
Factors affecting pollination

Too few pollinators

- Poor quality hives

Solutions

- Contract with beekeeper (ENY 110: https://edis.ifas.ufl.edu/aa169)
- Colony inspection at delivery (with beekeeper)
- Of 10 frames per hive:
  - 8+ should have adults covering frame
  - 6+ should have brood in the frame cells



Factors affecting pollination

Pollinator foraging behaviors

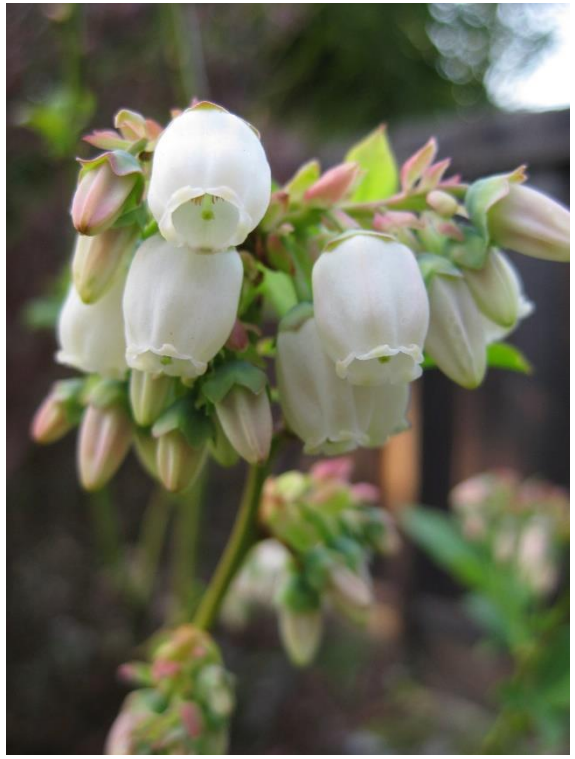
- Ineffective pollen transfer (nectar robbing, no buzz pollination)
  - Honey bees, carpenter bees
- Visiting other blooming plants in the area
  - Honey bees, bumble bees, carpenter bees

Solutions

- Increase managed bee stocking density
- Diversify pollinators (managed honey bees and bumble bees)
- Limit competing bloom on and around farm

Future research

- Pollination requirements of different cultivars
- Variation in blueberry cultivar attractiveness to bees
- Traits that increase attractiveness to bees
- Breed plants for enhanced pollination and/or fruit set



Future research

- Optimal stocking densities for managed honey bees
- Value of managed bumble bees and optimal stocking densities
- Effects of farm management and surrounding landscape on bees and pollination

Searching for:

- Farms with recent poor pollination/low fruit set
- Farms with historically high fruit set/good pollination
- Farms using low density of managed bees (< 3 hives per acre)
- Farms using high density of managed bees (> 5 hives per acre)
- Farms with small blocks/interspersed cultivars
- Farms with large, single-cultivar blocks
- Contact me at rachel.mallinger@ufl.edu

Questions?