

**Pierce's Disease Control Program
2006 Annual Report to the Legislature**



Pierce's Disease Control Program

California Department of Food and Agriculture

Annual Report to the Legislature

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A.G. Kawamura, *Secretary*

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Statement of the Secretary

Invasive pests and diseases are a recurring story in California, both for our agricultural community and for the rest of the state's environment, natural resources, and public and private property. California's diverse agricultural production, its varied landscape and its range of weather conditions make this state an ideal place to produce more than half of the nation's supply of fruits and vegetables. Unfortunately, these same conditions make California a hospitable place for an ever-expanding list of invasive pests like the glassy-winged sharpshooter.

While Pierce's disease has been in California for a century or more, the establishment of the glassy-winged sharpshooter infestation in southern California in the late 1990s suddenly thrust the disease to the top of the list of threats to crops ranging from grapes to alfalfa to stone fruits. Thanks to substantial investment by both growers and state and federal governments, we have been able to develop a multi-faceted program that has succeeded in keeping this pest and disease from gaining ground.

In the complex case of Pierce's disease and the glassy-winged sharpshooter, Californians deserve no less from their leaders than an innovative solution. The Department's staff, as well as growers and researchers, have known since the beginning of this program that it would take time, effort and investment to succeed. This report shows the progress the program is making toward that goal.

A.G. Kawamura, Secretary
California Department of Food and Agriculture

Executive Summary

The Pierce's Disease Control Program (PDCP), in its sixth year of existence, is realizing that no two years are quite the same. Each year presents its own challenges. This past year glassy-winged sharpshooter (GWSS) populations increased, and new infestations required additional rapid response programs. In addition, the Pierce's Disease and Glassy-winged Sharpshooter Board (PD/GWSS Board) selected a research director and the nursery treatment pilot program continued to generate valuable efficacy data.

County inspection programs, with the cooperation of California nurserymen, collaborated to continue to reduce GWSS hitchhiking in plant shipments to non-infested areas of California. Despite this year's spike of high GWSS populations in southern California, nursery shipment rejections were once again held to a very low number in 2006.

The nursery treatment pilot program tests the effectiveness of treating plants, known to have GWSS egg masses, with approved pesticides. Plants are treated, sleeved with a mesh protective covering and shipped to destination localities where they are observed. To date, the data confirms 100% mortality of all emerging GWSS nymphs.

In 2006, GWSS infestations were found in two new areas in northern California. They were the Kingsburg area of Fresno County and the Evergreen area of south San Jose, Santa Clara County. The Kingsburg area was reinfested in 2006 after being declared eradicated of GWSS in 2004. Rapid response activities have been initiated in both of these new infestations.

Researchers from universities and government agencies continue on a determined course to find a cure for Pierce's disease. The PD/GWSS Board's recent selection of a research director will aid in this search. A research symposium, held in San Diego, shared the progress of approximately 80 ongoing research projects.

Biological control facilities in Riverside and Arvin continued to produce tiny stingerless wasps for use as biological control agents against GWSS.

Until research discovers a cure for Pierce's disease, the program will continue to manage GWSS through biocontrol and areawide projects and by constantly refining regulatory, detection and urban treatment techniques.

Background

The Threat

Pierce's disease has been present in California for more than 100 years. The disease has caused sizable losses in California viticulture in the past, but the damage occurred primarily in traditional "hotspot" areas. Until recently, it was not severe enough to completely prevent grape production in areas where the pathogen was present. This situation changed dramatically with the arrival of the glassy-winged sharpshooter. Viticulture in traditionally safe growing regions is now at risk from the disease. Considering only grapes, the disease now threatens a crop production value of \$4.14 billion and associated economic activity in excess of \$45 billion. Other crop and ornamental plant resources such as almonds (\$2.86 billion) and susceptible species of citrus (\$1.22 billion), stone fruits (\$1.13 billion), and shade trees are also at risk, either from the Pierce's disease strain of the bacterium or from related strains found elsewhere in the world. To counter this threat, the Pierce's Disease Control Program was established within the California Department of Food and Agriculture to minimize the statewide impact of Pierce's disease and the glassy-winged sharpshooter.

Pierce's Disease



A vine showing symptoms of Pierce's disease

Pierce's disease in grapevines was first noted in California near Anaheim around 1884. The disease is caused by a strain of the bacterium *Xylella fastidiosa*. It kills grapevines by clogging their water-conducting vessels (xylem). Several strains of this bacterium exist, attacking and causing damage to different host plants including grapes, citrus, stone fruits, almonds, oleander, and certain shade trees such as oaks, elms, maples, and sycamores. Since its discovery, Pierce's disease has been reported and is known to exist in 28 counties. The University of California reported that the disease destroyed over 1,000 acres of grapevines in northern California between 1994 and 2000¹, causing \$30 million in damages. There is currently no known cure for Pierce's disease.

¹ Report of the Pierce's Disease Research and Emergency Response Task Force. April 2000.

The Glassy-winged Sharpshooter

The glassy-winged sharpshooter was first reported in California in 1994 but probably arrived in the state in the late 1980s. It is native to the southeastern United States and northeastern Mexico. It feeds on the xylem fluid of a large number of plants. This sharpshooter builds up large populations on a diverse array of host plants and is an aggressive flyer, traveling greater distances than native sharpshooters.



An adult glassy-winged sharpshooter

California's first indication of the severe threat posed by this new disease and vector combination occurred in Temecula, Riverside County in August of 1999, when over 300 acres of grapevines infested with the glassy-winged sharpshooter were destroyed by Pierce's disease.

Scientists believe that the glassy-winged sharpshooter has the potential to increase both the incidence and severity of Pierce's disease in California. As observed in the Temecula infestation, the sharpshooter:

- Builds to high populations that substantially increase the number of insects vectoring the destructive *Xylella fastidiosa* bacteria to crops;
- Travels longer distances in a shorter time than other sharpshooters;
- Makes use of more breeding habitats and plant hosts than native vectors; and
- Transmits the bacteria from vine to vine, resulting in an exponential increase in disease incidence in vineyards.

The combination of Pierce's disease and the glassy-winged sharpshooter constitutes an unprecedented threat to California's multi-billion dollar grape and wine industry, as well as to almonds, oleander, and other crop and ornamental plants.

Program Description

The Pierce's Disease Control Program works to minimize the statewide impact of Pierce's disease and the glassy-winged sharpshooter. The strategy is to slow or stop the spread of the glassy-winged sharpshooter while short- and long-term solutions to Pierce's disease are developed. This strategy relies upon the following five elements:

1. Contain the Spread

Prevent the spread of the GWSS to new areas of the state by regulating shipments of host plants and other host material.

2. Statewide Survey and Detection

Find and monitor GWSS infestations and populations through trapping and visual survey.

3. Rapid Response

Respond quickly to detections of GWSS in new areas by intensively surveying the area and applying treatments if necessary.

4. Outreach

Raise awareness about Pierce's disease and its vectors while responding to the concerns of growers and the general public.

5. Research

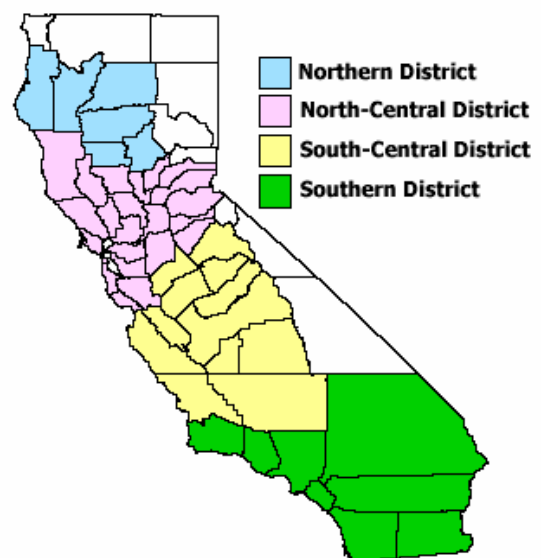
Develop solutions to Pierce's disease and its vectors.

Organization

The PDCP is a partnership that includes the CDFA, the county agricultural commissioners, the USDA, the University of California and the California State Universities, other state and local agencies, industry, and agricultural organizations throughout the state.

A statewide coordinator directs the program in accordance with the policies and priorities established by the Secretary of CDFA. Program staff are located throughout the state and are responsible for coordinating and implementing various elements of the program, as well as communicating with program stakeholders. This includes working closely with the county agricultural commissioners to ensure that program activities are conducted in accordance with all statutory and regulatory requirements. Scientists at CDFA's Plant Pest

Pierce's Disease Control Program Districts



Diagnostics Center provide pest identification services. Natural enemies of GWSS are produced in CDFA laboratory facilities in Riverside and Arvin. Researchers throughout the state and elsewhere are under contract with CDFA, USDA and other funding organizations. Local task forces help develop action plans, mobilize local resources, and share information with stakeholders and affected parties.

County Workplans

The agricultural commissioner of each county is responsible for conducting local PDCP activities. These activities are guided by annual workplans developed by the county agricultural commissioners (in consultation with CDFA) and submitted to CDFA for approval. As stated in legislation (California Food and Agricultural Code Section 6046), county workplans must include the following elements:

1. Outreach presentations and training in local communities that respond to local concerns;
2. Ongoing training of employees in the biology, survey, and treatment of Pierce's disease and its vectors;
3. Identification of a local coordinator;
4. Proposed response to the discovery of the disease and its vectors (including delimitation and treatment); and
5. A system to track and report new infestations.

Program activities are conducted year-round. County agricultural commissioners submit activity reports electronically to CDFA each month. Audits are conducted on one or more counties each year to verify accuracy and appropriateness of charges and expenditures.

Advisory Groups

Several groups advise the PDCP. These include the following:

Pierce's Disease and Glassy-winged Sharpshooter Board

The PD/GWSS Board is composed of representatives from the winegrape industry. It provides recommendations to the Secretary on the use of funds collected under the PD/GWSS winegrape assessment that has raised approximately \$23.4 million over five years. The Board is advised by subcommittees established to focus on specific areas and issues.

Pierce's Disease Advisory Task Force

The Pierce's Disease Advisory Task Force is composed of county agricultural commissioners, scientists, agricultural representatives, and other experts. The Task Force meets regularly to review program progress and develop recommendations for the Secretary. Similar to the PD/GWSS Board, the Task Force is advised by subcommittees established to focus on specific areas and issues.

Pierce's Disease/Glassy-winged Sharpshooter Science Advisory Panel

The PD/GWSS Science Advisory Panel is composed of university scientists who are experts on Pierce's disease and its vectors. The Panel provides input and expertise on scientific issues associated with the program.

California Agricultural Commissioners and Sealers Association/ Glassy-winged Sharpshooter Advisory Group

The California Agricultural Commissioners and Sealers Association (CACASA)/ Glassy-winged Sharpshooter Advisory Group is composed of agricultural commissioner representatives from each of the five CACASA area groups in the state. This group meets regularly to discuss issues of statewide and regional concern and to promote statewide program consistency and good communication among state and county cooperators.

Pierce's Disease Research Symposium Planning Group

The Pierce's Disease Research Symposium Planning Group is composed of representatives from the University of California, USDA, and industry. This group assists the PDGP with the planning of the annual research symposium by providing input on the symposium's format, content, and schedule.

Contain the Spread

The Contain the Spread element of the program is designed to prevent the spread of the glassy-winged sharpshooter to uninfested areas on articles and commodities shipped from infested areas. Emergency regulations governing the movement of nursery stock and bulk grapes were first adopted in July 2000. Regulations on bulk citrus were added later, following finds of live sharpshooters in citrus shipments. Permanent program regulations were adopted in July 2003.

Nursery

Nursery stock is a high-risk commodity for spreading the glassy-winged sharpshooter. California has approximately 11,500 licensed nurseries, 72% of which are located in sharpshooter-infested counties. Many of these nurseries ship to the uninfested areas of the state. Activities to mitigate the risk of moving GWSS on nursery stock include:

1. Inspection of nursery stock in infested areas prior to shipping to non-infested areas;
2. Treatment of nursery stock when necessary;
3. Certification of shipments; and
4. Inspection of nursery stock at receiving nurseries prior to sale.

Inspection Results

As of November 30, 2006, there were 66,175 shipments of nursery stock from infested areas to uninfested areas. Viable life stages of GWSS were discovered on only 47 of these shipments. Since 2001, the total number of shipments has increased by 26% while the total number of loads with viable life stages has decreased by 46%.

Over 90% of all rejections between 2001 and 2006 have been for egg masses. The table on the right reflects the results of the ongoing nursery inspection and shipment certification program.

YEAR	NUMBER OF SHIPMENTS	GWSS FOUND	% FREE OF GWSS
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	69,000	47	99.93%

Regulated nursery shipment results

Enforcement Actions

Enforcement actions are taken against nurseries and shipments that are in violation of the regulations. Actions can be taken at origin or destination.

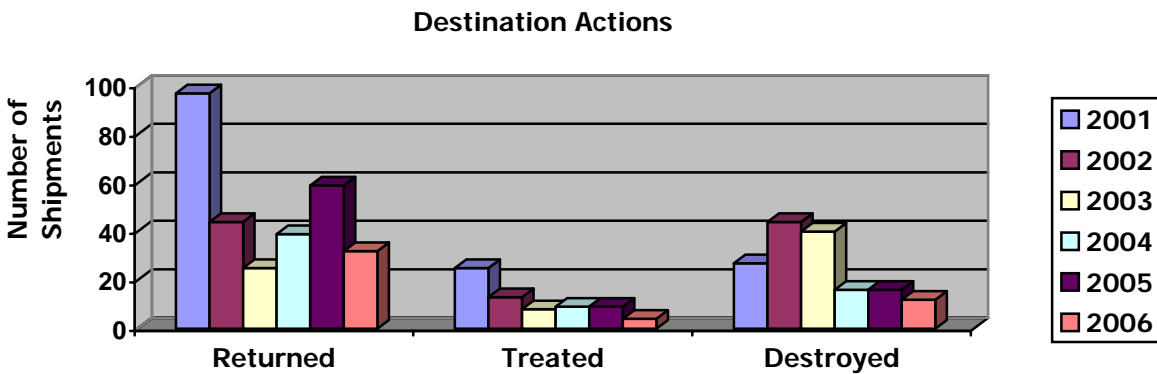
Actions that can be taken at origin consist of the following:

- **Restriction:** The nursery is restricted from shipping certain species of host material out of the infested area for a period of time.
- **Suspension:** The nursery is suspended from shipping all host material out of the infested area until the pest risk is mitigated.
- **Revocation:** The nursery's compliance agreement is revoked and it cannot ship any host material out of the infested area for an established period of time.

Actions that can be taken at the final destination of nursery shipments include the following:

- **Treatment:** The nursery shipment must be treated with an effective material.
- **Return:** The shipment must be returned to origin.
- **Destruction:** The shipment must be destroyed.

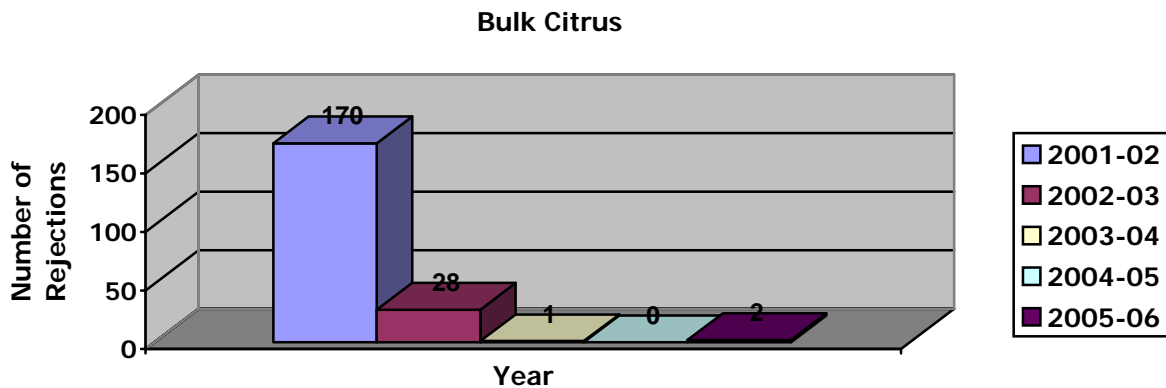
Shippers and receivers who violate nursery stock regulations are subject to fines. In 2006, administrative penalties were levied against six companies, totaling \$29,300.



Bulk Citrus

Citrus trees are primary hosts for the glassy-winged sharpshooter throughout the year. When the weather is warm, the insects are active and will flee the disturbances associated with harvest. However, once the weather turns cold, the sharpshooters are relatively inactive, and can end up in picking bags with harvested fruit, ultimately turning up at processing facilities in other parts of the state.

During the most recent citrus-shipping season (October 2005 through September 2006), live glassy-winged sharpshooters were found in only two out of approximately 45,000 certified shipments of bulk citrus. This shipping season achieved a success rate of 99.99%. This success is attributed to the cooperative efforts of bulk citrus program participants.



Bulk citrus rejections have been reduced drastically over the past five years

Statewide Survey and Detection

The Statewide Survey and Detection element of the program is designed to locate new glassy-winged sharpshooter infestations quickly, and verify that uninfested areas remain free of infestation.

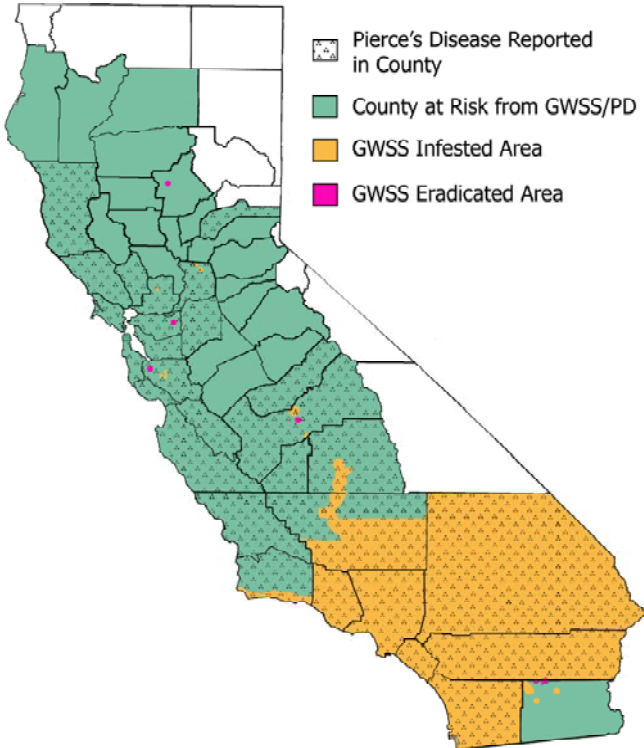
The activities of this element focus on systematically surveying and trapping commercial and residential areas and nurseries to determine if GWSS is present. The program maintains an internet map server to quickly map and display discoveries of Pierce's disease and GWSS.

To survey for GWSS, yellow panel traps are deployed in 43 counties that are not infested or are partially infested with GWSS. The GWSS are attracted to the trap's bright yellow color and will stick to the adhesive surface. County and state personnel service traps on a regular basis during the trapping season from March through October.



A yellow panel trap in crape myrtle

GWSS/PD Distribution by County



Each trap is checked bi-weekly and moved to a new location every six weeks. New traps are used as needed. Survey protocols were distributed to each county participant in the spring of 2006.

Program biologists provided detection training to 366 county and state personnel during 2006. Biologists assisted county personnel with field surveys and also conducted quality assurance examinations of state and county GWSS detection programs.

Statewide, detection of GWSS continues with additional finds in the County of Santa Clara and the reinfestation in Fresno County (Kingsburg area).

Rapid Response

The Rapid Response element of the program involves responding quickly to potential new glassy-winged sharpshooter infestations. When one or more GWSS lifestages are found in a new area, a delimitation survey is initiated by the county agricultural commissioner's office to determine if an infestation is present and, if so, to identify the boundaries. In urban and residential areas, the program provides the funding for treatments, which are applied under the supervision of the county agricultural commissioner. In agricultural settings, treatments are the responsibility of the grower, and must be conducted in a manner approved and supervised by the commissioner.

During 2006, a new GWSS infestation was discovered in the Evergreen area of San Jose, Santa Clara County. This discovery resulted in sustained rapid response actions. In Fresno County, the community of Kingsburg was found to be re-infested after the discovery of a localized GWSS population. In Monterey County, a potential infestation was successfully averted by early discovery of GWSS in newly-planted trees. A GWSS infestation in Fowler, Fresno County, was successfully eradicated. This year, no GWSS were discovered in the previously infested area of Vacaville, Solano County. Statewide, GWSS were detected at approximately 950 residential properties in the partially-infested counties of Fresno, Sacramento, Santa Clara, and Tulare. Approximately 5,500 properties (infested plus adjacent properties) were treated during rapid response activities.



Checking a yellow panel trap as part of the rapid response survey activities after GWSS detection

Pre-Treatment Communication with Stakeholders

Specific steps are taken to ensure residents are properly advised and environmental concerns are addressed before an infested area is treated. A public meeting with community members precedes treatment in urban or residential areas. This provides residents the opportunity to learn and discuss the treatment process with environmental health and program specialists. Door-to-door contacts, direct mail, and/or local media sources are used to inform residents of public meetings. Occupants of all properties scheduled for treatment are provided individual, advanced notification of the treatment date and time, the label of the pesticide to be used, and a phone number to call for more information. A database of threatened and endangered species is consulted to determine if any listed species are present in the treatment area. The U.S. Fish and Wildlife Service, the California Department of Fish and Game, the California Department of Pesticide Regulation, the California Department of Health Services, and other agencies are notified prior to treatment.

Treatment

Public safety is the Department's number one concern whenever pesticide treatments are applied. Program staff and cooperators ensure that only registered materials are applied, in strict compliance with label and other restrictions.

Imidacloprid has proven very effective against the glassy-winged sharpshooter. It is used in treatment programs in urban and residential settings. Cyfluthrin is another material that has been used. The insecticide carbaryl has been used in residential settings and recent data shows that it is very effective against adult and emerging nymphs of GWSS on a broad variety of ornamental plants and fruit trees.

The Environmental Hazards Assessment Program of the California Department of Pesticide Regulation has monitored pesticide treatments to determine resulting target and non-target residue levels. This information is used by the PDCP to assess proper application rate and coverage. Sampling results and related monitoring reports are available on the Department of Pesticide Regulation's website: www.cdpr.ca.gov/docs/gwss.

The program has enlisted the assistance of the California Conservation Corps (CCC) and the California Department of Transportation (Caltrans) in the fight against Pierce's disease and the glassy-winged sharpshooter. The CCC has helped the program to quickly delimit new infestations and prepare for treatment activities. Caltrans employees have been trained to identify the sharpshooter and have assisted with treatment activities along California's highways.



A CCC member removing brush that serves as a GWSS refuge

Outreach

The goal of the Outreach effort is to raise awareness about Pierce's disease and GWSS and the threat they pose to agriculture and the environment of California. Public awareness leads to public involvement, which in turn leads to earlier detection of infestations and reduced damage from this serious pest and disease complex. The PD/GWSS Board initiated a public awareness campaign in 2004 and continues to raise winegrape grower awareness about ongoing program efforts that are funded by the winegrape grower assessment.

PD/GWSS Board Outreach

For 2006, the outreach and education campaign shifted its priority from educating growers about the threat, to showing what has and is being done to find a solution to Pierce's disease. The PD/GWSS Board continues to provide background and supporting material to other audiences (advisors, media, and farm, regional and wine associations).

The following materials were prepared or updated:

- Newsletters
- Website message board
- A tabletop display/exhibit
- Brochures
- Speaking points
- PD/GWSS brand identity (logo)
- Presentation kit containing fact sheets, frequently asked questions, background information and list of resources

A quarterly newsletter continues to be mailed directly to California's more than 7,000 winegrape growers, and a tabletop display, accompanied with an updated brochure, has been updated to highlight the research that is taking place around the state. The program continues to maintain a presence at key industry events. This year the PD/GWSS Board sponsored a research forum at the American Society of Enology and Viticulture's annual meeting in Sacramento. The forum allowed growers the opportunity to meet directly with researchers to see and discuss their research projects related to Pierce's disease and GWSS. Another forum is planned for 2007.

In the fall of 2006, a website message board was created to open lines of communication between stakeholders on the issues of Pierce's disease and GWSS (www.pdgwss.net). This website is intended to enhance communications between winegrape growers, researchers and others who share the common interest of eliminating the Pierce's disease and GWSS threat.

Local County Outreach

Local county agricultural staff and industry members played key roles in maintaining program visibility and stakeholder awareness. County public outreach and education efforts included the distribution of Pierce's disease and GWSS informational material to local retail, production and shipping nurseries, landscape companies and to the members of the community. Information was provided at local cultural events, county fairs, and by mail. Industry publications, cooperative extension newsletters and media interviews also proved to be successful methods of outreach. Many counties participated in continuing education seminars and conducted training for landscapers, pest control operators, nursery employees and nursery association members.

In addition, Napa County declared the month of May to be "GWSS Awareness Month" as part of its "Not In My Backyard" campaign. Napa County's public outreach and educational programs continue to incorporate their "Bugspot" website (www.bugspot.org), toll-free phone number for information and reporting, wallet cards, magnets, posters and brochures all designed to raise awareness of Pierce's disease and GWSS. A communications firm was hired to develop informational materials in English and Spanish that have been a great outreach resource for the community and industry.

Research Symposium

The annual Pierce's Disease Research Symposium provides a venue for researchers and growers to interact and share information.



Researchers and other attendees viewing scientific posters at the Pierce's Disease Research Symposium

Media Coverage

In 2006, articles and reports about Pierce's disease and GWSS continued to appear in national and international publications, on television and radio shows, and on internet websites. On balance, the coverage has been fair and factual and has included many statements and information generated by the Outreach Program.

Informational Materials

The Outreach Subcommittee of the PD/GWSS Board compiled a list of outreach materials produced by the PDCP, county officials, the University of California, and industry groups. A video was produced in English and Spanish demonstrating effective monitoring and identification of live GWSS in fields or croplands. These materials can be quickly adapted to match local needs, and help deliver a more consistent and cohesive message.

Website

The CDFA has a highly successful website dedicated to Pierce's disease and GWSS. The website, which was activated in March 2000, offers frequent updates on program activities, survey guidelines, regulatory guidelines, upcoming meetings and events, the GWSS host list, and other information. In addition, the website provides an interactive interface that allows direct activity reporting by local entities. This website is located on the Internet at: <http://www.cdfa.ca.gov/phpps/pdcp/index.htm>.



A graphic from the PDCP website

Research

Research continues to be an integral part of the Pierce's Disease Control Program. In 2006, the flurry of research activity that began at the start of the program continued with approximately 80 projects being worked on by some of the nation's top plant health researchers. Projects ranged from lab-based investigations at the molecular and genomic levels to areawide projects in major agricultural areas. The information generated provided valuable insight into the biology, ecology, and behavior of Pierce's disease and its vectors, moving us closer to an eventual solution.

In 2006, a contract was established with a consultant to serve as research director, providing advice and direction to the program and the PD/GWSS Board on the overall Pierce's disease research effort. Also in 2006, a scientific summit was convened jointly with the University of California, to identify the research areas which offer the most promise for finding solutions to Pierce's disease. These initiatives were implemented to help ensure that the program's investments in research remain focused on those areas most likely to lead to practical field applications.

Research Symposium

Every year, the PDCP organizes a research symposium focused on Pierce's disease and its vectors. Approximately 200 persons attend these meetings to share information and learn more about the progress being made against Pierce's disease. The 2006 symposium was held in late November in San Diego.

A compendium of research progress reports is prepared each year and distributed at the symposium. This document, known as the Proceedings, can also be accessed electronically on the program's website (www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2006symp.htm).

Research Proposal Solicitation and Review

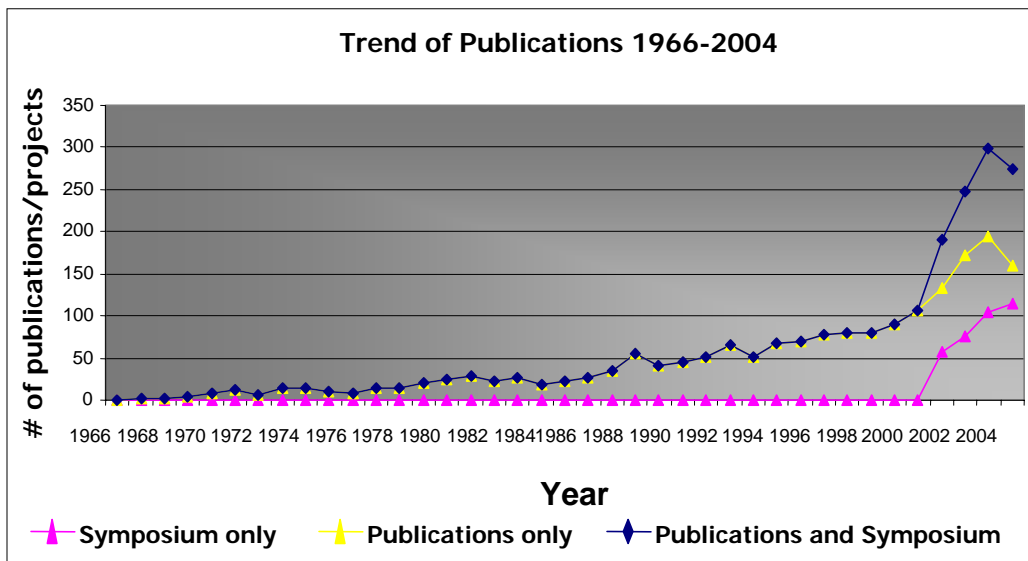
In 2006, the PDCP consolidated its research proposal solicitation and review process with the University of California's Pierce's Disease Research Grants Program. A total of 63 proposals were reviewed, with CDFA managing ad hoc reviews and the University of California managing panel reviews. Based on the feedback received during this extensive vetting process, 19 research projects, totaling \$1.97 million, were selected for funding by CDFA using winegrape assessment funds. The University of California funded 12 projects, totaling \$1.46 million.

Research Publications

The graph below shows the number of reports published each year between 1966 and 2004 which deal with Pierce's disease. The upsurge evident in recent years reflects the increased resources and efforts directed towards finding a solution to this serious plant disease. Progress from these efforts includes the following:

- The genome sequences of different strains of the Pierce's disease bacterium were determined;
- Methods for mass rearing biological control agents were developed;
- Trap efficacy was tested;
- GWSS population dynamics and ecology were characterized;
- Pierce's disease epidemiology studies examined the efficacy of different inoculum reduction measures; and
- Insecticide materials and methods for use against GWSS were evaluated.

Studies into these and other areas are continuing, building the foundation of knowledge from which lasting solutions will be found.



Source: Public Intellectual Property Resource for Agriculture (PIPRA), UC Davis

Pilot Projects

Nursery Treatment Pilot Program

The Nursery Treatment Pilot Program began in June 2005. This program was implemented in an effort to reduce the costly inspection program that currently exists, and to further test the efficacy of laboratory-proven pesticides in real delivery situations. In this program, sleeved plant material containing treated GWSS egg masses are allowed to enter designated non-infested nurseries under a special compliance agreement. In 2006, three counties at origin and two counties at destination participated in the pilot program.

Areawide Treatment Programs

The areawide program coordinates insecticidal treatments in commercial citrus blocks and urban areas along with the release of biological control agents.

Kern County

The Kern County Pest Management Pilot Project has proven to be successful at dramatically reducing GWSS populations and was therefore utilized as the model for areawide programs in Fresno, Kern, Riverside, Tulare and Ventura counties. Monitoring for GWSS and Pierce's disease is occurring throughout these project areas.

In 2006, the boundaries of the Kern County infested area remained the same as in 2005. The infested area includes agricultural lands as well as Bakersfield and several smaller Kern County communities. There were 4,788 acres of citrus treated in 2006 compared to 7,001 acres treated in 2005.

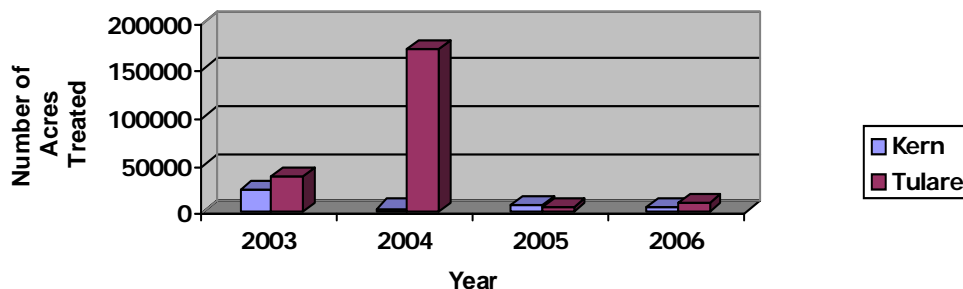
Tulare County

The infested area in Tulare County has not expanded since 2004. In 2006, there were 9,614 acres of citrus treated. This is more than the 4,901 acres treated in 2005, but still substantially less than the approximately 17,000 acres treated in 2004.

Fresno County

In the summer of 2003, Fresno County implemented areawide-trapping for GWSS in citrus groves. Through 2006, no GWSS have been detected within the areawide program, and no treatments were needed.

Areawide Citrus Acreage Treated in Kern and Tulare Counties



Riverside County - Coachella Valley

In 2006, the GWSS management boundaries remained the same as in 2005. The trap numbers were increased from 2005 so the management program would have the same ¼ mile grid trapping protocol as other GWSS management programs. In the Coachella Valley, there are two main peaks of GWSS activity, one in January-February and a higher one in July. Imidacloprid was applied to 1,482 acres of conventional citrus and Pyrethrins were applied to 80 acres of organic citrus.

Riverside County - Temecula Valley

In 2006, the GWSS management boundaries remained the same as in 2005. There were 120 acres of citrus treated with Imidacloprid and 130 acres of organic citrus that were treated with Pyrethrins.

Ventura County

For the fourth year of the areawide GWSS management program in Ventura County, the focus was changed to suppress GWSS populations throughout the county. A treatment coordinator was hired and worked closely with county, state and federal cooperators. Also, approximately 60 additional traps were placed in previously untrapped citrus areas of the county (mostly coastal citrus not near shipping nurseries) raising the total to 1,373 areawide traps placed in Ventura County. As of October 10, 2006, approximately 19,470 acres of citrus were targeted for treatment with either Imidacloprid or Pyrethrins.

Nurseries within the Ventura areawide program were given the option of applying and being reimbursed for treatments that coincided with surrounding citrus treatments. In 2006, eight nurseries treated 10 different locations totaling 1109 acres.

Epidemiology Projects

Two serious epidemics of Pierce's disease in California have been associated with population outbreaks of GWSS. The first was at Temecula in Riverside County in the mid 1990s, and the second was near Bakersfield in Kern County, peaking in 2002. These two epidemics were unlike the typical pattern of Pierce's disease in California over the last 100 years. They were far more rapid and damaging. For the last five years, research scientists from the CDFA, the USDA-Agricultural Research Service (USDA-ARS), the University of California and the University of California Cooperative Extension have cooperated on independent but collaborative research projects to better understand these new epidemics.

This year some important results emerged from these studies. There are two ways that new *Xylella* infections can be transmitted: (1) from sources outside the vineyard, called primary transmission; and (2) vine-to-vine transmission within the vineyard, called secondary transmission. The risk associated with these two kinds of transmission differs. The disease and vine loss pattern associated with primary transmission is (with some yearly variation) linear, meaning that a relatively constant number of vines per year become infected. By contrast, the loss pattern associated with secondary transmission is rapid and severe. As happened in Temecula, entire vineyards can be lost within just a few years. Before the Temecula and Kern county epidemics, secondary transmission has not been seen in California for more than 100 years.

New research indicates that secondary transmission cannot begin in a vineyard until the middle of the growing season. There is a window of opportunity for *Xylella* when secondary transmission can result in vineyard losses. In the southern San Joaquin Valley, this window appears to be during the months of June and July. Secondary transmission can continue to occur after July, but these late infected vines naturally recover over the winter dormant season. The window of opportunity for secondary transmission in Temecula is probably somewhat longer, but has not yet been experimentally established. These results, combined with previous research now provide growers with cost-effective management tools to control the loss from secondary transmission. First, we now have inexpensive methods to find and remove diseased vines. Second, we have now defined the window of opportunity. Therefore, vines can be chemically protected against transmission by GWSS during that interval, and an epidemic is prevented. These tools could dramatically reduce the risk of economic loss from epidemics of secondary transmission in the susceptible areas of southern California.



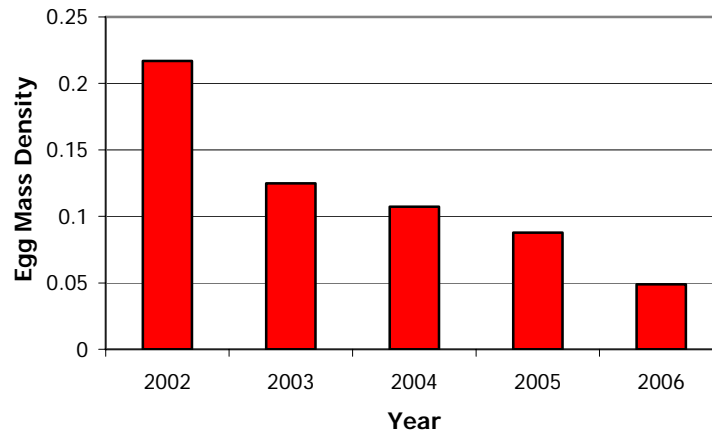
These dormant vines in a Fresno County research vineyard are part of ongoing experiments about over-winter curing

Other research conducted in 2006 indicates that secondary transmission is extremely unlikely in the central valley north of Fresno County, and the northern coastal areas of California. Because the climate in the dormant season is more severe, there is no window of opportunity for secondary transmission to cause disease in these places. Secondary transmission of the bacteria can occur in these areas, but these infections likely will not survive the winter dormant season, and the vines will be free of disease the following year. This means that growers in these areas are probably not susceptible to rapid, severe losses such as happened in Temecula. However, early season primary transmission of Pierce's disease in these areas continues to be an ongoing source of economic loss, and it is not yet known what the impact would be if GWSS were to become established in areas such as the Napa Valley.

Biological Control

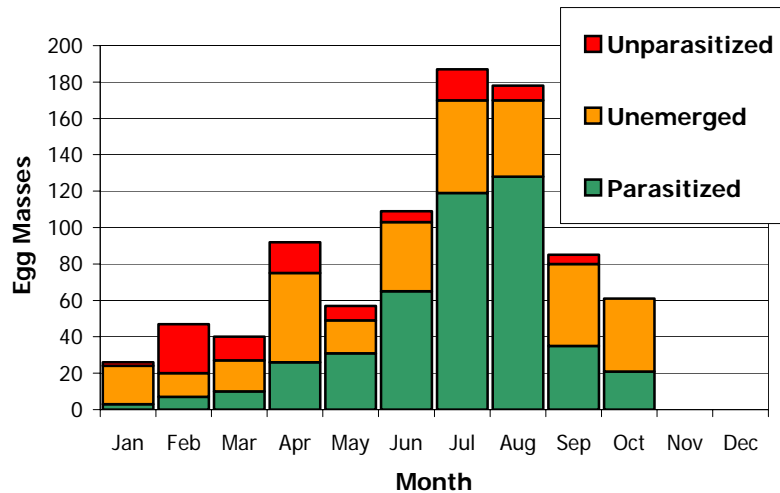
The GWSS biological control group has been producing, releasing, and evaluating agents for the control of GWSS since 2001. Since the inception of the program, over 1.3 million parasitoids have been released to control GWSS. A total of six species of agents have been produced by the CDFA production facilities in Kern and Riverside counties. These species have been released in 13 counties over the past six years. It is only after this length of time that the success of the agents can be properly evaluated and steps taken to improve the biological control aspect of this program. As a part of the evaluation process of introduced agents, native and introduced natural enemies have also been evaluated for their importance in controlling GWSS. This information is invaluable in assessing the importance of natural enemies in suppressing GWSS populations and the potential of new agents.

A structured monitoring protocol has been in place at all release sites since 2002. The density of egg masses in the field are evaluated by counting the number of egg masses present on 30 leaves for 10 trees at each site. There has been a general decline over the past five years in egg mass density that may or may not be due to parasitism.



GWSS egg mass density at biological control agent release sites

After monitoring at the release sites, the fresh egg masses are collected from the field and incubated in the laboratory for two weeks. Egg masses are checked daily for parasitoid emergence and GWSS emergence. At the end of the incubation period, the number of unemerged GWSS eggs are also recorded. The figure below shows the monthly totals of parasitized, unparasitized and unemerged egg masses for the year of 2006.

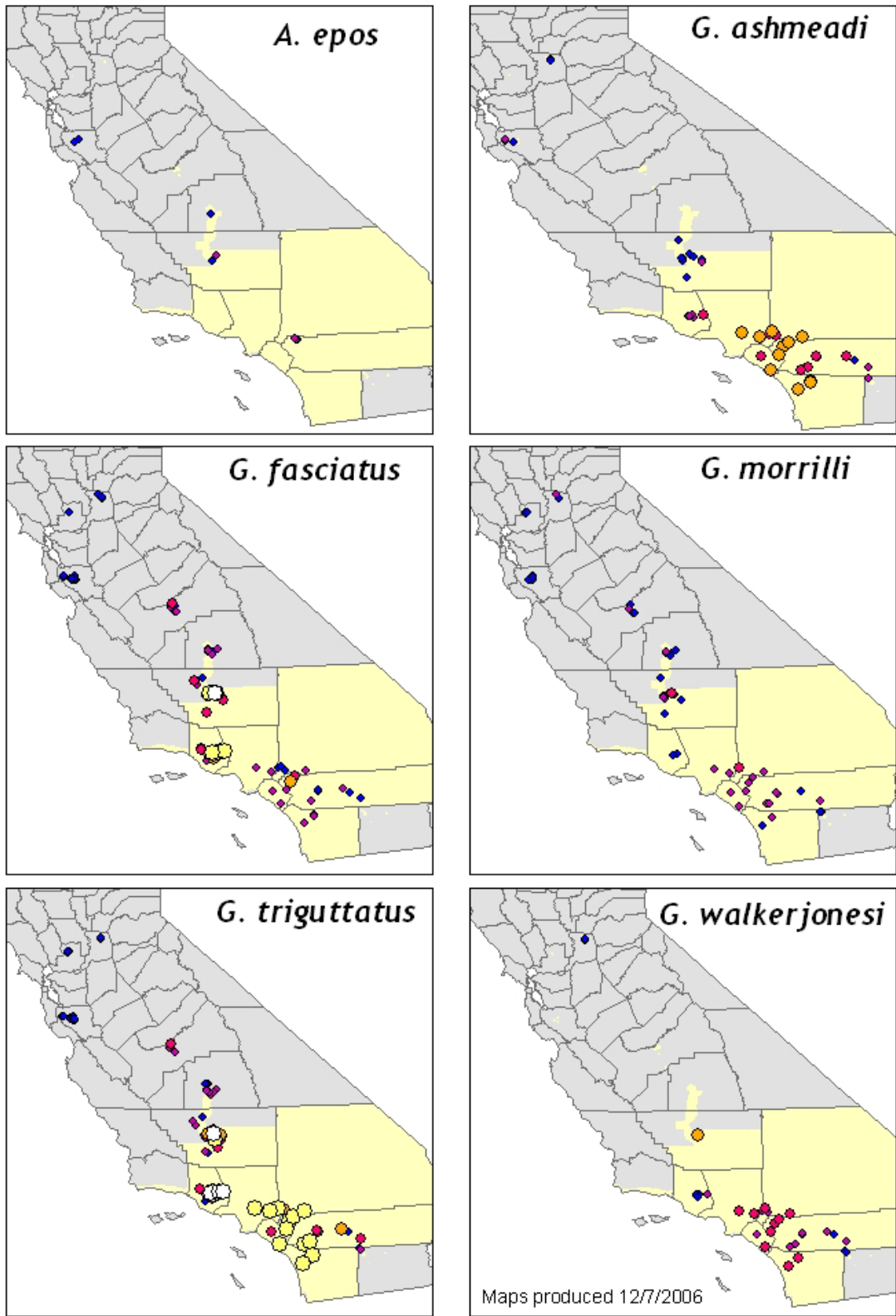


Parasitism rates of GWSS egg masses collected at 27 field sites in 2006

Lack of emergence may be due to natural mortality or the monitoring protocol. No information is available regarding the parasitism rates of unemerged eggs. Overall, only 12% of eggs successfully emerged as GWSS and 38% did not emerge at all. The proportion of GWSS emerging from eggs declines as the year progresses. Any emerging parasitoids are identified to species. In 2006, 70% of parasitoids collected were *Gonatocerus ashmeadi*, 12% were *G. walkerjonesi*, and 7% were *Ufens* spp. The remaining 11% were *G. triguttatus*, *G. morgani*, *G. novifasciatus*, *G. fasciatus*, or *G. incomptus*.

Information gained through monitoring allows us to develop management decisions regarding the value of specific biological control agents in suppressing GWSS in California. For instance, the production of *G. fasciatus* has been halted after 330,000 parasitoids were released with very few recoveries. This species was replaced by *G. morrilli*, an exotic species closely related to *G. walkerjonesi*. Also certain parasitoid species are more common at coastal areas so attention is being given to which species are released at each site.

Other accomplishments for 2006 include the adoption of server-based monitoring software developed by the GIS section of the CDFA and the initiation of PCR-based strategies for rapid species identification of parasitized eggs. Studies are also underway to break ovipositional diapause of GWSS through the use of juvenile hormone applications.



Total number of insects released for biological control of GWSS in California 2001-2006

Environmental Compliance

In 2006, the California Department of Food and Agriculture continued with its commitment to ensuring that the Pierce's Disease Control Program is conducted in an environmentally responsible manner. These efforts include adhering to a special notification and consultation process with federal and state environmental stewardship agencies prior to treatment, ensuring that pesticide applications are performed by licensed pest control professionals in strict accordance with pesticide laws and regulations, and conducting environmental monitoring during some pesticide treatments.

A statewide programmatic environmental impact report (EIR) was released for the PDCP in mid-2003. A legal challenge was filed against the EIR, and in 2005, litigants were successful with their challenge. Although a trial court had previously found the EIR to be adequate, in late December 2005 the State Appeals Court reversed the trial court's judgment. In 2006, the CDFA began the process of complying with the court's ruling by preparing a revision or supplement to the EIR. This work will continue into 2007.

Financial Statement

FISCAL YEAR	2005/06	2006/07
REVENUE		
State (Budget Act)	\$ 4,341,000	\$ 4,359,538
Federal (USDA)	\$ 14,691,100	\$ 15,300,000
Board Assessment	\$ 343,400	\$ 455,000
Total Revenue	\$ 19,375,500	\$ 20,114,538
EXPENDITURES		
Personal Services	\$ 3,708,169	\$ 3,592,202
Operating Expenses	\$ 3,230,881	\$ 3,422,336
County Payments	\$ 12,436,450	\$ 13,100,000
Total Expenditures	\$ 19,375,500	\$ 20,114,538

Abbreviations/Acronyms

CACASA	California Agricultural Commissioners and Sealers Association
CCC	California Conservation Corps
Caltrans	California Department of Transportation
CDFA	California Department of Food & Agriculture
EIR	Environmental Impact Report
GWSS	Glassy-winged sharpshooter
PD/GWSS Board	Pierce's Disease & Glassy-winged Sharpshooter Board
PDCP	Pierce's Disease Control Program
USDA	United States Department of Agriculture
USDA-ARS	United States Department of Agriculture-Agricultural Research Service