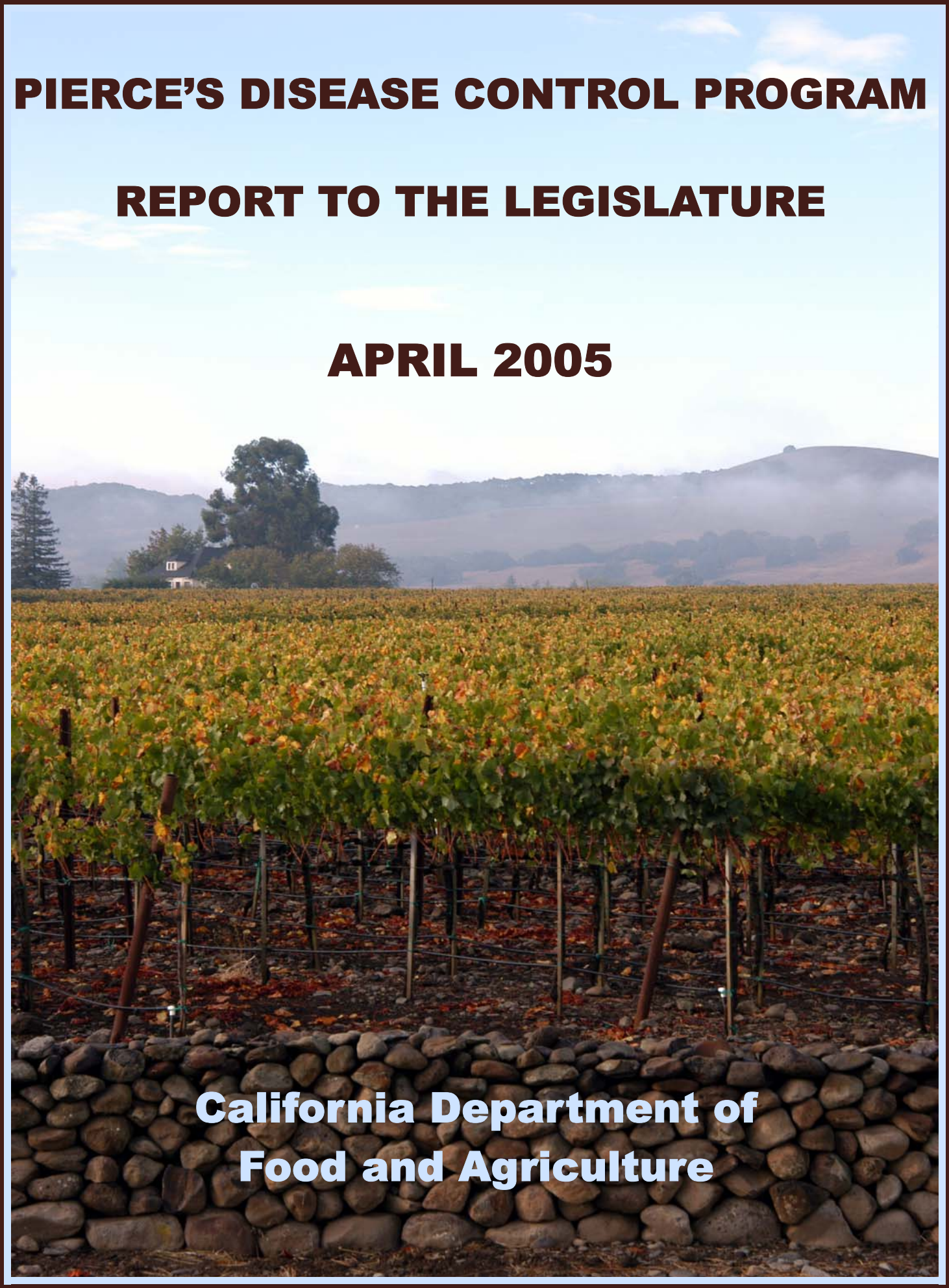
PIERCE'S DISEASE CONTROL PROGRAM

REPORT TO THE LEGISLATURE

APRIL 2005



California Department of
Food and Agriculture

Pierce's Disease Control Program
California Department of Food and Agriculture

Report to the Legislature

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, Barry Hill, Terrance Lorick, Julie Lindsey, David Morgan, Greg Morris, Stacie Oswalt, Nadia Shifa, Roger Spencer, Athar Tariq, and Rosie Yacoub.

Table of Contents

Statement of the Secretary 1

Executive Summary 2

Background 3

Program Description 5

Summary of Accomplishments 8

Contain the Spread 10

Statewide Survey and Detection 13

Rapid Response 14

Outreach 16

Research 19

Biological Control 22

Environmental Compliance 26

Conclusion 27

Financial Statement 28

Appendix

Abbreviations/Acronyms A1

Statement of the Secretary

In August 1999, grape growers in California's Temecula Valley saw their crops wither and die from the effects of Pierce's disease. 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.

The California Department of Food and Agriculture plays a key role in nurturing and protecting California's crops, and also the environment, jobs and many other elements of our society that are linked to agriculture. For the past five years, the Pierce's Disease Control Program has devoted considerable resources and expertise to protect the state from the glassy-winged sharpshooter and the disease-causing bacteria it spreads. We have been successful in controlling the spread of the pest and continue to work with the top-research scientists and advisors to explore long-term solutions. The prestigious National Academy of Sciences has joined this think-tank of experts to provide guidance and leadership by exploring a variety of scientific areas. Field personnel and county agricultural staff diligently maintain surveillance and eradication efforts to protect not just grapes but also almonds, alfalfa, peaches, plums and other crops vulnerable to this disease. The nursery and citrus industries are also key participants in the program, not because they are targeted by the disease, but because their crops are key hosts of this pest and their cooperation allows us to effectively limit the spread of the glassy-winged sharpshooter.

California's grape crop has an estimated economic impact of $45 billion. Almonds also are a top-ten crop, and California's leading agricultural export. Add the economic weight of the additional crops protected by this program, and its importance is readily apparent. California's wine industry, which has the most at stake in this fight, has worked hard to develop the consumer's trust and confidence in their product. However, the competition from growing wine markets in Chile, Australia, Mexico, Oregon and Washington is fierce. These emerging markets understand the value and economic impact the wine industry has on California and hope to capture part of that market. If California is to retain this vital industry, it is critical that the state provide an environment in which our producers and farmers can grow a safe, reliable product. The threat of Pierce's disease adds one more challenge to this vital industry. California must continue its work to limit the spread of the glassy-winged sharpshooter and maintain an aggressive research regimen to develop a long-term solution to Pierce's disease.

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

Executive Summary

The Pierce's Disease Control Program (PDCP) met the challenge of their mission in 2004 by controlling the spread of the glassy-winged sharpshooter (GWSS) while actively pursuing a cure for Pierce's disease. The GWSS, new to the California environment, is a voracious feeder and an efficient vector of Pierce's disease, which kills grapevines. Research is the key to managing Pierce's disease. Existing program elements such as regulatory compliance, detection, and rapid response treatments are being perfected and tuned as this program evolves from its infancy. A coalition between collaborating agencies and the agricultural industry has formed a strong foundation committed to the success of the Pierce's Disease Control Program.

A GWSS infestation was successfully eradicated from the community of Kingsburg, Fresno County in October, 2004. In contrast, a new glassy-winged sharpshooter infestation was discovered in Vacaville, Solano County in early June of 2004 raising awareness that the threat of Pierce's disease continues to be real. Vacaville sits geographically at the doorstep of Napa, Sonoma, and Mendocino counties where many of the most prized vineyards exist in California, the nation and the world.

Research is the answer for long-term and short-term solutions. The Pierce's Disease Control Program organized a research symposium in early December bringing together scientists from many universities and agencies that are investigating over 115 different scientific projects.

The National Academy of Sciences, under contract with the Pierce's Disease / Glassy-winged Sharpshooter (PD/GWSS) Board, released their findings in a publication titled "California Agricultural Research Priorities: Pierce's Disease."

The PDCP's biological control unit acquired a much-needed larger facility in Arvin, Kern County, to increase the production of control agents. Numerous field recoveries of these tiny parasitic wasps show that colonies are being established throughout California and are significantly reducing offspring of GWSS.

Areawide treatment programs in Kern, Riverside, Tulare, and Ventura counties proved extremely successful to control GWSS populations throughout vast agricultural regions. Regulatory programs to prevent the movement of GWSS in nursery stock, bulk citrus, and bulk grapes were very effective in 2004. The nursery industry shipped plants for a record number of months without hitchhiking glassy-winged sharpshooters. Bulk citrus loads with live glassy-winged sharpshooters showed a marked improvement, dropping from 170 infested shipments in 2002 to only 1 in 2004. As in past years, no glassy-winged sharpshooters were found in bulk grape shipping containers.

The challenge continues into the next year as cooperators, researchers, and stakeholders fight vigilantly against this pest and disease complex. There is a steadfast goal in mind to control the vector and fund research through government and stakeholder assistance. Meanwhile, academics search to unlock the riddles that allow enterprise to not just continue but thrive in the California environment.

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 affected areas. This situation changed dramatically with the arrival of the glassy-winged sharpshooter. Viticulture in traditionally safer-areas is now threatened in significant growing regions are now at risk from the disease. Counting only grapes, the disease now threatens a crop production value of $3.2 billion and associated economic activity in excess of $45 billion. Other crop and ornamental plant resources such as almonds ($1.6 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

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 2000[1], causing $30 million in damages. There is currently no known cure for the disease.

Grapevine showing symptoms of Pierce's disease.

The Glassy-winged Sharpshooter

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

Adult glassy-winged sharpshooter.

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 *X. 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.

Program Description

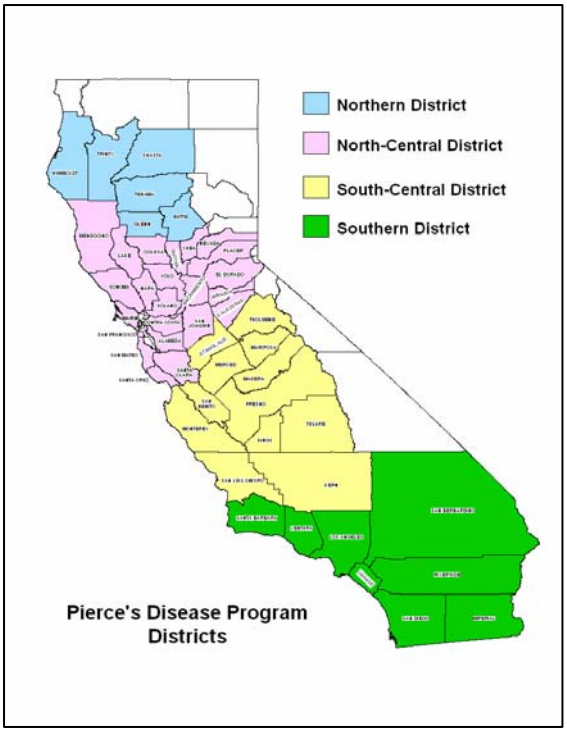
The Pierce's Disease Control Program works to minimize the statewide impact of Pierce's disease and the glassy-winged sharpshooter. The strategy is to slow or stop the spread of the glassy-winged sharpshooter while short- and long-term solutions to Pierce's disease are developed. This strategy relies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

1. **Contain the Spread**
   Prevent the spread of the glassy-winged sharpshooter to new areas of the state by regulating shipments of host plants and plant materials.
2. **Statewide Survey and Detection**
   Find and monitor glassy-winged sharpshooter infestations and populations through trapping and visual survey.
3. **Rapid Response**
   Respond quickly to detections of the sharpshooter 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 Food and Agriculture. 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 the glassy-winged



Map showing the Program districts.

sharpshooter are produced in CDFA and USDA laboratory facilities in Riverside and Arvin. Researchers throughout the state and elsewhere are under contract with CDFA, the USDA, industry, 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 that are 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 Pierce's Disease and Glassy-winged Sharpshooter (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 four years has raised approximately $17.8 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 the 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, United States Department of Agriculture, 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.

Program Goals for 2005

- Conduct a referendum of California winegrape growers to decide if the PD/GWSS Board and the winegrape assessment will be extended to March 2011.
- Implement, on a pilot basis, a new regulatory system for nursery stock shipments.
- Increase production of biological control agents and focus releases into infested urban areas to reduce infestation size and the risk of spread.
- Coordinate the 2005 research proposal review and decision processes for the PD/GWSS Board.
- Defend the program's environmental impact report against the legal challenges filed against it in 2004.

2004 Summary of Accomplishments

The following summarizes the major accomplishments of the Pierce's Disease Control Program in 2004.

Contain the Spread

- Approximately 76,700 shipments of regulated plant material were made in 2004, with only 64 rejected shipments. This represents a decrease of 57 percent in shipments containing the glassy-winged sharpshooter when compared to 2001.
- PDCP staff conducted training sessions to prepare county staff for the busy spring nursery stock shipping season.
- The success of the bulk grape shipping inspection and certification program continued in 2004 with no glassy-winged sharpshooters detected in shipments.
- During this year's citrus shipping season (October 2003 through September 2004), a single, live glassy-winged sharpshooter was found in 1 out of approximately 62,000 certified shipments of bulk citrus, resulting in a 96 percent reduction in rejected shipments compared to the previous year.

Statewide Survey and Detection

- Survey efforts revealed that 35 California counties remain completely free of the glassy-winged sharpshooter.
- A new localized GWSS infestation was found in Vacaville, Solano County.
- Quality control checks were concentrated on county and state trapping programs to ensure effectiveness and statewide consistency.
- The PDCP provided onsite training in 31 counties to prepare county staff for detection and delimitation trapping, and visual surveys.

Rapid Response & Control Activities

- In early June 2004, a new glassy-winged sharpshooter infestation was discovered in Vacaville, Solano County. The county coordinated a sustained rapid response plan to eradicate the infestation. Drawing upon the resources of neighboring counties, this response was a model of how different counties can share resources across jurisdictional boundaries in a combined effort to control the spread of the insect.
- Delimitation and treatment activities continued against isolated infestations of GWSS in Butte, Fresno, Imperial, Sacramento, Santa Clara, and Tulare counties. Fresno County was successful in eradicating the GWSS infestation from the community of Kingsburg.

Public Outreach

- County agricultural staff and industry members continued to play key roles in maintaining and increasing public awareness about Pierce's disease and GWSS. A variety of new programs were implemented at the local level in 2004.
- In May of 2004, the Pierce's Disease/Glassy-Winged Sharpshooter Board awarded a contract to Brown·Miller Communications of Martinez, California to conduct an outreach and education program. Brown·Miller has produced an outreach video,

written and distributed newsletters, provided booth displays at trade association events, and coordinated speakers for public outreach opportunities.

Research

- The nation's top plant health and pest researchers were engaged in 115 research projects to aid in the fight against Pierce's disease and the glassy-winged sharpshooter.
- The fourth annual PD Research Symposium was held in December 2004, bringing together scientists currently engaged in Pierce's disease research projects. The symposium proceedings were published and distributed to those attending the event and were posted on the program's website.
- The National Academy of Sciences completed its review of past, current, and potential research activities for the development of a long-term research strategy to combat Pierce's disease and its vectors. The final report, titled "California Agricultural Research Priorities: Pierce's Disease" was released in October 2004.
- Pest management pilot projects were continued in Kern, Riverside, Tulare, and Ventura counties. Approximately 36,000 acres were treated in the areawide projects. Treatments significantly decreased GWSS populations in most of the areas.
- Scientists from the CDFA and the University of California developed an effective low-cost method for growers to identify and remove diseased vines from their vineyards.

Biological Control

- The CDFA has released 1.1 million parasitic wasps for the control of the glassy-winged sharpshooter in California.
- The CDFA biological control production facilities house the largest and one of the few laboratory colonies of glassy-winged sharpshooter. These insects are guaranteed to be free of *Xylella fastidiosa* and are invaluable for transmission studies.
- Four species of minute parasitic wasps, each less than 1/16" long, have been permitted for release. All species attack the eggs of the glassy-winged sharpshooter. Two species are exotic to California.
- The CDFA and USDA/Agricultural Research Services (ARS) are evaluating several species of sharpshooter parasitoids from South America in quarantine conditions. These wasps are in their 27th generation of reproduction and are feeding on egg masses of the glassy-winged sharpshooter. Currently, no California native sharpshooter species have been affected by these wasps.
- Ongoing monitoring by the CDFA at release sites have recorded over 144 separate recoveries of introduced parasitoids from field-collected eggs of the glassy-winged sharpshooter. Additional recoveries have been recorded by independent sources. The significance of recoveries show that these newly introduced parasitic wasps are surviving and thriving in California further reducing GWSS populations.
- Exploration for potential biological control agents continues in North and South America. The PDCP biological control unit has provided plants, sharpshooters, parasitic wasps, training, and expert advice to over 15 research projects involved in the search for control strategies for *X. fastidiosa* and its vector, the glassy-winged sharpshooter.

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 shipments 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 glassy-winged sharpshooter. California has almost 9,000 licensed nurseries, 60 percent 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 the glassy-winged sharpshooter 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.

A nursery stock treatment pilot program will be implemented in 2005. This program will test the efficacy of laboratory proven pesticides in real delivery situations from infested areas to uninfested areas of the state.

Inspection Results

There were approximately 76,700 shipments of nursery stock from infested areas to uninfested areas in 2004. Viable life stages of glassy-winged sharpshooter were discovered on only 64 of these shipments. Since 2001, the total number of shipments is up by 33% while the total number of loads with viable life stages has decreased by 57%.

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%

Regulated nursery shipment results.

Over 90% of all rejections between 2001 and 2004 have been for egg masses. The table above reflects the results of the ongoing nursery inspection and shipment certification program.

Enforcement Actions

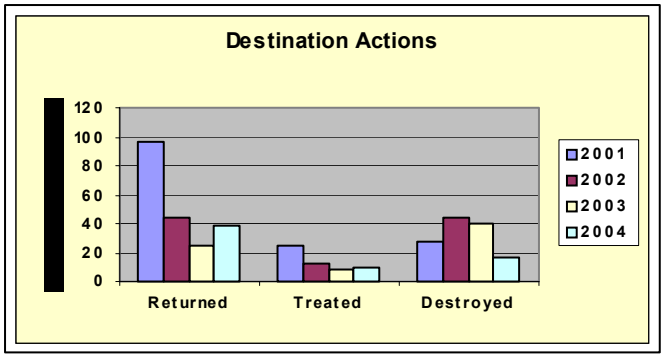
Enforcement actions are taken against nurseries and shipments that are in violation of the regulations. Actions can be taken at origin or destination. Actions that can be taken at origin consist of the following:

- ***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 2004, administrative penalties were levied against three companies, totaling $2,400.



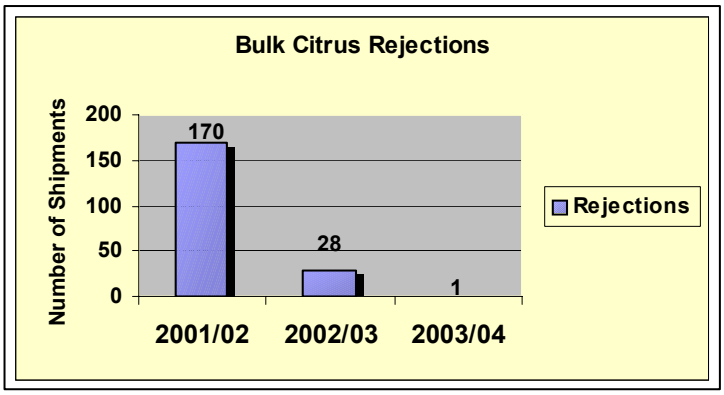
Number of actions taken at destination.

Bulk Grapes

Many of the state's grape growers sell their harvest to grape processors (i.e., wineries and juice manufacturers) located far from the production vineyard. A program is in place to prevent GWSS from being moved in bulk grape shipments. The program includes inspection and monitoring of origin vineyards and bulk grape shipments from counties with infested areas, along with a color-coded certificate tag system for shipments from counties with infested areas. During 2004, approximately 104,000 shipments of bulk grapes, about 2.3 million tons, were monitored. Nearly 20,000 of those shipments originated from infested counties and traveled to their destination after being properly inspected. In 2004, as in prior years, no glassy-winged sharpshooters were found on bulk grape shipments.

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.

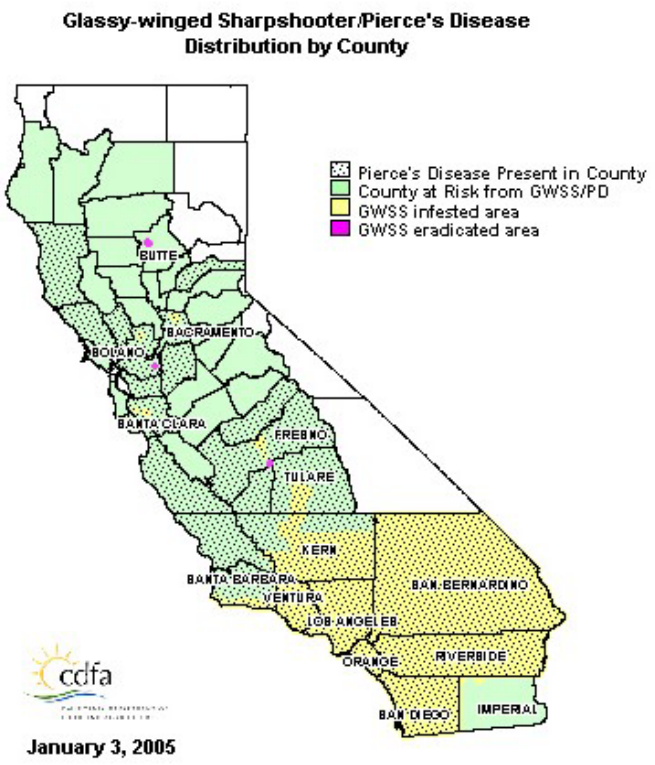


Bulk citrus rejections have declined drastically over three years.

During the most recent citrus shipping season (October 2003 through September 2004), live glassy-winged sharpshooters were found in only 1 out of approximately 62,000 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.

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.



Map showing the at-risk area and the distributions of Pierce's disease and the glassy-winged sharpshooter.

The activities of this element focus on systematically surveying and trapping commercial, residential, nursery, and cropland areas to determine if the glassy-winged sharpshooter is present. The program maintains an internet map server to quickly map and display discoveries of Pierce's disease and the glassy-winged sharpshooter.

To survey for GWSS, flat panel, sticky traps are deployed in 43 counties that are not infested with GWSS or only partially infested. The GWSS are attracted to the trap's bright yellow color. County agricultural commissioners service 155,588 traps annually from March or April through October. Each trap is observed bi-weekly and moved to a new location every six weeks.

Revised survey protocols were distributed to all California counties in the spring of 2004. The revisions reflected de-creased emphasis on visual survey and more reliance on trapping to achieve initial detections of new infestations.

During 2004, onsite detection training was provided to county personnel in 31 counties. CDFA biologists assisted county personnel with field surveys and also conducted quality control inspections of county and state detection trapping programs.

Glassy-winged sharpshooter flat panel, yellow sticky trap

Rapid Response

The Rapid Response element of the program involves responding quickly to potential new glassy-winged sharpshooter (GWSS) 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, the boundary lines are drawn. In urban and residential areas, treatment costs are covered by the program and applied under 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 2004, a discovery of a localized GWSS infestation in Solano County resulted in a rapid response action in Vacaville. In Fresno County, the GWSS infestation in the community of Kingsburg was successfully eradicated. Statewide, glassy-winged sharpshooters were detected at approximately 1,100 residential properties in the partially infested counties of Fresno, Kern, Sacramento, Santa Clara, Solano, and Tulare. Approximately 7,000 properties (positive with GWSS, and adjacent to) were treated during rapid response activities. The status of Butte County as GWSS-free is being reviewed after recent discoveries of GWSS life stages.

A CCC member conducts a visual survey for glassy-winged sharpshooter.

Pre-Treatment Communication with Stakeholders

Specific steps are taken to ensure residents are properly advised and environmental concerns addressed before infested areas are 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 on ornamental plantings. The insecticide carbaryl was used

against new infestations detected in the first year of the program in residential settings and recent data showed that carbaryl is very effective against adult glassy-winged sharpshooters and emerging nymphs 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 to raise winegrape grower awareness about ongoing program efforts which 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 about 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 a newsletter and published two editions in 2004 (with two more planned for 2005). To reach growers and other audiences, the outreach program maintained a presence at key industry events (four trade shows in 2004, with two more planned for the first quarter of 2005). Media and message training was also conducted for Board members, as well as other stakeholders. A series of news releases on PD/GWSS Board activities has been released, and the outreach program contributed a feature article in Wine Business Monthly about the discovery of a GWSS infestation in Vacaville, and the role the winegrape assessment played in the response.

Presentation kits and videos were distributed to cooperators to enlist their help ensuring winegrape growers are kept adequately informed of program activities.

Local County Outreach

Local county agricultural staff and industry members played key roles in maintaining program visibility and stakeholder awareness. Examples of these efforts include:

- 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 combining their resources to hire 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;
- San Francisco County working closely with the local media and using the internet for outreach efforts;
- 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.

Researchers viewing posters at 2004 Symposium

Media Coverage

In 2004, 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 much information generated by the outreach program.

Informational Materials

Program staff, working with the Outreach Subcommittee of the Pierce's Disease Advisory Task Force, compiled a list of outreach materials produced by the program, 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 them to match local needs, and help deliver a more consistent and cohesive message.

Website

Graphic from the home page of the Program's 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, treatment information, upcoming meetings and events, the 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/.

Research

Research continues to be an integral part of the Pierce's Disease Control Program, and holds the key to developing a long-term solution to Pierce's disease. The flurry of research activity that began at the start of the program continues, with approximately 115 projects in progress in 2004 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 provides valuable insight into the biology, ecology, and behavior of Pierce's disease and its vectors, moving us closer to an eventual cure.

Scientific Communication

The fourth annual Pierce's Disease Research Symposium was held December 7-10, 2004 in Coronado, California. By all accounts, the meeting was a success with approximately 200 persons attending to share information and learn more about the progress being made against Pierce's disease.

As in prior years, a compendium of research progress reports was prepared beforehand by the PDCP and provided at the symposium. This year's proceedings contained 115 progress reports, an increase of 11 over last year. The proceedings are available in printed form from the PDCP, or can be accessed electronically on the program's website: cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

Research Strategy

In late 2004, the National Academy of Sciences, National Research Council completed and released its report on the Pierce's disease research effort, providing recommendations on the most promising research topics. The study, funded from winegrape assessment funds, was conducted by a 12-member committee of experts. The report can now be used to help direct the future investment of research dollars. Briefings on the report were provided by representatives of the committee at a joint meeting of the Pierce's Disease Advisory Task Force and Pierce's Disease/Glassy-winged Sharpshooter Board, and at the 2004 Pierce's Disease Research Symposium.

Research Proposal Review

In 2004, the PDCP managed the PD/GWSS Board's research proposal solicitation and review process for the 2004-05-research contract year. This involved coordinating the review of 63 pre-proposals and 72 full proposals. Based on the feedback from an extensive vetting process, 50 research projects, totaling $4.08 million, were selected for funding in Fiscal Year 2004-05 using winegrape assessment funds.

Pilot Projects

Pest management pilot projects initiated in 2001 continued in Kern County and Temecula. These projects are a partnership between CDFA, USDA, the University of California, and the agricultural industry. A key component of these projects is a computerized data collection management system that uses barcodes and scanners to improve tracking of each insect trap in the project. The data collected is used for coordinating treatments and developing maps to analyze glassy-winged sharpshooter

distribution and movement. The pilot projects have proven to be tremendously successful at reducing GWSS populations.

Areawide Projects

Following the early success of the Kern County Pilot Project, a similar project for the entire production area of Kern County was implemented. This includes agricultural lands as well as the City of Bakersfield and several smaller communities. In 2004, only 4,270 acres required treatment compared to 17,764 acres treated in 2003. Similar projects have also been implemented in Riverside County (Temecula and Coachella Valley), Tulare, and Fresno counties. Monitoring for the glassy-winged sharpshooter and Pierce's disease is occurring throughout these project areas.

Since 2002, areawide project activities have continued in Temecula and the Coachella Valley. Visual survey and trapping in these areas provide information on sharpshooter population numbers and serve as indicators of developing "hot spots" where treatments may be needed. During 2004, a total of 580 acres of citrus were treated within the Temecula project area and 1,555 acres of citrus were treated in the Coachella Valley.

An areawide management project was initiated in Ventura County in 2003 to test the effectiveness of sharpshooter control in citrus at protecting shipping nurseries from infestation. This project involves treating citrus groves in close proximity to shipping nurseries. In 2004, an area of 11,556 acres of citrus was treated under this program. In addition, 12 nursery sites within the pilot area totaling 930 acres received a one-time treatment.

In Tulare County, 18,000 acres of citrus were treated in 2004, compared to 38,652 in 2003. Thanks to the project, little or no spread of GWSS has been observed toward the west where many grape vineyards exist.

An areawide trapping project was implemented in Fresno County in the summer of 2003, to determine if glassy-winged sharpshooter populations are present in the citrus croplands. In 2004, trapping results indicate the continued absence of glassy-winged sharpshooters throughout the Fresno County citrus belt.

These areawide projects are financed with federal funds and coordinated by the local county agricultural commissioners.

Epidemiology Projects

Over the last three years, scientists from the CDFA and 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's 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.

Experimental verification and expansion of the new epidemiological hypothesis will be pursued over the next two growing seasons, and the results should benefit growers throughout California.

Vine-to-vine spread of Pierce's disease in Red Globe variety wine grapes

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 geographic information system database 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.

Biological Control

Biological control involves the use of a pest's natural enemies to reduce its population size and consequent damage. In some cases, this control strategy can eliminate the need for other control methods. In other cases, biological control can be integrated with other methods to reduce pest populations. Biological control is currently one of the most promising long-term solutions for combating the glassy-winged sharpshooter in California.

The PDCP biological control unit has three major components:

1) Biological Agent Selection
2) Biological Agent Production
3) Biological Agent Release and Evaluation

Biological Agent Selection

Selecting the right organisms to use as natural enemies is critical to the success of biological control efforts. The most successful agents will persist in the new target environment and reduce pest numbers to nondamaging levels without impacting non-target organisms. Early studies on the glassy-winged sharpshooter revealed that the insect's most important natural enemies were tiny wasps that oviposited (laid eggs) in the eggs of the sharpshooters, thereby killing them.

***Gonatocerus morrilli* female**

***Anagrus epos* female**

Exploration for biological control agents has covered the southeastern U.S. and northeastern Mexico. Many species of wasps have been identified as potential biological control agents. Currently, four North American species of natural enemies of the glassy-winged sharpshooter are being released : *Gonatocerus ashmeadi*, *G. morrilli*, *G. fasciatus*, and *G. triguttatus*. All species are tiny Mymarid wasps, about the size of a grain of sand (approx. 1/16"). Another species of wasp, *Anagrus epos*, was collected from Minnesota in 2004 and is currently under evaluation for release in California. This insect is minute, can produce over 10 offspring per sharpshooter egg, and is capable of surviving severe winters.

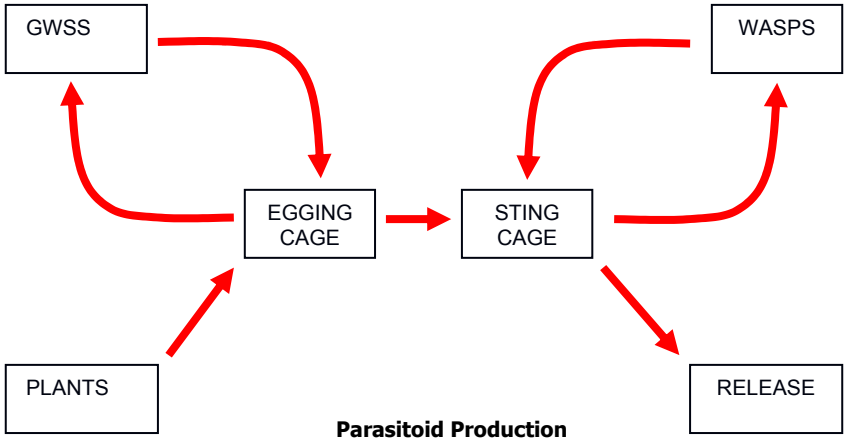
Surveys carried out by the USDA Agricultural Research Service over the past two years have resulted in the recovery of several potential biocontrol agents from South America. Two species of wasp are in the process of being evaluated for release in California. This process includes rigorous screening studies at quarantine facilities in California and Texas.

Biological Agent Production

In 2004, production of GWSS biological control agents in Kern County was relocated from Bakersfield to a site near Arvin. CDFA Secretary A.G. Kawamura officially opened the Arvin facility in June. The opening coincided with the program's release of its millionth GWSS biological control agent in California. The field station will be responsible for production of agents for release in Fresno, Kern, Tulare, and Ventura counties. Renovation is ongoing, with the goal of using the Arvin facility as a permanent biological control facility dedicated to the protection of agriculture in California.

A second facility, Mount Rubidoux field station, is located in Riverside. This facility serves Southern California and provides expertise, material, organisms, and space to more than 15 separate research projects aimed at the control of GWSS. Both the Arvin and Mount Rubidoux facilities are charged with the identification, production, release, and evaluation of GWSS biological control agents, and with the development of techniques to optimize the efficacy of selected agents.

Producing biocontrol agents of GWSS at rearing facilities is challenging because it also requires producing the glassy-winged sharpshooter and its host plants. Field-collected and laboratory-reared sharpshooters are used to obtain eggs for producing the egg parasites. The program is constantly evaluating each step to look for ways to optimize overall production.

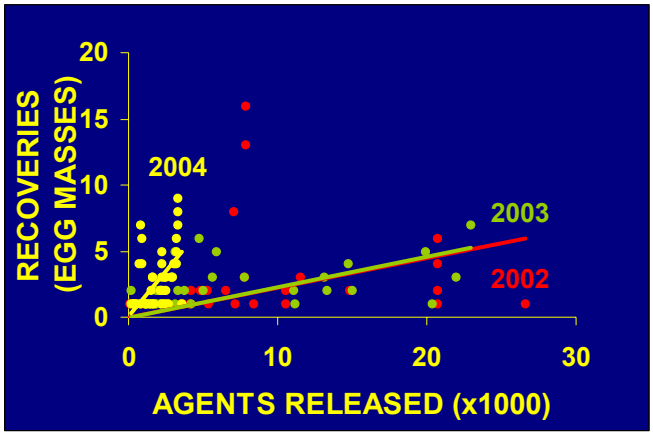


Parasitoid Production

The production facilities are extremely valuable to researchers as they maintain continuous populations of non-contaminated glassy-winged sharpshooters that are essential for many research projects. Researchers from laboratories throughout the world visit these facilities to learn the techniques involved in the production and maintenance of sharpshooter colonies.

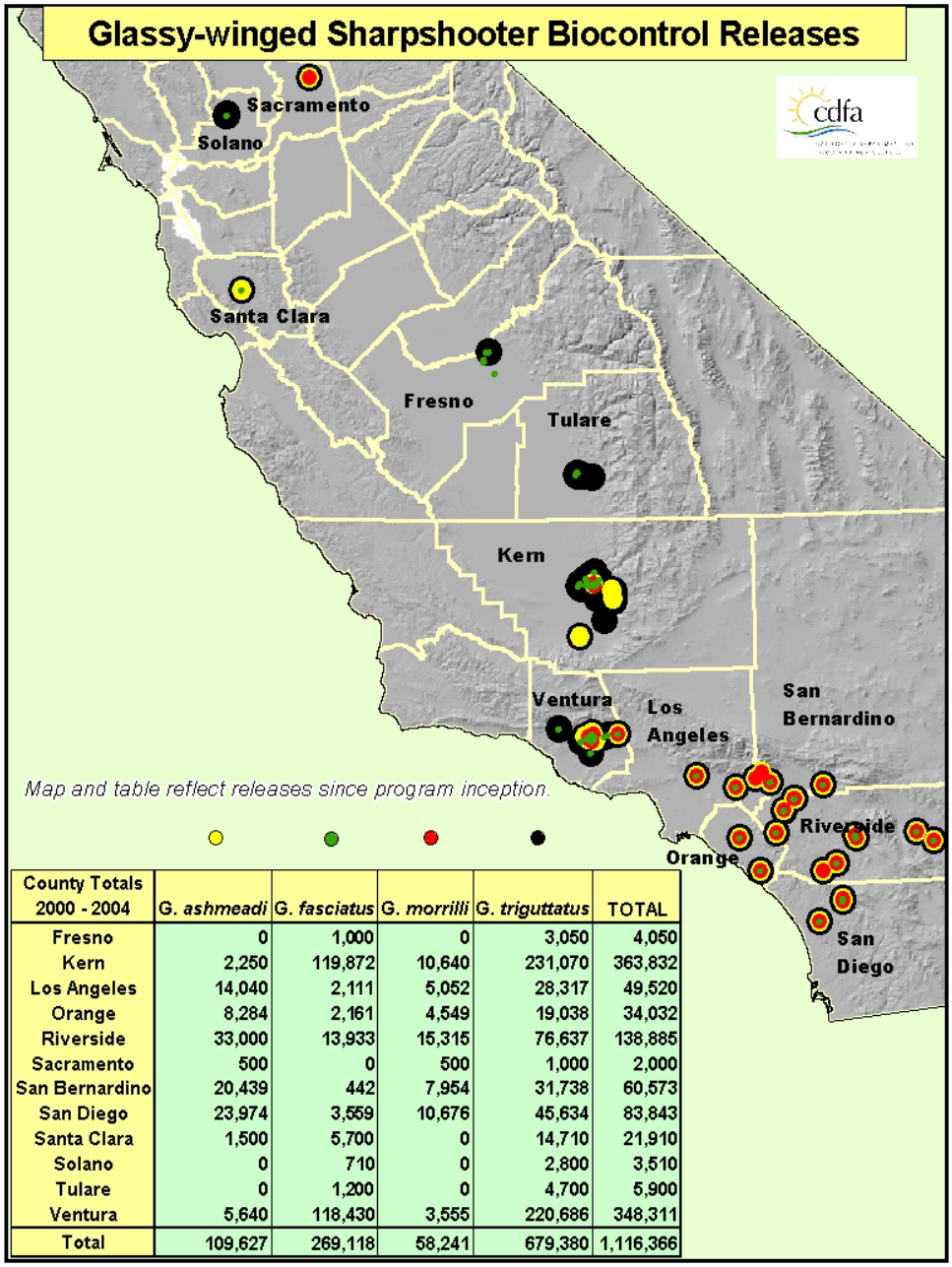
Agent Release and Evaluation

The PDCP biological control unit has released over 1.1 million biological control agents since its inception in 2000. Biocontrol agent releases were lower in 2004 than 2003 resulting from the disruption of rearing biocontrol agents while relocating to the Arvin facility.



Biological control agents released and recovered

GWSS eggs are collected from biocontrol agent release sites periodically to determine if released agents are active in the area. Over 144 parasitized egg masses have been recovered in the field. This is significant as it proves that parasitoids reared in the laboratory can survive and reproduce in the field. Furthermore, the number of recoveries of agents in 2004 were similar to those of 2003.



County Totals 2000 - 2004	*G. ashmeadi*	*G. fasciatus*	*G. morrilli*	*G. triguttatus*	TOTAL
Fresno	0	1,000	0	3,050	4,050
Kern	2,250	119,872	10,640	231,070	363,832
Los Angeles	14,040	2,111	5,052	28,317	49,520
Orange	8,284	2,161	4,549	19,038	34,032
Riverside	33,000	13,933	15,315	76,637	138,885
Sacramento	500	0	500	1,000	2,000
San Bernardino	20,439	442	7,954	31,738	60,573
San Diego	23,974	3,559	10,676	45,634	83,843
Santa Clara	1,500	5,700	0	14,710	21,910
Solano	0	710	0	2,800	3,510
Tulare	0	1,200	0	4,700	5,900
Ventura	5,640	118,430	3,555	220,686	348,311
Total	109,627	269,118	58,241	679,380	1,116,366

Distribution of biological control agent releases.

After three years of monitoring, patterns are becoming evident regarding optimal species selection. For instance, *G. morrilli* is most frequently found at release locations that have maritime influences and *G. fasciatus* is not as successful as initially hoped. Results from monitoring efforts during the next year will assist management decisions regarding the selection of agent species and where to focus future releases.

The imminent addition of two species to the biological control agent armory should help improve the effectiveness of the biological control of GWSS.

Environmental Compliance

The CDFA continues with its commitment to ensuring that the Pierce's Disease Control Program is conducted in an environmentally responsible manner. A statewide programmatic environmental impact report was prepared. PDCP adheres to a special notification and consultation process with federal and state environmental stewardship agencies when treatments are planned. Environmental monitoring is conducted during treatments. PDCP ensures that pesticide applications are performed by licensed pest control professionals in strict accordance with pesticide laws and regulations.

In May 2003, the final environmental impact report for the Pierce's Disease Control Program was released and certified. This extensive, in-depth environmental review, conducted with full opportunity for public and stakeholder input, determined that program activities did not present a risk of causing significant environmental impacts. In June 2003, a lawsuit was filed against the environmental impact report by three environmental groups. A hearing on the lawsuit was held in San Francisco Superior Court in February 2004, and on April 29, 2004, the trial court ruled in favor of the environmental impact report and the program. In June 2004 the petitioners filed a notice of appeal against the trial court's ruling. The case is currently being adjudicated and should be decided in early 2005.

Conclusion

2004 was a year of challenges and successes for the Pierce's Disease Control Program. The program withstood court battles and a new urban infestation near some of the most valuable vineyards in the state. The courts ruled in favor of the program and its environmental impact statement. Vacaville is now the site of the newest GWSS infestation under a treatment regime and is also the closest infestation to the prized Napa Valley vineyards. As a testament to the program and our original legislative mandate, the program stood strong to control the vector and disease complex while research continues to search for a cure to Pierce's disease.

Research and biological control continue to hold their promise of providing long-term solutions to GWSS and Pierce's disease. Scientists met collectively at a research symposium in Coronado to discuss with one another on approaches to finding a cure for Pierce's disease. The priorities established by the National Academy of Sciences will provide direction for future research. Today's research is leading us to tomorrow's breakthroughs. Over one million parasitic wasps have been released to combat glassy-winged sharpshooter populations. Further expansion of GWSS biocontrol agent rearing capacity and release are anticipated in the coming year.

The good news of GWSS eradication from the city of Kingsburg in Fresno County and the absence of GWSS in once-infested Cupertino, Santa Clara County, was countered by the detection of a new infestation in Vacaville, Solano County. Throughout the state, the California Agricultural Commissioners continue to keep a watchful eye on GWSS by monitoring detection traps, regulating bulk commodities, and rapidly responding to new infestations. The PDCP will continue to provide leadership, training and assistance to the agricultural commissioner staffs in all aspects of the program.

Areawide projects and efforts to contain the spread of GWSS were very successful in 2004. Populations of GWSS in Kern, Tulare, and Riverside counties were severely reduced. Meanwhile, regulated commodities such as nursery stock and citrus had record years for reductions in hitchhiking GWSS and bulk grapes have not been found to be a carrier of GWSS. Research to eliminate GWSS in nursery stock has been concluded. An approved nursery stock treatment protocol will be implemented on a pilot basis, in 2005.

The availability of resources continues to be a key challenge to the program. State funding is critical to the program's success. The federal government has recognized the importance of finding a solution to Pierce's disease by committing significant funding and has indicated it will provide future support. Industry's willingness to participate in funding has been demonstrated and is vital to the success of the program. With the ongoing cooperation and assistance of our federal and county counterparts and university and industry partners, we will continue moving closer to finding a long-term solution for this serious agricultural threat.

Financial Statement

FISCAL YEAR	2002/03	2003/04	2004-05
Beginning Balance	51,384	826,097	2,302,273
REVENUE			
State (Budget Act)	6,401,000	6,408,000	4,408,000
Federal (USDA)	10,807,953	12,317,341	13,300,000
Board Assessment	152,000	968,000	305,000
SMIF	39,755	104,720	40,000
Total Resources	17,452,092	20,624,158	20,355,273
EXPENDITURES			
Personal Services	2,534,429	3,051,778	3,280,355
Operating Expenses	2,143,071	3,268,319	3,390,799
County Payments	11,948,495	12,001,788	13,000,000
Total Expenditures	16,625,995	18,321,885	19,671,154
Fund Balance	826,097	2,302,273	684,119

Abbreviations/Acronyms Used in this Document

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