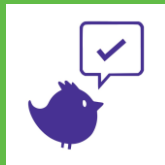
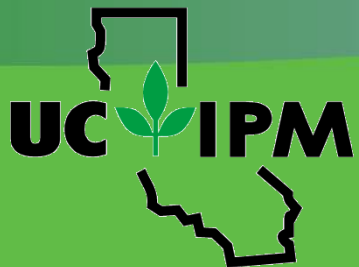


integrated pest management strategies for yellowjacket wasps and nuisance ants



Andrew Sutherland
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We work with professionals to improve pest control through research and education in order to protect our communities and the environment.

<https://ucanr.edu/sites/urbanIPM/>



Central tenets of IPM

- **Education**
- **Prevention**
- **Monitoring**
- **Treatment Thresholds**
- **Multiple Tactics**
- **Integration**
- **Evaluation**



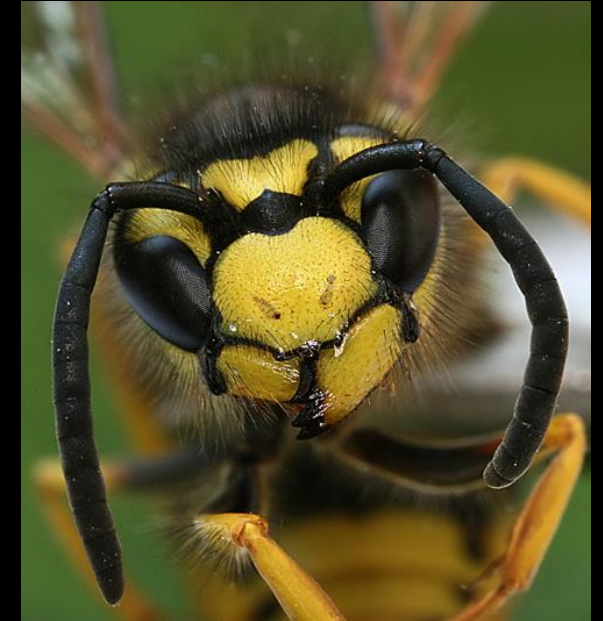
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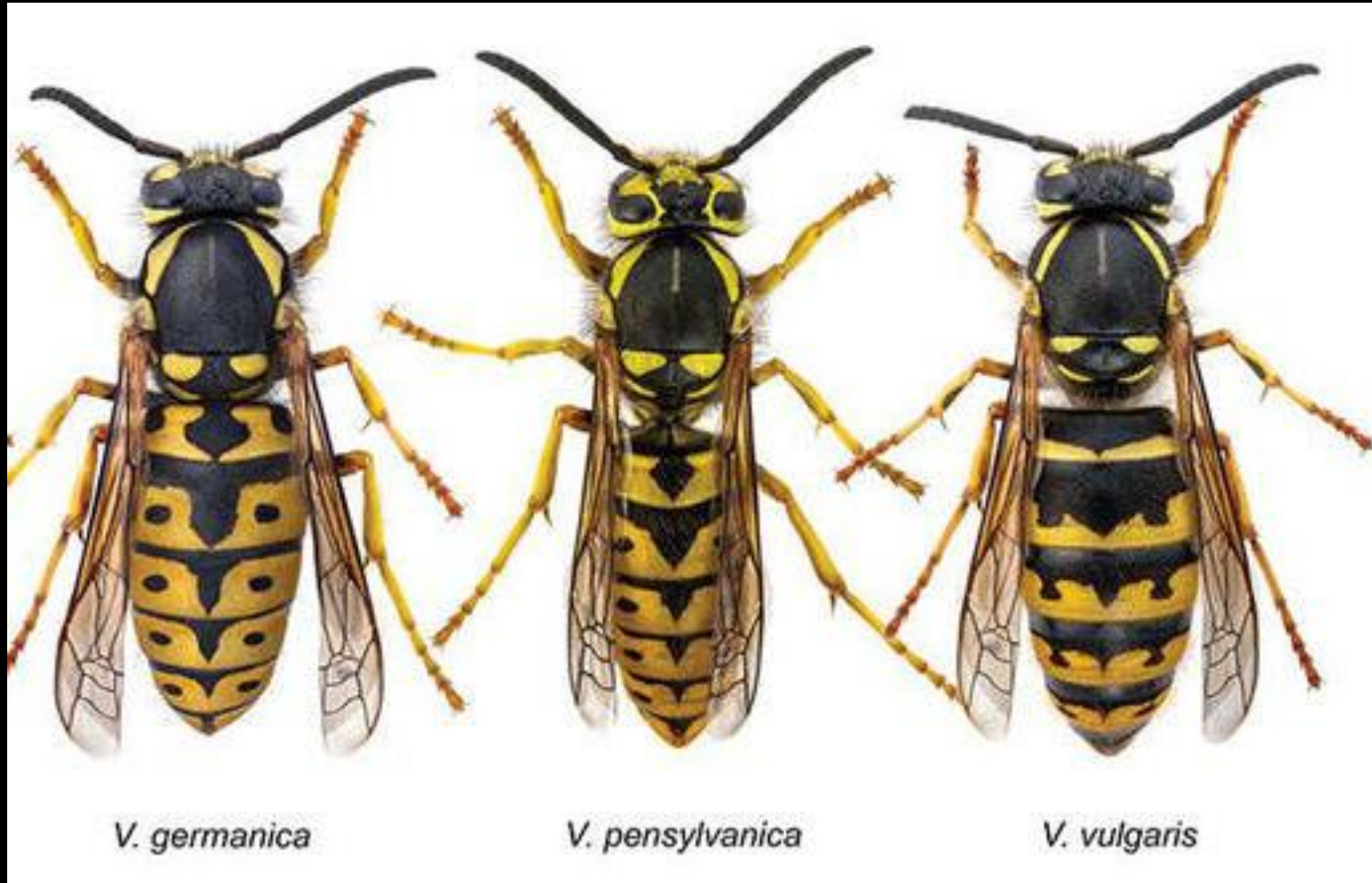


IPM for Yellowjackets in CA

- **Identify species, understand ecology**
- **Prevent nesting, prevent stings**
- **Trap queens, trap foraging workers**
- **How many yellowjackets = too many?**
- **Protect sensitive sites with trap perimeters, nest treatments, nest removal**
- **Bait?**



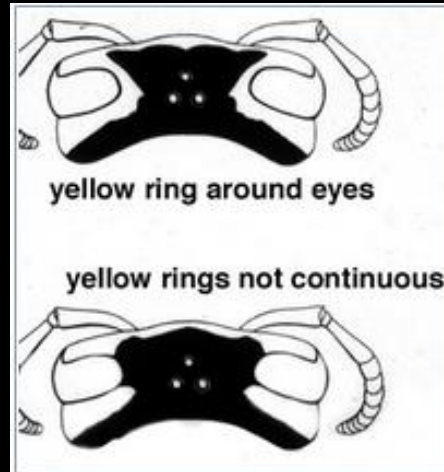
pest yellowjacket species in California



- Know how to distinguish western yellowjacket (*Vespula pensylvanica*) from German yellowjacket (*Vespula germanica*)

- *V. germanica* may nest in structural voids, may be more cold-tolerant, may be increasing in urban areas

<http://wasps.ucr.edu/waspid.html>

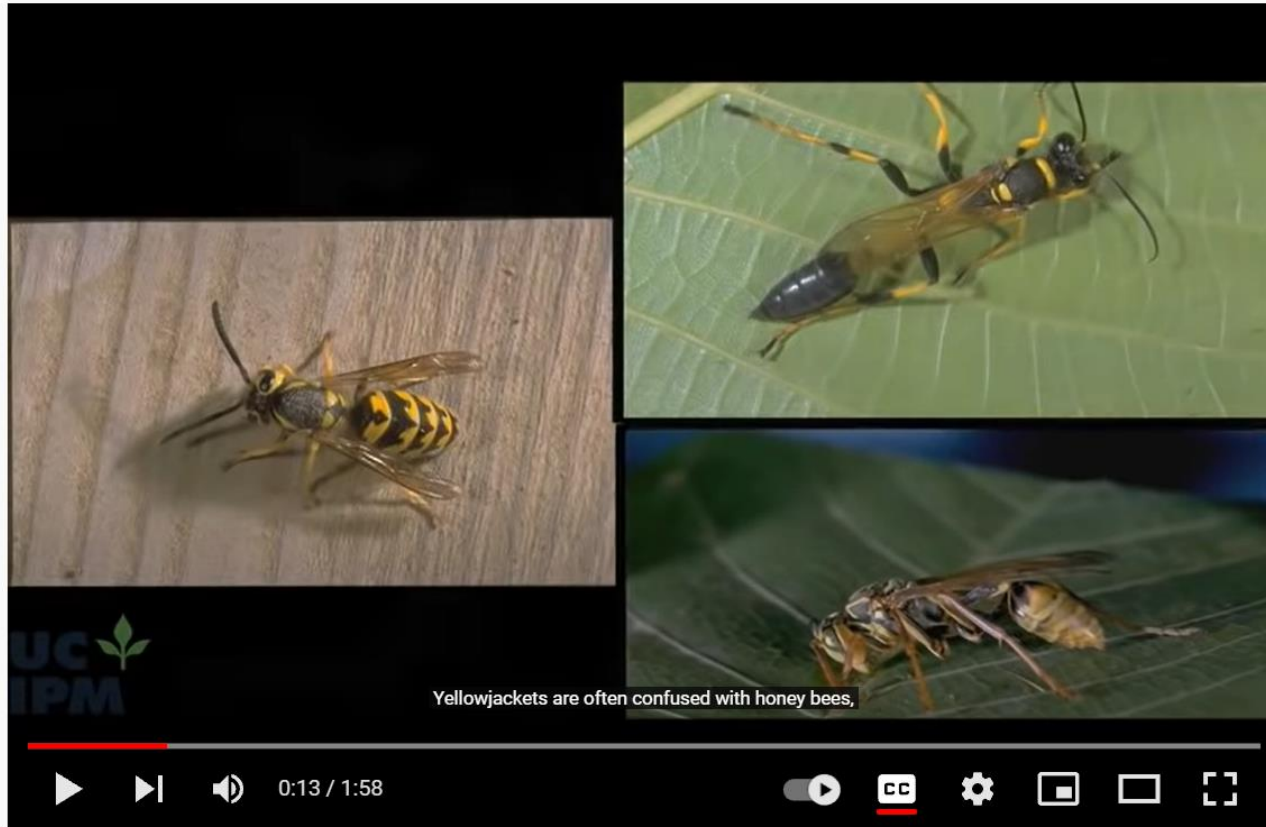


- > if yes, it is the western yellowjacket, *V. pensylvanica*. (There will also be a yellow blotch of pigment on the first antennal segment.)
- > if no, continue to the next step

When looking straight down on the wasp's head, is the yellow ring broken up around the eyes?



- > if yes, it is the German yellowjacket, *V. germanica*. (Also, the first antennal segment will be completely black).
- > if no, either you don't have a yellowjacket, you have a male yellowjacket, or you have a species not considered here.



Distinguishing between yellowjackets, wasps, and look alikes

137,469 views • Oct 11, 2013

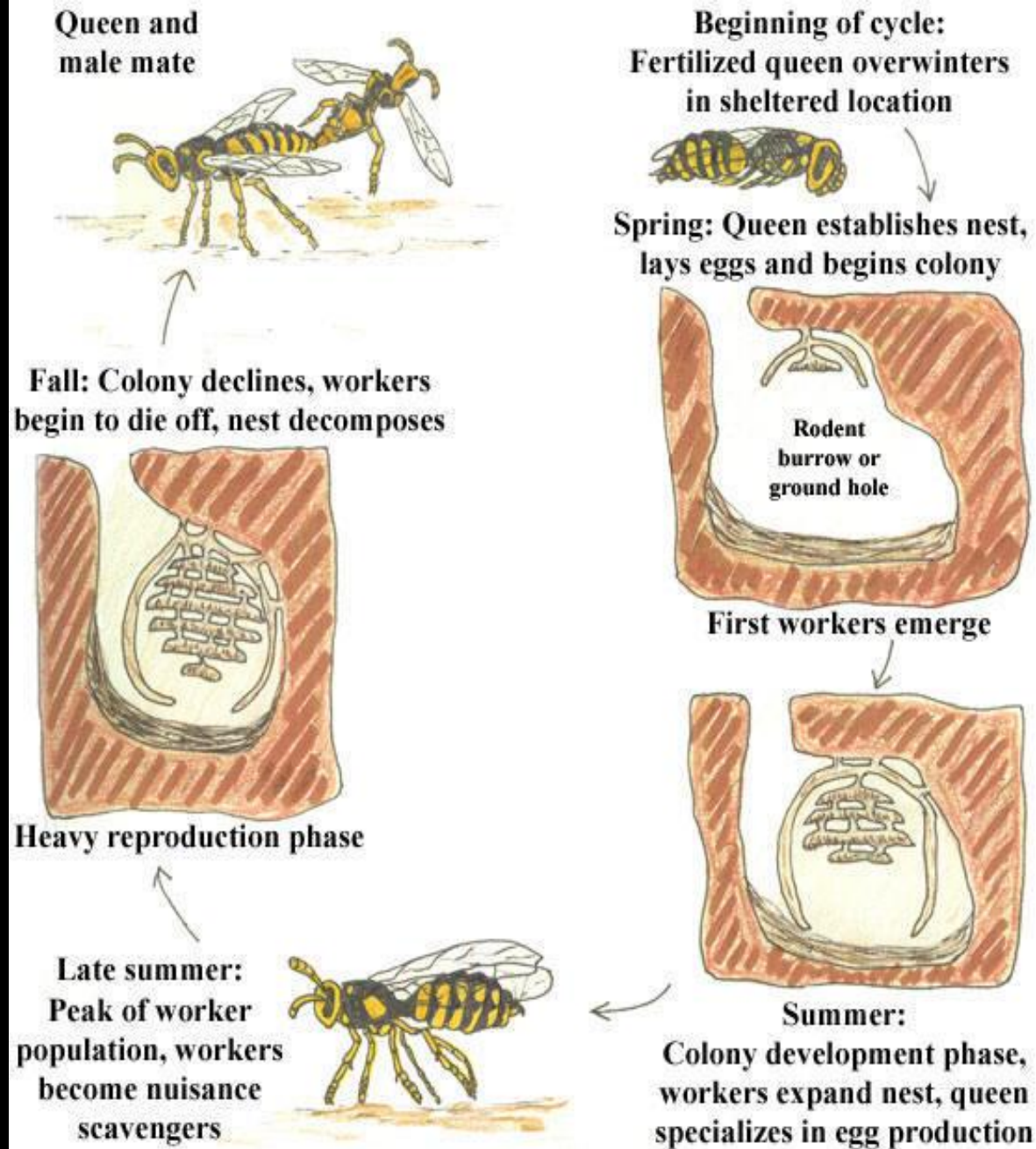
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<https://www.youtube.com/watch?v=PJHKA-Fre0k>





winter: no colony, workers are dead, mated queens are inactive

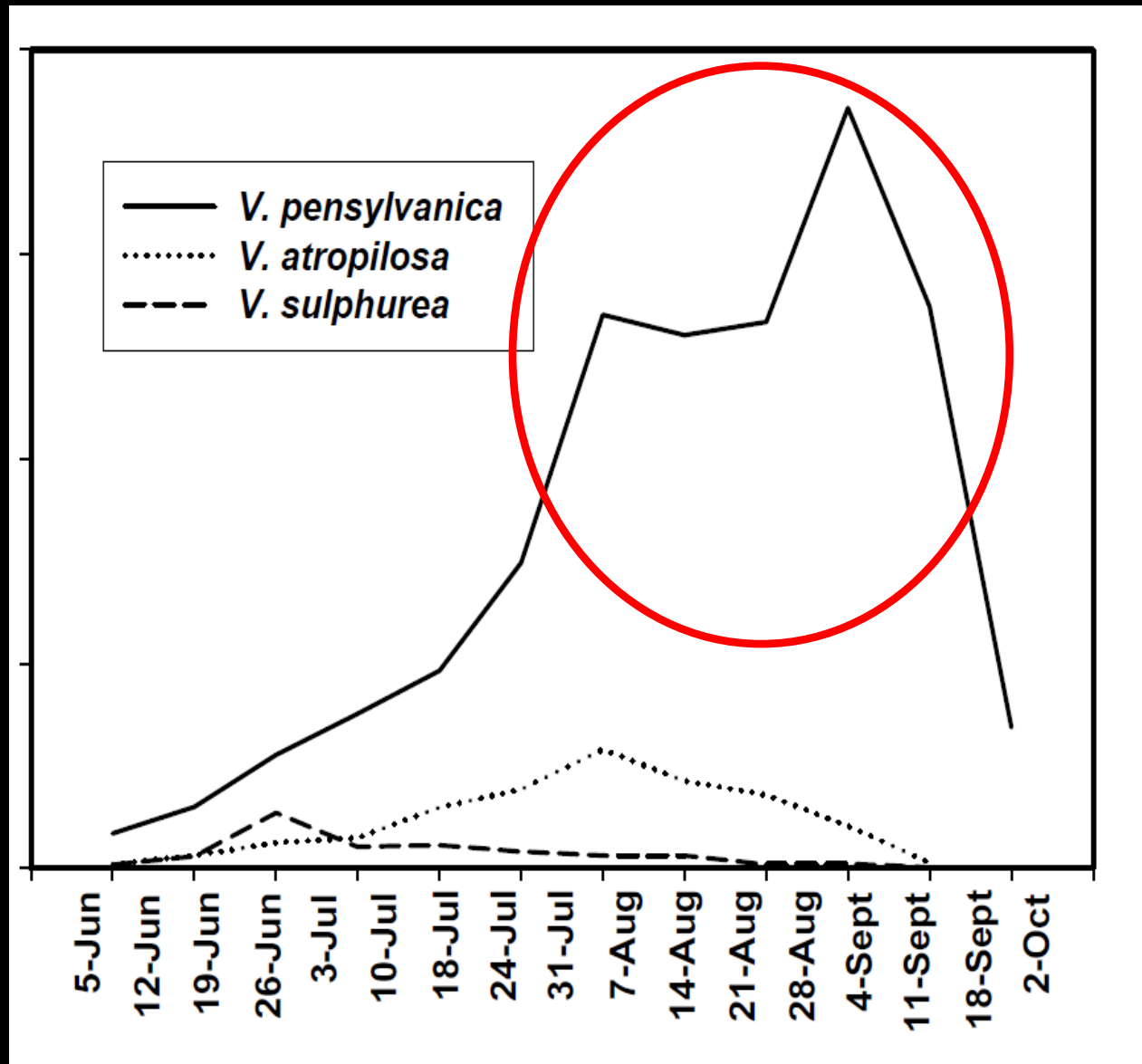
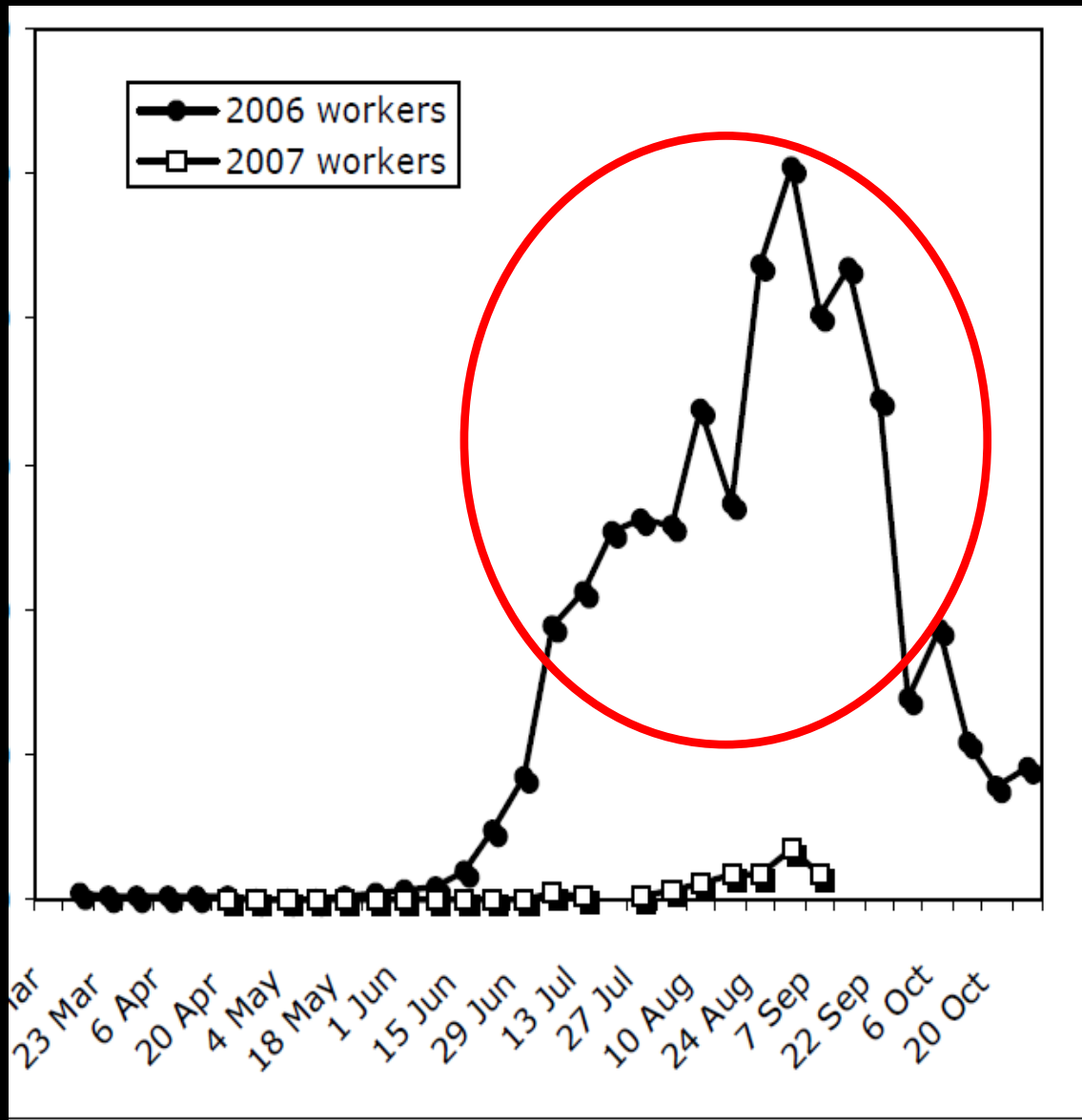
spring: colony begins, queen lays eggs, workers collect protein for larvae

summer: colony expands to thousands of workers, larvae → protein, adults → sugary liquids

fall: maximum size, larvae have matured, all eat sugary liquids, workers begin to die



https://www.pestboard.ca.gov/howdoi/research/2009_yellowjacket.pdf



pollinators & predators, but also **pests**

- Foraging yellowjackets may be attracted to human foods (protein, then sugars)
- Incidental stings, general nuisance may occur
- Colony will defend underground nests



UC Statewide IPM Project
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sensitive environments

- Schools & child care
- Health care
- Picnic & recreation, theme parks, etc.



IPM for Yellowjackets in CA

- **Prevention**

- Eliminate nesting sites

- Rodent burrows, dense vegetation, structural voids, hollow trees

- Ensure proper sanitation

- Use trash bags, tightly-covered trash cans

- Prevent stings

- Lids on sugary drinks, don't go barefoot





IPM for Yellowjackets in CA



- **Monitoring**

- heptyl butyrate lures

- UC “wet traps”

- “picnic observations” / complaints

- nest detection

IPM for Yellowjackets in CA

	No. Trapped	No. Stings
Jan.	-	1
Feb.	-	5
March	84	4
April	53	19
May	64	10
June	1,663	24
July	9,174	16
Aug	13,067	12
Sept.	18,262	-
	42,367	91

- **Monitoring**

- heptyl butyrate lures
- UC “wet traps”
- “picnic observations”
complaints
- nest detection

IPM for Yellowjackets in CA



- **Monitoring**
 - heptyl butyrate lures
 - UC “wet traps”
 - “picnic observations”
complaints
 - nest detection

**FORAGING DISTANCES OF VESPULA
PENNSYLVANICA WORKERS
(Hymenoptera: Vespidae)¹**

ROGER D. AKRE, W. B. HILL, J. F. MAC DONALD,
AND W. B. GARNETT²

Department of Entomology, Washington State University
Pullman, Washington 99163

ABSTRACT

A method employing metal labels and magnets was used to determine the foraging distances of *Vespula pensylvanica* workers. It was found about 80% of the workers foraged within 1100 feet of the nest. Foraging constancy and directions are discussed.

Akre, R. D., W. B. Hill, J. F. Mac Donald, and W. B. Garnett. 1975. Foraging distances of *Vespula pensylvanica* workers (Hymenoptera: Vespidae). J. Kansas Entomol. Soc. 48: 12–16.

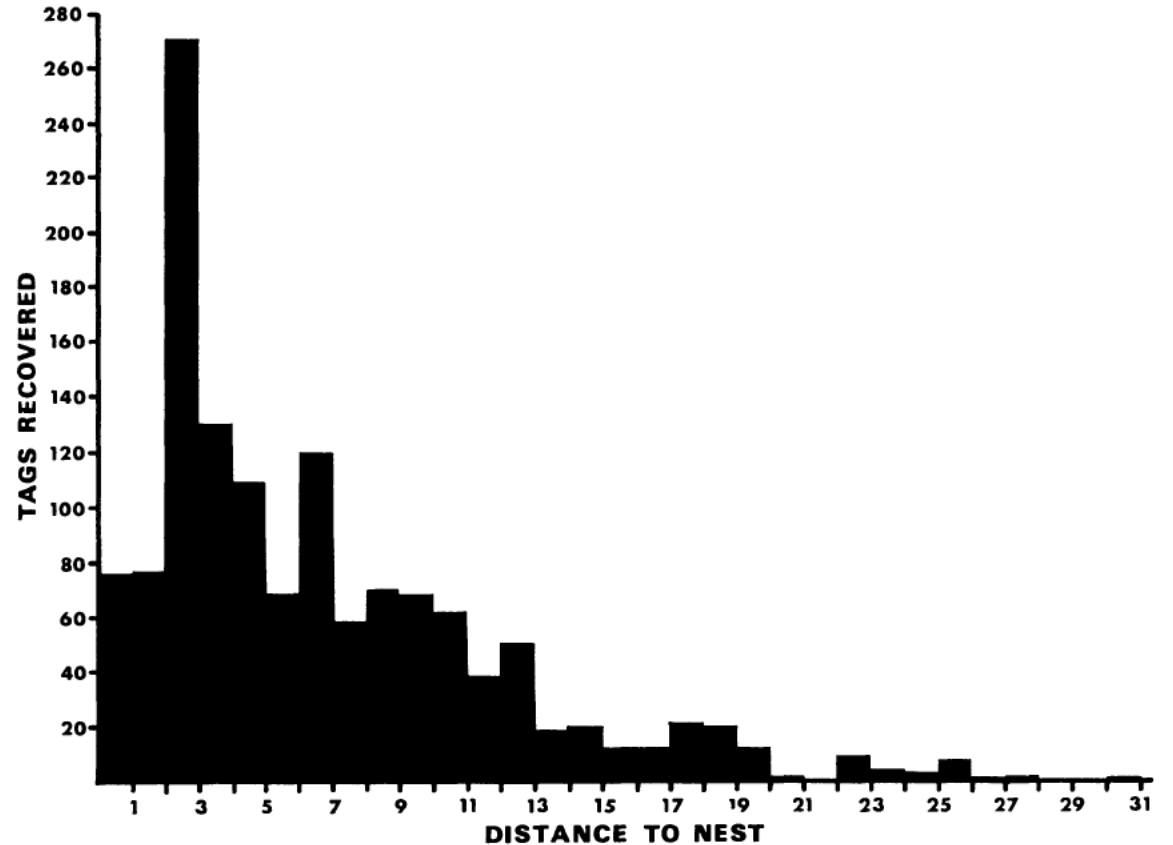
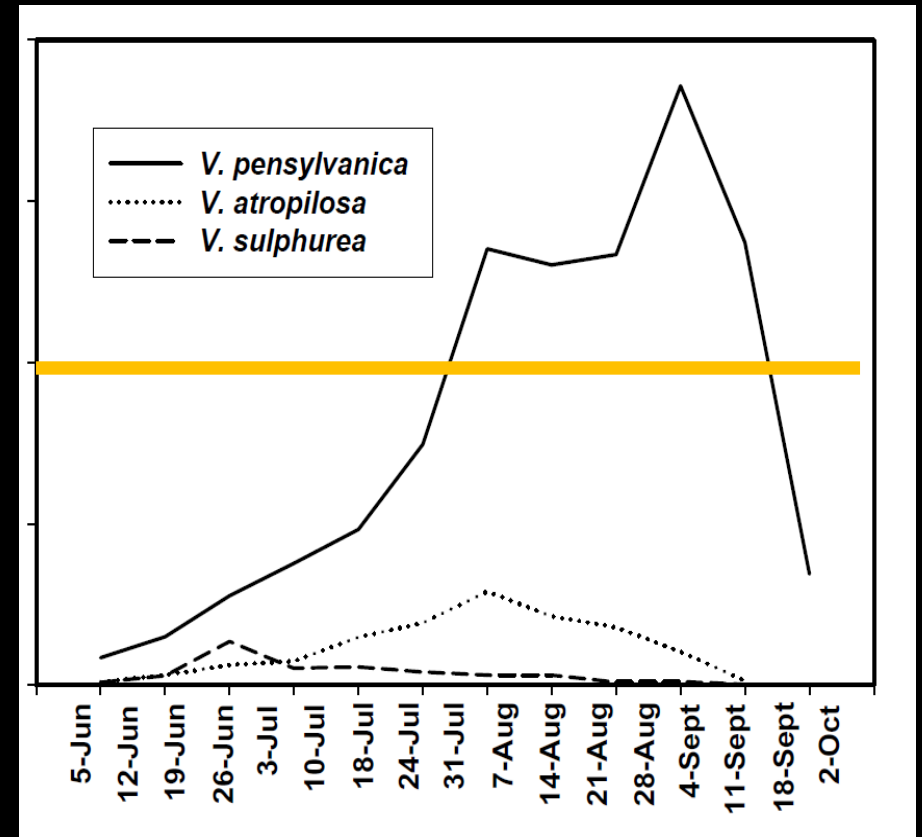


FIG. 1. Foraging distances for workers of *Vespula pensylvanica* determined by metal labels recovered at the nest. Distance given in hundreds of feet.

IPM for Yellowjackets in CA

- **Thresholds: How many yellowjackets = too many?**
 - **Stings reported? Nests detected? Sensitive site?**
 - **Rust et al (2010) proposed action threshold (efficacy threshold):**
10 wasps / trap / day
 - **What's the “sting threshold”?**



IPM for Yellowjackets in CA

- **Multiple Tactics: Exclusion Trapping**

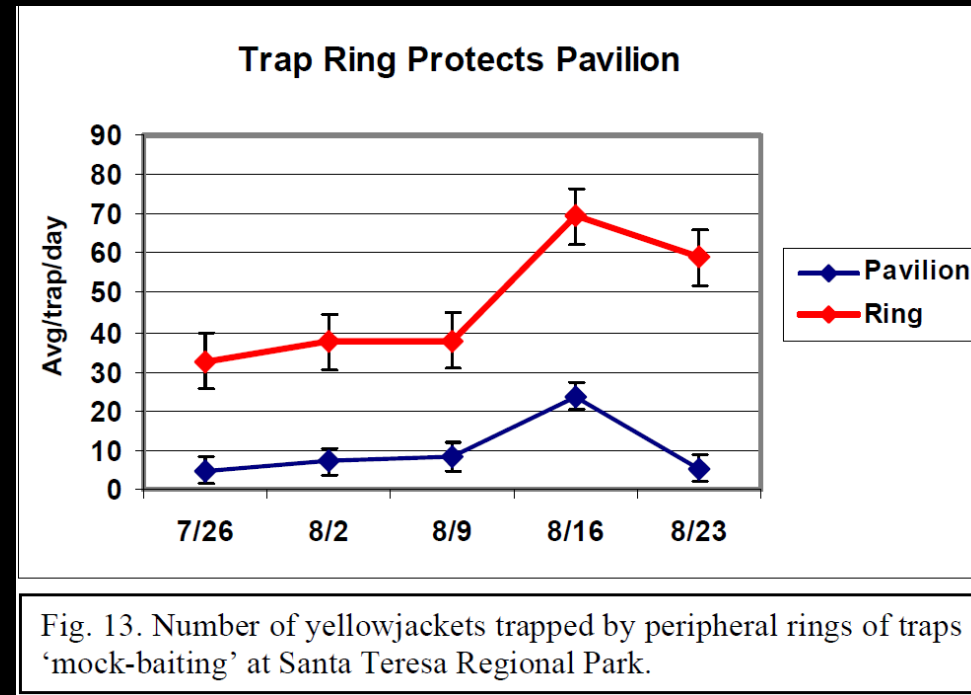
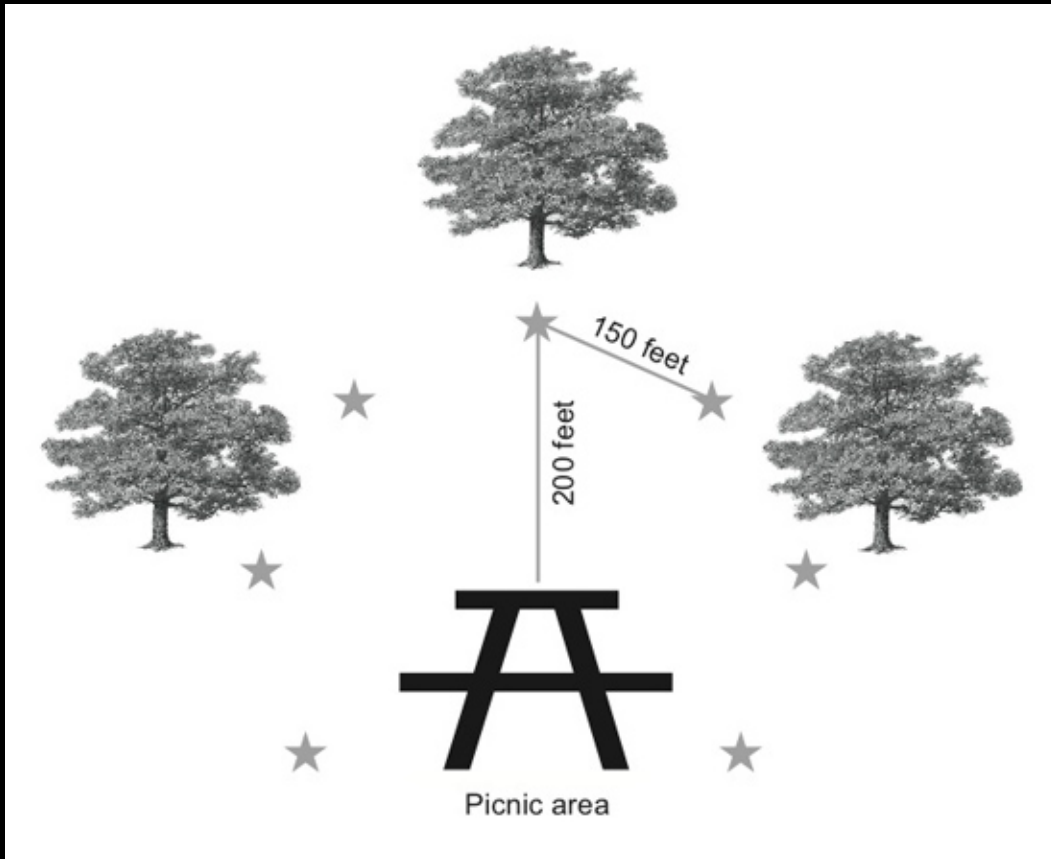


Fig. 13. Number of yellowjackets trapped by peripheral rings of traps 'mock-baiting' at Santa Teresa Regional Park.

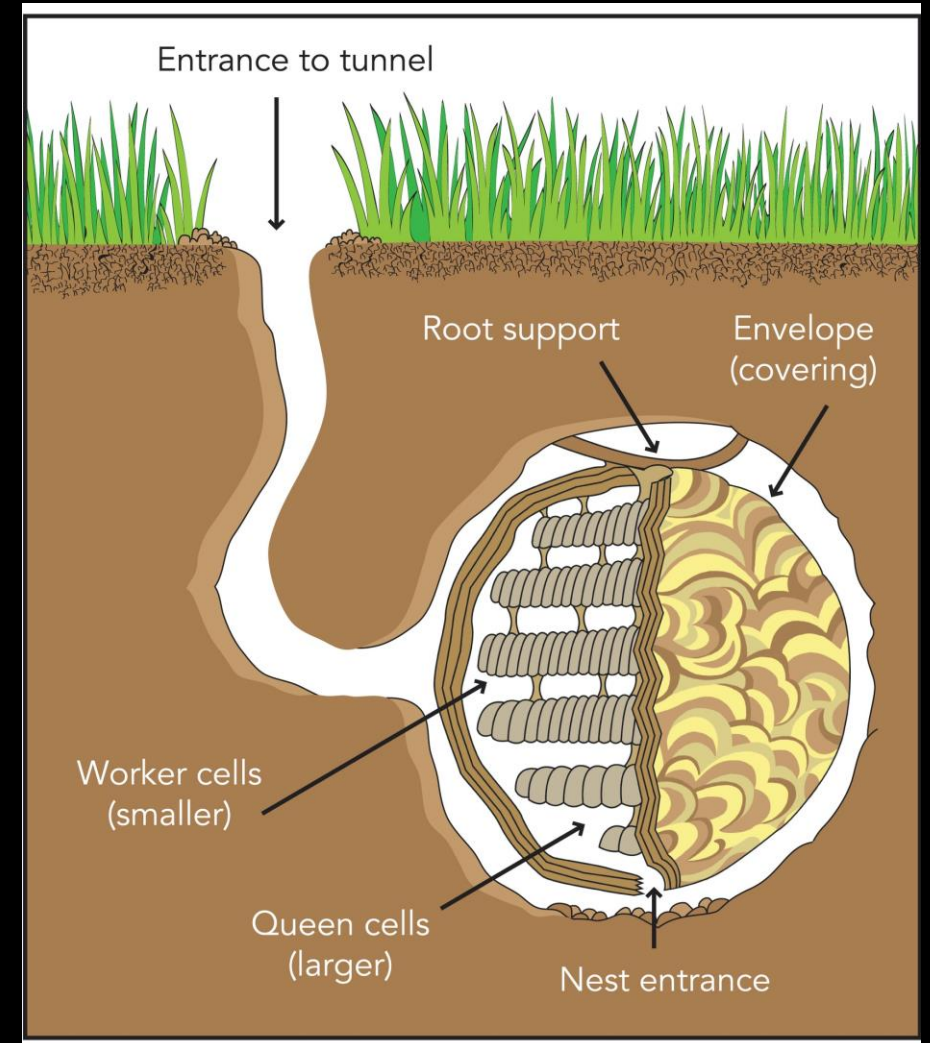
IPM for Yellowjackets in CA

- **Multiple Tactics: nest treatments**
 - **Where's the nest?!**
 - **Pyrethroids, pyrethrins**
 - **Essential oil [25(b)] products?**
 - **Dusts, liquids, foams**



IPM for Yellowjackets in CA

- **Multiple Tactics: nest removal**
 - **Where's the nest?!**
 - **Dig it out?**
 - **Vacuum it out?**



IPM for Yellowjackets in CA

- **Multiple Tactics: bait?**

- **Onslaught / Alpine Yellowjacket Bait Stations**

- **microencapsulated esfenvalerate 6.4%**
 - **Requires mixing with cat food or other food attractant**
 - **May be repellent**
 - **May be ineffective**
 - **May be highly attractive to nontarget animals / wildlife**
 - **Only product registered for this kind of application in CA**





Research Overview

- August 2018 – November 2021
- Statewide project: southern CA, SF Bay Area, Tahoe area
- Goals:
 1. Evaluate attractants and bait formulations
 2. Evaluate monitoring methods and protocols
 3. Evaluate different toxicants / active ingredients
 4. Assess colony-level effects of baiting

Methods

- Regular monitoring using UC “wet traps” (May – November)
- Curation of voucher specimens from each trap, each event
- Targeted baiting when wasp density exceeded 10 / trap / day
- **Incidental evaporation from bait matrices measured in tandem**
- Mass bait removed calculated for all acceptance tests, bait trials
- Microsatellite genotyping of all vouchers pre, post baiting

Counting wasps, curating vouchers



general bait deployment protocols



results: fluralaner baits



2020: 0.025% fluralaner (Bravecto)

	No. Yellowjackets/ trap/ day				
	Pre-bait	1 wk 1 st bait	2 wk 1 st bait	3 wk 1 st bait	1 wk 2 nd bait
0.025% fluralaner	20.21	3.04 (84.9)	5.62 (72.2)	4.98 (75.3)	0.1 (98.0)
Control B	6.08	4.92 (19.1)	11.94 (0.0)	2.29 (62.3)	0.37 (83.8)
Control C	4.37	3.63 (16.9)	9.2 (0.0)	3.98 (8.9)	0.81 (79.6)

note: baits were only deployed during daylight hours to reduce risk of nontarget exposure

Project Report

The Potential of Fluralaner as a Bait Toxicant to Control Pest Yellowjackets in California

Michael K. Rust ^{1,*} , Chow-Yang Lee ¹ , Ho Eun Park ¹, Kathleen Campbell ¹, Dong-Hwan Choe ¹, Mary Sorensen ², Andrew Sutherland ³, Casey Hubble ³, Beatriz Nobua-Behrmann ⁴, John Kabashima ⁴, Shu-Ping Tseng ⁵ and Linda Post ⁶

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² Placer Mosquito & Vector Control District, Roseville, CA 95678, USA

³ University of California Cooperative Extension, Alameda County, Hayward, CA 94544, USA

⁴ University of California Cooperative Extension, Orange County, Irvine, CA 92618, USA

⁵ Department of Entomology, National Taiwan University, Taipei City 10617, Taiwan

⁶ San Diego Zoo Safari Park, Escondido, CA 92027, USA

* Correspondence: michael.rust@ucr.edu

Simple Summary: The western yellowjacket, *Vespula pensylvanica*, is an important seasonal pest of recreational and outdoor venues in the western United States. Effective control strategies are limited, and the objective of this study was to determine the potential of the isoxazoline fluralaner as a bait toxicant. A minimum of 27 colonies were detected foraging at an individual monitoring station using microsatellite markers. As colonies disappeared after baiting, new colonies were detected. Minced chicken and hydrogel baits containing 0.022% and 0.045% fluralaner bait significantly reduced the number of foragers.

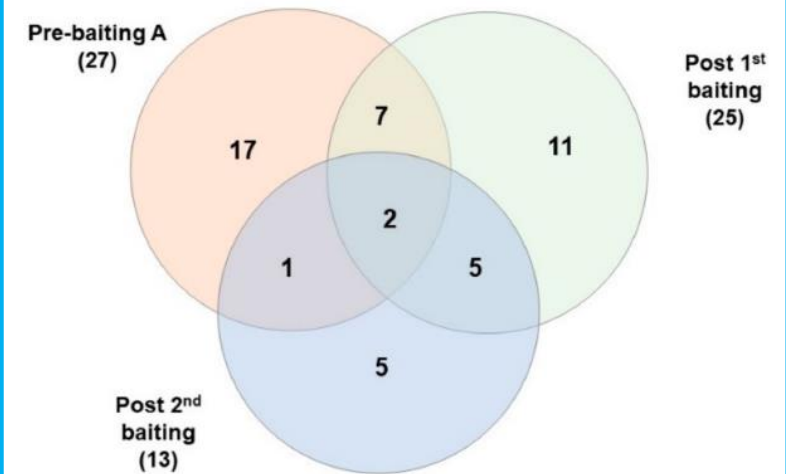


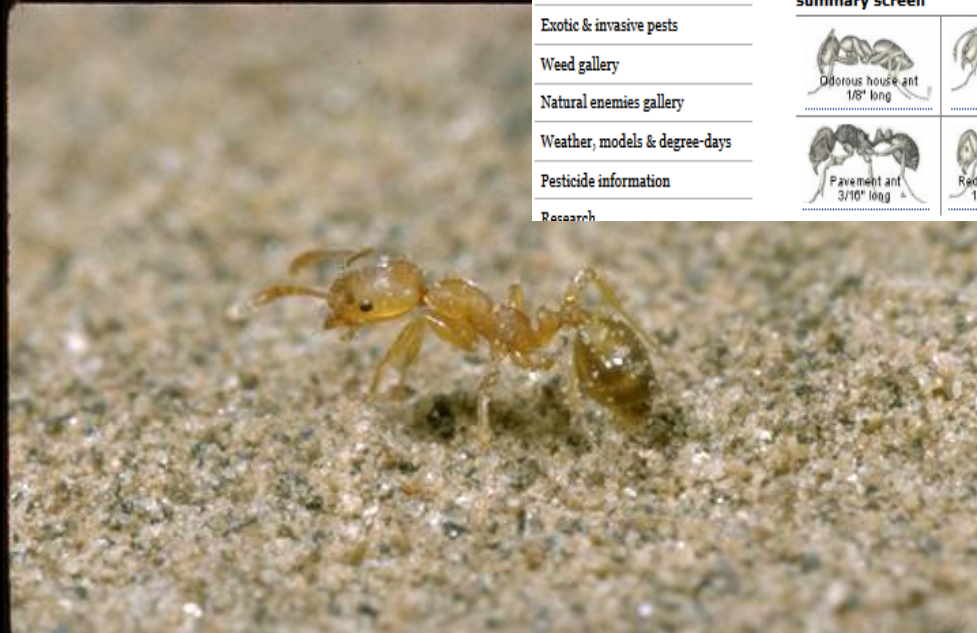
Figure 6. Venn diagram of the number of colonies at RFS.

overall findings

- Fluralaner hydrogel baits appear to be moderately to very effective
- Numerous yellowjacket colonies, with overlapping foraging ranges, may visit traps and bait stations simultaneously
- Eliminations of some colonies may be associated with foraging range expansions from other colonies
- Intensive area-wide and repeated baiting programs may be required to sustain control of pest yellowjacket populations

IPM for urban ants

- **Education**
 - **Identification is paramount!**
 - **Outdoor or indoor resident?**



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- Natural environment pests
- Exotic & invasive pests
- Weed gallery
- Natural enemies gallery
- Weather, models & degree-days
- Pesticide information
- Research

How to Manage Pests
Key to Identifying Common Household Ants

This key includes the ant species that are most likely to be a nuisance around home invaders. [References](#) | [Acknowledgment](#)









Begin key

- Click through the key until you get to a summary screen of the ant that the key identified

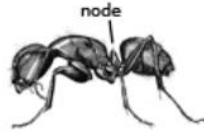
Supple

- An in
- Quick
- PDF

Already know your species? Click on an illustration below to go directly to a summary screen

 Odorous house ant 1/8" long	 Argentine ant 1/8" long	 Pharaoh ant 1/10" long	 Carpenter ant 1/4 - 1/2" long
 Pavement ant 3/10" long	 Red imported fire ant 1/10 - 1/5" long	 Southern fire ant 1/8 - 1/4" long	 Thief ant 1/32" long

one-node ants



Argentine ant

(*Linepithema humile*)

Food: sweets, sometimes proteins

Nest: outdoors in shallow mounds.

Physical description: 1/8 inch, dull brown



Carpenter ant

(*Camponotus* spp.)

Food: sweets.

Nest: in tree stumps, firewood, fence posts, hollow doors or window frames; deposits sawdustlike frass outside nests.

Physical description: large, workers vary from 1/4 to 1/2 inch, black or bicolored red and black



Odorous house ant

(*Tapinoma sessile*)

Food: sweets, sometimes proteins.

Nest: in shallow mounds in soil or debris or indoors in wall voids or around water pipes or heaters

Physical description: 1/8 inch, dark brown to shiny black, very strong odor when crushed



Velvety tree ant

(*Liometopum occidentale*)

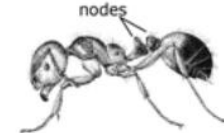
Food: sweets and insects.

Nest: in dead wood such as old tree limbs, stumps, and logs

Physical description: workers vary from 1/8 to 1/4 inch, brownish-black head, red thorax, velvety black abdomen, very distinct odor when crushed



two-node ants



Pavement ant

(*Tetramorium caespitum*)

Food: sweets, proteins, grease

Nest: in lawns or under stones or boards; builds mounds along sidewalks and foundations or near water

Physical description: 3/16 inch, dark brown to black



Pharaoh ant

(*Monomorium pharaonis*)

Food: fats, proteins, sweets

Nest: in wall or cabinet voids, behind baseboards or insulation, or outdoors in debris

Physical description: 1/16 inch, yellow or honey-colored to orange



Red imported fire ant

(*Solenopsis invicta*)

Food: sweets, proteins.

Nest: in mounds with multiple openings in soil or lawns and sometimes in buildings behind wall voids

Physical description: workers vary from 1/16 to 1/5 inch, reddish with dark brown abdomen



Southern fire ant

(*Solenopsis xyloni*)

Food: proteins and sweets

Nest: in small mounds with flattened, irregular craters in wood or under rocks

Physical description: workers vary from 1/8 to 1/4 inch, amber head and thorax, black abdomen, golden hairs cover body



ant invasions



Argentine ants, *Linepithema humile*



Effect of Weather on Infestation of Buildings by the Invasive
Argentine Ant, *Linepithema humile*
(Hymenoptera: Formicidae)

DEBORAH M. GORDON¹

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LINCOLN MOSES

Department of Statistics, Stanford University, Stanford California 94305

MEIRA FALKOVITZ-HALPERN

Pediatric Infectious Diseases, Stanford Medical School, Stanford California 94305

AND

EMILIA H. WONG

Department of Biological Sciences, Stanford University, Stanford California 94305-5020

ABSTRACT.—Weekly reports of the abundance of the Argentine ant, *Linepithema humile*, in 69 households for 18 mo (1/98–7/99) in the San Francisco Bay Area in northern California were compared with weather data. Ant abundance inside homes was highest in cold rainy weather, and there was a second smaller peak of ant abundance in hot dry weather. Pesticide use in the home decreased ant abundance, from one week to the next, only when ant abundance was extremely high.

“There is clearly an association between the weather and the level of infestation by Argentine ants. Ants are most likely to enter homes in cold wet conditions, typically in the winter in northern California. There is a second smaller peak in the level of infestation in hot dry conditions, typically in August and September.”

preventing ant invasions

- reduce moisture around structures
- control sap-sucking insects in landscapes
- remove pet food, fallen fruit
- seal structural gaps



pesticide treatments for ant invasions



- may not be necessary
- avoid regular spray programs / services
- consider bait
 - sugar vs protein
 - liquid vs gel vs granule
 - concentration of a.i.
- wait it out...

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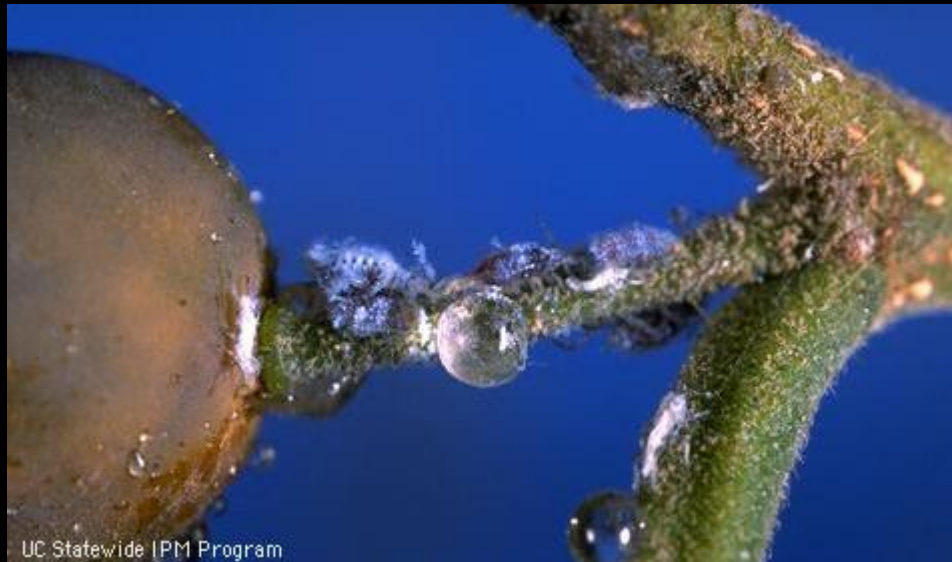
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“The results of this study suggest that it is not helpful to use pesticides to control Argentine ant infestation when weather conditions make infestation unlikely. Efforts to control infestation will be most useful during extended periods of hot or rainy weather, and the most reliable cause of a decline in infestation may be a change in the weather.”

honeydew management without neonicotinoids

Asian woolly hackberry aphid



Alternative tactics and IPM approaches:

- Provide proper irrigation, avoid fertilization unless deficiency confirmed
- Forceful water sprays (best on small trees, requires power sprayer)
- Conserve natural enemies, exclude ants
- Consider site-specific threshold for honeydew
- Monitor for honeydew using water-sensitive cards
- Soaps, oils, and pyrethrins (requires good coverage, power spray)
- **Replace problem trees with alternative species!**



honeydew management without neonicotinoids

tuliptree scale



soft scales



citricola scale

Alternative tactics and IPM approaches:

- Provide proper irrigation, avoid fertilization unless deficiency confirmed
- Prune out heavily-infested branches
- Conserve natural enemies, exclude ants
- Consider site-specific threshold for honeydew, monitor for honeydew
- Monitor for crawlers (1st instar nymphs)
- Soaps, oils, and pyrethrins (requires good coverage, power spray)
- **Replace problem trees with alternative species!**



Central tenets of IPM

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Thanks!...Questions?

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