PROGRESS REPORT FOR CDFA CONTRACT NUMBER 07-0176

IMPROVED DETECTION, MONITORING AND MANAGEMENT OF THE GLASSY-WINGED SHARPSHOOTER

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ABSTRACT
Efficient and precise methods for detection of new colony infestations and for monitoring glassy-winged sharpshooter, *Homalodisca vitripennis* (Germar) (GWSS) population dynamics on a temporal and spatial basis for IPM related decision-making are lacking. This proposal provides an approach that will address the detection and monitoring needs as well as develop a new strategic approach to management of GWSS.

INTRODUCTION
The GWSS as a vector of *Xylella fastidiosa*, remains a threat to grapes, almonds, stone fruit and oleander and impacts citrus and nursery crops throughout much of California. It remains an important quarantine pest for the Napa and Sonoma Valleys and other uninfested areas. Due to the unique biology and behavior of the xylophagous GWSS which is driven by plant xylem chemistry and nutrition, conventional detection and monitoring approaches may not provide the necessary statistical precision needed by the regulatory and producer community for management decisions. This proposal provides an approach that will address the detection and monitoring needs as well as develop a new strategic approach to management of GWSS.

OBJECTIVES
Overall: To determine the most efficient and cost effective trapping system to detect and monitor *Homalodisca vitripennis* Germar (GWSS) population dynamics and the potential to manage GWSS populations.

1. Evaluate and summarize previous sampling and trapping efforts for GWSS.
2. Trap configuration and number: Determine the potential and optimize the number of traps that are most efficient and cost effective in detecting and estimating GWSS populations.
3. Determine the effects of host plants in combination with traps: Determine the potential and the optimization of a combination of GWSS host plants in sentinel plots to detect, estimate and manage GWSS population dynamics.

RESULTS AND DISCUSSION
We have completed Objective 1 which was discussed in the October report and that segment will be updated as new literature appears. We are completing the field experiments to meet objectives 2 and 3 and these results will be completely summarized in the final project report submitted for the Annual Research Symposium in December. Once the field experiments are completed we can make the final inferences and recommendations. Here we provide a partial series of data to indicate some of the approaches we have taken. In brief we have looked at trap size, color, height, shape, orientation, background contrast, placement relative to vegetation and a number of other factors relative to *H. vitripennis* behaviors with the objective of improving trap efficiency. We have also made some novel discoveries about *H. vitripennis* behavior along the way which will be discussed when completed in the final report.

H. vitripennis are attracted to yellow which stimulates them to land on traps. In an evaluation of trap color (Table 1, Fig. 1) we determined that *H. vitripennis* prefers yellow and appears to respond negatively to the intensity of the UV wavelengths reflected by traps. Furthermore, perhaps males are more sensitive to this factor than females. The glidden yellow treatment captured ~60% less *H. vitripennis* than the other three yellow hues tested. The major difference between the spectra of the 4 yellows tested is in the intensity of the glidden yellow at all wavelengths. It is unlikely that the wavelengths of yellow and above (>500 nm) would be inhibitory so it is likely that the wavelengths below 500 nm are the factors suppressing *H. vitripennis* trap response. This inhibitory response to wavelengths in the UV range has been shown in other piercing-sucking insects through the use of UV-reflectant mulches.

We have completed a number of experiments to investigate trap parameters on *H. vitripennis* capture rate. *H. vitripennis* responds positively to trap size in a linear manner (, Table 2, Fig.2). We have also shown that *H. vitripennis* capture rate may be increased by changing the trap configuration from a flat two-sided trap into a cylinder shape which apparently samples the entire surrounding 360 degrees.

Monitoring and detection devices work most efficiently from both an IPM and regulatory perspective if their capture rate is indicative of the surrounding pest populations. Unfortunately, there is only one reference (Castle and Naranjo 2008) that demonstrates statistically that any trapping method for *H. vitripennis* provides an accurate indication of the populations sampled. Castle and Naranjo (2008) demonstrated this in citrus orchards where large populations of *H. vitripennis* occurred during the study. In the southeastern U.S. high populations of *H. vitripennis* are rare and are highly related to host plant quality as we have discussed in previous research (Mizell et al. 2008). Crape myrtle is a favorite host of *H. vitripennis* in summer both in the southeast and in California. However, in crape myrtle *H. vitripennis* traps do not reflect leafhopper density on plants (Fig. 3). In fact during times when peak numbers of *H. vitripennis* are found on crape myrtle the correlation between trap catch and density on plants is often negative (data not shown). When *H. vitripennis* are feeding on a host plant of high quality their trivial movement appears to decrease resulting in a reduction in overall trap catch, but with a concomitant increase in the proportion of male *H. vitripennis* trapped.

Table 1: The response of the glassy-winged sharpshooter (leafhopper), *Homalodisca vitripennis* (Say), to different colored sticky traps in a field choice experiment during June and July. Traps (20 x 50 cm) of each color were mounted on a T-shaped post and board ca. 2m above ground. Traps of each color were displayed on the boards which were placed in five different locations (replicates). Leafhoppers were counted by sex, removed and the relative placement of each trap was re-randomized each time the traps were checked. Paints are all enamels and were covered with a thin layer of Tanglefoot.

	Mean ± SE Leafhoppers/Trap/Day	
Trap Color	***H. vitripennis* Males**	***H. vitripennis* Females**
Gliddon Safety Yellow[1]	0.41 ± 0.12A[2]	0.44 ± 0.10A
Kem Lustral Yellow[3]	0.39 ± 0.09A	0.35 ± 0.07A
Kem Lustral Yellow/White[4]	0.18 ± 0.05 B	0.32 ± 0.06A
Glidden Yellow	0.16 ± 0.04 B	0.13 ± 0.13 B
Kem Lustral Black[3]	0.05 ± 0.02 B	0.06 ± 0.01 B
Kem Lustral Red[3]	0.03 ± 0.01 B	0.05 ± 0.01 B
Kem Lustral White[3]	0.03 ± 0.01 B	0.04 ± 0.01 B
Clear Plexiglas	0.01 ± 0.01 B	0.02 ± 0.01 B

[1]) Glidden Glid-guard alkyd industrial enamel, 4540 safety yellow.
[2]) Means not followed by the same letter are significantly different as determined by contrast statements, P <0.05.
[3]) Spectral reflectance patterns for these paints can be found in Owens and Prokopy (1978).
[4]) Mixture provides higher UV reflectance.

Table 2: Number of *H. vitripennis* trapped in two trap types over 30 days in north Florida. Traps were deployed on stakes 1 m above ground in a crape myrtle planning with 10 replicates per treatment for ~ 30 days.

	Total Number Trapped		
Trap Type	**Male *H. vitripennis***	**Female *H. vitripennis***	**Total**
1. Pherocon AM	410	247	657
2. Cylinder, 305×76mm, Safety Yellow	462	296	758

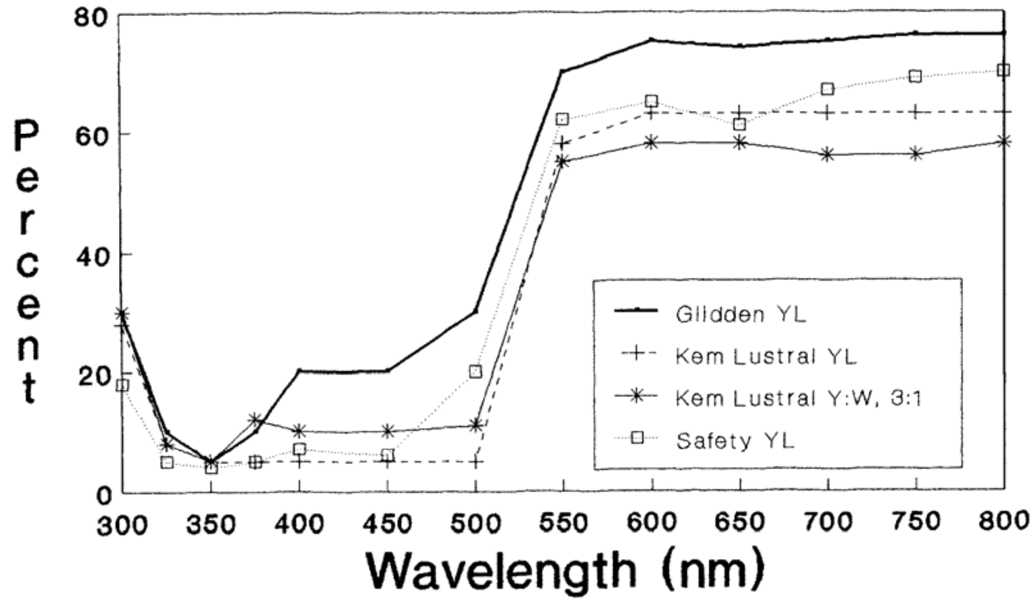

Figure 1: Spectral reflectance patterns from four different paints used to trap *H. vitripennis*. See table 1 for results.

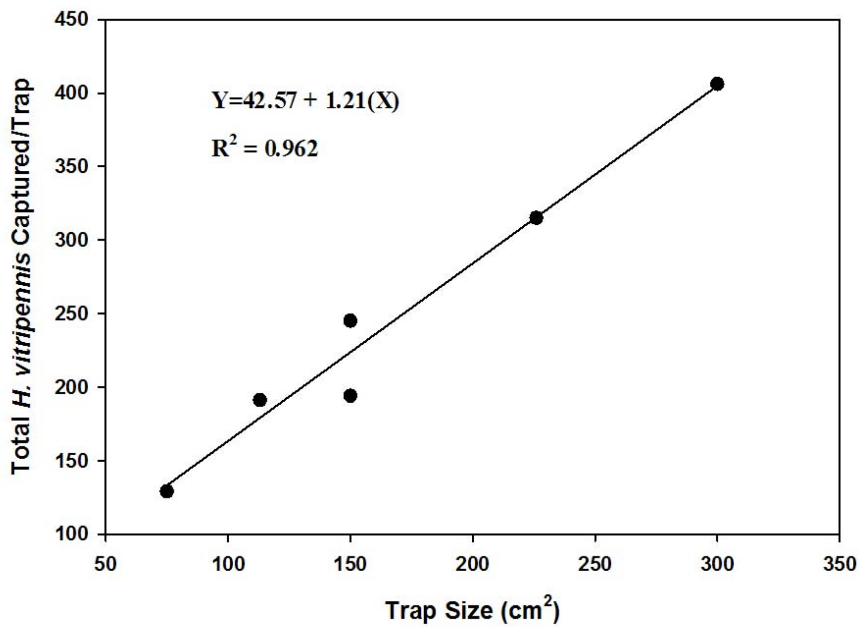

Figure 2: Relationship of trap size to capture rate of *H. vitripennis* using cylinder traps (76 mm wide of varying lengths) painted safety yellow. Counts are total leafhoppers captured by all traps (n=5) over the entire experiment.

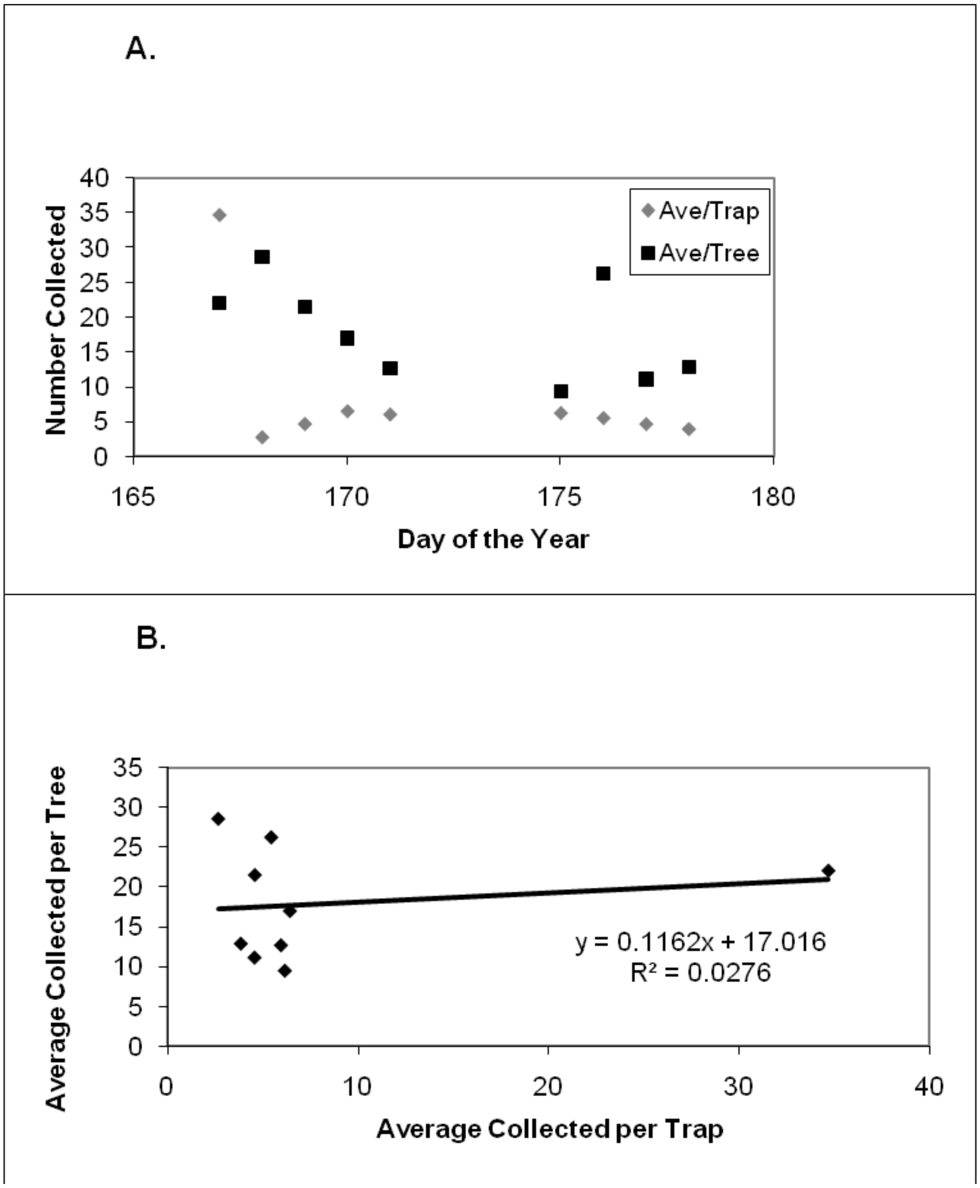

Figure 3: Number of *H. vitripennis* captured in yellow sticky traps in relation to visual counts on crape myrtle plants over time in north Florida. A. Mean number per tree and trap per day and B. correlation of means on plants to means on traps by linear regression.

Publications:

Project Reports on CDFA website and in Research Symposium Proceedings.

Northfield, T. R. F. Mizell, T. C. Riddle and P. C. Andersen. 2009. Landscape level geospatial distribution of glassy-winged sharpshooter *Homalodisca vitripennis* (Hemiptera: Cicadellidae) in north Florida. (pending).

References:

Castle, S., and S. Naranjo. 2008. Comparison of sampling methods determining relative densities of *Homalodisca viitripennis* (HemipteraL Cicadellidae) on citrus. J. Econ. Entomol. 101: 226-235.

Mizell, R. F., C. Tipping, P. C. Andersen, B. V. Brodbeck, T. Northfield and W. Hunter. 2008. Behavioral model for the glassy-winged sharpshooter, *Homalodisca vitripennis* (Hemiptera: Cicadellidae): optimization of host plant utilization and management implications. Environ. Entomol. (Forum) 37:1049-62.

Owen, E. D. and R. J. Prokopy. 1978. Visual monitoring trap for European sawfly. J. Econ. Entomol. 71: 576-578.

CONTRIBUTE TO SOLVING THE PD PROBLEM IN CALIFORNIA

Management of the vector and PD is contingent on the availability of efficient sampling field methods. This proposal aims to improve upon the current methods.

FUNDING AGENCIES

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