Pierce's Disease Control Program

2015
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 2015

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Statement of the Secretary

Fifteen years ago, in the Pierce's Disease Control Program's first report to the California Legislature, my predecessor Bill Lyons, Jr. wrote, "In the long term, we hope that research will provide management tools to control the disease. I look forward to continuing to expand the partnership that is making this program a success." At the time, I was serving as the president of the California Association of Winegrape Growers and the threat of Pierce's disease (PD) loomed large. There were so many unknowns then; so much basic research to do just to understand the biology of the pest and the mechanism of disease transmission. Yet, even at that early stage, there's a clear and distinct note of confidence in that quote. Our leadership was confident in the power of science to solve even a problem of this magnitude and complexity – and the reason behind that confidence was the partnership that had quickly coalesced behind such a momentous and urgent issue.

That partnership continues to evolve, and it continues to be the key to this program's success. Science has, indeed, put solutions within reach. PD-resistant vines are on the cusp of commercial availability, and researchers continue their progress toward other options that may prove important in the future. The time it took to do that work would not have been enough if it hadn't been for the highly-coordinated and cooperative work of a wide range of people, starting with the farmers themselves – not just grape growers and winemakers but also nursery, citrus and other key commodity groups along the way. The governmental roles at the federal, state and local levels are fairly self-explanatory, and we have also leaned heavily on offices like the UC Cooperative Extension and even local master gardeners in this program. In each community that is a part of our program, there are also local officials such as our agricultural commissioners, as well as non-governmental organizations and others who have joined us as stakeholders and helped us ensure success and progress. It would be nearly impossible to name them all, and that in itself is a sign of our success.

The work of the Pierce's Disease Control Program is not finished, but its success thus far is highly encouraging. We still have puzzles to solve, including the return of high pest pressure in some infested areas, requiring our prompt and focused attention. I look forward – with confidence – to the solutions yet to come.

Karen Ross, Secretary
California Department of Food and Agriculture

Executive Summary

When the glassy-winged sharpshooter (GWSS) arrived in California it had few natural enemies; left unchecked, its populations built up rapidly. Unfortunately, this insect was found to be an aggressive vector of Pierce's disease (PD). Before much was understood about the GWSS, acres of grapevines began dying in southern California due to the combination of PD and its new vector.

With the future of the wine grape industry in the balance, and with the essential cooperation of that industry, the California Department of Food and Agriculture (CDFA) responded in the year 2000 to the threat of PD and GWSS with the creation of the Pierce's Disease Control Program (PDCP). The five major components of the program (contain the spread; statewide survey and detection; rapid response; outreach; and research) have been sufficiently effective to make the PDCP a model for subsequent pest prevention and response programs. The PDCP also developed a biological control program that rears and releases tens of thousands of natural enemies each year that help reduce glassy-winged sharpshooter populations.

California has experienced greater incidence of Pierce's disease and increased populations of the GWSS during the past year. Researchers are investigating several causal theories including climate change, insecticide resistance, and new vectors. Warmer winters have led to an increase in the number of GWSS generations and also influenced a new uptick in PD in Northern California.

The PDCP relies upon federal assistance and wine grape assessments that fund operations and research. The Pierce's Disease and Glassy-winged Sharpshooter Board advises on the use of assessment funds and has been instrumental in funding scientific research to develop lasting solutions to Pierce's disease and its vectors. The PDCP also relies upon the network of state, federal, and county agencies along with private entities and stakeholders that together have built a viable and successful program.

Background

The Threat

Pierce's Disease (PD) is a fatal bacterial disease of grapevines that is spread by certain types of insects, such as leafhoppers. It has been present in California for more than 100 years and in the past has caused sizable losses to viticulture in localized "hotspot" areas of the state. Until recently, it did not pose a severe threat to the majority of areas under grape production. This situation changed dramatically with the arrival of the glassy-winged sharpshooter (GWSS), an aggressive insect vector of Pierce's disease. Because of this insect, 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 $5.59 billion and associated economic activity within California in excess of $61.5 billion. Other crop and ornamental plant resources such as almonds ($5.77 billion) and susceptible types of citrus ($742 million), stone fruits ($646 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 PDCP was established within the CDFA to minimize the statewide impact of PD.

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* that kills grapevines by 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. 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 PD.

Vines and leaves 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 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.

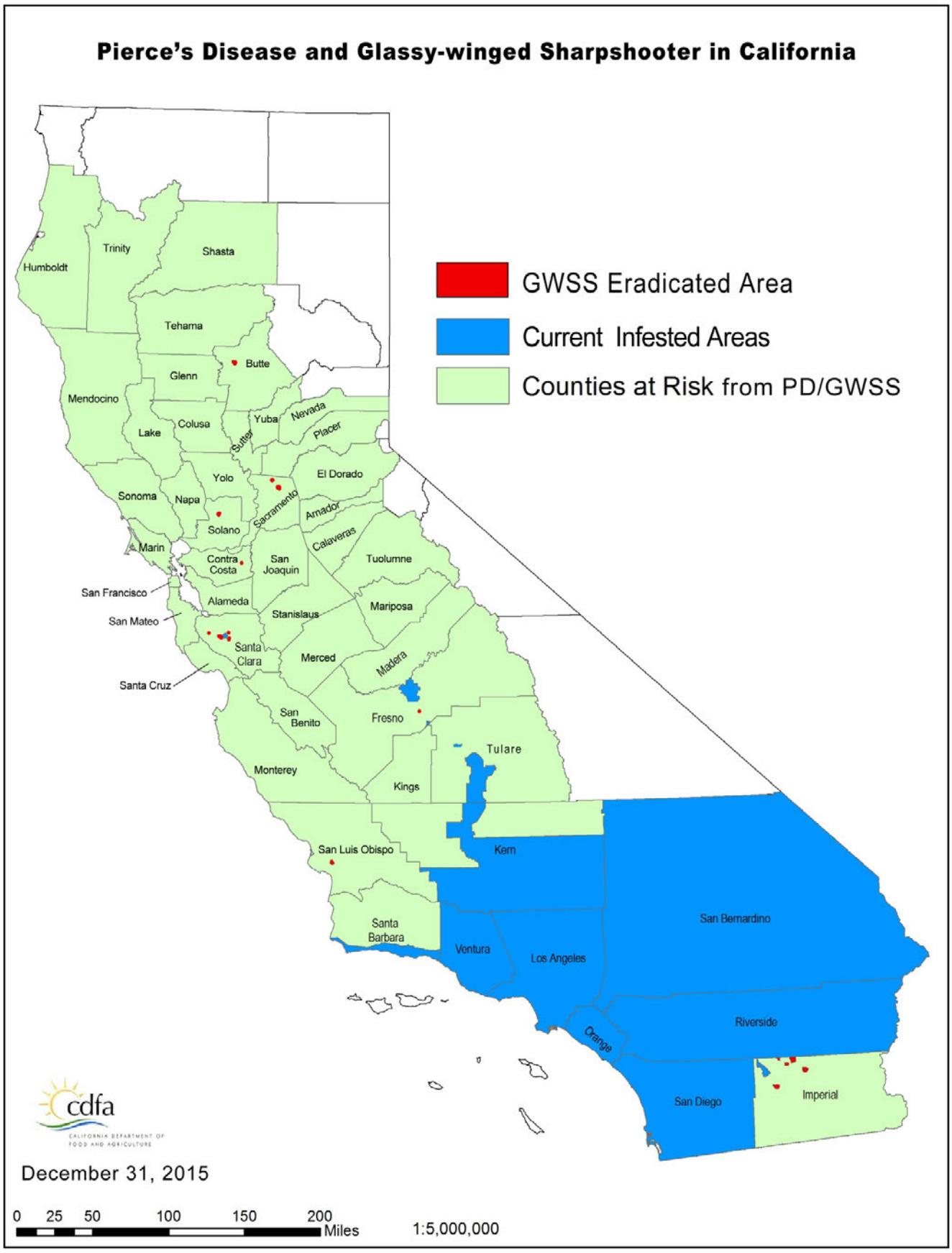
California's first indication of the severe threat posed by this new disease and vector combination occurred in Temecula, Riverside County, in August of 1999, when over 300 acres of grapevines infested with GWSS were destroyed by PD. Losses continued to mount in Temecula and other infested areas in following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

The GWSS clearly has the potential to increase both the incidence and severity of PD 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 PD and the GWSS 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 female glassy-winged sharpshooter


Pierce's Disease and Glassy-winged Sharpshooter in California
GWSS Eradicated Area
Current Infested Areas
Counties at Risk from PD/GWSS
Humboldt
Trinity
Shasta
Tehama
Butte
Glenn
Mendocino
Colusa
Lake
Yuba
Nevada
Sutter
Placer
Yolo
El Dorado
Sonoma
Napa
Sacramento
Amador
Solano
Calaveras
Marin
Contra Costa
San Joaquin
Tuolumne
San Francisco
Alameda
Stanislaus
Mariposa
San Mateo
Santa Clara
Merced
Madera
Santa Cruz
San Benito
Fresno
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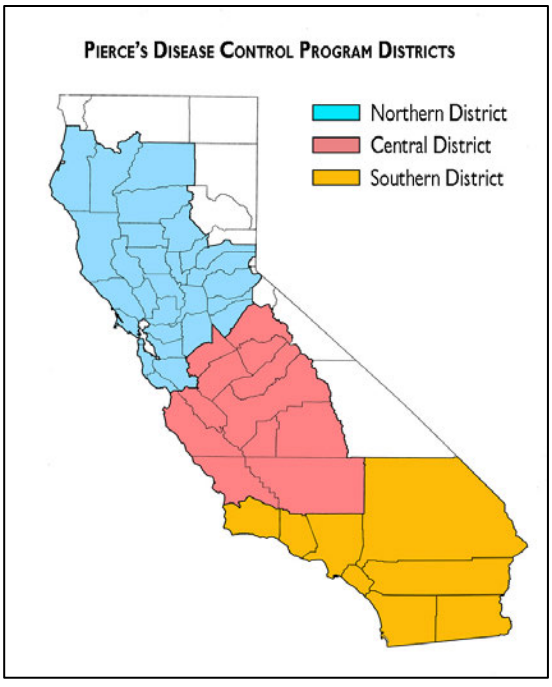
Program Description

The Pierce's Disease Control Program (PDCP) works to minimize the impact of Pierce's disease (PD) in California. The strategy is to slow or stop the spread of the GWSS while short- and long-term solutions to PD are developed. This strategy relies upon the following five elements:

1. **Contain the Spread**
   Prevent the spread of the Glassy-winged sharpshooter (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 PD and its vectors while responding to the concerns of growers and the public.
5. **Research**
   Develop solutions to PD 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 (UC), 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 the CDFA. Program staff are located throughout the state and are responsible for coordinating and implementing the elements of the program. 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 conduct research geared towards finding solutions to PD.

County Workplans

The County Agricultural Commissioners are responsible for conducting local Pierce's Disease Control Program activities. These activities are guided by workplans developed by the County Agricultural Commissioners and submitted to the California Department of Food and Agriculture 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 PD 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 the 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 Pierce's Disease and Glassy-winged Sharpshooter (PD/GWSS) Board is composed of 14 representatives from the winegrape industry, plus one member from the public. It provides recommendations to the Secretary of CDFA on the use of funds collected under the PD/GWSS winegrape assessment, a statewide value-based assessment which has raised approximately $50 million over the last 14 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 reviews program progress and develops 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 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, industry and the CDFA. This group assists with planning the annual Research Symposium by providing input on the format, content, and schedule of the event.

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

The California Agricultural Commissioners and Sealers Association (CACASA)/GWSS 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 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 (GWSS) 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 GWSS. Approximately 60% of California's 12,000 licensed nurseries are located in sharpshooter-infested counties. Many of these nurseries ship to the non-infested areas of the state. Activities to mitigate the risk of moving the 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 non-infested areas.

Inspection Results

In 2015, there were 38,000 shipments of nursery stock from infested areas to non-infested areas. Viable life stages of GWSS were discovered in only six of these shipments. Origin county inspectors stopped 150 egg masses, three nymphs, and 13 adults from moving in nursery stock shipments.

Over 90% of all rejections between 2001 and 2015 have been for viable 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%
2012	44,600	2	99.99%
2013	45,800	6	99.99%
2014	44,000	12	99.97%
2015	38,000	6	99.98%

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.

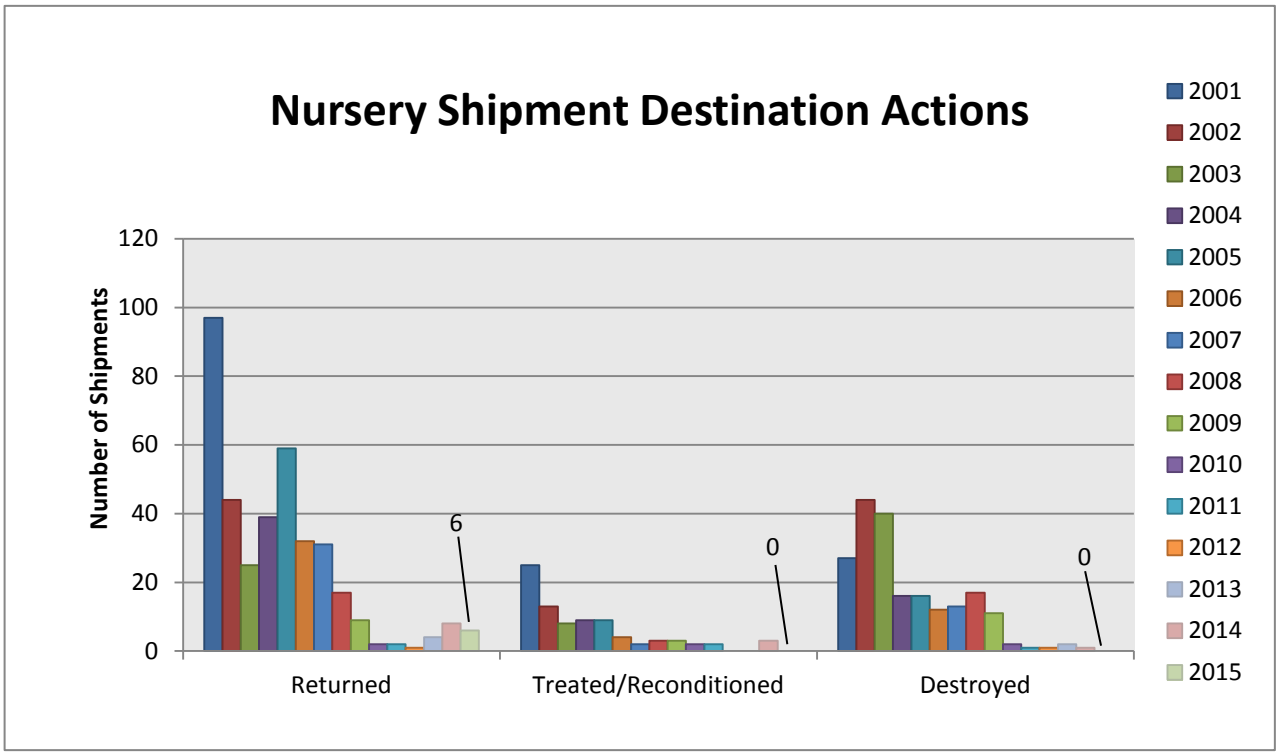
Actions that can be taken at the origin of nursery shipments consist of the following:

- ***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 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 2015, administrative penalties were levied against two companies, totaling $4,750.



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 specified materials, to non-infested areas without an origin inspection. These materials are 100% efficacious at killing emerging GWSS nymphs.

In 2015 there were eight participating nurseries that shipped approximately 2.43 million plants in 10,179 shipments. There were a total of 27 yards associated with these eight nurseries. Forty-five counties received plant material from ATP nurseries, with no viable GWSS detected in any shipments.

Trapping is conducted in ATP nurseries to ensure pest free standards are met. Yard traps are maintained at two traps per acre in all ATP nurseries. If a trap exceeds the threshold of 10 GWSS within a two-week period, then all host plant material within a 100-foot radius is placed on hold and must be treated within five days. If a hold treatment is not conducted within five days, plants within the 100 foot radius will be held for a minimum of two weeks from the time the treatment is made.

All trapping is conducted by county or PDCP staff. Results from the 2015 trapping efforts are as follows:

Number of Nursery Yards	Number of Nursery Acres	Number of Traps Deployed	Number of Traps with >10 GWSS
27	1,376	2,937	347

Nursery stock being shipped under this program must be treated with carbaryl or fenpropathrin. All treatments are witnessed by licensed county inspectors. Additional monitoring of treatments includes quality control checks by PDCP staff using water-sensitive paper. Yellow sheets of water-sensitive paper are placed within the nursery stock shipment at various heights and locations. After treatment, the sheets are checked to see if they were hit by the pesticide. When the pesticide droplets make contact with the paper, it turns from yellow to blue. In 2015, PDCP staff placed water-sensitive paper at each participating nursery a minimum of once a month. Out of 260 water-sensitive papers inspected only five indicated the need for retreatment of the shipment.

Water sensitive paper

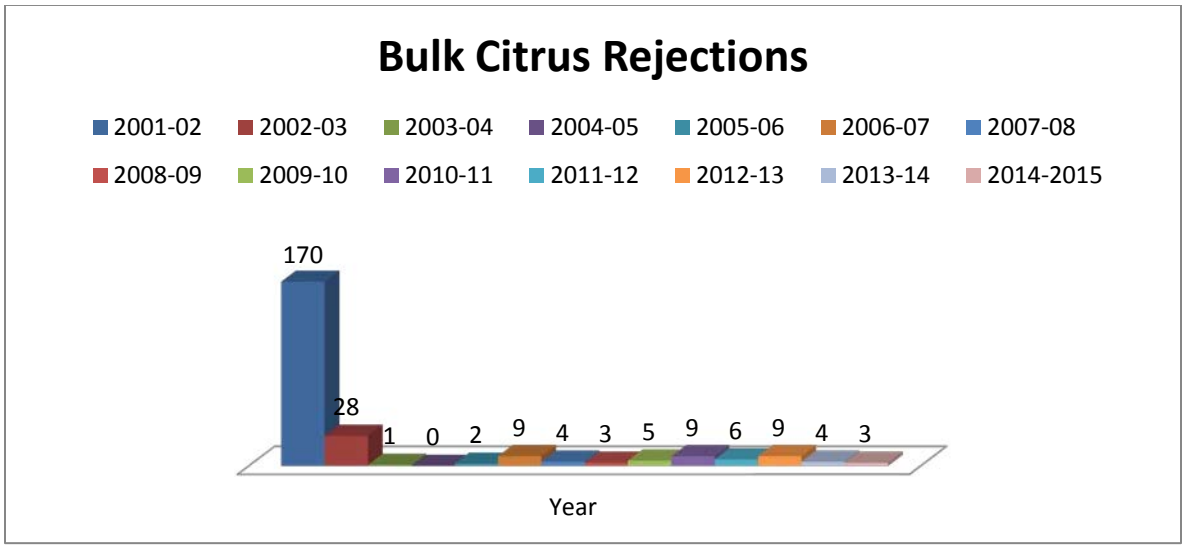
Insect rearing sleeve

Under the ATP program, county inspectors may choose to monitor GWSS egg masses found at destination on treated shipments of nursery stock. In 2015, a total of 18 egg masses from five ATP yards were monitored in insect rearing sleeves by destination counties. There was no viable GWSS emergence.

Bulk Citrus

Citrus trees are primary hosts for the GWSS 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 2014 through September 2015), live GWSS were found in only three 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.



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 confirm that non-infested areas remain free of infestation.

The activities of this element focus on systematically trapping urban 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.

GWSS are detected by using yellow panel traps that are deployed in 43 counties that are not infested or are only partially infested with GWSS. The GWSS are attracted to the trap's bright yellow color and become stuck on the adhesive surface. County and state personnel service traps on a regular basis during the trapping season.

Yellow panel trap in crape myrtle

Each trap is checked every second or third week 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 2015.

Survey/detection and nursery training for County personnel

During 2015, Program staff provided detection training to 359 employees from 38 counties, CDFA, ATP participating nurseries, and citrus packing houses. PDCP staff assisted county personnel with field surveys and also conducted quality control inspections of County trapping programs. These 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 partially-infested or non-infested counties. When one or more GWSS are found in a new area, a delimitation survey is conducted by County biologists, often with Pierce's Disease Control Program (PDCP) assistance, to determine if an infestation is present and, if so, to identify the boundaries of the infestation. Treatments in urban and residential areas are applied under the supervision of the County Agricultural Commissioner and funded by the PDCP, using winegrape assessment funds. In agricultural settings, treatments are the responsibility of the grower and must be conducted in a manner approved and supervised by the County Agricultural Commissioner.

In 2015, one new GWSS infestation was found in the partially-infested county of Fresno in the city of Sanger. In total, GWSS were found on approximately 850 residential properties in the partially-infested counties of Fresno, Madera, Santa Clara, and Tulare. In response, approximately 5,820 properties (infested plus adjacents) were treated.

Visual surveys are conducted in response to new glassy-winged sharpshooter finds

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 efforts 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, advance 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 Wildlife, 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 the GWSS. It is used in treatment programs in urban and residential settings and can be used for both foliar and soil treatment 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 treatment of a tree in a glassy-winged sharpshooter infested area by a pest control operator

Outreach

The Outreach element of the Program is designed to raise awareness about Pierce's disease (PD) and its vectors while responding to the concerns of growers and the general public. There are two outreach efforts, one conducted by the County Agricultural Commissioners and the Pierce's Control Program (PDCP) for the benefit of regulated and affected commodity groups and the general public, and the other by the Pierce's Disease/Glassy-winged sharpshooter (PD/GWSS) Board to keep winegrape growers in California informed of research and program activities.

2015 saw the winegrape assessment renewed with nearly 84 percent of California's winegrape growers voting to extend it for another five years.

THE ASSESSMENT VOTE

Conducting at vote every five years gives California's winegrape growers the opportunity to determine whether or not they wish to continue paying the assessment and the program, activities, and services which it supports. To be valid, at least 40 percent of the growers had to participate in the referendum, and specific thresholds had to be reached for the assessment to continue. In late 2014 reminders were sent to all the wine media about the upcoming vote in 2015. As the timeline for the vote progressed, details of how the vote would work were sent out to the wine and grower media, posted on the PD/GWSS Board Facebook page, published in the PD/GWSS Board newsletter and sent out in the monthly e-newsletter. A special effort was made to keep local winegrape grower associations around the state updated with details about the vote so they could communicate directly with their members. When the final votes were tallied, a special e-newsletter was sent out informing the winegrape grower community and the wine press of the results. Information about the vote was also published in the summer PD/GWSS Board newsletter.

RESEARCH MILESTONES

2015 saw a number of research milestones achieved, including completion of the first phase of field trials of modified PD resistant rootstocks, the release of traditionally-bred winegrapes and their rootstocks to UC Davis' Foundation Plant Services and continued testing of a benign strain of *Xylella fastidiosa* and a mixture of bacteriophages (viruses that attack bacteria) to control PD. These continued successes of the program were highlighted in a brochure, a trade show display and videos. A brochure entitled "Pierce's Disease: 15 Years of Success," an infographic timeline highlighting some of the major successes of the program over the last 15 years, was completed in late 2014. This brochure was sent to all the winegrape growers and other stakeholders in the first quarter of 2015. The version of the infographic featured in the brochure was also added to the trade show display.

PD/GWSS Information Booth

COUNTY AGRICULTURAL COMMISSIONER OUTREACH ACTIVITIES

In 2015, 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. Some counties also participated in continuing education seminars and conducted training for landscapers, pest control operators, nursery employees, and nursery association members.

PD/GWSS BOARD'S OUTREACH PROGRAMS

The PD/GWSS Board initiated its outreach and education program in 2004. It has since maintained a communications effort to keep winegrape growers informed about activities that are funded by the winegrape assessment as well as other programs funded on their behalf by other funding sources.

A vineyard tour of PD resistant grapevines at UC Davis

In 2015 the main objectives of the outreach and education program were:

- Update growers on the assessment vote that was under way during the first half of 2015.
- Inform winegrape growers of the research milestones accomplished on their behalf.
- Educate growers on newly designated pests and diseases.

OTHER DESIGNATED PESTS AND DISEASES

Besides PD and GWSS, the PD/GWSS Board has designated a few other pests and diseases as serious threats to California winegrapes. The list now includes European grapevine moth (EGVM), red blotch (GRBaV), brown marmorated stink bug (BMSB), grapevine leafroll and fanleaf virus, and all mealybugs that attack winegrapes. As part of the outreach and education effort information about these threats is communicated to winegrape growers around the state via brochures, trade show displays, speaking engagements, websites and special fact sheets. During the year, the monthly e-newsletter that was sent out containing current information about PD and GWSS also included information about these designated pests and diseases.

The following materials were prepared or updated in 2015:

- Newsletters (quarterly)
- Website message board
- Facebook page
- LinkedIn group
- YouTube video channel
- "Pierce's Disease: 15 Years of Success" brochure
- Stock photography
- Large trade show display/exhibit
- Videotaped researcher interviews
- Monthly e-newsletter
- Fact Sheets on newly designated pests and diseases

MEDIA COVERAGE

In 2015, articles and reports about PD and the GWSS continued to appear in print media and on Internet websites, with some television and radio coverage. While the coverage mainly focused on newly-discovered infestations, there was also coverage on new research and PD-resistant grapevines. Coverage of the EGVM tapered off considerably due to the fact that only one small area of infestation remains. Most of the attention centered on when EGVM would be declared eradicated. Meanwhile the designated disease red blotch continued to receive major attention, largely because it is widespread and affects vineyards in virtually every corner of the state.

WEBSITE

In March 2000, the CDFA activated a highly successful web site focused on PD and the GWSS. 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 2015 continued to be used as an effective tool for providing current and reliable information to interested parties.

Pierce's Disease Control Program webpage

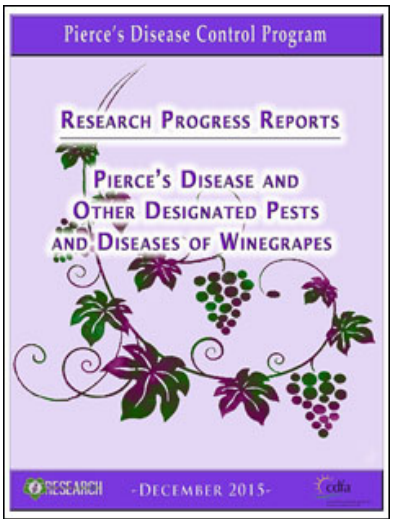
Research

Research continues to be an integral part of the Pierce's Disease Control Program (PDCP). In 2015 the flurry of research activity that began at the start of the program continued, with approximately 41 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 (PD) and its vectors.

The extensive and sustained research effort on PD 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 non-virulent 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. Several grapevine scions and rootstocks bred for resistance to Pierce's disease using traditional methods have been field tested and provided to Foundation Plant Services at UC Davis for possible commercialization. Small lots of wine have been produced from some of these and have tested well in wine tastings. Field testing of grapevine plant material developed using transgenic approaches began in 2010 and continued through 2015. In 2013 a Technology Facilitator was brought in to advise on developing and commercializing these promising discoveries, and in 2014 the services of a Viticulture Consultant were obtained to ensure the field trial test vineyards were properly managed. Looking back, it is clear that solutions are getting very close, relative to where we were 16 years ago.

Research Symposium

Beginning in 2001, the PDCP has organized 13 annual research symposia to foster communication and information sharing among scientists and stakeholders on the latest research progress and findings on PD. In 2015 a symposium was not held. However, as in prior years, a compilation of progress reports on current research projects on PD and the glassy-winged sharpshooter (GWSS) was prepared by the Pierce's Disease Control Program. For the first time, the compilation also included reports for research projects on other winegrape pests and diseases besides Pierce's disease and its vectors. The other pests and diseases reported on were the brown marmorated stink bug, red blotch disease, and vine mealybug, all of which had been designated as serious threats to California winegrapes by the CDFA PD/GWSS Board. The compilation of research progress reports can be accessed electronically on the program's website at



The 2015 compendium contains 41 reports

http://www.cdfa.ca.gov/pdcp/Research.html. Research progress reports and other research-related information are also available on the following website: http://www.piercesdisease.org/.

Research Proposal Solicitation and Review

In 2015, the PDCP partnered with the Unified Grant Management for Viticulture and Enology Program at UC Davis to conduct its research proposal solicitation and review process. In addition to calling for research proposals on Pierce's disease and its vectors, this year's request for proposals also called for research proposals on three other pests and diseases of winegrapes: brown marmorated stink bug, red blotch disease, and vine mealybug. A total of 24 proposals were received and reviewed, with 11 research projects totaling $2.75 million selected for funding by the CDFA using winegrape assessment funds. In addition, eight ongoing projects were approved to continue for another fiscal year.

Area-wide Management Programs

The area-wide management programs coordinate GWSS management efforts in large, agriculturally diverse grape production areas.

Fresno County

Fresno County implemented area-wide trapping for GWSS in citrus groves in 2003. In 2011 traps were added to grapes near the existing infested area and the San Joaquin River. In 2015, there were 107 GWSS finds in citrus and grapes, compared to 41 trap finds in 2014. About 1,400 acres of citrus were treated in 2015, compared to 970 acres in 2014.

Kern County

In 2015, the boundaries of the Kern County infested area remained the same as in 2014. The infested area includes agricultural lands as well as the city of Bakersfield and several smaller Kern County communities. In 2015, there were 201,060 GWSS finds in area-wide traps, compared to 112,766 in 2014. About 15,550 acres of citrus were treated in 2015 compared to 16,045 acres in 2014.

This year also saw a significant increase in the number of GWSS trapped in Kern County. In October, a meeting of researchers was held to study the situation and help find solutions. After seeing the area first-hand and receiving an overview of the program, short and long-term recommendations were made to help the Kern County area-wide program achieve better GWSS suppression.

Madera County

In 2015 there were three GWSS finds, compared to one GWSS found in a Citrus Program trap in 2014. About 80 acres of citrus were treated in 2015, compared to 580 acres in 2014.

Riverside County

In 2013, due to budgetary constraints, the area-wide management programs in Riverside County were reduced to monitoring-only activities. These activities resulted in a total of

less than 400 GWSS caught during the summer peak (July through September). Overall GWSS numbers were intermediate in 2015; a little less than previous high years (2008 and 2009) but slightly lower than in previous low years (2010 and 2011).

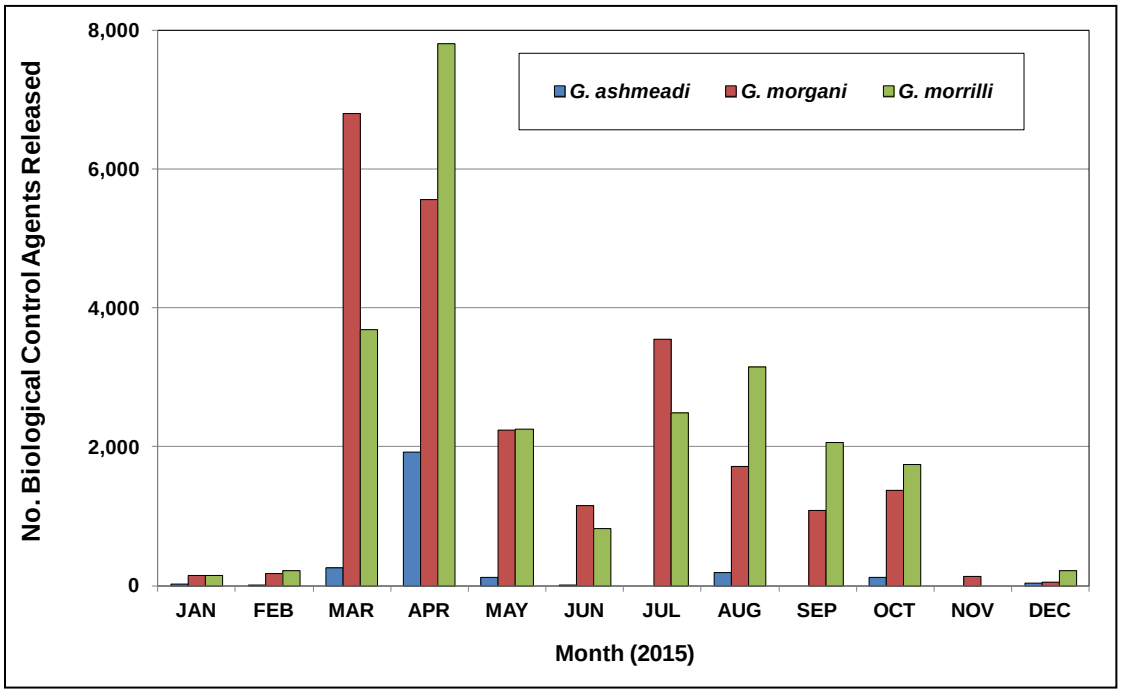
Tulare County

The infested area in Tulare County has not expanded since 2004. In 2015, there were 5,251 GWSS finds, compared to 3,215 in 2014. There were about 6,000 acres of citrus treated in 2015 compared to about 2,725 in 2014.

Biological Control

Biological control is a method of controlling target pests using other living organisms. Biological control agents used for controlling insect pests include predators, parasitoids, and pathogens. Biological control is often used to suppress infestations of target pests in areas where other control methods are not cost effective or not feasible. Since 2001, the Pierce's Disease Control Program (PDCP) has been using biological control as an important component of its Integrated Pest Management approach to controlling the glassy-winged sharpshooter (GWSS). The biological control agents of GWSS are stingless parasitic wasps. The female wasps lay their eggs inside GWSS eggs. The emerging wasp larvae develop by feeding on the GWSS eggs, eventually killing them. Upon completion of development, adult wasp emerges from the GWSS egg and repeats the cycle. Life cycles of the wasps are much shorter than that of GWSS, which allows for the rapid population growth of the wasps compared to GWSS.

In 2015, three species of GWSS biological control agents were released by the PDCP for control of the GWSS: *Gonatocerus ashmeadi*, *G. morgani,* and *G. morrilli*. Among these, *G. ashmeadi* is thought to be self-introduced and *G. morgani* is considered native to California, whereas *G. morrilli* is native to the southeastern United States and Mexico. All the biological control agents are very host-specific, solitary egg parasitoids, with one adult wasp emerging from each GWSS egg parasitized.



The number of biological control agents released per month in 2015

In 2015, the Biological Control group produced 65,757 wasps, including 34,094 *G. morrilli*, 27,940 *G. morgani*, and 3,273 *G. ashmeadi*. Of these a total of 51,308 wasps were released at field sites in five counties (Fresno, Kern, Madera, Tulare and Ventura). Since the start of the Program, more than 2.5 million biological control agents have been released in California. The field release of the biological control agents was conducted year-round but more agents were released in spring, in order to synchronize seasonal occurrence of the GWSS eggs in the field. At each site a post-release survey was conducted to evaluate the performance of the species released. The data indicated that in most locations, *G. ashmeadi* was the dominant species and *G. triguttatus* was the least abundant. Both *G. morrilli* and *G. morgani* were successful in Ventura County but *G. morgani* performed better than *G. morrilli* in the Central Valley.

G. morrilli

G. ashmeadi

G. morgani

In addition, in 2015 the Biological Control group provided technical assistance to scientists in other agencies and supplied biological control agents (total of 1,800 adults) to County Agricultural Departments for GWSS control.

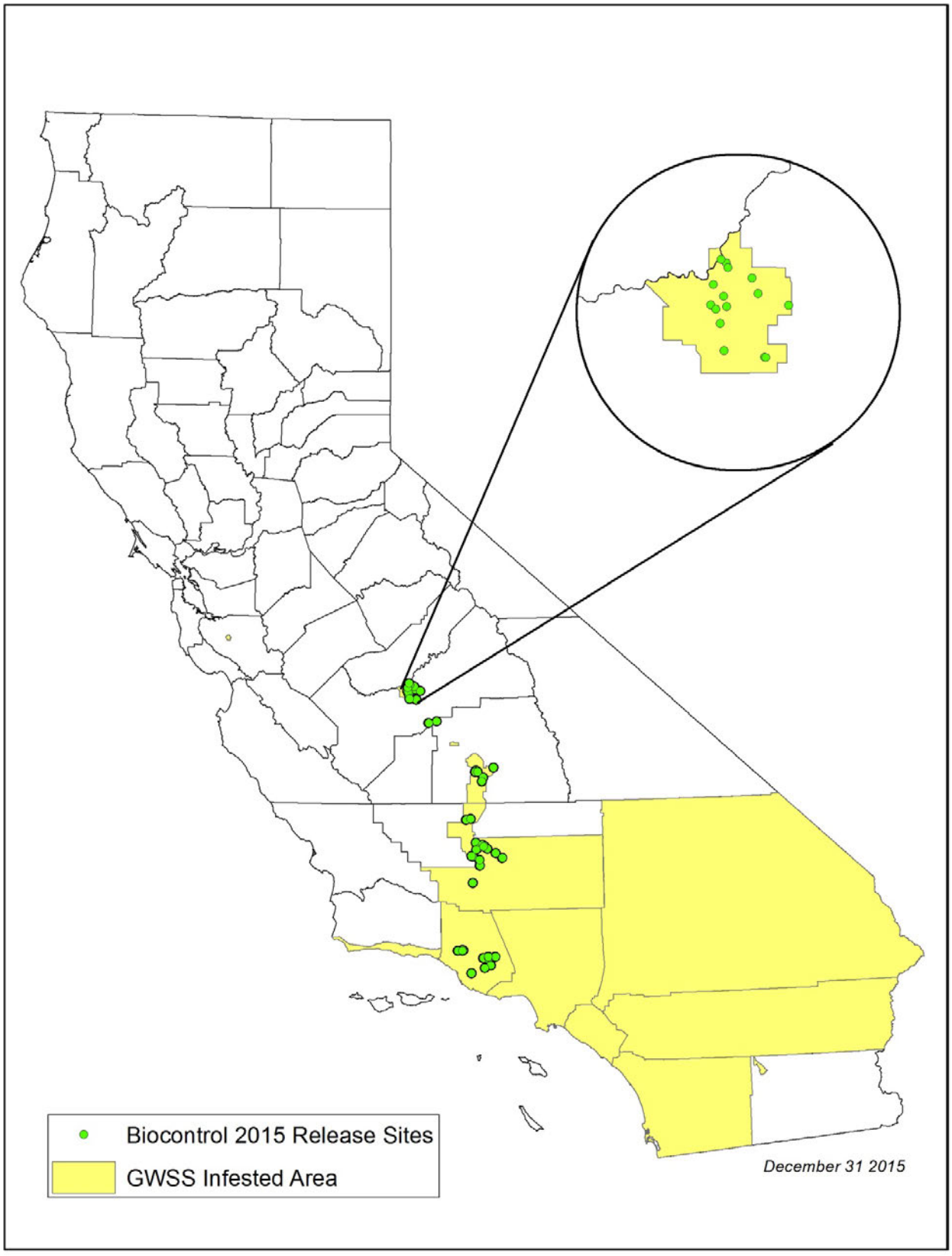
The number of biological control agents released in 2015

County	No. Sites	Species				Total
		G. ashmeadi	*G. morgani*	*G. morrilli*	*G. triguttatus*	
Fresno	15	187	3,469	3,682	0	7,388
Kern	16	883	5,548	10,551	0	16,982
Madera	2	26	31	97	0	154
Tulare	13	1,194	3,309	3,255	0	7,758
Ventura	14	393	11,676	7,007	0	19,076
Total (2015)	60	2,683	24,033	24,592	0	51,308

The number of biological control agents recovered in post-release surveys in 2015

County	No. Sites	Species				Total
		G. ashmeadi	*G. morgani*	*G. morrilli*	*G. triguttatus*	
Fresno	15	2,079	1	1	0	2,038
Kern	16	2,547	100	2	0	2,639
Madera	2	0	0	0	0	0
Tulare	13	888	65	1	0	834
Ventura	14	745	80	354	11	1,190
Total (2015)	60	6,259	246	358	11	6,874

Biological Control Release Sites



Environmental Compliance

In 2015, the CDFA continued its efforts to ensure that the PDCP is conducted in an environmentally responsible manner. These efforts included 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 addition, the PDCP continued posting notifications of program-related pesticide applications on a CDFA web page in compliance with a permit obtained to meet the requirements of the National Pollutant Discharge Elimination System.

A statewide programmatic environmental impact report was released for the PDCP in mid-2003. A legal challenge was filed against the environmental impact report shortly thereafter. Although a trial court found the environmental impact report 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. In 2012 it was decided to combine the efforts of this project with a similar one being conducted for the Department's statewide plant health and pest prevention program. This work continued through 2014 and in late December the final EIR for the CDFA statewide plant pest prevention program, including the PDCP, was certified by the secretary. The full document can be found at http://www.cdfa.ca.gov/plant/peir/index.html

Financial Statement

PIERCE'S DISEASE CONTROL PROGRAM

	FY 2014-15 (Actual)	FY 2015-16 (Budgeted)
REVENUE		
Federal (United States Department of Agriculture)	$15,348,373	$15,410,292
Industry (PD/GWSS Board winegrape assessment)	$1,072,519	$1,045,777
Total Revenue	**$16,420,892**	**$16,456,069**

EXPENDITURES	FY 2014-15 (Actual)	FY 2015-16 (Budgeted)
Personal Services	$2,933,002	$2,963,179
Operating Expenses	$2,306,910	$2,306,910
Total County Payments	$11,180,980	$11,180,980
Total Expenditures	**$16,420,892**	**$16,456,069**

Abbreviations and Acronyms

ATP	Approved Treatment Program
CACASA	California Agricultural Commissioners and Sealers Association
CDFA	California Department of Food & Agriculture
EGVM	European grapevine moth
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