

**CALIFORNIA CITRUS PEST AND DISEASE PREVENTION PROGRAM
SCIENCE AND TECHNOLOGY SUBCOMMITTEE MEETING**

Meeting Minutes
Tuesday, July 10, 2018

The Science and Technology Subcommittee meeting was called to order at 10:00 am on July 10, 2018.

Committee Members Present:

Dr. Ed Civerolo	Dr. Beth Grafton-Cardwell*	Dr. Jason Leathers*
Aaron Dillon	Dr. Melinda Klein	Kevin Olsen
		Dr. Etienne Rabe

Committee Members Absent:

George McEwen

Interested Parties:

Dr. Jim Adaskaveg	Rick Dunn	Sara Khalid	James McFarlane	Joel Nelsen	Dr. Spenser Walse*
Bob Atkins	Holly Deniston-Sheets	Geoff Hollenbeck*	Brianna McGuire	Lea Pereira*	Keith Watkins
Harold Browning*	Sara Garcia Figuera*	Leslie Leavens*	Dr. Neil McRoberts	Dr. Mamadou Setamou	Judy Zaninovich*
Jonathan Bixler*	Jim Gorden	Ray Leclerc	Cheol MinLee*	Cressida Silvers*	Sandra Zwall*
Nick Condos	Victoria Hornbaker	Magally Luque-Williams*	Dr. Beth Mitcham	Roger Smith	
Jim Cranney	Karen Jetter	Greg McCollum*	Tobias Moyneur*	Jennifer Van Dyke*	

*** Participated via Webinar**

Opening Comments

Dr. Etienne Rabe welcomed the Subcommittee, staff, and members of the public participating in person and online. It was noted that there was a quorum for the meeting.

Review of Scientific Assumptions-Workload, Staff Needs, Costs

Nick Condos gave a brief overview of the workload and budget. He went over the lab capacity, which will increase now that the Citrus Research Board (CRB) has a certified lab. Workload assumptions were based on low average infection rates of trees and using a linear projection. This may have underestimated the number of trees, workload needed for delimitation surveys, and tree

removals for the future. Nick suggested running through different scenarios to determine program costs and what the program needs in the future. Dr. Rabe recommended to take the topics of Risk-Based Survey, Tree Removal, and Treatment around HLB Positives to a smaller group to discuss and come back with recommendations. Nick commented that commercial citrus surveying is being done. In regard to area wide treatments, it was discussed how many residential treatments would qualify for area wide treatments if all growers participated. The current budget is based on low grower participation, based on historical evidence. If all growers decided to participate, there would be 107,721 properties in the 400-meter buffer treatment area that would have to coincide with the grower treatments. 254 Tru Green trucks are needed to complete residential buffer treatment in all counties around all groves, and within the grower treatment window. 308 State staff would be needed to oversee the trucks. Dr. Rabe and Nick also commented that the full committee wanted research conducted on area wide treatments and whether they are effective. Dr. Beth Grafton-Cardwell stated that the timing needs to be done at a certain time of the year. Bob Atkins suggested giving this workload to the Pest Control Districts. A recommendation will be presented to the full committee regarding the Program moving away from area wide buffer treatments for ACP, and if the Pest Control Districts (PCD) can take that workload. Dr. Neil McRoberts commented that work has been done to develop a fixed budget to treat a portion of residential properties, which can be given to PCDs.

Strategy 1-Quickly Detect and Eradicate Diseased Trees

Cost/Benefit Analysis Update

Karen Jetter gave an update on the economic risk analysis of ACP/HLB management in Southern California. An “expected cost” was described as the estimated cost of a management option multiplied by the probability that that specific option will be needed. So far, economic data from CDFA has been collected. Key people on the team have been identified, and meeting and collaborating on developing specific scenarios have been productive. The model will be run in Los Angeles, Orange, Riverside, and San Bernardino counties. It will be five square miles by five square miles and will be using the Gottwald model design. The grids selected were based on infestations on the edge, commercial citrus areas, and choosing a representative area. Karen is looking at increasing survey capacity in specific locations, and how much lab capacity will be needed in the different scenarios. Emphasis will be placed on changes in survey capacity in different areas. In one of the scenarios, the number of human surveyors will double in each five by five grid and operate under different parameters within that grid. Other scenarios include keeping the number of human surveyors constant, but adding canine teams, tree rogue, following the same treatment protocol for ACP, delimiting surveys from 400 meters from a find, and a probability distribution being used for the rate of spread instead of a point estimate. The model will run for five to six years. Project outputs include probabilities of spread, number of trees affected, number of sites affected, expected cost of each scenario, and expected increase needed in lab capacity and lab costs. Roger Smith suggested focusing on specific areas which will be more valuable to thwart the spread to commercial groves.

Review “Exposure” Data Analysis

Brianna McGuire presented on exposure work in Southern California. For the scope of the data, 546 positive trees were measured, with 237,196 total tree samples. 139 positive ACP were measured, with 50,664 total ACP samples. Positive HLB and ACP samples are occurring roughly in the same area. Brianna’s analyses were divided into four sections. The first section was in 800 -meter areas where there was at least one CLas positive ACP detected and no positive HLB trees.

This cluster had 3,148 trees. The next cluster were 800-meter areas where at least one CLAs positive ACP have been detected and only one CLAs positive HLB tree. This are had 5,624 trees. The third cluster had at least one positive CLAs ACP detection and more than one CLAs positive HLB detection. This area had 78,769 trees. The last cluster was 800-meter areas where no CLAs positive ACP have been detected and at least one CLAs positive HLB tree has been detected. This area had 2,240 trees. Previous estimations were around 5,000 to 68,000 trees exposed based on psyllid path. Based on Dr. Gottwald' s data, 3,497-14,828 trees are currently infected. However, "infected" does not mean "exposed." Definitions of "exposure" and "infections" were discussed based on research paper definitions. Primary exposure is defined as a disease that has arrived in the area. Secondary exposure is the rate of infection. According to these definitions and data, 70 percent of the trees should be defined as "exposed" in an area where a psyllid has been detected. The rate of the psyllid transmitting a disease can be as low as three percent if the leaves are mature. Conversely, it can be as high as 97 percent in the right type of flush and habitat. Benefits of using previous work to the HLB system are psyllid dynamics, location of HLB positive trees, and possible calculations. Challenges include the unknown number and location of all trees in the quarantine zone, and the true number of trees. Known quantities used for the primary and secondary infection rates are leaves infected per psyllid, positive psyllid proportion, psyllid density, and dispersal. The overall proportion of infected psyllids in all counties in California is higher than the overall proportion of infected psyllids in areas with HLB. This indicates that primary infections may be operating at a higher rate outside of the existing infection zone. Secondary infections are driving most of the infections that we see now. This data indicates that primary infections outside of the existing quarantine zone should be more of a concern to us, and inoculum-based models may better describe what is occurring in the existing infected regions and may be driving exposure. Greg McCollum commented that if an infected adult ACP is found, it is very likely that a surrounding tree will also be infected. However, if an infected ACP feeds on a tree, it does not necessarily mean that the tree will develop HLB.

Strategy 2-Control Movement of Psyllids around the State; Regulations

Post-Harvest Quarantine Treatment of Bulk Citrus

Ethyl Formate Fumigate Efficiency, Use Restrictions, Registration

Jim Cranney and Dr. Beth Mitcham discussed that the industry is looking at other options for "spray and move." One of the options is Ethyl Formate. Due to Evergreen coming into its own set of issues, the focus has now been on Ethyl Formate. Jim and Dr. Mitcham are working with a registrant to run toxicology tests for EPA to register the product, and will meet with them on August 1 to go over the registration requirements. One issue to overcome is being able to see commercial level efficacy, and technical issues that will need input from the industry. Tarped fumigation is no longer an option due to the amount of gas.

Evergreen Fogging Efficiency, Use Restrictions, Registration

Dr. Spenser Walse reported that the Evergreen research is done, and an attempt is being made to lower the volume of Evergreen treatment in foggers and dry foggers in trucks. There are clear research directives, and Dr. Walse is confident that Evergreen will be able to obtain a registration. Between the two products, Dr. Walse recommends Ethyl Formate.

Bulk Citrus Regional Quarantine Risk Model Matrix

Nick Condos commented that subject matter experts are needed to obtain inputs to Sara Garcia Figuera's risk model. Suggestions for experts include two or more people from the CPDPP, someone from a packinghouse, CRB Board Member, California Citrus Mutual staff, and Dr. David Morgan. A group will be decided at the full committee meeting tomorrow.

Proposed Criteria to Remove County from ACP Regional Quarantine

Aaron Dillon presented on what the conditions would be that would allow an area to move from Zone 2 back to Zone 1. Currently, there are five counties that have not had an ACP detection in over two years. There is no protocol to move a county out of quarantine. A discussion group will be needed to develop criteria. It was decided that they will work in conjunction with the group working on the bulk citrus risk model matrix.

Strategy 3-Suppress Asian Citrus Psyllid Population

HLB Data Analysis and Treatment Zone Radius Recommendation

Dr. Tim Gottwald presented on sampling efficiency of California residential risk based analysis for 2018. The methodology was based on what can be learned from previous surveys. The 2017 risk based survey was presented. A progression was shown for ACP in southern California from 2012-2017. From these slides, the presence of ACP in Kern, Santa Barbara, and San Luis Obispo were depicted over time. The next slide showed sampled areas over time from 2012-2017. 2014 was when samples from the Central Valley began due to risk. The intensity of sampling increased in 2015, then decreased in 2017. This is because of current findings that have stimulated the number of sampling areas to be adjacent to previous finds due to higher risk. The mean sampling density over time for ACP and for trees show that the number of locations continue to increase until 2016. The number of locations once again decreased due to the number of sampling that needed to be done around previous find sites. However, the number of samples going to the lab have increased. Sampling has also been done inside and outside designated STRs. The ones outside of designated STRs are in the proximity of commercial citrus. An HLB progress curve was compared between Orange and Los Angeles counties. There has been an increase in Los Angeles and Orange county discoveries. The number of visits of sampled locations have been decreasing due to the ease of discovering HLB infected trees, and the increase in the prevalence of the disease. More sampling will lead to an increase of the detection probability. Dr. Gottwald has been working with CDFA to balance detection probability across different areas by increasing sampling.

Dr. Gottwald posed the questions of the ability to estimate the actual HLB incidence in each STR grid from the data gathered. More samples were taken in the high-risk areas. The HLB incidence can be adjusted based on findings and detection accuracy. Tree infections in each STR can then be estimated based on past findings, and detection capability. The minimum and maximum incidences based on percent was then shown based on these determinations. The risk-based survey for 2018 was created based on these findings. Ct values were discussed and there was a large amount of negative ACP and trees. Ct values less than 38.5 or inconclusive were located and mapped. Dr. Gottwald commented that most of these findings end up being positive for CLAs. This could be because during one sampling they are negative, and the second re-sampling ends up being positive, which are most likely not inconclusive. Mapping the higher Ct values these on the risk based maps changes the results considerably. The risk model is based on ten factors. These are census travel, ACP density, CLAs positive ACP, potential ACP sources, transportation corridors, packinghouses, farmer's markets, military and Indian reservations, organic citrus, and weather suitability. The

HLB/ACP risk map for 2018 will include more risk values to commercial citrus, to protect it from an infestation.

Sampling coverage for surveyors has increased and is being analyzed with Nick Condos. Resources and people can move where there is more of a risk and where they are needed. There will be a three-cycle survey. The new survey will be based on the number of plant samples and ACP samples and high risk STRs. STRs are shifting to include a 25 percent bias towards commercial citrus. More sampling efforts are being made in Ventura, Riverside, and the Central Valley. Dr. Gottwald then analyzed a reduction of the treatment and survey area from 800 meters to 250 meters. He looked at the number of finds that were in those areas surrounding each individual infected tree that was discovered. When 250 meters were used, some but not all HLB positive locations were captured. If 250 meters are repeatedly used due to the discovery of another find, more locations are captured, and so on. Dr. Gottwald concluded that even though a smaller distance is used for surveying, almost every find is still captured in the entire area, even though only a fraction of the entire whole is being surveyed. Using cluster analysis, 41 different clusters discovered HLB positive trees. It was also shown temporally how these clusters found HLB positive sites over time. This data can be used to determine the distance needed to capture all the infections through time. 350 meters showed 100 percent coverage of the infections. Going over 350 meters does not add much benefit. 400 meters was the new proposed protocol developed for delimitation surveying.

The distance between HLB trees and CLas positive ACP finds were discussed. There is a nearly 90 percent chance of finding at least one HLB tree within 450 meters. It is an 80 percent chance within 400 meters. When there is a new site that is discovered, you will expect to find a nearby HLB positive tree within two months.

CDFA is also using this as a guide for treatment and quarantine distances. Nick Condos asked if the treatment area should be reduced to 400 meters based on Dr. Gottwald's findings. It was asked how many trees need to be infected with HLB to reach a "point of no return." Dr. Gottwald answered that it only takes a few infections, and that treatment will slow down the disease progression, but it will not completely halt it. Greg McCollum stated that to stay ahead of the disease, the best option would be to survey where the disease is not established, and that would be in the Central Valley. Dr. Mamoudou Setamou suggested to shift the priority to protecting groves. Dr. Gottwald also advised to look at the present data and how treatments would take place in the future.

A motion will be presented to the full committee to reduce the treatment area to 400 meters around HLB finds. Ed Civerolo presented the motion. It was seconded by Dr. Melinda Klein. All other subcommittee members were in favor of the motion when asked by Dr. Rabe.

Research on Area Wide Buffer Treatment Efficacy and Duration

Dr. Beth Grafton-Cardwell presented determining efficacy and residual control of psyllids in residential citrus. She discussed how variable tree health can be in residential backyards. How well they are cared for will affect the efficacy of insecticides. Riverside residential ACP densities were examined around HLB positives on mandatory 800-meter treatments. Five flushes were examined (when available) on two to five trees at each site. The conclusions that were drawn were that

Tempo and Merit were rapidly effective in four out of six sites that were treated, populations in one control declined to very low levels on their own while another population persisted for 24 weeks, and Site three had detectable psyllids 24 weeks after treatment.

Strategy 4-Improve Data Technology, Analysis, and Sharing

Bactericide White Paper

Jim Cranney presented on integrated HLB management with bactericides. Jim requested to make a recommendation to the full committee to adopt HLB management practices to include the use of bactericides. Jim worked with Dr. Jim Adaskaveg to put together a Section 18 for two antibiotics to stop or slow down the spread of HLB. Jim Cranney presented an integrated approach, with steps including monitoring for ACP and using early HLB detection if available, maintain an aggressive HLB control program, use of bactericides, promote healthy root system with irrigation and phytophthora control, and remove positive trees. There will be six sprays a year to protect the flush. A motion will be made at the full committee meeting to include bactericides in the HLB integrated approach. Nick Condos suggested making the motion more generic for it to go through and approved by the Secretary.

The meeting was adjourned at 2:45 pm. The next Science and Technology meeting will be held on September 4, 2018.