



CALIFORNIA DEPARTMENT OF
FOOD & AGRICULTURE

Karen Ross, Secretary

March 18, 2014

Dear Citrus Industry Stakeholder:

Subject: Asian Citrus Psyllid and Huanglongbing Science Advisory Panel Report

The California Department of Food and Agriculture's (CDFA) Asian Citrus Psyllid (ACP) and Huanglongbing (HLB) Ad Hoc Science Advisory Panel (SAP) is a group of scientists selected by the Secretary to provide scientific advice to the Department to ensure that we are using the best science available when developing program policy and protocols. These scientists consist of experts from states that have already experienced the sequence of events associated with ACP/HLB infestation, as well as California-based scientists with local knowledge to ensure a diverse perspective.

The panel met in December 2013 and was tasked with providing recommendations on a series of non-regulatory questions vetted by CDFA. This report contains the list of questions and the answers from the ACP-SAP. In addition, the report contains the SAP's comments and recommendations for consideration in the development of ACP/HLB programs in California.

The SAP made program-wide recommendations that fall under the area of responsibility of not just CDFA, but also collaborating agencies and stakeholders. Therefore, we intend to review the SAP recommendations jointly with all affected entities including the Citrus Pest and Disease Prevention Committee, United States Department of Agriculture, Citrus Research Board, Agricultural Commissioners, and the nursery industry, in order to ensure a common understanding of those recommendations that can be implemented by the agency and/or stakeholders responsible.

The stakeholder meeting is scheduled for March 26, 2014 from 1:00 p.m. to 4:00 p.m. at CDFA headquarters, 1220 N Street, Room 133, Sacramento, CA 95814. Call in information will be furnished upon request.

If you have any questions or concerns, please do not hesitate to contact our Citrus Program Manager, Victoria Hornbaker at 916-654-0317 or via email at Victoria.Hornbaker@cdfa.ca.gov.

Yours truly,

Nick Condos
Director

The March 26th Meeting has
been canceled and will be
rescheduled.



ACP SAP Questions & Answers. Questions for the ACP/HLB SAP sent to the SAP 10-3-13 by Jason Leathers from California's ACP/HLB Programs. **Answers from the SAP are in bold text.**

- 1) What is the appropriate size of treatment areas around ACP find sites in eradication zones under a variety of scenarios?
 - a) An urban area where no HLB has been detected – **Treating all urban ACP hosts within 400 m as is currently done seems appropriate as well as any commercial citrus grove that falls within 400 m.**
 - b) An urban area where HLB has been detected – **Treat 800 m for urban ACP hosts as well as any commercial citrus groves that falls within 800 m. In addition, background checks should be done to try and determine why HLB was likely present. All infected trees should be removed rapidly and trees in the area should be tested for CLas using the best detection methods available at that time, especially during the spring and fall when titers are highest. Because transovariol transmission of CLas within ACP occurs at low rates, detection of CLas in ACP nymphs from an urban tree is proof that the tree is infected with CLas (i.e. it then falls under category 1b).**
 - c) A commercial grove where no HLB has been detected – **Treat that grove and any grove or urban ACP hosts that fall within 400 m.**
 - d) A commercial grove where HLB has been detected – **Treat that grove and any grove or urban ACP host that falls within 800 m. In addition, background checks should be done to try and determine why HLB was likely present. All infected trees should be removed rapidly and trees in the area should be tested for CLas using the best detection methods available at that time, especially during the spring and fall when titers are highest. Once the cumulative number of infected trees in that grove has reached 2%, all trees in the grove should be removed. Because transovariol transmission of CLas within ACP occurs at low rates, detection of CLas in ACP nymphs from a commercial tree is proof that the tree is infected with CLas (i.e. it then falls under category 1d).**
- 2) To mitigate risk of natural spread of HLB we currently treat ACP detections in a 2-mile wide buffer on either side of the border with Mexico. What is the minimal width of such a buffer that will mitigate the natural movement of HLB? -- **Two miles on either side of the border (four miles total) appears to be a suitable minimal width.**
- 3) Are the early HLB detection methods in development (sniffer, root survey, metabolite analysis) appropriate for use now, are they truly accurate? -- **Research is underway in the UC Davis Containment Facility to try and answer this question. It is urgent that this work continues as fast as possible. The close agreement (on three separate trees, three different methods each indicated presumptive "positive" for CLas) of several very different experimental methods on trees chosen around the Hacienda Heights Ground Zero tree are highly suggestive that several of these methods are accurate.**

- 4) Would it be beneficial to freeze dry leaves from asymptomatic, VOC positive trees for future analysis, when technology improves? -- **In part, this is a matter of resources and their best use for answering scientific questions. In some cases, such leaves should be collected on ice (one method) or dry ice (three of the methods), delivered to the Citrus Research Board Dimitman Laboratory for processing, and then stored at -80°C for later analysis. Consult with the CRB lab (Dr. Polek) to see if this process can be streamlined.**
- 5) Beyond what level of HLB survey will we see diminishing returns? -- **Right now is an absolutely critical time period with respect to finding and eliminating CLas infected citrus trees in California. Based on experience from Florida, once one passes 2-8% CLas tree infection, one sees diminishing returns.**
- 6) What role should tree nutrition play in ACP/HLB management? Is phosphoric acid a viable treatment for ACP? -- **Proper nutrition is essential to citrus tree health and most commercial growers in California already practice good tree nutrition. The SAP absolutely rejects the concept that CLas should be allowed to spread and that this disease can be managed through enhanced nutrition – unfortunately, many growers in Florida have taken this approach and are beginning to see dramatic negative impacts (e.g., very high levels of fruit drop this year; negative impacts on flavor which can be mitigated to some degree with blended juice but ruins a fresh fruit market like California's). No – phosphorous (phosphite or H_3PO_3) acid treatments are absolutely not the way to manage ACP or HLB.**
- 7) What methods should growers use to facilitate the establishment of *Tamarixia radiata* and other biological control agents when they are introduced in and around groves? Will agents require refugia? -- **Management of Argentine ant and other ants that interfere with biological control is essential to establishment of *T. radiata* in urban areas and to high levels of parasitism that will allow this parasitoid to spread as much as possible. Research and trials by pest control advisors and growers will help us learn which natural enemies can survive under various treatment programs in both organic and non-organic citrus. Leaving refugia of uncontrolled ACP in place is not wise.**
- 8) The California ACP/HLB Task Force and USDA TWG recommended a time period of 24 months to declare eradication of ACP from an area. This is to allow for the passage of 3-4 flushing cycles of citrus. Should the length of the quarantine be reconsidered in conjunction with the treatment program and a lack of finds? -- **If 24 months pass and monthly traps and visual surveys do not reveal an additional ACP find, the SAP considers that a good time period to declare eradication a success.**

- 9) In lieu of the field cleaning process, chemical treatments are now considered sufficient to mitigate risk of spreading ACP on bulk fruit, stems, and leaves from commercial groves in areas of low ACP prevalence.
- a) What criteria should be used to determine areas of low pest prevalence? – **Based on science, the SAP considers southern California to no longer be an area of low pest prevalence and this will likely soon be true of other areas such as the San Joaquin Valley. Given the current HLB situation, the SAP does not believe chemical treatment is sufficient to reduce levels of ACP that might be carrying CLAs in shipments of fruit from southern California and coastal areas into the SJV. Instead, the SAP recommends that all fruit be run through a wet packing house wash / brushing before movement to the SJV and fruit should be moved in enclosed or tarped trucks. No treatment should be needed for movement of fruit within a quarantine zone. For movement of fruit from within a SJV quarantine zone to a non-quarantine area, the current list of chemical treatments appears adequate except the SAP further suggests two approved organic spray could be substituted for each approved traditional spray unless the treatment is deemed 'eradication' and then there are no organic treatments deemed eradicated.**
- b) Is there a different set of chemicals that would be sufficient for high prevalence areas? – **For the reasons stated above, the SAP does not consider any insecticide treatment to be sufficient for movement from southern California (because of the risk of moving CLAs inoculative ACP) into either a non-quarantine area or low-density area such as the SJV sufficient. Instead, all such fruit should be run through a wet packing house wash / brushing before movement and should be moved in enclosed or tarped trucks.**
- 10) In addition to the treatments listed in Attachment 1, are there other efficacious alternatives for control or eradication of ACP in commercial organic groves? – **The SAP has modified the chemicals listed under Attachment 1 below to include four products deemed appropriate to list at present. The SAP does not know of sufficient efficacy data to add additional chemicals to the list at this time. It is important that additional organic testing be done so that the strongest products can be selected for use in organic citrus. The SAP does not consider organic products to be eradicated, but they may be used where eradication has been replaced with an areawide treatment program.**
- 11) With most of the ACP detections in Tulare County being on traps placed on poles rather than within the canopy, should we change trap placement for the ACP program? – **Trials are currently underway to compare adult ACP trapping on cards hung using protocols used for GWSS vs. by CPDPC vs. by CDFA in urban citrus. Pending the outcome of those trials, data should be submitted to the SAP so that a recommendation can be made.**
- 12) On March 23, 2014 we will be 2 years without a HLB detection in California. What should be our exit strategy? – **The SAP believes an HLB exit strategy does not make sense given that it is extremely unlikely the Hacienda Heights infected tree is the**

only one in that area and the likelihood that CLas inoculative ACP are becoming more moving northward from Mexico towards California. The long latency period between when a tree is infected with CLas and when HLB symptoms appear (can be as long as 3-4 years depending on variety, size of the tree, time of the year, etc.) must be considered.

Attachment 1

University of California – KAC Citrus Entomology – Organic Treatments

Laboratory and field research is underway to increase knowledge of the organic products available for managing Asian citrus psyllid. The following is a list of products that have demonstrated efficacy. In all cases, direct contact with the insect is required and residual activity is short (days) - that is why frequent applications are necessary.

- Pyganic + oil
- Oils (petroleum spray oils, TriTek, JMS stylet oils, others)
- PFR-97 (*Isaria fumosoroseus* fungus)
- Trilogy (neem oil)

The ACP SAP convened via conference call on January 16, 2014 to discuss questions related to whether or not ACP is established in areas of Tulare County. On the call were Matt Ciomperlik, Ed Civerolo, Tim Gottwald, Beth Grafton-Cardwell, Charla Hollingsworth, Joe Morse, Mamoudou Setamou, Georgios Vidalakis. Mark Hoddle was not able to call in.

Unincorporated Tulare County East of Richgrove (Map 1)

Detections: On November 4, 2013 one adult male ACP was identified. On December 23, 2013 four additional ACP were trapped: 3 were on 2 yellow panel traps inside the 800m eradication area and the 4th was at a residence approximately 2km northeast. On December 30, 2013 two additional ACP were trapped just outside the eradication area.

Treatments: At least 3 groves in the original 800m area were not treated subsequent to the November 4 detection. One grower has indicated his/her intentions to refuse treatment for several additional months.

Questions:

- 1) Is this pattern of detections consistent with evidence of an established population, or does it indicate repeating introductions of ACP to the area?

Answer: This is consistent with evidence of an established population.

- 2) Are the detections of ACP just outside the 800m eradication area and 2km to the northeast across a host-free area evidence that ACP have spread beyond the original 800m area?

Answer: This could be argued either way.

Dinuba (Map 2)

Detections: On August 13, 2013 two single male ACP were found on two yellow panel traps in the city of Dinuba. On September 9, 2013 a third male ACP was trapped at one of these two sites and visual survey revealed that a breeding population of hundreds to thousands of individuals of all life stages of was present on multiple small trees at an adjacent residential property. In January 2014 a single ACP was trapped outside a juicing facility less than 2km north of the previous detections.

Trace Back Investigation: Trace back investigation revealed that the trees had been planted at the property for at least nine months.

Questions:

- 3) Is this pattern of detections consistent with evidence of an established population, or does it indicate repeating introductions of ACP to the area?

Answer: This is consistent with evidence of an established population.

- 4) Is it likely that ACP may have spread beyond the 800m eradication area before treatments were applied?

Answer: Yes, growers should engage in area-wide control measures CDFA should follow-up with continued survey and residential psyllid control in the urban area.

Porterville

Detections: On June 26, 2013 four ACP were found on a yellow panel trap south of Porterville. Two additional ACP were found within a 5km radius on June 26th and October 3rd.

ACP SAP Questions & Answers – Winter 2014

Questions:

- 5) Is this pattern of detections consistent with evidence of an established population, or does it indicate repeating introductions of ACP to the area?

Answer: As ACP is capable of traveling long distances in short times it is splitting hairs to worry about establishment in individual areas. An established ACP population should be considered present throughout Tulare County.

Asian Citrus Psyllid / Huanglongbing Ad Hoc Science Advisory Panel Report

From SAP Members: Edwin Civerolo*, Timothy Gottwald, Beth Grafton-Cardwell (co-chair), Mark Hoddle, Joseph Morse (co-chair), Mamoudou Setamou*, and Georgios Vidalakis (* = not present at the Dec. 3-4 meeting but contributed to this report)

Executive Secretary of the SAP: Jason Leathers
Advisor to the SAP: Mathew Ciomperlik

Background

A meeting of the ACP HLB SAP was convened in Ontario, CA December 3-4, 2013 (Agenda = Appendix A). Prior to the meeting, the SAP was provided a list of 12 questions (ACP SAP Questions & Answers, answers from the SAP in bold type) that California's ACP/HLB programs asked be addressed.

December 3 (morning) -- In an open meeting, the SAP and interested parties listened to a series of presentations by Celestina Galindo and Nawal Sharma of the CDFA and MaryLou Polek of the Citrus Research Board updating the group on the status of the ACP and HLB situation and responding to a number of questions that SAP members had submitted prior to the meeting. Presenters responded to questions from the SAP and the public during and/or after their presentations. Following the presentations, all those present were provided an opportunity to pose questions of the SAP or others present or to make statements voicing their concerns.

December 3 (afternoon) and December 4 (morning) -- The SAP met in closed session with Jason Leathers and Mathew Ciomperlik to discuss the ACP/HLB situation in California and develop the framework for their report. At 11 a.m. on December 4, the SAP met with the public to share the highlights of their draft recommendations and receive feedback.

Following the meeting, the SAP developed this report, made sure all SAP members had a chance to review the draft and suggest changes, and then submitted the report to CDFA.

SAP Comments and Recommendations

The SAP organized the report around topic concepts. ACP SAP Questions & Answers contains answers (bold type) to the specific questions the SAP members were asked to address.

A. Rapid Detection of HLB Infected Trees and/or Psyllids

The SAP recommends that the absolute top priority of the program should be rapid detection of HLB-associated *Liberibacter*(s) and HLB, and elimination/reduction of CLAs.

A1. Survey for HLB twice a year. Combining the information that was provided to the SAP; information about HLB spread in Florida, Brazil, and Texas; and the experience of the SAP panel members, the SAP considers that it is almost certain that HLB-associated *Liberibacter*(s) (e.g., CLAs) are currently present in one or more citrus trees in California. Every effort should be made to rapidly find these infected trees and to remove them so as to reduce the potential for spread. The SAP feels it is important that that surveys are done in the most effective and efficient manner possible and as new information is obtained it be provided rapidly to relevant parties (e.g., to Tim Gottwald) so that it can be used to update both urban and commercial citrus risk based surveys.

Based on information discussed at the SAP meeting and the presentations in the morning on December 3, Tim Gottwald plans to update his urban risk analysis survey protocol, including an update of a density driven SAP Report, 3 February 2014

analysis around Hacienda Heights and East Los Angeles (identified at the meeting as an additional high risk area). He will also provide his latest commercial citrus survey protocol to CDFA, CPDPC and other relevant parties need to discuss what funds are available for expanded surveys. The SAP recommends that HLB surveys be done with the objective of covering trees identified by the density-based Gottwald system twice a year (e.g., not every tree around Ground Zero but instead those identified by the Gottwald risk based system which will naturally weigh those around Ground Zero highly). It is the opinion of the SAP that focusing on high-risk locations twice a year with the existing funding is better than trying to survey more locations less frequently. The SAP feels this is important because the appearance of HLB visual symptoms vary markedly over the year and two sweeps provide a higher likelihood that at least one of the surveys will be done during a symptom-optimal time of the year. In addition, there needs to be greater flexibility in changing the structure of the sampling protocol based on the changing situation in the field. The operational protocol for the HLB survey should be reviewed by the SAP panel yearly and whenever significant changes are made.

A2. Rapid exchange of information. It is certain that CLAs is going to be found in California again. Anticipating this, involved parties need to develop a communication system whereby the details on what sites have been sampled and the results (positive vs. negative) are communicated rapidly to Tim Gottwald so that he can update the HLB survey model and communicate modifications back to those who are conducting the surveys. The time to develop and fine-tune this system is now rather than later. The SAP cannot suggest how this communication system is best improved but it is critical that it be improved.

A3. Re-training. The visual symptoms of HLB infection in dooryard citrus are easy to miss. Survey personnel (both CDFA and CPDPC) need to be trained and retrained (re-familiarized with visual HLB symptoms) on a regular basis so that they can best detect the visual symptoms of HLB infection. This retraining should be done every six months by sending survey leaders to Florida to view the field symptoms. We suggest that Tim Gottwald and/or Mike Irey be consulted for advice regarding how this training/re-training is best done.

A4. Hacienda Heights Experimental CLAs survey. The SAP understands that the CPDPC has authorized the funding of a "Transect Survey" using several of the non-PCR early detection methods (VOC sniffer, metabolomics, etc.) in a 5-mile area around the "Ground Zero" Hacienda Heights CLAs positive tree. **The SAP feels that this is an extremely important survey and that it needs to be done as soon as possible.** The results of this transect survey will help determine the density of CLAs presumptive positive trees.

The SAP suggests that Tim Gottwald's risk-based analysis be used to suggest which locations be sampled based on a density-driven analysis in this 5-mile area using a sector format (contact Dr. Gottwald for further details), rather than the proposed format (similar to spokes of a wheel). For example, if it is determined that funding is available for 48 samples, then instead of selecting the 48 sample locations based on symmetry, they should be selected using risk analysis. The SAP also suggests that 48 sample locations are not nearly enough. VOC-or metabolomic-positive trees should also be used as foci for risk based sampling. Such sampling should also be done in the East Los Angeles area where ACP has been present for quite some time and census data (e.g., population ethnicity and density) predicts high risk.

The SAP also suggests that an operational protocol for the Hacienda Heights/ East Los Angeles surveys be written and presented to the SAP for review and comment.

A5. Commercial grove CLAs sampling. The SAP suggests that a high priority of the CPDPC is sampling and testing for CLAs in psyllids (and perhaps plant material when suspicious symptoms are present) in commercial citrus groves. Obviously, funding is limited and CLAs sampling in the urban areas of Los Angeles is a very high priority. But the SAP also suggests that commercial citrus sampling should be initiated, especially in areas where areawide ACP management programs have begun and ACP is established.

A6. Expanding capacity for CLas sampling. The SAP believes that processing a large number of samples in a timely manner is critical and the volume of this work is going to increase exponentially in the future. Thus, the processing capacity needs to be expanded substantially. A suggestion of the SAP is that the CDFA lab continue testing all leaf and root samples and the CRB lab assume the processing of all ACP samples, including those collected in Zones 1, 2, and 3 around Hacienda Heights and other high risk areas. The SAP also suggests that the current Zone 1-3 plant samples continue to be collected per the current protocol (Appendix C).

A7. ACP treatments/sampling in Hacienda Heights. Because of the existence of the CLas positive citrus tree (Hacienda Heights “Ground Zero”) and the neighboring HLB suspect trees (based on sampling using experimental methods), it is critical that two objectives be met simultaneously: (1) improved control of ACP in the Hacienda Heights area and (2) as many ACP nymphs be collected for CLas testing as possible (collections timed just prior to treatments and especially at times of the year when titers in ACP might be highest – e.g., after the fall flush). The SAP believes that CLas positive ACP nymphs collected from a tree may be the best way to confirm a tree is HLB positive.

Beth Grafton-Cardwell and Joseph Morse have volunteered to work with CDFA in developing an optimal ACP treatment program. Imidacloprid treatments need to be timed better than they have in the past because there is poor imidacloprid uptake into the tree during the spring. Two suggested changes are to apply imidacloprid only June – September and to make multiple lower rate applications to smaller trees. Second, it appears no beta-cyfluthrin treatments were applied in 2013 – at least three treatments should be applied annually. Third, other treatment options need to be developed for urban trees. For example, if there are bloom concerns, spraying with oil would be better than no foliar sprays at all. Given the risk of HLB in the area, the SAP considers the current low level of ACP control unacceptable.

Three trees have tested presumptively positive in the Hacienda Heights area using experimental methods and are still in the ground (#913, #948, and #7911). The SAP suggests that whatever method was used successfully previously to enlist homeowners to voluntarily remove trees also be used for these three trees and they are removed as soon as possible.

A8. Voluntary removal of Hacienda Heights citrus trees. Depending a good deal on the results of the expanded CLas survey in the Hacienda Heights region using experimental non-PCR methods, the SAP suggests it is prudent to enlist homeowners in Zone 1 of Hacienda Heights (400 m around Ground Zero) to voluntarily remove their citrus trees if they are found to be positive by one or more experimental method. The SAP understands there are ca. 565 citrus trees in Zone 1. If this plan of action is successful, removal should then be expanded to Zone 2.

Such a removal project should be done carefully, with advanced planning, and by enlisting the public in a positive manner so that this is a positive public relations experience.

B. Longitudinal Study Being Conducted in the UC Davis Containment Facility

The overall goal of this in progress study is to validate the sensitivity and reliability of the currently available experimental HLB-associated *Liberibacter* non-PCR early detection methods (volatile organic compounds by Cristina Davis et al., UC Davis Dept. of Mechanical & Aerospace Engineering; metabolomics by Carolyn Slupsky et al., UC Davis Dept. of Nutrition; elicitors by Wenbo Ma et al., UC Riverside Dept. of Plant Pathology & Microbiology; proteomics by Michelle Cilia et al., USDA-ARS Boyce Thompson Institute at Cornell Univ.; and small RNAs by Hailing Jin et al., UC Riverside Dept. of Plant Pathology & Microbiology) as soon as possible.

B1. Varieties, replication, timing. The SAP feels that the “experimental” non-PCR early detection methods currently being developed are critical to winning the war against HLB. The SAP applauds the Citrus Research SAP Report, 3 February 2014

Board, other agencies funding such work, and involved researchers in moving these methods forward towards acceptance of one or several of these methods for regulatory use in the near future. It is critical that the reliability and level of sensitivity of each of the non-PCR methods is evaluated as soon as possible.

The SAP has several suggestions regarding the longitudinal study. First, Georgios Vidalakis should be consulted regarding the choice of citrus varieties that are utilized in the studies. The SAP also feels it is important that sufficient replications of each variety be included so that analysis can be done on the frequency with which false positives and false negatives result. Second, the study should be replicated over time (first inoculation with CLAs is planned for February 1, 2014). Citrus grows best during the summer. Infection is slower due to the lower metabolism of the plant and is less receptive to CLAs infection during winter months. The SAP suggests that there should be another round of inoculations later in 2014 and that the study be replicated three times in order to take into account seasonal effects. Mike Irey should be consulted to suggest what time of year is the best to inoculate potted citrus with CLAs in a greenhouse environment.

B2. Other Strains of CLAs. Logically, the UCD longitudinal study (B1) is using the Hacienda Heights strain of CLAs and our understanding is that the containment facility is able to house only one CLAs strain at a time. However, the SAP is concerned that it is likely that a different strain of CLAs is moving northward from Mexico towards California. The SAP suggests that it is prudent to plan several tests of the most promising methods from the longitudinal study on HLB-positive citrus trees in Mexico and/or to expand tests done in Texas.

C. Potential for Movement of CLAs Infected ACP with Fruit Movement

The goal is to limit the spread of ACP and CLAs via fruit movement. There are already mechanisms in place to clean fruit, however the methods may not be sufficient to prevent ACP movement on fruit, leaves, and twigs. This will become more important as CLAs spreads.

C1. Movement of fruit from Mexico into the U.S. The occurrence of HLB is increasing northward towards California, Arizona, and Texas from Mexico. There is uncertainty regarding exactly where HLB is present in Mexico. The SAP does not feel fully informed and would like to hold a conference call with Prakash Hebbar (National Coordinator, Citrus Health Program, USDA/APHIS/PPQ/Plant Health Programs), who may be able to inform the SAP regarding National Agricultural Release Program (NARP) guidelines and current protocols. Based on that conference call, the SAP may have suggestions regarding what might be done to reduce the likelihood that CLAs-inoculative ACP move with fruit shipments into California. We believe David Bartels has done work on this topic and perhaps he could be asked to join a conference call with Prakash Hebbar and the SAP.

C2. ACP treatment buffer along the California – Mexico border. The SAP suggests that the current treatment program two miles south into Mexico and two miles north into California be continued until such time that the Mexican strain of CLAs is determined to be present in California at multiple locations and eradication seems unlikely.

C3. Movement of fruit from southern California into the San Joaquin Valley. Given the current HLB situation and the likelihood this will become worse with time, the SAP strongly believes that in-field dry brushing or preharvest pesticide treatments in southern California are inadequate with respect to removal of ACP from fruit loads which might be CLAs-inoculative. This is because the densities of ACP in some areas of southern California are high, will continue to increase, and with in field dry brushing, some adult ACP are likely to resettle in pack bins. Field applied pesticide treatments without leaf/stem removal are inadequate because it is difficult to achieve perfect coverage and live ACP are likely to be present on trash leaves in the bins following such treatments. The SAP believes it is time that all fruit shipments (including culls going to juice plants) from southern California going into the SJV first go through a packing house wet wash and brushing and that trucks shipping such fruit be enclosed or tarped. The SAP realizes there are economic and/or

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political consequences but at this time, this is what makes biological sense. The SAP feels that the risk of moving ACP into the San Joaquin Valley that are CLas-inoculative is too high to continue with current protocols.

D. Recommendations Regarding Areawide ACP Treatment Programs

Areawide ACP management is a critical method of reducing HLB spread until a cure/treatment for HLB is found. Areawide 'CHMAs' (Citrus Health Management Areas) need to be established in all areas of California as soon as possible. The SAP is of the opinion that a statewide coordinator is needed as soon as possible to interface with and help coordinate the treatment liaisons.

D1. Optimal size of areawide treatment programs. Using Florida data and a landscape analysis for California, Tim Gottwald can provide recommendations by June 2014 regarding the optimal size and configuration of California areawide treatment programs. This will be especially important for the San Joaquin Valley where there are large contiguous areas of commercial citrus. There may be logistical reasons why program areas may be different from what is recommended (a strong component of local input in setting boundaries for treatment areas makes sense) but regardless, such information should be considered and will help to define treatment areas needed by treatment liaisons.

D2. Commercial ACP treatments. There will be differences between Florida, Texas, Arizona, and California regarding the specific design or components of an optimal areawide treatment program and this will also vary across different citrus growing regions of California. Involved parties need to initiate and optimize areawide treatment programs in California as quickly as possible.

The SAP has several recommendations at this point. First, the winter dormant period (roughly December – February) when mostly adult ACP are present and it is cold enough so that there is limited adult movement is a critical time for coordinated areawide treatments. Note there may be some varieties, e.g., lemons or limes that flush some during the winter; coastal areas may be warm enough so that some adult movement occurs. All treatments within the areawide program should go on over a 2-3-week period, regardless of season, and if ground treatment is used and it is feasible, growers should treat first the perimeter two trees/rows and then treat the center of the grove.

Second, additional insecticide treatments are applied during the field season, especially during the early stages of flushing and utilizing insecticides that are ACP-effective and needed for other pests.

It is essential that research continue to identify the best organic treatment options and that organic growers be included in areawide treatment programs. Because of the short residual activity of organic products identified to date, two organic sprays should be applied for each traditional spray, ideally with one organic treatment applied both at the beginning and the end of a particular non-organic treatment spray timing.

D3. Urban treatments around commercial citrus. The current CDFA protocol is to treat urban areas 400 m around commercial citrus, only if that commercial citrus is part of an effective areawide treatment program. The SAP believes this practice is sound and should be continued in all regions of California. If issues such as the presence of bees arise, alternatives to pyrethroids and neonicotinoids such as oil should be used rather than not treating.

D4. ACP sampling within areawide programs. The SAP believes that consistent ACP sampling will be essential to the success of areawide treatment programs. The sampling should be standardized and occur at approximately monthly intervals as well as before and after treatments to demonstrate efficacy of insecticides. In Florida, sampling data are displayed on a web site visually and the presence of groves with high levels of

ACP provides peer pressure inducing recalcitrant growers to treat. That SAP suggests that the Citrus Research Board accelerate their efforts to assist areawide grower groups in web-based visualization of sampling data.

D5. Management of abandoned or poorly managed groves. The SAP realizes that where effective areawide management is conducted, a few growers who are unwilling to participate can undermine a great deal of good work that is done by others at a significant cost. The SAP believes that sooner, rather than later, is when areawide management programs should explore mitigation options (e.g., initiate discussions with local County Agricultural Commissioners). Areawide liaisons need to consider how these poorly managed groves can be tracked in the best way.

E. Recommendations Affecting Quarantine Areas

Suggestions regarding current quarantine areas, which may change as these areas change.

E1. Tulare County quarantine area. Based on the known low sensitivity of traps used to detect ACP, the map of ACP finds in the San Joaquin Valley and the overlap of eradication zones in Tulare, the SAP believes that it is no longer feasible to eradicate ACP in Tulare County and all of Tulare County should be quarantined for ACP. If a Tulare ACP find is near the border of another county, then the treatment area should extend 800 m around the find into that neighboring county. Treatments in Tulare and the neighboring county should be coordinated.

The SAP considers that a treatment zone 800 m around an ACP find is appropriate within eradication areas.

E2. ACP trapping methods. The SAP examined preliminary trapping data in which two groves with ACP in southern California were trapped using the current protocols for (a) GWSS trapping, (b) CPDPC commercial citrus trapping, and (c) CDFA (urban citrus) trapping. Data suggest that the CDFA method traps a higher number of psyllids. However, the SAP suggested changes to the trapping experiment to make it more scientifically sound and believes more data are needed before a change can be suggested. Pending the outcome of those trials, data should be submitted to the SAP so that a recommendation can be made.

E3. Citrus cull piles. The SAP does not feel sufficiently well enough informed regarding the handling of citrus cull piles (composted or left as animal feed) and green waste to suggest what should be done. The SAP suggests an industry working group, perhaps containing an SAP member, be put together to develop strategies.

F. Recommendations Affecting Citrus Nurseries

The goal is to provide best management practices for movement and sale of disease-free nursery plant materials within California.

F1. Movement of tissue culture material and cuttings. The SAP perceives extremely low risk of contamination with ACP or CLas during movement of citrus tissue culture material from an approved laboratory facility (even if it is within a quarantine area) to another such laboratory (even if outside of quarantine) as long as the material is transported securely in a sealed container (i.e. it is properly contained and not opened until inside the second laboratory). Similarly, the SAP sees extremely low risk with movement of citrus cuttings from inside an approved enclosed facility (even if within a quarantine area) to other locations (even if outside quarantine) as long as (a) the cuttings contain no leaves or small twigs that might harbor ACP nymphs or adults and (b) the movement is inside a sealed container.

F2. Accelerate movement into protective structures. Outdoor nursery trees are at risk for HLB infection. The SAP recommends that all citrus nursery production (not just mother trees and increase trees), regardless of location in California, be moved into approved protective structures by July 1, 2015 (18 months from now). The SAP Report, 3 February 2014

deadline for moving seed trees within protective structures might be January 1, 2017 (36 months). There are solid scientific reasons for suggesting this. There is a considerable time lag between when citrus is first infected with CLAs and when symptoms appear. Unfortunately, ACP can acquire CLAs from non-symptomatic trees. Thus, the mistakes made in Florida should not be repeated allowing the movement of Liberibacter-infected trees without apparent symptoms to spread the pathogen (also see F3-F4 below).

The issues listed below under F3a and F3b are complex enough that the SAP feels an industry working group is needed to develop recommendations that might be presented for consideration to USDA and CDFA. The working group should probably include USDA and CDFA representation so that suggestions conform to what is possible. Thus, ideas listed under F3a and F3b below are only suggestions the working group might consider.

F3a. Storage and sale of citrus nursery trees at retail outlets. It is the opinion of the SAP that the retail outlets are one of the highest risk pathways for the spread of psyllids and HLB-associated Liberibacter(s). This was well demonstrated in Florida. There are several significant problems with how retail nurseries are being currently handled in California: (1) citrus trees are often treated with pesticides long before they reach the retail nursery; (2) citrus trees are being held at retail outlets for long periods of time, often well in excess of 90 days, some times for over a year; (3) trees are often over-watered at retail outlets, resulting in leaching of systemic pesticides so that the expected duration of ACP control is not achieved; (4) CDFA no longer is monitoring or regulating retail outlets; and (5) as CLAs spread in California, it can be carried by ACP into nurseries and spread by consumers purchasing and moving plants.

For the above reasons the SAP believes a working group needs to be appointed as soon as possible to develop a safe system that allows for citrus trees clean of ACP and free of HLB-associated Liberibacter(s) be provided to the public.

SAP does not want to constrain ideas this working group might develop but our recommendations are as follows: (1) Trees should be treated with both an approved systemic and foliar pesticide soon before they leave the production nursery, perhaps no more than 10 days before movement (the regulations currently state 90 days); (2) Trees must be either destroyed or re-treated with both an approved systemic and foliar pesticide if they have not been sold within 90 days of when they left the production nursery; (3) There is a need to ensure that trees are not moved from southern California into coastal areas or the San Joaquin Valley; and (4) The working group may need to entertain novel strategies – one the SAP discussed might involve asking buyers to order citrus trees in advance including prepayment (thus making it likely trees would remain at the retail location for a limited period of time). As noted above, this is a difficult situation and it may not have an easy fix. However, a system must be developed that will generate a ready supply of citrus trees to the public in a safe manner or consumers are likely to obtain unsafe trees from other sources.

F3b. Interim plan for movement of nursery trees until all trees are inside protective structures. The second issue the SAP suggests the working group address is to develop protocols for the movement of different types of plant material within, between, and through quarantine areas within California. These protocols need to focus on potential risk with the goal of reducing pesticide use and maximizing the level of protection of trees where there is high risk of ACP/HLB exposure. These guidelines should be re-examined by the SAP as CLAs are found in new areas and/or as quarantines expand.

Movement of plants from an area where CLAs has been detected (e.g., widely around the Hacienda Heights area)
No movement should be allowed

Movement of plants within a quarantine area

1. Approved structure to approved structure – trees need to be enclosed, no pesticide treatment needed
2. Approved structure to ground (planting) – no restrictions, no pesticides needed

3. Open field nursery (or unapproved structure) to ground – no restrictions, no pesticides needed

Movement of plants from within a quarantine zone through a non-quarantine area to another quarantine area

4. Approved structure to approved structure – trees need to be enclosed, no pesticide treatment needed
5. Approved structure to ground – trees need to be enclosed, no pesticide treatment needed
6. Open field nursery (or unapproved structure) to ground – trees need to be enclosed, approved pesticide treatments required

Movement of plants from a quarantine area to a non-quarantine area

7. Approved structure to approved structure – trees need to be enclosed, no pesticide treatment needed
8. Approved structure to ground – trees need to be enclosed, no pesticide treatment required
9. Open field nursery (or unapproved structure) to ground – movement should not be allowed

Movement of plants from a non-quarantine area to a quarantine area

10. Approved structure to approved structure – trees need to be enclosed, no pesticide treatment needed
11. Approved structure to ground – trees need to be enclosed, no pesticide treatment needed
12. Open field nursery (or unapproved structure) to ground – trees need to be enclosed, approved pesticide treatments required

Movement from a non-quarantine area through a quarantine area to another non-quarantine area

13. Approved structure to approved structure – trees need to be enclosed, no pesticide treatment needed
14. Approved structure to ground – trees need to be enclosed, no pesticide treatment needed
15. Open field nursery (or unapproved structure) to ground – trees need to be enclosed, approved pesticide treatments required

Movement from a non-quarantine area to another non-quarantine area

16. Approved structure to approved structure – no restrictions
17. Approved structure to ground – no restrictions
18. Open field nursery (or unapproved structure) to ground – approved pesticide treatments required

F4. Harmonization of USDA and CDFA regulations. It is essential that USDA-APHIS regulations governing interstate movement of citrus be harmonized with CDFA regulations governing movement of citrus within California. The list of approved systemic and foliar treatments should be the same under both sets of regulations and should be updated as new information is made available. Second, the approved foliar and systemic treatments should be made shortly before shipment (the SAP suggests within 10 days). SAP reasoning is that the foliar treatment will not remain effective for much longer than several weeks and if the systemic treatment is made more than 10 days prior to shipment, the time period treatments will remain effective in controlling young nymphs resulting from eggs laid on foliage after the trees leave the production nursery will be reduced.

F5. Use of solid systemics. The SAP is not aware of efficacy data showing that solid systemic insecticides (e.g., tablets) are effective as ACP management treatments. Thus, the SAP cannot suggest they be added to the list of approved treatments at this time.

Appendix A. Agenda of the Dec. 3-4, 2013 ACP/HLB SAP Meeting

**California Department of Food and Agriculture's
Asian Citrus Psyllid / Huanglongbing Ad Hoc Science Advisory Panel
December 3-4, 2013
Holiday Inn Express & Suites
2280 South Haven Avenue, Ontario CA 91761
(909) 930-5555**

Purpose of the Meeting: To convene an Asian Citrus Psyllid & Huanglongbing Ad Hoc Science Advisory Panel (ACP HLB SAP) and create draft advisory recommendations.

Tuesday, December 3, 2013

Holiday Inn Express & Suites

California Department of Food and Agriculture Program Overview - Open to the Public

10:00-10:10	Opening Remarks/Housekeeping Introductions & Review Agenda	Jason Leathers
10:10-10:30	Update on ACP in California	Tina Galindo
10:30-10:50	HLB – Hacienda Heights	Tina Galindo
10:50-11:10	Experimental HLB Detection & Hacienda Heights	MaryLou Polek
11:10-11:30	ACP & HLB Nursery Update	Joshua Kress & Nawal Sharma
12:00	Adjourn	
1:00-5:00	ACP HLB SAP Break-out Session - SAP Members	
2:00-5:00	ACP HLB Data Sharing/GIS Break-out Session - Open to the Public (Location TBA)	

Wednesday, December 4, 2013

Holiday Inn Express & Suites

08:00-10:30	ACP HLB SAP Break-out Session - SAP Members
11:00-12:00	Report of Preliminary ACP HLB SAP Recommendations - Open to the Public

Appendix C. Current CDFA Survey Protocol in Response to HLB Find in Hacienda Heights

Task Force / CPDPC Recommendations

Zone One - Collect plant tissue from every host plant (100%) within a minimum of 400 m every other month (6X/year) for 2 years and collect both adult psyllids and nymphs if present. Tissue should be collected from individual trees/single samples (do not pool). CDFA protocol: Adult psyllids are collected by site, nymphs are collected by tree.

Zone Two - 400-800 m survey: Survey and collect a tissue sample from 100% of the host plants by combining (pooling) 4 host plants in one PCR sample. Survey every 4 months (3X/year). If present, collect psyllids (both adults and nymphs).

Zone Three - >800 m/1 – 1.2 km: Survey 50% of the host plants twice/year. Collect plant samples by pooling 4 host plants per sample, at a frequency of twice/year. This zone is based mostly on logistics/practicality. If present, collect psyllids (both adults and nymphs). There is not sufficient information concerning California conditions to limit collections during certain times/seasons of the year.