PIERCE'S DISEASE

A Decade of **PROGRESS**

"Research helped Temecula recover from our devastating losses. The lessons learned and the partnerships formed here with other industries are helping to keep GWSS and PD from spreading to other parts of the state until there is a permanent solution"

BEN DRAKE
Grape Grower, Temecula

In the late '90s, a new pest, the glassy-winged sharpshooter (GWSS), caused severe damage to grapevines in California, spreading the fatal Pierce's disease (PD) through vineyards at a rapid pace. California was facing its biggest threat to grapevines since phylloxera.

Today, 10 years later, the future is looking brighter. A unique partnership of state, federal, and local agriculture departments, industry, and research institutions is not only controlling the pest, but through research is also building a foundation of new information and advances helping to close in on solutions to Pierce's disease.

PD/GWSS BOARD RESEARCH

Stopping the Spread of Pierce's Disease

CDFA's Pierce's Disease Control Program (PDCP): The PDCP works to minimize the statewide impact of PD and GWSS. The strategy is to slow or stop the spread of GWSS while solutions to PD are developed. This strategy relies upon five elements: Contain the Spread, Statewide Survey and Detection, Rapid Response, Outreach and Research.

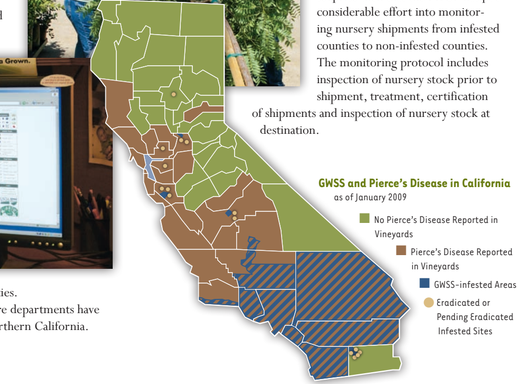
GWSS presence is limited to 13 of California's 58 counties. Continued efforts by county, state and federal agriculture departments have prevented the spread and establishment of GWSS in Northern California.

"This office, as well as all county ag commissioners throughout the state, has had to be on constant vigilance to ensure GWSS isn't moved into new areas of California. We have been successful so far thanks to the effective working partnerships formed among the grape, citrus, and nursery industries, and county, state, and federal agencies."

SCOTT HUDSON, San Joaquin County Ag Commissioner

Moving Plants Without Moving the Pest

GWSS Nursery Shipping Protocol: Seventy-two percent of California's 11,500 licensed nurseries are located in GWSS-infested counties. It's no surprise then that the PDCP has put considerable effort into monitoring nursery shipments from infested counties to non-infested counties. The monitoring protocol includes inspection of nursery stock prior to shipment, treatment, certification of shipments and inspection of nursery stock at destination.



Sharing Results Stimulates New Ideas

Annual Research Symposium: New results stimulate new ideas which can lead to powerful results. This has certainly been the case with the annual Pierce's Disease Research Symposium. Each year researchers from around the nation and world convene, share results and work to leverage their combined discoveries to accelerate the pace of moving research results to the field.

No Time to Waste in Finding a Solution

Strategic Approach to Research: With the clock ticking, research has to yield quick results. Research funding undergoes an extensive review process and then is strategically allocated to the most promising projects. As a result, the findings generated by some of the nation's top plant biologists, microbiologists and insect researchers are rapidly moving us closer to a solution.

"The success of the program can be seen in that we don't have glassy-winged sharpshooters in our vineyards while they are just over the hill from us here in Santa Barbara County."

KEVIN MERRILL, Grape Grower, Santa Barbara County

Managing the Pest – Controlling PD

Area-wide Control Programs: Intensive and proactive area-wide control programs funded primarily by the USDA draw on a comprehensive toolbox that includes pesticide treatments, biological control and trapping to manage GWSS populations in infested or vulnerable areas. Keeping GWSS levels low is vital to stopping the spread of PD.

"When the guys putting up the money are the same ones who are making the decisions, you get results."

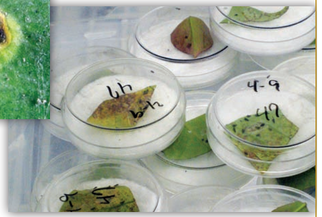
AL ROSSINI, Grape Grower, Denair

A Unified Approach

Partnering for Success: By leveraging resources, knowledge and funds from dozens of partnering organizations, the PDCP continues to expand its capabilities and build on its successes. From researchers to agricultural commissioners, citrus growers to nursery stock producers, the depth of collaboration has yielded significant results and served as a model program for invasive pest management and response.

PD Is Lethal

What Is the Potential Danger? PD is lethal! While new and emerging vineyard pests and diseases can be costly, when PD strikes, vines die. For that reason, growers, working through their PD/GWSS Board, have contributed to the statewide effort to keep the insect vector and disease in check while an aggressive research program works towards finding long-term solutions that will protect the state's $51.8 billion wine industry.



Protecting the Growers' Investment When Solutions Are Discovered

Public Intellectual Property Resource for Agriculture: Turning research discoveries into usable tools is the driving principle of the PD/GWSS Board. To get a head start on navigating discoveries through the patent process, the Board has partnered with PIPRA, a non-profit collaboration located at UC Davis established to help reduce the time it takes for agricultural discoveries to reach the marketplace. This partnership with PIPRA will help accelerate the availability of new technologies and discoveries to users and innovators.

Grower-Funded Grower-Directed

The voice of growers is represented from every winegrape growing region in the state. The diverse grower board ensures that the unique challenges faced in vastly different regions of the state are carefully considered and weighed to tailor approaches that work.

Kevin Andrew
Sun World International, Inc., Bakersfield

Dennis Atkinson
Tejon Ranch Company, Lebec

Gregory Coleman
E & J Gallo Winery, Modesto

Edgar "Pete" Downs
Jackson Family Wines, Santa Rosa

Ben Drake
Drake Enterprises, Inc., Temecula

David House
Village Nurseries Wholesale, LLC, Orange

Andrew (Drew) Johnson
Beringer Wine Estates, St. Helena

Bradford Lange
LangeTwins Winery and Vineyards, Acampo

Jim Ledbetter
Vino Farms, Lodi

Steve McIntyre
Monterey Pacific, Inc., Soledad

Dana Merrill
Mesa Vineyard Management, Inc., Paso Robles

Albert Rossini
Albertoni Land Co., Ltd., Denair

Steve Schafer
Schafer Farms, Madera

Herb Schmidt
Silverado Vineyards, St. Helena

Marilyn Wolf
Constellation Wines US, Woodbridge

PIERCE'S DISEASE A Decade of PROGRESS

99

- 300 acres of grapevines in Temecula infested with the glassy-winged sharpshooter are destroyed and the full extent of the threat the GWSS posed to California agriculture is recognized
- CDFA appoints task force to develop research priorities to combat the GWSS threat
- Federal assistance secured to reduce sharpshooters in Temecula

00

- The University of California reports that Pierce's disease transmitted by blue-green sharpshooters destroyed over 1,000 acres of grapevines in Northern California since 1994, causing $30 million in damages
- CDFA develops and releases statewide survey protocols and guidelines for counties to use to find infestations of GWSS
- Federal government issues declaration of emergency, providing $22.3 million to counter spread of GWSS and support research to find cure for Pierce's disease

01

- Assembly Bill 1394 signed, bolstering research and other program activities by providing approximately $4 million per year for five years from an assessment on winegrapes
- Statewide survey shows GWSS present in eight Southern California counties
- GWSS egg parasitoids, *Gonatocerus ashmeadi* and *Gonatocerus walkerjonesi*, first released
- First annual Pierce's Disease Research Symposium

02

- Assessment rate set at $2 per $1,000
- Pierce's Disease/GWSS Science Advisory Panel meets in Sacramento to review program and develop recommendations
- Structured monitoring protocol put in place at all GWSS egg parasitoid sites
- First localized GWSS infestation eradicated in Brentwood (Contra Costa County)
- GWSS egg parasitoid, *Gonatocerus fasciatus*, first released

03

- Experiment conducted to test efficacy of pre-shipment treatment of nursery stock to kill GWSS eggs and emerging nymphs
- Second localized GWSS infestation eradicated in Chico (Butte County)
- Fresno County implements area-wide trapping for GWSS in citrus groves
- Tulare County implements area-wide program that includes trapping and treatments for GWSS

04

- GWSS infestation in Kingsburg area of Fresno County declared eradicated
- National Academy of Sciences (NAS) releases independent scientific review of research program
- GWSS infestation in Vacaville, Solano County, detected
- Biocontrol program relocated to larger facility in Arvin, Kern County, to increase the production of biological control agents
- SB 1650 passed to allow grower referendum

05

- GWSS egg parasitoids, *Gonatocerus morrilli* and *Anagrus epos*, first released
- Nursery Treatment Pilot Program begins
- GWSS infestation in Cupertino, Santa Clara County, is declared eradicated
- Winegrape growers vote to continue the winegrape assessment for PD research

06

- Infestation discovered in the Evergreen area of south San Jose in Santa Clara County
- Five counties participate in the Nursery Treatment Pilot Program
- Statewide Survey and Detection protocols distributed to counties
- Statewide Survey and Detection biologists provide detection training to 366 county and state personnel
- GWSS infestations in Fowler, Fresno County, and Chico, Butte County, are declared eradicated

07

- Assessment rate set at $1.50 per $1,000
- PD/GWSS Research Scientific Review released by the Research Scientific Advisory Panel (RSAP)
- Solano County GWSS infestation declared eradicated
- 73,100 shipments of nursery stock from infested areas to uninfested areas inspected
- Biocontrol agents released in over 13 sites throughout California

08

- Assessment rate set at $1 per $1,000
- Nursery Approved Treatment Program implemented for nurseries in GWSS-infested areas
- Three adult glassy-winged sharpshooters found in Santa Clara County, prompting a rapid-response survey. These detections led to the new Capitol area infestation in the city of San Jose, Santa Clara County

PIERCE'S DISEASE

Investing in Your FUTURE

"Our biggest mistake now would be for the wine industry to think this disease is no longer a problem. Ultimately, continued research is going to be the only way to someday find a means of putting the threat of Pierce's disease behind us."

MIKE SANGIACOMO
Winegrape Grower, Carneros Region, Sonoma County

Over the last 10 years, millions of dollars have been invested in protecting California's grape-growing areas from PD and GWSS. During this time, government funds have primarily been used to prevent the spread of GWSS to new areas or to manage GWSS in areas it has already reached, while industry funds collected via the PD/GWSS Board Assessment have been used to support research seeking long-term solutions to the PD threat. This sharing of responsibility has created an effective partnership that has successfully met the many challenges presented by PD and GWSS in California.

FUNDING

Where It Comes From

How It Is Spent

Some of the Research Projects Funded by the PD/GWSS Board

- Seasonal Transmission of *Xylella fastidiosa* by the Glassy-winged Sharpshooter From Grapevines Infected for Various Lengths of Time
- Comparative Genomics: Identifying Similarities and Differences Across Three Leafhopper Vectors of *Xylella fastidiosa*
- Assessing the Post-Winter Threat of Glassy-winged Sharpshooter Populations
- Systemic Control of Pierce's Disease by Altered Expression of Anti-Apoptotic Genes or Their RNA-Based Regulatory Elements
- Which Grape Varietals Are Sources of Pierce's Disease Spread? Decoupling Resistance, Tolerance and Glassy-winged Sharpshooter Discrimination
- Optimizing Grape Rootstock Production and Export of Inhibitors of *Xylella fastidiosa* Polygalacturonase Activity
- The Pit Membrane Barrier to *Xylella fastidiosa* Movement in Grapevines: Biochemical and Physiological Analysis
- Do Cell Wall Structures Limit *Xylella fastidiosa* Distribution in Inoculated, Pierce's Disease Susceptible and Resistant Grapevines?
- Bacterial Populations in Grapevines Apparently Resistant to Pierce's Disease of Grapevine
- *Xylella fastidiosa* Transmission by Glassy-winged Sharpshooters and Smoketree Sharpshooters From Alternate Hosts to Grapevines
- Understanding Control of *Xylella fastidiosa* Cell Aggregation: Importance in Colonization and Biofilm Development in Grapevine and Sharpshooter Foregut
- Biological Control of Pierce's Disease of Grapevine With Benign Strains of *Xylella fastidiosa*
- Inhibition of *Xylella fastidiosa* Polygalacturonase to Produce Pierce's Disease Resistant Grapevines
- Map-Based Identification and Positional Cloning of *Xylella fastidiosa* Resistance Genes From Known Sources of Pierce's Disease Resistance in Grape
- Breeding Pierce's Disease Resistant Winegrapes
- The Economics of Pierce's Disease in California

RESEARCH HIGHLIGHTS
At Work for You

Biological Control: Unleashing tiny wasps to track down and kill GWSS eggs before they can hatch has shown promise for reducing GWSS populations. Over 1.7 million of these parasitoids have been released since the start of the program.

Understanding the Disease: Losses during the 1999 Temecula outbreak caused by vine-to-vine transmission were rapid and severe. By identifying at what point during the growing season this type of spread occurs, researchers have provided growers with cost-effective management tools to reduce vine loss.

Identifying Plant Hosts: The plants and trees surrounding vineyards could actually serve as hosts for PD or GWSS. Thanks to research, growers now have a better idea of the common landscaping plants and crops most likely to host these pests and can now make better-informed landscaping decisions.

Breeding PD-Resistant Winegrapes: While controlling GWSS is critical, the ultimate goal is to put a stop to PD. One of the most exciting Board-funded research programs has identified a PD-resistant gene from wild grape stock, which is leading the way to the development of new PD-resistant grape varieties.

Looking Inside Plants for a Cure: Researchers have discovered compounds which appear to be effective at stopping or greatly reducing the symptoms of PD in grapevines. Additional studies may lead to methods of applying or having the vines produce these compounds themselves, resulting in preventing or reducing PD in the vineyard. Lab testing is underway, and field trials are expected to begin within a few years.

PD/GWSS BOARD RESEARCH

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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For more information, you can visit these Web sites:

CDFA Pierce's Disease Control Program
www.cdfa.ca.gov/pdcp

PD/GWSS Board Forum
www.pdgwss.net

PIPRA – The Public Intellectual Property Resource for Agriculture
pd.pipra.org

UC Pest Management Guidelines for PD
www.ipm.ucdavis.edu/PMG/r302101211.html

Pierce's Disease News and Research
www.piercesdisease.org