

Pierce's Disease Control Program Annual Report to the Legislature 2005



California Department of Food and Agriculture



Pierce's Disease Control Program

California Department of Food and Agriculture



Annual Report to the Legislature

2005

Arnold Schwarzenegger, *Governor*
A.G. Kawamura, *Secretary*

Published by the California Department of Food and Agriculture
Sacramento, CA 95814

The following members of the Pierce's Disease Control Program staff contributed to this publication (in alphabetical order):

Amadou Ba, Peggy Blincoe, Tom Esser, Craig Hanes, Sean Hardy, Barry Hill, Terrance Lorrick, Julie Lindsey, David Morgan, Melinda Mochel, Greg Morris, Stacie Oswald, Roger Spencer, Athar Tariq, Jay Van Rein, Sean Veling, Rosie Yacoub.

Table of Contents

Statement of the Secretary.....	1
Executive Summary.....	2
Background.....	3
Program Description.....	5
Contain the Spread.....	8
Statewide Survey and Detection.....	11
Rapid Response.....	12
Outreach.....	14
Research.....	17
Biological Control.....	21
Environmental Compliance.....	24
Financial Statement.....	25
Abbreviations/Acronyms.....	26

Statement of the Secretary

When Pierce's disease began killing vines in Temecula in August 1999, no one knew it would be the beginning of an unprecedented, cooperative effort to protect California agriculture. California's grape, citrus and nursery industries acted quickly to form a coalition with agricultural agencies to address the threat being posed by the glassy-winged sharpshooter, a pest that spreads this disease. As this report explains, the years since then have showcased the will, resolve, tenacity and creativity of our industry.

For the past six years, the California Department of Food and Agriculture and its Pierce's Disease Control Program have devoted considerable resources and expertise to protect the state from the glassy-winged sharpshooter and the disease-causing bacteria it spreads. We have controlled the spread of the pest while our research efforts search for long-term solutions. Our surveillance and eradication efforts are designed to protect not only grapes but also almonds, alfalfa, peaches, plums and other crops vulnerable to this disease. While the nursery and citrus industries are not targeted by the disease, their crops are key hosts of this pest and their cooperation with our efforts is vital.

California's wine industry has the most at stake in this fight, and they have rallied admirably in response to Pierce's disease. But they cannot "do it alone." The cooperation of so many other growers and members of the agricultural family in California is a testament to the entire industry.

The fight against Pierce's disease is going well, but it is far from over. Perseverance is the key, and California's growers, researchers and officials are fully prepared to stay the course.

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

Executive Summary

The year 2005 saw significant progress in the battle against Pierce's disease and the glassy-winged sharpshooter. Winegrape growers demonstrated their continued support for the program when, by a 9 to 1 margin, they voted to continue an assessment on the sale of their winegrapes to support research and program activities that battle Pierce's disease and the spread of the glassy-winged sharpshooter (GWSS).

Continued successes were realized in the rapid response element of the program. GWSS was eradicated from the communities of Chico and Cupertino, reducing the potential impact of Pierce's disease in California.

Areawide pilot programs continued with great success in 2005 by tracking and reducing GWSS populations in vast agricultural areas in Fresno, Kern, Riverside, Tulare, and Ventura counties. Using sophisticated trapping schemes, treatment coordinators monitored GWSS populations and synchronized grower treatments as necessary. Populations of GWSS in these areas were reduced significantly.

Biological control continues to be a critical element of the program. Now utilizing five different species of parasitoids, the number of biocontrol agents released has reached 1.2 million.

A new pilot program, the Nursery Treatment Pilot Program, began in June 2005. This project was implemented to test the efficacy of nursery stock treatments for preventing the spread of GWSS on nursery stock. Currently, nursery stock inspection programs at origin and destination are the primary means of preventing the spread of GWSS. This project may provide a more cost-effective alternative.

Last, researchers continued to search for a solution to Pierce's disease. More than 100 research projects were reported on at the 2005 Pierce's Disease Research Symposium, evidencing substantial progress in the continuing search for solutions. There are plans to bring aboard a research director for the Pierce's Disease & Glassy-winged Sharpshooter (PD/GWSS) Board. Until research finds a cure for Pierce's disease, improved methods are being discovered each year to control the spread of GWSS. Our hope for a cure is strengthened as the many agencies and strategic partners in alliance with the Pierce's Disease Control Program (PDCP) strive to preserve, protect and improve California's agriculture.

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. Counting only grapes, the disease now threatens a crop production value of \$2.8 billion and associated economic activity in excess of \$45 billion. Other crop and ornamental plant resources such as almonds (\$2.2 billion) and susceptible species of citrus (\$1.05 billion), stone fruits (\$905 million), 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 leaf 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 spread to other areas of the state and is currently known to exist in 25 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.

The Glassy-winged Sharpshooter

The glassy-winged sharpshooter was first reported in California in 1994 but probably arrived and established 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.

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

California's first indication of the severe risk 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;
- Covers 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.



An adult glassy-winged sharpshooter.

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 plant 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 California Department of Food and Agriculture (CDFA), the county agricultural commissioners, the United States Department of Agriculture (USDA), the University of California, other state and local agencies, industry, and agricultural organizations throughout the state.

A statewide coordinator directs the program in accordance with the policies approved 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 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 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 winegrape assessment, which over five years has raised approximately \$23.4 million. 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 PDCP 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 almost 9,000 licensed nurseries, 60% 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

There were approximately 72,600 shipments of nursery stock from infested areas to uninfested areas in 2005. Viable life stages of GWSS were discovered on only 81 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%.

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	81	99.89%

Regulated nursery shipment results.

Over 90% of all rejections between 2001 and 2005 have been for egg masses. The table above reflects the results of the ongoing nursery inspection and shipment certification program.

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.

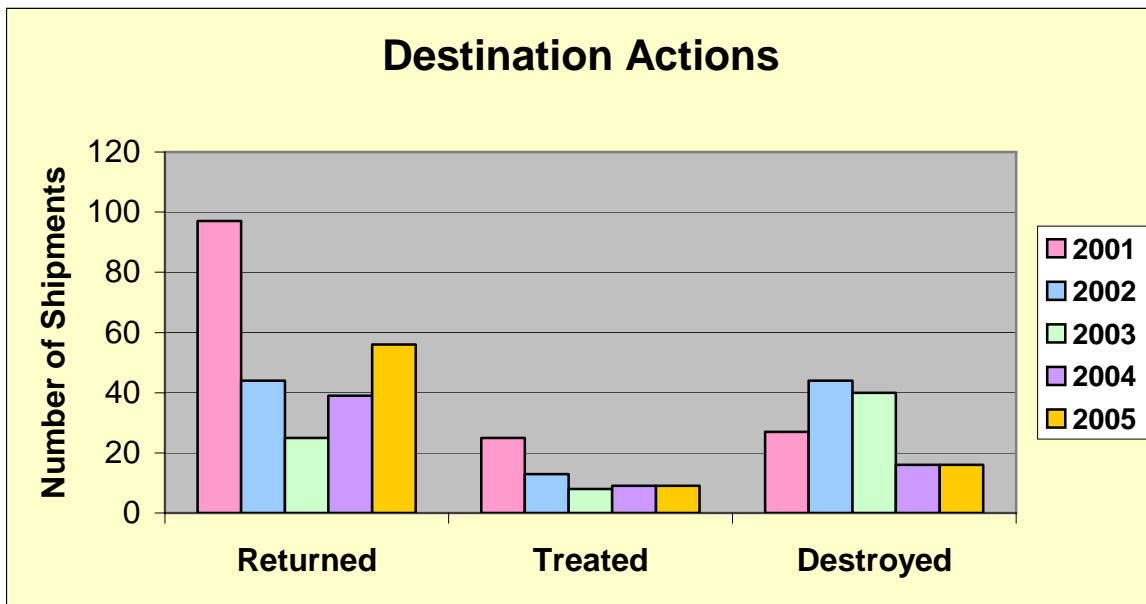
Actions that can be taken at origin consist of the following:

- **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 2005, administrative penalties were levied against three companies, totaling \$2,400.



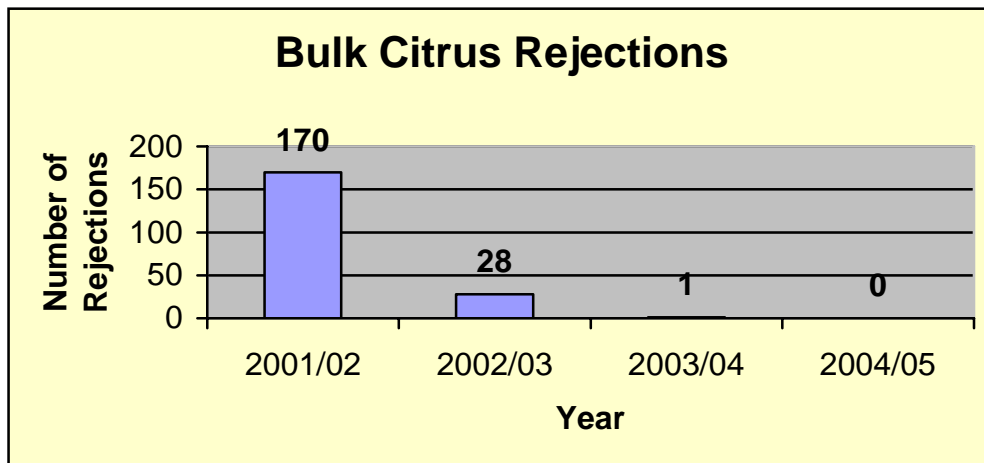
Bulk Grapes

In 2005, based on the absence of GWSS on all bulk grape shipments for the past four years, the bulk grape certification-tagging program was discontinued. Regulations remain in place for the movement of bulk grapes from GWSS-infested areas to non-infested destinations in California. County agricultural commissioners retain or establish compliance agreements with shippers but no longer issue certification tags. Shippers are still required to keep bulk grape shipments free of GWSS.

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 2004 through September 2005), not a single glassy-winged sharpshooter was found in any of the 68,016 certified shipments of bulk citrus. This shipping season achieved a success rate of 100%. This success is attributed to the cooperative efforts of bulk citrus program participants.



Bulk citrus rejections have been reduced drastically over the past four 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 annually from March or April through October.

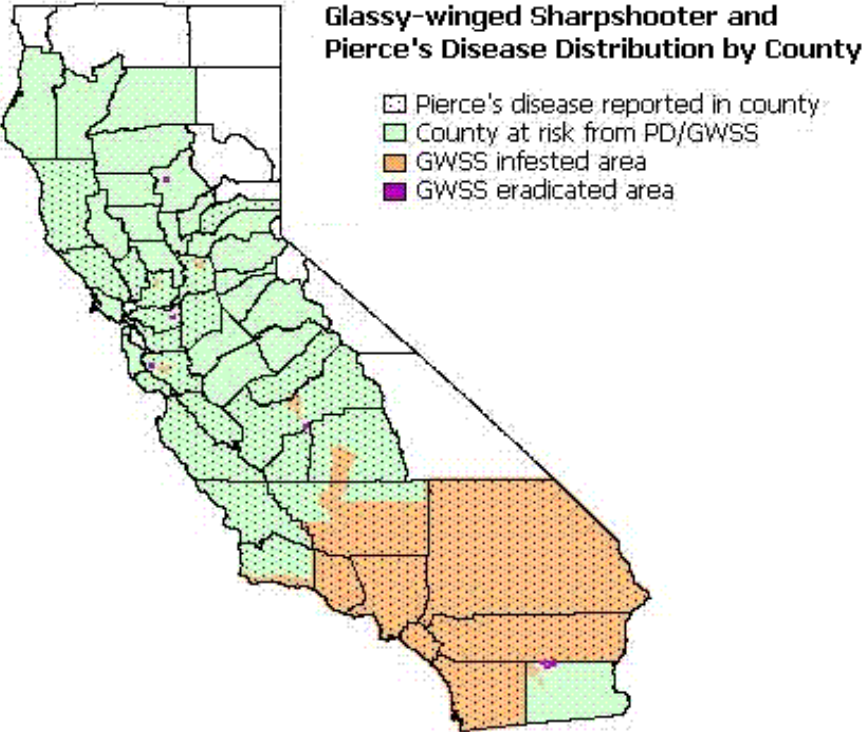


A yellow panel trap in citrus.

Each trap is checked bi-weekly and moved to a new location every six weeks. Survey protocols were distributed to each county participant in the spring of 2005.

Onsite detection training was provided to 275 county and state personnel in 38 counties during 2005. CDFA biologists assisted county personnel with field surveys and also conducted quality control inspections of county and state detection trapping programs.

Though statewide detection trapping found a single GWSS in Monterey County, there were no new infestations in the northern 32 non-infested counties in 2005.



At-risk areas and the distribution of Pierce's disease and the glassy-winged sharpshooter.

Rapid Response

The Rapid Response element of the program involves responding quickly to potential new glassy-winged sharpshooter infestations. When evidence of a potential new infestation is discovered, 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, treatment costs are covered by the program and treatments 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 2005, the GWSS infestation in Cupertino (Santa Clara County), was successfully eradicated. The discovery of a single GWSS in Salinas (Monterey County), resulted in rapid response action with no additional insects found. Statewide, GWSS were detected at approximately 450 residential properties in the partially-infested counties of Fresno, Sacramento, Santa Clara, Solano, and Tulare. Approximately 5,000 properties, infested plus adjacent, were treated during rapid response activities.



A CCC member removing brush that serves as a GWSS refuge.

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:
<http://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.

Outreach

The goal of the Outreach effort is to raise awareness about Pierce's disease and the glassy-winged sharpshooter and the threat these 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 that continued in 2005 to raise winegrape grower awareness about ongoing program efforts that are funded by the winegrape grower assessment.

PD/GWSS Board Outreach

Recognizing the importance of ongoing communications with winegrape growers regarding the PD/GWSS Board's activities, the Board elected to undertake a concerted grower communications effort.

The outreach and education campaign placed a priority on communicating face-to-face with growers, while providing background and supporting material to other audiences (advisors, media, and farm, regional and wine associations).

The following materials were prepared:

- Video
- Newsletters
- Tabletop Display/Exhibit
- Brochure
- Speaking Points
- PD/GWSS Brand Identity (logo)
- Presentation Kit containing fact sheets, frequently asked questions, background information and list of resources

In the first phase of the campaign, a survey of winegrape growers was conducted to learn their opinions and awareness of the PD/GWSS threat. The survey was instrumental in identifying gaps of understanding and charting best approaches for the education campaign. As a result, the outreach program developed and published a quarterly newsletter targeting approximately 7,700 California winegrape growers. To reach other audiences, the outreach program maintained a presence at key industry events. Media and message training was also conducted for Board members, as well as other stakeholders.

Local County Outreach

Local county agricultural staff and industry members played key roles in maintaining program visibility and stakeholder awareness. While Napa and Solano counties contracted with a public relations firm for outreach programs, most counties used PDCP materials and pamphlets for outreach and education. Examples of these efforts included:

- Napa County's public outreach and educational programs that incorporate their "Bugspot" website (<http://www.bugspot.org/>), toll-free phone number for information and reporting, wallet cards, magnets, posters and brochures;
- Napa and Solano counties hiring a communications firm to develop informational materials in English and Spanish;
- Santa Clara County providing nursery employee training, contributing articles in industry and cooperative extension newsletters, booths at local cultural events, and giving media interviews;
- Sutter County providing handouts to local retail nurseries;
- Butte County providing displays at public events;
- Los Angeles County providing informational materials to shipping nurseries and holding talks for landscapers, pest control operators and nursery association members;
- Mariposa County distributing pamphlets at nurseries and continuing education seminars;
- Orange County providing outreach to production nurseries within infested areas; and
- Alameda County distributing posters and brochures to nurseries, landscape companies, growers and homeowners as well as participating in pesticide applicator training seminars.

Research Symposium

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

Media Coverage

In 2005, articles and reports about Pierce's disease and the glassy-winged sharpshooter 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.



Researchers and attendees viewing scientific posters at the 2005 Pierce's Disease Research Symposium.

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 glassy-winged sharpshooters 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 the glassy-winged sharpshooter. 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/>.



A graphic from the PDCP website.

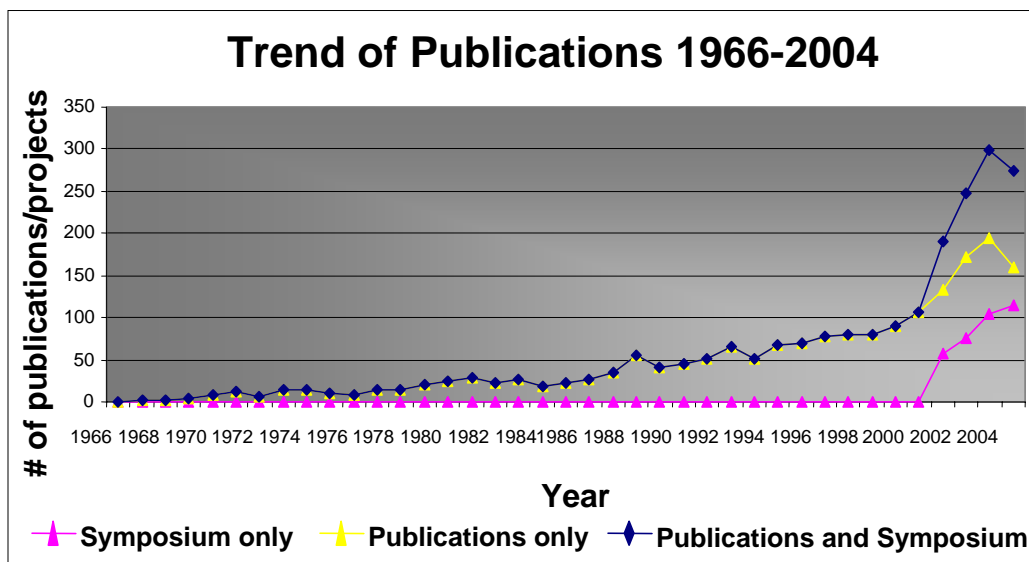
Research

Research continues to be an integral part of the Pierce's Disease Control Program. In 2005, the flurry of research activity that began at the start of the program continued with approximately 120 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.

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
- 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. Currently, three counties at origin and two counties at destination are participants in the pilot program.

Pest Management Pilot Project

Pest Management Pilot Projects were initiated in 2001 to study the spread of GWSS and continue today in the Kern County and Temecula regions. These projects are a partnership between CDFA, USDA, county agricultural commissioners, the University of California, and the agricultural industry. These coordinated group efforts are essential for funding, data collection, and scientific assessment for the overall direction of the pilot programs to control GWSS populations. The data collected is used for coordinating insecticide treatments and biological control releases, and for developing maps to analyze GWSS population dynamics. These pilot projects have proven to be tremendously successful at reducing GWSS populations and becoming the standard of each areawide project.

Areawide Treatment Programs

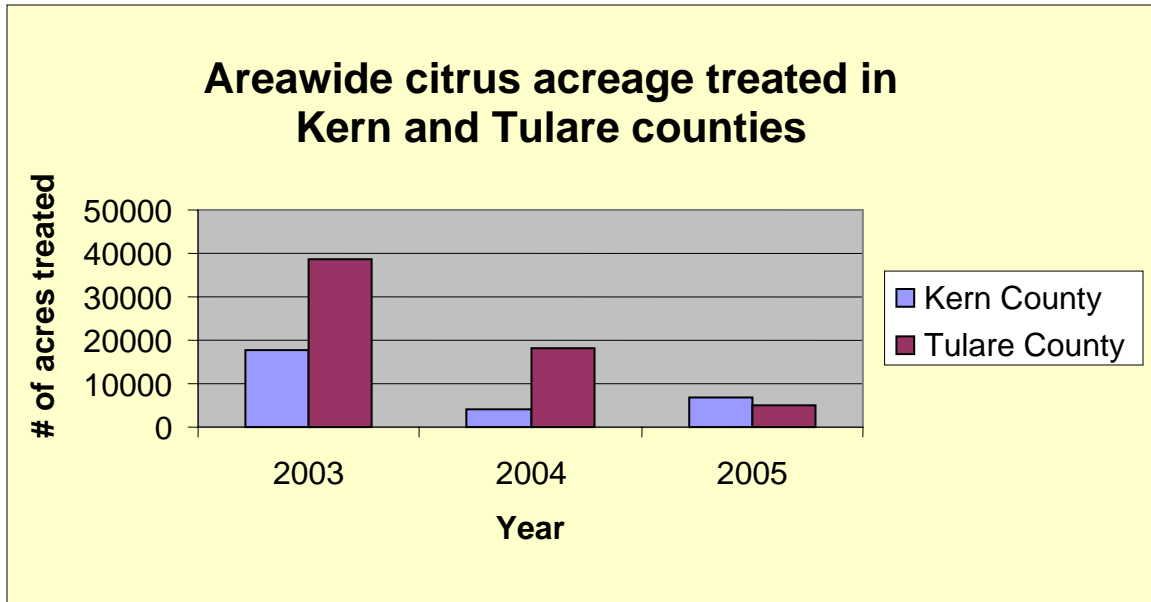
Kern County

The Kern County Pest Management Pilot Project was shown 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 with the use of barcode scanners for real-time tracking of the insect and disease.

In 2005, the boundaries of the Kern County infested area remained the same. The infested area includes agricultural lands as well as Bakersfield and several smaller Kern County communities. There was a slight increase in the number of acres treated in 2005 compared to the prior year.

Tulare County

Since 2004, Tulare County has kept its infested area boundaries from expanding. The areawide program coordinates insecticidal treatments in commercial citrus blocks and urban areas along with the release of biological parasitoids.



Fresno County

In the summer of 2003, Fresno County implemented an areawide program that includes trapping for GWSS in citrus groves. Through 2005 no GWSS have been detected within the areawide program.

Riverside County

In 2005, the Riverside County programs adopted the data management techniques used in other PDCP areawide programs. This includes using barcodes on traps, uploading trapping data, and producing digital maps on the PDCP website.

There were 477 traps deployed in the Coachella Valley, capturing 434 GWSS in 2005. There were two main peaks of activity, one in January-February and a higher one in July. Because the majority of GWSS were caught on traps adjacent to citrus groves, groves located in a one-mile radius surrounding the trap finds received treatments. Imidacloprid was applied to conventionally grown citrus and PyGanic was applied to organic groves. Approximately 4,000 acres of citrus were treated in the Coachella Valley and 700 acres of citrus were treated in the Temecula Valley.

Ventura County

In 2005, treatments focused on suppressing GWSS populations in citrus within a ½ mile radius around shipping nurseries. Imidacloprid, acetamiprid, or PyGanic were used to treat 2,864 acres of citrus.

Nurseries within the Ventura areawide program were given the option of applying and being reimbursed for a one-time treatment that coincided with surrounding citrus treatments. This program, funded by the PD/GWSS Board, treated 15 nurseries for a total of 971 acres.

Excluding the one-time nursery treatment program, all areawide programs are financed with federal funds and coordinated by CDFA, USDA and the county agricultural commissioners.

Epidemiology Projects

Over the last three years, scientists from the CDFA and the University of California Cooperative Extension have conducted collaborative research projects on the epidemiology of Pierce's disease in Kern and Tulare counties. These projects have produced two important benefits. First is the development of cost-effective methods to manage vineyards, identify and remove infected vines, and greatly reduce grower losses from Pierce's disease. Second is the formulation of a new hypothesis that will be aimed at improving the industry's ability to assess risk, manage investment in new vineyards, and protect vineyards in susceptible areas.

The recent research suggests that many viticultural areas of California may have a severe-enough winter climate so that *Xylella* infections acquired in the mid-to-late season die out over the winter and the vines are disease-free the following year. Only the very early season infections survive to cause fatal disease in the vines. The dynamics of this over-winter curing phenomenon in the various areas are the subject of new experiments. Understanding how over-winter curing applies to the various viticultural regions will help quantify the risk to growers. Results from these ongoing experiments should benefit growers throughout California.

Research by other University of California scientists has been enhanced by the creation of a central data center to integrate and compile epidemiological information. This new data center is facilitating collaboration and coordination among university researchers, state and federal agencies, and industry.

These efforts will enable both industry and government to design better management and control practices, and improved risk assessment tools. The management of local, areawide, regional and statewide control programs continues to improve and be more cost effective.

Experiments in this Fresno County research vineyard (pictured at right) over the next 3 years will provide new information about the dynamics of the over-winter curing phenomenon. Results will help in defining cost-effective cultural practices to reduce losses from Pierce's disease in many viticultural areas.



Over-winter curing in a Fresno County research vineyard.

Biological Control

The Pierce's Disease Control Program employs biological control as part of its integrated approach to reducing GWSS populations, particularly in areas where conventional control strategies are problematic. Such areas include organic, riparian, and urban environments.

GWSS Biological Control in Organic Production Systems

The range of insecticides available for GWSS suppression in certified organic production systems is limited. Furthermore, many approved insecticides are broad spectrum and can disrupt programs employed to control pests other than GWSS. Through the use of egg parasitoids that attack GWSS eggs, native natural enemies of GWSS and other pests are conserved in the ecosystem, thereby supporting sustainable agricultural practices.

GWSS Biological Control in Riparian and Natural Vegetation

Much of California agriculture interfaces with riparian and natural vegetation where the use of insecticides is either illegal or economically prohibitive. While native vegetation provides a valuable refuge for beneficial insects such as predators, it may also provide a refuge for GWSS and the plant diseases it vectors. Releases of GWSS biological control agents into natural and riparian vegetation provides a means of controlling GWSS in these areas and provides a reservoir of beneficial insects for GWSS suppression.

GWSS Biological Control in Urban Settings

The greatest diversity of plant species and microclimatic conditions can be found in urban areas, making them difficult environments for pest management. Difficulties in monitoring, access, treatment, and economics interact to leave the urban environment an ideal breeding ground for new agricultural pests and diseases. The use of GWSS biological control agents in urban areas is frequently easier than the use of other control strategies as they are seen as environmentally friendly, and, unlike insecticidal treatments, beneficial organisms can disperse to inaccessible locations.

Current GWSS Biological Control Activities

In excess of 1.2 million GWSS biological control agents have been released in California since the inception of the PDCP biological control group in 2000. Five species of agents are currently in production. The newest in production, closely related to the native wasp *Gonatocerus morrilli*, has yet to be given a name. Recoveries of this species have already been made. *Anagrus epos* was also released for the first time in California. A production strategy using alternative hosts, including the beet leafhopper, is under development. This will ensure a good supply of this agent that does not depend on the availability of GWSS eggs. This insect may also act as a natural enemy for the suppression of other leafhoppers and sharpshooters that vector Pierce's disease and related plant pathogens.

Of the other three biological control agents that are in production, *Gonatocerus triguttatus* continues to be the most effective exotic introduction. A population of

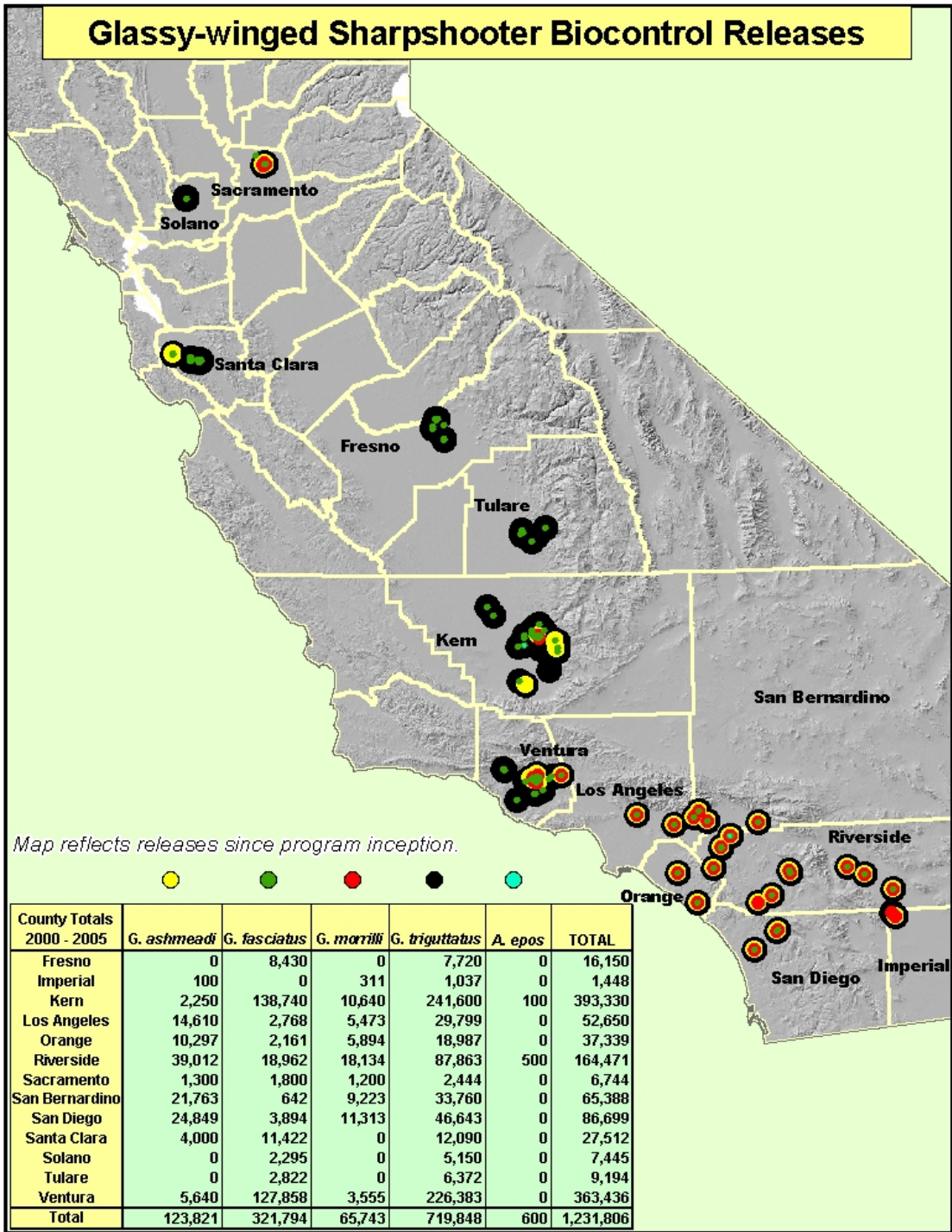
Gonatocerus ashmeadi, the most important native GWSS natural enemy, is also being released. This population can be discriminated from the native population through genetic analysis. *Gonatocerus fasciatus* proved to be a poor biological control agent in California, possibly due to climatic differences between the release area and its native range, Louisiana. If this insect does not show any potential within the next year, production of this species will be ceased.

The PDCP biological control production facilities in California continue to provide expertise, material, organisms, and space to more than 15 separate research projects that focus on the control of GWSS and the diseases it vectors. The equivalent of an estimated 800,000 wasps were provided to assist research funded by CDFA, USDA and the University of California.

Evaluating the success of biological control agents in integrated pest management practices is a long-term process. It takes a significant amount of time for the introduced agents to build a population and for variables such as temperature, precipitation, management methods and host plant effects to be factored out of the assessment results. Not enough time has elapsed to allow for a full and extensive evaluation of the impacts the PDCP biological control agents have had on the spread of GWSS or Pierce's disease.



A female *Anagrus epos* wasp.



Distribution of biological control agent releases as of 12/31/2005.

Environmental Compliance

The CDFA continues with its commitment to ensuring that the Pierce's Disease Control Program is conducted in an environmentally responsible manner. These efforts include preparation of a statewide programmatic environmental impact report (EIR), adhering to a special notification and consultation process with federal and state environmental stewardship agencies prior to treatment, and ensuring that pesticide applications are performed by licensed pest control professionals in strict accordance with pesticide laws and regulations.

The program's EIR has been subject to legal challenge since its release in mid-2003. 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. Consequently, this issue will continue into 2006 and possibly beyond.

Financial Statement

FISCAL YEAR	2003/04	2004/05	2005/06
REVENUE			
State (Budget Act)	6,408,000	4,408,000	4,341,000
Federal (USDA)	9,885,525	14,903,606	15,300,000
Board Assessment	968,000	305,000	343,400
Total Resources	17,261,525	19,616,606	19,984,400
EXPENDITURES			
Personal Services	3,053,409	3,456,754	3,658,520
Operating Expenses	2,206,328	3,040,503	2,852,186
County Payments	12,001,788	13,119,349	13,473,694
Total Expenditures	17,261,525	19,616,606	19,984,400

Abbreviations/Acronyms

ARS	Agricultural Research Service
CACASA	California Agricultural Commissioners and Sealers Association
CCC	California Conservation Corps
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