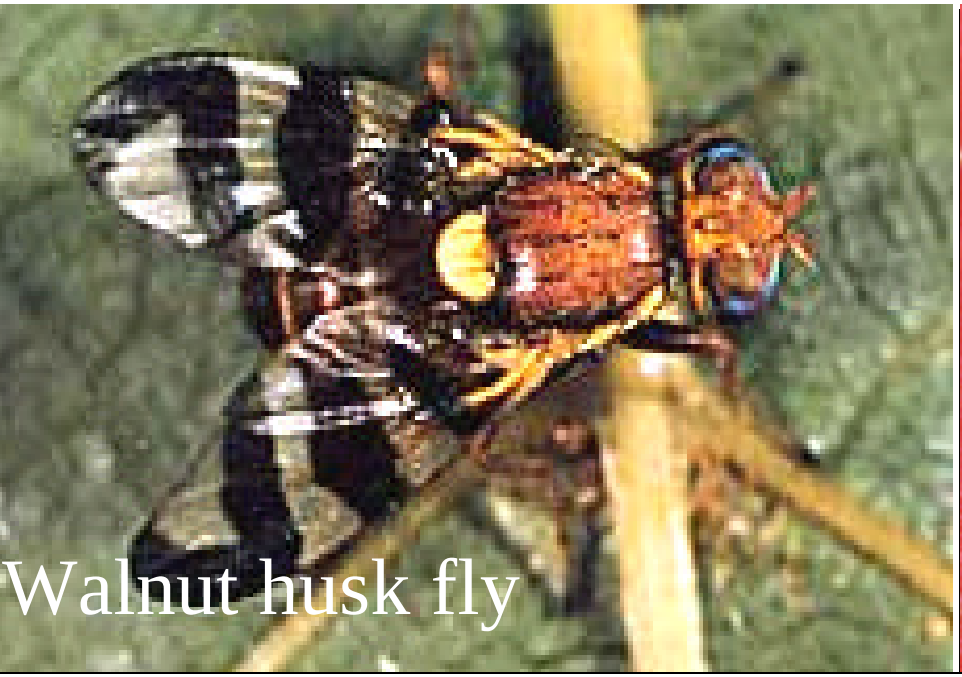
Olive Fly – Biology, Control and Research Update

Marshall W. Johnson
mjohnson@uckac.edu

Department of Entomology, University of California, Riverside
UC Kearney Agricultural Center
Parlier, California


Mediterranean
fruit fly

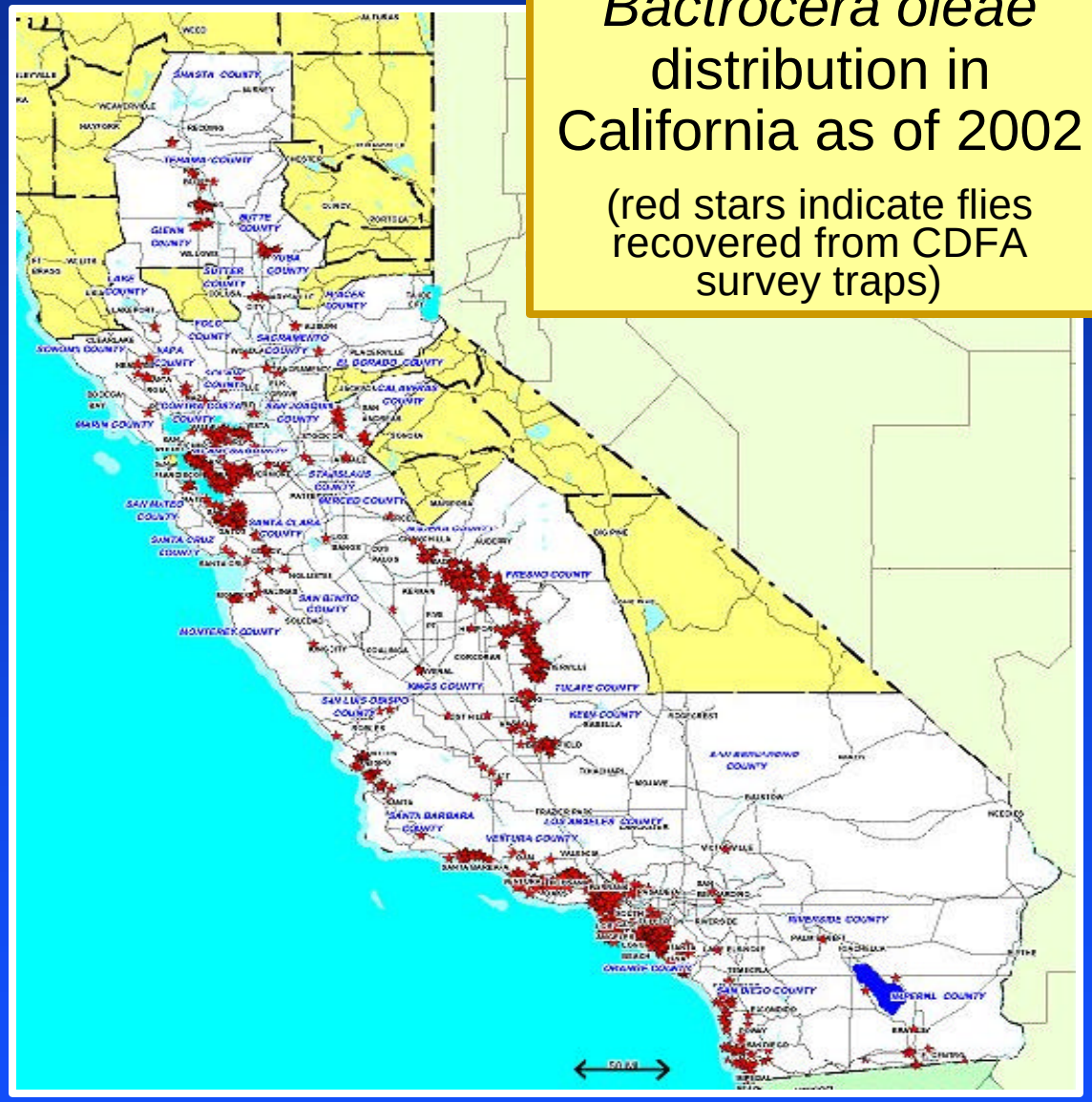

Oriental fruit fly


Walnut husk fly


Melon fly

First detected in October 1998, the olive fly has established in most of the localities in California where olives are grown. However, the climatic conditions vary tremendously from the mild coastal climates to the Central Valley to the inland deserts.

Research to date suggests that climate and availability of host fruit may play a significant role in determining the levels to which olive fly is a pest of the various types of olives produced (i.e., table vs oil).



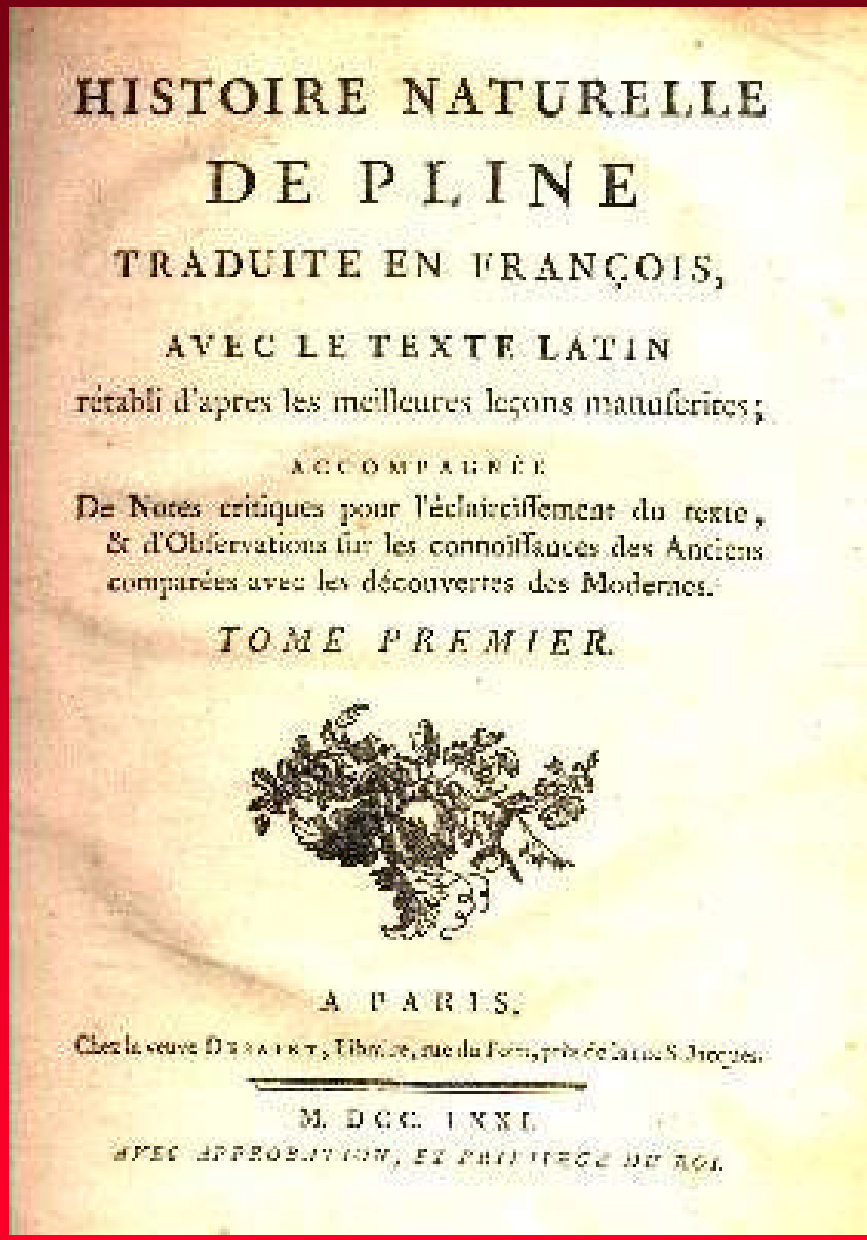
Bactrocera oleae distribution in California as of 2002

(red stars indicate flies recovered from CDFA survey traps)

An Ancient Pest

- In the Mediterranean region, the olive fly is an ancient pest
- It was mentioned in Greek / Roman writings dating back to the 3rd Century B.C. by Pliny the Elder (Caius Plinius Secundus) A.D. ca. 23 - 79)

— *Historiae Naturalis Libri*



HISTOIRE NATURELLE
DE PLINE
TRADUITE EN FRANÇOIS,
AVEC LE TEXTE LATIN
rétabli d'après les meilleures leçons manuscrites;
ACCOMPAGNÉE
De Notes critiques pour l'éclaircissement du texte, & d'Observations sur les connoissances des Anciens comparées avec les découvertes des Modernes.
TOME PREMIER.

A PARIS,
Chez la veuve DESAINT, Libraire, rue du Foin, près de la rue S. Jacques.

M. DCC. LXXI.
AVEC APPROBATION, ET PRIVILEGE DU ROI.

Olive Fly in the Mediterranean Area

- The major olive producers in the Mediterranean Area are Spain, Italy, Greece, Turkey, Tunisia, Syria, Morocco, and Portugal
- Most of the olive production in these countries is for oil production for consumption and industrial use.
- Olive fly is the most serious pest on olives in these countries
- The threshold for olive fly infestation of table olives is near zero, but is higher for oil olives (8 - 10%).
- Many countries have government-sponsored management programs that provide area-wide spray programs
- Average crop losses with current control measures vary between 5 to 15%

What are they doing in Europe for olive fly?

- Insecticidal bait sprays from ground or air — These are the current standard control method. Alternate row spraying is recommended, but in many places the entire orchard is sprayed. In the E.U., aerial applications have been banned except by special permission or in localized areas. Area wide management is a must for success.
- Cover sprays — Conventional spray method treating all foliage. Used in localized areas where bait sprays have failed and OLF is above treatment threshold. Organophosphates are used as well as Spinosad. Used only in emergency situations due to adverse side-effects.
- Mass trapping — Used to obtain extended control compared with the bait sprays and to avoid adverse side-effects of cover sprays. Only two trap types registered for use. Traps gradually lower olive fly numbers compared to quick knock down of bait sprays, but when used over long periods (e.g., 3 years) are quite effective.

Contributing to olive fly research efforts in California are:

- Marshall Johnson, UCR
- Kent Daane, UCB
- Robert Van Steenwyk, UCB
- Susan Opp, CSU Hayward
- Russell Messing, U of Hawaii
- Kim Hoelmer, USDA - ARS
- Charlie Pickett, CDFA
- Frank Zalom, UCD
- Hannah Burrack, UCD
- Louise Ferguson, UCD
- Judy Stewart-Leslie, PMA
- Tim Ksander, Ag Advisors
- Hannah Nadel, UCR
- Mark Robertson, UCR
- Mary Bianchi, UCCE
- Paul Vossen, UCCE
- Joe Connell, UCCE
- Bill Krueger, UCCE
- Vickie Yokoyama, USDA ARS
- Joe Zermeno, CSU Hayward
- Cullen Wilkerson, CSU Hayward

What We Need to Know

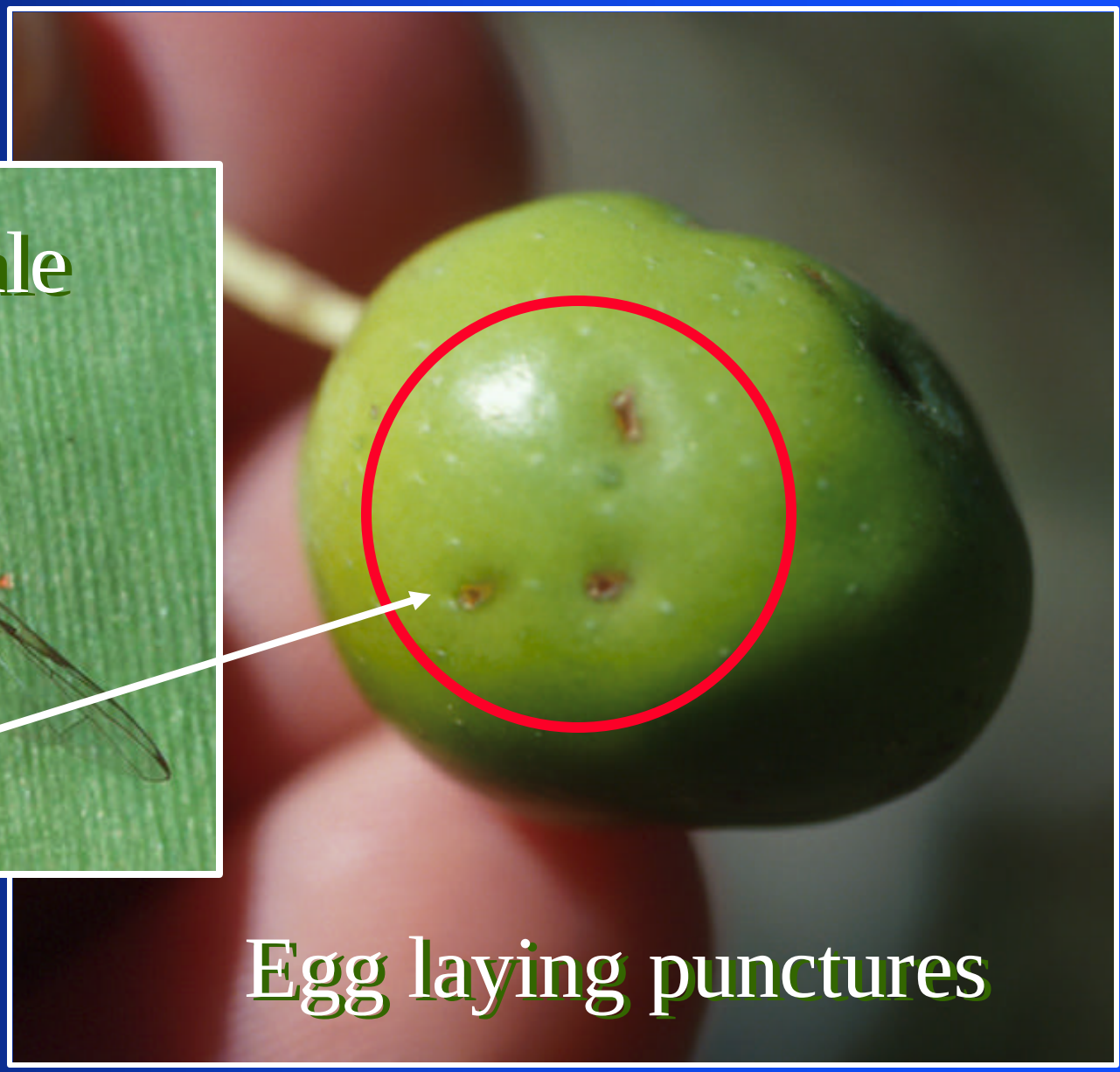
For Current Management

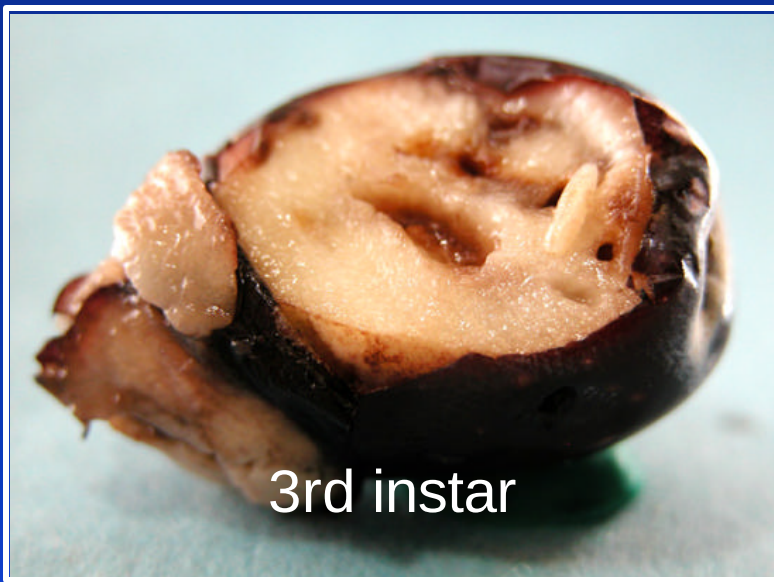
- Effective survey / monitoring methods
- Effective insecticides and application methods

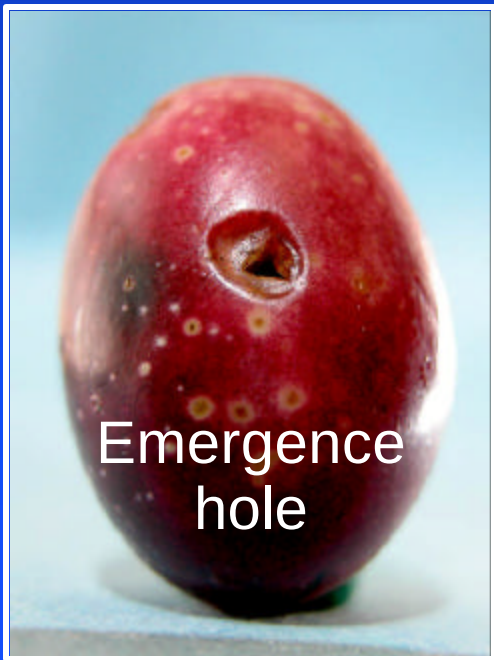
To Improve & Sustain Management

- Biology and ecology in various climatic regions of California
- Determine risks imposed by urban olive fly sources
- How to disrupt olive fly movement into orchards
- Potential for control using biological control agents
- How to effectively mass rear the olive fly
- Evaluate value of post harvest cultural management


Adult female
Photo: R. Copeland


Egg laying punctures





Olive fly biology


Buds and flowers


Green fruit


Ripe fruit


Fallen ripe fruit

Presentation Topics

- Approaches to monitoring olive fly
- Types of adult traps available
- Optimum placement of traps within trees
- Current management options
- Timing and application of GF-120
- Olive fly numbers in untreated olives

Ways to Monitor Olive Fly

- Visual inspection of foliage / fruit for adult flies — Problem: Adult flies are rarely seen within the trees. Adults do not always remain in a grove, but may move among various crops.
- Check for infested fruit within trees and on the ground — Problem: Usually densities within fruit are extremely low, thereby requiring huge numbers of fruit to be inspected. Fruit are not always available to sample. Given zero-tolerance levels for table olives, need to prevent fruit from being infested
- Monitor for adults with traps hung in trees — Best technique available, simple, inexpensive, but numbers caught do not always reflect presence of olive fly in an area


Adult olive flies are difficult to
see on olive foliage


Checking fruit is too time consuming

Aerial traps attract adult flies with the help of food and sex lures

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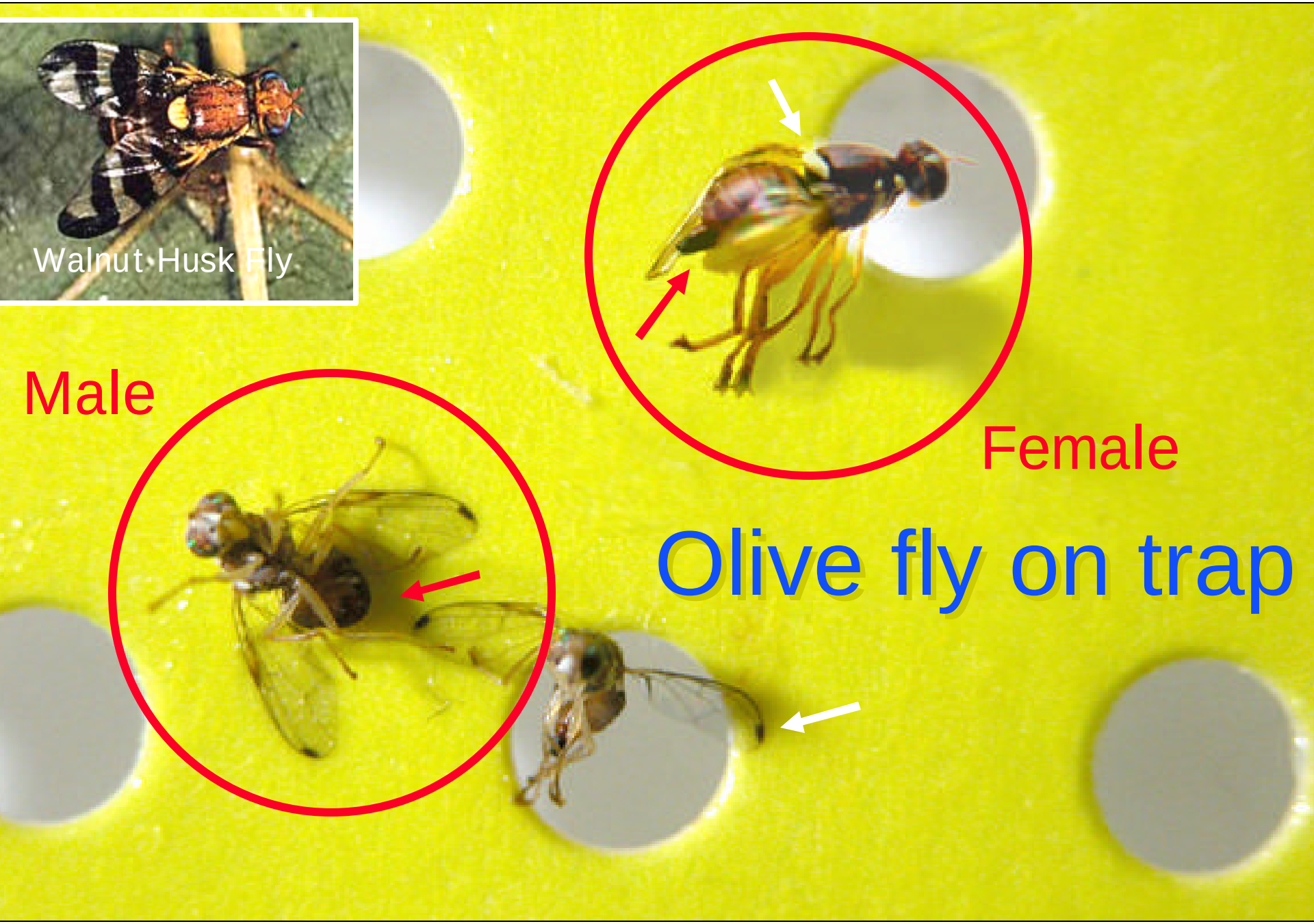
ChamP Trap

Simple Yellow Panel Trap

- Easy to assemble
- Commercially available


Walnut Husk Fly
Male
Female
Olive fly on trap

Trap Maintenance

- Check yellow panel traps weekly
- Change the ammonium bicarbonate packets every 2 to 4 weeks depending on amount of active ingredient left
- Change the spiroketal pheromone plugs every four months
- Change traps when they become too cluttered with other insects or dust

McPhail Trap

Torula Yeast & Borax

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Placement in Trees

- Place on north side of tree in spring / summer
- Place on south side of tree in fall / winter
- Place in upper one third of tree
- Allow clear space around trap
- At least one trap per 5 - 10 acres of olives
- At least 2 traps per olive block; use more if possible

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Ways to Suppress Olive Fly

- Insecticidal bait sprays** — The only product currently available is GF-120 NF Naturalyte Fruit Fly Bait (a formulated Spinosad bait, Dow AgroSciences LLC). Approved for organic use. Section 18 presently.
- Attract and kill traps — Two types / commercially produced and homemade. Utilize food and sex lures to attract olive fly adults and some method to kill attracted adults.
- Kaolin clay protectant — Fine film of clay covers plant and changes olive fly attraction or behavior towards plant host. Research is still ongoing to determine its best use.

Application of Bait Spray

GF-120 NF Naturalyte Fruit Fly Bait
Approved for organic use
Section 18 presently

Attract & Kill Trap

- Produced by CertisUSA
- Currently undergoing registration
- Adult olive flies are attracted by food and sex lures, and die after contacting insecticide impregnated material
- Active ingredient is lambda cyhalothrin

OLIPE

Olive Fruit Fly Trap from Spain

1.5 to 2.0 liter plastic bottle. Fill $^{2}/_{3}$ full with a 3-5% (30-50 grams per liter) solution of di-ammonium phosphate or ammonium bicarbonate and water. Sometimes vinegar and protein hydrolysate bait is also added

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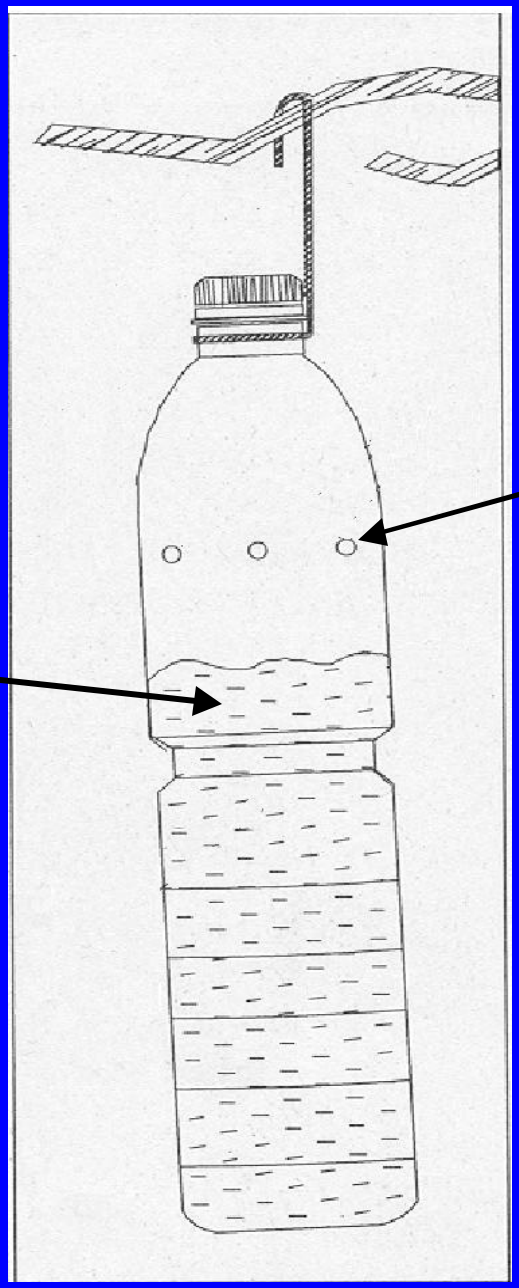
If stings exceed 3% - one mg of microencapsulated liquid spiroketal pheromone is added



Hang in the inside of the south side of the tree in the shade

Three to six 4-5mm ($^{3}/_{16}$ – ¼ inch) holes drilled or melted into neck

June – Sept.
8-10 traps/acre

Sept. – Dec.
16-20 traps/acre

From *Varela & Vossen 2002*

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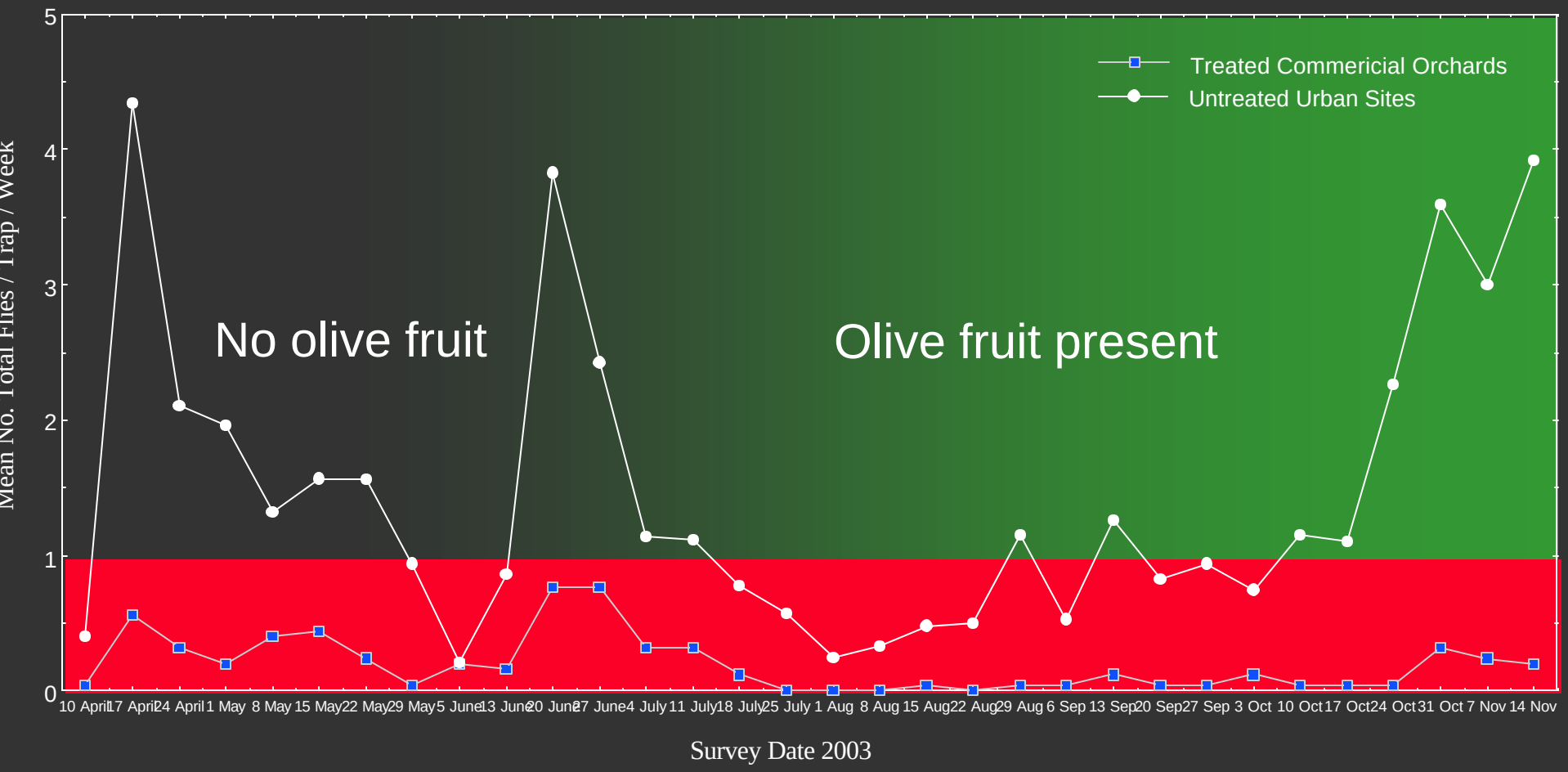
Timing and Use of Bait Sprays

As recommended by the Olive Advisory Group

- Control of olive fly is essential because of the zero tolerance level established by table olive processors
- Timing of bait sprays should be based on a sharp increase in numbers of male flies coming to monitoring traps as well as crop phenology. A safe guideline is to initiate treatments near June 1 or two weeks before olive pit hardening
- GF-120 is the only sprayable bait legally available for use
- It cannot be applied more than once every 7 days
- Use rates vary from 10 oz. to 20 oz. active ingredient per acre
- 14 oz. a.i. per acre is currently being recommended

Average Adult Olive Fly Trap Counts in Tulare & Fresno Counties



Application of Bait Spray

- Aerial applications not recommended
- Use alternate row coverage
- Treat north or east sides of trees
- Direct spray into upper half of tree
- Use dilutions from 1: 1.5 to 1: 4 parts GF-120 to water
- 4 - 5 mm droplets are best

Improving chemical controls

Robert Van Steenwyk
UC Berkeley

Marshall W. Johnson
UC Riverside

Efforts are ongoing to determine the effectiveness of GF-120 bait (Spinosad) sprays as well as to detect any non-target impacts on beneficial natural enemies in olives.

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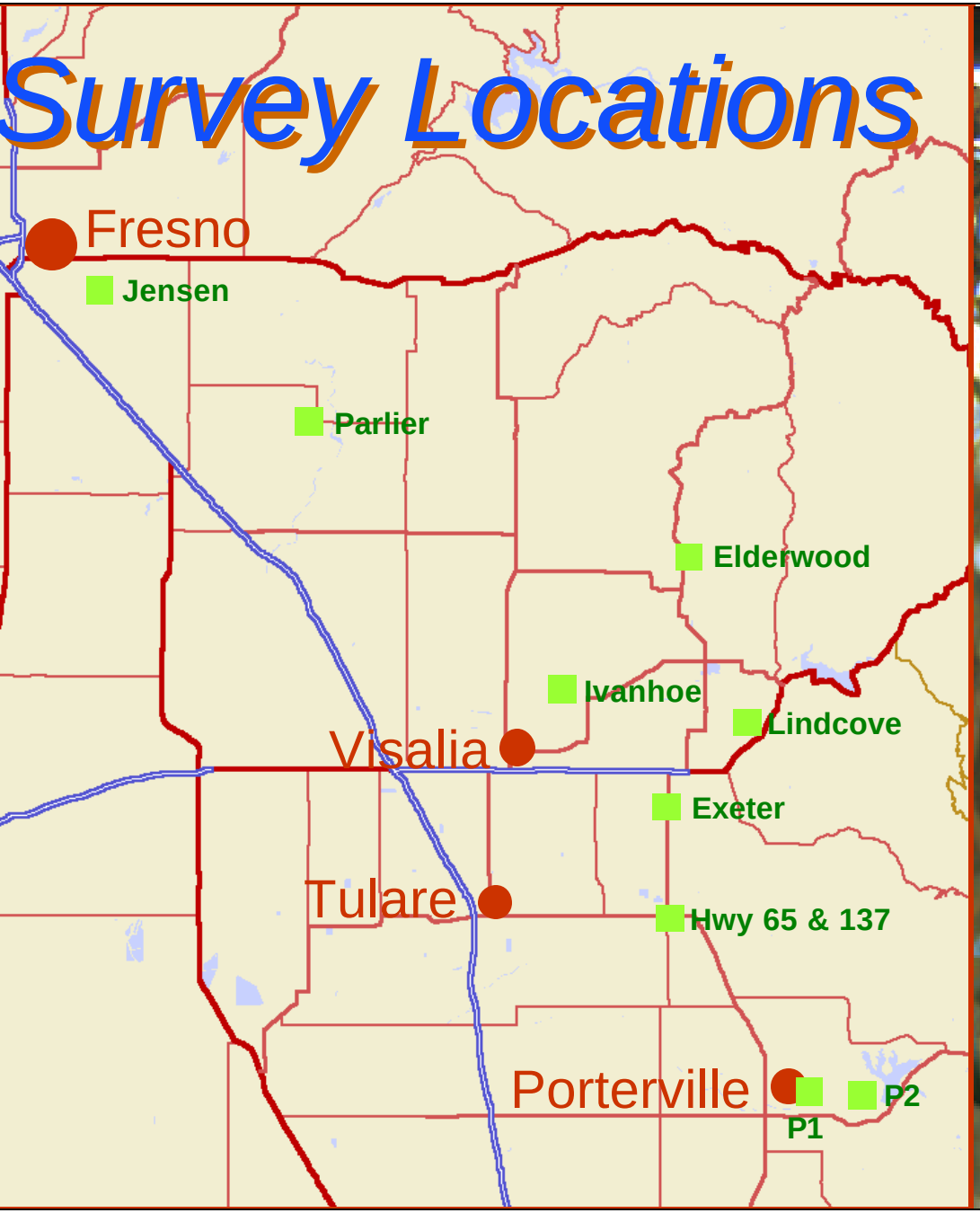
Roadside Ornamental Olive Trees

Untreated olives:

- Abandoned orchards
- Residential / business landscapes
- Roadside plantings
- Organic orchards

Survey Locations



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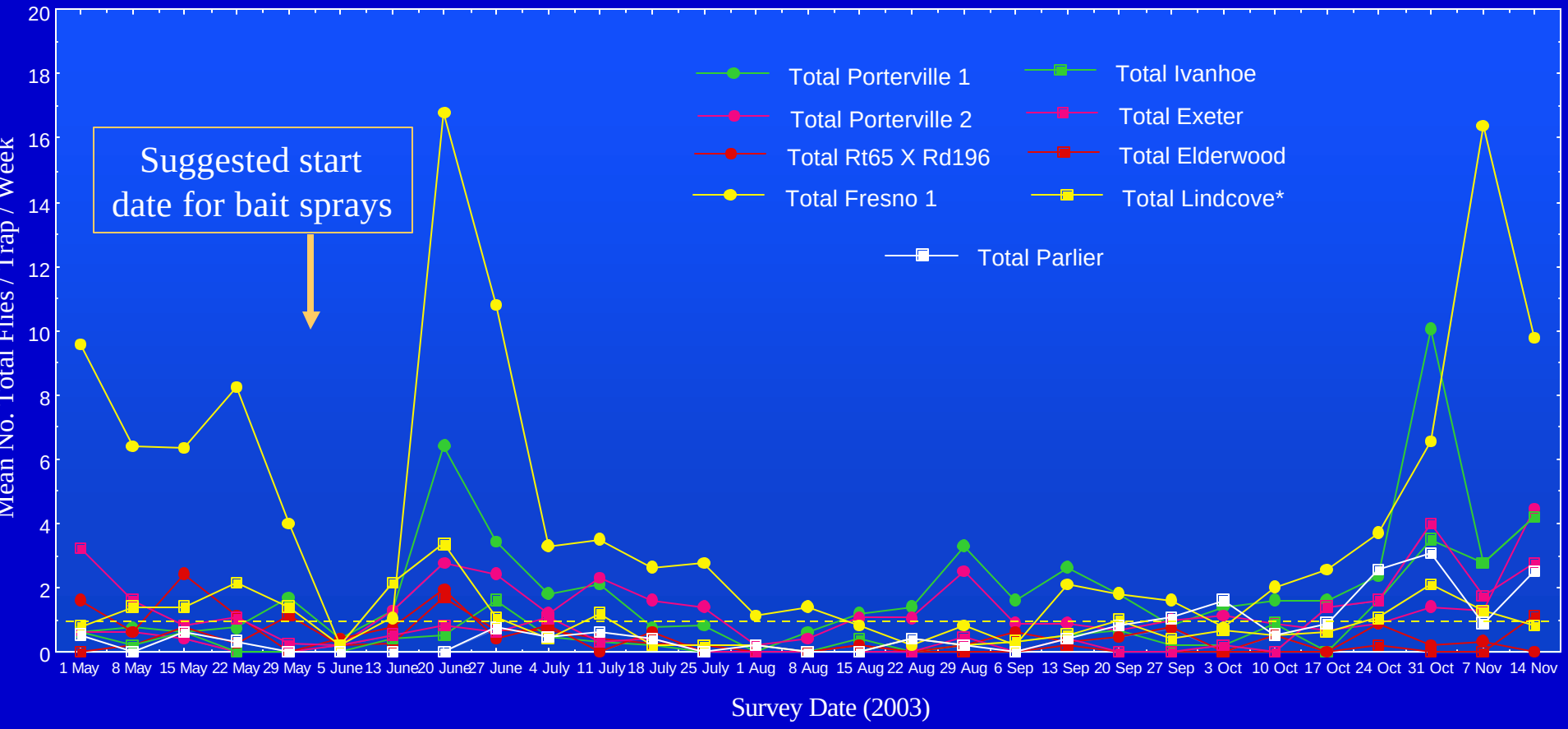
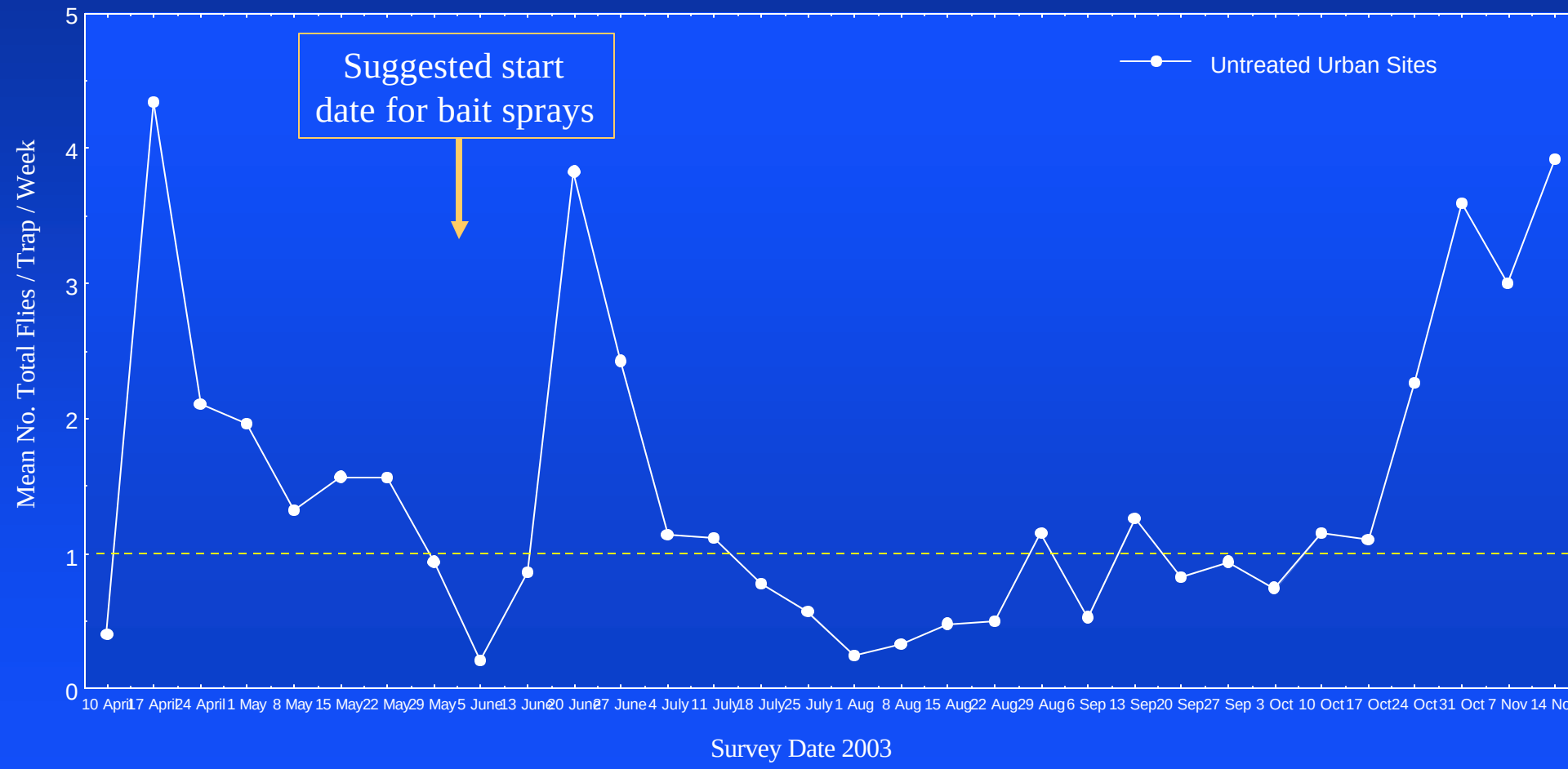
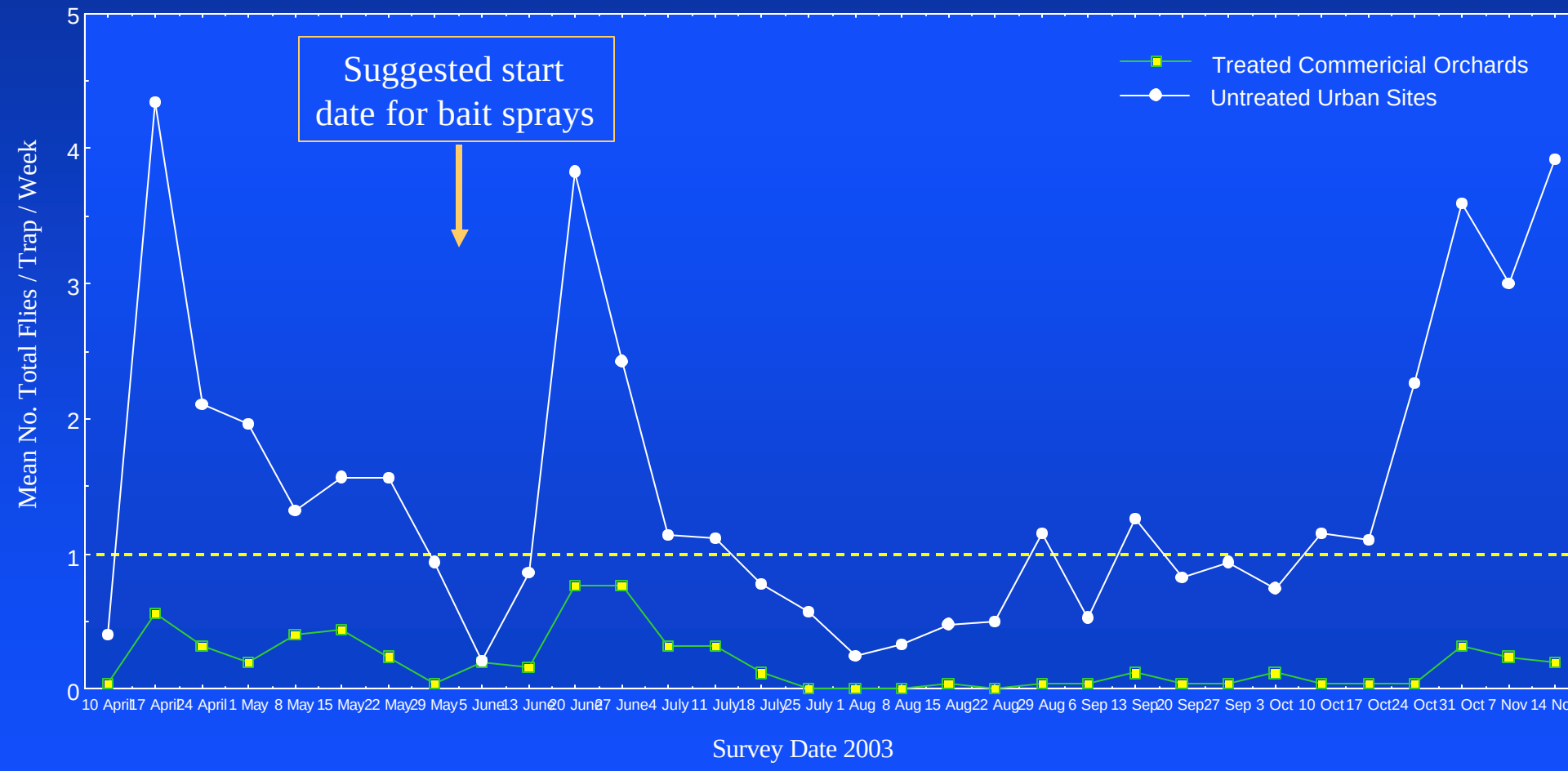
Mean No. Total Olive Flies Captured on ChamP Traps per Week in pesticide-free olive trees at 9 urban and agricultural sites in Fresno and Tulare Counties



Mean OFF counts from 9 untreated sites



Comparison of OFF counts from 9 untreated and 5 treated sites



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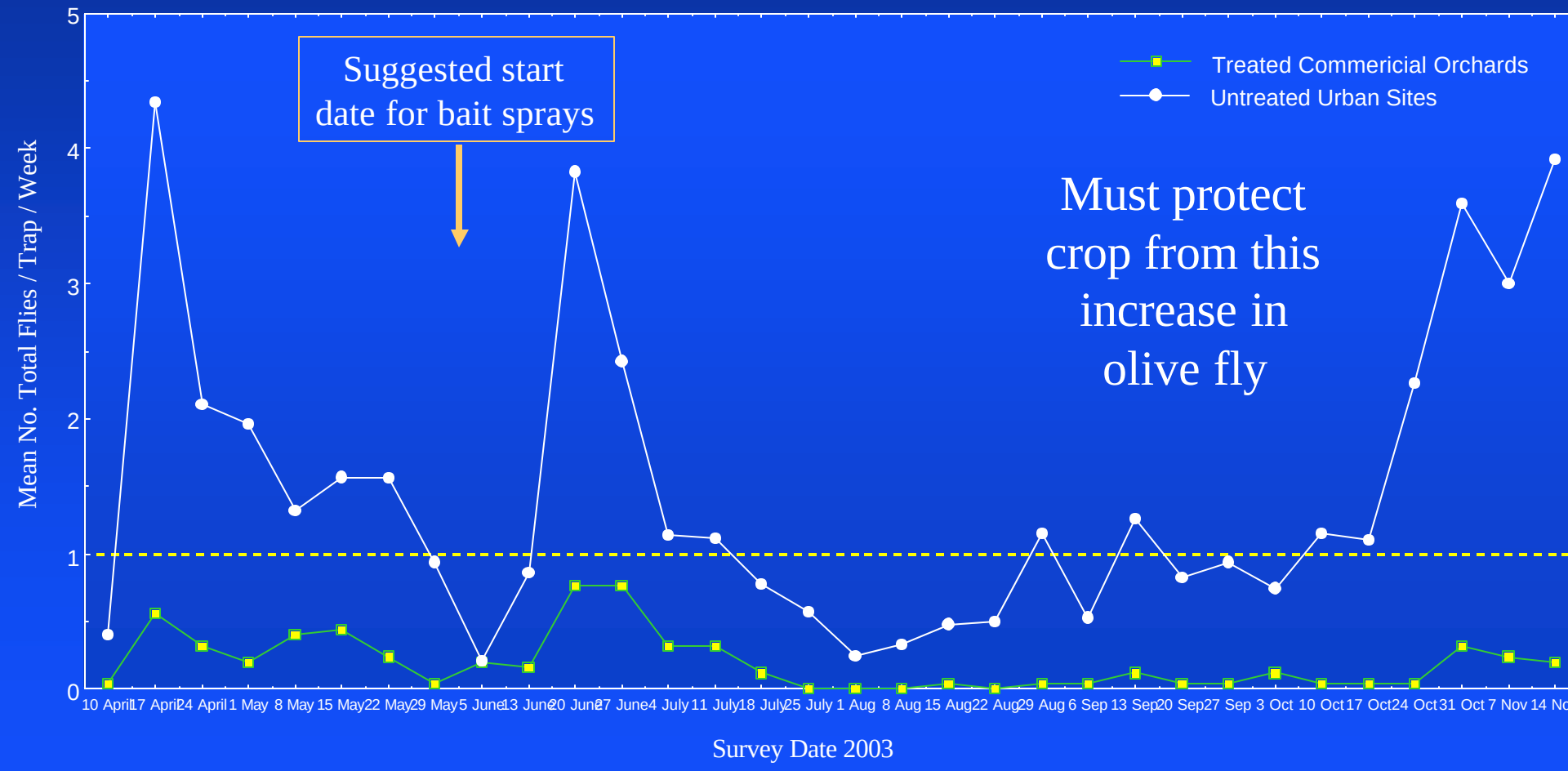

Why do we see a drop in trap catches?

- Do the yellow panel traps suddenly become less attractive?
- Do the flies alter their behavior patterns so that they are only active during cooler periods (i.e., early morning), thus less chance to be trapped?
- Do the flies cease most activity (i.e., summer estivation) and sit out the extreme heat within the olive grove?
- Do the flies leave the olive grove to seek out cooler, more humid places to sit out the extreme heat (e.g., citrus trees)
- Does the extreme heat quickly kill most of the flies?
- Are the flies just tricky critters that like to confuse us?
- *Can we assume that if flies are not going to the traps that they are not depositing eggs in susceptible olives?*

Potential Factors Impacting Adult Olive Fly Survival

- Insecticide applications
- High and low temperatures
- Low humidity
- Available water for drinking
- Availability of ‘refuge’ plants for shelter
- Availability of nutrient sources (e.g., honeydew)
- Distance to fruiting olive trees
- Availabilty of suitable olive fruit for egg deposition
- Presence of natural enemies

Summary

- The easiest and most efficient way to monitor for olive fly is via yellow panel traps that attract adult flies with food and sex lures
- Traps should be checked weekly and be well maintained (change lures, clean or replace traps)
- Various options for suppression of olive fly are available with GF-120 bait sprays probably being the optimum control currently available to commercail olive producers
- GF-120 should be applied to alternate rows weekly with the aim of producing 4-5 mm diameter droplets


Questions?