State Bill Introduced to Boost Funding for PD Control Program

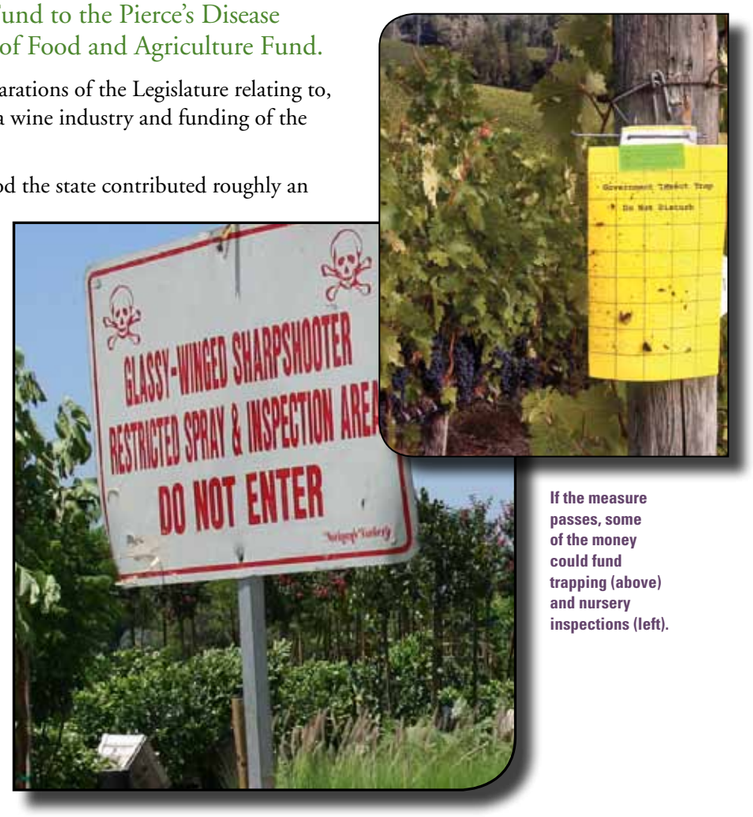
California Assembly Bill 2714, introduced in February 2016 by Assembly Member Jim Cooper with coauthors Assembly Member Devon Mathis and Senators Jeff Stone and Lois Wolk, would appropriate $5 million from the General Fund to the Pierce's Disease Management Account in the Department of Food and Agriculture Fund.

The bill would also state various findings and declarations of the Legislature relating to, among other things, Pierce's disease, the California wine industry and funding of the Pierce's Disease Control Program.

The bill recognizes the fact that for a 12-year period the state contributed roughly an average of nearly $5.6 million annually to the program, but the economic downturn in 2011–12 forced the state to cease its investment in the Pierce's Disease Control Program. Since that time, the program has been operating solely on industry and federal funds.

The bill states that now, in light of increased threats and tight resources, the Pierce's Disease Control Program and other pest and disease programs require additional funding to prevent movement and establishment of pests throughout California. So with an economic recovery well under way, the bill says, "Now is the time to recommit state funding and support to combat Pierce's disease and other pests and diseases that affect winegrape production in the state."

On May 31 the bill passed the Assembly with a unanimous vote and was sent to the Senate.



If the measure passes, some of the money could fund trapping (above) and nursery inspections (left).

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PD/GWSS BOARD RESEARCH

PD/GWSS BOARD

SUMMER 2016

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PD/GWSS Board Gets a Taste of Wine Made From PD-Resistant Grapevines

After the April joint meeting of the PD/GWSS Board and the PD Advisory Task Force, members were invited to the offices of the California Association of Winegrape Growers to taste wines made from grapes grown from PD-resistant grapevines.

For over two decades Dr. Andy Walker from UC Davis has been using traditional breeding methods to develop grapevines resistant to PD. Today there are thousands of Dr. Walker's PD-resistant vines planted in field trials not only in California but in Texas and Georgia as well. Both Texas and Georgia lie within an area where the glassy-winged sharpshooter is a native insect, making these areas great proving grounds for testing the PD-resistance of these vines.

Dr. Andy Walker (above) explains to the group the processes that are used in breeding of the PD-resistant winegrapes. At left a row of wine glasses with samplings of wine made from PD-resistant grapes waiting to be tasted.

Dr. Walker's work has been built on a foundation of naturally PD-resistant grapevines that were collected from the U.S. and Mexico by Dr. Harold Olmo during the 1960s and 1970s. Dr. Walker has also added to that collection over the years. The genes that impart PD-resistance were identified from this group of wild grapevines and bred into winegrapes.

Over the last few years a growing number of people in the wine industry have had the opportunity to taste wines made from Dr. Walker's PD-resistant winegrapes.

Dr. Walker feels these grapes from vines planted in areas of established vineyards generally hard hit by PD will most likely be used as blending grapes. However, in the winegrape growing regions of Texas and Georgia, some vintners there are looking forward to planting entire vineyards with the PD-resistant vines.

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PD Board Funding for PD and Other Research Projects
- In April, the Board voted to fund a number of research projects, most related to PD, while a few were for other designated pests and diseases.

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On the Research Front
- Gene "stacking," adding a combination of distinct protective transgenes in a single rootstock line, could foster durability and offer more robust protection of the non-transformed scion against Pierce's disease.
- A natural process called RNA interference (RNAi) could be a way to help control sharpshooters in vineyards.
- A diffusible signal factor (DSF) molecule suppresses PD in grapevines. Field trials reveal that DSF-producing Freedom grape is much less susceptible to PD outdoors, especially in plants naturally infected by sharpshooter vectors.

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State Bill Introduced to Boost Funding for PD Control Program
- A bill that would appropriate $5 million dollars to the PD Control Program has been introduced and is making its way through the legislature.

PD Board Funding for PD and Other Research Projects

During their April 2016 meeting, the PD/GWSS Board voted to fund 15 of 25 research proposals received for FY 2016-17. Most of the proposals submitted and funded were for Pierce's disease research projects. (See chart at right.)

Proposals were also received and funded for pests and diseases that have been designated by the Board as serious threats to California winegrapes.

California Agriculture Secretary Karen Ross addressing the joint meeting of the PD/GWSS Board and the PD Task Force in April 2016.

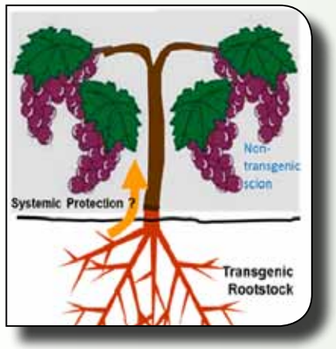
Additionally, 11 previously approved and funded ongoing multi-year research projects will continue to be funded for the 2016-17 fiscal year. One is these is for traditional breeding of PD-resistant winegrapes by Dr. Andy Walker and his team at UC Davis. Other projects include evaluating potential shifts in PD epidemiology in North Coast vineyards. Some non-PD/GWSS projects included continuing the search for potential vectors of red blotch, improving winter and spring vine mealybug controls, and looking at resistance to grapevine fanleaf virus in rootstocks.

"The research screening process is evolving to better coordinate with the American Vineyard Foundation (AVF), as the PD/GWSS Board takes on proposals specific to Pierce's disease and the various pests and diseases that the Board has designated and AVF concentrates its activities on remaining issues pertinent to the grape and wine industry," said Board member Steve McIntyre, who chaired the Research Screening Committee (RSC).

The Board's research screening process includes reviews and input from numerous scientists serving on review panels and the Research Scientific Advisory Panel. Their comments and recommendations are then reviewed by the RSC. The process culminates with a half-day meeting of the RSC where it formulates recommendations to the Board as to which projects to fund in the current cycle.

2016 PD/GWSS Board Research Funding Recommendations

TOPIC	PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE
INSECTS			
Glassy-winged Sharpshooter	Thomas Perring	UC Riverside	Insecticide resistance in the glassy-winged sharpshooter: Using historical use patterns to inform future management strategies.
Vine Mealybug	Kent Daane	UC Berkeley	Improving winter and spring vine mealybug controls: Using HPLC to follow insecticide movement in the vine.
PIERCE'S DISEASE			
Pierce's Disease	Steven Lindow	UC Berkeley	Biological control of Pierce's disease of grape with an endophytic bacterium.
Pierce's Disease	Steven Lindow	UC Berkeley	Field evaluation of Pierce's disease resistance of various DSF-producing grape varieties as scions and rootstocks.
Pierce's Disease	David Gilchrist	UC Davis	Field evaluation of cross-graft protection effective against Pierce's disease by dual and single DNA constructs.
Pierce's Disease	Caroline Roper	UC Riverside	Characterization of *Xylella fastidiosa* plant cell wall degradation and inhibition of the Type II secretion machinery.
Pierce's Disease	David Gilchrist	UC Davis	Transgenic rootstock-mediated protection of grapevine scion by single and stacked DNA constructs.
Pierce's Disease	Neil McRoberts	UC Davis	Mapping Pierce's disease and vector populations in the southern San Joaquin Valley and developing a dynamic model to assess management strategies.
Pierce's Disease	Abhaya Dandekar	UC Davis	Field-testing transgenic grapevine rootstocks expressing CAP and PGIP proteins.
Pierce's Disease	Christopher Rock	Texas Tech	Genome editing of TAS4, MIR828 and targets MYBA6/A&: A critical test of *Xylella fastidiosa* infection and spreading mechanisms in Pierce's disease.
Pierce's Disease	Philippe Rolshausen	UC Riverside	Greenhouse evaluation of grapevine microbial endophytes and fungal natural products for control of Pierce's disease.
Pierce's Disease	Abhaya Dandekar	UC Davis	Management of the federal permit for field-testing transgenic grapevine rootstocks in California.
VIRUSES			
Fanleaf Virus	Marc Fuchs	Cornell	Resistance to grapevine fanleaf virus in rootstocks.
Red Blotch	Marc Fuchs	Cornell	Biology and spread of grapevine red blotch-associated virus.
Red Blotch	Robert Martin	USDA ARS Corvallis	Timing of field transmission of grapevine red blotch-associated virus.



The illustration above shows how the transformed rootstock may protect the untransformed scion across a graft union.

Transgenic Rootstock-Mediated Protection of Grapevine Scions by Single and Stacked DNA Constructs

Principal Investigator: David G. Gilchrist, Dept. of Plant Pathology, UC Davis

A team of researchers (Lindow, Dandekar, Labavitch/Powell and Gilchrist) has identified or constructed and advanced the evaluation of five novel gene constructs that when added to grapevine rootstocks show suppression of Pierce's disease (PD) symptoms. These projects have moved from proof-of-concept in the greenhouse to field trials where data indicates that each of the five transgenes, introduced as single constructs to rootstocks, has shown the ability to protect non-transformed scions. The next step involves "stacking" pairs of these transgenes in a single rootstock line, to test for enhanced durability and a more robust protection of the non-transformed scion against Pierce's disease. Field testing is expected to begin in 2017.

Continued Field Evaluation of Diffusible Signal Factor Producing Grape for Control of Pierce's Disease

Principal Investigator: Steven E. Lindow, Dept. of Plant and Microbial Biology, UC Berkeley

Xylella fastidiosa (Xf) coordinates its behavior in plants in a cell density-dependent fashion using a diffusible signal factor (DSF) molecule which acts to suppress its virulence in plants. Artificially increasing DSF levels in grapes by introducing the *rpfF* gene, which encodes a DSF synthase, reduces disease severity in greenhouse trials. We are testing two different lineages of DSF-producing plants both as own-rooted plants as well as rootstocks for susceptible grape varieties. Field trails reveal that the DSF-producing Freedom grape, which was highly resistant to Pierce's disease in the greenhouse, is also much less susceptible to disease in the outdoors, especially in plants naturally infected by sharpshooter vectors.

The vine at right is typical of all plants in this field trial in that it shows little or no symptoms of Pierce's disease despite the fact that it had been inoculated repeatedly in previous years.

Shizuo G. Kamita measures the juvenile hormone hydrolytic activity of JHEH from GWSS at UC

Selective Disruption of Glassy-winged Sharpshooter Maturation and Reproduction by RNA Interference

Principal Investigator: Shizuo George Kamita
Dept. of Entomology & Nematology, UC Davis

A natural process called RNA interference (RNAi) is used by a wide range of organisms to regulate normal gene function and defend against viruses. This process can be artificially manipulated and potentially used as a "gene-based" insect control tactic. Two critical keys for developing an RNAi-based control tactic are: (1) the identification of a selective target gene, in this case the gene that encodes juvenile hormone epoxide hydrolase (JHEH), and (2) the development of a system to produce and deliver RNAi effectors in whole insects. In this project, researchers are identifying genes that are found in the glands of the glassy-winged sharpshooter (GWSS) for targets of RNAi. A field-applicable delivery system for inducing RNAi against these targets will also be tested.