Olive Pest Research Update

Orland 2009

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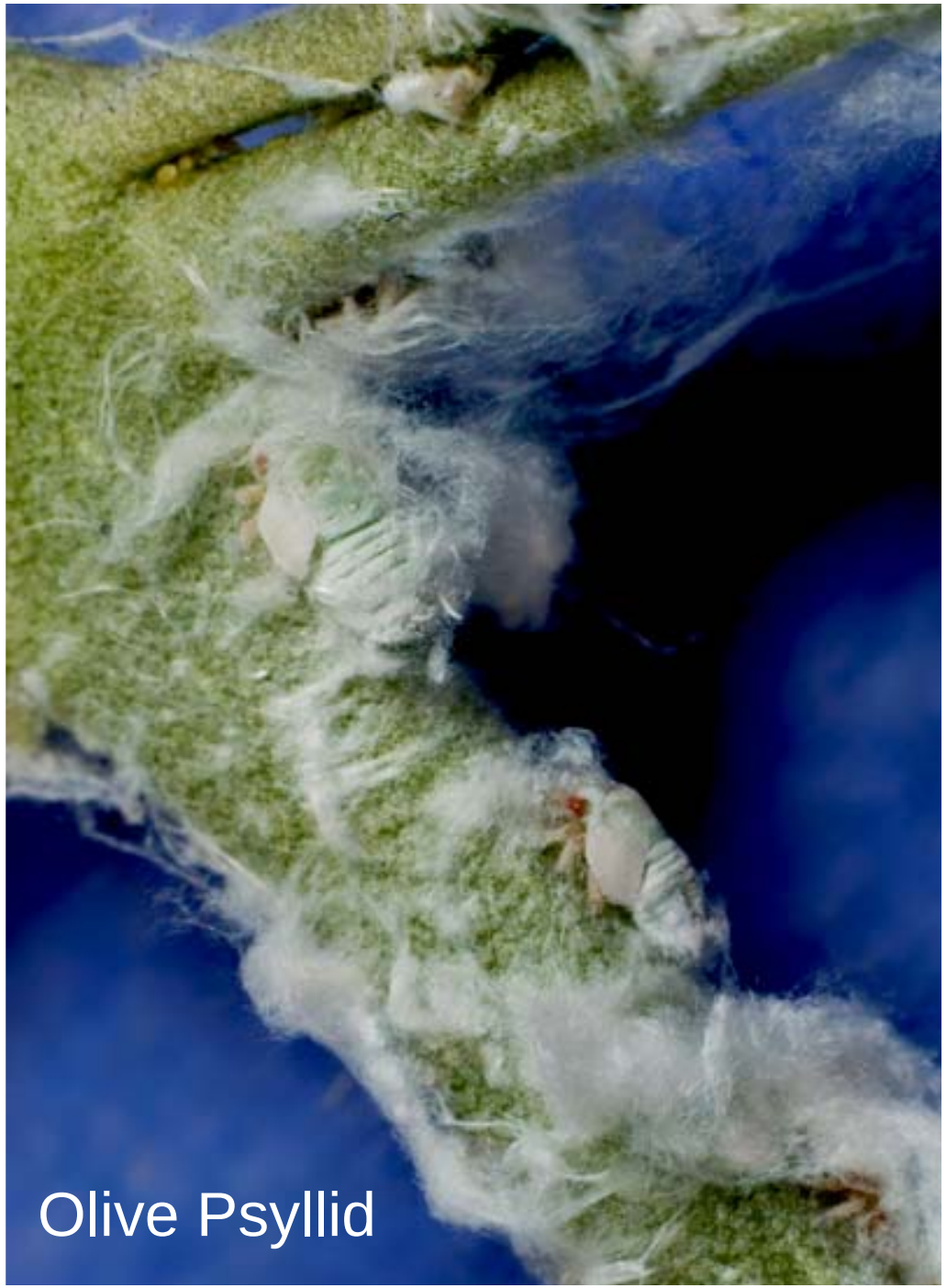
Olive Fly


Black Scale
© Marshall W Johnson


Olive Psyllid

Presentation Topics

- Timing and application of GF-120
- The need to manage black scale
- Biological control efforts underway
- Beware the olive psyllid

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

UC PLANT PROTECTION QUARTERLY

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This newsletter is published by the University of California Kearney Plant Protection Group and the Statewide IPM Program. It is intended to provide timely information on pest management research and educational activities by UC DANR personnel. Further information on material presented herein can be obtained by contacting the individual author(s). Farm Advisors and Specialists may reproduce any portion of this publication for their newsletters, giving proper credit to individual authors.

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Agricultural Experiment Station

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OLIVE FRUIT FLY MANAGEMENT GUIDELINES FOR 2006.

Marshall W. Johnson[1,11], Frank G. Zalom[2], Robert Van Steenwyk[3], Paul Vossen[4], Alexandra K. Devarenne[4], Kent M. Daane[5,11], William H. Krueger[3], Joseph H. Connell[6], Victoria Yokoyama[7], Barat Bisabri[8], Janet Caprile[9], and Janet Nelson[10]; Dept of Entomology, UC Riverside[1], Dept of Entomology, UC Davis[2], Division of Organisms and Environment, Dept of Environmental Science, Policy and Management, UC Berkeley[3], UCCE Sonoma and Marin Counties[4], UCCE Glenn and Tehama Counties[5], UCCE Butte County[6], USDA Agricultural Research Service, San Joaquin Valley Agricultural Sciences Center, Parlier, CA[7], Dow AgroSciences LLC[8], UCCE Contra Costa County[9], California Olive Committee, Fresno, CA[10], and UC Kearney Agricultural Center, Parlier, CA[11].

Keywords: Olive fruit fly, *Bactrocera oleae*, olive, GF-120, Spinosad, bait spray, IPM

Introduction

In the decade prior to 2000, California olive orchards were infrequently treated with insecticides for any arthropod pests. Of the most significant pests, black scale, *Saissetia oleae* (Olivier), could be managed by pruning of the interior tree canopy to increase the temperature in summer, and olive scale, *Parlatoria oleae* Colvée, was under good biological control (Daane et al. 2004). In 1998, the olive fruit fly (OLF), *Bactrocera oleae* (Rossi), was discovered in California (Rice 2000). It has now spread to most locations where olives grow within the state (Rice et al. 2003). In nature, this insect only reproduces in olive fruit. The developing larval stages

IN THIS ISSUE

University of California and the United States Department of Agriculture cooperating

Olive Fruit Fly Management Guidelines for 2006

http://www.uckac.edu/ppq/PDF/jul2006-v16_03_.pdf

Timing and Use of Bait Sprays

As recommended by the Olive Advisory Group / 2006

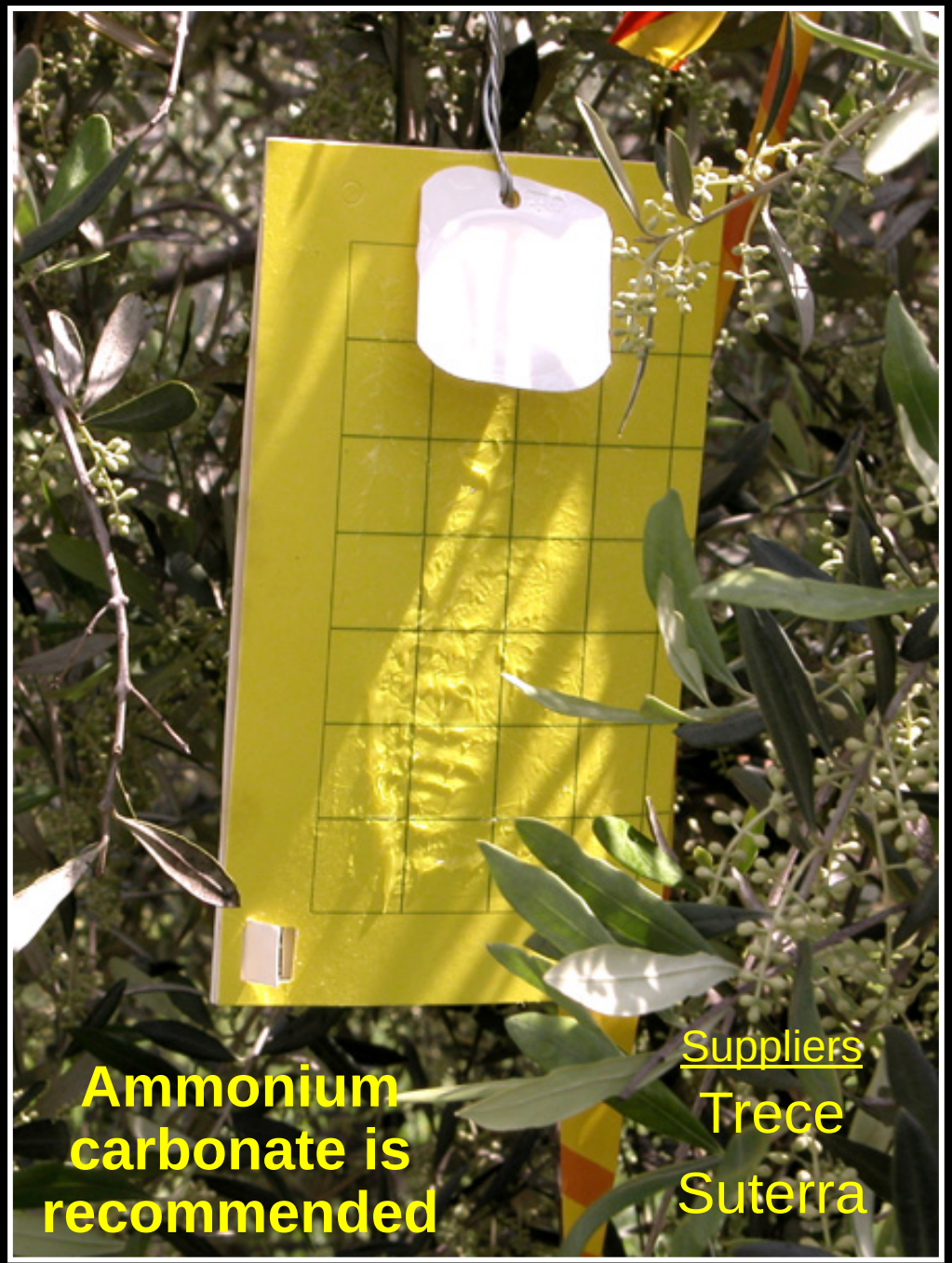
- Control of olive fly is essential because of the near-zero tolerance level established by table olive processors
- When fruit will be pressed for oil, the damage levels can be greater than in table olives, but best to keep fruit infestations below 10%
- A safe guideline is to initiate treatments near June 1 or two weeks before olive pit hardening
- If spring conditions are warm, a couple of early sprays may be warranted in March or April to knock down the population. If populations are high, use a dilution ratio of 1 part GF-120 to 9 parts water to bring high populations down.
- 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

McPhail Trap

Torula Yeast & Borax

Simple Yellow Panel Trap

- Easy to assemble
- Commercially available



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
- Traps should be placed in trees no later than March 1


Walnut Husk Fly
Male
Female
Olive fly on trap

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Application of Bait Spray

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

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
- For low OLF numbers use dilutions from 1: 1.5 to 1: 4 parts GF-120 to water
- 4 - 5 mm droplets are best

What about high numbers of Olive Fly?

- No registered insecticide gives quick knock-down against high numbers of olive fly adults
- Use of the “recommended” rates of GF-120 under conditions with high olive fly numbers results in depletion of the GF-120 residues before all the flies are killed.
- To knock down high olive fly populations, use a dilution of 1 part GF-120 to 9 parts water and apply the recommended rate (14 fluid oz) per acre (R. Van Steenwyk). Even though less active ingredient is present in the droplet residues, it is enough to kill olive fly adults that feed on it.
- Once the olive fly population is knocked down (after 1 to 2 treatments), then drop the application rate back to the lower rates (1:1.5 or 1:4).
- Presently, the product Danitol® (fenpropathrin) in combination with a fruit fly attractant (Nulure) has been submitted to the IR-4 program for registration for olive fly control. However, registration is probably a few years away.

University of California Kearney Agricultural Center
Geographic Information Systems Facility

UCKAC Snapz Pro X GIS

PROJECTS

- Commodity and Research Mapping
- County Soils Maps
- Citrus Peelminer Survey
- Citrus Leafminer Survey
- Mosquito Research
- Avocado Thrips
- **Temperature Threshold Maps for Olive Fly Management**

- **GIS Support for Cooperative Extension**
- GIS Links
- TUTORIALS
- MEETINGS
- CONTACT INFORMATION
- KAC HOME

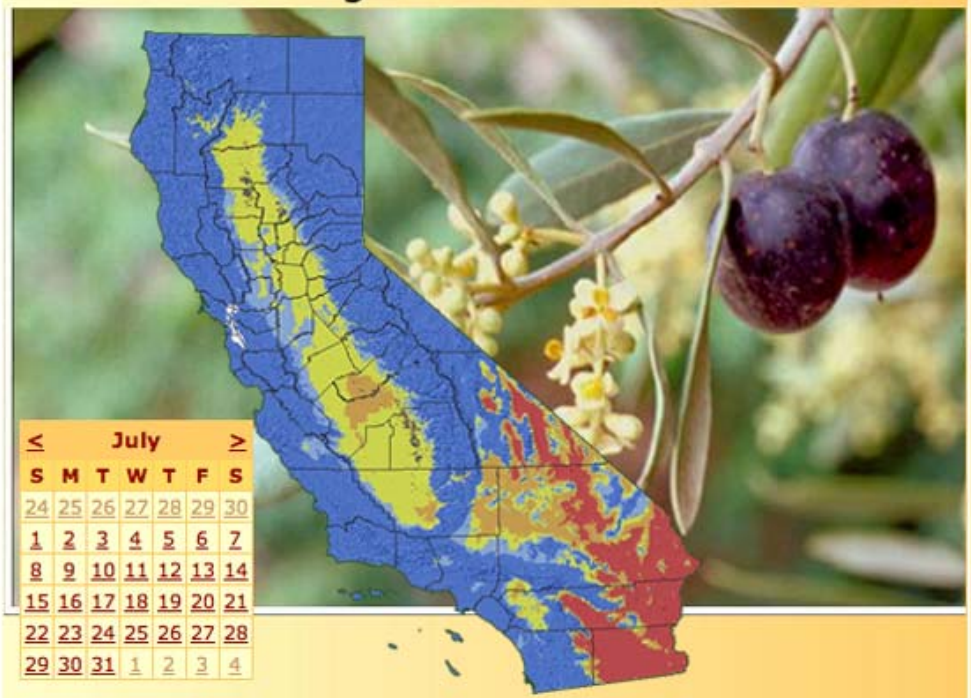
Last updated:04/12/2007

Go to webpage at:
http://gis.uckac.edu/

University of California
Kearney Agricultural Center
Web-Based GIS

Home | Resources | Olive Fly Information | Tutorials | Links

Interactive Climate Maps for Olive Fly Management Decisions



<	July					>
S	M	T	W	T	F	S
24	25	26	27	28	29	30
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

Project Description

The goal of this GIS project is to produce distribution maps of average maximum daily temperature achieved for 3, 4, and 5 consecutive days in the San Joaquin Valley to be used for mitigation decisions.
More info...

Mapping Climate Thresholds

The source data consisted of signed 16-bit raster (gridded) data of daily maximum temperature for the State of California. The raster data was interpolated from specific point data by ZedX, Inc. using their proprietary methods. The dates of the data ranged from 1 January 1992 through 29 April 2002, inclusive.
More Info...

Providing CIMIS Data

The layers for the map are served dynamically by Microsoft SQL Server based on the user's interactions with the map. The previous five days of CIMIS temperature data are downloaded automatically...
More info...

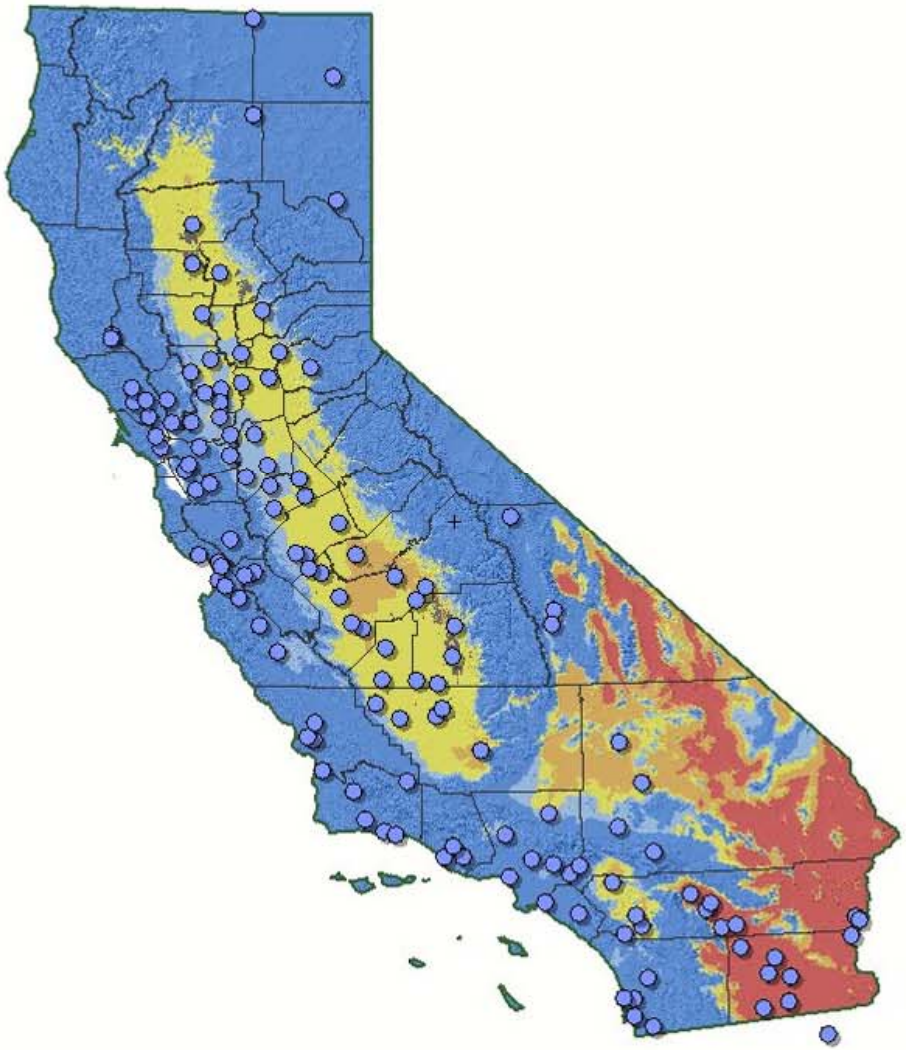
Methods & Research

Using Climate Maps in Olive Fly Management Decisions

- **The Problem: The olive fly in California**
  - History, biology
  - Current management options, shortfalls
- **Searching for solutions: Climatic clues**
  - Observations from the field
  - Testing ideas in the laboratory
- **First steps toward using GIS in olive fly management decisions.**
  View PDF...

University of California
Kearney Agricultural Center
Web-Based GIS

Layers | Legend | Key Map | Locate | Calendar | Bookmarks | Create PDF | Help | Exit



Map center: 37°19' N, 119°3' W

Jump To: Select a theme to view

Map Layers

Feedback

- California Reference
  - California
  - County
  - Sections
  - Townships
- Transportation
  - Local Roads
  - Major Roads
- Land Use
  - Land Use
  - Olives
- CIMIS Stations
  - CIMIS Stations
- Max Temp > 100°F for 3 Consecutive days
  - July
  - August
    - August 1
    - August 2
    - August 3
    - August 4
    - August 5
    - August 6
    - August 7
    - August 8
    - August 9
    - August 10
    - August 11
    - August 12
    - August 13
    - August 14
    - August 15
    - August 16
    - August 17
    - August 18
    - August 19
    - August 20
    - August 21
    - August 22
    - August 23
    - August 24
    - August 25
    - August 26

Scale: 1: 6,000,000 go Map Tool: Zoom In Active Layer: CIMIS Stations

Powered by geocortex

Presentation Topics

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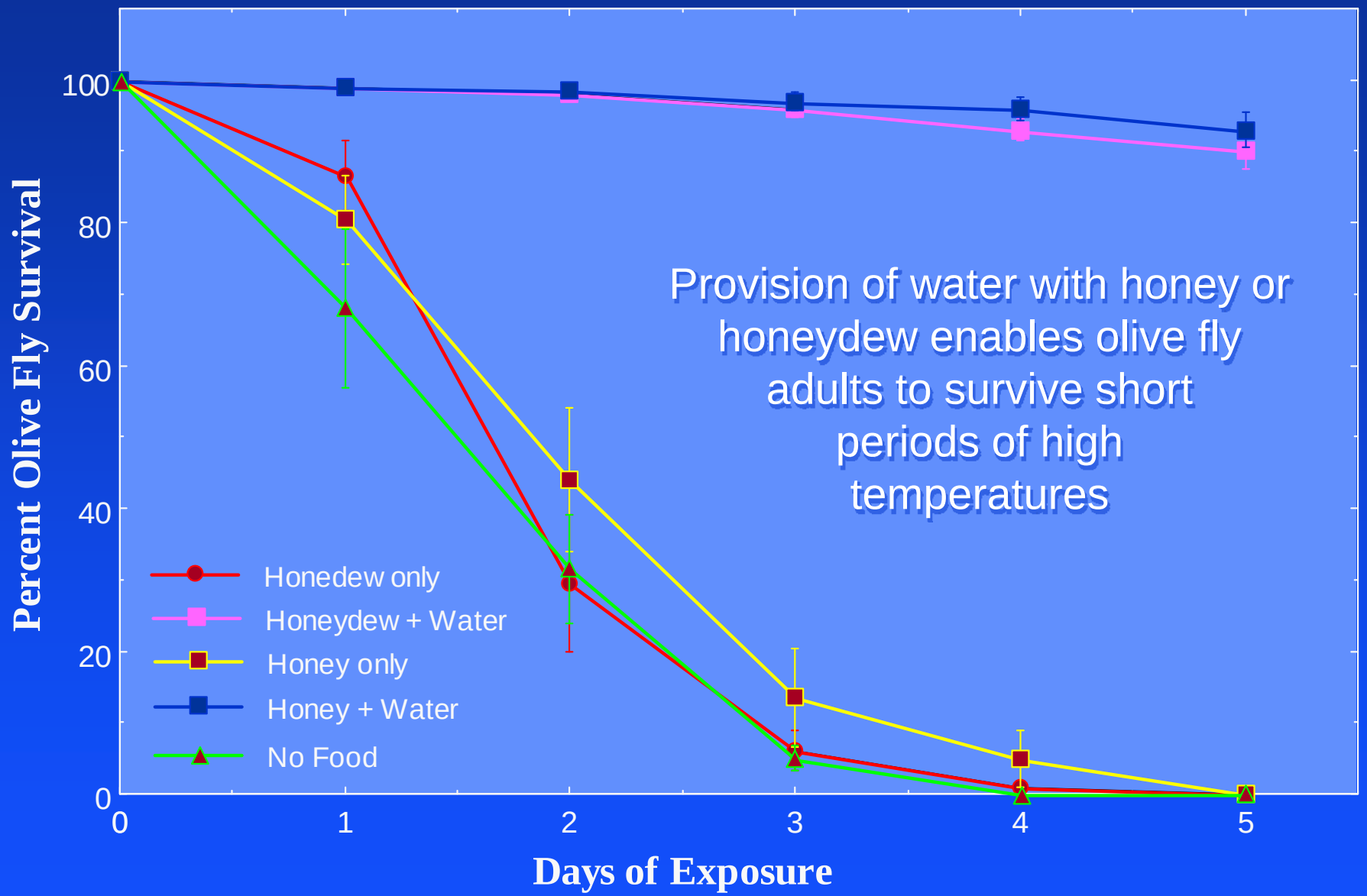
- Biological control efforts underway
- Beware the olive psyllid

Black scale, *Saissetia oleae*

- Black scale is common throughout the Central Valley and produces honeydew that flies may potentially use as a carbohydrate source
- Honeydew consumption enables flies to survive periods of extreme heat

Laboratory Data: High = 97.5 ºF; Low = 65 ºF



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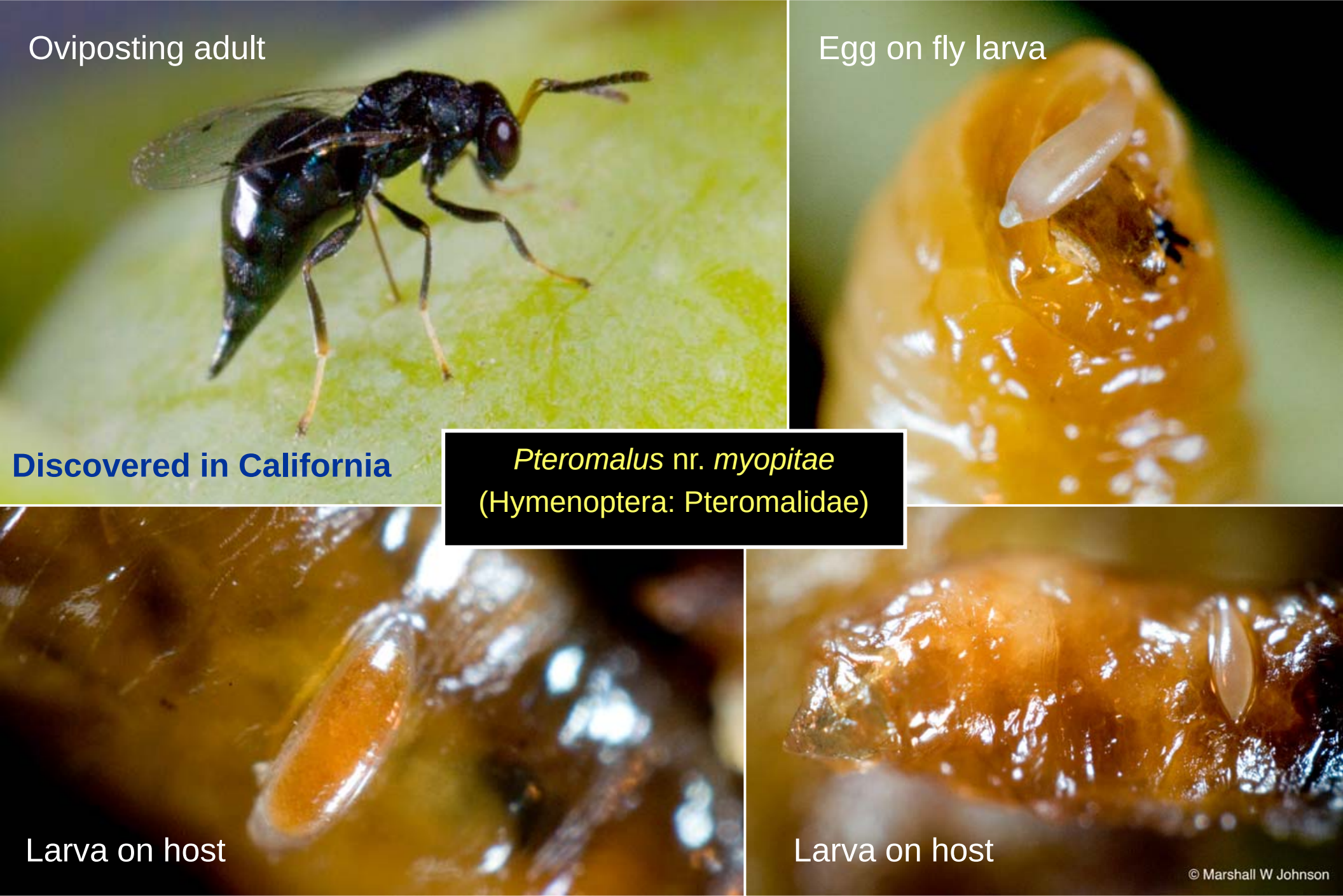
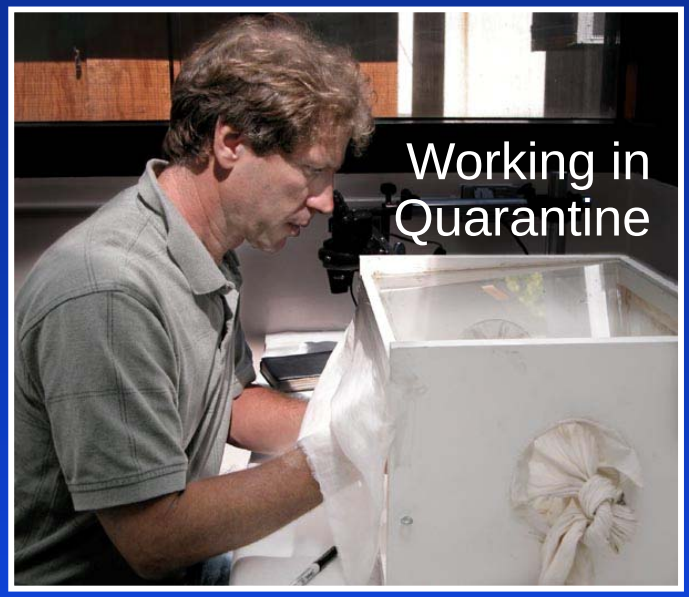

Oviposting adult
Egg on fly larva
Discovered in California
Pteromalus nr. *myopitae*
(Hymenoptera: Pteromalidae)
Larva on host
Larva on host
© Marshall W Johnson

Potential for control using exotic biocontrol agents



Biocontrol Agents Under Consideration for Release

Exotic Biocontrol Agents Undergoing Colonization


Tree Cage

Patterns of *B. oleae* parasitism produced by the two larval parasitoids

Parasitoid (or strain)	Location	Set-up date	Ratio of host to parasitoid	Parasitism (%)	Temp. range (°C)
P. lounsburyi	KAC	02/09/07	4.2 ± 0.7a	26.3 ± 3.5a	5.5-19.2
	Lindcove	03/19/07	13.2 ± 1.7b	8.7 ± 1.1b	8.7-21.7
	Lindcove	05/04/07	5.0 ± 0.9a	19.2 ± 1.8a	10.2-28.9
	Lindcove	06/15/07	6.7 ± 0.4a	24.0 ± 2.0a	15.4-35.4
	KAC	10/04/07	4.5 ± 0.9a	27.4 ± 4.5a	8.5-22.5
	KAC	10/01/08	6.2 ± 1.7a	7.9 ± 2.9b	8.7-25.2
	SLO	10/22/08	4.2 ± 0.9a	6.2 ± 1.8b	10.0-25.1
P. cf. *concolor*	Lindcove	06/15/07	7.4 ± 0.5a	47.2 ± 7.6a	15.4-35.4
	KAC	10/04/07	4.3 ± 0.6b	42.5 ± 3.4a	8.5-22.5
	KAC	04/28/08	6.5 ± 1.1ab	49.0 ± 5.9a	9.9-26.8
P. nr. *concolor*	KAC	10/01/08	6.2 ± 1.2a	60.3 ± 6.7a	8.7-25.2
	SLO	08/22/08	6.5 ± 0.6a	32.4 ± 5.7bc	12.9-27.0
	SLO	08/28/08	4.6 ± 0.9a	64.3 ± 9.7a	11.9-28.4
	SLO	10/07/08	10.3 ± 1.9b	42.5 ± 5.3b	10.1-26.2
	SLO	10/22/08	3.5 ± 0.7c	37.7 ± 4.6bc	10.0-25.1
	KAC	10/20/08	4.1 ± 0.7ac	43.9 ± 5.4b	8.8-26.4
	KAC	11/12/08	3.3 ± 0.4c	31.3 ± 3.3c	6.1-17.0

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Psytallia concolor

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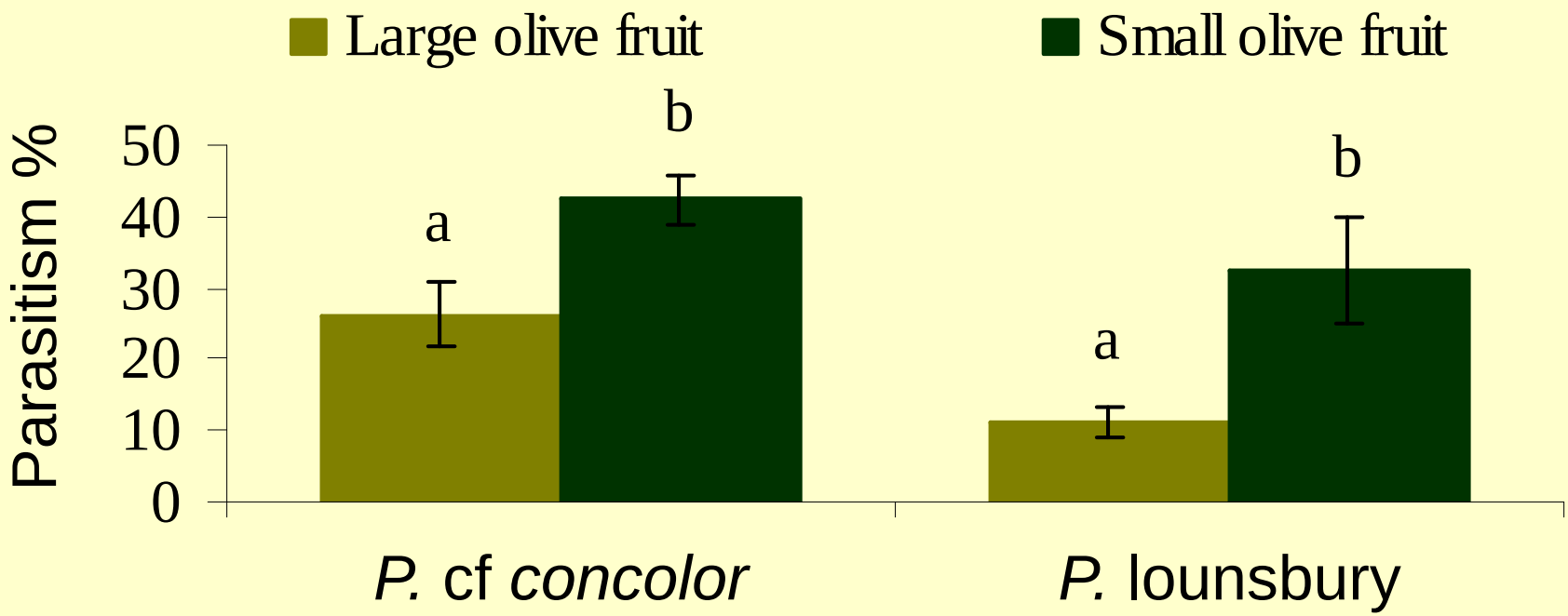
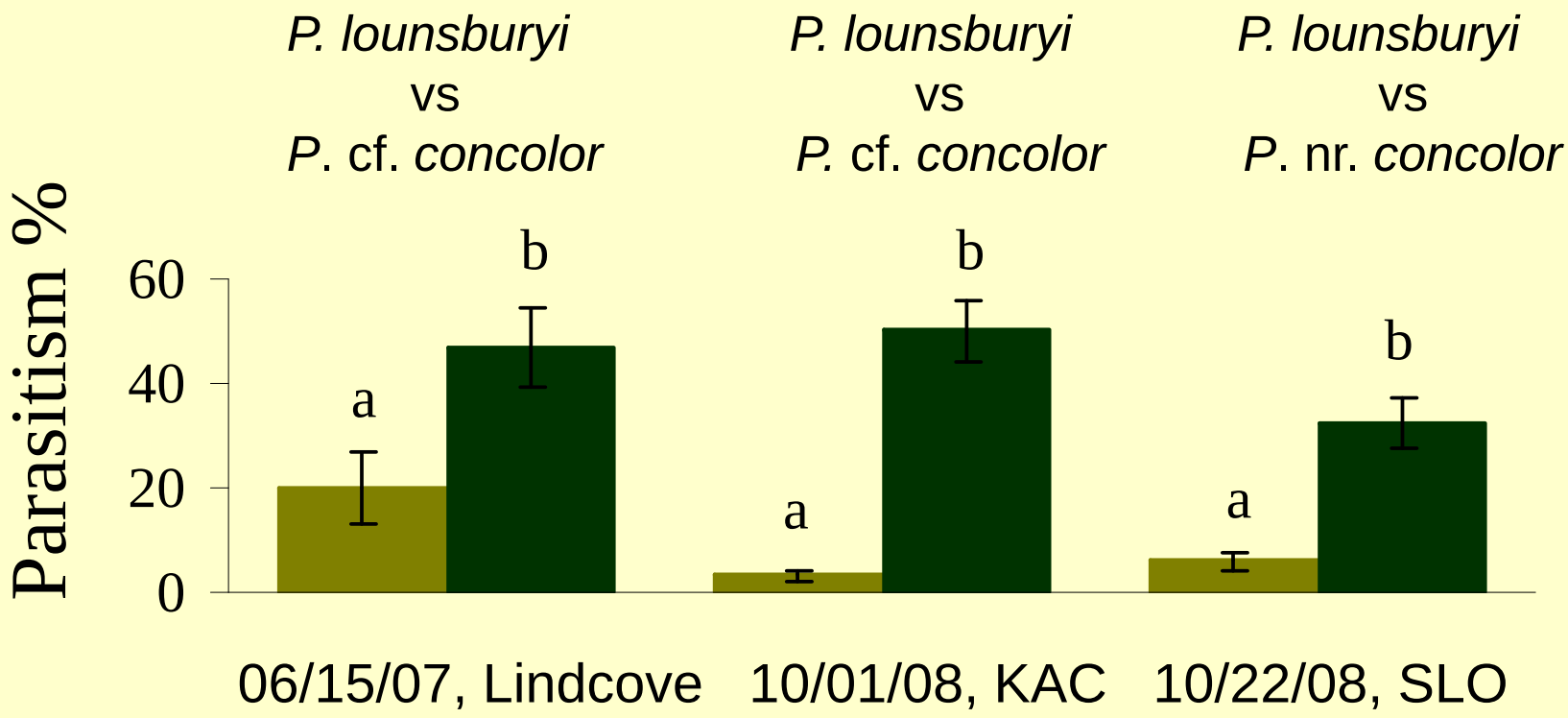


Parasitism levels by *P.* cf *concolor* and *P. lounsburyi* on olive fruit fly larvae in small (Mission) and large (Sevillano) olive fruit. Values (means ± SE) followed by different letters are significantly different (ANOVA, $P < 0.05$).



Comparison of parasitism between *P. lounsburyi* and *P. concolor* on olive fruit fly larvae. Values (means ± SE) followed by different letters are significantly different for each pair comparison (ANOVA, $P < 0.05$).

Presentation Topics

- Timing and application of GF-120
- The need to manage black scale
- Biological control efforts underway
- Beware the olive psyllid

What is it?

- Olive pysllid: *Euphyllura olivina* Costa
- Related to aphids, mealybugs, scales, leafhoppers, sharpshooters
- Stages include an egg, 5 nymphal instars, and adults (both sexes)
- They have incomplete metamorphosis (i.e., immatures look like adults, but wings are non-functional)**
- The life cycle is about 3 months long depending on temperature
- Females may lay more than 1,000 eggs
- Initiation of egg laying is correlated with the appearance of new olive shoots
- It has 3 host plants: Olive, Russian Olive (oleaster), and Mock Privet
- Optimal growth conditions are between 68 to 77°F
- There are typically 3 generations. The first in early spring. The second generation becomes inactive when maximum temperatures exceed 81°F, and active again when temperatures drop. The 3rd generation should overwinter.
- Populations should die out at temperatures greater than 90°F


Olive psyllid:
Euphyllura olivina Costa
© Marshall W Johnson

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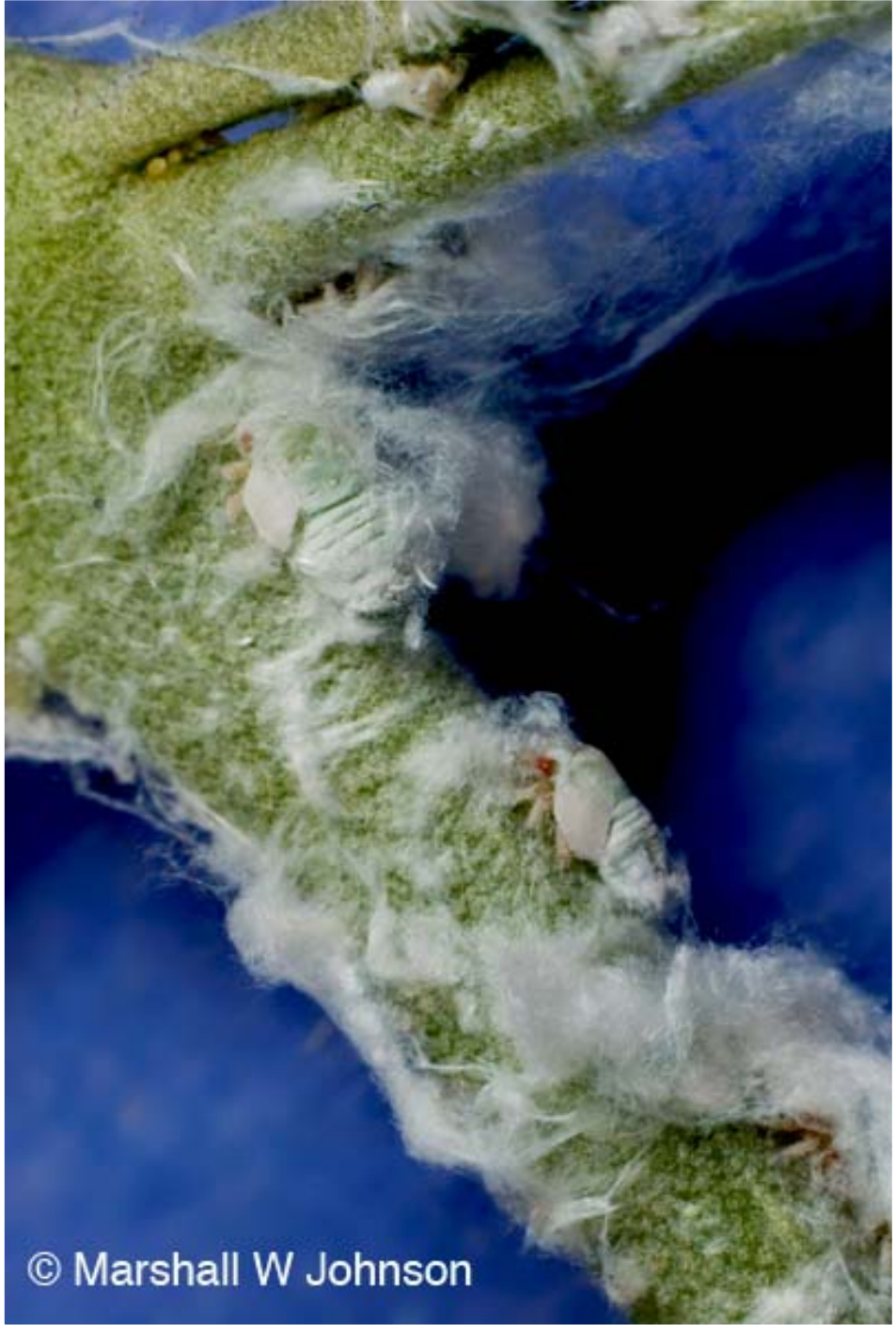
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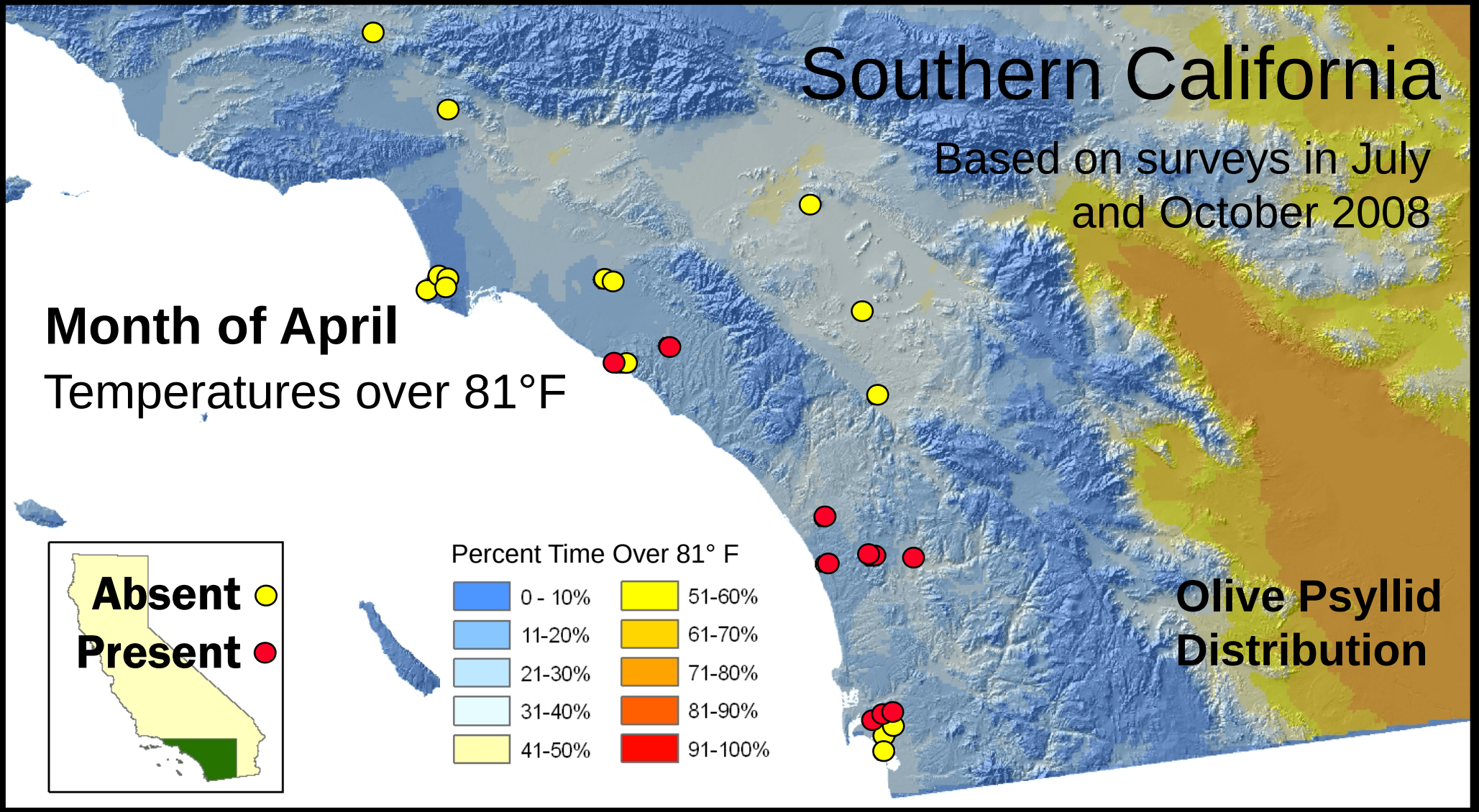
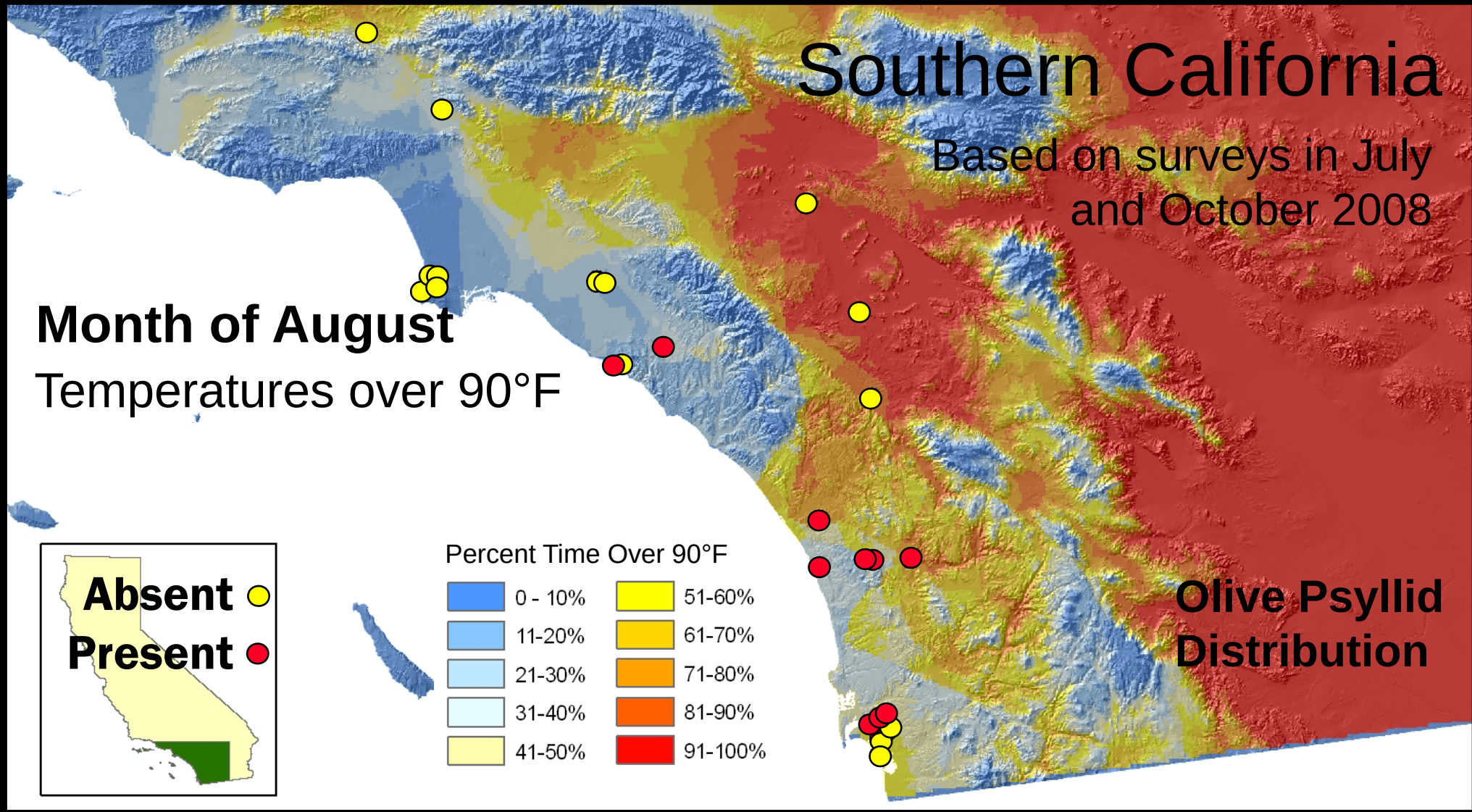
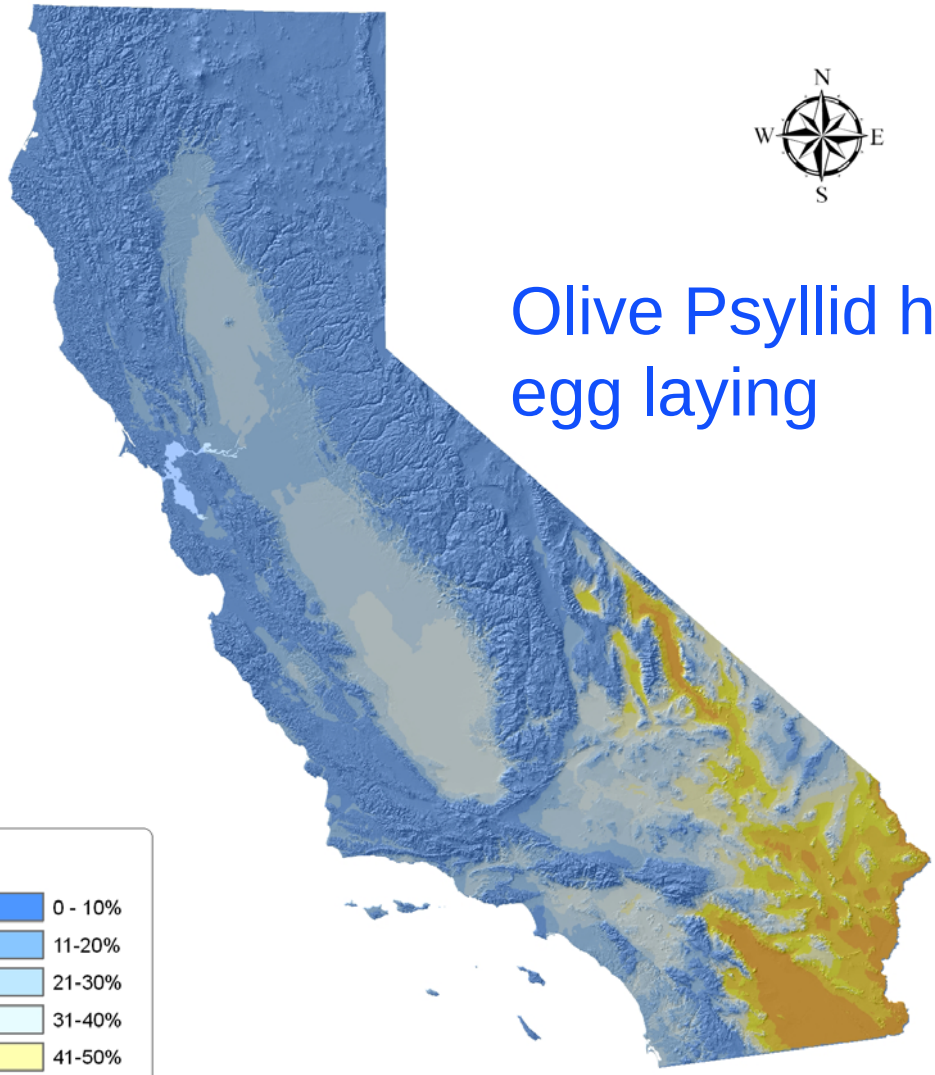
Southern California
Based on surveys in July and October 2008
Santa Clarita
Burbank
Riverside
Palo Verdes
Anaheim
Sun City
Irvine
Newport Beach
Temecula
Oceanside
Carlsbad
Escondido
San Marcos
San Diego
Absent
Present
Olive Psyllid Distribution

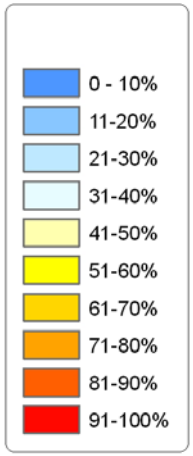

Southern California
Based on surveys in July and October 2008
Month of April
Temperatures over 81°F
Absent
Present
Percent Time Over 81° F
0 - 10%
11-20%
21-30%
31-40%
41-50%
51-60%
61-70%
71-80%
81-90%
91-100%
Olive Psyllid Distribution


Southern California
Based on surveys in July and October 2008
Month of August
Temperatures over 90°F
Absent
Present
Percent Time Over 90°F
0 - 10%
11-20%
21-30%
31-40%
41-50%
51-60%
61-70%
71-80%
81-90%
91-100%
Olive Psyllid Distribution

10 Year Average of Max Temperature Above 81°
April

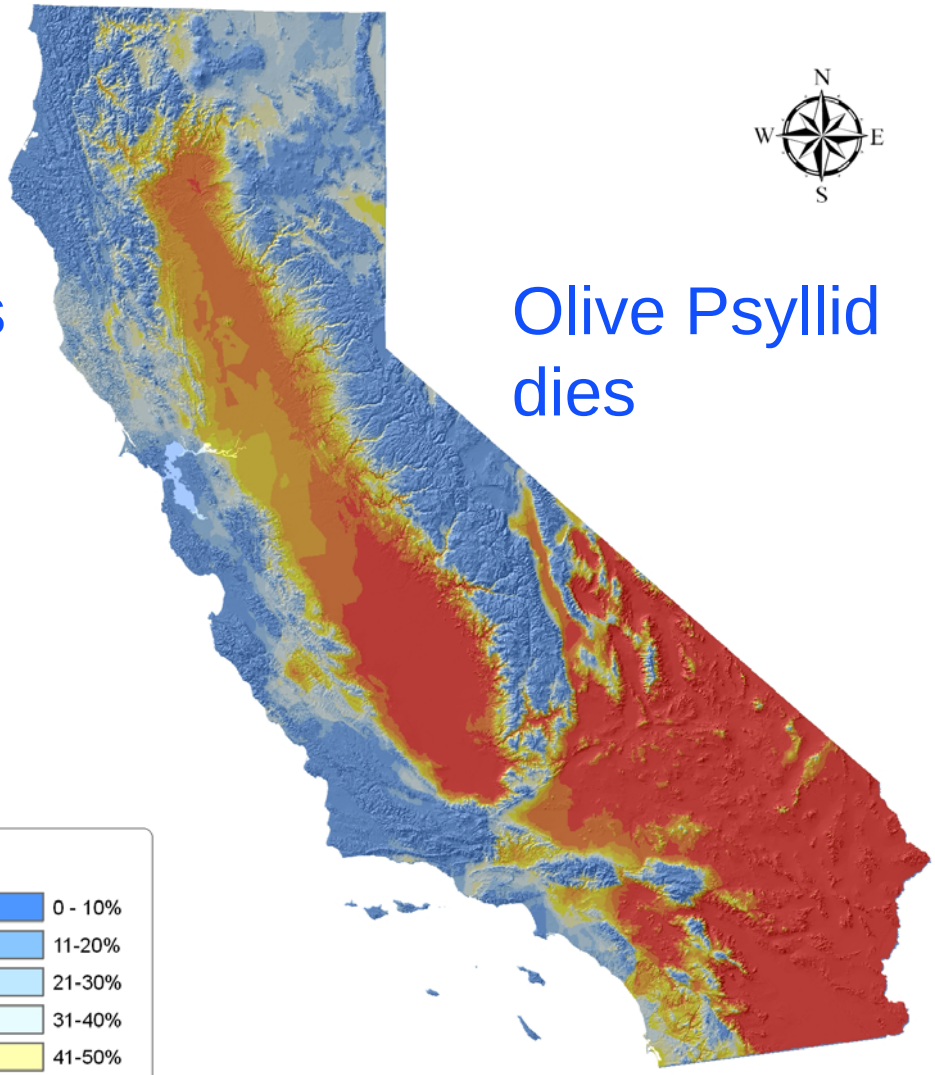


Olive Psyllid halts egg laying

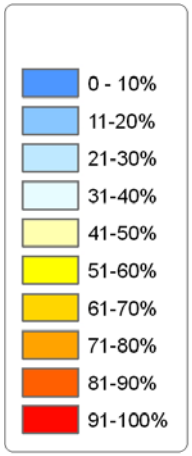


Temperature Data Analyzed and Map Prepared by the
UC Kearney Agricultural Center GIS Facility

10 Year Average of Max Temperature Above 90°
August



Olive Psyllid dies



Temperature Data Analyzed and Map Prepared by the
UC Kearney Agricultural Center GIS Facility

What does it do?

- Nymphs and adults feed by rupturing cells and ingesting sap, reducing nutrients essential for tree development and fruit production
- Plant parts attacked include buds, tender shoots, floral axes, inflorescences, and young fruits
- Nymphs secrete sticky wax that accumulates on the foliage and stimulate premature flower drop**
- The wax can actually protect them from some insecticides so it is best to control the first generation when buds and flowers are not present
- Nymphs and adults produce honeydew (similar to aphids), which can produce sooty mold.
- When colonies are on inflorescences, the level of sap loss is directly proportional to psyllid numbers
- Yield reductions in some areas outside the USA have been as much as 40 to 60%. Populations > 20 nymphs per inflorescences can cause such losses.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Olive psyllid infestations

Recent images from San Diego

Olive leaf scorch?

Xylella fastidiosa?

Olive leaf scorch?

Xylella fastidiosa?

Summary

- GF-120 is the only insecticide that is registered to control olive fruit fly adults
- Depending on the size of the olive fly population, the ratios of GF-120 and water should be varied to obtain the best control
- An understanding of the impact of extreme summer temperatures is necessary to avoid unnecessary losses due to olive fly infestations
- Control of black scale may reduce survival of olive fly adults due to removal of a potential food source
- Biological control is poor at this time, but new exotic natural enemies are being released to improve levels of biological control
- The olive psyllid, a new olive pest, has been discovered in San Diego and Orange Counties, but currently is confined to southern California
- Keep on the alert for “olive leaf scorch” infected olive trees


QUESTIONS ANYONE?