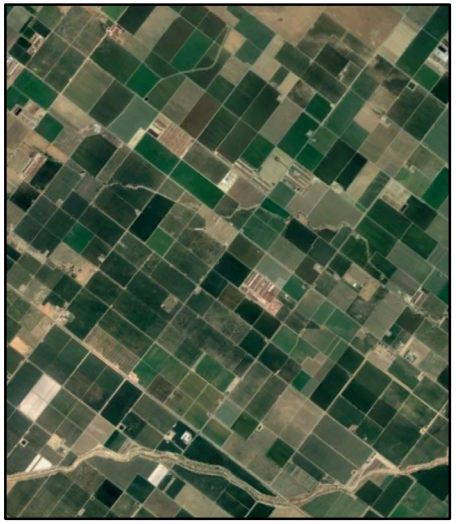
Integrated Pest Management for Walnuts
Highlights and Recent Advances





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Outline for Today

Current Pest Problems

- Navel orangeworm
- Walnut husk fly

Short-Term Solutions (New Tools)

- Improved Monitoring – Ovibait + PPO
- Mating Disruption NOW
- Mass-trapping NOW
- WHF Lures

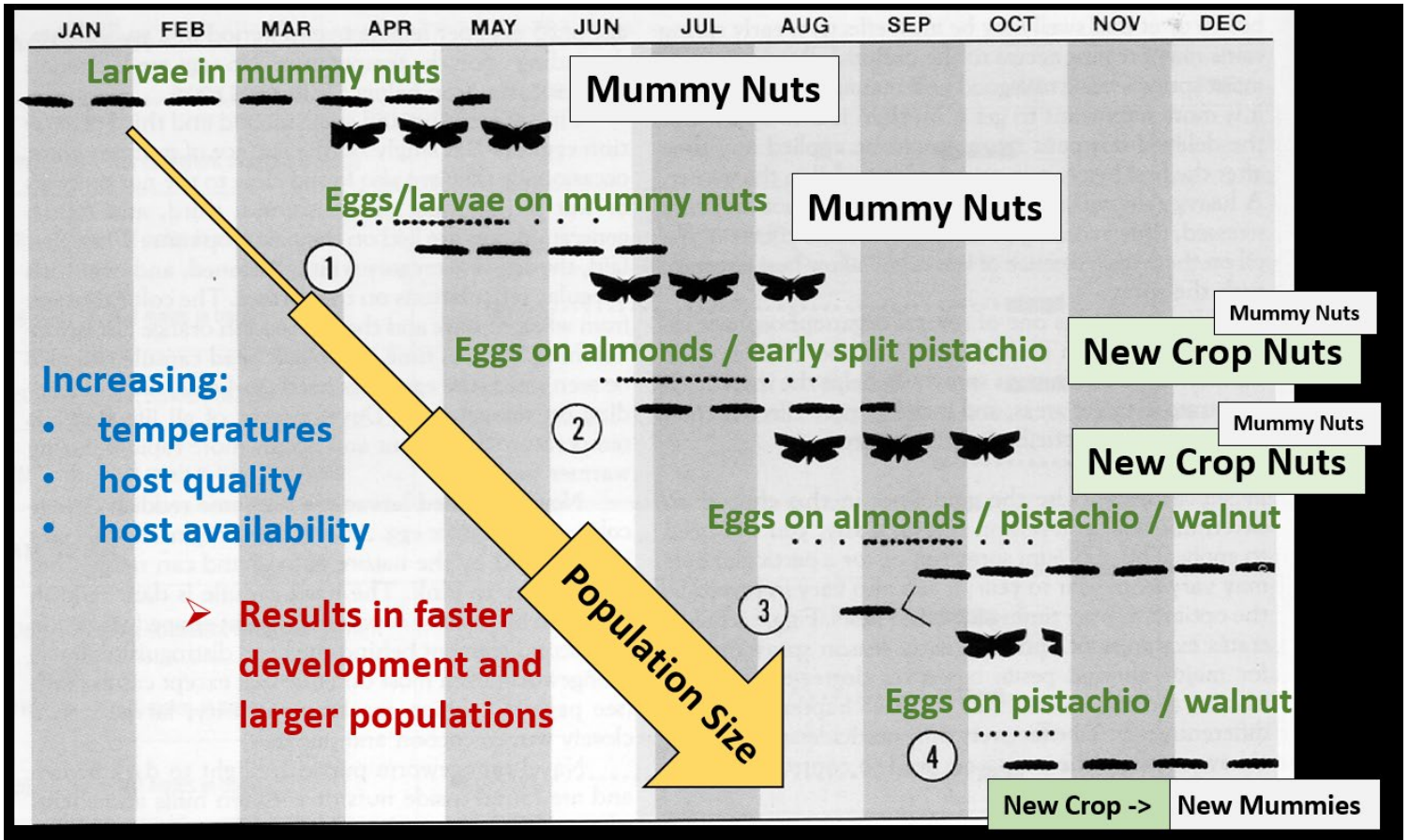
Long-Term Solutions (Ecology)

- Movement Ecology of NOW and WHF
- Sterile Insect Technique - NOW
- Overwintering biology - WHF

Navel Orangeworm

Ecology

- Multiple potential hosts, tree nuts are the best
- Larvae overwinter in mummies
- 3-4 flights/year, starting in March/April
- Hull integrity is key to access



Navel Orangeworm

Nature of the Problem in Walnuts

- Directly attack the nuts
- Hull integrity is key
- Codling moth can facilitate early-access

Codling moth damage with frass evident

Walnut Blight

Sunburn

Navel Orangeworm

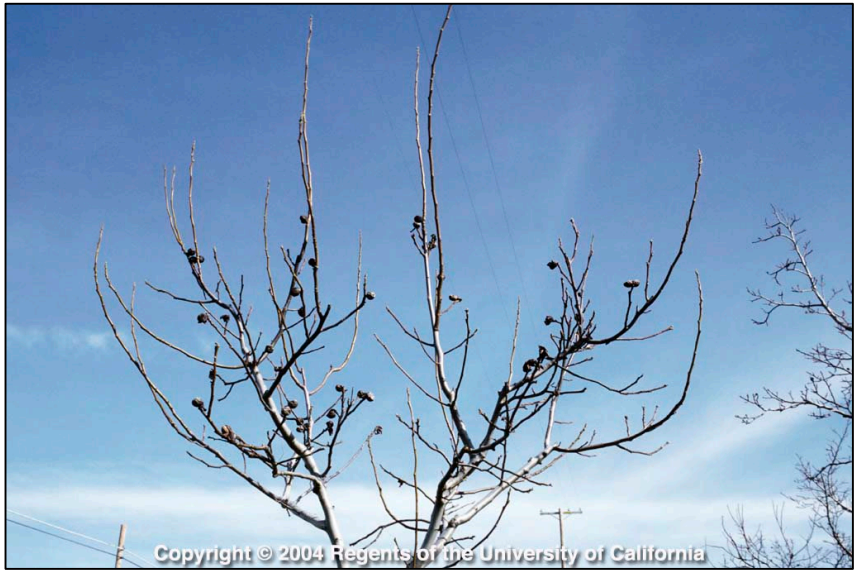
Current Management

- Crop sanitation
- Codling moth control
- Monitoring x well-timed sprays
- Mating disruption

Foundation of NOW Control = Sanitation of Mummy Nuts

Walnut mummies on ground during dormant season can harbor NOW larvae and pupae; *inset*, walnut with navel orangeworm inside.

ment, they were covered by a mesh. Rainfall was measured throughout



Navel Orangeworm

New and Better Ways to Kill Them

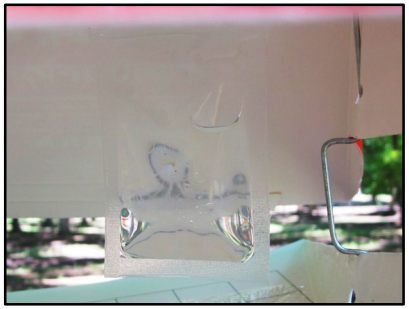
Monitoring

- **Different Trap Types**
- **Trap Catch x Damage? Remains Unclear**

Pheromone Lures (males)

Ovipositional Baits (females)

Phenyl-Propionate (PPO) Lures (males + females)

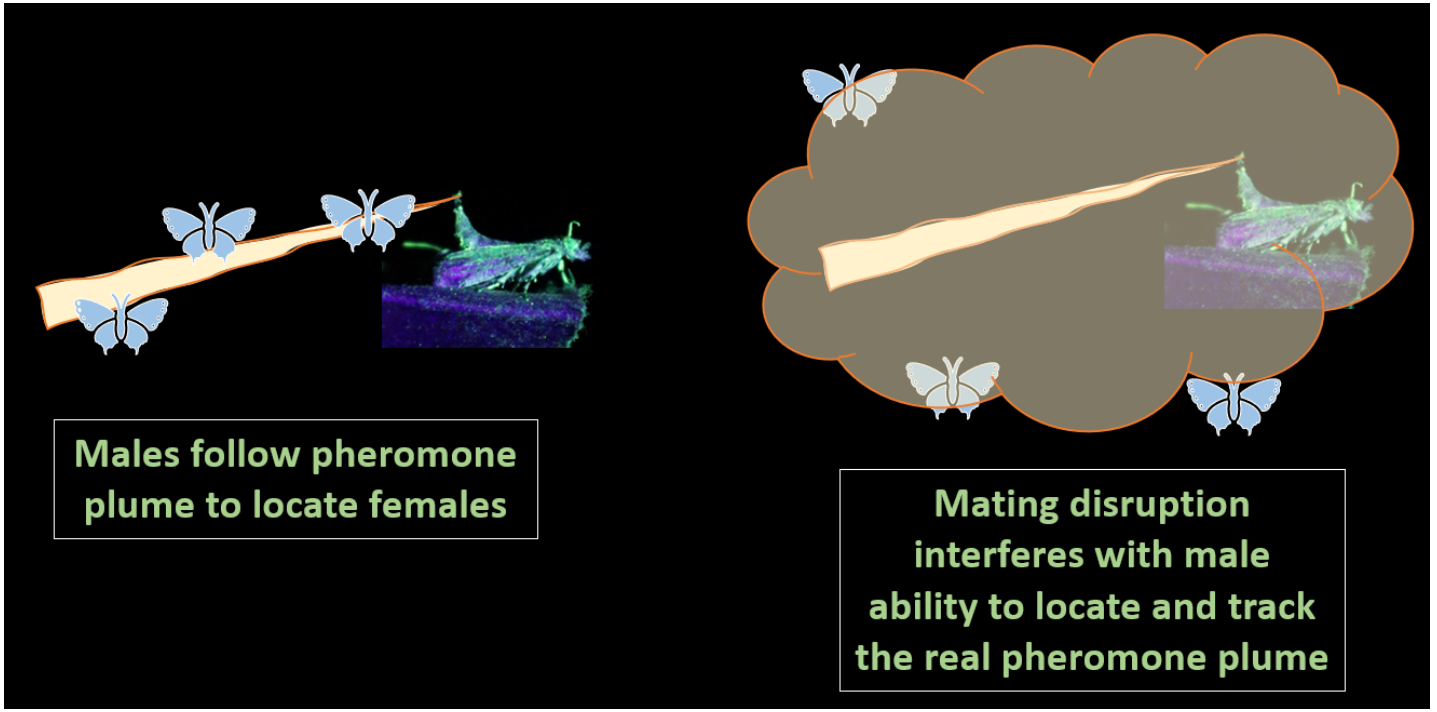


Navel Orangeworm

New and Better Ways to Kill Them

Mating Disruption

- Synthetic pheromone disrupts male ability to locate females
- Various forms – aerosols, plastic emitters, flowables
- Good efficacy data in almonds…but walnuts are different.
- Block size and late phenology = risk mated female immigration



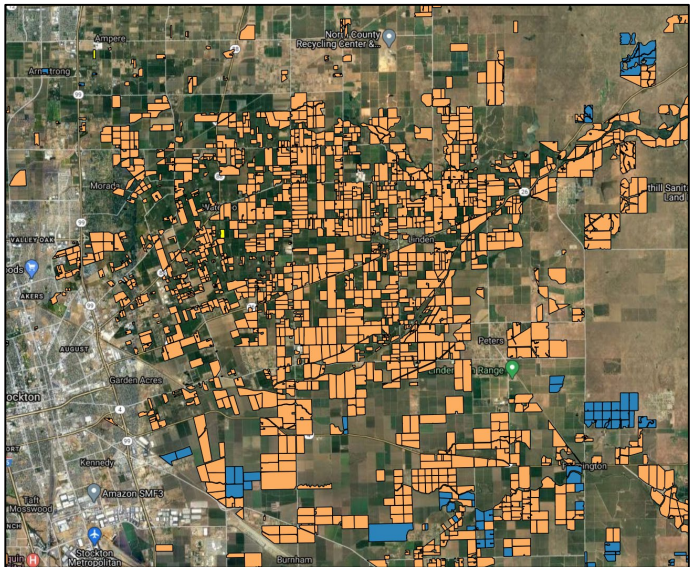
Navel Orangeworm

Long Term Trajectory

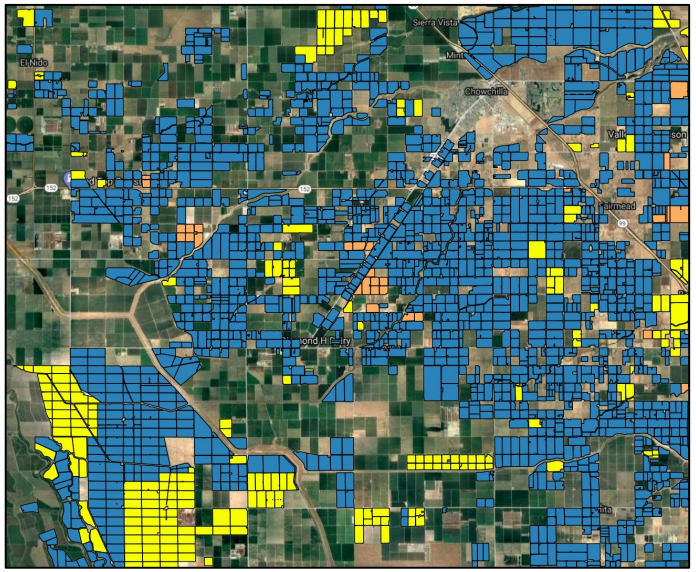
Movement of NOW Between Orchards

- More tree nuts, more NOW
- Walnut is last to go, so extended opportunity for infest
- Almond/pistachio harvest may trigger movement into walnuts

Walnut Almond Pistachio



Walnut Dominant



Almond Dominant

Navel Orangeworm

Long Term Trajectory

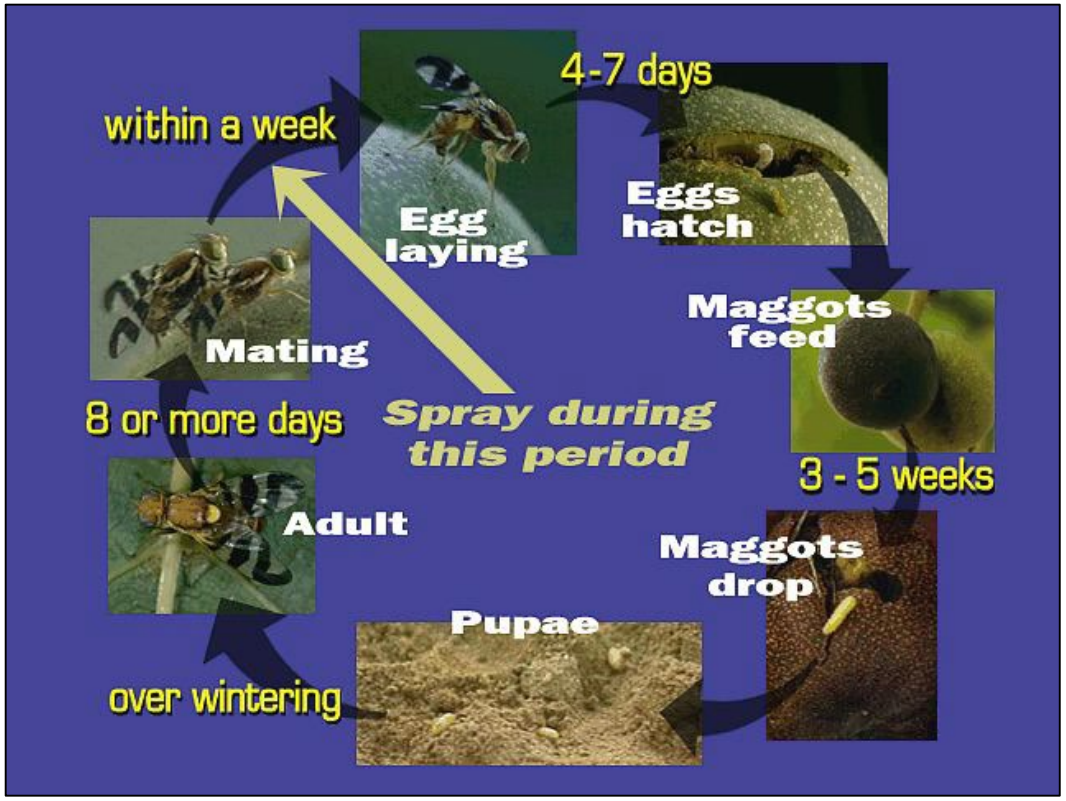
Sterile Insect Technique

- Release large number of sterilized NOW into the orchard
- Steriles mating with wild NOW negates their ability to reproduce
- Successfully used for many insects, including Lepidoptera
  - Codling moth (British Columbia, Washington – apples)
  - Pink bollworm (Arizona/California – cotton)
  - False codling moth (South Africa – citrus)

Walnut Husk Fly

Ecology

- Very specific to walnuts
- Overwinter as pupae in the soil
- 1 flight/year, emerge in June/July



Walnut Husk Fly

Nature of the Problem in Walnuts

- Directly attack the nuts
- About 2-week lag between emergence and attack (need to mate)
- Trapping can alert you, but it sometimes misses

Walnut Husk Fly

Current Management

- **Monitor to time sprays**
- **Sprays can be…**
  - **Baits (NU-Lure, GF-120)**
  - **Contacts (Brigade, Warrior, Delegate, Entrust etc.)**
  - **Systemics (Assail, Admire, Belay etc.)**

Walnut Husk Fly

New and Better Ways to Kill Them

New Lures and Approaches

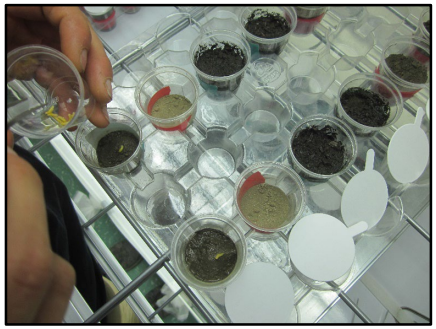
- **Standard = Sticky trap + ammonium-carbonate lure**
- **New lures more attractive?**
- **What is the trapping radius?**

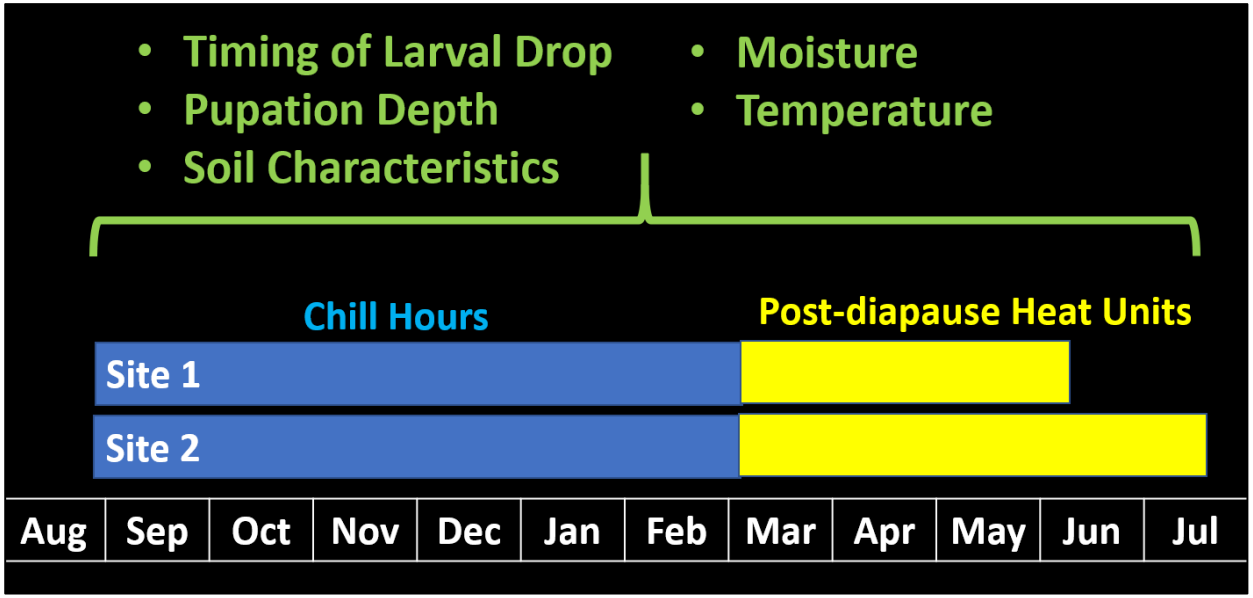
Walnut Husk Fly

Long Term Trajectory

Overwintering Biology

- Pupate in the soil, seems like an opportunity to interfere
- Winter chill x moisture x soil type - influences timing of emergence
  - ➢ Better prediction of hot spots and emergence timing?
  - ➢ Manipulate conditions to increase overwintering mortality?



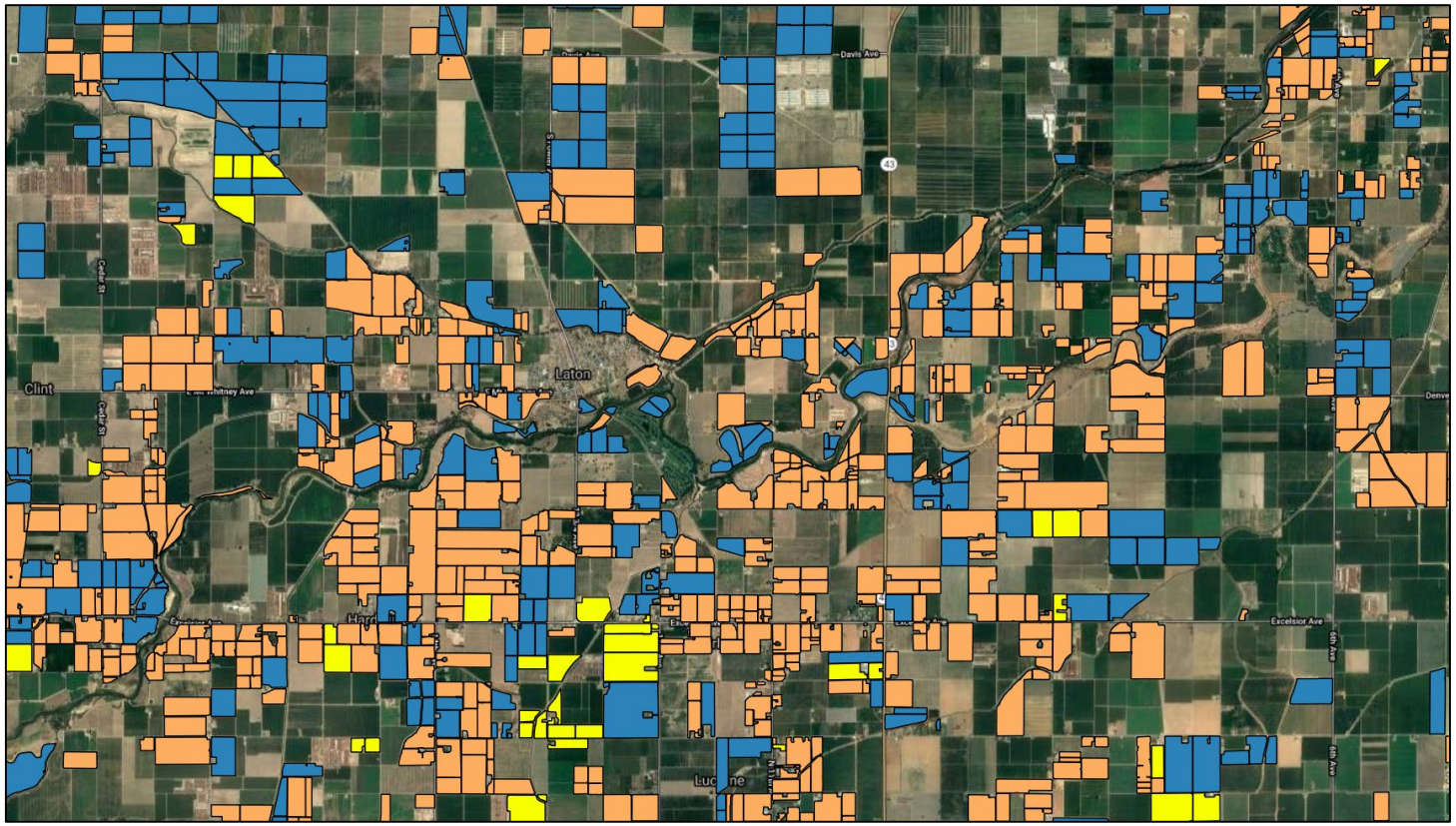


Walnut Husk Fly

Long Term Trajectory

Movement Ecology

- Do WHF move between orchards?
- If so, to what extent?



Thank you!!
Good luck this year!

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