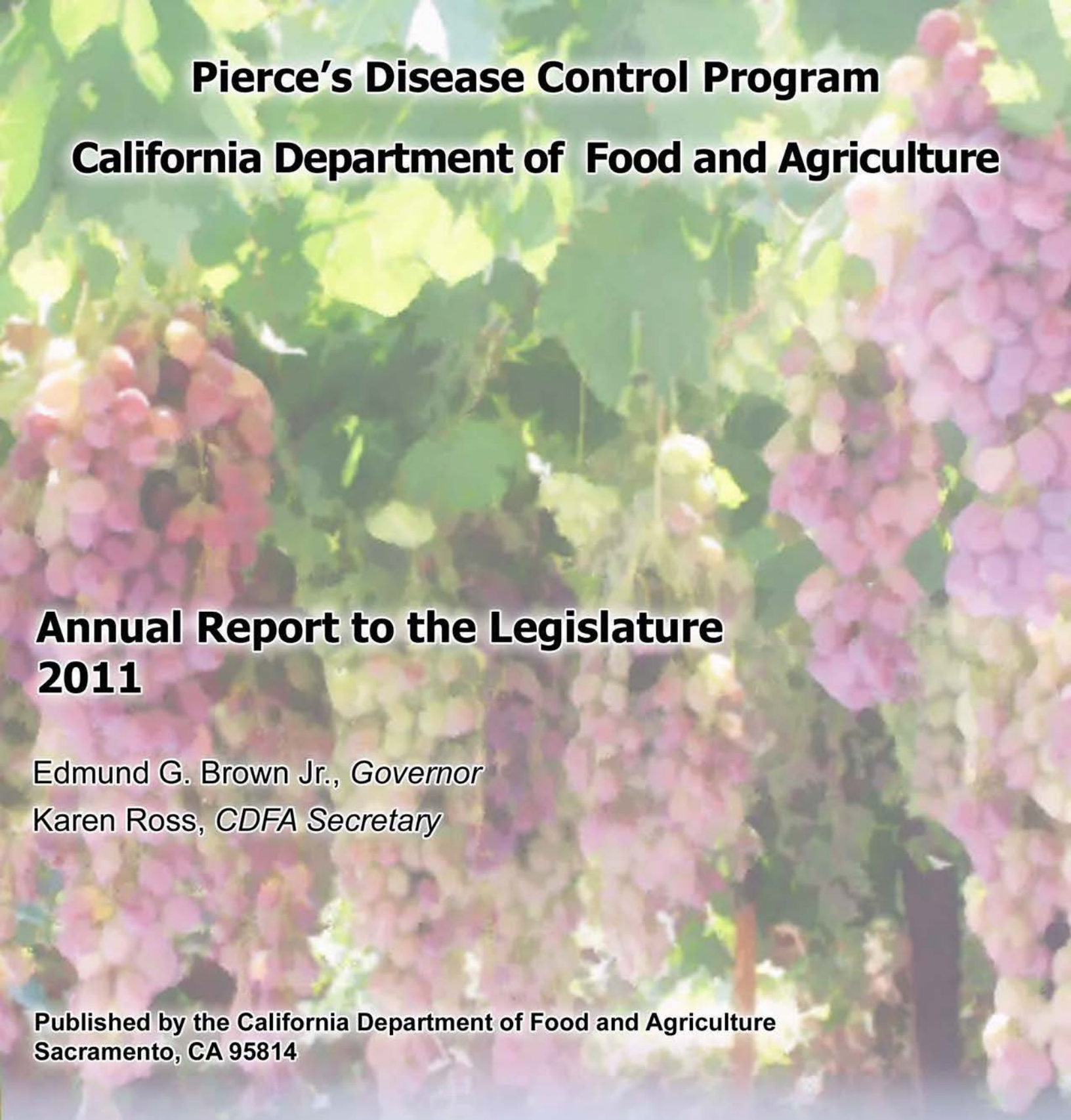
Pierce's Disease Control Program

2011
Annual Report to the Legislature

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Pierce's Disease Control Program

California Department of Food and Agriculture



Annual Report to the Legislature 2011

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Karen Ross, *CDFA Secretary*

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Statement of the Secretary

In December 2011, researchers, growers, winemakers and agricultural officials gathered in Sacramento for the annual Pierce's Disease Research Symposium. I had the pleasure of welcoming them and conveying my sincere appreciation for the work they have done to protect California's grape crop - and everyone whose livelihood depends on it. Their work is the centerpiece of a program that is now more than a decade in the making. This program has become a leading example of how well a grower-government partnership can work.

As you read and use this document, I encourage you to bear in mind the enduring, cooperative nature of our project. For several years we have kept sharpshooter infestations in check, buying time for researchers to develop long-term solutions for the disease that these pests can spread to California's vines. Along the way, this program has become the standard upon which we model our responses to pests such as the Asian citrus psyllid, the European grapevine moth and others. This program has achieved success and produced value well beyond the impressive numbers and charts in these pages. I extend my thanks and appreciation to the many growers, winemakers, researchers and their colleagues who have persevered in this endeavor.

Karen Ross, Secretary
California Department of Food and Agriculture

Executive Summary

The Pierce's Disease Control Program (PDCP) continues to be a model program that guides our response to more recent invasive species introductions such as the European grapevine moth and the Asian citrus psyllid. California's continuing search for solutions to its budget imbalance saw the elimination of the PDCP's State General Fund revenue as of July 1, 2011, so the challenge now is to maintain our exemplary performance with more limited resources. A fiscal subcommittee was formed with federal, state, county, and industry stakeholders to recommend and implement cost reduction measures that trim program expenses while keeping the program effective. As the PDCP lost state revenue, the wine grape industry augmented financial support to protect and assure vital program elements continue.

The five major components of the PDCP -- contain the spread, statewide survey and detection, rapid response, outreach, and research -- remain as integral to the program as in past years. However, extra layers of safeguards that were previously affordable have been eliminated. Biocontrol continues from a consolidated facility in the southern San Joaquin Valley.

Research on Pierce's disease and the glassy-winged sharpshooter continues to hold great promise for commercial applications in the near future. Research is attacking Pierce's disease and the glassy-winged sharpshooter, and their effects, from several different angles. Scientists are breeding disease-resistant grape rootstocks, discovering ways to keep the vascular tissues of grapevines free from the choking effects of Pierce's disease, and are furthering research on the biology of the glassy-winged sharpshooter with regard to acquisition and inoculation of *Xyllela fastidiosa*, the pathogen that kills grapevines. Commercial applications, based on this research, may eliminate or drastically reduce the incidence of Pierce's disease in California.

In the following pages of this report, you'll see that the statewide, cooperative Pierce's Disease Control Program continues to fulfill its mission by minimizing the impact of Pierce's disease and its vectors in California. With the support of our many stakeholders we are confident this program can continue to provide a lasting benefit to those whose livelihoods depend on healthy grapevines.

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 all areas where the pathogen was present. This situation changed dramatically with the arrival of the glassy-winged sharpshooter. Viticulture in traditionally safe growing regions is now at risk from the disease. Considering only grapes, the disease now threatens a crop production value of $3.2 billion and associated economic activity within California in excess of $62 billion. Other crop and ornamental plant resources such as almonds ($2.8 billion) and susceptible species of citrus ($721 million), stone fruits ($684 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 (CDFA) to minimize the statewide impact of Pierce's disease and the glassy-winged sharpshooter.

Pierce's Disease

Pierce's disease (PD) 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) and triggering cell death in the plant. Several strains of this bacterium exist, attacking and causing damage to different host plants including grapes, citrus, stone fruits, almonds, oleander, and certain shade trees such as oaks, elms, maples, and sycamores. Since its discovery, Pierce's disease has been reported in 28 of California's counties. The University of California (UC) reported that the disease destroyed over 1,000 acres of grapevines in northern California between 1994 and 2000, causing $30 million in damages.[1] There is currently no known cure for Pierce's disease.

Vines showing symptoms of Pierce's disease

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

The Glassy-winged Sharpshooter

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

California's first indication of the severe threat posed by this new disease and vector combination occurred in Temecula, Riverside County, in August of 1999, when over 300 acres of grapevines infested with the glassy-winged sharpshooter were destroyed by Pierce's disease. Losses continued to mount in Temecula and other infested areas in following years, eventually exceeding 1,100 acres statewide by 2002.

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

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

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

An egg mass, nymph, and adult of the glassy-winged sharpshooter

Pierce's Disease and Glassy-winged Sharpshooter Distribution

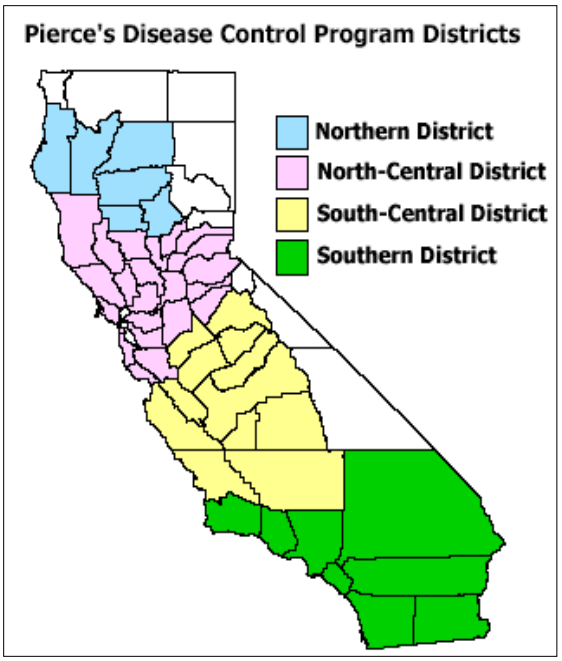
December 31, 2011

Program Description

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

1. **Contain the Spread**
   Prevent the spread of the GWSS to new areas of the state by regulating shipments of host plants and other host material.
2. **Statewide Survey and Detection**
   Find and monitor GWSS infestations and populations through trapping and visual survey.
3. **Rapid Response**
   Respond quickly to detections of GWSS in new areas by intensively surveying the area and applying treatments if necessary.
4. **Outreach**
   Raise awareness about Pierce's disease and its vectors while responding to the concerns of growers and the 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), county agricultural commissioners, the United States Department of Agriculture (USDA), the University of California and the California State Universities, other state and local agencies, industry, and agricultural organizations throughout the state.

A Statewide Coordinator directs the program in accordance with the policies and priorities established by the Secretary of CDFA. Program staff are located throughout the state and are responsible for coordinating and implementing the 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. Biological control agents

are produced in the CDFA laboratory facility in Arvin. Researchers throughout the state and elsewhere are under contract with CDFA, UC, and the USDA. 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 workplans developed by the county agricultural commissioners and submitted to CDFA for approval. As stated in the law (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 the accuracy and appropriateness of charges and expenditures.

Advisory Groups

Several groups advise the PDCP. These include the following:

Pierce's Disease and Glassy-winged Sharpshooter Board

The PD/GWSS Board is composed of representatives from the winegrape industry. It provides recommendations to the Secretary on the use of funds collected under the PD/GWSS winegrape assessment, a statewide value-based assessment which has raised approximately $40 million over the last nine years. The Board is advised by subcommittees established to focus on specific areas and issues.

Pierce's Disease Advisory Task Force

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

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

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

Pierce’s Disease Research Scientific Advisory Panel

The Pierce's Disease Research Scientific Advisory Panel is composed of university scientists with expertise in research areas directly applicable to Pierce's disease and its vectors. It provides input and expertise on the research effort.

Pierce's Disease Research Symposium Planning Group

The Pierce's Disease Research Symposium Planning Group is composed of representatives from the USDA, UC, CDFA, 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.

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.

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 of the state 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 bulk citrus shipments. Permanent program regulations were adopted in July 2003.

Nursery

Nursery stock is a high-risk commodity for spreading the glassy-winged sharpshooter. Approximately 70% of California's 12,000 licensed nurseries 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;
4. Inspection of nursery stock at receiving nurseries prior to sale; and
5. Trapping in and near nurseries shipping to infested areas.

Inspection Results

In 2011, there were 44,500 shipments of nursery stock from infested areas to uninfested areas. Viable life stages of GWSS were discovered on only four of these shipments.

Over 90% of all rejections between 2001 and 2011 have been for GWSS egg masses. The table on the right presents the results of the ongoing nursery inspection and shipment certification program.

YEAR	NUMBER OF SHIPMENTS	GWSS FOUND	% FREE OF GWSS
2001	57,600	149	99.74%
2002	65,800	77	99.88%
2003	65,000	40	99.94%
2004	76,700	64	99.92%
2005	72,600	84	99.88%
2006	69,000	47	99.93%
2007	73,100	46	99.94%
2008	62,600	37	99.94%
2009	53,700	23	99.96%
2010	50,600	6	99.99%
2011	44,500	4	99.99%

Regulated nursery shipment results

Enforcement Actions

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

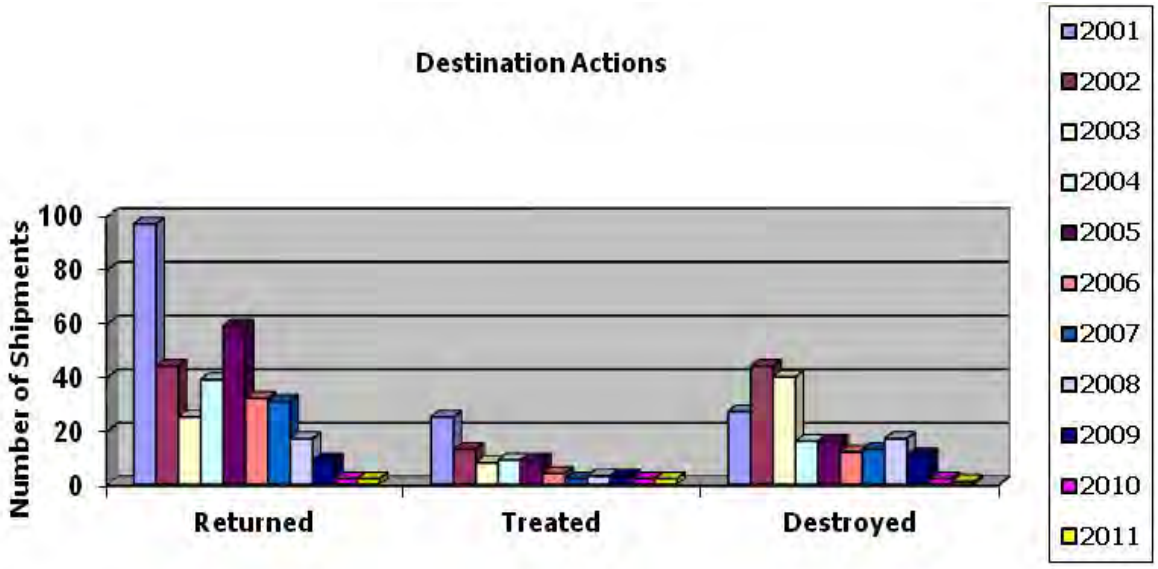
Actions that can be taken at the origin of nursery shipments consist of the following:

- ***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 consist of 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 2011, administrative penalties were levied against three companies, totaling $15,150.



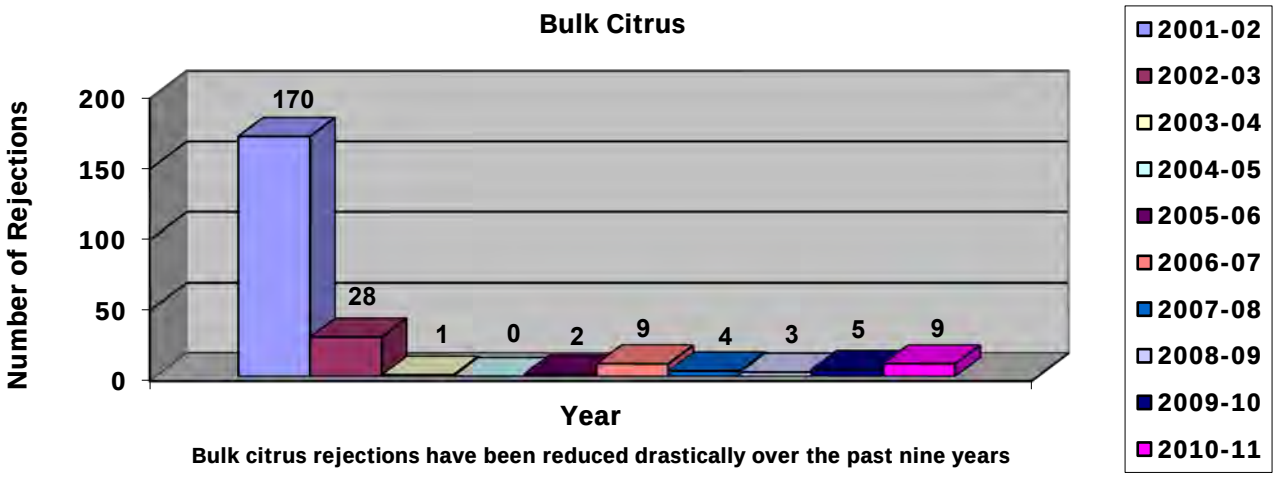
Nursery Stock Approved Treatment Program

The Nursery Stock Approved Treatment Program (ATP) began in June 2008. This program was implemented following the successful three-year Nursery Treatment Pilot Program. With the ATP, qualified nurseries are allowed to ship nursery stock, treated with selected materials, to non-infested areas without an origin inspection. In 2011 there were seven participating nurseries that shipped approximately 2.8 million plants in 8,986 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.

During the most recent citrus-shipping season (October 2010 through September 2011), live glassy-winged sharpshooters were found in only nine out of approximately 35,000 certified shipments of bulk citrus. This shipping season achieved a success rate of 99.99%**.** This success is attributed to the cooperative efforts of bulk citrus program participants.



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

Citrus harvest and inspections

Statewide Survey and Detection

The Statewide Survey and Detection element of the program is designed to locate new glassy-winged sharpshooter (GWSS) infestations quickly and verify that non-infested 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 are present. The program maintains an internet map server to quickly map and display discoveries of GWSS.

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

Each trap is checked bi-weekly and moved to a new location every six weeks. New traps are used as needed. Survey protocols were updated and distributed to each county participant in the spring of 2011.

A yellow panel trap in crape myrtle

Survey/detection and nursery training for County personnel

During 2011, program biologists provided survey and detection training to 394 employees from 37 counties and regional state employees. PDCP biologists assisted county personnel with field surveys and also conducted quality control (QC) inspections. These QC inspections are done to ensure that target insect recognition, trap placement, host selection, servicing schedules and record keeping are being performed at the desired levels.

Rapid Response

The Rapid Response element of the program involves responding quickly to new glassy-winged sharpshooter (GWSS) detections in partial or non-infested counties. When one or more GWSS are found in a new area, a delimitation survey is conducted by the county biologists and PDCP staff to determine if an infestation is present and, if so, to identify the boundaries. Treatments in urban and residential areas are applied under the supervision of the county agricultural commissioner and funded by the PDCP. In agricultural settings, treatments are the responsibility of the grower and must be conducted in a manner approved and supervised by the commissioner.

In 2011, GWSS was discovered in new areas of Madera County, the Madera Ranchos and Bonadelle Ranchos. After holding a public meeting, treatments were applied to both areas. In total, GWSS were found in 2011 on approximately 325 residential properties in the counties of Fresno, Madera, Santa Clara, San Luis Obispo, and Tulare. In response, approximately 5,750 properties (infested plus adjacent) were treated.

While no incipient infestations were eradicated in 2011, there still have been 15 statewide since the program's inception.

Visual surveys in response to a new find

Pre-Treatment Communication with Stakeholders

Specific steps are taken before an infested area is treated to ensure residents are properly advised and environmental concerns are addressed. A public meeting or other outreach effort for community members precedes treatment in urban and residential areas. This provides residents the opportunity to learn about and discuss the treatment process with program and environmental health 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, information on the material 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 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 GWSS. It is used in treatment programs in urban and residential settings and can be used for both foliar and soil injection applications.

The Environmental Monitoring Branch of the California Department of Pesticide Regulation has monitored pesticide treatments to determine resulting residue levels. This information is used by the PDCP to assess application rates and coverage. Sampling results and related monitoring reports are available on the Department of Pesticide Regulation's web site at http://www.cdpr.ca.gov/docs/emon/epests/gwss/.

Foliar spray of a bush in an infested area by a pest control operator

Outreach

The objective of the outreach effort is to raise awareness about the threat posed to agriculture and the environment by Pierce's disease and the glassy-winged sharpshooter. 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.

As the program has matured, the focus has included showing stakeholders the progress that has been made in finding a solution to the threat posed to the wine and grape industry by Pierce's disease.

In 2004, the PD/GWSS Board initiated a communication effort to keep winegrape growers informed about activities that are funded by the winegrape grower assessment. These efforts continued in 2011. Outreach efforts focused in part on informing growers about field trials currently being conducted to test possible solutions to Pierce's disease. A brochure, tabletop display, and short video presentations featuring the researchers and their field trials that were produced in 2010 continue to be used in presentations to winegrape grower groups and industry trade shows around the state.

Outreach keeps growers informed

In 2011, the e-newsletter with current information about Pierce's disease, the glassy-winged sharpshooter and the Pierce's Disease Control Program continued to be sent monthly to a list of over 1,000 interested stakeholders, with over 600 of those being California winegrape growers. It has proven useful for getting program information out in a timely manner to all stakeholders. Information from the e-newsletter was often reprinted in many of the wine trade publications verbatim. In addition to the monthly e-newsletter, a quarterly newsletter was produced and mailed directly to California's 7,000+ winegrape growers as well as other stakeholders.

The following materials were prepared or updated in 2011:

- Newsletters (1 each quarter)
- Web site message board
- Tabletop display/exhibit
- Videotaped researcher interviews
- Monthly e-newsletter
- Stock photography
- European grapevine moth (EGVM) web page
- EGVM flyer directed at home winemakers alerting them to the risk of accidently transporting the moth

With renewal of the PD/GWSS assessment, the PD/GWSS Board was also given the opportunity to fund research and outreach activities on other serious pests and diseases of winegrapes. During 2010, the PD/GWSS Board voted to make the European grapevine moth (EGVM) a designated pest of winegrapes.

One area of concern voiced by members of the board was the possible transportation of EGVM by home winemakers. To address this concern, an article was placed in the country's largest magazine directed at home winemakers *WineMaker Magazine*. Also, a flier alerting home winemakers of the risks of transporting EGVM and what steps to take to avoid that risk was created, and 15,000 copies were printed. Fliers were distributed to county agricultural commissioners, home winemaking clubs, and to home winemaker equipment suppliers. Web versions of the flier were also placed on several Internet websites, including the board's PD/GWSS Forum site.

Local County Outreach

This year, local county agricultural staff and industry members played key roles in maintaining program visibility and stakeholder awareness. County public outreach and education efforts included the distribution of PD and GWSS informational material to local retail, production and shipping nurseries, landscape companies, and members of the community. Industry trade publications, cooperative extension newsletters and media interviews also proved to be successful methods of outreach. Many counties participated in continuing education seminars and conducted training for landscapers, pest control operators, nursery employees, and nursery association members.

Media Coverage

In 2011, articles and reports about Pierce's disease and the glassy-winged sharpshooter continued to appear in print media, TV, radio, and Internet websites. While the coverage mainly focused on newly discovered infestations, the coverage helped to keep the threat on the minds of stakeholders and underlined the fact that PD/GWSS was still a very real threat. There was also coverage in the wine industry publications of the board's new ability to designate other pests and diseases that threaten the wine industry and the process undertaken to do so.

Research Symposium

The annual Pierce's Disease Research Symposium provided a venue for researchers and growers to interact and share information, facilitating the communication of research progress and potential.

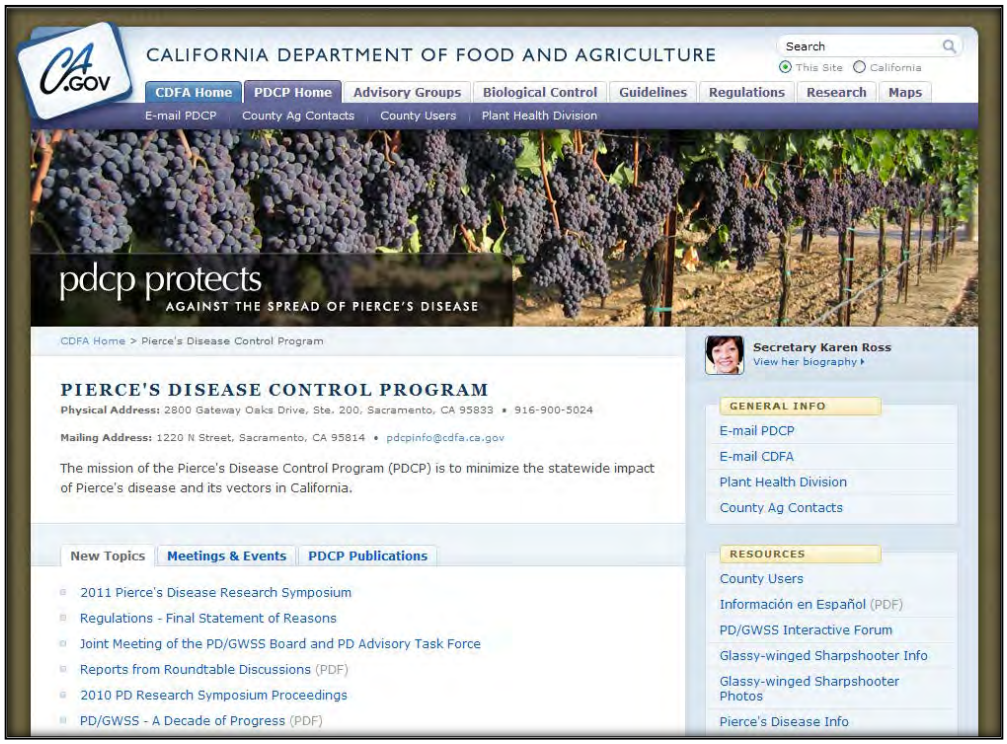
Attendees viewing scientific posters at the 2011 Research Symposium

Media Coverage

In 2011, articles and reports about Pierce's disease and the glassy-winged sharpshooter continued to appear in print media, radio, and Internet web sites. The coverage has included many statements and information generated by the PD/GWSS Board Outreach and Education Program.

Web Site

In March 2000, the CDFA activated a highly successful web site focused on Pierce's disease and the glassy-winged sharpshooter. It features information on program activities, survey guidelines, regulatory guidelines, announcements of upcoming meetings and events, the GWSS host list, and other information. In addition, the web site provides an interactive interface that allows direct activity reporting by local entities. This web site is located on the Internet at: www.cdfa.ca.gov/pdcp and in 2011 continued to be used as an effective tool for providing current and reliable information to interested parties.



A snapshot from the Pierce's Disease Control Program's website

Research

Research continues to be an integral part of the Pierce's Disease Control Program (PDCP). In 2011, the flurry of research activity that began at the start of the program continued with approximately 23 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 area-wide projects in major agricultural areas. The information generated provided valuable insight into the biology, ecology, and behavior of Pierce's disease and its vectors.

The extensive and sustained research effort on Pierce's disease has yielded discoveries and approaches that show good potential for leading to solutions to this serious disease problem. These include using conventional plant-breeding methods to develop disease-resistant grapevines; using nonvirulent strains of *Xylella fastidiosa* to displace and outcompete pathogenic strains; identifying the mechanisms and processes leading to bacterial infection and spread; and elucidating the biochemical pathways which result in disease symptoms and death. Scientists have developed plant metabolites that block damage-causing pathways and processes, and are experimenting with ways to introduce them into the plants via specially-developed rootstocks, topical applications, and other means. Field testing of these new technologies began in 2010. Looking back, it is clear that solutions are getting very close relative to where we were 12 years ago.

Research Symposium

Every year the PDCP organizes a research symposium focused on Pierce's disease and its vectors. Approximately 100 people attend these meetings to share information and learn more about the progress being made against Pierce's disease. The 2011 symposium was held in mid-December in Sacramento.

A compendium of research progress reports is prepared each year and distributed at the symposium. This document, known as the Proceedings, can be accessed electronically on the program's web site (http://www.cdfa.ca.gov/pdcp/Research.html).

The 2011 Proceedings contained 48 research progress reports

Research Proposal Solicitation and Review

In 2011, the PDCP coordinated its research proposal solicitation and review process with the University of California's Pierce's Disease Grant Program. A total of 26 proposals were received and reviewed, with CDFA managing ad hoc reviews and the University of California managing panel reviews. Based on the feedback received during this extensive vetting process, nine research projects totaling $1,177,507 were selected for funding by CDFA using winegrape assessment funds. In addition, 13 ongoing projects were approved to receive continued funding in the coming fiscal year.

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Area-wide Management Programs

The area-wide management programs coordinate insecticidal treatments in commercial citrus blocks around grapes and other agricultural commodities.

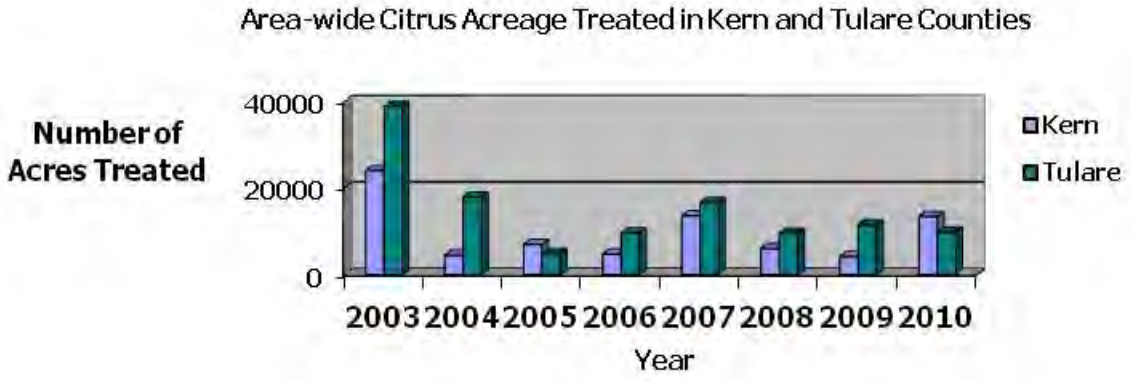
Kern County

The Kern County Area-wide Management Program has proven to be successful at dramatically reducing GWSS populations and was therefore utilized as the model for area-wide programs in Fresno, Riverside, and Tulare counties. Monitoring for GWSS and PD is occurring throughout most of these project areas.

In 2011, the boundaries of the Kern County infested area remained the same as in 2010. The infested area includes agricultural lands as well as the city of Bakersfield and several smaller Kern County communities. There were 17,350 acres of citrus authorized to treat in 2011, compared to 13,383 acres treated in 2010. The wetter-than-average spring of 2011 delayed spring applications. More GWSS were trapped in 2011 than in the prior year, and this population correlated with more acres treated than in 2010.

Tulare County

The infested area in Tulare County has not expanded since 2004. In 2010, the number of GWSS detected was slightly higher than in the prior year. Consequently, there were more acres of citrus authorized to treat in 2011 compared to 2010 (11,713 acres vs. 9,866 acres, respectively).



Fresno County

In the summer of 2003, Fresno County implemented area-wide trapping for GWSS in citrus groves. In 2011 traps were added to grapes near the infested area and the San Joaquin River. There were 39 trap finds in citrus and grapes in 2011, compared to five in 2010. About 457 acres of citrus were authorized to treat in 2011

Riverside County - Coachella Valley

In 2011, traps continued to be monitored on a 1/4 mile grid system in the Coachella Valley management program. A total of 1,694 acres of citrus were treated with imidacloprid (Admire Pro) using chemigation. Treatments were initiated in late April and concluded by June.

Riverside County - Temecula Valley

In the Temecula Valley management program, a total of 743.75 acres of citrus were treated with imidacloprid (Admire Pro) by chemigation and 18.5 acres treated by soil drench. Additionally, pyrethrum (PyGanic) was applied to 13 acres of organic citrus. The 2011 treatments were initiated in late April and concluded by June.

Epidemiology Projects

The epidemiological patterns for Pierce's disease (PD) are fundamentally different in northern California when compared to southern California. Previous research projects have led to the development of control methods in southern California that enable growers to grow grapevines without significant losses to PD. These temporary control methods can likely sustain and protect the industry until more robust control technologies are developed. Similar projects in northern California are at an earlier stage of development.

Pierce's Disease Management in Southern California

Cooperative epidemiological research conducted following the severe Temecula PD epidemic of the late 1990s led to the development of an effective PD control protocol. This protocol involves the following three steps: (1) applying a systemic neonicotinoid insecticide such as imidacloprid in mid-May; (2) monitoring vineyards for diseased vines and removing them; and (3) maintaining an area-wide GWSS management program to prevent large GWSS population outbreaks. The success of this program has led to significant new investments in vineyards, wineries and resorts, along with an increase in tourism activity in the Temecula area over the last nine years.

2011 was the second season of a multi-year project at UC Riverside to quantify the benefits and practices of this management program. The preliminary results indicate vineyards that have regularly adhered to the systemic insecticide treatment program for the last nine years have had very little incidence of PD. Vineyards that have not fully employed the management protocol have had variable results, and many of these vineyard operations suffer significant economic loss from PD. This new project is leading to a more refined understanding of the costs and benefits of good PD/GWSS management, and will enable growers to make better informed management decisions to avoid economic losses.

At UC Riverside, two other research projects are aimed at specific components of PD control programs. The first one is developing more cost-effective and improved techniques to monitor sharpshooters and their parasitoids. Parasitic wasps attack the eggs of GWSS. These parasitic wasps are produced in CDFA rearing facilities and released into both urban and agricultural settings to help control sharpshooter populations. The monitoring techniques being developed will improve the assessment of the effectiveness of these wasps by providing more reliable, accurate, and less expensive methods for determining parasitism rates.

Another project is assessing other insecticides. The effective control of PD in the Temecula area and other parts of southern California is based on the timed and efficient use of systemic insecticides that are derivatives of nicotine, called neonicotinoids. There

are several insecticides in this class, many of which have not yet been thoroughly tested for their effectiveness against GWSS. In the lab and the greenhouse, researchers are evaluating the action of some of these compounds to establish the effective application rates needed to kill GWSS nymphs and adults feeding on a vine.

Pierce's Disease Management in Northern California

There is a fundamental difference between the epidemiology of PD in northern California versus southern California. Both areas have a window of vulnerability during part of the growing season. Transmissions and new infections acquired during this vulnerable window will progress to disease and eventual death of the vine. The window of vulnerability in northern California is the first six to 10 weeks after bud break, which is earlier than the window of vulnerability in southern California (June through August). Systemic insecticides are the most effective management protocol in southern California since they protect the vines against disease transmission during the vulnerable window of time.

In 2008, a new project was begun to find ways to protect the vineyards in Sonoma County by applying modified methods that have proven successful in Temecula. Modification was necessary to accommodate the earlier window of vulnerability in the north. The challenge is to find a way to introduce the systemic chemical into the vines during the early part of the growing season to protect them during the first 10 weeks after bud break. This project is in its third season, and will continue for at least an additional year.

Pierce's Disease Management Using a Bio-Protective Strain of *Xylella fastidiosa*

California field trials were continued in 2011 to test a microbial bio-control system to prevent damage from PD, using a benign strain of *Xylella fastidiosa (Xf)* that does not cause Pierce's disease. In Florida during field trials over the last 13 years, this strain protected grapevines from the virulent strains of *Xf*, thus preventing the development of PD.

The field trials in California are being conducted in Napa, Riverside, and Sonoma counties. The test plots are located in commercial vineyards where losses from PD are high.

The early results from these plots show a reduction of PD in the vines with the bio-control strain. Another test of the bio-control system is using cuttings from plants infected with the bio-control strain for grafting. Early results suggest this may be an effective way to produce grapevines hosting the bio-protective strain of *Xf*.

Biological Control

Biological control is the use of natural enemies of a pest to control pest populations. Since 2001, the Pierce's Disease Control Program (PDCP) has included biological control as part of its integrated pest management approach to controlling glassy-winged sharpshooter (GWSS). A total of 2.3 million biological control agents have been released against the GWSS during this time period. The biological control agents raised and released are tiny wasps which lay their eggs inside the eggs of GWSS. When the wasp egg hatches, the larva feeds on and kills the developing GWSS. In 2011, four species of these tiny wasps were raised and released against the GWSS: *Gonatocerus ashmeadi, G. morgani, G. morrilli, and G. triguttatus.*

In 2011, almost 200,000 biological control agents were released at 58 sites in 11 counties (**Table 1**). The sites were visited on a regular basis to make releases and monitor the status of the biological control agents.

County	*G. ashmeadi*	*G. morrilli*	*G. triguttatus*	*G. morgani*	*TOTAL*
Fresno	135	14,688	11,382	3,444	**29,649**
Imperial	104	962	603	763	**2,432**
Kern	0	17,320	14,600	6,903	**38,823**
Los Angeles	391	1,891	815	643	**3,740**
Madera	0	230	985	300	**1,515**
Orange	178	1,405	1,512	0	**3,095**
Riverside	818	5,433	3,800	2,287	**12,338**
San Bernardino	500	3,483	4,161	1,763	**9,907**
San Diego	142	1,877	905	784	**3,708**
Tulare	0	11,017	8,365	2,132	**21,514**
Ventura	0	32,338	21,316	16,635	**70,289**
Total for 2011	**2,268**	**90,644**	**68,444**	**35,654**	**197,010**
Total since 2000	**186,866**	**480,577**	**1,116,551**	**101,900**	**2,303,255**

Table 1. GWSS biological control agents released in California, 2011. Includes releases of three other species of wasps not used in 2010 [*G. fasciatus* (350,294), *G. walkerjonesi* (59,582), *Anagrus epos* (7,485)], and releases made by UC researchers in 2000.

The PDCP's Biological Control Group has been working with and collecting information on biological control agents for 11 years. This has resulted in a large data set that can be used to better understand geographical and spatial patterns of GWSS parasitism in California. Natural enemies can be seen to play an important role throughout the year (**Figure 1**), with over 80% of all eggs laid by GWSS being killed by the time winter draws on. **Figure 2** presents a more detailed look at the population levels of biological control agents in 2011.

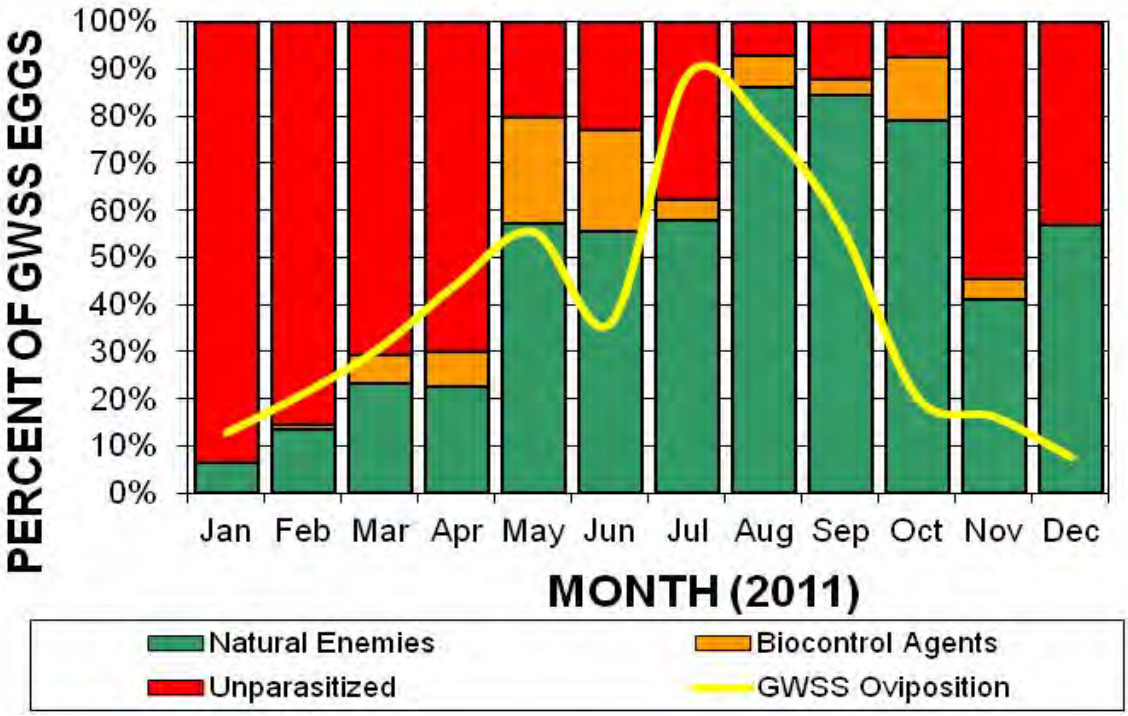


Figure 1. **Parasitism status of GWSS egg masses by month in 2011**

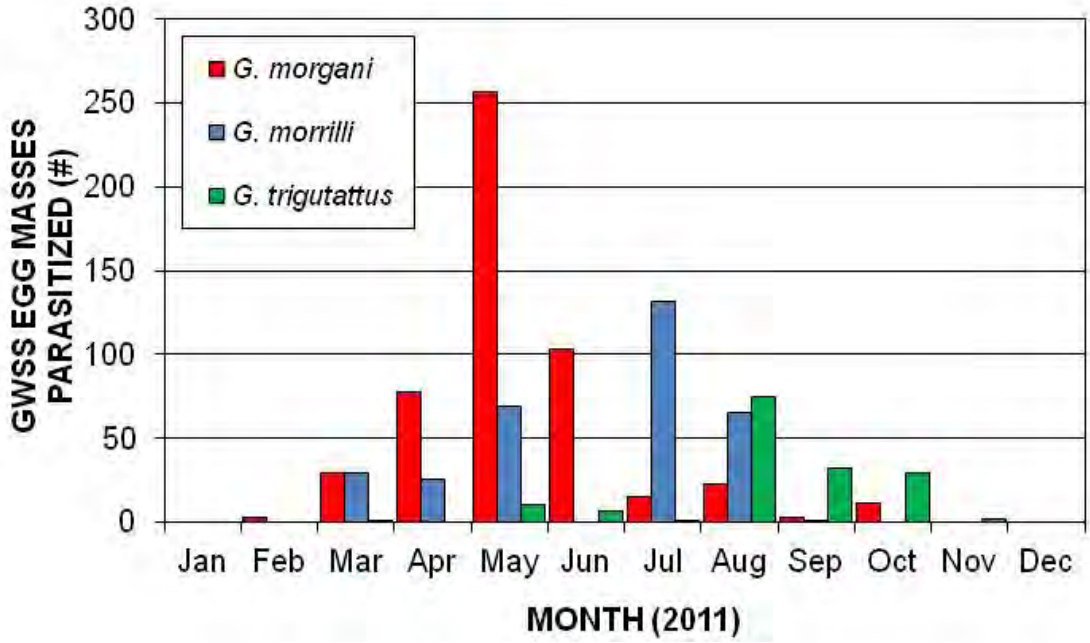
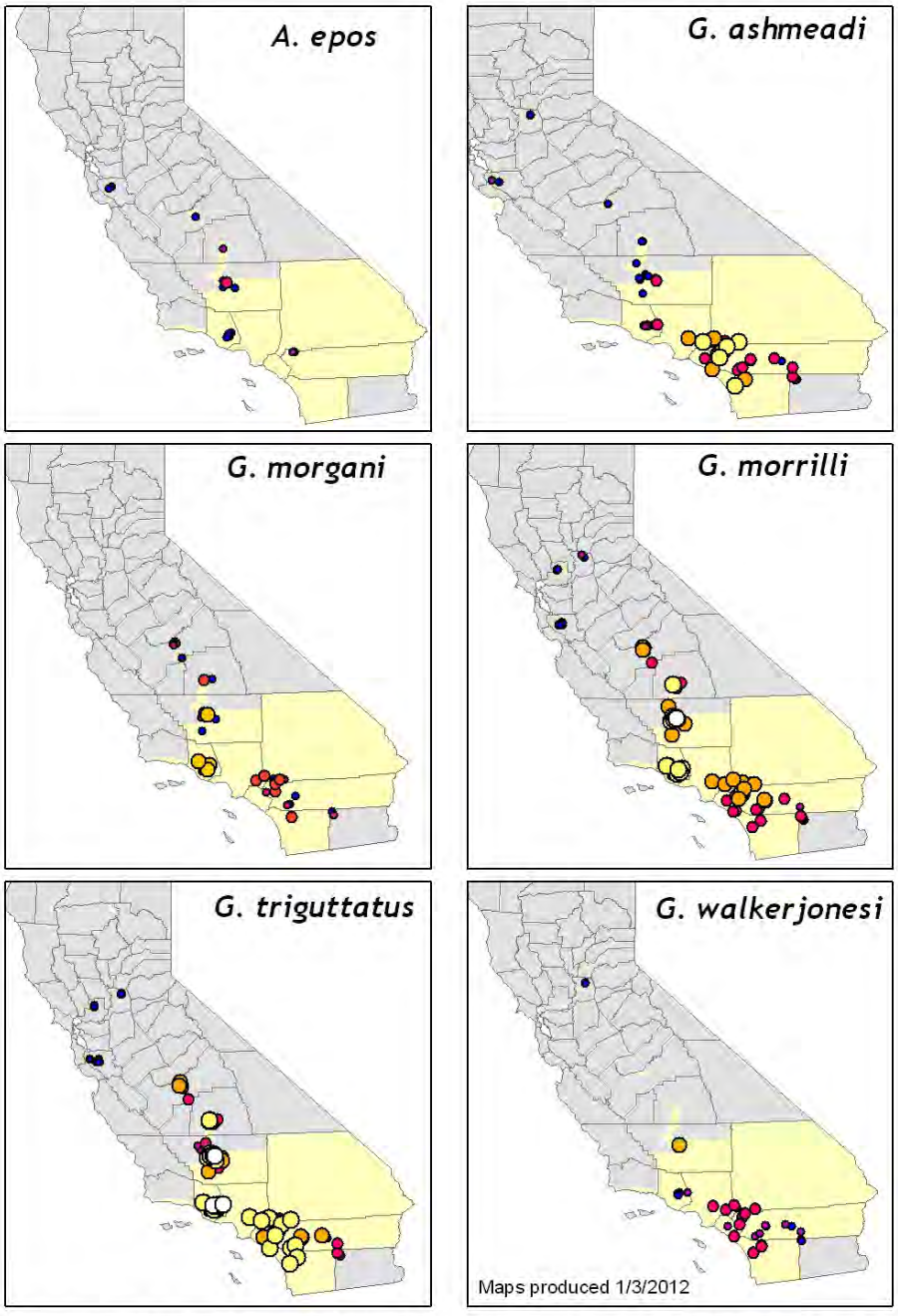


Figure 2. Monthly recoveries of parasitized GWSS egg masses during 2011

Figure 2 shows that *G. morgani* built up populations more rapidly early in the season but then declined in number, possibly as a consequence of being out-competed by natural enemies such as *G. ashmeadi*. Populations of *G. triguttatus* built up slowly throughout the year but *G. morrilli* built up populations exponentially throughout the year in a way that seems to be more an effect of temperature than host populations, unlike the other biological control agents that show strong host density dependence.

Biological Control Release Sites



Total # of Insects For Biological Control of Glassly-winged Sharpshooter (GWSS) in California 2001-2011

30- 500 | 501 - 2,000 | 2,001 - 5,000 | 5,001 - 10,000 | 10,001 - 25,000 | Over 25,001

A = Anagrus G = Gonatocerus

Environmental Compliance

In 2011, the California Department of Food and Agriculture (CDFA) continued its efforts to ensure that the Pierce's Disease Control Program (PDCP) is conducted in an environmentally responsible manner. These efforts include adhering to a special notification and consultation process with federal and state environmental stewardship agencies prior to treatment and ensuring that pesticide applications are performed by licensed pest control professionals in strict accordance with pesticide laws and regulations.

In October 2011 the CDFA obtained a permit from the California State Water Resources Control Board for biological and residual pesticide discharges to waters of the United States from spray applications. The permit was obtained to meet the requirements of the National Pollutant Discharge Elimination System. In compliance with that permit, the PDCP is now posting notifications of program-related pesticide applications on a CDFA webpage established for that purpose.

A statewide programmatic environmental impact report (EIR) was released for the PDCP in mid-2003. A legal challenge was filed against the EIR shortly thereafter. Although a trial court found the EIR to be adequate, the State Appeals Court later reversed the trial court's ruling. In 2010, the CDFA contracted with an environmental consulting firm and began preparing the environmental analyses, documents, and risk assessments called for by the Appeals Court. Efforts on this project continued in 2011 and will continue in 2012.

Financial Statement

PIERCE'S DISEASE CONTROL PROGRAM

FISCAL YEAR	2010-11	2011-12
REVENUE		
State (Budget Act)	$ 3,836,531	$ 0
Federal (USDA)	$ 15,694,608	$ 15,658,433
PD/GWSS Board	$167,888	$ 1,209,868
Total Revenue	$ 19,698,917	$ 16,868,301
EXPENDITURES		
Personal Services	$ 3,409,956	$ 3,088,870
Operating Expenses	$ 2,429,797	$ 2,055,394
County Payments	$ 12,007,893	$ 11,724,037
Total Expenditures	$ 17,847,646	$ 16,868,301

Abbreviations and Acronyms

CACASA	California Agricultural Commissioners and Sealers Association
CDFA	California Department of Food & Agriculture
EGVM	European Grape Vine Moth
EIR	Environmental Impact Report
GWSS	Glassy-winged Sharpshooter
PD	Pierce's disease
PD/GWSS Board	Pierce's Disease and Glassy-winged Sharpshooter Board
PDCP	Pierce's Disease Control Program
UC	University of California
USDA	United States Department of Agriculture
Xf	*Xylella fastidiosa*