Requirements and Initiatives of the CA-CRaFT's program

PROJECT OVERVIEW:

Citrus Research Board (CRB), with USDA HLB-MAC support, executes the California-focused Citrus Research and Field Trials (CA-CRaFT) project. CA-CRaFT's core objective is evaluating supplementary mitigations' impact on Asian citrus psyllid (ACP) control in California's diverse citrus-growing regions. Annual assessments compare psyllid levels in treated and control groves to regional levels, aiming to reduce psyllid populations and share optimal practices with growers. Findings will be disseminated to participating growers regionally, statewide, and nationally.

GROWER APPLICATION AND GUIDELINES:

Commercial citrus producers in California are invited to apply for the program, and eligibility is open to all. Applications must be submitted online through the CRB's CA-CRaFT website (https://citrusresearch.org/growers-application). Applications will be accepted until program capacity has been reached with priority being given to those applications received by **March 15, 2024**. Participating citrus producers are required to actively maintain and manage their groves throughout the program. Additionally, strict adherence to all terms specified in the project contract is mandatory, as failure to comply will lead to disqualification from the program.

CA-CRaFT's GROVE INCLUSION AND SELECTION PROCESS:

CRB's CA-CRaFT initiative seeks participation from commercially managed citrus groves in California, subject to the implementation of specified mitigations and adherence to the overall experimental design. We encourage both organic and conventional citrus growers to submit applications. Grove selection criteria will consider existing management practices, with a preference for those actively utilizing ACP management in accordance with the University of California's Integrated Pest Management (UC IPM) guidelines. Priority consideration will be accorded to California citrus groves facing sustained psyllid pressures or located close to significant psyllid risk factors, such as transportation corridors and residential areas. Preferred grove sizes range from 20 to 160 contiguous acres, with flexibility for other sizes. Citrus producers can apply without any limitations on the total acreage, and we welcome applications for multiple blocks or groves.

SUGGESTED MITIGATIONS AS PART OF THE CA-CRaFT PROGRAM:

Under this program, the tested strategies are categorized as preventative and threshold-based:

Preventative Mitigations:

Preventative measures will center on implementing physical barriers to prevent the entry of ACP along borders where there is a higher likelihood of infiltrating commercial groves. Prioritization of these border treatments will be based on their proximity to factors contributing to psyllid risk, with considerations such as grove design, tree height, variety, irrigation (in specific cases), and available border space. If the proposal is accepted, growers must identify and source fencing, windbreaks, and trap crops, subject to review and approval by CA-CRaFT's staff before initiating the project. CA-CRaFT envisions the implementation of three types of permanent barriers:

1. ***Barrier Mesh Fencing***: Entails the installation of mesh fencing along the grove borders to deter ACP entry. The mesh should allow airflow while efficiently keeping out ACP. Suggestions include a minimum fence height of 12 feet and the utilization of anti-insect netting or mesh with a screen size ranging between 40-50 meshes. Assistance will be provided to cover costs associated with installing and maintaining mesh fencing. Compensation will be granted on a per-foot basis, along with additional annual support on a per-acre basis for participants to address expenses related to data collection and field access for scouts.
2. ***Living Windbreaks:*** Encompasses the planting of trees or shrubs along the borders of the groves to establish a physical barrier, mitigating psyllid movement into and between groves. Assistance will be given for the costs of establishing new plantings or maintaining existing, immature, or mature windbreaks. Compensation will be granted on a per-tree basis, with additional annual support on a per-acre basis for participants to cover expenses related to data collection and field access for scouts. Suggestions involve opting for fast-growing tree or shrub species well-suited for the region, prioritizing native varieties when possible, selecting non-reproductive hosts for invasive shot hole borers, and considering tree types like casuarina trees, cypress trees, hollyleaf cherries, Lombardy poplars, oleanders (avoid near grape), and wax myrtles.
3. ***Trap Crops:*** Involves cultivating trap crops like the curry leaf tree, attracting and controlling psyllid populations, with periodic monitoring and replacement integrated. Trap crops refer to trees or shrubs capable of hosting ACP but not proven to host the *Candidatus* liberibacter asiaticus (*C*Las) bacterium responsible for huanglongbing (HLB) disease in citrus. Recommendations include plantings of one or two border rows, with the curry leaf tree (*Murraya koenigii* or *Bergera koenigii*) as the approved trap crop. If selected, applicants must provide a commercial source for curry leaf trees. Assistance will be offered to cover expenses related to establishing new plantings or maintaining existing ones. Compensation will be given on a per-plant basis, along with additional annual support on a per-acre basis for participants to manage costs associated with data collection and field access for scouts.

Threshold-based Mitigations:

Mitigations based on threshold levels will require the application of treatments when psyllid counts in participating groves surpass the ACP thresholds specified in the UC IPM guidelines. CA-CRaFT explicitly disclaims any obligation to provide recommendations regarding the necessity for ACP mitigation treatments. CA-CRaFT's sole responsibility is to supply informative pest count data for each sampling method and cycle. Growers are solely responsible for consulting with their Pest Control Advisors (PCAs) to evaluate the need for ACP mitigation treatments based on the provided information or to determine if additional scouting is necessary. The project anticipates implementing two types of mitigations based on thresholds:

1. ***Border Treatments***: Recommended for regions experiencing seasonal spikes in psyllid populations rather than consistent year-round pressures.
    a. *Repellents*: Involves applying compounds to make the crop unappealing to psyllids. Visual repellents may need multiple applications, contingent on flush cycles and environmental/weather conditions. Prominent repellents include kaolin clay and diatomaceous earth. Caution is recommended when using repellents alongside biocontrol agents. Assistance will be provided to cover costs associated with applying ACP repellents along grove borders. Compensation will be granted on a per-foot basis for the application of repellents, along with additional annual support on a per-acre basis for participants to address expenses related to data collection and field access for scouts.
    b. *Pesticides*: Involves applying both synthetic and organic insecticides effectively along the borders of participating groves, adhering to UC IPM guidelines for ACP control. Border-only treatments limit psyllids from entering or control infestations along high-risk corridors. Support will be provided to cover costs associated with applying ACP border sprays along grove borders. Compensation will be awarded on a per-foot basis for the application of sprays, along with additional annual assistance on a per-acre basis for participants to address expenses related to data collection and field access for scouts.
2. ***Whole Grove Treatments:*** Recommended if psyllids are found within the grove or in young orchards with attractive new growth.
    a. *Ant Control*: Project efforts will concentrate on managing Argentine ants and gray field ants, both of which are liquid sugar-feeding ant species. These ants consume ACP honeydew, a sugary substance found in citrus orchards, providing protection to psyllids from their natural predators. UC IPM recommends employing liquid sugar baits for effective ant control. Support will be provided to cover costs associated with applying ant treatments. Compensation will be awarded on a per-acre basis for the application of ant baits, along with additional annual assistance on a per-acre basis for participants to address expenses related to data collection and field access for scouts.
    b. *Biological Control*: Involves deploying specific biological control agents to suppress ACP populations, necessitating ongoing assessments of their impact and

effectiveness, while also advocating for the conservation and release of generalist predators like syrphid flies, lacewings, and lady beetles. Assistance will be offered to cover costs associated with releasing ACP natural enemies. Compensation will be granted on a per-acre basis for the release of natural enemies, along with additional annual support on a per-acre basis for participants to address expenses related to data collection and field access for scouts. Anticipated are multiple releases of these agents each year. Relying solely on biological control may not fully prevent or reduce psyllid populations. Growers employing this strategy should consider coordinating with other necessary measures, such as area-wide treatments. Growers are mandated to specify the ACP natural enemies they intend to utilize in the program and provide the commercial source for acquiring these insects.

Growers are required to directly communicate their CRaFT-related mitigations with CRaFT personnel before implementing them to ensure proper program application and eligibility for reimbursement. Additionally, it is mandatory to present all Pesticide Use Reports (PURs) during biannual Zoom meetings with the CRaFT Program Manager and the CRB's Entomologist, as specified in the "Additional Grove Management Provisions" section.

Strict adherence to the UC IPM guidelines is crucial; for detailed information on each of these suggested mitigations, please visit their website:
https://ipm.ucanr.edu/agriculture/citrus/asian-citrus-psyllid/

Control plots must refrain from receiving any additional mitigations, be they preventative or threshold-based, recommended by the program, as outlined above.

Annual assistance on a per-acre basis for participants to cover expenses related to data collection and field access for scouts will be provided for control plots, as well as for other plots participating in the program as outlined above.

Growers are allowed to conduct regular scheduled plot maintenance and apply various treatments for pests, including ACP, in all plots, including control plots. However, they will not receive compensation for these routine treatments that fall outside of program priorities endorsed by CA-CRaFT.

GROVE-WIDE PEST MONITORING PROCEDURES:
Grove-wide pest monitoring within this program will be executed by CA-CRaFT personnel, utilizing a combination of tapping and visual inspections, yellow sticky traps, and canine scouting:

a. *ACP Trapping with Yellow Sticky Traps*:
CA-CRaFT's ACP trapping using yellow sticky traps will deploy four traps per block strategically placed in each cardinal direction, designed to capture adult ACP through adhesive coating. Servicing will occur bi-weekly from April to November and monthly from December to March, aligning with ACP tapping cycles. Grower participants will be provided with a comprehensive report in Portable Document Format (PDF) containing service dates and ACP trap counts.

b. *ACP Tapping and Visual Inspections*:
CA-CRaFT's ACP tapping and visual inspections in the program will sample 50 trees per block—ten in each of the four cardinal directions and ten at the center of the grove—biweekly (April to November) and monthly (December to March), recording tap counts for adult ACP and conducting visual flush inspections for both adult and nymph stages. Growers will receive PDF reports with averaged ACP counts by block.

c. Canine Surveys:
As an extra measure for monitoring psyllids in specific regions and on a limited scale, the program will provide biannual canine-based ACP detection. Interested applicants should indicate their intent in the application. These canine surveys, conducted by a third-party agency during spring and fall, will document ACP alerts using sniffing dogs as they walk around the grove perimeter. Subset surveys will be conducted in each sampling cycle, and growers will receive PDF reports containing information collected through canine scouting.

Participating citrus producers must provide CA-CRaFT's personnel and affiliates with reasonable access to project locations for location reviews and data collection outlined both above and below.

CA-CRaFT's REPORTING OBLIGATIONS:
CA-CRaFT, within the scope of this program, is tasked with regularly providing growers with block-specific pest count data. Detailed PDF reports, encompassing tap and visual samplings, trap detections, and, if applicable, canine detections, will be generated by CRB's Entomologist and the CA-CRaFT Program Manager. Following each sampling cycle, these reports will be distributed to individual grower participants.

LEGAL LIMITS AND GROWER RESPONSIBILITIES IN MITIGATION APPLICATIONS:
CA-CRaFT expressly disclaims any obligation to offer recommendations on the need for ACP mitigation treatments. CA-CRaFT's sole responsibility is to furnish informative pest count data for each sampling method and cycle. Growers bear sole responsibility for consulting with their PCAs to assess the necessity of ACP mitigation treatments based on the provided information or to determine if additional scouting is required.

COMPENSATION AND REIMBURSEMENT POLICY:
Compensation is exclusively provided to growers implementing endorsed additional preventative or threshold-based mitigations, such as barrier mesh fencing, living windbreaks, trap crops, biological control releases, border sprays, psyllid repellents, or ant control, as outlined above. No reimbursements will be provided for mitigations executed outside program priorities, such as full block insecticide treatments or pesticide applications in area-wide management spraying programs. Growers must communicate their planned mitigations for the CA-CRaFT program within participating blocks directly with CA-CRaFT personnel before execution to ensure both proper application and eligibility for reimbursements. Control plots must avoid receiving any additional mitigations, whether preventative or threshold-based, recommended by the program, as listed above. Annual compensation is contingent upon the successful completion of all specified contract terms, including a site survey. Citrus producers seeking compensation must submit a claim form with required documentation, and payments will be sent by mail to the designated producer.

ADDITIONAL GROVE MANAGEMENT PROVISIONS:

a. *Aerial Surveillance of Participating Sites:*
Employing a third-party agency, an annual drone survey will be executed each spring at participating groves, focusing on standardized grove mapping and imaging to comprehensively assess grove health. These surveys will be scheduled with advance notice, ensuring that growers receive detailed information, encompassing tree counts, identification of missing trees, tree metrics (such as height and diameter), and an overall evaluation of grove health. Consent for utilizing drones for this purpose will be obtained from all program participants. It's imperative to highlight that all data derived from aerial imaging, including images, measurements, and observations, is the property of the CA-CRaFT program. This information will be utilized to produce reports, analyses, and publications in an aggregated format.

b. *Biannual Reporting Obligation for Participating Growers:*
Participating growers will be obligated to submit biannual reports detailing their orchard management practices. These reports should encompass current soil reports, Pesticide Use Reports (PURs) for treatments related to ACP, providing specifics on pesticide spray products and application timing. Also, growers are expected to include relevant information on pests, diseases, and detailed insights into pruning, weed management, and irrigation practices. To streamline the exchange of this information, biannual Zoom meetings will be coordinated among CA-CRaFT's Program Manager, CRB's Entomologist, and individual participating growers. This collaborative reporting approach is implemented to ensure effective communication and adherence to program guidelines.