Farm Practices for Beneficial Insects and Pollinators

Photo: Matthew Shepherd
Agricultural practices can impact beneficial insect populations

- Identify practices that could negatively impact pollinators and beneficial insects
- Determine how practices could be altered to reduce these impacts
Farm Practices: Managing Pesticides

Pesticides are an important tool for protecting crops

BUT their impact on non-target organisms can be devastating
Reducing pesticide use through IPM

"An ecologically based pest control strategy that relies heavily on natural mortality factors and seeks out control tactics that disrupt these factors as little as possible."

- Flint and van den Bosch, 1981

Benefits of IPM

- Focus on pest prevention
- Incorporates multiple management strategies
- Use insecticides only when there is a *demonstrated need*
Farm Practices for Beneficial Insects: IPM

IPM works with Conservation Bio-Control:

- Preventative pest management
- Reduced-risk pest control
- Enhances pest control already present in the farming environment


Photo: Sarah Foltz Jordan
Farm Practices for Beneficial Insects: IPM

IPM works with pollinator conservation:
• Generally results in reduced, more judicious, pesticide use
Steps to Implementing IPM

1. Reduce conditions that favor pest population growth
2. Regularly monitor and scout for pest and beneficial insect populations
3. Properly identify insects (both pests and beneficials)
4. Determine thresholds to make treatment decisions
5. Select appropriate management strategies when threshold is reached
Farm Practices for Beneficial Insects: IPM

Alternatives to Pesticides

- Pheromone trapping
- Mating disruption
- Floating row covers
- Fruit bagging
- Crop rotation
- Crop diversity
- Resistant varieties
- Sanitation
- Planting or harvesting date (offsetting life cycles of crops and pests)
Farm Practices for Beneficial Insects: IPM

Maintain healthy plants and healthy soils

• Healthy plants are more tolerant of pest problems (insect, diseases)
• Pests often seek out weakened plants
Preventing Pest Problems

IPM on Large Scale: California Almonds and the Navel Orangeworm (NOW)

- Robust cultural control - thorough removal of mummy nuts, early harvest
- Use of parasitic wasps – conservation biocontrol or augmentative (purchased and released) biocontrol
- UC IPM degree day model developed to predict egg hatch
- Egg traps developed to assist in monitoring and used in conjunction w/ degree day modeling
- Pheromone traps exist to monitor flight of adult males
Insecticides can cause significant harm to beneficial insects

- Minimize use overall
- Follow labels carefully
- Use most targeted / least toxic options

Even when bee caution labels are followed, there is limited protection for many native bees and other beneficial insects

UC IPM Website: http://www.ipm.ucdavis.edu/mitigation/index.html OR http://www2.ipm.ucanr.edu/beeprecaution/
Product Selection:

- Broad spectrum more likely to be harmful to pollinators and beneficials
- Consider residual toxicity – generally short RTs easier to mitigate
Farm Practices: Managing Insecticides

Timing is everything:

• Don’t spray on plants in bloom
  o Includes crops, cover crops and weeds
  o Mow before spraying

• Spray at night
  • Pollinators not active at night
Farm Practices: Managing Pesticides

Manage Drift and Over Application

- Avoid windy conditions and temperature inversions
  - Light breeze optimal
- Calibrate equipment annually
- Improved technology
  - Nozzles and Sprayers
Farm Practices: Managing Pesticides

Minimizing Drift: Protect Habitat Areas

• Establish buffers or setbacks
  o Unsprayed area (30’ – 60’)
  o Avoid aerial spraying

• Pesticide drift barriers
  o ‘Non-habitat’ vegetative barriers
    (eg. conifers; dwarf Italian cypress)
Farm Planning: Field Border Habitat

Examples: CA Field Crops and CA Almond Orchard.
- Reducing pesticide exposure

CA Field Crop:
- extended (60’) buffer between cropped area and habitat area
- No neonicotinoid use
- Ground applications only

CA Almonds:
- No spraying of last row to reduce drift.
- No neonicotinoid use
- Habitat in close proximity to deliver best ecosystem services

Photos: Jessa Kay Cruz
What’s not on the label:

- Tank sprays – synergistic effects of mixing pesticides. Eg. DMI fungicides w/ neonicotinoids or pyrethroids (triazoles)

Neonicotinoid Insecticides:

- Systemic mode of action
- Can be persistent over time in plants and soil
- Residues in pollen and nectar
- Move through soil and water

(Van der Sluijs et al 2013, Stoner and Eitzer 2012 & 2013)
Neonicotinoid Insecticides:

- Wide spread use
- Used prophylactically; ie treatment before damage occurs
- Different application methods have different toxicity levels and pathways of exposure (eg. seed coatings, soil treatments, trunk injections, foliar sprays)
- Different neonicotinoids have different levels of toxicity (Clothianidin, Dinotefuran, Imidacloprid and Thiamethoxam = most problematic)
Tough Times for Insects – Unprecedented rise in neonicotinoid use

Estimated Agricultural Use for Imidacloprid, 1994

Estimates use on agricultural land, in pounds per square mile:
- < 0.01
- 0.01 - 0.02
- 0.03 - 0.04
- > 0.04
- No estimated use

Photo: USGS
Tough Times for Insects – Unprecedented rise in neonicotinoid use

Estimated Agricultural Use for Imidacloprid, 1997

EPest-Low

Estimated use on agricultural land, in pounds per square mile:

- < 0.01
- 0.01 - 0.02
- 0.03 - 0.04
- > 0.04
- No estimated use

Photo: USGS
Tough Times for Insects – Unprecedented rise in neonicotinoid use

Estimated Agricultural Use for Imidacloprid, 2004

EPest-Low

Estimated use on agricultural land, in pounds per square mile

- < 0.01
- 0.01 - 0.02
- 0.03 - 0.04
- > 0.04
- No estimated use

Photo: USGS
Tough Times for Insects – Unprecedented rise in neonicotinoid use

Estimated Agricultural Use for Imidacloprid, 2009
E.Pest-Low

Estimated use on agricultural land, in pounds per square mile

- < 0.01
- 0.01 - 0.02
- 0.03 - 0.04
- > 0.04
- No estimated use

Photo: USGS
Tough Times for Insects – Unprecedented rise in neonicotinoid use

Estimated Agricultural Use for Imidacloprid, 2013 (Preliminary)

EPest-Low

Estimated use on agricultural land, in pounds per square mile

- < 0.01
- 0.01 - 0.02
- 0.03 - 0.04
- > 0.04
- No estimated use

Photo: USGS
Organic-Approved Pesticides are not risk-free

- Pyrethrins: Highly toxic, broad-spectrum
- Spinosad: Highly toxic, broad-spectrum
- Can harm bees and beneficial insects
Safer Pesticide Options

- Bt sprays
- Insect repellents (e.g. garlic or citrus oils)
- Horticultural oils
- Insecticidal soaps
- Kaolin clay barriers (Surround)
Farm Practices for Beneficial Insects

Protect Ground Nests and Ground Dwelling Insects

- Reduce Tillage
- Rotate tilled areas
- Minimize plastic mulch