University of California
Agriculture and Natural Resources

Current Status of Pierce's Disease in California and Management Practices

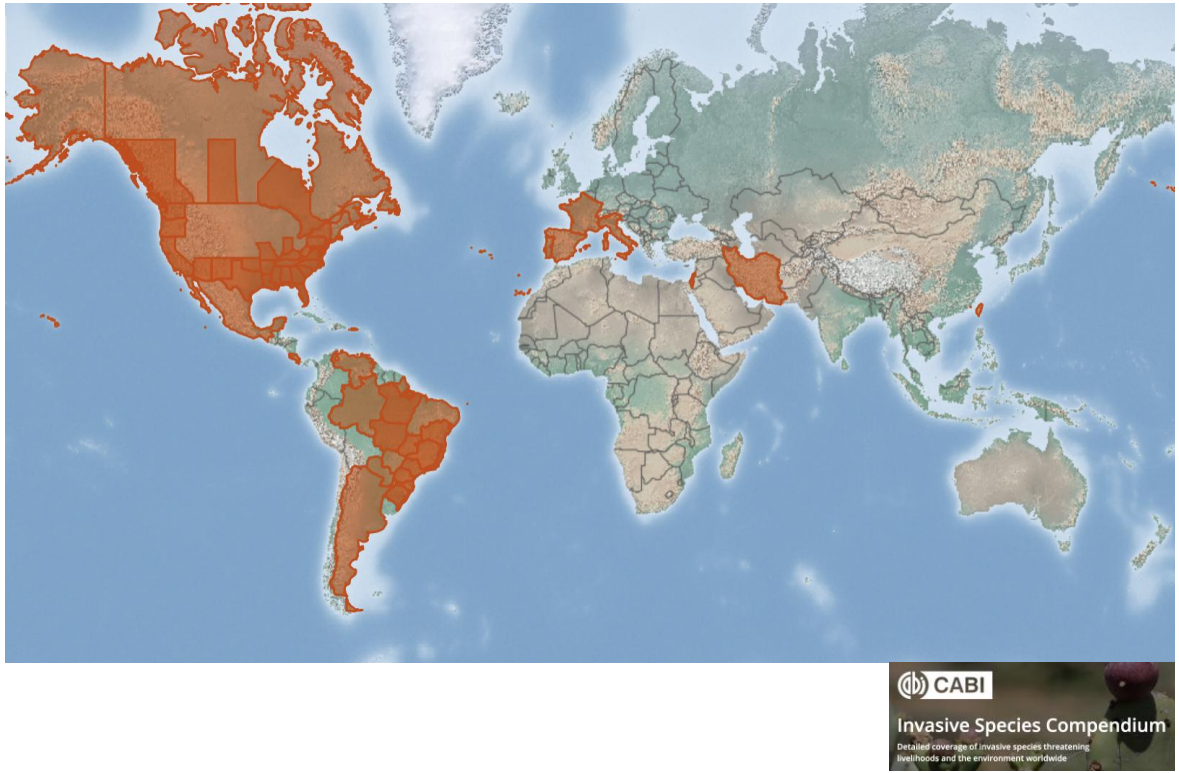
Advances in Vineyard Management:
Water, Pests, Diseases and Regulations
November 2025

Philippe Rolshausen
Professor of Cooperative Extension

UC RIVERSIDE UNIVERSITY OF CALIFORNIA

Xylella fastidiosa Geographic Distribution

- Broad host range.
- Several bacterial strains of Xylella fastidiosa affect different hosts.
    - Grapevine Pierce's Disease
    - Almond Leaf Scorch
    - Citrus Variegated Chlorosis
    - Olive Quick Decline
    - Plum, Coffee, Peach
    - Oleander, oaks, elms, maples, and sycamores.



Olive Quick Decline, Italy

Almond Leaf Scorch, Spain

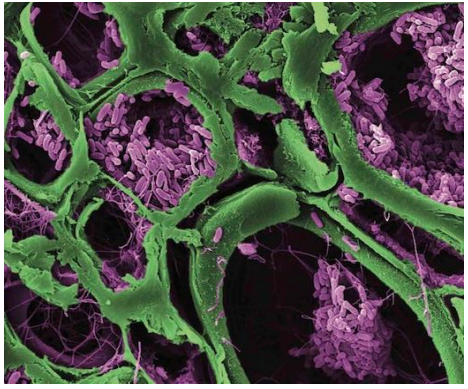
NEWS

Pierce's Disease Devastates Vineyards in California's Temecula Region

By Lynn Alley

Sep 16, 1999

Pierce’s Disease Symptoms



Pierce's Disease Distribution in CA

Anaheim 1890's

Pierce's Disease and Glassy-winged Sharpshooter in California

GWSS in California

- Glassy-Winged Sharpshooter is native of southeastern US and northeastern Mexico
- Introduced to southern CA in the 1990's
- Warming temperature could create more favorable conditions for outbreaks
  - Longer season and broader geographical range of vector activity .
  - Decrease vine recovery from cold curing (number of days below 40F).

Pierce’s Disease State Control Program

- Cooperative program between USDA, CDFA, Ag County Departments, Univ. of CA, industry groups and the public.
  - Contain the Spread: Prevent the spread of glassy-winged sharpshooters to non-infested areas with nursery inspections, trapping, and treatment, bulk citrus inspections, area-wide treatment programs and biological control.
  - Statewide Survey and Detection: Find new GWSS infestations and confirm that non-infested, at-risk areas remain free of infestation.
  - Rapid Response: Respond quickly to detections of GWSS in new areas with surveying and treatments.
  - Outreach: Raise awareness about Pierce's disease and its vectors.
  - Research: Sponsor research and development for sustainable solutions to Pierce's disease and its vectors.

Contain the Spread: Nurseries

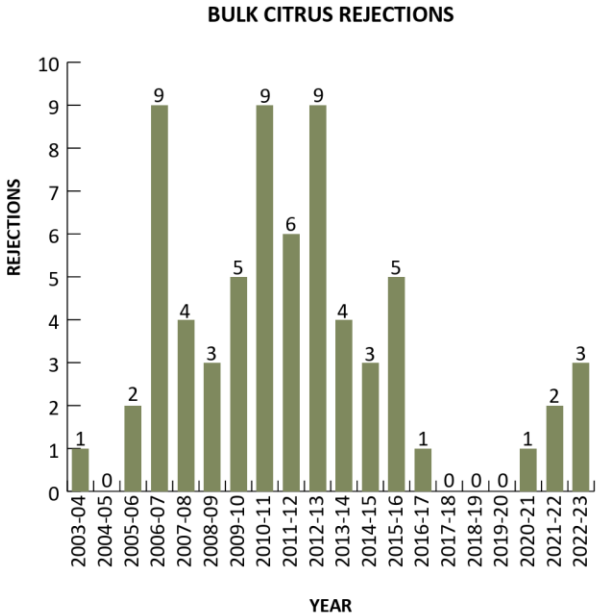
- >350 plant species are GWSS hosts
- 54% of California's 13,262 licensed nursery locations are located in GWSS-infested counties.
- Inspection of nursery stock in infested areas prior to shipping to non-infested areas;
- Treatment of nursery stock when necessary;
- Certification of shipments;
- Inspection of nursery stock at receiving nurseries prior to sale;
- Trapping in and near nurseries shipping to non-infested areas.

REGULATED NURSERY SHIPMENT RESULTS

YEAR	NUMBER OF SHIPMENTS	GWSS FOUND AT DESTINATION	% FREE OF GWSS AT DESTINATION
2001	57,600	149	99.74%
2002	65,800	77	99.88%
2003	65,000	40	99.94%
2004	76,700	64	99.92%
2005	72,600	84	99.88%
2006	69,00	47	99.93%
2007	73,100	46	99.94%
2008	62,600	37	99.94%
2009	53,700	23	99.96%
2010	50,600	6	99.99%
2011	44,500	4	99.99%
2012	44,600	2	99.99%
2013	45,800	6	99.99%
2014	44,000	12	99.97%
2015	38,000	6	99.98%
2016	36,000	9	99.97%
2017	36,700	6	99.98%
2018	34,400	0	100%
2019	43,300	6	99.99%
2020	40,800	5	99.99%
2021	39,800	2	99.99%
2022	37,200	2	99.99%
2023	32,700	1	99.99%

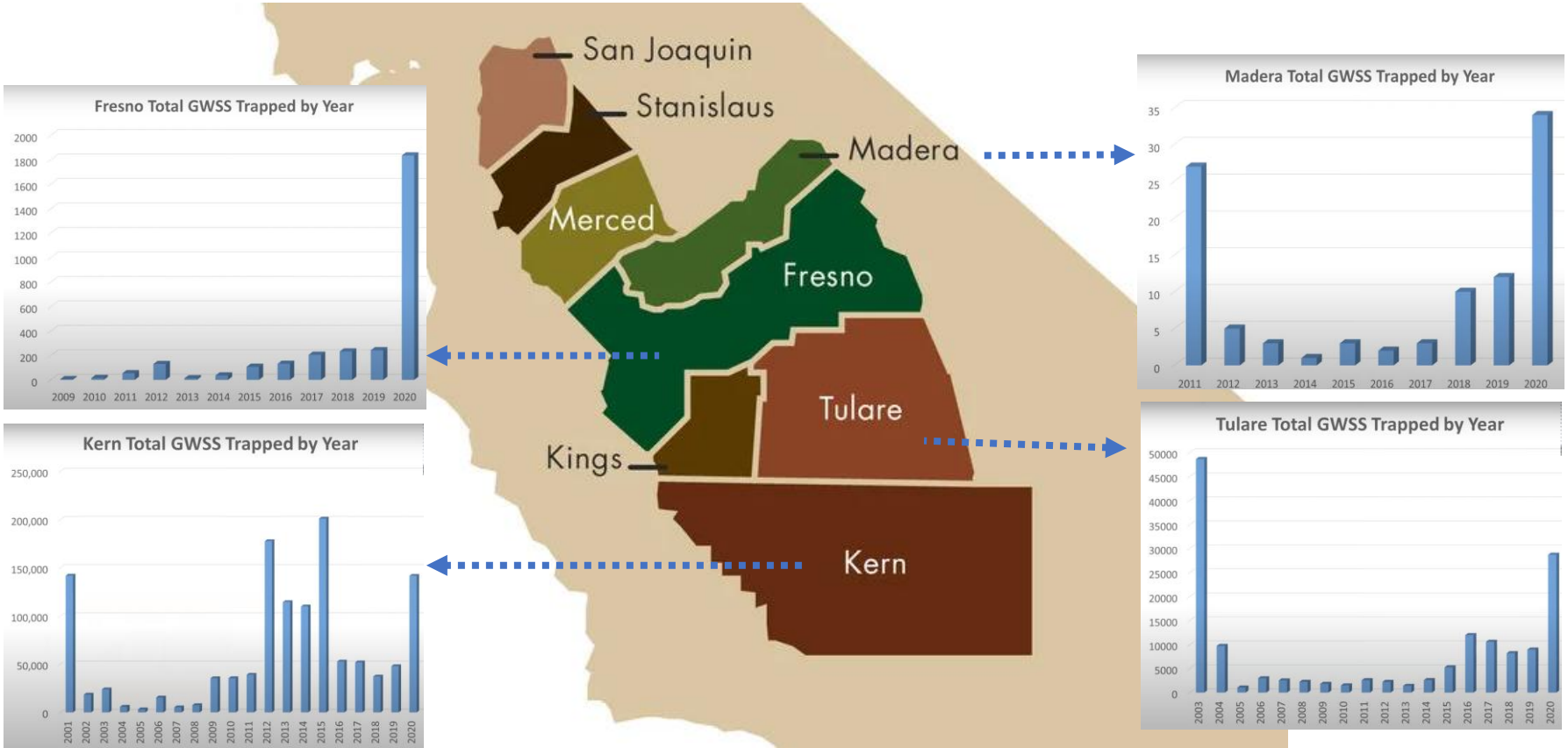
Contain the Spread: Bulk Citrus

- Citrus trees are primary hosts for GWSS throughout the year.
- GWSS active populations in warm weather (move to vineyards), inactive in cold weather (found on harvested fruits and bins and move to processing facilities).



Pierce's Disease Wide Area Management Program

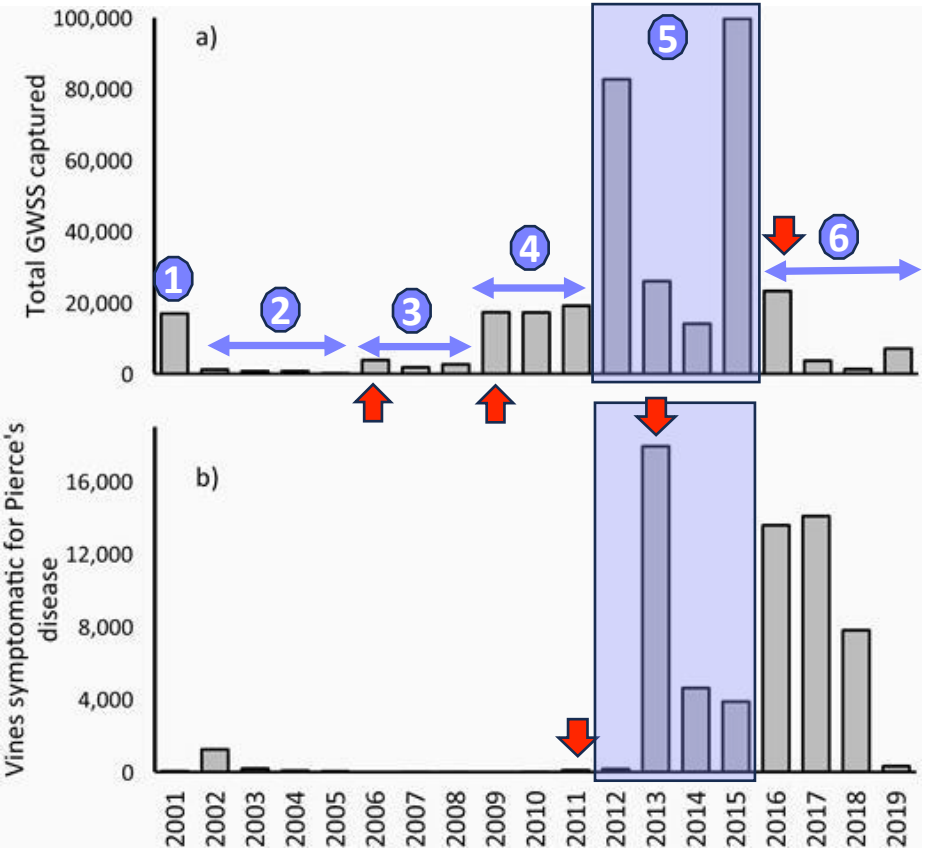
The area-wide management programs coordinate GWSS management efforts in large, agriculturally diverse grape and citrus production areas where GWSS is present.



Pierce's Disease Wide Area Management Program:
The Beale Pilot Project (D. Haviland Kern County)

- Case study for the use of areawide monitoring and treatment programs for GWSS, and monitoring and roguing programs for PD-infected grapevines.
- 50km square (10x5) with citrus groves (orange), vineyards (purple) and cherry orchards (pink). Several windbreaks (tall trees that are reservoir for GWSS)
- 470 traps annually (400 m square grid) have been used to monitor GWSS populations regionally by the CDFA, and to inform coordinated, areawide treatments by the USDA-APHIS Areawide Treatment Program to overwintering GWSS in citrus.
- Inspection of 50-60 vineyards (45,000 vines) per year. Grape growers were responsible for treating their own vineyards, and for the roguing of infected grapevines based on surveys provided by UC.

Pierce's Disease Wide Area Management Program:
The Beale Pilot Project (D. Haviland Kern County)



1: All citrus trees treated with neonicotinoids. Grape growers treated their vineyards with approximately one neonicotinoid and one organophosphate.

2: Two neonicotinoid applications (foliar and systemic) per year covering 20-50% of citrus acreage. Grapes 1-2 treatment per year.

3: Two imidacloprid applications per year covering 50-100% of citrus acreage. Grapes 3 treatments per year. Spray windbreaks

4: Two imidacloprid applications per year covering 100% of citrus acreage. Grapes 3 treatments per year. Spray windbreaks.

5: Same as 4

6: Switch from foliar neonicotinoids to pyrethroids

Research Article

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(wileyonlinelibrary.com) DOI 10.1002/ps.6258

Insecticide resistance in California populations of the glassy-winged sharpshooter *Homalodisca vitripennis*

Frank J Byrne* and **Rick A Redak**

Abstract

BACKGROUND: The glassy-winged sharpshooter, *Homalodisca vitripennis* (Germar), is a primary vector of Pierce's disease of grapes in California. Systemic imidacloprid treatments have been the mainstay of area-wide treatment programs that were established in the Central Valley (Kern and Tulare Counties) and Southern California (Riverside County) during the 1990s to combat the pest. The programs helped to suppress populations on citrus, a major sharpshooter host, to levels that significantly reduced migration into adjacent vineyards. However, beginning in 2012, there has been a resurgence of glassy-winged sharpshooter populations in Kern and Tulare counties, and hitherto successful treatment strategies have not been as effective. This study investigated the possibility that insecticide resistance was a contributing factor to the population resurgence.

RESULTS: Topical application bioassays detected high levels of resistance to imidacloprid in Kern and Tulare populations, and lower levels of resistance (perhaps due to cross-resistance) to the foliar neonicotinoid acetamiprid (20-fold), the pyrethroid fenpropathrin (7.4-fold), and the butenolide flupyradifurone (4-fold). Samples of glassy-winged sharpshooters from citrus groves under organic management also exhibited high levels of imidacloprid resistance.

CONCLUSION: The long-term use of imidacloprid has selected for resistance in glassy-winged sharpshooters. The most resistant populations also exhibited resistance to the foliar neonicotinoid acetamiprid, the pyrethroid fenpropathrin, and the butenolide flupyradifurone. High levels of imidacloprid resistance in insects sampled from organic groves indicate that resistant insects are migrating from nearby conventional groves, which could compromise the control of sharpshooters in organic systems with insecticides affected by cross-resistance.

Pierce's Disease Wide Area Management Program:
Grape Grower Guidelines

- August to September—Survey for and remove grapevines that are symptomatic for PD. If vines cannot be removed immediately, mark symptomatic vines for removal during the winter. Assume the presence of asymptomatic, yet PD-positive, vines that escape detection and survive to the next season.
- November to February—Control adult GWSS in their overwintering habitat. Take action to ensure that no refuges exist, such as windbreaks. Coordinate treatments regionally to a short application window, ideally less than 10–14 d.
- March to June—Monitor the overwintering host for egg masses and nymphs from GWSS that may have survived winter treatment. If needed, retreat the overwintering host to control the first in-season generation of GWSS before they become adults that migrate to grapes in summer months.
- April to July—Treat grape vineyards with a systemic insecticide to ensure that immigrating GWSS that acquire the Xf bacteria from any chronically infected vine (infected but still asymptomatic during surveys the previous fall) are unable to move to and infect new vines.
- Repeat this process annually to account for inefficiencies in efforts to control GWSS and rogue infected vines.

Long-term Management of GWSS

Treated: This healthy three year old vineyard has been treated using the new management protocol. The fallow land behind the vineyard is where vineyards wer to Pierce's disease, and removed during the epidemic of 1996 to 2000.

Untreated: The many blue stakes in this four year old untreated vineyard are where vines have been lost to Pierce's Disease and are being replanted.

https://www.sandiegocounty.gov ›

Registered Insecticides for GWSS Management

Synthetic Chemicals

A. IMIDACLOPRID			
(Admire Pro, soil application)	7–14 fl oz/acre	12	0
RANGE OF ACTIVITY: Pests: narrow (aphids, glassy-winged sharpshooters, Asian citrus psyllid, citrus leafminer, weevils, whiteflies); Natural enemies: predatory beetles and parasites			
PERSISTENCE: Pests: long; Natural enemies: intermediate			
RESISTANCE: Some glassy-winged sharpshooter populations in Kern County.			
MODE-OF-ACTION GROUP NUMBER[1]: 4A			
COMMENTS: Apply to soil; remains effective 4 to 5 months. Moderately effective against nymphs and adults. Requires 3 to 4 weeks for uptake into mature citrus to begin to kill the sharpshooter nymphs and adults; does not kill eggs. Lightly pre-wet soil for several hours before application to break soil surface tension. For optimum uptake, apply to newly planted trees or trees irrigated by drip, microsprinkler, or low-pressure irrigation systems. Emitters must provide even, uniform distribution of water. Once the irrigation system reaches operating pressure, inject the insecticide into the system over a calculated time interval (generally 2 hours) to allow uniform distribution throughout the system. The use of a dye marker in the insecticide solution is recommended to determine when lines are clear of the insecticide. Once the solution has cleared all irrigation lines and emitters, continue irrigation to move the insecticide into the active root zone but do not overirrigate or cause runoff. Wait 24 hours before subsequent irrigations. Apply in citrus orchards just before bloom (March) or after petal fall (May–July). Repeat applications of *any* neonicotinoid insecticide (acetamiprid-Assail; imidacloprid-Admire) can lead to resistance to *all* neonicotinoids. Alternate neonicotinoids with an insecticide that has a different mode of action to help delay the development of resistance.			

Organic Chemicals

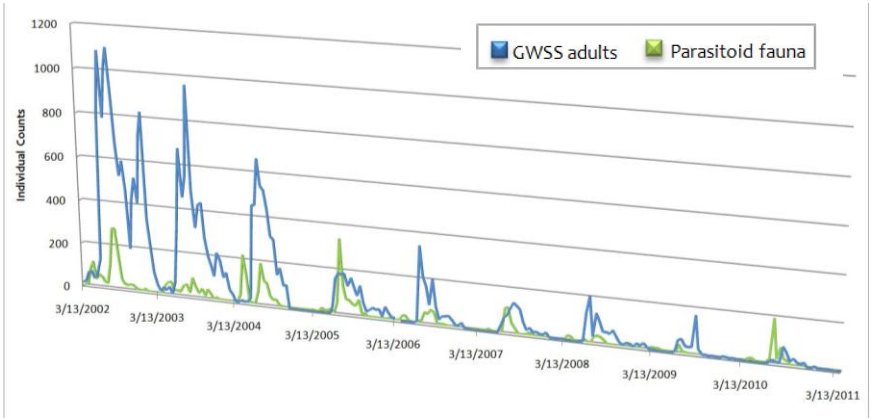
A. PYRETHRIN#			
(Pyganic EC5.0II)	4.5–15.61 fl oz/acre	12	0
(Pyganic EC1.4)	16–64 fl oz/acre in 100–200 gal (OC)	12	0
RANGE OF ACTIVITY: Pests: broad (many insects); Natural enemies: most			
PERSISTENCE: Pests: short; Natural enemies: short			
MODE-OF-ACTION GROUP NUMBER[1]: 3A			
COMMENTS: Short residual, requires repeated applications every 10 to 14 days. Buffering the final spay solution to a pH of 5.5–7.0 is important for efficacy. Pyrethrins degrade rapidly in sunlight. Pyrethrins are only suppressive of glassy-winged sharpshooter, thus frequent applications are needed.			
...PLUS...			
415 NARROW RANGE OIL#	0.5–1.0%	See label	See label
RANGE OF ACTIVITY: Pests: broad (unprotected stages of insects and mites); Natural enemies: most			
PERSISTENCE: Pests: short; Natural enemies: short			
MODE OF ACTION: Contact including smothering and barrier effects; also improves translaminar movement and insecticide persistence.			
COMMENTS: Check with certifier to determine which products are organically acceptable.			

https://ipm.ucanr.edu/agriculture/citrus/glassy-winged-sharpshooter/

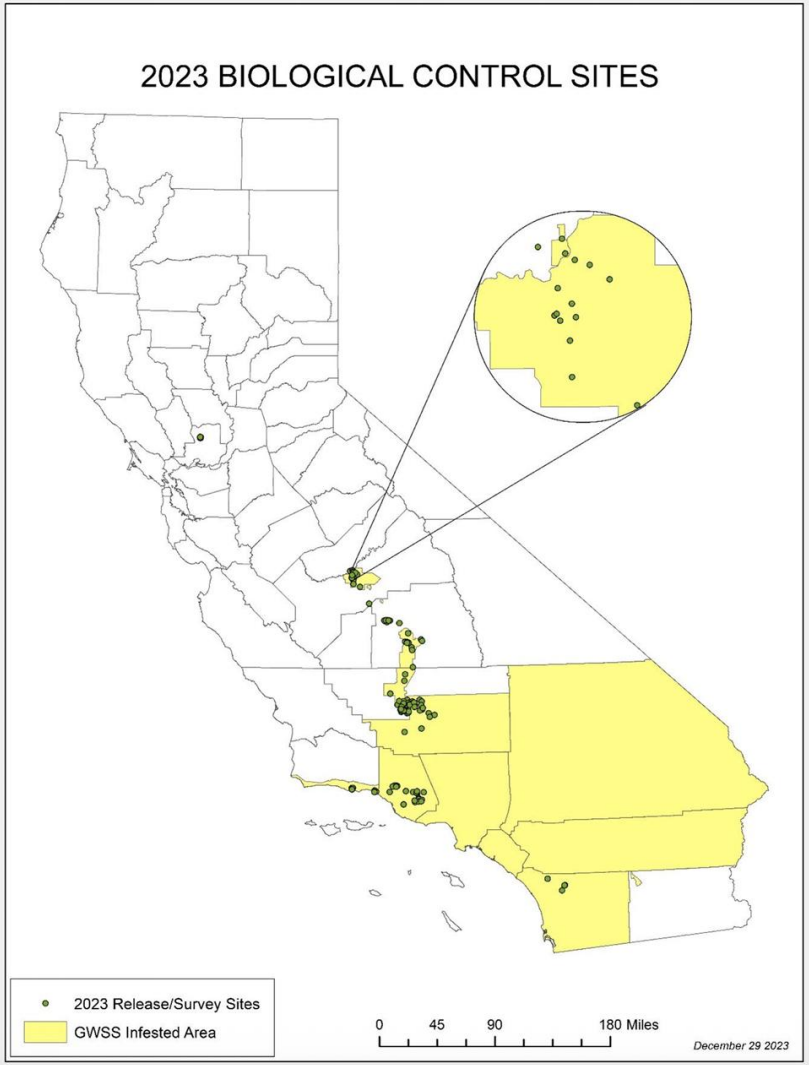
GWSS Bio


Gonatocerus ashmeadi


Gonatocerus morilli



https://biocontrol.ucr.edu/glassy-winged-sharpshooter



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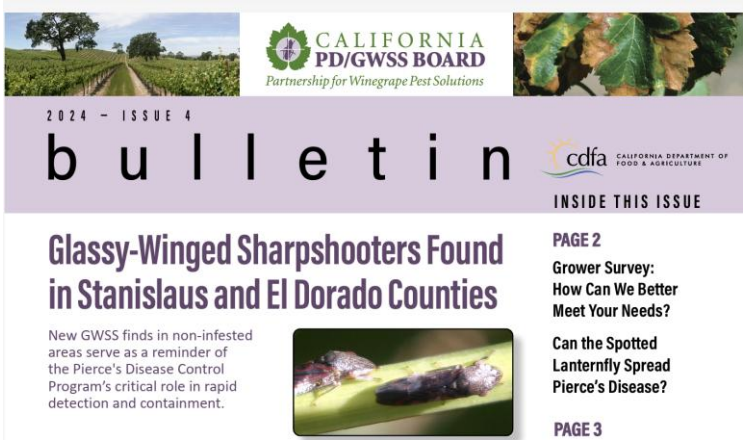
Statewide Survey, Detection, Response



CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

PROCLAMATION OF AN EMERGENCY PROGRAM AGAINST THE GLASSY-WINGED SHARPSHOOTER

FOR THE CITY OF VACAVILLE IN SOLANO COUNTY

On October 1, 2021, the California Department of Food and Agriculture (CDFA) confirmed the presence of the glassy-winged sharpshooter (GWSS), the invasive vector of the bacterium that causes Pierce's disease in grapes, in the city of Vacaville, Solano County. Based on this detection and recommendations from CDFA GWSS staff entomologists, the CDFA concludes that an infestation of GWSS exists in the area. This pest presents a significant, clear, and

Plant Pierce's Disease-Resistant Varieties

ANR NEWS RELEASES
News releases from the UC Division of Agriculture and Natural Resources

UCANR: Safeguarding abundant and healthy food for all Californians

Pierce's disease-resistant grape varieties give growers hope

Author: Saoimanu Sope

Published on: August 22, 2022

Andy Walker

WINTER 2021
bulletin
cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

INSIDE THIS ISSUE

Wines Made From PD-Resistant Grapevines Spotlighted at Unified Wine & Grape Symposium

Plant Pierce's Disease-Resistant Varieties

Camminare Noir has characteristics of *Cabernet Sauvignon* and *Petite Sirah*

Errante Noir has characteristics of Cabernet Sauvignon

Paseante Noir has characteristics of *Zinfandel*

Ambulo Blanc has characteristics of *Sauvignon Blanc*

Caminante Blanc has characteristics of *Sauvignon Blanc* and *Chardonnay*

Introducing

XylPhi-PD™

Bactericide for use in grapevines.

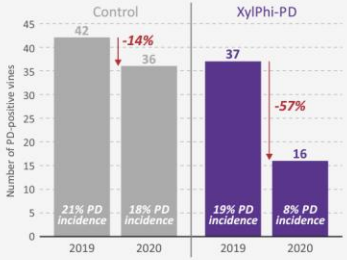
A&P Inphatec

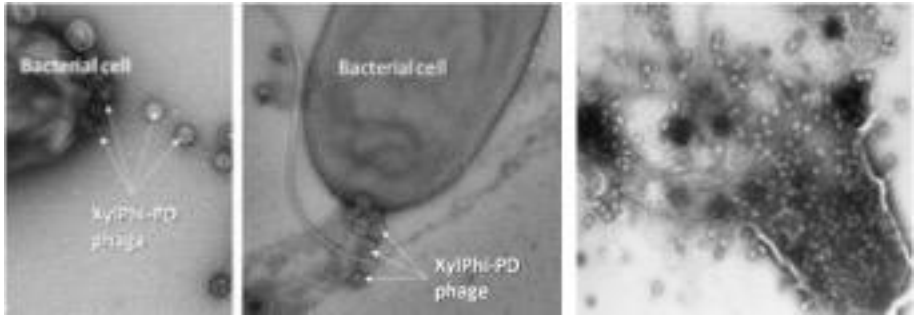
The Proven Treatment and Prevention for Symptoms of Pierce's Disease

- Alternative to costly rogueing and replacement of grapevines.
- Maintains production, efficiency, and uniformity in the block.
- Flexible application timing with durable injection system.
- OMRI-listed for use in organic production.

*Consistent XylPhi-PD use reduced PD incidence by **57%** year-to-year in a 4-site California field study.*[1]

- 400 commercial vines with a history of Pierce's Disease (PD):
  - 200 untreated controls;
  - 200 treated with XylPhi-PD.
- Detection of *Xylella fastidiosa* (bacterium that causes PD) by DNA-based qPCR, performed on petioles collected from vines in the fall of both 2019 and 2020.





Phytopathology® • 2024 • 114:503-511 • https://doi.org/10.1094/PHYTO-06-23-0219-R

Bacteriology

Control of Pierce's Disease of Grape with *Paraburkholderia phytofirmans* PsJN in the Field

Steven Lindow,† Renee Koutsoukis, Kyle Meyer, and Clelia Baccari

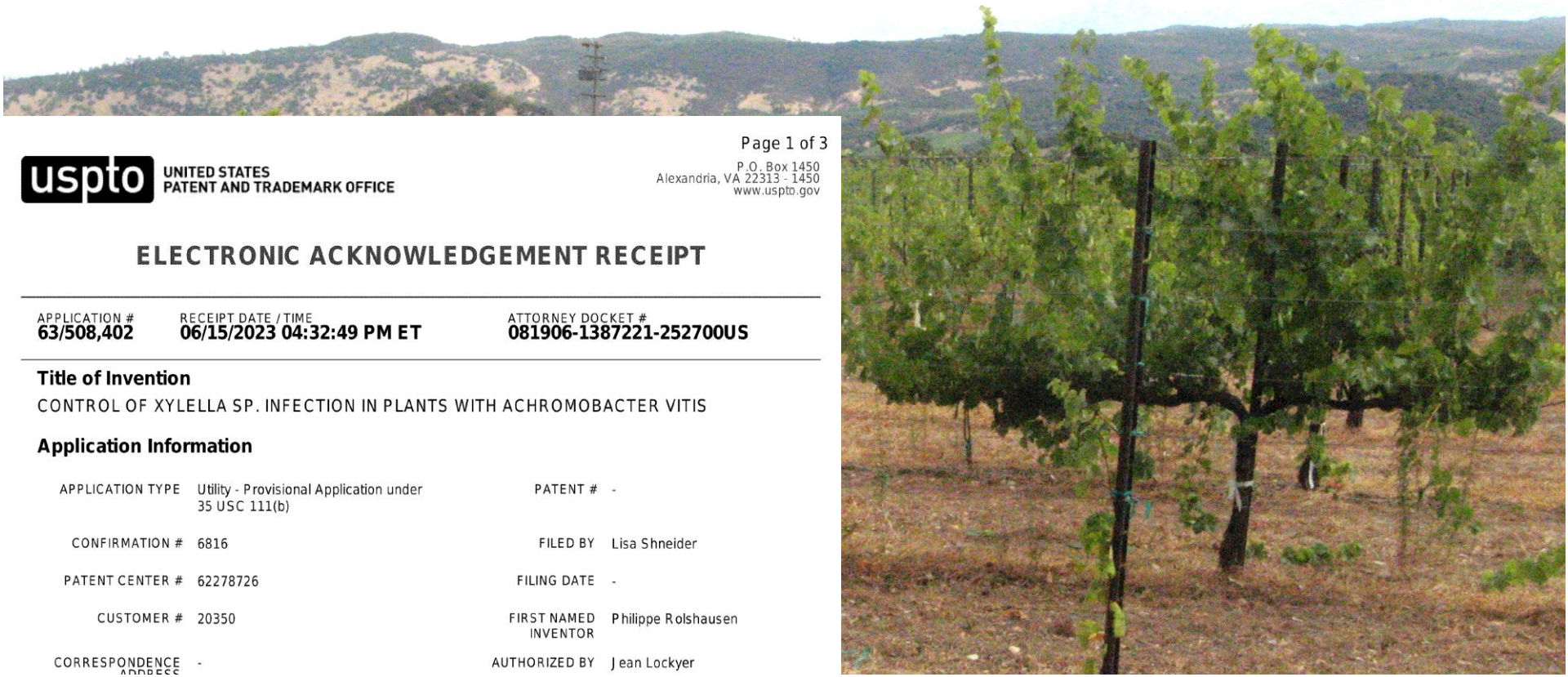
Department of Plant and Microbial Biology, University of California, Berkeley, CA 94720

Accepted for publication 17 October 2023.

A new biocontrol shot protects wine grapes from Pierce's disease

University of Florida plant pathologist Don Hopkins surveys vines in University of California -Riverside test plots for symptoms of Pierce's disease.

Identification of Grapevine Native Biological Control Agent of *Xylella fastidiosa*



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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
63/508,402	**06/15/2023 04:32:49 PM ET**	**081906-1387221-252700US**

Title of Invention

CONTROL OF XYLELLA SP. INFECTION IN PLANTS WITH ACHROMOBACTER VITIS

Application Information

APPLICATION TYPE	Utility - Provisional Application under 35 USC 111(b)	PATENT #	-
CONFIRMATION #	6816	FILED BY	Lisa Shneider
PATENT CENTER #	62278726	FILING DATE	-
CUSTOMER #	20350	FIRST NAMED INVENTOR	Philippe Rolshausen
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Jean Lockyer

Biopesticides to Manage Pierce's Disease Trialed at UC Davis

by Ted Rieger
Sep 8, 2022

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Advancing Biopesticide Technologies for Managing Pierce's Disease

Of the many threats to grapevines, Pierce's disease (PD) stands out as an especially formidable foe. Growers who have encountered PD don't need to be reminded of its perils, they have devastating losses to show for it. It's time PD met its match.

Dr. Anika Kinkhabwala administers Xylphi-PD, one of the biological treatments the research team is evaluating to control Pierce's disease.

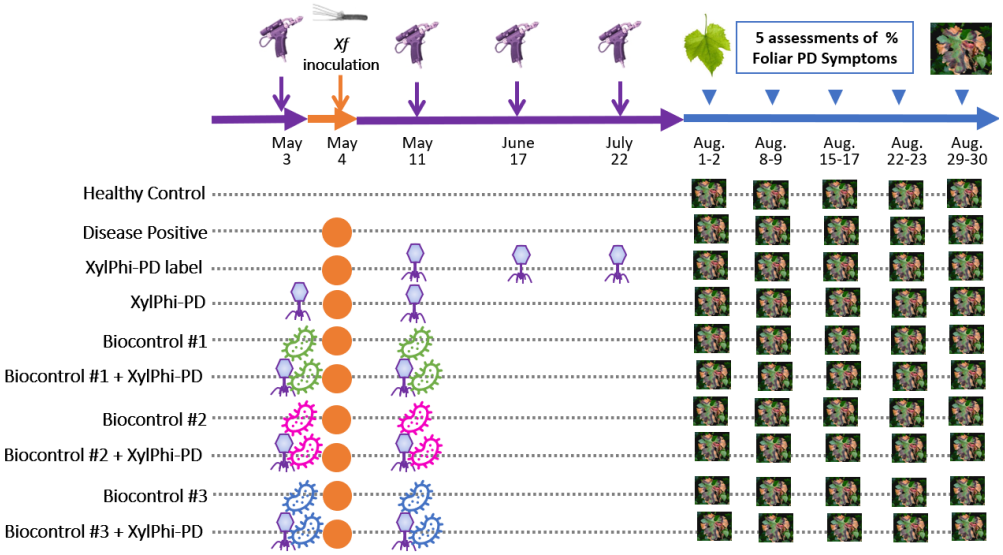
A team of researchers, led by Dr. Akif Eskalen at University of California, Davis, has been diligently testing eight combinations of four biological treatments for controlling *Xylella fastidiosa* (*Xf*), the bacterial pathogen that causes PD, in the field. Less than one year into a three-year study, they observed promising results and hosted a field day to share them.

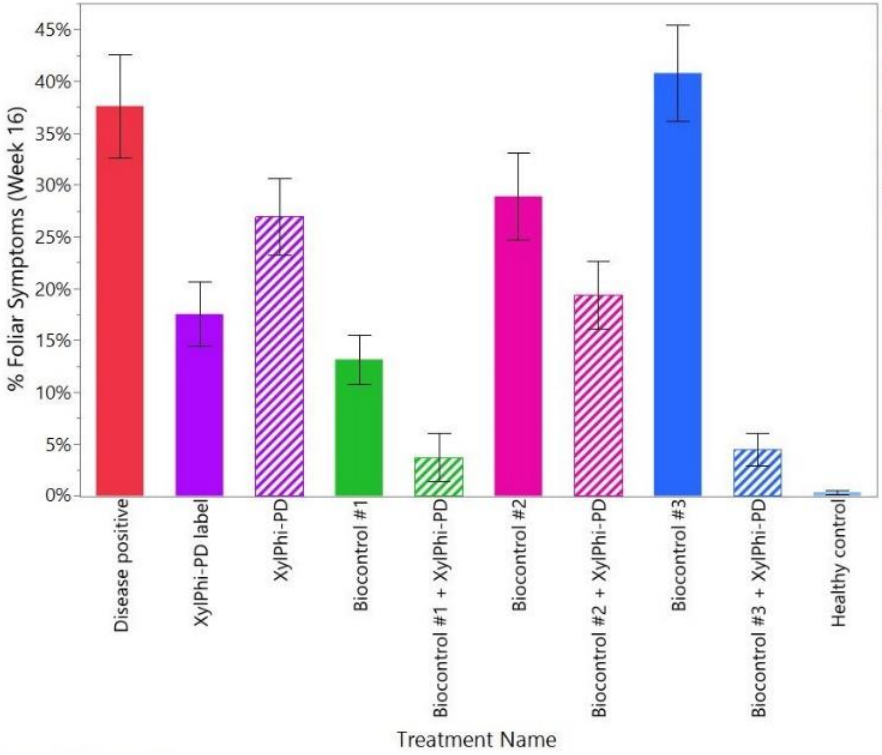
"I'm really happy that the project got funded by the Pierce's Disease and Glassy-Winged Sharpshooter Board because we can compare treatments of all the biopesticides," said research collaborator Dr. Philippe Rolshausen. "This is a major step forward."

In September 2022, a crowd gathered at the research site, UC Davis' 11-year-old Cabernet Franc vineyard, which, crucially, has no history of PD. Eskalen explained that the team has spent the past several months observing symptoms in controls versus eight treatments of experimental biopesticides along, and in combination, with a bacteriophage. The results will offer valuable insight into which methods growers could use and how they should use them.

All treatments were administered via a Xyleject, an application device used to inject the product directly into the grapevine, and grapevines were artificially inoculated with *Xf* one week later. The team followed up with a second round of treatments the following week and closely observed the vineyard for symptoms of PD.

UC Davis Field Trial





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