
UF IFAS Extension
UNIVERSITY of FLORIDA
UNIVERSITY of FLORIDA Honey Bee
Research & Extension LABORATORY
Use of Non-*Apis* Managed Pollinators
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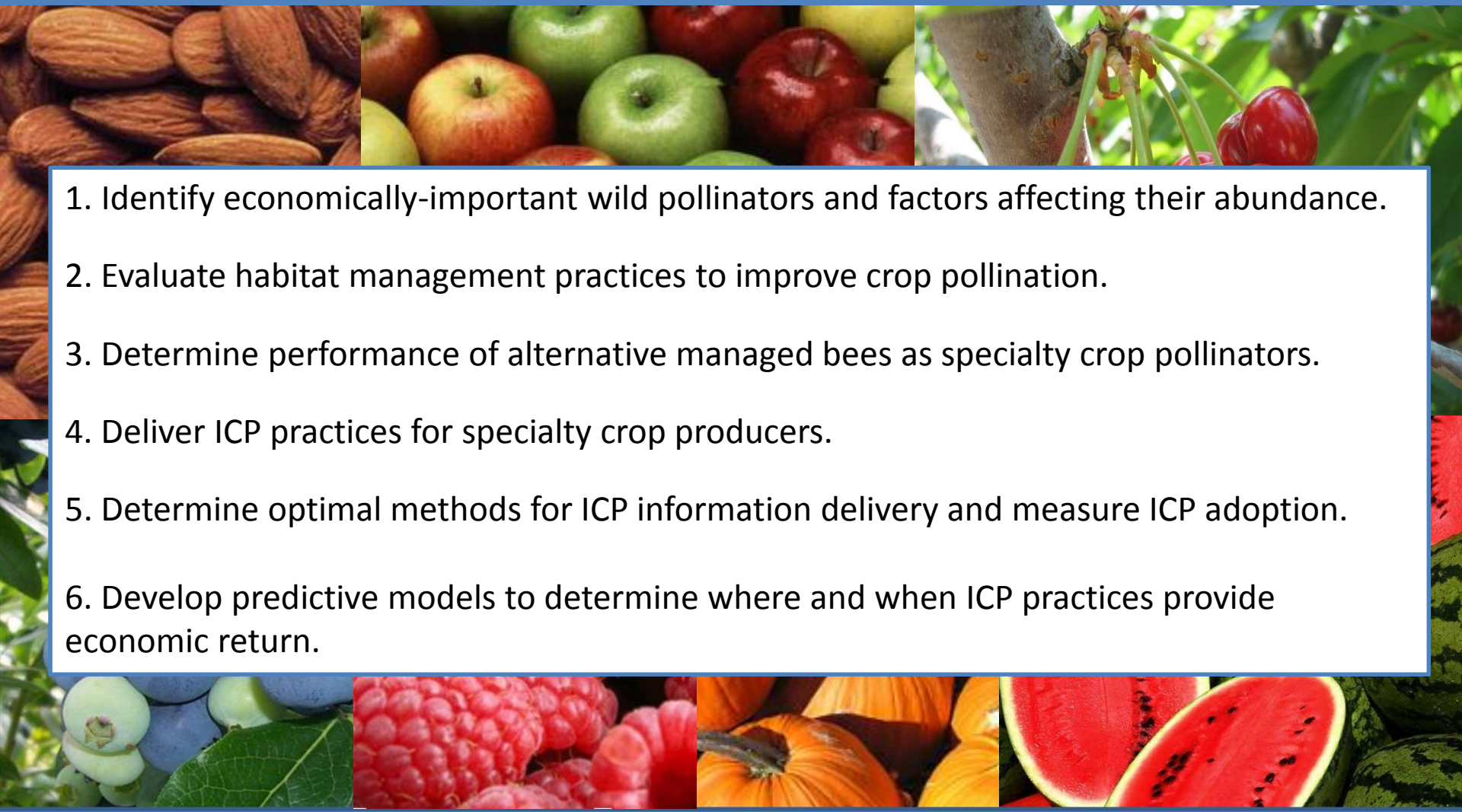
PROJECT ICP

Integrated Crop Pollination

Integrated **C**rop **P**ollination is the combined use of wild and managed pollinator species, habitat augmentation, and crop management practices to provide reliable and economical pollination of crops.

Adapted from R. Isaacs, MSU

The Integrated Crop Pollination Project: supporting production of U.S. specialty crops



1. Identify economically-important wild pollinators and factors affecting their abundance.

2. Evaluate habitat management practices to improve crop pollination.

3. Determine performance of alternative managed bees as specialty crop pollinators.

4. Deliver ICP practices for specialty crop producers.

5. Determine optimal methods for ICP information delivery and measure ICP adoption.

6. Develop predictive models to determine where and when ICP practices provide economic return.

Adapted from R. Isaacs, MSU

Why are Honey Bees the Pollinator of Choice for Agriculture?

- Mobility
- Manageability
- Familiarity

Why do we need alternative pollinators?

- Maximize pollination
  - Other bees pollinate many crops more effectively than honey bees.
- Honey bee health issues
- Avoid dependence on a single species
  - Having multiple pollinators provides “crop insurance.”

Photo: D. Artz, USDA ARS

“Alternative” vs. “Native” Pollinators

Alternative =

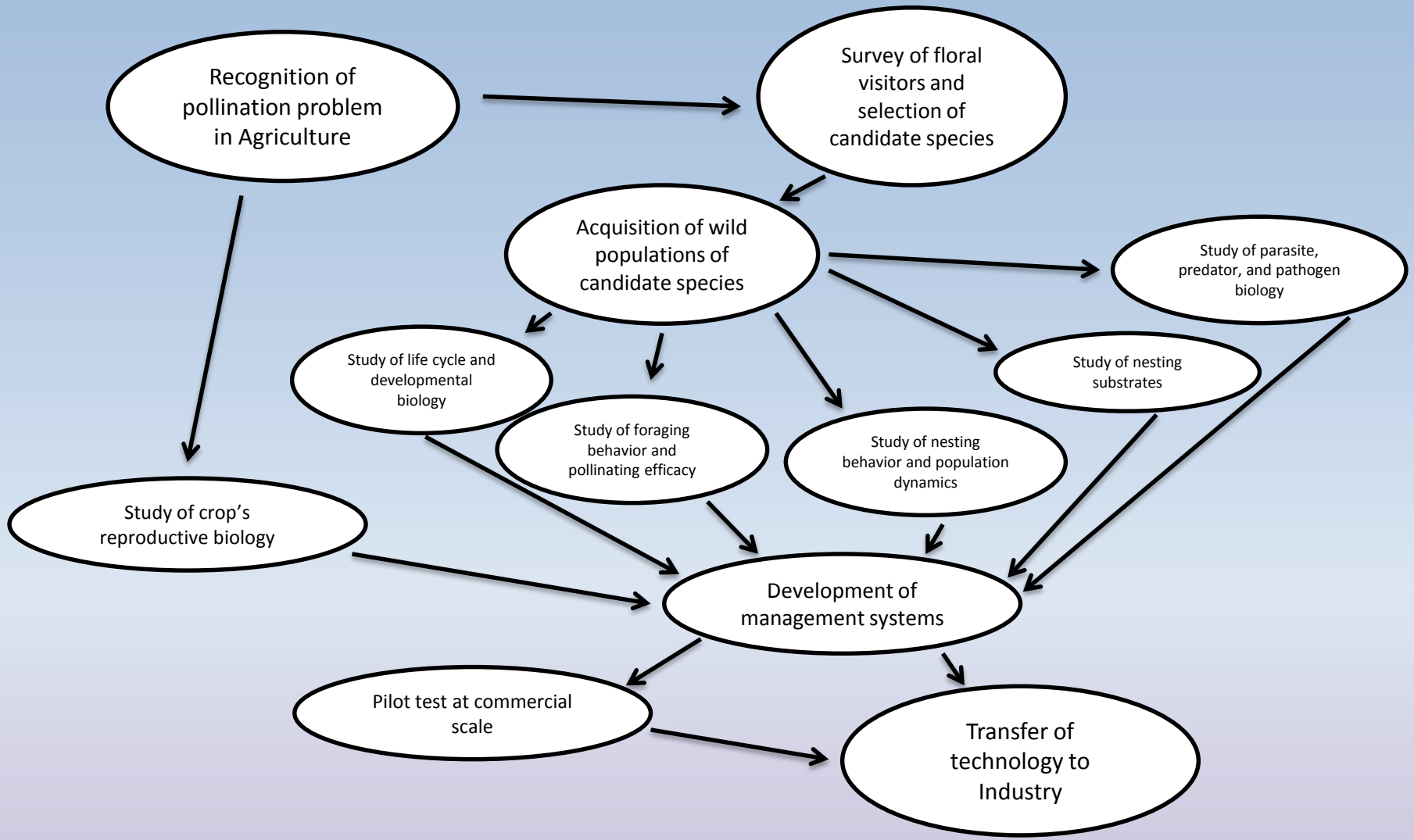
any pollinator that typically is not used

Native =

any pollinator that occurs naturally in the area

Photos: Theresa Pitts-Singer, USDA ARS

Domestication of a Pollinator



Adaptedfrom J. Bosch and W.P. Kemp. 2002. Developing and establishing bee species as crop pollinators: the example of Osmia spp. (Hymenoptera: Megachilidae) and fruit trees. Bulletin of Entomological Research. 92: 3–16. DOI: 10.1079/BER2001139

Managed Alternative Pollinators

- Nearly 100 managed and potentially managed bee species
  (J. Graham, 2014)
- Some well-known examples include:
  - Spanish mason bee (*Osmia cornuta*)
  - alkali bee (*Nomia melanderi*)
  - alfalfa leafcutting bee (*Megachile rotundata*)

  - **Bumble bees (*Bombus* spp.)**
  - **Mason bees (*Osmia* spp.)**

Managed Alternative Pollinators – Bumble Bees (*Bombus* spp.)

- Primitively eusocial
- Introduced to New Zealand from the U. K. in 1885 & 1906 to improve seed set of red clover
- Attempts at domestication documented in *The Humble-bee* (Sladen, 1912).
- Successful domestication in the 1970's
- Commercially available species have included:
  - *B. terrestris* - Europe, Asia, New Zealand, Chile
  - *B. impatiens* - North America
  - *B. occidentalis* - North America
  - *B. ignitus* - China, Japan
  - *B. lucorum* - China
- Project ICP
  - Primarily using *B. impatiens*
  - Effectiveness as blueberry pollinators being examined by MSU, SFU, and UF.
  - Effectiveness as watermelon pollinators being examined by UF.

Managed Alternative Pollinators – Mason Bees (*Osmia spp.*)

- Solitary, tunnel nesting
- Similar biology and life history
- Blue orchard bee (*O.lignaria*)
  - U.S. native with broad geographical range
  - Biology and management research began in 1970's by P. Torchio at the USDA ARS Bee Biology & Systematics Laboratory in Logan, UT

- Japanese hornfaced bee (*O. cornifrons*)
  - Used in Japan for 80+ years
  - Introduced to U.S. in 1970's
  - Biology and management research originated by S. Batra at the USDA ARS Bee Research Laboratory in Beltsville, MD
- Orchard Bee Association
- Project ICP
  - *O. lignaria* effectiveness as almond pollinators being evaluated in CA by USU and AgPollen.
  - *O. cornifrons* effectiveness as pollinators of cherries being evaluated by MSU.
  - *O. cornifrons* on apples was being evaluated by PSU, but now looking at cherries.

Why…?

Honey Bees

- Mobile
- Manageable & familiar
- Polylectic
- Recruitment of foragers
- Large colonies
- Easy to move midseason
- Active entire growing season
- Widely available

Bumble Bees

- Mobile
- Manageable
- Polylectic
- No recruitment
- Fewer bees required
- High flower visitation rate
- Better at handling flowers with large or joined corollas
- Buzz pollination
- Likely to move between rows
- Easy to move midseason
- Able to forage in cool weather
- Work in greenhouses

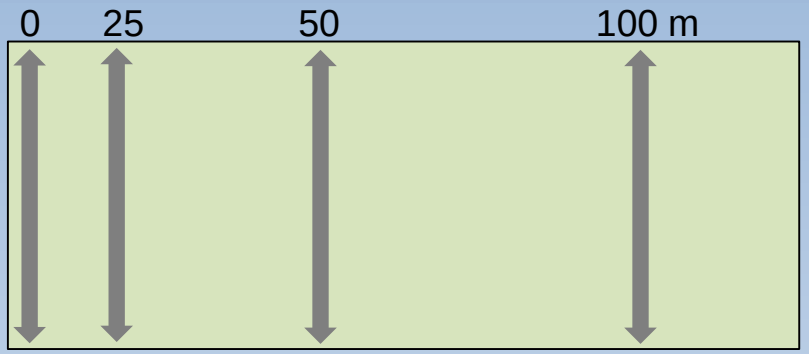
Mason Bees

- Mobile
- Manageable
- Oligolectic
- No recruitment
- Fewer bees required
- High flower visitation rate
- Likely to move between rows
- Able to forage in cool weather
- Work in greenhouses
- No division of labor
- Scopa on abdomen


Do alternative managed pollinators make a difference for specialty crops?

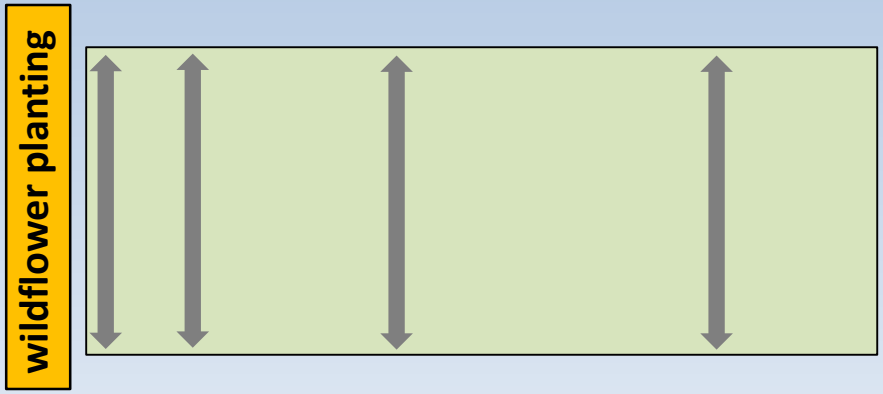
Project ICP experimental design - general

Objective 1
Standard



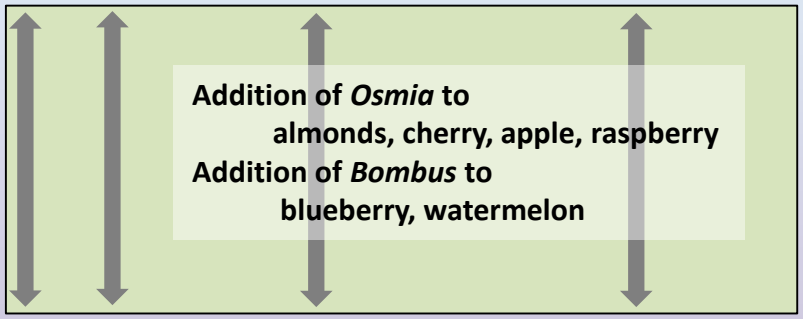
Standard management
- honey bees at local standard rates
- sample insects at flowers during bloom
- sample management intensity
- measure pollination, crop yield
- quantify surrounding landscape
- pesticide application records

Objective 2
Enhanced bee habitat



Standard management + flowers
- enhancement 0.25 ac
- prepare and seed in 2014
- sample insects at wildflower strip in comparison with unenhanced borders

Objective 3
Alternative managed bees

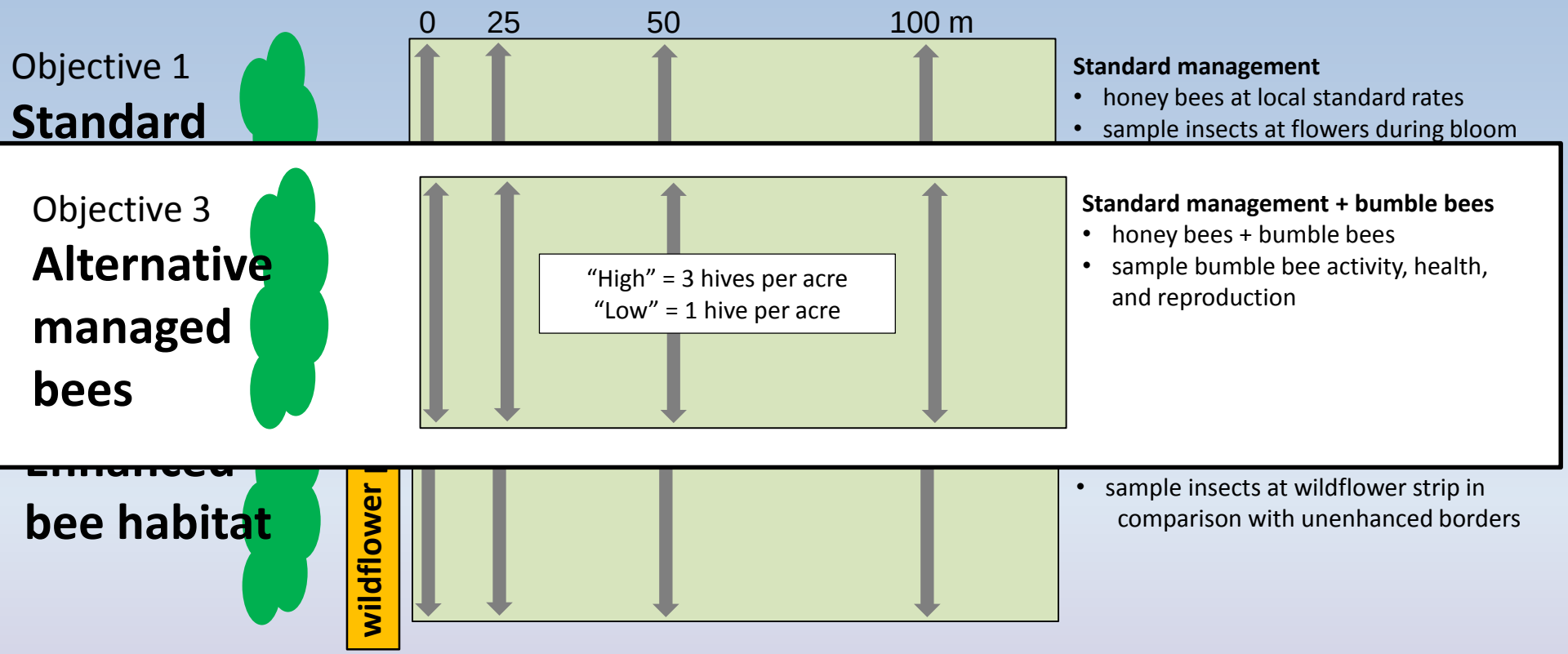


Standard management + alt. managed bees
- honey bees + alt. managed bees
- evaluation of forage for *Osmia*
- sample *Osmia/Bombus* bee activity, health, and reproduction

Slide: R. Isaacs, MSU

Project ICP experimental design – Florida Blueberries

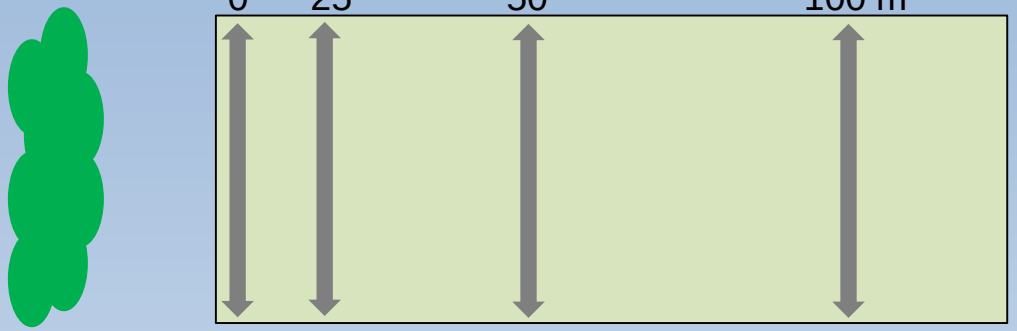
Issue: Florida blueberry growers already pollinate with bumble bees.



Slide adapted from R. Isaacs, MSU

Project ICP experimental design – Florida watermelons

Objective 1
Standard



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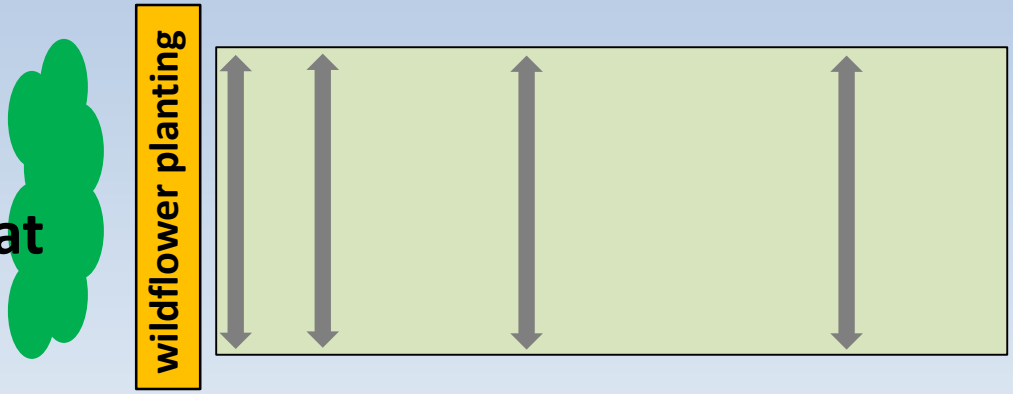
Enhanced bee habitat



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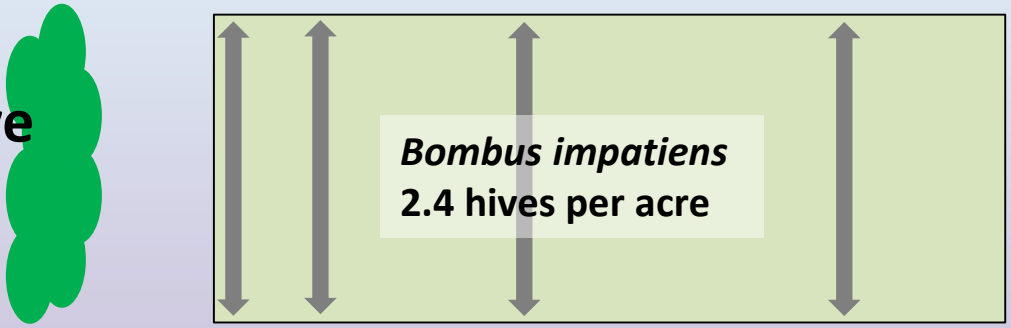
Objective 3
Alternative managed bees



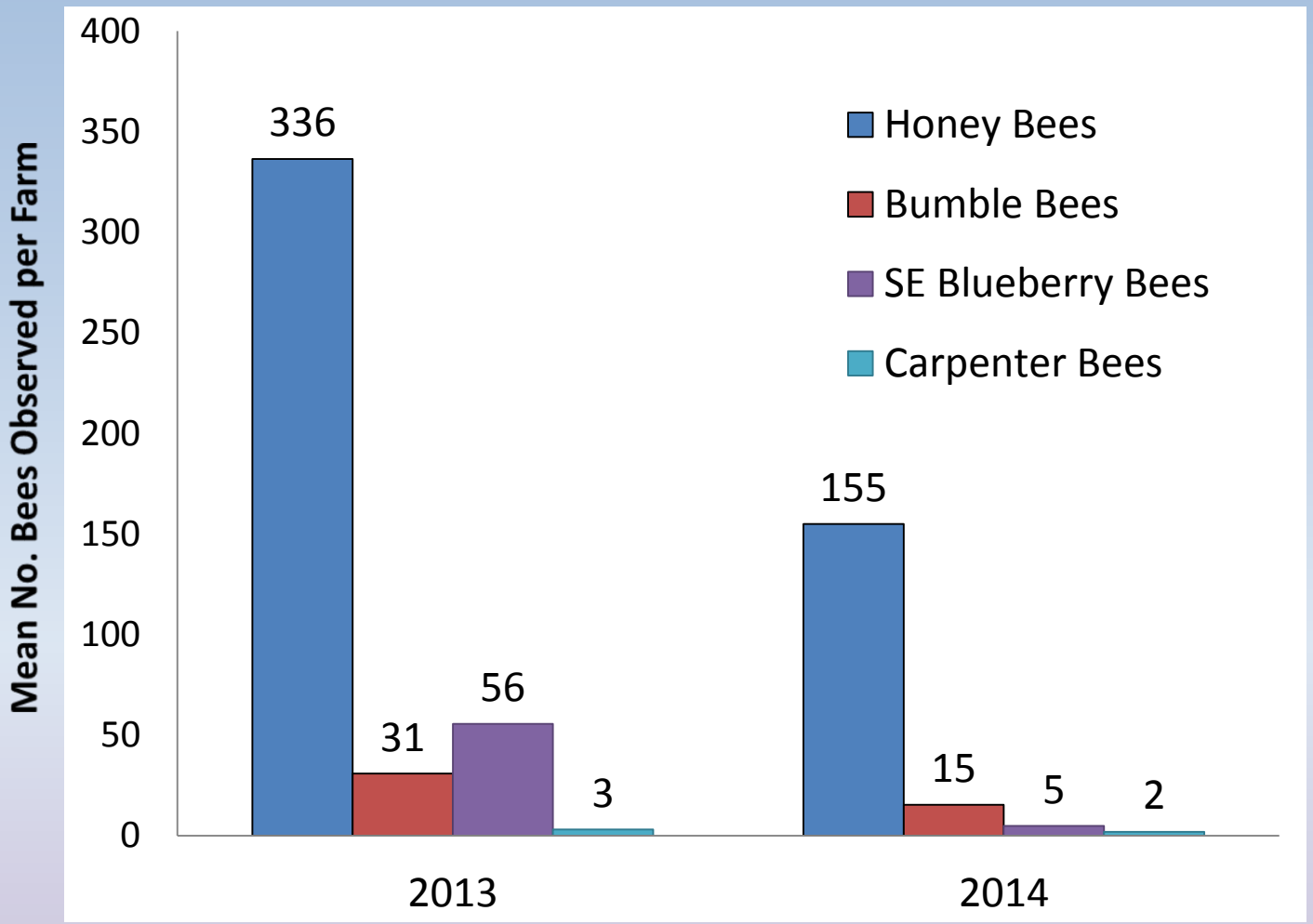
Standard management + bumble bees
- honey bees + alt. managed bees
- Most growers do not use bumble bees
- Objective 1 fields serve as controls

Slide adapted from R. Isaacs, MSU

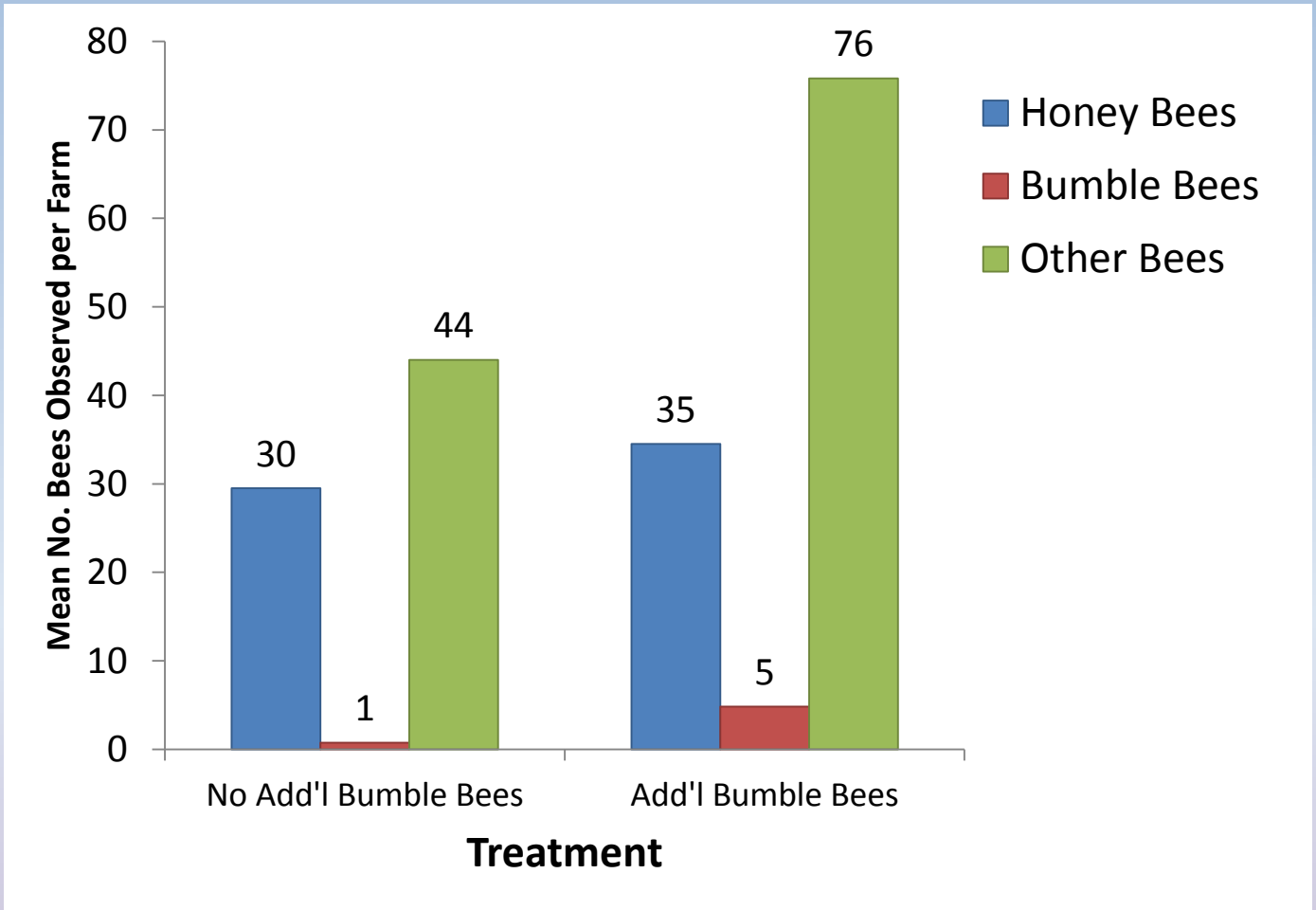
Data Collection

Data Collection

Mean Number of Bees Observed on Florida Blueberry Blooms in 2013 & 2014



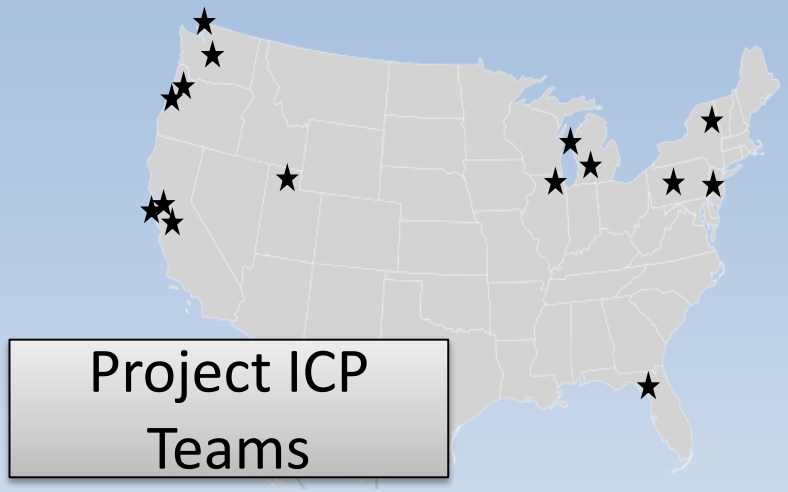
Mean Number of Bees Observed on Florida Watermelon Blooms in 2014



Summary

- Alternative pollinators are needed for several reasons.
- Some bees are well-suited for management.
- ICP is examining the effectiveness of several managed alternative pollinators on specialty crops, with more results to come.

Acknowledgements



- Growers and their employees
- UF Honey Bee Research & Extension Lab
  - Native Bee Team
    - Mary “She Rocks” Bammer
    - Chiho Kimoto
    - Chase Kimmel
    - many additional technicians
- USDA Specialty Crop Research Initiative
- Syngenta Operation Pollinator
- T. Pitts-Singer, R. Isaacs, J. Strange, G. Trostle

KOPPERT BIOLOGICAL SYSTEMS

Questions?