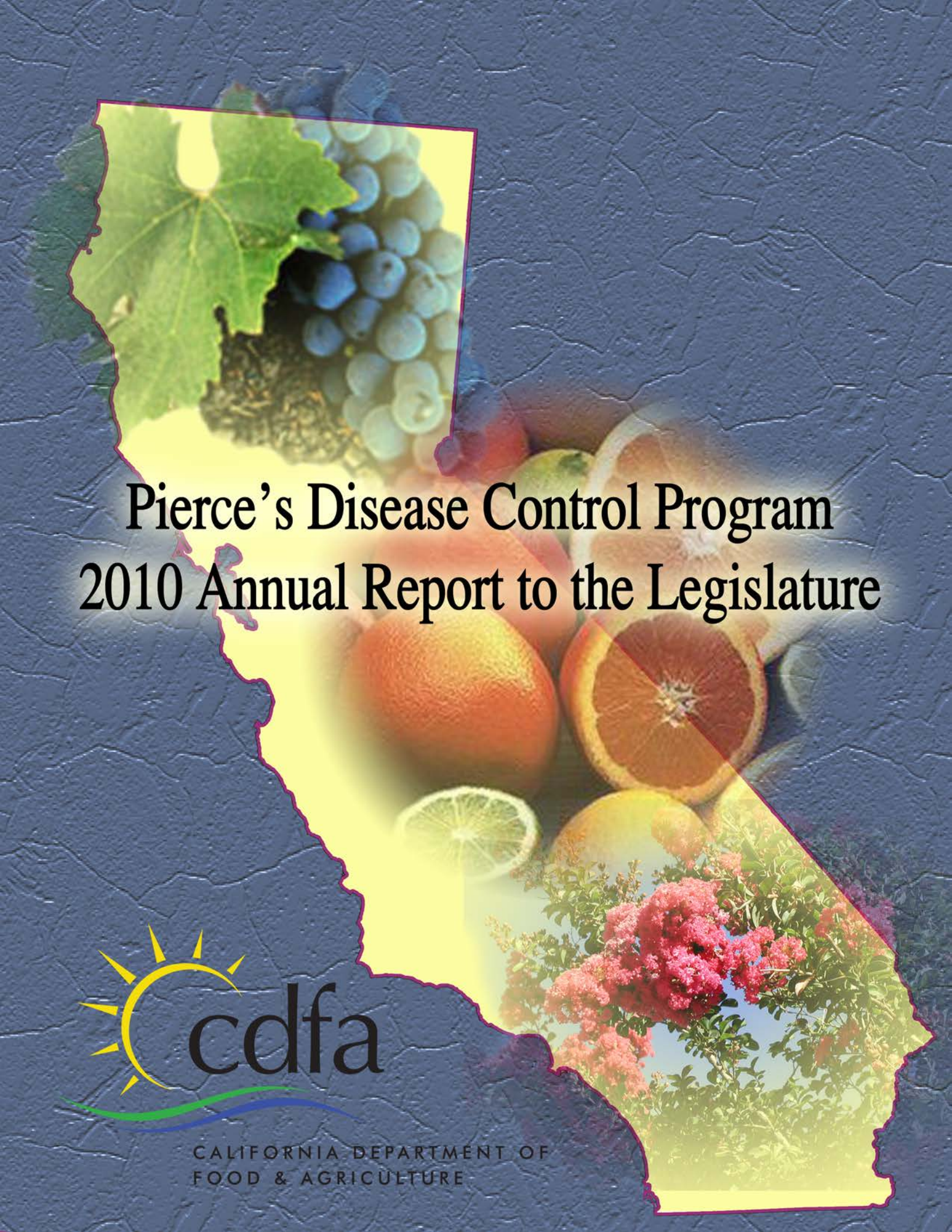

# Pierce's Disease Control Program
# 2010 Annual Report to the Legislature

cdfa

CALIFORNIA DEPARTMENT OF
FOOD & AGRICULTURE

# Pierce's Disease Control Program

# California Department of Food and Agriculture

# Annual Report to the Legislature 2010

Edmund G. Brown Jr., *Governor*

Karen Ross, *CDFA Secretary*

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# Statement of the Secretary

"Runaway train." That's what unnamed experts called it, back in 1999 when *Wine Spectator* dedicated its cover story to the "California Vineyard Apocalypse" threatened by the arrival of the glassy-winged sharpshooter. Grape growers, vintners, researchers and regulators alike were, at the very least, fearful of this pest and its unprecedented ability to spread Pierce's disease.

Fast-forward a decade. Did we cure Pierce's disease? Are the sharpshooters gone? In agriculture, as in life, the answers are seldom that simple. We rolled up our sleeves, though, and we are still here, still harvesting grapes, still marketing wine and raisins and juice and all of the other products that come from California's "top crop."

The Pierce's Disease Control Program (PDCP) has matured into a model program whose successes and advancements advise and inform nearly every other major project at this department. The labor-intensive survey and trapping efforts, the painstaking inspections, the forward-thinking research — all of it adds up to a successful program that keeps farmers farming and keeps our crops on their way to the dinner table.

It would be easy to credit the regulators for our success, and we agricultural officials have certainly played necessary roles in funding, operations and oversight. But the guidance, the funding and the elbow grease have come from growers, plain and simple. Growers, winemakers and their colleagues in the larger agricultural community met this problem head-on in 1999 and have kept at it ever since. We owe it to them, and to our consumers, to continue the progress of this exemplary program.

Karen Ross, Secretary
California Department of Food and Agriculture

# Executive Summary

The Pierce's Disease Control Program gained momentum in the spring of 2010 when winegrape growers voted in a legislated referendum (Senate Bill 2, Wiggins) to extend the assessment on all winegrapes crushed in California until March 1, 2016. The assessment is used to fund research and related activities on Pierce's disease and the glassy-winged sharpshooter, subject to the recommendations of the Pierce's Disease/Glassy-Winged Sharpshooter Board. This referendum also authorized the use of assessment monies for research and outreach on other serious pests and diseases of winegrapes. The European grapevine moth, *Lobesia botrana*, became the first winegrape pest designated to receive funding for research and outreach.

During 2010, two incipient infestations of the glassy-winged sharpshooter (GWSS) were eradicated. Both infestations were in Santa Clara County. This brings to 15 the number of incipient infestations of GWSS that have been eradicated from the non-infested portions of the state.

The nursery stock approved treatment program (ATP) continued to be successful at preventing the movement of GWSS on shipments of nursery stock. In 2010, there were 50,600 regulated shipments of nursery stock. More than one-fifth of those were ATP shipments that were delivered to uninfested areas of the state without incident and without the need for costly 100% inspection of the shipments.

Over two million biological control agents have now been released over the life of the program, helping to reduce GWSS populations. These tiny stinger-less wasps lay their eggs inside GWSS eggs, killing the GWSS and producing more wasps to continue the cycle.

Research into finding solutions to Pierce's disease has moved from the laboratory to the field. In 2010, field trials were begun to test promising new approaches for controlling this disease. These trials will bring us one step closer towards commercial applications for managing Pierce's disease.

In the pages that follow, you'll see how the statewide cooperative Pierce's Disease Control Program continued in 2010 to fulfill its mission of minimizing the statewide impact of Pierce's disease in California. With the ongoing support and cooperation of our many stakeholders, we are confident we can continue to do so.

# 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 $2.9 billion and associated economic activity within California in excess of $62 billion. Other crop and ornamental plant resources such as almonds ($2.3 billion) and susceptible species of citrus ($609 million), stone fruits ($688 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.

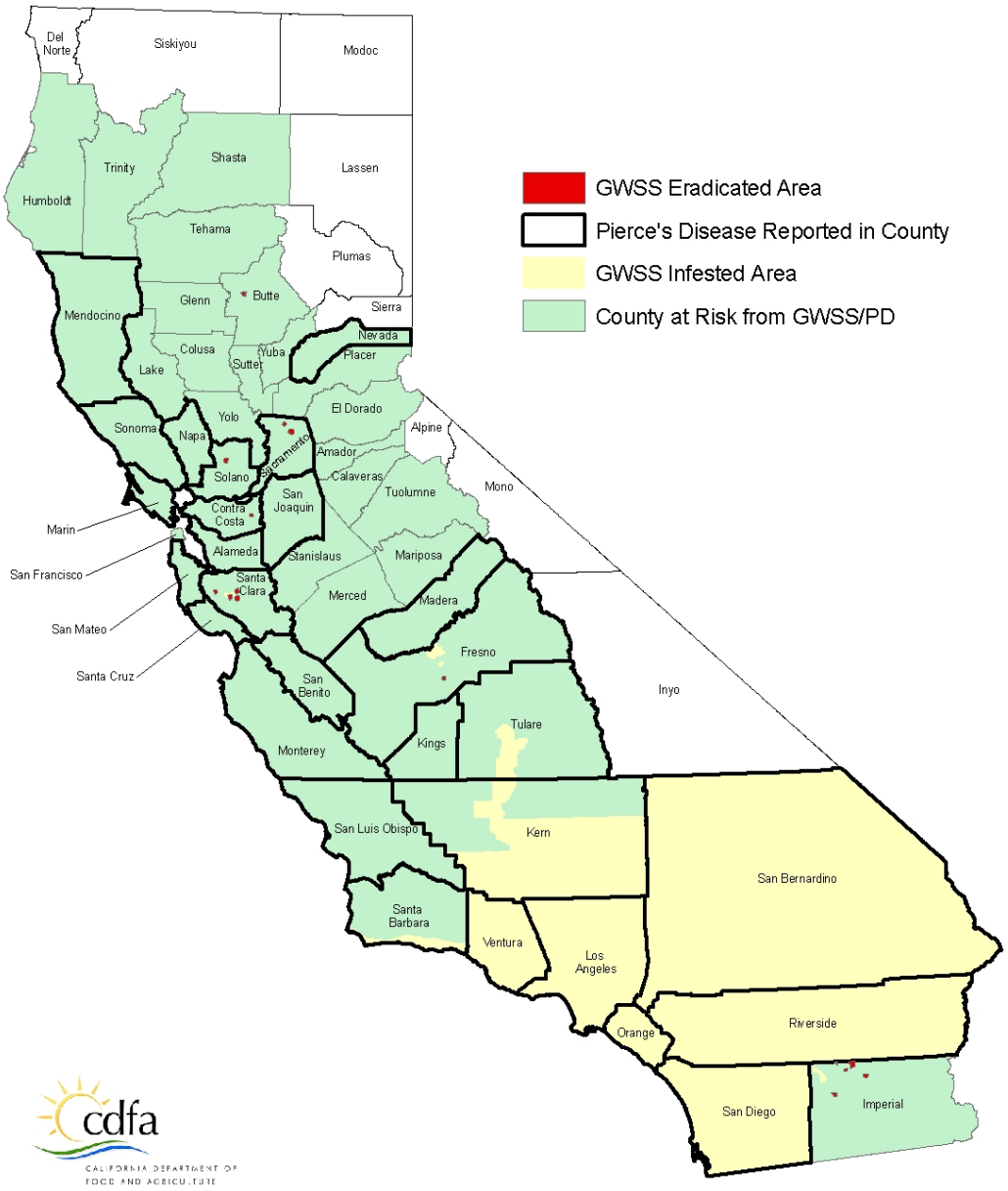
The glassy-winged sharpshooter clearly has the potential to increase both the incidence and severity of Pierce's disease in California. As observed in the Temecula infestation, the sharpshooter:

- 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



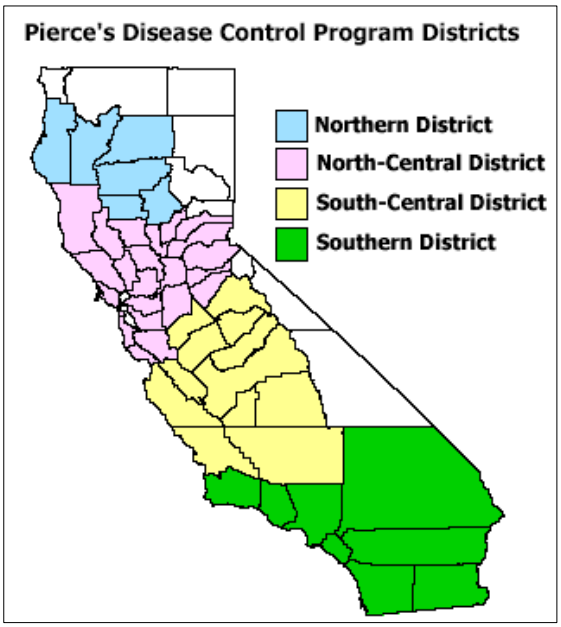

December 31, 2010

# Program Description

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

1. **Contain the Spread**
   Prevent the spread of the GWSS to new areas of the state by regulating shipments of host plants and other host material.
2. **Statewide Survey and Detection**
   Find and monitor GWSS infestations and populations through trapping and visual survey.
3. **Rapid Response**
   Respond quickly to detections of GWSS in new areas by intensively surveying the area and applying treatments if necessary.
4. **Outreach**
   Raise awareness about Pierce's disease and its vectors while responding to the concerns of growers and the general public.
5. **Research**
   Develop solutions to Pierce's disease and its vectors.

## Organization




The PDCP is a partnership that includes the 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 CDFA laboratory facilities in Riverside and 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[2]

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 $37 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.[2]

[2] In 2010, as required by legislation passed in 2009 (Senate Bill 2, Wiggins), a referendum was held among winegrape growers regarding the winegrape assessment and Board. In that referendum, growers voted in favor of continuing the assessment and Board for another five years and expanding the uses of the assessment to include research and outreach on other serious pests and diseases of winegrapes.

### 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 2010, there were 50,600 shipments of nursery stock from infested areas to uninfested areas. Viable life stages of GWSS were discovered on only six of these shipments.

Over 90% of all rejections between 2001 and 2010 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% |

**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.

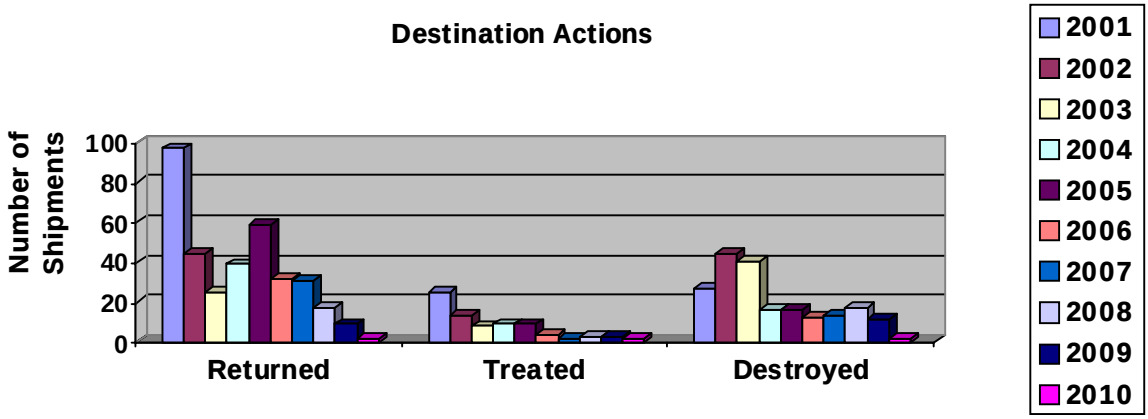
Actions that can be taken at the origin of nursery shipments consist of the following:

- ***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 2010, administrative penalties were levied against four companies, totaling $14,495.



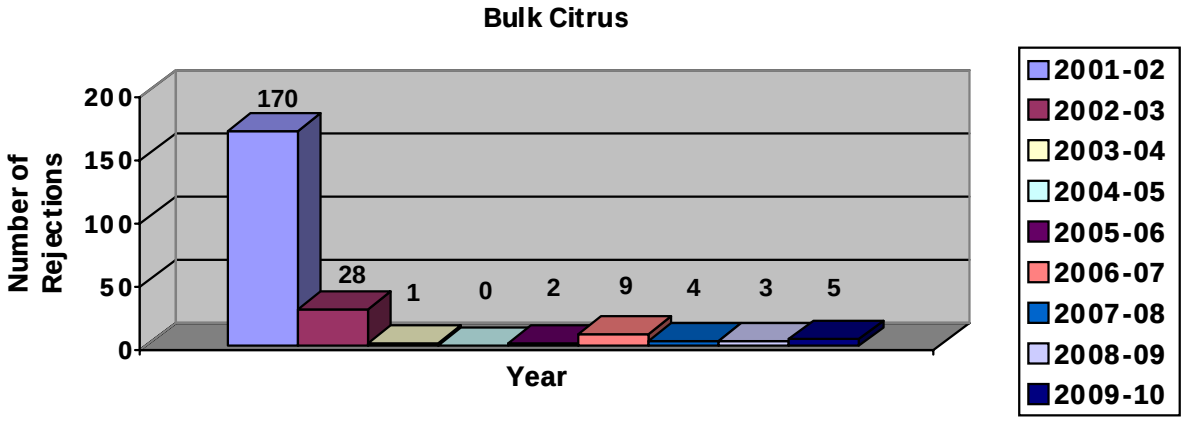

## Nursery Stock Approved Treatment Program

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 2010 there were seven participating nurseries that shipped approximately 3.9 million plants in 11,499 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 2009 through September 2010), live glassy-winged sharpshooters were found in only five 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 significantly over the past nine years.**

**Citrus harvest and inspection.**

# 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 (March 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 2010.

**A yellow panel trap in crape myrtle.**

During 2010, program biologists provided survey and detection training to 239 employees from 43 counties. 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 and state's biologists 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 2010, new incipient GWSS infestations were discovered in two counties. In Madera County, GWSS were found in a mobile home park right across the San Joaquin River from Fresno County. Follow-up survey and trapping activities found GWSS in a nearby neighborhood. After holding a public meeting, treatments were applied in the infested area. In San Luis Obispo County, GWSS were found in the city of San Luis Obispo. Because they were found late in the season and only in small numbers, treatment was scheduled for early spring 2011. In total, GWSS were found in 2010 on approximately 290 residential properties in the counties of Fresno, Madera, Santa Clara, San Luis Obispo, and Tulare. In response, approximately 1,925 properties (infested plus adjacent) were treated.

**Conducting visual surveys is part of rapid response activities following detection of GWSS in new areas.**

Two GWSS infestations were declared eradicated in 2010, both in Santa Clara County. The Branham and Evergreen infested areas in the city of San Jose were declared eradicated on December 2, 2010 after going over two years with no GWSS detections. This makes a total of four incipient infestations eradicated in Santa Clara County and 15 statewide since the PDCP program's inception.

### 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 goal 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.

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 2010. Outreach efforts focused in part on informing growers about field trials currently being conducted to test possible solutions to Pierce's disease. These solutions came about through research funded by winegrape growers through an annual assessment on winegrapes. A brochure, tabletop display, and short video presentations featuring the researchers and their field trials were produced. These materials will be used in presentations to winegrape grower groups around the state.

Outreach keeps growers informed.

Also in 2010, an 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 long list of interested parties. Information from the e-newsletter was often reprinted in many of the wine trade publications, and it has proven useful for getting program information out in a timely manner to all stakeholders. 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 program also actively maintained a presence on the Internet and at key industry events with a tabletop display and a brochure featuring research and control program progress.

The following materials were prepared or updated in 2010:

- Newsletters (1 each quarter)
- Web site message board
- Tabletop display/exhibit
- Brochure - *Planting Solutions to Pierce's Disease*
- Videotaped researcher interviews
- Monthly e-newsletter
- Stock photography
- Presentation kit, containing fact sheets, frequently asked questions, background information, list of resources and informational sheets

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 a designated pest of winegrapes. This action was publicized by the Outreach and Education Program.

## 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 2010 Research Symposium.**

## Media Coverage

In 2010, 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 2010 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 web site.**

# Research

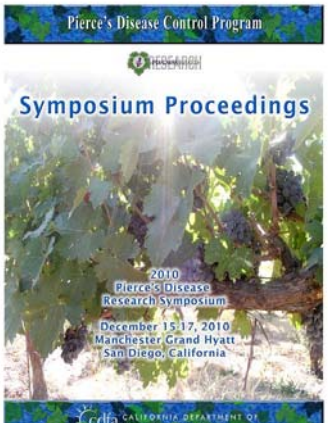
Research continues to be an integral part of the Pierce's Disease Control Program (PDCP). In 2010, the flurry of research activity that began at the start of the program continued with approximately 65 projects being worked on by some of the nation's top plant health researchers. Projects ranged from 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 11 years ago.

### Research Symposium

Every year the PDCP organizes a research symposium focused on Pierce's disease and its vectors. Approximately 125 people attend these meetings to share information and learn more about the progress being made against Pierce's disease. The 2010 symposium was held in mid-December in San Diego.

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




**The 2010 Proceedings contained 64 research progress reports.**

### Research Proposal Solicitation and Review

n 2010, the PDCP coordinated its research proposal solicitation and review process with the University of California's Pierce's Disease Grant Program. A total of 40 proposals were reviewed, with CDFA managing ad hoc reviews and the University of California managing panel reviews. Based on the feedback received during this extensive vetting process, six research projects totaling $865,992 were selected for funding by CDFA using winegrape assessment funds. In addition, 10 ongoing projects were approved to receive continued funding in the coming fiscal year.

## Area-wide Management Programs

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

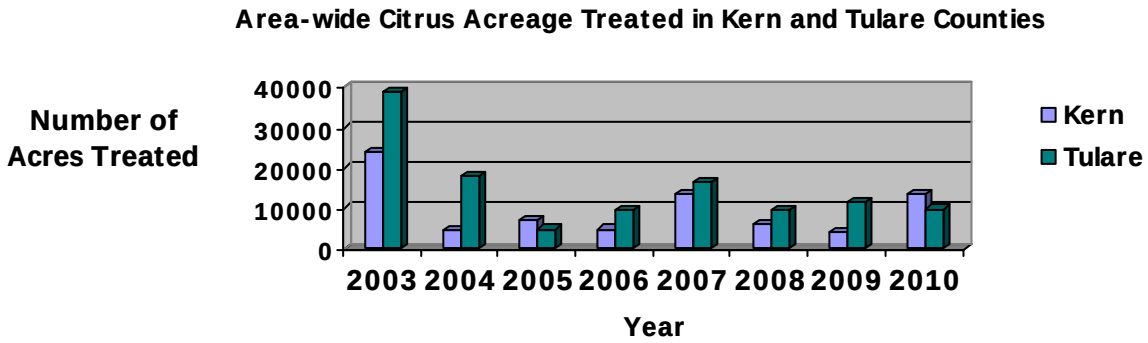
### Kern County

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 2010, the boundaries of the Kern County infested area remained the same as in 2009. The infested area includes agricultural lands as well as the city of Bakersfield and several smaller Kern County communities. There were 13,383 acres of citrus treated in 2010, compared to 4,182 acres treated in 2009. The increase is due to changing the timing of treatments. Treatments traditionally done in the fall of the prior year were applied in the spring of 2010 instead. Also, some areas that had higher GWSS numbers were treated with a foliar knock down and a systemic treatment, adding to the amount of acres treated.

### Tulare County

The infested area in Tulare County has not expanded since 2004. In 2010, the number of GWSS detected was slightly lower than in the prior year. Consequently, there were fewer acres of citrus treated in 2010 compared to 2009 (9,866 acres vs. 11,528 acres, respectively).




### Fresno County

In the summer of 2003, Fresno County implemented area-wide trapping for GWSS in citrus groves. In 2009 there was one area-wide trap find, and in 2010 there were five finds. In response, CDFA worked closely with USDA and the Fresno County Agricultural Commissioner's Office to have treatments conducted around these finds. About 1,350 acres of citrus were treated.

### Riverside County - Coachella Valley

In 2010, the GWSS management boundaries in the Coachella Valley remained the same as in the previous year. Traps continued to be monitored on a 1/4 mile grid system. Due to low GWSS populations, only 596 acres of citrus needed to be treated out of approximately 12,000 acres total.

### Riverside County - Temecula Valley

In the Temecula Valley, a total of 946 acres of citrus were treated with imidacloprid (Admire Pro) and 45 acres of organically grown citrus were treated with pyrethrum (PyGanic) in 2010. Due to the low residual activity of the organic insecticide, the organic citrus was treated three times during the season. The first treatment was applied in early June and the second and third in July and September, respectively.

## 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.

2010 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 2010 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 2.1 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 2010, four species of these tiny wasps were raised and released against the GWSS: *Gonatocerus ashmeadi, G. morgani, G. morrilli, and G. triguttatus.*

In 2010, a total of 185,486 biological control agents were released at 64 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.

**Table 1. GWSS biological control agents released in California, 2010.**

| County | *G. ashmeadi* | *G. morrilli* | *G. triguttatus* | *G. morgani* | *TOTAL* |
|---|---|---|---|---|---|
| Fresno | 0 | 10,886 | 11,968 | 1,306 | **24,160** |
| Imperial | 721 | 605 | 817 | 357 | **2,500** |
| Kern | 0 | 24,831 | 22,083 | 7,023 | **53,937** |
| Los Angeles | 850 | 1,053 | 300 | 594 | **2,797** |
| Madera | 0 | 80 | 100 | 0 | **180** |
| Orange | 190 | 1,391 | 603 | 0 | **2,184** |
| Riverside | 3,708 | 3,156 | 3,136 | 1,920 | **11,920** |
| San Bernardino | 1,763 | 1,344 | 1,143 | 2,023 | **6,273** |
| San Diego | 892 | 895 | 140 | 415 | **2,342** |
| Tulare | 0 | 9,155 | 7,265 | 1,752 | **18,172** |
| Ventura | 0 | 26,213 | 22,390 | 12,418 | **61,021** |
| **Total for 2010** | **8,124** | **79,609** | **69,945** | **27,808** | **185,486** |
| | | | | | |
| **Total since 2000** | **184,284** | **383,052** | **1,042,376** | **64,113** | **2,091,186*** |

*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.

e PDCP's Biological Control Group has been working with and collecting information on biological control agents for 10 years. This has resulted in a large data set that can be used to 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 2010.

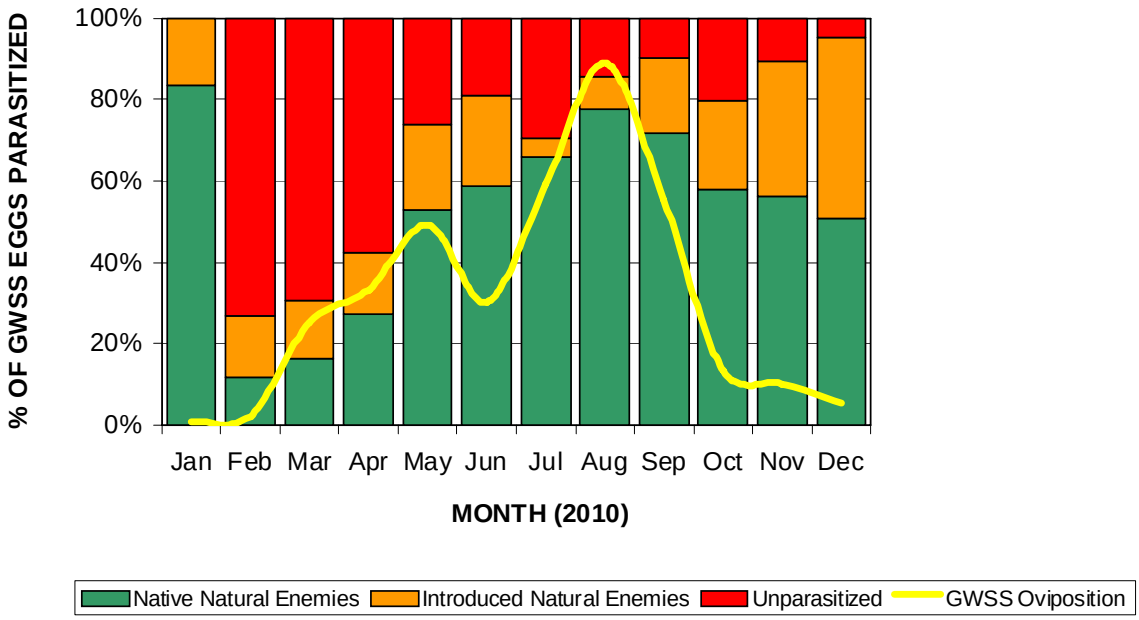



**Figure 1**. **Parasitism status of GWSS egg masses by month in 2010.**

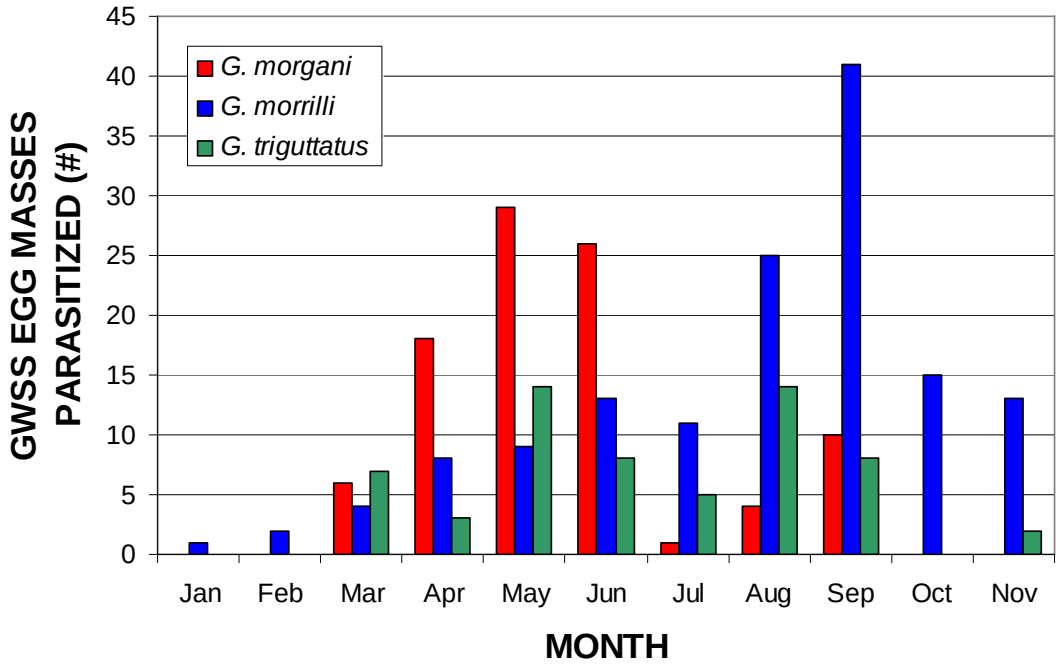



**Figure 2. Monthly recoveries of parasitized GWSS egg masses during 2010.**

**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.

Investigations into the locations where recoveries were made also revealed spatial patterns for survival of biological control agents (**Figure 3**). Only *G. morrilli* survived the high temperatures of the desert regions of California. By contrast, *G. morgani* was better adapted to coastal areas and was particularly successful in the Central Valley. Analyses such as these allow us to determine which biological control agent to release at specific locations and times of year.

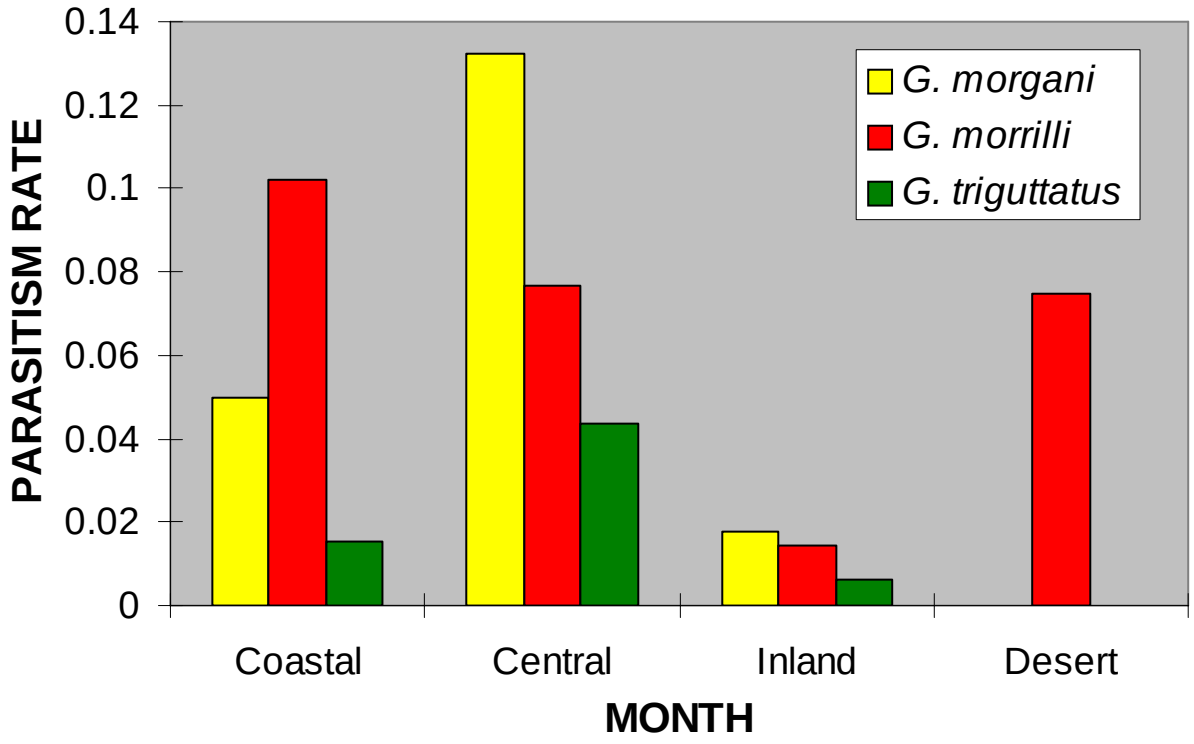
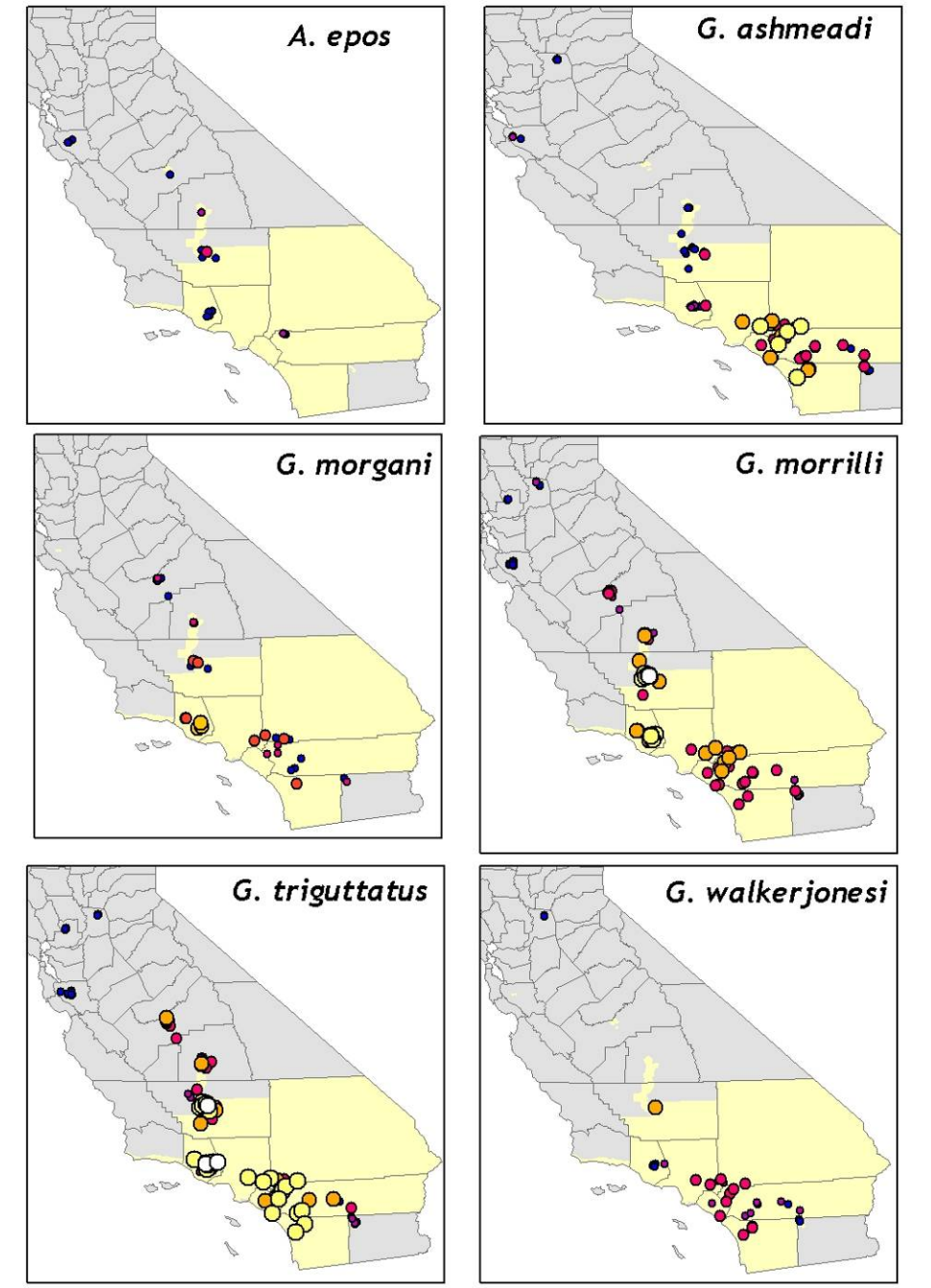



**Figure 3**. **Parasitism rate of GWSS eggs by region.**

Coastal areas include release sites within 10 miles of the Pacific Coast (Los Angles, Orange, San Diego, and Ventura counties). Central areas include release sites in the San Joaquin Valley (Fresno, Kern, and Tulare counties). Inland areas include sites within the Los Angeles Basin (western side of Riverside and San Bernardino counties). Desert areas include release sites in the Mojave Desert (eastern Imperial County and Riverside County).

# Biological Control Release Sites




Maps produced 12/22/2010

Total # Insects Released For Biological Control of Glassy-winged sharpshooter (GWSS) in California 2001-2010

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 2010, the California Department of Food and Agriculture 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.

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 will continue in 2011.

# Financial Statement

## PIERCE'S DISEASE CONTROL PROGRAM

| FISCAL YEAR | 2009-10 | 2010-11 |
|---|---|---|
| **REVENUE** | | |
| State (Budget Act) | $ 3,721,272 | $ 3,923,577 |
| Federal (USDA) | $ 14,755,698 | $ 15,269,299 |
| **Total Revenue** | $ 18,476,970 | $ 19,192,876 |
| **EXPENDITURES** | | |
| Personal Services | $ 3,600,436 | $ 3,331,704 |
| Operating Expenses | $ 2,784,565 | $ 2,031,172 |
| County Payments | $ 12,091,969 | $ 13,830,000 |
| **Total Expenditures** | $ 18,476,970 | $ 19,192,876 |

## PIERCE'S DISEASE/GLASSY-WINGED SHARPSHOOTER BOARD

| FISCAL YEAR | 2009-10 | 2010-11 |
|---|---|---|
| Beginning Balance | $ 8,790,479 | $ 9,242,458 |
| Assessments + Interest | $ 2,810,017 | $ 2,121,490 |
| **Total Resources** | $ 11,600,496 | $ 11,363,948 |
| **Total Expenditures** | $ 2,358,038 | $ 4,650,366 |
| Ending Balance | $ 9,242,458 | $ 6,713,582 |

# Abbreviations and Acronyms

| | |
|---|---|
| CACASA | California Agricultural Commissioners and Sealers Association |
| CDFA | California Department of Food & Agriculture |
| 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* |