CALIFORNIA
INVASIVE SPECIES
ADVISORY COMMITTEE

A Statewide Strategic Initiative to Control Fusarium Dieback – Invasive Shot Hole Borers in California

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PURPOSE

This document presents the outcomes of a statewide initiative towards the control and management of the emergent pest-disease complex Fusarium dieback - invasive shot hole borers (FD – ISHB). Based on its observed significant impact, apparent rapid expansion in Southern California, and the potential for widespread impacts to agriculture, the nursery industry, urban landscapes, and riparian communities in Southern California and beyond, it is imperative to develop and provide clear and appropriate management information to first responders at local, state, and federal levels. This strategic initiative was executed through a two-month public consensus-building process under the direction of the California Invasive Species Advisory Committee (CISAC). The committee determined priorities for the appropriation of $5 million awarded by the state to develop a cohesive strategy to control of the FD – ISHB complex and prevent economic losses and further damages to landscapes. Lead researchers in the field, land managers, and regulators collaborated to design and implement a holistic action plan to support the development of essential components of an evolving regional Integrated Pest Management program. The plan outlined herein was generated through the work of four CISAC subcommittees: 1) Research and Technology Development; 2) Survey, Detection, and Rapid Response; 3) Greenwaste and Firewood as Pathways; 4) Outreach and Education. The subcommittees prioritized action plans that were used to guide appropriate procedures to fund projects deemed most important.

EXECUTIVE SUMMARY

The CISAC ISHB Sub-Committees have concluded their prioritization phase and are ready to begin drafting RFPs/Grants to start addressing top priorities. All four sub-committees have come to a consensus on the next steps.

The **Research and Technology Development** subcommittee developed 28 priority research questions and projected budgets to study each question. The questions and projected costs were developed with input from labs that will conduct the research. The sub-committee is aware that AB 2470 funding cannot support all research questions and is actively working to identify other sources of funding (e.g., Farm Bill Suggestions) to support identified research priorities.

- Top Three Research Questions: $1,213,000 covers biological control agents, integrated pest management, and epidemiology.
- Top Six Research Questions: $1,646,000 adds chipping, endophytes, and economic impacts.
- Top 10 Research Questions: $2,106,000 adds microbial community changes, optimizing traps, agricultural crops, and chemical spot treatments.
- Top 13 Research Questions: $2,402,170.00 adds controlling the spread at the frontier, beetle expansion by flight vs. human dispersal, and social aspects of firewood movement.
- Top 20 Research Questions: $3,307,170.00 adds individual climate models, beetle/insect interactions/flight behavior, nutrient availability, mycangial microbial communities, defense activators, and beetle/fungal attack’s effects on survival and growth of riparian tree species.
- All 28 Research Questions: $4,287,170.00 adds irrigation, re-sprouting, canine detection, biorational pesticides, ISHB-induced tree mortality impacts, host tree water potential, genetic diversity patterns, and batch identification.

The committee is ready to proceed with drafting RFPs/grants for the top six research questions at a projected cost of $1,646,000 + 25% overhead ($411,500) for a total of $2,057,000 to tackle the highest priority areas first.

The **Survey** – Early Detection and Rapid Response subcommittee and the Greenwaste and Firewood as **Pathways** subcommittee both recommend the following trapping by counties be funded as soon as possible. They recommend providing $1,624,392 total for three years to counties for the following activities:

- Hire one full-time trapper/visual surveyor per county in Five leading edge counties (Los Angeles, San Bernardino, Ventura, Santa Barbara, Riverside) each doing 10 to 15 traps per day March through October to track and slow the spread of ISHB.
- Place 48 to 50 traps in 2nd tier counties of Kern and San Luis Obispo. Even though these counties do not have current infestation they have increased vulnerability.
- 20-24 traps in remaining counties with bi-weekly servicing to track if leapfrogging.

This activity to be funded through CAL FIRE:

- Provide funding for high-hazard safe tree removal and disposal and possible treatments by professional, California Environmental Quality Act compliant, and insured tree removal companies through contracts with counties. $200,000 x 3 years = $600,000

Additional funding should be allocated for:

- A centralized trapping/visual survey coordinator to help prioritize the trapping locations and density, including around Greenwaste facilities and firewood stockpiles and distribution sites. Additionally, this position would be a liaison with the local enforcement agencies in Los Angeles, Orange, and Ventura Counties to identify Greenwaste facilities and understand host greenwaste pathways through our communities and final destinations. $120,000 x 3 years = $360,000 + 25% overhead ($90,000) for a total of $450,000

The **Greenwaste and Firewood as Pathways** subcommittee and Greenwaste Working Group developed a scope of work to amend an existing contract with local enforcement agencies (LEA). This addition helps to identify and access Greenwaste facilities in Los Angeles, Orange, and Ventura Counties for trapping and visual survey activities. The collaboration between LEAs and county agricultural commissioners in Los Angeles, Orange, and Ventura Counties will help the survey coordinator, researchers, county trappers, and CDFA and CAL FIRE staff track host greenwaste movement from origin to end, and determine current actions being used to mitigate the spread of FD – ISHB. $50,000 to LEAs in Los Angeles, Orange and Ventura counties for one year = $150,000

The **Outreach and Education** subcommittee did an inventory of current materials and target audiences and created a list of venues to address various audiences through different formats.

The sub-committee achieved consensus on the top three priorities:

- ISHB Communications Coordinator: Jan Gonzales of UC ANR along with the Outreach Coordinator Working Group have developed a scope of work for a potential statewide outreach coordinator and have begun looking at potential funding sources and administering agencies. This outreach coordinator will augment work already being done by the sub-committee members including speaking at conferences, creating informational videos and training courses. $120,000 x 3 years = $360,000 + 25% overhead ($90,000) for a total of $450,000
- Regional Outreach Coordinators. (To be funded when additional resources are identified.)

- A training program, communication operations funds, and rapid response (online trainings, field trainings, roadshow trainings). Five main categories of trainings have been identified, based on the needs of the audiences: Land Management and Greenwaste, Landscape and Gardeners, Campground and Recreation, Public Training, Staff of CA agencies and other conservation officers, including county staff. Communication operations funds for the development and production of outreach materials for different audiences and languages as well as creation and augmentation of existing ISHB training activities, including development of training videos/materials. Funds may be used to travel to different venues and for fees associated with securing booth space at events or other outreach expenditures. Finally, the development of a rapid response kit for leading-edge counties. $80,000 x 3 years = $240,000

Other priorities identified by the sub-committee are:

- Website and social media development: including rehabbing the PSHB.org website (Currently being done by UC ANR)
- Online outreach (advertisement buys for the video that is in production by CDFA)

The sub-committee also recognized the imperative need of developing specific printed materials and trainings to be used as an important component of projects identified as priorities by the **Survey** and **Pathways** sub-committees.

Other long-term goals identified by the sub-committee are to expand the outreach efforts to the non-infested areas in Northern California; insert educational materials into K-12 curriculum; educate consumers about hiring gardening and tree care services that use best management practices for FD – ISHB; engage local air and water boards in outreach efforts.

BACKGROUND

The Fusarium Dieback – Invasive Shot Hole Borers Pest – Pathogen Complex

Pest – Pathogen Agents

The emergent invasive pest – pathogen complex Fusarium dieback – invasive shot hole borers (FD – ISHB) has caused considerable ecological and economic harm in Southern California (Eskalen, 2016; Eskalen et al., 2013; Kabashima, 2016). The dieback is caused by the combined effects of two ambrosia beetles and the specific symbiotic fungal pathogens each beetle species carries (Table I; Figs. 1-2). Invasive shot hole borers belong to a particular group of cryptic ambrosia beetle species within the genus *Euwallacea*. Cryptic species look so similar the beetle species can be mistaken for one another. The most well-known species of *Euwallacea* is the tea shot hole borer (TSHBb; *E. fornicatior*), a pest of tea (*Camellia sinensis*) in India and Sri Lanka (Danthanarayana, 1968; Gomez et al., 2018). Collected specimens showing similar morphology were commonly assigned to TSHBb until concerns raised by the impacts of FD – ISHB and subsequent genetic studies led to a better understanding of the *Euwallacea* species complex (Stouthamer et al., 2017). Each beetle within this complex has

Table I. Insect vectors and corresponding fungal pathogens causing Fusarium dieback on tree hosts in California.

Invasive Shot Hole Borers		**Fusaria Pathogens**	**Other Mycangial Fungi**	
Species Name	Common Name			
[1-2]*Euwallacea fornicatus*	Polyphagous shot hole borer (PSHB)	[4]*Fusarium euwallaceae*	[5]*Graphium euwallaceae*	[5]*Paracremonium pembeum*
[1]*E. kuroshio*	Kuroshio shot hole borer (KSHB)	[6]*F. kuroshium*	[6]*G. kuroshium*	

[1]Gomez et al., 2018; [2]S. M. Smith et al., 2019; [3]Mendel et al., 2012; [4]Freeman et al., 2013; [5]Lynch et al., 2016; [6]Na et al., 2018

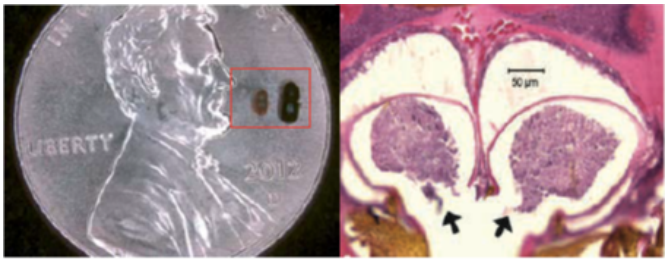

Figure 1. Adult invasive shot hole borer on a penny (left) showing the female on the right and the smaller, flightless male on the left. Females carry fungal spores within special mandibular cavities called mycangia (right). Photo credit Akif Eskalen, UC Davis, and Matthew Kasson, West Virginia University.

evolved an obligate mutualism with wood-inhabiting, closely related *Fusarium* species over the last 21 million years (Gomez et al., 2015). Most ambrosia fusaria share a unique spore morphology that is different from other species of *Fusarium* (Kasson et al., 2013). They are the most abundant fungal species within the mycangia of Euwallacea spp. (Lynch et al., 2018), and serve as a food source for the beetles.

History

Genetic analysis indicates that ISHB was introduced into California from Southeast Asia on two separate occasions from Vietnam (PSHB) and Taiwan (KSHB) respectively (Stouthamer et al., 2017). The beetles presumably arrived on infested wood packaging material or plant material (Wingfield et al., 2010). In 2003, a single PSHB beetle was caught in a CDFA trap in Los Angeles. The species went unnoticed until 2012 when it was found damaging a backyard avocado tree and urban forest trees in the Los Angeles basin. A rapid monitoring response uncovered the broad host range of the pest-pathogen complex (Eskalen et al., 2013), but its ability to establish in native vegetation was only gradually recognized. With a host range of over 65 tree species, including 20 California natives, riparian, oak woodland, and mixed evergreen communities are highly susceptible to invasion and mortality by these invasive pests (Eskalen et al., 2013). Another 260+ species in 64 families are attacked but do not support beetle reproduction. Unlike most bark and ambrosia beetles, ISHB prefer healthy, well-watered trees (Boland, 2016; Swain et al., 2017). Attack symptoms exhibited by infected host trees vary by species and include staining, gumming, sugary exudates, and or frass outside of boring holes (Eskalen et al., 2013; Eskalen et al., 2017). Signs and symptoms by host species can be reviewed at https://UC ANR.edu/sites/eskalenlab/files/290780.pdf, but proper training to identify ISHB-infested trees is required as these symptoms can be induced by other pest species (Dimson et al., 2017).

Spread and Impacts

Since 2012, the PSHB beetle-fungus complex spread throughout Los Angeles and Orange counties, and into certain areas of Riverside, San Bernardino, and Ventura counties. A separate invasion by KSHB occurred in San Diego County in early 2014, and this species has since been detected in Orange, Santa Barbara, and San Luis Obispo counties (Rios, 2015; UC ANR, 2017). Trap data indicate that the ISHB range is rapidly expanding and preliminary research suggests that the beetles can survive as far north as Tehama County (Umeda, 2017). In Southern California, FD – ISHB has caused extensive destruction in riparian ecosystems. By October 2015, KSHB infested more than 280,000 willow trees (*Salix* spp.) in 597 acres of riparian forest in the Tijuana River Valley, with more than 140,000 trees suffering major limb damage (Boland, 2016a; Boland, 2016b). Given that FD - ISHB kills willow and cottonwood (*Populus* spp.), invasive plant species such as giant cane (*Arundo* donax) and saltcedar (*Tamarix* spp.) can encroach into these riparian habitats, and cause further damage to the ecosystem. Many new areas of native vegetation in Southern California continue to be invaded, and many of the affected locations are critical breeding habitat for endangered bird species. In addition to native vegetation, FD – ISHB has established and spread through urban forests and the main avocado-growing regions of California, and new infestations are reported regularly (https://ucanr.edu/sites/pshb/Map). Because of its wide host range (Eskalen et al., 2013), temperature tolerance (Eskalen, 2016), and lack of natural enemies in the United States, FD – ISHB could spread statewide and into other suitable parts of the country (Umeda, 2007).

Initial estimates suggest that FD – ISHB has the potential to kill roughly 27 million trees (38%) in Southern California's 4,244-square mile urban region (McPherson, 2016). An understanding of the economic impacts of current tree losses is lacking due to limited investment in research of those impacts paired with systematic monitoring efforts. However, economic repercussions have been realized for urban forests in Orange County, where the removal of 1,524 infested trees and treatment of 2,228 trees cost the county approximately $3 million between 2013 – 2017 (OC Parks, 2017). Tree losses in both urban and wildland forests result in decreased ecosystem services such as carbon storage, storm water retention, temperature moderation, and air pollution filtration. Given that urban forest trees in California remove the carbon

equivalent of 120,000 cars annually (567,748 t CO_2), and their annual value of all ecosystem services is $1.0 billion (McPherson et al., 2017), costly large-scale tree removal efforts to manage the problem could have unintended consequences for the environment and public health.

Life History and Implications for Control

Controlling the spread of FD – ISHB is difficult due to the mating strategies of the beetles. Within a host tree, female beetles mate with sibling males before leaving the natal gallery (Fig. 2). Unmated females are also capable of producing male offspring from unfertilized eggs and can then mate with those offspring to produce females (Cooperband et al., 2016). This mating strategy enables both mated and unmated females to initiate new galleries within the same or neighboring host trees (Eskalen, 2015, personal observation). Because the beetles mate before dispersing, they do not use long-ranging pheromones. As such, trapping of the beetles is an ineffective control method since pheromones cannot be used as an attractant (Kabashima, 2016). Trapping efforts are thus only effective for detection and understanding beetle flight activity and are not efficient at reducing beetle populations or their dispersal. Because the beetles spend nearly their entire life inside galleries within the host plant, they are protected from contact pesticides, further limiting management options. Moreover, the broad host range makes it necessary to coordinate management on a variety of landscape types to prevent persistence of beetle sources in treated areas. Coordinated management can be complicated and sometimes impossible, depending on land ownership. Finally, lack of public awareness on the issue can enhance the artificial spread of the species. People can unknowingly introduce the beetles and fungi to non-infested areas over long distances by moving firewood and unchipped beetle-infested trees and branches (Buy, 2015). For these reasons, there are few effective control measures in place, and responses to the magnitude of the problem are limited.

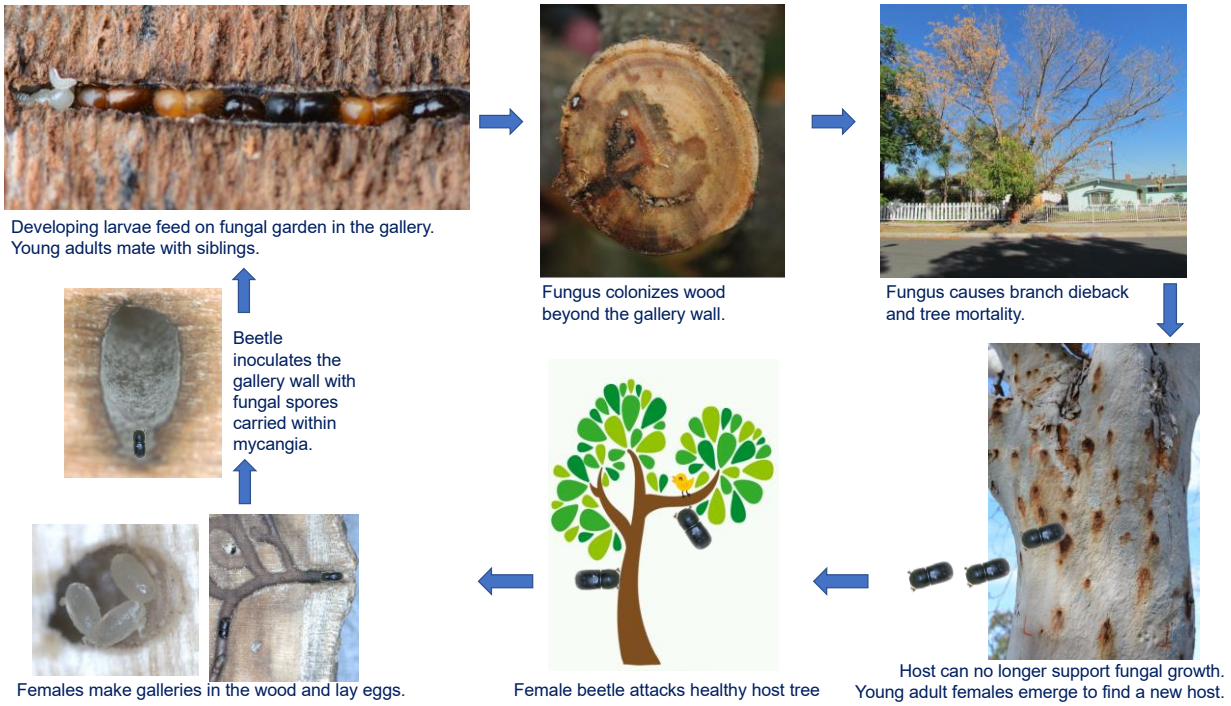

Figure 2. Fusarium dieback – invasive shot hole borers suggested life cycle based on previous research (Freeman et al., 2013, Eskalen et al., 2013, Mendel et al., 2012).

Statewide Strategic Initiative

The primary goal in the management of FD – ISHB is to limit its expansion and minimize its impacts in already established areas. To meet this goal, coordination is essential across jurisdictional boundaries, industries, interest groups, and scientific disciplines because the pest-pathogens have a unique life history, a broad host range, and can establish and spread across varied landscapes (Table II). Controlling FD – ISHB also requires a regional effort to prioritize investment for solutions in the long and short term if further losses of critical habitat are to be prevented.

To meet management goals, the California Invasive Species Council (CISAC) convened a statewide summit in January of 2018. This summit initiated a regional collective action process involving collaboration between stakeholder groups, policymakers, and researchers to address the problem. Out of the summit came suggestions that were incorporated into Assembly Bill No. 2470 which is co-authored by Assembly Members Lorena Gonzalez Fletcher and Timothy Grayson representing the 80th and14th Assembly Districts. The Bill authorized CISAC to build a consensus and develop a plan "...for the cure or suppression of diseases associated with the spread of Invasive Shot Hole Borers, including, but not limited to the Polyphagous and Kuroshio shot hole borers". Later in 2018, the California Legislature passed, and Governor Brown approved AB 2470 and allocated $5 million for the execution of the plan.

California Invasive Species Advisory Committee (CISAC)

In 2009, the Invasive Species Council of California (ISCC) was formed by state agencies and approved the California Invasive Species Advisory Committee Charter (2011) to advise the ISCC on best measures to forestall the ecological and economic harm caused by invasive species “...based on input from and cooperation with other stakeholders and existing organizations” (CISAC Charter, 2011). The ISCC is an interagency council chaired by the Secretary of the California Department of Food and Agriculture and vice-chaired by the Secretary of the National Resources Agency (http://www.iscc.ca.gov/). Appointed CISAC members represent the scope of knowledge necessary to address the complex issues concerning invasive species (e.g., biologists, industry representatives, regulators, economists, educators, county agricultural commissioners, researchers, public relations specialists).

INITIATIVE IMPLEMENTATION

Multiple elements tailored to the development of a statewide FD – ISHB management plan under AB 2470 were organized under the direction of an Executive Committee and four subcommittees: 1) Research and Technology Development; 2) Survey, Detection, and Rapid Response; 3) Greenwaste and Firewood as Pathways; 4) Outreach and Education (Table III). For each subcommittee, co-chairs facilitated a public consensus-building process to prioritize the appropriation of funds within respective elements of the plan. Each of the four subcommittees met four times at two-week intervals while gathering information and developing ideas between meetings to facilitate progress. Meetings were conducted via a public online GoToWebinar forum (https://www.gotomeeting.com). Ten days prior to each meeting, agendas and access instructions were distributed publicly in several ways: 1) a permanent list of meetings hosted by CISAC on their website: http://www.iscc.ca.gov/cisac_meetings.html; 2) Collaborative Tools – an online communication platform for sharing messages and documents hosted by University of California Agriculture and Natural Resources (UC ANR): http://anrcs.ucanr.edu/Base-New/Information_Technology/Web_Development/tools/ctools/; 3) email notifications to roughly 150 actors explicitly asking recipients to spread the information widely. Participants were also invited to sign up to receive notices of all the meetings at

Table II. Stakeholder organizations in which representatives share a vested interest in developing and implementing a statewide management strategy to control Fusarium dieback – invasive shot hole borers.

Stakeholder Category	Organization
Academic	UC Davis
	UC Riverside
	UC Santa Barbara
	UC Santa Cruz
	University of California Agriculture and Natural Resources
Federal	United States Department of Agriculture, Forest Service, Forest Health Protection
	United States Forest Service: Fire
	United States Fish and Wildlife Service
State	California Agricultural Commissioner
	California Board of Forestry and Fire Protection
	California Department of Fish and Wildlife (CDFW)
	California Department of Food and Agriculture
	California Department of Forestry and Fire Protection (CAL FIRE)
	CalRecycle: Local Enforcement Agency (LEA)
	California State Parks
County	Contra Costa County Agricultural Commissioner
	Imperial County Agricultural Commissioner
	Los Angeles County Agricultural Commissioner
	Orange County Agricultural Commissioner
	Ventura County Agricultural Commissioner
	Los Angeles County Agricultural Pest Control Division
	Los Angeles County Agricultural Weights and Measures
	Orange County Parks
	Orange County Public Works
	San Diego County Plant Pathologist
	Ventura County Resource Conservation District
City	San Diego Association of Governments
	City of San Diego
	City of San Diego Parks and Recreation
Non-Profit	Irvine Ranch Conservancy
	Natural Communities Coalition of Orange County
	Resource Conservation District of Santa Monica Mountains
	Resource Conservation District of San Diego County
	Southwest Wetlands Interpretive Association
	The Wildlands Conservancy, San Bernardino Mountains
Private	Alliance Care Landscaping Company
	Arborjet
	Private Arborists
	Davey Tree Expert Company
	Disneyland
	Dudek Environmental

https://www.cdfa.ca.gov/subscriptions. Actions between meetings were executed through smaller working groups within each subcommittee, and these working groups reported back accomplishments and recommendations to their subcommittee for discussion and consensus-building. All public meetings were hosted by CISAC at the California Department of Food and Agriculture in Sacramento and recorded using the GoToWebinar system for public access. A designated note-taker at each meeting distributed the minutes to the subcommittee chairs to send to participants for review and comment. Final minutes and associated action items were approved at the next meeting and then posted on the ISCC website (Appendix A).

Table III. Title and affiliation associated with each committee chair

Committee, Chair(s)	Title	Affiliation
Executive		
Kyle Beucke	Primary State Entomologist/ Environmental Scientist	California Department of Food and Agriculture (CDFA)
John Kabashima	Environmental Horticulture Advisor, Emeritus	UC ANR – UC Cooperative Extension
David Pegos	ISCC Agency Liaison, CISAC Executive Director Special Assistant, Plant Health Division, CDFA	ISCC, CDFA
Joe Scheele	Automated Commercial Environment Agent	Department Homeland Security Customs and Border Protection
Sheri Smith	Regional Entomologist	USDA Forest Service Forest Health Protection (FHP)
Andy Cline	Entomologist	CDFA
Subcommittees		
Research and Technology Development		
Stacy Hishinuma	Forest Entomologist	USDA Forest Service, FHP
Shannon Lynch	Ph.D. Candidate	UC Santa Cruz
Survey, Detection, and Rapid Response		
Andrea Hefty	Forest Entomologist	USDA Forest Service, FHP
Ed Williams	Agriculture Commissioner	Ventura County
Greenwaste and Firewood as Pathways		
Thomas Smith	Forest Pest Management Specialist	CAL FIRE
Kevin Turner	Southern California Invasive Pest Coordinator	CAL FIRE
Outreach and Education		
Beatriz Nobua-Behrmann	Urban Forestry and Natural Resources Advisor	UC ANR – UC Cooperative Extension

Committee Actions

At the first meeting for each subcommittee, participants identified 1) key players that needed to be involved who were currently not present; 2) issues, concerns, and opportunities as they relate to the responsibilities associated with each subcommittee; 3) action items and individuals to accomplish the action item between subcommittee meetings. The subcommittee determined the next meeting date and time, and each participant was then invited to provide public comment. Issues and action items were addressed and refined at subsequent meetings following the same format. All agendas and meeting minutes are in Appendix A. What follows is an outline of the process and products that emerged from each subcommittee over after four, two- to three-hour meetings.

Research and Technology Development

Subcommittee Co-chairs:
Shannon Lynch, Ph.D. Candidate, University of California Santa Cruz
Stacy Hishinuma, Ph.D., Forest Entomologist, USDA Forest Service, Forest Health Protection

The Research and Technology Development Subcommittee of CISAC identified and prioritized research and technology development (RTD) questions to guide the development and implementation of an integrated pest management (IPM) program to control and slow the spread of FD – ISHB in California. The subcommittee consisted of key research experts in plant pathology, entomology, and ecology from the University of California, and participants representing state, county, private, and non-profit agencies in Southern California (Table II). As a group, the subcommittee identified research needs and those needs were divided into categories of research (Table IV). Participants then volunteered to coordinate or participate in developing questions for each of the research categories, hereafter referred to as working groups.

Table IV. Research and technology development categories, coordinators, and participants within each working group.

Research Category	Coordinator	Participants
Epidemiology	Shannon Lynch	
Biology	Shelley Bennett	Akif Eskalen Richard Stouthamer Shannon Lynch Adam Lambert
Monitoring	Chris Shogren Richard Stouthamer	Kyle Beucke
Control	Akif Eskalen Richard Stouthamer	
Integrated Pest Management	Akif Eskalen John Kabashima	Shannon Lynch
Restoration Biology	Shelley Bennett Adam Lambert	
Sociology and Economics	John Kabashima	

Research and Technology Development Questions by Category

Independent working groups for each category developed the following questions to address identified research needs:

Epidemiology

Questions one – three address epidemiology, which is the study of the distribution and spread of pests and pathogens, and the application of this study to the control of diseases. Here, the epidemiological research will focus on the distribution of the beetle – fungus complex throughout California.

1. **Research Question:** *What are the patterns of disease dynamics throughout Southern California, and what processes influence those patterns?*
2. **Research Question:** *How do beetle dispersal by flight and long-distance human-assisted movement contribute to the spread of FD – ISHB?*
3. **Research Question:** *Can climate-matching degree-day models help accurately predict the ultimate FD – ISHB distribution in California?*

Biology

Questions four and five address important aspects of the beetles' behavior and ecology.

4. **Research Question:** *Do other borer species facilitate or antagonize ISHB colonization or affect ISHB population dynamics and or disease progress?*
5. **Research Question:** *What is the beetles' flight behavior?*

Questions six - nine address whether environmental conditions of host trees affect ISHB colonization and infestation.

6. **Research Question:** *How does host tree water potential affect ISHB preference or reproductive success? Does host tree water potential affect fungal growth?*
7. **Research Question:** *How does nutrient availability affect ISHB host preference, growth rates, and the success of the symbiotic fungi?*
8. **Research Question:** *How do irrigation and fertilizer affect beetle establishment on urban trees?*
9. **Research Question:** *Why are the re-sprouting willows in the wet forests not being reinfested by KSHB? Does the chemical composition of the recovering infested tree change?*
10. **Research Question:** *What are the patterns of genetic diversity of the beetles' pathogenic fungi and can monitoring of those patterns inform origins, introductions, and dispersal patterns of disease?*

Microbial Communities: Questions 11 - 12 fit within a larger question concerning the role of the tree microbiome (endophytes) in FD – ISHB spread, and fulfills an expressed research need to study host-fungal-beetle interactions in native vegetation.

11. **Research Question:** *How do microbial communities change over time inside diseased and non-diseased trees? Do microbial communities within galleries influence beetle fitness?*
12. **Research question:** *Can we exploit the role of the different microbial communities for controlling both the fungal and beetle population growth?*

Monitoring

Questions 13 – 16 address research needs to improve monitoring efforts.

13. **Research Question:** *How can traps be optimized for ISHB monitoring?*
14. **Research question:** *How can we reliably and efficiently detect species composition of PSHB and KSHB beetles caught in survey traps?*
15. **Research Question:** *Which agricultural crops (including stone fruits), ornamentals, hybrids, or CA native tree species are potential new hosts?*
16. **Research Question:** *Can canine detection teams be used for early detection of ISHB and or preventing the movement of infested wood in the event of a quarantine? Under what settings could this approach be applied?*

Control

Current management options in agriculture and urban forests include the use of pesticides, chipping, solarization, and removal of infested material; management options in the natural setting are limited to chipping, solarization, and material removal (Eskalen, 2016, Lynch et al., 2016). The application of many pesticides and other topical treatment sprays is prohibited in or near aquatic habitats (CCR Section 6970) and their use is often impractical, making them a non-viable management option for these areas.

Trees that provide habitat structure necessary for nesting of some riparian bird species may become infested, and the stockpiling of woody debris may have negative impacts on the endangered arroyo toad, compelling management decisions to be site dependent and contingent upon the species present. The Control Working Group identified future short- and long-term control options to study. The research questions below are categorized by control method: mechanical (amplifier tree removal and chipping), biological (beetles and fungi), defense activators, and chemical (biorational pesticides and spot injections). The working group came to the conclusion that it would be best minimize focus on pesticide treatment experiments because 1) this work has been completed in urban environments; 2) using pesticides in wildlands is problematic.

Mechanical*:*

17. **Research Question:** *How do we control the spread of the infestation at the frontier?*
18. **Research question:** *How can chipping procedures be optimized to effectively kill the beetles in applied settings (i.e. post-processing treatments)?*

Biological control of the beetles:

19. **Research question:** *Can we introduce parasitoid wasps from the native range of the beetles into California as a biological control measure? Can we introduce nematodes from the native range of the beetles into California as a biological control measure?*

Biological control of fungal pathogens:

20. **Research Question:** *Do endophytes (micro-organisms living inside the tree) prevent ambrosial fusaria from colonizing mature plants, saplings, or cuttings in greenhouse and field settings?*

Defense activators:

21. **Research Question:** *Do plant defense activators impede ambrosial fusaria and beetle establishment in field settings? How do hosts respond to beetle attack and or fungal colonization when treated with defense activators?*

Chemical Control:

Commercial biological agents

22. **Research question:** *Can applying biorational pesticides in combination with Barricade Fire Gel increase the viability of biological agents to aid in shot hole borer control?*

Spot Injections:

23. **Research question:** *Can chemical spot treatments be applied to lightly infested trees as a control measure?*

Integrated Pest Management (IPM)

Integrated pest management is a strategy for addressing pest problems by combining control techniques to reduce the pest's impacts while minimizing impacts on people and the environment. This approach focuses on long-term management using a program of six components: pest identification, monitoring and assessing pest populations and damage, thresholds for when management action is triggered, prevention methods, control tools, and evaluating the effectiveness of management (https://www2.ipm.ucanr.edu/).

24. **Research Question:** How can current knowledge of ISHB be integrated into an effective IPM program for both urban and riparian forests? What are the metrics of success to evaluate the effectiveness of the IPM program?

Restoration Biology of Affected Riparian Areas

These questions are related to riparian ecology and strategies for long-term restoration projects that may be impacted by ISHB.

25. **Research Question:** *How does beetle/fungal attack affect survival and growth of riparian tree species planted as part of restoration efforts?*
26. **Research Question:** *What are the impacts of ISHB-induced tree mortality and subsequent loss of habitat (nesting locations, food resources, etc.) on obligate riparian species (such as least Bell's vireo and southwest willow flycatcher)?*

Sociology and Economics

27. **Research Question:** *What are the limiting factors that discourage people from buying firewood locally (or buying where they burn it)?*
28. **Research Question:** *What economic impact will ISHB-FD have on the major forest systems in California by region and host species?*

A justification and estimated duration and cost for each of the 28 questions were compiled in a document and distributed to all CISAC subcommittee members and a broader community of stakeholders through UC ANR Collaborative Tools list-serves. Participants were asked to review the questions, provide feedback, and cast votes at the final public meeting to prioritize projects. At the meeting, participants stated their top five questions of priority. A note-taker tallied votes for each question and then ranked projects in order from highest to lowest priority (Table V).

Table V. Research questions ranked in order of priority.

Research Question Number	Rank	Vote Count	Projected cost	Description
19	1	18	$600,000	Biocontrol of beetles
24	2	16	$200,000	Integrated Pest Management
1	3	11	$413,000	Epidemiology: risk assessment
18	4	7	$75,000	Mechanical control: chipping
20	4	7	$208,000	Biocontrol of fungal pathogens
28	4	7	$150,000	Economic impacts
11	5	6	$150,000	Microbial community changes
13	5	6	$150,000	Monitoring: trap optimization
15	5	6	$85,000	Monitoring: host range
23	5	6	$75,000	Chemical control: spot treatments
17	6	5	$200,000	Mechanical control at the frontier
2	7	4	$40,000	Epidemiology: flight versus human – mediated dispersal
27	7	4	$56,170	Sociology of firewood movement
3	8	3	$40,000	Epidemiology: individual climate models
4	8	3	$190,000	ISHB – insect interactions
5	8	3	$220,000	Biology: ISHB flight behavior
7	8	3	$80,000	Biology: nutrient availability effects
12	8	3	$60,000	Biology: mycangial microbial communities
21	8	3	$165,000	Control: defense activators
25	8	3	$150,000	Restoration: ISHB- effects on planted trees
8	9	2	$150,000	Biology: irrigation and fertilizer effects
9	9	2	$100,000	Biology: host re-sprouting
16	9	2	$40,000	Monitoring: canine detection
22	9	2	$100,000	Chemical control: commercial biological agents
26	9	2	$350,000	ISHB- induced mortality effects on wildlife
6	10	1	$60,000	Biology: host tree water potential
10	10	1	$150,000	Biology: genetic diversity patterns of fungal pathogens
14	10	1	$30,000	Monitoring: ISHB batch identification

Research Questions with Justifications

19. Biological Control of Beetles

Parasitoid wasps -

Research question: *Can we introduce parasitoid wasps from the native range of the beetles into California as a biological control measure?*

Justification: The beetles are invading many different habitats within urban-wildland forests and within agricultural settings. In agricultural areas, there may be methods to control the beetle using chemicals, but these will be difficult if not impossible to apply in the other habitats where the beetles are found. Consequently, we need to reunite the beetle with the natural enemies that keep the beetle populations in check in their native range. Such biological control organisms are present in their native range and potential candidates have been found in Taiwan consisting of parasitoid wasps and nematodes. Preliminary research has shown that at least three different parasitoid species attack ISHB in Taiwan (Stouthamer, *unpublished*). These have been identified and need to be studied for their potential as biological control organisms in California. To address the broader question above, the following specific questions need to be addressed:

- Can we establish insectary populations of the parasitoid wasps?
- Are different parasitoids host specific?
- What is the relative abundance and activity of the three different parasitoid species in Taiwan?

Nematodes-

Research question: *Can we introduce nematodes from the native range of the beetles into California as a biological control measure?*

Justification: Many different nematodes have been found in association with ISHB in Taiwan, but their biology remains to be studied. Entomopathogenic nematodes are known to parasitize bark and ambrosia beetles, and some species infect the ovaries of the host and cause sterility. To address the broader question above, the following specific questions need to be addressed:

- What nematode species negatively affect ISHB in Taiwan?
- What are the optimal conditions by which nematodes suppress ISHB?

Duration: 3 years
Cost: $600,000 + overhead

24. Integrated Pest Management

Research Question: How can current knowledge of ISHB be integrated into an effective IPM program for both urban and riparian forests? What are the metrics of success to evaluate the effectiveness of the IPM program?

Justification: Metrics need to be developed to evaluate the success of an IPM program and the various IPM control strategies (cultural, physical, mechanical, and chemical), in conjunction with survey, monitoring and IPM practitioner training across urban and native forests. The threshold of damage that can be tolerated from an ecological and economic standpoint needs to be determined for this system.

Duration: 2 years
Cost: $200,000 (personnel, travel, supplies) + overhead

1. Epidemiology: Risk Assessment

Research Question: *What are the patterns of disease dynamics throughout Southern California, and what processes influence those patterns?*

Justification: This question addresses the broader question concerning where the beetle is most likely to become established and cause the most damage so that management and control procedures are applied appropriately. We are developing a risk model that can be used to make the best decisions given the information available at the time based on a two-year dataset of over 14,000 surveyed trees in 260 permanent monitoring plots established in native vegetation and avocado groves in San Diego, Orange, and Ventura counties (Lynch, Eskalen, Gilbert, Stouthamer). Continuous monitoring over time will be crucial to validate and improve the model and we need a five-year data set at minimum to characterize disease dynamics. The model will be adaptive in the sense that because we are monitoring plots over time, we can continually update the parameters of the model to incorporate new information and improve management decision making in infested and non-infested sites. This question also addresses the expressed need to document/quantify tree recovery, model risk, and identify favorable environmental/climate conditions as microclimate is being monitored in every plot. Contributes to Biology and IPM research categories.

Duration: Three years to get a five-year data set
Cost: $413,000 (personnel, travel, supplies) + Overhead

18. Mechanical Control: Chipping

Research question: *How can chipping procedures be optimized to effectively kill the beetles in applied settings (i.e. post-processing treatments)?*

Justification: Chipping has been shown to kill 99% of beetles, with chipping to sizes less than one inch killing >99.9% of beetles (Jones & Paine 2015, Paine et al. 2019). Solarization or composting after chipping have been recommended as post-chipping procedures to eliminate any risk of beetle survival in chipped material. Once composting and solarization processes are complete, the material can be repurposed and used as daily cover at regional waste facilities, or for burning at biomass facilities (Paine et al., 2019; Wood, 2016). Solarization times are dependent on the time of year and the cover material used (Jones & Paine, 2015). This method is most effective during the summer months, but year-round use is possible if treatment times are increased (Jones & Paine 2015, Paine et al. 2019). It is necessary to fully contain infested material during treatment to prevent beetles from escaping and establishing colonies in surrounding host trees.

Solarization or composting on site can increase time and cost for chipping operators. Research is needed to examine post-processing procedures on beetle emergence in settings that correspond to typical commercial processing of greenwaste. Specific research questions include:

- How does beetle survival compare for chipped material and unchipped material when handled as it would be in a commercial composting operation?
- How does commercial processing compare to solarization of chipped material?

Duration: Two years
Cost: $75,000 + overhead

20. Biological Control: Fungi

Research Question: *Do endophytes (micro-organisms living inside the tree) prevent ambrosial fusaria from colonizing mature plants, saplings, or cuttings in greenhouse and field settings?*

Justification: This question is important because if endophytes can control fusaria growth, then beetle establishment is impeded, and the plant is protected. Endophytes are thus a promising alternative to pesticides in native habitats and restoration settings. Preliminary experiments have shown that several species of the genus *Bacillus* can at least for some time reduce the growth rate of fusarium in the plant (Eskalen, Lynch). To address the question above, we ask the following specific questions:

- What combination of endophytes are most effective in controlling fusaria pathogens and under what conditions?
    - Need to test whether polycultures (multiple endophytes in a treatment) are more effective at disease suppression to account for changes in microbial interactions under different conditions.
- Which delivery methods of endophyte treatments are most effective?
    - Need to test various ways to introduce endophytes to young or mature plants that will ensure endophyte establishment without causing more harm to the plant (e.g., avoid creating infection courts for other secondary pathogens).
- Do naturally occurring beneficial microorganisms influence beetle/fungal establishment in tree species in southeast Asia where these beetles are native?
    - Need to screen for beneficial endophytes within tree hosts of the beetles' native range.

Duration: Three years (testing and evaluation), extending into long term (monitor treatment success over time)
Cost: $208,000 + overhead

28. Economic Impacts

Research Question: *What economic impact will FD – ISHB have on the major forest systems in California by region and host species?*

Justification: The major systems that will be impacted by FD – ISHB are the urban forest, riparian forest (willows, poplars, box elders, sycamores, etc.), and oak woodlands. Previous research by Dr. Greg McPherson calculated economic impacts of FD – ISHB to the urban forest over 5-10 years under a 50% and 80% mortality rate scenario (McPherson et al., 2017). As FD – ISHB expands it range outside of Southern California, there is a need to extend urban forest research to riparian forests and oak woodlands and model several rates of spread and mortality to determine potential economic impacts of the pest-pathogen complex on the various forest systems and species in Northern and Central California.

Duration: Two years
Estimated Cost: $150,000 + overhead

11. Biology: Microbial Community Changes

Research Question: *How do microbial communities change over time inside diseased and non-diseased trees? Do microbial communities within galleries influence beetle fitness?*

Justification: This question builds off of Lynch's work using next generation sequencing from wood tissues of 1,600 trees to characterize the spatial distribution of microbial communities on healthy and diseased trees over a broad geographic range. Work will focus on a subset of these

plots and trees to examine the temporal change in microbial communities in trees that are unaffected, infested, or recovering from fungal-beetle attack. In general, changes in environmental conditions can also affect microbial community composition so multiple time points per year will be sampled to examine variability in community composition and how it changes among previously sampled non-infested, infested, and recovering trees. This work advances our understanding of how seasonal changes in native tree microbial communities interact with pathogen/beetle establishment. The experimental work requires a combination of culturing microbes, high throughput amplicon sequencing, and analysis of fungi and bacteria compositions from the collected environments.

Duration: Two years
Cost: $150,000 for two years of data collection and analysis. + overhead

13. Monitoring: Trap Optimization

Research Question: *How can traps be optimized for ISHB monitoring?*

Justification:

Optimization of trapping lure

Extensive research has been done on the composition of the querciverol attractant for the invasive shot hole borers (Dodge et al., 2017). While the attractant substantially improves, the trap catch of lured traps vs. unlured control traps, the attractant does not have a large radius in which all the beetles are attracted to the trap (<2m), consequently the chance of using this lure for such applications as substantially reducing the population density in an area is very limited. Potentially trapping efficiency can be improved by combining attractants and deterrents.

Trap size

The current recommended trap for monitoring ISHB is the Elm Bark Beetle panel trap. The trap is 18"x 28" in size and the estimated cost per trap is $5, smaller white sticky traps are available for $1. For detection purposes, what is the relationship between the size of the trap and the number of beetles caught? Could a smaller more cost-efficient trap provide the same level of detection?

Trap height

While there are many factors that affect beetle flight, is there an optimal height to place traps?

Trap placement

How far away from a sensitive tree should a trap be placed. Folks worry about placing traps in non-infested areas fearing they may attract beetles to their trees.
Duration: Two years
Cost: $150,000 + overhead

15. Monitoring: Host Range

Research Question: *Which agricultural crops (including stone fruits), ornamentals, hybrids, or CA native tree species are potential new hosts?*

Justification: Previous studies showed that economically important agricultural crops could be potential reproductive hosts for the beetles and susceptible to their plant pathogenic associated fungi. Avocado and almond are two examples. It is still unknown whether the beetle will spread to and attack agriculturally important crops including stone fruits, pistachio, and pomegranate – will these crops become reproductive host? If so, what preventative measures could be taken? Host range testing needs to be conducted on various species.

Duration: One – two years
Cost: $85,000 per year + overhead

23. Chemical Control: Spot Injections

Research question: *Can chemical spot injections be applied to lightly infested trees as a control measure?*

Justification: Spot injections involve using a syringe to inject synthetic pesticides and or biocontrol agents into individual entry holes to kill adult beetles and their developing larvae within a gallery. Several researchers and pest managers have applied this technique at OC Parks, Disneyland, and other settings in Orange County (Nobua-Berhman, Kabashima, Eskalen, Shogren). Preliminary data from subsequent trap monitoring and gallery inspections suggest that spot injections could kill the beetles and their fungi on recently infested sycamores. Several Agricultural commissioners have approved the use of spot injections, in conjunction with frequent monitoring to forestall ISHB advancement on lightly infested trees. This approach shows promise an alternative to tree removal or traditional chemical injections during the initial phase of an infestation. However, a statistically robust efficacy trial needs to be conducted to officially recommend spot injections for treatment in appropriate settings.

Duration: Two years
Cost: $75,000

17. Mechanical Control

Research Question: *How do we control the spread of the infestation at the frontier?*

Justification: Contributes to IPM research category. At this stage, the idea is that if there are certain trees at the frontier that are very suitable for beetle reproduction then removing such trees will result in a substantial slowing of the spread of the beetle. The theory behind the amplification trees is that a single tree in a previously non-infested area becomes infested and starts releasing beetles late in the infestation. Consequently, taking out these trees would be a method to control the expansion of the beetles into new areas. While this is one of the control strategies currently employed many questions remain:

- Do most of the offspring born on these trees remain there or are beetles from elsewhere attracted to these trees?
- What methods are needed to distinguish beetles based on their natal tree?
- What is the effect of amplifier tree removal on surrounding native vegetation?
- Do only trees of a particular species become amplifier trees, or can any reproductive host become an amplifier?
- Under which circumstances are rapid response treatments appropriate and cost effective?
    - Rapid response, i.e. taking out heavily infested trees, may be useful in cases of a single tree known to be very susceptible (“amplifier tree”). Preliminary data suggest removing an amplifier tree in a managed urban landscape reduced the number of beetles captured in traps. It is still unclear whether this approach could be used in a peri-urban environment where tree composition primarily consists of susceptible hosts.

Duration: Two years
Estimated Cost: $200,000 + overhead

2. Epidemiology: Flight vs Human – Mediated Dispersal

Research Question: *How do beetle dispersal by flight and long-distance human-assisted movement contribute to the spread of FD – ISHB?*

Justification: The applied question here is what is the best approach to stop the spread of ISHB populations throughout California- should we concentrate on dispersion by diffusion (beetle flight) or long distance dispersal by human assisted dispersal or both? In practical terms, should we concentrate our control and monitoring effort on the "frontier" or on expansion by wood and Greenwaste transport. Can existing models be adapted for the ISHBs and what variables need to be determined to make the model realistic?

Duration: Six months
Cost: $40,000 (modeling effort) + overhead

27. Sociology of Firewood Movement

Research Question: *What are the limiting factors that discourage people from buying firewood locally (or buying where they burn it)?*

Justification: The adoption of new practices is influenced by many factors. Behavior change only occurs when the barriers to adopting a practice are overcome (Rogers, 2003). There are twelve determinants of behavior adoption which range from social norms to policies (Food, 2013). To understand the barriers to adopting the best practice of buying firewood locally instead of transporting it, we will conduct a barrier analysis of 45 adopters and 45 non-adopters. The barrier analysis is a methodology that uncovers the barriers to adoption and suggests recommendations to counter those barriers (Crump). It is rigorous and with 90 interviewees has proven to be valid.

Duration: 1.5 years
Estimated Cost: $56,170 + overhead (personnel, analysis, travel)

3. Epidemiology: Individual Climatic Models

Research Question: *Can climate-matching programs and degree-day models help accurately predict the ultimate FD – ISHB distribution in California?*

Justification: At the moment, the models for beetle development are simply based on data from studies at ambient temperature in vials containing artificial media. The temperature of the media will be very close to the temperature of the cabinet in which the vials are kept. The temperature inside trees will differ from the air temperature and is most likely lower than the air temperature. We do not have good data of the correlation between within tree temperatures and the ambient temperature and consequently using the day degree models from lab experiments to estimate the expected distribution of the beetles through modeling of the climate will be inaccurate. Climate matching programs should be run with precipitation excluded as a factor used in the climate matching, because in most of the native range of the beetle there is a lot of precipitation, while in California the water is supplied by homeowners/ agriculture, while the trees found in riparian areas get water from streams.

Duration: Six months
Cost: $40,000 + overhead

4. Biology: ISHB – Insect Interactions

Research Question: *Do other borer species facilitate or antagonize ISHB colonization, or affect ISHB population dynamics and or disease progress?*

Justification: Invasive shot hole borers do not live in isolation. Many other insects utilize the same host trees and may alter ISHB colonization rates and success in certain host trees. This study will characterize the community of bark boring insects in host trees in Southern California riparian systems and examine interaction strength in co-occurring species. Our preliminary studies suggest that these interactions can have significant impacts on host tree death, such as concurrent infestation by *Xyleborinus saxesenii* or infestation by secondary colonizers (e.g., *Anobiidae* spp.) following ISHB colonization.

Duration: Two years
Cost: $190,000 (personnel, travel, supplies) + overhead

5. Biology: Flight Behavior

Research Question: *What is the beetles' flight behavior?*

Justification: Little is known about the various aspects of the beetles' flight behavior, yet knowledge of the initiation of flight, distance covered and success post flight are important for many of the actions we may take to contain the spread of the beetle through the environment. In addition, better estimates of flight distance are needed for the modelling approach (see epidemiology) to determine the relative importance of local vs. long distance dispersal, and to guide early detection surveys on best ways to deploy monitoring traps (e.g., locations, density).

Specific questions to be addressed:

- Does the quality of the natal tree determine the females' choice to remain on the tree or to fly away?
    - Important for the "amplification tree hypothesis"
    - Important for the directionality of beetle dispersal during fall: "tree drying out hypothesis"
- What are the flight statistics? For example, flight speed, flight direction relative to the wind, flight height etc.
    - Important for monitoring of traps beyond current frontier of the beetle invasion
- What is the fate of the beetles post-flight, in both the large spring and fall flights.
    - Important for understanding the population dynamics of the beetles and deciding when to monitor- assumption is that after the spring flight beetles will have a lower success rate

Duration: Two years
Cost: $220,000 + overhead

7. Biology: Nutrient Availability Effects

Research Question: *How does nutrient availability affect ISHB host preference, growth rates, and the success of the symbiotic fungi?*

Justification: This question addresses the role of host tree nutrient availability on ISHB infestation, specifically in areas impacted by nutrient-rich agricultural run-off, and Boland's observation that KSHB may grow more quickly inside nutrient-enriched trees (Enriched Tree Hypothesis; Boland and Woodward, 2019). Increased nutrient availability can change a host's volatile profile, potentially altering beetle attraction to that host. In addition, nutrient availability

can affect the growth of symbiotic fungi and in turn the reproductive success of the beetle. Contributes to Epidemiology and Control research categories.

Duration: One – two years
Cost: $80,000 (personnel, travel, supplies) + overhead

12. Biology: Mycangial Microbial Communities

Research question: *Can we exploit the role of the different microbial communities for controlling both the fungal and beetle population growth?*

Justification: It is well known that many insects and trees harbor fungal and bacterial symbionts that play various roles in their life history. For instance, fungus-growing ant species carry colonies of bacteria on their bodies that produce fungicides that specifically kill competing fungi found in the fungal gardens that the ants cultivate as their sole food source. The beetles cultivate similar fungal gardens that they need to protect them from invasive fungi. It is likely that some of the bacterial species that we have found in the mycangia of the beetles have a similar role in protecting the fungal gardens (Stouthamer). The most common fungal competitors found in trees may be species carried along by other ambrosia beetle species. If each species has bacteria that protect their fungi from other fungi, then we should explore these bacteria for their antifungal action and we could discover novel fungicidal components that can be exploited to specifically kill of the fusaria carried by ISHB. Contributes to Control research category.

Duration: One year
Cost: $60,000 + overhead

21. Control Using Defense Activators

Research question: *Do plant defense activators impede ambrosial fusaria and beetle establishment in field settings? How do hosts respond to beetle attack and or fungal colonization when treated with defense activators?*

Justification: Plant defense activators are environmentally friendly compounds capable of inducing resistance against many plant pathogens of ornamental trees and crops (Hu et al., 2018). Such defense activators, including salicylic acid, oxalic acid, acibenzolar-S-methyl, and potassium phosphate, are produced naturally by plants. Foliar spray or trunk injection of plant defense inducers have been shown to provide significant control of disease progress (e.g., huanglongbing on citrus, anthracnose on cashew, and rice blast disease) (Hu et al., 2018; Lopez & Lucas, 2002; Sreeja, 2014). Our pilot study on recently infested willow trees in semi-natural habitats at UC Irvine showed that the aforementioned defense inducers reduced the number of new attacks on willows by 30% within a year (Eskalen). Defense activators are thus a promising alternative to pesticides in native habitats and restoration settings.

Duration: Two years
Cost: $165,000 + overhead

25. Restoration Biology: FD – ISHB effects on planted trees

Research Question: *How does beetle-fungal attack affect survival and growth of riparian tree species planted as part of restoration efforts?*

Justification: Substantial resources are being invested in riparian restoration programs throughout the invasive range of FD – ISHB, and extensive damage from FD – ISHB infestation

is being documented in some areas, especially to willow and cottonwood species established from pole cuttings (Bennett & Lambert). An evaluation of revegetation efforts is needed to determine the relative effects of beetle-fungal attack on riparian trees by species and life history traits (e.g., growth stages; survival). Understanding the relative effects of beetle-fungal attacks on different host species will aide in the selection of plant species that may have some level of resistance and enable project vegetation cover goals to be met. This project will evaluate revegetation strategies as part of ongoing restoration efforts in the Santa Clara river floodplain. Contributes to Epidemiology and IPM research categories.

Duration: Three years
Estimated Cost: $150,000 + overhead

8. Biology: Irrigation and Fertilizer Effects

Research Question: *How do irrigation and fertilizer affect beetle establishment on urban trees.*

Justification: This question follows up on a study of already infested trees at UCI (Umeda & Jones) and addresses questions six and seven in an urban setting. Studies show that ISHBs do not exhibit a preference for well-watered hosts (Umeda & Bennett). Bennett & Boland have been investigating the role of host nutrient availability on ISHB infestation. Urban trees are irrigated (often with reclaimed water) and fertilized regularly. A study of the interactions of irrigation, fertilizer and ISHB in an urban setting is needed.

Duration: Three – five years (Long term project pursued by OC UCCE, potentially in collaboration with UCR)
Costs: $150,000 (personnel, travel, supplies) + overhead

9. Biology: Host Re-sprouting

Research Question: *Why are the resprouting willows in the wet forests not being reinfested by KSHB? Does the chemical composition of the recovering infested tree change?*

Justification: This question fulfills the expressed need to document and quantify tree recovery. In the Tijuana River Valley, the resprouts of willows previously infested by KSHB are not being re-attacked. It is predicted that this may be due to a change in chemical composition of the recovering trees (Boland). This study will attempt to identify the mechanisms underlying this phenomenon.

Duration: Two years
Cost: $100,000 + Overhead

16. Monitoring: Canine Detection

Research Question: *Can canine detection teams be used for early detection of ISHB and/or for preventing the movement of infested wood in the event of a quarantine? Under what settings could this approach be applied?*

Justification: Detection dogs have demonstrated the ability to detect emerald ash borer eggs, larvae, and adults. They are also used for detection of huanglongbing disease and associated vectors. Canines could be used to detect infested trees if they are not infected in the crown, or to detect the beetles in firewood. One consideration is that there are currently no laws to enforce action if the beetles are detected.

Duration: One – two years
Cost: $29,000 & $8,000-10,000/dog as an educated guess

22. Chemical Control: Commercial Biological Agents

Research question: *Can applying biorational pesticides in combination with Barricade Fire Gel increase the viability of biological agents to aid in shot hole borer control?*

Justification: Biorational pesticides are substances or processes that when applied in an ecological context have little or no adverse consequence for the environment and non-target organisms but cause lethal or other suppressive or behavior modifying action on a target organism and augment the control system (Horowitz et al., 2010). There is a strong desire for a biorational management option for industry, wildland managers, and private landowners. However biological agents have a short effective period in arid environments. A spray coating of Barricade fire gel has been shown to increase the efficacy of the biological agents for a variety of wood-boring insects. Barricade fire gel is nontoxic, and is approved for use by the Forest Service for fire fighting. Lab trials and a preliminary field trial have shown increased control when biorational pesticides are used with Barricade. Further research is needed to address the following specific questions:

- What biorational insecticides and fungicides have increased efficacy when used with Barricade fire gel in field settings?
- What concentration of Barricade provides optimal benefit?
- How often would treatments need to be applied?

Duration: Two years
Cost: $100,000 (personnel, materials) + overhead

26. Restoration Biology: Implications of ISHB – Induced Tree Mortality

Research Question: *What are the impacts of ISHB-induced tree mortality and subsequent loss of habitat (nesting locations, food resources, etc.) on obligate riparian species (such as least Bell's vireo and southwest willow flycatcher)?*

Justification: Partial and mass die-off of riparian vegetation may lead to degraded and less abundant riparian habitat for wildlife. Several state and federally listed species in Southern California are dependent on these habitats, but it is unclear what effect ISHB-caused decline will have on these species or if restoration or natural re-growth will ameliorate these effects.

Duration: Four years
Cost: $350,000 + overhead

6. Biology: Host Tree Water Potential

Research Question: *How does host tree water potential affect ISHB preference or reproductive success? Does host tree water potential affect fungal growth?*

Justification: Invasive shot hole borers were initially detected in irrigated host trees and were thought to prefer healthy, well-watered trees. However, several studies (Umeda & Bennett) have refuted this idea, showing that ISHBs do not exhibit a preference for well-watered hosts and will infest trees within a wide range of water availability. Previous studies did not account for the effect of host tree water potential on ISHB reproductive success or symbiotic fungal growth, and more work is needed to fully understand the relationship between host water availability and FD – ISHB. Contributes to Control research category.

Duration: One year
Cost: $60,000 (personnel, travel, supplies) + overhead

10. Biology: Genetic Diversity of Fungal Pathogens

Research Question: *What are the patterns of genetic diversity of the beetles' pathogenic fungi and can monitoring of those patterns inform origins, introductions, and dispersal of disease?*

Justification: Monitoring changes in the genotypes of fungi associated with infestations and causing disease in trees is necessary to track how the fungal components of the disease are dispersing in California. There are multiple introductions of both beetle and fungi and tracing the pathways of infection to better understand the origins and timing of these introductions is important. Sequencing of entire genomes provides precise details of the genetic differences among individuals enabling examination of which populations are contributing to new occurrences of disease. Longitudinal study of the genetic identity of fungal strains will be performed using the isolates collected since 2012. This will enable improved monitoring and assessment of genotypes that are spreading more rapidly and support predictions for future outbreaks. Development of technology for rapid and accurate genotyping of the multiple species of fungi associated with ISHB galleries will also be built from these collected sequence data and enabled by robust computational and experimental workflows.

Duration: Two years
Cost: $150,000 (personnel, 100 strain genomes sequenced and analyzed) + overhead

14. Monitoring: Batch Identification

Research question: *How can we reliably and efficiently detect species composition of PSHB and KSHB beetles caught in survey traps?*

Justification: This question will be used to develop technologies for identifying the species composition of a batch of beetles. Beetle trapping efforts in detection surveys will result in some cases in large numbers of beetles caught per trap. For these batches the important question may be are they all one species or do both species occur in the batch. Developing a method that can answer the question: Does this batch consist of only PSHB, only KSHB or a mixture of the two? Such a protocol could speed up the identification process and provide insight into pathways.

Duration: Two months
Cost: $30,000 + overhead

Research and Technology Development Summary

The Research and Technology Development Sub-Committee developed 28 priority research questions and projected budgets to study each question. The questions and projected costs were developed with input from labs that will conduct the research. The sub-committee is aware that AB 2470 funding cannot support all research questions and is actively working to identify other sources of funding (e.g., Farm Bill Suggestions) to support identified research priorities.

- Top Three Research Questions: $1,213,000 covers biological control agents, integrated pest management, and epidemiology.
- Top Six Research Questions: $1,646,000 adds chipping, endophytes, and economic impacts.

- Top 10 Research Questions: $2,106,000 adds microbial community changes, optimizing traps, agricultural crops, and chemical spot treatments.
- Top 13 Research Questions: $2,402,170.00 adds controlling the spread at the frontier, beetle expansion by flight vs human dispersal, and social aspects of firewood movement.
- Top 20 Research Questions: $3,307,170.00 adds individual climate models, beetle/insect interactions/flight behavior, nutrient availability, mycangial microbial communities, defense activators, and beetle/fungal attack's effects on survival and growth of riparian tree species.
- All 28 Research Questions: $4,287,170.00 adds irrigation, re-sprouting, canine detection, biorational pesticides, ISHB-induced tree mortality impacts, host tree water potential, genetic diversity patterns and batch identification.

The committee is ready to proceed with drafting RFPs/grants for the top six research questions at a projected cost of **$1,646,000 + 25% overhead ($411,500) for a total of $2,057,000** to tackle the highest priority areas first.

Survey, Detection, and Rapid Response

Subcommittee Co-chairs:
Andrea Hefty, Ph.D., Forest Entomologist, USDA Forest Service, Forest Health Protection
Ed Williams, Ventura County Agricultural Commissioner

The Survey, Detection, and Rapid Response subcommittee prioritized actions to establish and implement 1) an effective statewide monitoring program to increase the detection potential for ISHB and document the level and extent of FD – ISHB infestations in California; 2) rapid response measures to prevent or slow the spread of ISHB through various pathways as they are detected. The subcommittee consisted of key participants representing research, regulatory agencies, and land management agencies (Table II). The survey, detection, and rapid response program will mobilize the appropriate agencies to apply measures to mitigate the problem in the short term as the research iteratively informs the development of better, long term solutions.

The statewide plan will provide a framework to coordinate local, regional, and statewide survey efforts, training protocols, data collection and management, communication protocols, and permits needed for all associated activities. The subcommittee established a Trapping and Visual Survey working group as essential components of an early detection plan, a Laboratory working group to streamline the beetle-fungal identification process, and a Rapid Response working group to develop a framework for actions once the beetles or fungi are detected (Table VI). The subcommittee developed the program and measures so they are adaptive and can be updated to incorporate new findings over time. The survey and rapid response priorities and associated costs are summarized in Tables XIII-XV. What follows is an outline of the process and products that emerged from these working groups. Products include priorities and protocols for surveys and rapid response measures.

Survey and Detection

Survey and detection efforts have four goals: 1) determine the frontier of the infestation, where previously non-infested sites might become infested; 2) monitor locations in non-infested areas at high-risk of an introduction from a long distance; 3) monitor sites that are potential sources of long distance movement to non-infested locations (e.g., large tree nurseries, firewood storage facilities); 4) develop a baseline of data that documents confirmed positive and negative finds to determine the extent of the infestation and track its rate of expansion. The key steps to achieving program goals are to identify areas at high-risk for an infestation, detect actual infestations, monitor the expansion rate of current infestations, and assess impacts using visual survey protocols. It is critical to not only document current infested areas, but also non-infested areas with high-risk resources or high-risk pathways for becoming infested.

Prioritizing Survey Areas

Survey and detection priorities focus on identifying where the beetle does and does not occur. Subcommittee members used prior knowledge from trapping data and reviewed other ISHB trapping protocols produced by various local agencies to build a consensus on a statewide early detection schematic plan that addresses who is responsible for monitoring in every jurisdiction, who carries out the incident action plan, who reports results, and ways to assess the effectiveness of the plan. The survey will target reproductive hosts at high-risk sites near campgrounds, greenwaste processing sites, riparian areas, and firewood distribution sites. High-risk tree species include documented reproductive hosts, including high-value specimen trees. The list of ISHB reproductive hosts is regularly updated at www.pshb.org.

Table VI. Working groups, responsibilities, coordinators, and participants in the survey, detection, and rapid response subcommittee.

Working Group	Responsibility	Coordinator	Participants
Trapping	Develop a trapping plan: Identify high-priority locations Determine where data will go Determine who will deliver the data Determine actions and responses to new detections	Andrea Hefty	Curtis Takahashi John Kabashima Madeleine Rauhe Matt Kaiser Ed Williams Curtis Ewing Richard Stouthamer Thomas Smith
Visual Survey	Develop a survey protocol with multiple tiers Identify expertise required at each tier Identify which tools are available Determine reporting mechanisms Determine where data will go Determine who will deliver the data	Rosi Dagit	Kim Corella Sabrina Drill Gretchen Heimlich Beatriz Nobua-Behrmann John Kabashima Jamie Whiteford Abigail Barraza
Rapid Response	Develop protocols for removal of highly infested trees in wildlands. Determine public outreach strategy for tree removal Determine regulatory authority for tree removal Identify funding sources	Ed Williams	John Kabashima Chris Oesch Rosi Dagit Madeleine Rauhe Andy Richards
Laboratory	Develop a system for laboratory identification Identify who conducts initial screenings Identify who performs official identification for action	Shannon Lynch	Richard Stouthamer Akif Eskalen Suzanne Latham Cheryl Bloomquist Stephen Gaimari Curtis Takahashi Curtis Ewing John Kabashima Alexey Tishechkin Nick Condos

Identified Survey Areas of Priority

In general, the number of traps to be deployed will depend on whether a county is on the leading edge of the infestation, is contiguous to the leading edge, or is non-infested. Non-infested counties will have the least number of traps deployed, and the largest number of traps will be deployed throughout leading-edge counties.

1. Counties on the Infestation Leading Edge

County agricultural commissioners (CACs) will hire one lead trapper per county to survey within counties on the known leading edge of the infestation (five total). Leading-edge counties include Los Angeles, Riverside, San Bernardino, Santa Barbara, and Ventura.

2. Counties Contiguous to the Infestation Leading Edge

CACs will deploy 50 individual monitoring traps at high-risk sites across San Luis Obispo and Kern Counties, which are contiguous to the leading-edge counties.

3. Other Non-Infested Counties

CACs will deploy 24 individual monitoring traps across counties beyond the leading edge of the infestation at the same kinds of locations described for counties contiguous to the leading edge.

Other Targeted Survey Locations

Large Tree Nurseries in Southern California

Trap monitoring activities at large tree nurseries will reduce the chances of ISHB movement in nursery stock. Agricultural commissioners in Los Angeles, Orange, Riverside, San Diego, San Bernardino, and Ventura counties will monitor nurseries with large known ISHB host trees (over six inches in diameter). These nurseries are generally involved in the Glassy-winged Sharpshooter Inspection Program.

Greenwaste Processing Facilities

Trapping will be conducted at greenwaste facilities along the leading edge and beyond the leading edge of the FD – ISHB-infested zone as part of the trapping programs noted above. Trapping will also be conducted at locations within the infested zone to a lesser extent as determined by the Pathways, Greenwaste and Firewood Subcommittee proposals. Shipments from those locations with high pest pressures should be monitored to avoid moving ISHB. However, not all areas within the infested zone may be heavily infested. These locations could thus possibly represent a pest-free, or reduced pest risk operation if trapping indicates low pest pressures. Monitoring efforts will inform the formation of a strategic plan for mitigating future risk. Education and Outreach activities will be used to encourage voluntary compliance from companies to ensure appropriate treatment of greenwaste before movement out of an infested area. Other quarantines such as Asian Citrus Psyllid (ACP) could be leveraged to require proper management of green waste.

Firewood Storage and Distribution Lots

Trapping will be conducted at firewood lots and distribution locations along the leading edge and beyond the leading edge of the FD – ISHB infested zone as part of the trapping programs noted above. Trapping will also be conducted at locations within the infested zone using a similar approach to efforts at greenwaste processing facilities. If possible, a tracking program for heavily infested firewood lots will be implemented to determine if and where large shipments are sent outside of the infested areas. There are currently no compliance agreements with firewood lots similar to those with greenwaste facilities dealing with quarantined pests (e.g., ACP). Education and Outreach activities will be strongly emphasized to encourage voluntary compliance.

Trapping Protocols

A trap is a monitoring tool that involves the use of a specific attractant to bait and capture a pest for detection purposes. For ISHB, white sticky panel traps are preferred because they are easy to deploy in various settings, are less expensive than other devices, and require less frequent servicing as beetles are preserved on the trap surface (Eskalen et al., 2017). Quercivorol is a plant-based chemical lure that attracts ISHB to the trap over short distances (i.e., if a beetle is within the local area). This section provides recommended trapping survey protocols and data fields to track the FD – ISHB infestation statewide. Protocols can be modified as needed to meet site-specific needs. CACs will consult risk maps and direct the timing, frequency, density, and extent of focused trapping survey efforts in compliance with statewide trapping protocols. When possible, CACs will coordinate trapping efforts with existing trapping programs for other pests (e.g., glassy-winged sharpshooter) to monitor nurseries that sell ISHB host trees. If traps

are ISHB positive, the local responsible agency (see below) will initiate a ground survey within one week delimit the extent of the infestation further. Following a thorough visual survey, the appropriate rapid response protocols will be activated (see Rapid Response section below).

When to Trap

Knowing when to trap is essential so that time and resources are used efficiently to correctly detect new infestations as quickly as possible and elicit an appropriate response. The subcommittee discussed two approaches to the timing of trap monitoring, which relate to the trapping period and intervals in between trapping, both of which would be worked out before the survey training program begins. The first option would be to sample for two months twice per year (spring and late summer). Under this scenario, trap locations would be moved twice in one year, allowing the program to cover more area in one year, which would increase the chances of early detection. The second option would implement a single, but longer trapping period (March – October). A Trapping Coordinator in this case would recommend new locations for traps every year based on the previous year's results. Under this scenario, trap locations would be moved twice in one year to cover more area in one year, which would increase the chances of early detection. The second option would implement a single but more extended trapping period (March – October). A Trapping Coordinator, in this case, would recommend new locations for traps every year based on the previous year's results. Researchers, CACs, and UC ANR – CE advisors will develop decision-making criteria to determine the circumstances under which a positive trap is moved to another location or removed for the rest of the sampling period. The former would cover more host area in a year; the latter would require visual surveys in the detected area for the remainder of the year.

Trapping Period

Patterns from several years of trapping data in Southern California suggest that although beetles do fly most of the year, ISHB flight activity is pronounced twice per year, and this pattern is associated with temperature (Calnaido, 1965; Stouthamer, *unpublished*). Beetles generally fly between 11:00 a.m. and 4:00 p.m. when temperatures are 68 F – 86 F. Beetles do not fly at temperatures above and below that range. Flight activity increases with rising temperatures, maximizes at ~79 F, and decreases to zero when temperatures reach 86 F. The number of beetles flying also depends on their local density within individual trees. During more extended periods of cold weather, beetles accumulate inside native galleries and are unable to fly until outside temperatures are substantially above 68 F. Mass numbers of beetles have been caught during the earlier part of the year, even in a single day, during periods of warm weather followed by these longer periods of cold weather (Stouthamer, *unpublished*). A spike in beetle catches has also been observed in the fall when drying conditions might cause moisture loss in previously suitable trees. Hence, this spike could be associated with a mass dispersal event if beetles are escaping trees that no longer support their reproduction (tree drying hypothesis). The first detection of ISHB in non-infested areas in Southern California has been shown to take place in the earlier months of the year (February – March) (Stouthamer, *unpublished*).

Research therefore suggests that the best use of time and resources to try and detect a beetle in a non-infested area is when beetles fly the most. For Southern California, this time of year is in Spring (February – April) and early fall (September – October). Surveyors can use the best local climate data available to determine exact time frames to survey in specific areas (e.g., Fig. 3). The assumption with this approach is that if ISHB is undetected in non-infested areas during peak flight periods, then it won't be detected the rest of the year when the chance of catching a beetle is minimal.

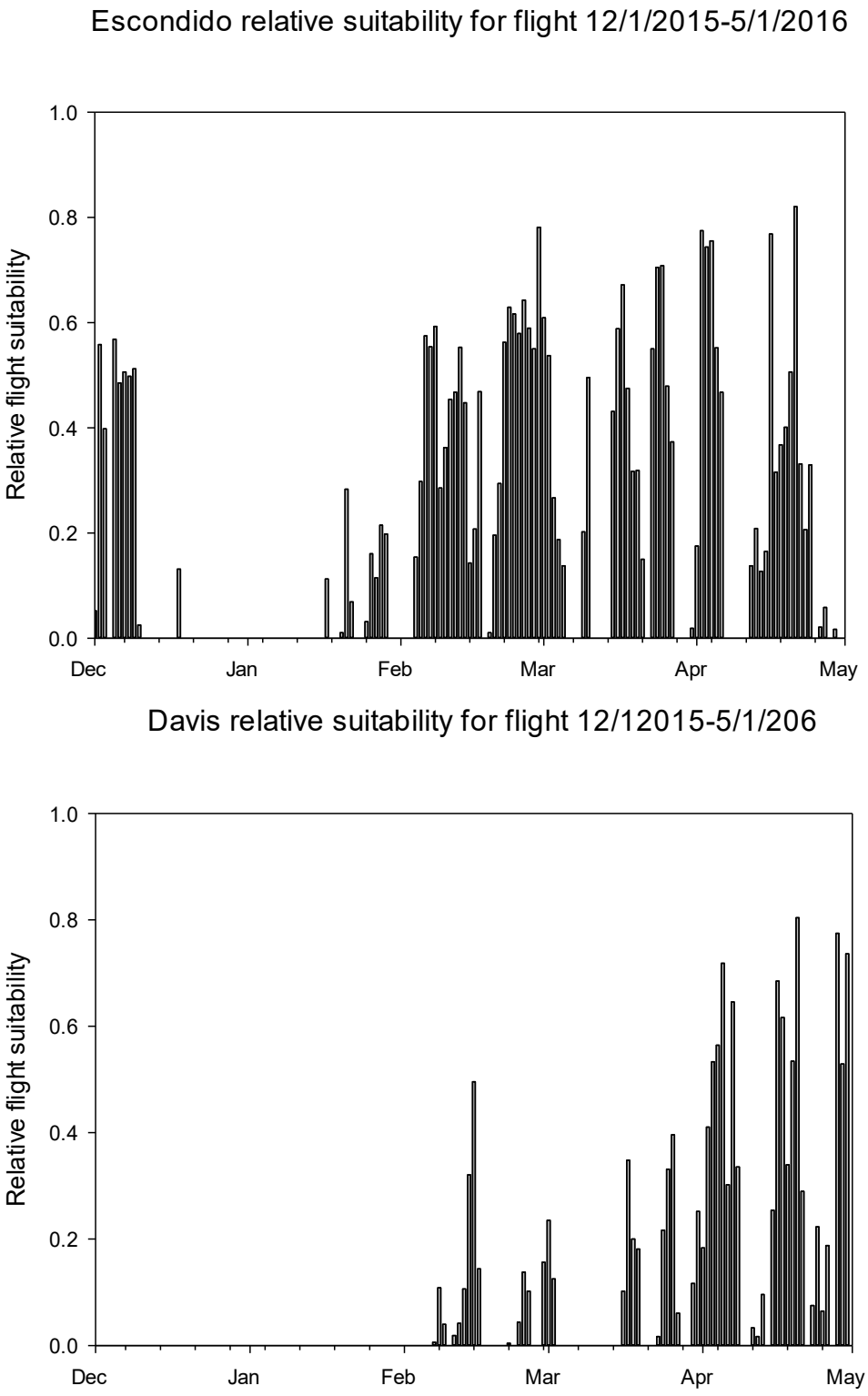

Figure 3. Relative suitability for beetle flight from December 2015 – May 2016 in Southern California (Top) and Northern California (Bottom). Relative suitability is based on optimal temperature conditions for beetle flight at different locations using local weather data from the California Irrigation Management Information System (CIMIS). Zero suitability indicates that beetles are not expected to fly. The chance of flight, and therefore catching a beetle, increases with increasing suitability. These data suggest that in winter, temperature conditions are not suitable for long enough at both locations.

Sampling Intervals

The subcommittee discussed the benefits to shorter and longer sampling intervals throughout different regions in California. A beetle caught in a trap where ISHB was previously undetected could be a colonizer- the first to arrive in an area. In this case, the chances of catching the original foundress of the population are low as they must be near to the trap to be attracted to their species-specific lure. Checking the area for additional beetles will not likely result in finding heavily infested trees because the beetles just arrived. Another explanation is that the beetle is the next generation of an established infestation, and those offspring are dispersing. The chance of catching a beetle during a dispersal event increases with outbreak age and tree health. Individuals prefer to tunnel a new gallery on their natal tree until the host is overcrowded or has lost its vigor. In both cases, the tree can no longer support Fusarium growth to produce new generations, so the beetles disperse. Given that roughly 398 degree days (as calculated in degrees C; temperatures over 55 F) are required to produce a generation of beetles, a site could yield 3 – 4 generations per year. In addition, ISHB- specific lures last four weeks. For these reasons, traps could conceivably be checked monthly in locations where the infestation is expected to be low. A more conservative approach would favor a biweekly sampling schedule to detect an infestation sooner and elicit a more rapid response. Some argue that given the beetles' life history, the effect of responding to a new beetle detection at a novel site on infestation progress will not differ between a biweekly and a monthly schedule. Moreover, a monthly sampling interval enables surveyors to distribute traps to twice as many locations and thus increase the chances of detecting a rare infestation.

Consensus on When to Trap

The subcommittee reached a consensus on when to trap, recognizing the need to allow for flexibility to refine and tailor methods as appropriate. Depending on the priority level of the site in Southern and Central California (Table VII), traps will be deployed either 1) March – October or 2) one month each in spring and fall (February – April and September – October). For areas at higher elevations or with cooler temperatures, trap schedules will be adjusted according to local conditions suitable for beetle flight (68 F – 84 F between 11 a.m. – 4 p.m.). If traps are serviced twice per year, they will remain at sites for four weeks (i.e., the duration of one lure life). Sites selected in Season One (February – April) can be used again in Season Two (September – October). Sites will be visited by crews a total of 6 times in one year maximum, with three visits per season, but no less than four visits per year. The crew will deploy the trap on the first visit (week one), check the trap on the second visit (end of week two), and collect and replace the trap and lure on the third visit (end of week four).

Rule of Thumb for When to Relocate Traps

If a trap catches ISHB on two consecutive sampling dates, that trap location will be abandoned. The surveyor will choose a new trap location for sampling at least one mile away from the center of infestation.

Deploying Traps

In general, traps should be appropriately labeled and accessible for maintenance, but away from high-traffic areas. Do not hang traps in or under tree canopies, in areas exposed to high winds, or where they could get wet (e.g., irrigated lawns, planters). County Agricultural Commissioners have used several reliable strategies to decide how to deploy traps over specific distances when monitoring other invasive insect species. In principle, traps must be deployed throughout high-risk sites systematically, so they are uniformly distributed over as much ground as possible within each county. Sites can be selected randomly within identified high-risk areas using a grid overlay on a map (27- or 55-yard square). A site might represent a point location of

concern (e.g., nursery, campground, trailhead), or contain transects with traps deployed at specific intervals (Fig. 4). At point locations, should be deployed traps within 200 yards of potential introduction pathways. Place traps near known host species within one mile from a previous find to identify where the infestation has spread. Specific trapping guidelines for ISHB are in Appendix B.

Table VII. Trapping protocols by location type.

Priority Survey Area	Trapping Protocol
Counties on Leading Edge of Infestation	The trapper will deploy individual white sticky traps and querciverol lures at approximately one-mile intervals along the infestation frontier within each county, targeting high-risk sites. Traps will be serviced March – October at greenwaste and firewood sites as beetles are expected to leave cut wood during favorable weather conditions. For the remaining sites, the surveyor will check traps either March – October or within one selected month twice per year (February – April and September – October). For the latter, trapping cycles will be adjusted to coincide with optimum temperatures for beetle flight patterns in the area. To save materials, the trapper will check traps at week two and check and replace traps and lures when they expire at week four. The trapper will conduct surveys either on biweekly or monthly intervals.
Counties Contiguous to the Leading Edge of Infestation	The timing and frequency of trap visits will proceed as described above.
Other Non-Infested Counties	CACs will deploy 24 individual traps across counties beyond the leading edge of the infestation at the same kinds of locations described for counties contiguous to the leading edge. There will be two monthly servicing periods beginning February – April and finishing in September – October. The Trapping Coordinator will pull temperature data from weather stations to give trappers/surveyors the ideal times to survey that correspond to optimal flight conditions. Surveys will additionally focus around firewood storage locations (March – October) and locations with castor bean (spring and fall).
Targeted Survey Areas within Counties	
Large Tree Nurseries in Southern California	Traps will be serviced biweekly or monthly from March – October since there is some degree of flight activity during that period. Should an ISHB be detected in one of these nurseries, a visual survey will commence to determine the most likely source of the infestation which could be the nursery or adjacent property containing competent hosts (e.g., park, riparian area).
Green Waste Processing Facilities	Traps will be deployed if there are known hosts in the area.
Firewood Storage and Distribution Lots	Traps will be deployed if there are known hosts in the area.

Trapping in Riparian Corridors and Natural Areas

Option 1: Three 0.1-acre plots per acre of continuous riparian host area (Fig. 3a).

1. Deploy one trap per plot (trap can be placed at an optimal place within the plot—it does not have to be located at plot center).
2. If trap yields a positive ISHB find proceed with a visual survey:
    a. Locate and record plot center and divide plot into quadrants
    b. Identify box elder in quadrants and perform a visual survey on stems >5" DBH (diameter at breast height) as well as castor bean plants older than two years, recognizable by woody bark.
    c. If box elder is not present in the plot, perform a visual survey of all stems >5" DBH of 15 most susceptible host species.

Option 2: Place one trap near hosts at one-mile intervals (Fig. 3b).

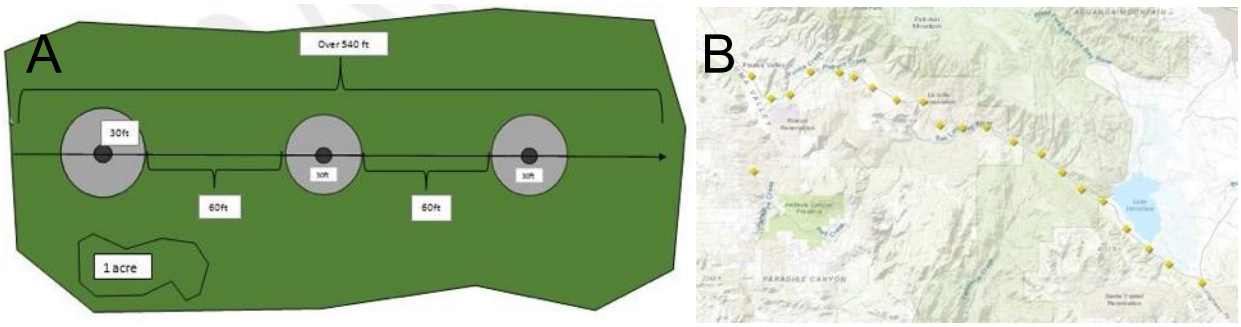

Figure 4. Trap deployment options for riparian corridors and natural areas. Option 1 involves three 0.1-acre plots per acre of continuous riparian host area (a). Option 2 involves deployment of traps at one-mile intervals (b).

Visual Surveys: Priorities and Protocols

A variety of visual survey methods and observers will be utilized to expand the search across sites and compliment trapping survey efforts. The two-tiered monitoring levels (trained professionals and community science volunteers) are outlined below and describe different levels of training, coordination, and review to ensure high-quality data acquisition. The subcommittee envisions using a suite of different survey methods to involve the most comprehensive number of observers possible and cover the most ground.

Tier 1. Trained Professionals

These surveyors will conduct regularly scheduled, planned surveys directed by and coordinated with the local lead agency.

Criteria:

- Passed an online FD – ISHB course developed by UC ANR
- Passed an in-field test supervised by UC ANR or other trainers
- Approved to input data

Examples: Agricultural pest inspectors, Fire and Forestry staff, Southern California Edison staff, Caltrans staff, Department of Public Works staff, staff in other utilities, Research Conservation District employees (e.g. Riverside, San Diego, Santa Monica Mountains, Ventura), Parks and Recreation staff, biologists, arborists, landscapers, tree trimmers.

Training

Online and Field Courses

UC ANR will host an online course paired with a field training in which participants learn to differentiate symptoms of ISHB attack from other look-alike insects in realistic settings. The online course provides information on FD – ISHB identification, biology, impacts, and management. It is the first part of a toolkit to identify ISHB-infested trees, but cannot cover the scope of the highly variable symptoms produced by the broad host range. Field training is a necessary next step to achieving proficiency in identifying and quantifying ISHB infestations.

Field trainings will include:

- Identifying FD – ISHB symptoms on several species, including but not limited to the most common hosts: castor bean (*Ricinus communis*), California sycamore (*Platanus racemosa*), London plane (*Platanus* x *acerifolia*), willows (*Salix* spp.), cottonwoods (*Populus* spp.), alder (*Alnus rhombifolia*), and box elder (*Acer negundo*).
- Distinguishing between active and inactive ISHB holes.
- Identifying symptoms of FD – ISHB recovery.
- Distinguishing symptoms of ISHB attack from those produced by other pests.
- How to set up traps.
- How to collect beetle and tissue samples for morphological or molecular confirmation of the beetles-fungi.
- How to submit samples to get an official identification.

Recruitment

Trained professionals will be recruited through outreach activities to maximize survey and rapid response efforts. Outreach will expand training to these professional observers who have access to and valuable local knowledge about particular sites. The CACs will collaborate with other lead agencies to coordinate regularly scheduled surveys with professionals in high priority areas. Professionals will also be recruited to share data from incidental reports on examined trees for other reasons (e.g., line clearance, park or landscape maintenance).

Protocols

Visual survey protocols will vary depending on the information goal, ISHB status at a site, and risk level. The CDFW 2017 Visual Survey Protocol (Table VIII; Appendix C) has been implemented and vetted but can be modified as needed to accommodate local conditions. The iNaturalist Survey Protocols (Table VIII) are currently being developed. Survey protocols include methods on how to collect data in the field, input and upload data on different platforms (e.g., iPad mini, phones with and without connection, hard copies), and conduct quality control.

Reporting Tools

A statewide Trap – Visual Survey Data coordinator will work with UC ANR – Cooperative Extension and UC Davis on data management and reporting protocols. A standardized list of data fields will be developed and serve as templates regardless of data-collecting platforms. Each agency has different constraints on data management and access. As such, we recommend these templates in all survey reporting tools: Survey 123 via ArcGIS, UC ANR Qualtrics (http://ucanr.edu/vcurbanshb), Excel spreadsheets, and tracklog mapping. A statewide procedure will be developed for data Quality Assurance/Quality Control and data uploading to the existing centralized database developed and managed by UC ANR and the Eskalen lab at UC Davis. Independent certified professionals (i.e. arborists, line clearance observers, landscapers, etc.) will record data by either entering data into TreeKeeper 8, iForm Builder, the UC ANR Qualtrics online reporting tool (with permission to access), or through the projects in

Table VIII. Information goal, ISHB status, and site risk level criteria to determine which visual survey protocol to follow.

Information Goal	ISHB Status	Risk Level	Examples	Survey Protocol Recommended
Identify baseline conditions areas with tree inventory data	Non-Infested	Unknown	City parks	CDFW 2017 Visual Survey Protocol
Identify baseline conditions areas with no inventory data	Non-infested	Unknown	Campgrounds	CDFW 2017 Visual Survey Protocol
Identify new infestations and track spread	Unknown	High	Riparian corridors, parks, wildlands	CDFW 2017 Visual Survey Protocol
Track rate of spread and density of an infested tree	Infested	Unknown		CDFW 2017 Visual Survey Protocol
Confirm FD – ISHB from incidental reports by trained professionals examining trees for other reasons	Unknown	Unknown		iNaturalist Survey Protocols
Focused high-risk tree species surveys	Unknown	High	Locations with castor bean, box elder, sycamore, willows, etc.	CDFW 2017 Visual Survey Protocol

iNaturalist. All platforms can be used on mobile devices in the field and on a desktop computer.

Software Platforms

TreeKeeper 8 is an example of a web-based tree management software developed and maintained by Davey Resource Group (DRG). Since 2017, DRG's team of arborists and web developers have collaborated with clients and researchers to refine collection methods for FD – ISHB monitoring programs. More information about the platform are at http://www.arborguard.com/tree-services/treekeeper/.

iForm builder is a data collection platform developed by Zerion Software that has been used by researchers conducting extensive FD – ISHB surveys throughout Southern California since 2012. More information about the platform are at https://www.zerionsoftware.com/iformbuilder/.

UC ANR Qualtrics is an online survey software available for UC ANR staff and academics. It is utilized for a variety of UC Cooperative Extension purposes and is currently being used in existing UCCE FD – ISHB survey projects. More information about the platform are at https://ucanr.edu/sites/CEprogramevaluation/Get_Qualtrics_through_ANR/.

iNaturalist is a data collection platform for Community Scientist Volunteers that is being used in existing UC Cooperative Extension FD – ISHB survey projects. More information about the platform are at https://www.inaturalist.org/.

Tier 2. Community Science Volunteers

These surveyors are self-selected, loosely organized, interested volunteers; survey locations meaningful to them are not necessarily part of a regularly planned systematic effort. Community science volunteers are outside regularly and may detect new infestations in locations they often visit but are not systematically surveyed by professionals. The quality of the data may not be as high as those collected by trained professionals. Still, community science volunteers will provide a valuable source of opportunistic incidental report data along hiking trails, recreation areas, backyards, city parks, county parks, open spaces, and other settings of interest to the observer.

Examples: Master gardeners, students, participants recruited from docent training, members from the Audubon Society, the Sierra Club, California Native Plant Society, or CA Naturalist.

Training

Training community science volunteers increases the number of reliable surveyors inspecting the broadest geographic area possible. Several of the community science observational sites are located in key areas of the wildland-urban interface (e.g., Topanga and Rural Calabasas in the Santa Monica Mountains). Community science volunteers will be trained based on a combination of the UC ANR Sycamore Master Gardener project and iNaturalist trainings. The UC ANR training is two days and teaches participants how to identify FD – ISHB symptoms on sycamore, identify different sycamore varieties, and use their phones to collect data. The training is geared towards surveying in urban parks and greenspaces, rather than wildland areas. The iNaturalist training is a three-hour field class at an FD – ISHB infested location. It includes instruction on how to set up the iNaturalist app on their phones, identify tree species and symptoms, capture observations and take photos, and connect to FD – ISHB projects.

Recruitment

Lead agencies (e.g., CACs) conducting regularly scheduled surveys in high priority areas per Tier 1 protocols will coordinate with local volunteer groups to assist with these efforts. UC ANR will organize groups through existing Cooperative Extension channels to recruit volunteers to collect incidental reports in locations determined by the observer.

Protocols

Tier 2 surveyors will use different protocols depending on the nature of the data being collected (Table IX). The iNaturalist protocols are currently in development; the complete UC ANR Sycamore Survey Protocol is in Appendix D.

Reporting Tools

Two types of reporting tools could be used by Tier 2 surveyors, which include iNaturalist and the www.pshb.org reporting tool. iNaturalist projects fall into two categories for working with data. A “collection” project is a saved Observations Search that is used to search data observations based on defined criteria (e.g. data range, taxa, location, surveyor). Examples of such projects are SCARAB and Santa Monica Mountains Bad Beetle Detection. A “Traditional” project is part of a specific surveying effort. Targeted projects require that the observer join a specific survey project (following a training event). Data fields include more detailed questions that are filled out with each entry. Observations are then linked directly to that specific project and are not automatically pulled in from general observations. Weekly-monthly administration of these observations requires dedicated time by a designated person/group/agency. Data managers at

Table IX. Information goal and corresponding protocol for Tier 2 Surveyors.

Information Goal	Protocol
Early detection at a leading edge	UC ANR Sycamore Survey Protocol
Identify new reproductive hosts	iNaturalist Traditional Project Protocol
Incidental reports by trained professionals examining trees for other reasons	iNaturalist Collection and Traditional Project Protocols; www.pshb.org online assessment tool

UC Cooperative Extension and UC Davis will coordinate quality assurance and quality control (QA/QC) and upload confirmed and verified results to the statewide data repository. These kinds of projects are limited in that they potentially generate many incorrect observations. However, the benefit is that they help to cover a much larger geographic area that could result in unique new FD – ISHB detections.

The www.pshb.org reporting tool is a two-part linked Qualtrics survey. The first part is a decision support tool designed to guide a tree owner through pest diagnosis. If surveyors end up reporting a tree that seems to be a probable candidate and in a new area, they get automatically connected into the 2nd survey to report the tree. This step weeds out reports from known infested areas. Data managers at UC Cooperative Extension and UC Davis would then coordinate QA/QC and upload confirmed and verified results to the statewide data repository. It is also possible to provide a direct link to the second survey portal to trained observers. The second survey portal has location, infestation level, and condition information that is similar to the fields used in the statewide data repository, TreeKeeper 8, and other Survey 123 tools.

Identification Procedures

Morphological and molecular identification protocols were adapted from methods developed by Richard Stouthamer, Akif Eskalen, and Shannon Lynch. The Laboratory Working Group of the subcommittee developed a screening process for specimen identification. A sample submission protocol will be developed and available on the at www.pshb.org. Staff from CDFA, CAC, or research labs (UCR and UCD) will report the location of the official find to UC ANR staff hosting the statewide ISHB distribution map and database (www.pshb.org) for updates.

Morphological identification

Beetles caught on traps deployed with just the quercivorol lures will generally consist of more than 80% PSHB or KSHB, with the remaining ambrosia beetles being *Xyleborinus saxeseni*. *Euwallacea* spp. and *X. saxeseni* are easy to distinguish by their size difference. Local agricultural commissioner staff will monitor and collect traps in collaboration with other agencies and researchers in the area. Staff will screen and count suspect beetles, remove specimens from sticky traps, and submit them to the California Department of Food and Agriculture (CDFA) Plant Pest Diagnostics Laboratory (PPDL) for morphological identification. Morphological identification to *Euwallacea* sp. (ISHB) satisfies CDFA's needs concerning regulation and will appear on the distribution map as an official ISHB find. If the beetles need to be distinguished between PSHB and KSHB, the PPDL will coordinate with the Stouthamer lab (UC Riverside) to officially identify specimens to species using molecular techniques.

Molecular identification

KSHB and PSHB cannot be reliably distinguished using morphological methods (Gomez et al., 2018; Stouthamer et al., 2017). However, the species differ in a region of their DNA sequence (cytochrome c oxidase subunit 1 gene, or COI). Molecular methods have been developed using this region to compare High Resolutions Melt Curves (HRM) of different specimens in a real-time polymerase chain reaction (qPCR) (Rugman-Jones & Stouthamer, 2018). Within two – three hours, up to 64 individuals can be identified to species (PSHB or KSHB). Any molecular identification of beetles will be carried out by the Stouthamer lab at UC Riverside.

Similarly, fungal samples can be tested using such methods to distinguish the different species of *Fusarium* associated with wood samples or samples of the beetle heads (Carillo et al., 2019). After being geographically separated for millions of years, multiple introductions of both beetle and fungal species into overlapping areas raises concerns over potential novel beetle-fungal interactions and further consequences to Southern California landscapes. It is essential to identify the Fusarium pathogens from beetle specimens to determine if individuals of different species are switching their specific symbionts where they overlap geographically. The effects of fungal switching on beetle fitness and implications on tree health can subsequently be studied once documented. Importantly, if a beetle specimen cannot be collected during visual inspections of symptomatic host trees, it is still possible to confirm FD – ISHB on a tree using necrotic plant tissue samples to identify the fusaria pathogens. The Plant Disease Diagnostics Laboratory at CDFA or the Eskalen lab at UC Davis will diagnose the fungal pathogens, and these labs will coordinate efforts with one another. Detailed protocols on how to remove specimens from sticky traps for further processing, now to prep specimens for DNA extractions prior to morphological vouchering, and how to extract fungal DNA from beetles or plant tissues are in Appendix E.

Identification Cost Considerations

There may be several sources of trapped specimens during monitoring efforts that may need to be identified, which are summarized in Table X:

1. Specimens collected from traps used to delineate the frontier of the infestation. Cost are rough estimates assuming 1,000 traps are deployed every year.
2. Specimens collected from traps placed at likely sources of human-assisted transport such as Greenwaste facilities and firewood locations. Costs are rough estimates assuming 500 traps in 50 locations per year to be inspected.
3. Identification of beetles for trees that need to be taken down for regulatory purposes. Costs are rough estimates assuming that 100 trees need to be taken down and three beetles per tree need to be tested for their identity.
4. Keep testing samples collected in areas where we know the ISHB is present.
5. Test specimens sent in by the public from new locations or from researchers. Costs are rough estimates assuming 300 beetles per year to be identified.

Table X. Yearly estimate of ISHB identification needs.

Need	Number of traps	Number of beetles
Frontier trapping	1000	1000
Greenwaste/firewood	500	500
Regulatory samples	100 @ 3beetles	300
Legacy population development		700
New population development		700
Specimens from new locations		300
Total beetle identification per year		**3500**

Summary of Identification Costs

- **PCR:** $4,250 (3,500 @ $1.50 per beetle)
- **Consumables** (e.g., microcentrifuge tubes, DNA extraction chemicals and kits): $5,000
- **Supplies:** $10,000
- **Full-time Lab Assistant:** $54,000 for 1,470 hours of work
    - **Sort and process submitted specimens:**
        - **Not Removed from Traps:** 750 hours to inspect traps and remove specimens (1,500 traps @ 30 minutes per trap).
        - **Removed from Traps and in Ethanol**: 120 hours of work to process 3,500 beetles (120 specimens @ Eight hours per day).
    - **Administrate and disseminate information**: ~300 hrs
    - **Maintain lab and order materials**: ~200 hrs

Overall annual estimated cost: $64,000 (@ $18.50 per specimen)

Coordinated Data Management

Overall, when a trapped specimen is officially identified as ISHB, the trapper will visually survey the detection site to locate any infested tree(s) in the vicinity. When an infested tree is officially confirmed FD – ISHB positive in the urban landscape, the management guides (Figs. 5-6; Table XI) will be used to determine whether to remove, treat, or continue to monitor the area. Once the frontier has shifted, traps will be relocated to track beetle movement beyond the new leading edge.

All teams conducting surveys will submit their data to within a week of the surveys, if not earlier. Preliminary quality assurance and quality control (QA/QC) will be completed by the observers, with a follow up conducted by the local data management team. Data will be submitted on a monthly basis to the statewide database managed by UC ANR – Cooperative Extension and the Eskalen lab at UC Davis and ongoing updates to the maps and infestation locations will be shared as quickly as possible. A protocol will be developed to illustrate where tree removal or other treatments controlled infestations.

Rapid Response

For FD – ISHB, the infested range is distributed over a diverse landscape with regional differences in composition and configuration. Suitable habitat ranges from countryside habitat, consisting of a mosaic of avocado groves, riparian vegetation, and oak woodlands, to urban forests that are largely comprised of impervious surfaces. Given that the FD – ISHB complex affects hosts that can either increase or slow the spread of the epidemic, how they are distributed across a landscape matters. In a landscape comprised of multiple land-use types

that support survival and reproduction of the beetle vectors, the context of a site where FD – ISHB is detected will thus suggest that certain response measures are more appropriate than others. The rapid response plan outlined below makes use of a multifaceted action plan to mitigate the problem based on our best understanding of the system at this time. There are currently no effective measures that can definitively control the problem. As different preventative and curative control options appropriate for different habitat types continue to be tested and developed, and insights are gained through monitoring data, the rapid response program for FD – ISHB will also evolve in an iterative process.

On Tree Removal

If tree removal is an appropriate action step, a California-licensed tree removal company or licensed timber operator will be contracted to remove and dispose of infested trees. Provisions in the contract should ensure that the contractor's actions are in compliance with the National Environmental Policy Act (NEPA) or the California Environmental Quality Act (CEQA) on federal or non-federal lands. At a minimum, removed trees must be chipped to pieces less than one-inch in size, followed by stump grinding (Appendix F). Chipped material may require further processing before relocating plant material to a greenwaste facility (Appendix F). It is impossible to know how many trees will need to be removed. Tree removal costs may vary significantly depending on proximity to structures, tree size, accessibility (local vs. remote), or accessibility to proper greenwaste processing facilities.

Rapid Response Priorities

Priority 1: Leading Edge and Contiguous Counties

CDFA or UC laboratories will officially identify submitted specimens collected from a trap on the leading edge of the infested zone or in contiguous counties. Once identified as ISHB, the trapper will visually survey the detection site to locate any FD – ISHB infested tree(s). The survey area will be determined based on site conditions (e.g., host type, host density) and other factors. When an FD – ISHB expert makes an official diagnosis on a suspect tree, appropriate next steps will be determined using the management guides (Figs. 5-6; Table XI). Either a fire agency will designate the tree as a high hazard, or the CAC will issue an abatement notice requiring removal or treatment.

Priority 2: Infested Zone

Trees identified as high-hazard or amplifiers should be removed within the area known to be infested with ISHB based on the management guides (Figs. 5-6; Table XI). Moderately, or lightly infested high-value trees can be treated in an attempt to save them at the cost of the owner or interested parties. Costs for high-hazard tree removals should be shared between the owners, interested parties, and or Invasive Species Council grant funding.

Rapid Response Protocols

Impact Assessment

The extent, severity, and impacts of infestations at each location will be evaluated based on monitoring data. Treatment options will be evaluated, and response levels identified. Local CAC leaders will lead this step and collaborate with CDFW and other interested local, state, or federal agencies to assess impacts. Designating Zones of Infestation will facilitate assistance from CAL FIRE and local CACs can implement limited quarantines for new infestations.

Establishing A Zone of Infestation

For CAL FIRE to designate a zone of infestation (ZOI) area, the department needs clear and definitive evidence documenting the impacts to the forest in the affected area. Evidence includes information documenting the levels of insect-disease, impacts, and what actions have been implemented thus far to stop the spread. CAL FIRE will require information on damage and distribution of affected trees, status of the outbreak, number of parcels and acres of ownerships affected, economic costs, proposed management and control options, a cost-benefit analysis of doing and not doing management, and ecological, cultural, and aesthetic losses to the region. CAL FIRE will also require a description of the proposed ZOI with corresponding maps.

The decision-making process to request the creation of a ZOI involves any affected Units in the CAL FIRE'S Southern Region. Those Unit Foresters help to prepare and review the document before moving it forward in the approval process. From the initial Unit level, the report goes through the chain of command to the Director of CAL FIRE for review. If the Director determines that a ZOI is needed, they make a recommendation to the California Board of Forestry and Fire Protection for approval. CAL FIRE pest management staff, local Unit staff, and other essential personnel then present the information to the Board for final approval. Sections of the Public Resources Code that further define the conditions and benefits of working within a Zone of Infestation are in Appendix G.

The value of establishing a Zone of Infestation is linked to:

- Fostering collaborative efforts with both current and potential local, state, and federal agency partners working on ISHB prevention, containment, control, and remediation.
- Enabling CAL FIRE and the California Board of Forestry and Fire Protection to communicate concerns to the public regarding FD – ISHB and its current and potential impact in California.
- Enabling CAL FIRE and the California Board of Forestry and Fire Protection to express support for efforts seeking funding for research, education and outreach, management efforts (e.g. control, processing infested wood), and other ISHB related activities.
- Creating a directive that ISHB suppression and control measures are feasibly addressed in Timber Harvesting Plans within the ZOI. This directive is applicable only in mixed conifer stands where susceptible hosts are being harvested incidentally with commercial conifer species.
- Establishing an official map that indicates the boundary of the known ISHB infestation. An official map will allow people to accurately communicate appropriate actions to stakeholders within known infested- and neighboring non-infested areas.
- Expressing the potential statewide harm that FD – ISHB presents to the state legislature, governor's office, and federal leadership.
- Partnering with local governments to stop the spread.
- Supporting the use of California Conservation Camp crews in control or management projects on private and state lands.

Establishing a Local Eradication, Control or Containment Area

The county Agricultural Commissioner can also use their local authority to establish a local eradication, control or containment area, or use a ZOI to support further actions. Once an invasive pest is detected, an incident action plan will be activated for CDFA and federal agencies to review and assess the threat to agriculture, urban-wildland forests, and the environment. A plan for treatment, tree removal, suppression, and management depends on the

distribution and prevalence of the infestation in particular habitat types (i.e. urban forest, oak woodland, riparian, agricultural property), and will be developed accordingly. An incident action plan would be developed by the Agricultural Commissioner in coordination with CDFA in an urban forest or agricultural area.

Incident Action Plans

Outbreak Containment Plan Teams will form as needed and comprise landowner representatives, relevant County departments (e.g., Agricultural Commission, Forestry Department, Public Works, Regional Planning), and or relevant federal, state, and local agencies. Each site-specific Incident Action Plan (IAP) will identify who is responsible for which containment and treatment actions over what time period, and produce a report documenting results. Examples of IAP's are in Appendix H.

Incident Action Plan Implementation Steps:

1. Notify landowner or land manager;
2. Schedule site visit with local agency representatives (e.g., Agriculture Commission, CAL FIRE, CDFA, appropriate landowner representative);
3. Evaluate infestation level and impacts to identify appropriate treatments;
4. Coordinate appropriate stakeholders to implement treatments;
5. Monitor effectiveness of the treatments;
6. Identify possible restoration actions.

Permits Needed

Right of Entry

Right of entry permits and or agreements may be needed to remove infested trees on private, state, federal, or local government lands per each agency's policies. Proper permits also ensure compliance with CEQA or NEPA. Entry permits are not required for private properties if the County Agricultural Commissioner issues an abatement order or the landowner voluntarily agrees to remove the tree(s). Education and Outreach activities will be used to encourage voluntary compliance from private property owners to enter onto the premises and check trees for FD – ISHB, even if CACs issue an abatement order. All applicable Federal laws would apply on federally managed land, but tree removal could be expedited with a Categorical Exclusion. Each county should establish a Memorandum of Understandings with participating public land agencies and develop landowner agreements for tree removals on private land.

Tree Removal

If required, the authority having jurisdiction will issue tree removal permits after experts have confirmed an FD – ISHB infestation on a tree and determined that it warrants removal. The Agricultural Commissioner also has the authority to authorize the removal of infested trees and implement containment strategies. Tree removal companies will be responsible for completing any required environmental compliance checklists before removing a tree, even under an abatement order (e.g., Appendix I). The permit approval process includes requirements for compliance with all applicable laws and regulations, including CEQA and local tree ordinances. Entities responsible for removing trees in public parks and along public right of ways (e.g., utilities, public works, park departments, Caltrans, cities) must also participate in this permitting process.

Private Property
If the infestation is on private property, permission from the landowner to remove or treat the tree is required. Once the pest is identified, CACs will follow up with homeowners with a notification to relieve them of the cost of removal and obtaining the required permits. If the property owner resists removal of an amplifier tree, the local or state agency should evaluate the tree for potential as a nuisance or hazard that would require removal. Depending on the location, such as within the Local Coastal Zone or Significant Ecological Areas, permits may be required. In CAL FIRE designated "Timberland" areas (per the Forest Practice Rules California Public Resources Code, or PRC), the property owner may need to file a California Forest Practice Rule 1038 exemption or other appropriate exemption. Additionally, if the landowner fails to act to address the infestation, PRC Section 4716 (b) allows CAL FIRE to control an infestation on private timberlands if within a ZOI.

Public Property
If the infestation is found on public property, permission from the applicable land manager is also required. A Right of Entry permit should be coordinated.

Interagency Coordination for Permit Compliance
Federal, state and local agencies can request Conservation Camp crew time from CAL FIRE to help with removal. Compliance with the appropriate CEQA or NEPA process, depending upon land ownership, will be required. The county can develop a project description that covers the range of possible treatment and removal strategies and any potential effects on the environment. A lead agency must assess the level of potential impacts on environmental resources associated with the proposed treatments/removals. These include protected species impacts, aesthetics, cultural resources, water quality, etc. Both onsite (actual tree removal) and off-site (transport to disposal facility, etc.) impacts need to be identified and described. The sample Environmental Checklist is in Appendix I. The appropriate federal agency would be the lead agency on federally managed lands.

In riparian corridors and locations hosting state or federally listed species of particular concern including rare, threatened, or endangered species, additional coordination with the responsible agencies (such as CDFW, NMFS, and USFWS) will be necessary. Again, setting up the Memorandum of Understanding regarding protocols, allowable actions and mitigation requirements should be initiated as soon as possible and be in place to facilitate rapid response.

Treatment and Removal Protocols (Best Management Practices)
As of spring 2019, chemical treatment protocols for ISHB are limited, and applicable only for important landscape trees located away from drainages, waterways, lakes, ponds, or open space areas (Mayorquin et al., 2018). An exception is the use of trunk injection application if a high-value tree is not located in standing water. A variety of research projects are underway examining the effectiveness of other potential treatments such as direct injection into active holes, bio-controls (e.g., bacteria, fungi, predators and parasites). These treatments will be incorporated into best management practices as new knowledge is available.

Any treatment strategy must be carefully considered within the context of the site. Management actions implemented must also be documented and uploaded into the statewide data repository. Recording actions will allow the county to track the effectiveness of treatments over time and support statewide tracking efforts.

For known infested areas in the urban forest, irrigated parks or agricultural areas, the management guides (Figs. 5-6; Table XI) provides guidance on which management actions are appropriate. For newly detected infestations along the leading edge, the matrix in Figure 5 provides a guide for management decisions in urban settings. A statewide management matrix that accounts for different site settings for each county (e.g., riparian habitats; wildland parks) is currently being developed (Lynch, *unpublished*). The current statewide criteria for removal is >150 active galleries combined with canopy dieback (Figs. 5-6; Table XI). If <10 holes are observed on box elder, however, the tree should be removed. Box elder is a highly susceptible host and serves as a population reservoir because it fosters rapid reproduction of the beetle. Tree stumps should be ground, removed, or treated with a pesticide and covered with soil.

Infested Wood Disposal Protocols

Disposal protocols for infested materials vary depending on the pest, but all share the requirement that proper procedures are implemented. Any infested material must be securely covered with a solid tarp if being transported off-site and taken to an approved disposal facility. Ideally, infested material should be chipped before transport. If material is being sent to a wood utilization or recovery facility, then coordinated monitoring to ensure that there is no spread is needed. Every effort should be made to avoid creating firewood size logs that remain on site, which could be transported randomly. The county or federal land manager should work with the statewide committee for ISHB and GSOB to coordinate appropriate guidelines and regulations for removal, storage, re-use, and transport of infected materials. Appendix F provides detailed decision trees and disposal options.

Post-Treatment Monitoring

Once the decision to monitor, treat, or remove a tree is made, appropriate follow-up monitoring is required to document the results of the action. Post-treatment monitoring of treated trees includes marking ISHB gallery entry holes over time with paint pens, or blocking holes with water-based latex paint to determine if galleries are active (Fig. 5; Mayorquin et al., 2018). Traps can also be used to monitor any increase or decrease in ISHB activity after treatment or tree removal. The management guides (Figs. 4-5; Table XI) will be used to make further decisions post-treatment. Reports on post-treatment conditions should be submitted to the central county database at least every three months and to the statewide data repository at least yearly.

FD – ISHB Management Matrix - Infested Urban and Peri-urban Forest

			ISHB Infestation Level & Management Options				
	Host Type	Hazard Level[1]	No Infestation	Low	Moderate I	Moderate II	Heavy
LOW VALUE TREES[1]	Reproductive Host	Low	Monitor	Monitor & Spot Inject	Monitor[2] Remove Actively Infested Branches	Monitor[2] Remove Actively Infested Branches	Remove Actively Infested Tree[2] & Stump
		High	Monitor	Monitor & Remove Hazard Branches	Monitor[2] Remove Hazard Branches	Remove Hazard Branches, or Remove Tree & Stump	Remove Tree[2] & Stump
	Non-Reproductive Host	Low	Monitor	Monitor	Notify UC ANR; consult with FD – ISHB experts to determine if species is a new reproductive host		
		High	Monitor	Monitor			

			ISHB Infestation Level & Management Options				
	Host Type	Hazard Level[1]	No Infestation	Low	Moderate I	Moderate II	Heavy
HIGH VALUE TREES[1]	Reproductive Host	Low	Monitor	Treat/Remove Infested Branches[3]	Treat/Remove Actively Infested Branches[3]	Treat/Remove Actively Infested Branches[2,3]	Remove Actively Infested Tree[2] & Stump
		High	Monitor	Treat/Remove Hazard Branches[3]	Treat/Remove Hazard Branches[3]	Remove Infested Branches, or Tree[2] & Stump	Remove Tree[2] & Stump
	Non-Reproductive Host	Low	Monitor	Monitor	Notify UC ANR; consult with FD – ISHB experts to determine if species is a new reproductive host		
		High	Monitor	Monitor			

[1] Definitions for tree value and hazard level vary. Classification must be determined by site and site use (e.g., economic or cultural value and risk to people or property).
[2] Confirm if beetle is actively reproducing in galleries by painting over select entry holes with water-based latex; gallery is active if entry hole is re-opened on painted area.
[3] If ISHB attack is confined to the branches of host tree, prune affected branches immediately to prevent advancement to the trunk. Prune hazardous branches on high-value hosts and treat pruning wounds to prevent re-infestations.

Figure 5. FD – ISHB management matrix for infested urban forests and locations on the leading edge of the infestation. The matrix was developed by Beatriz Nobua-Behrmann (UC ANR), Monica Dimson (UCLA), Shannon C. Lynch (UCSC), John Kabashima (UC ANR), and Akif Eskalen (UCD), and revised July 2019.

Table XI. Definitions to terms introduced in the Management Matrix in Figure 5.

Tree Value[1]	
Low	Species of low economic value; smaller and/or younger trees; trees with undesirable form, structural issues (e.g., codominant branches), or other issues (e.g., other pests)
High	Species of high economic or cultural value (e.g., heritage trees); larger and/or older trees
Host Type	
Reproductive	Plant species suitable for beetle reproduction and growth of *Fusarium euwallaceae* or *F. kuroshium* (see pshb.org for updated list of ISHB-FD reproductive hosts)
Non- Reproductive	Plant species that have not yet proved suitable for beetle reproduction; however, these species may be susceptible to *Fusarium euwallaceae* or *F. kuroshium*
Hazard Level[1]	
Low	Trees that pose a low risk to people or property
High	Trees that pose a high-risk to people or property (e.g., trees adjacent to walkways, playgrounds, high-use lawns, parking lots)
Infestation Level	Attacks (number of entry holes observed)
Low	<50
Moderate I	≥50 and <150
Moderate II	≥150
Heavy	≥150 + dieback
Treatment Options	
Reproductive Host (infested)	• Imidacloprid drench, trunk or soil injection. • Emamectin Benzoate trunk or spot injection • Propiconazole trunk or spot injection • Optional - Pentra Bark + *Bacillus subtilis* and/or bifenthrin trunk spray • Optional - Pentra Bark + tebuconazole and/or bifenthrin trunk spray
Reproductive Host (no infestation)	Monitor - Preventative treatment not recommended.
Non-Reproductive Host (Infested)	Notify UC ANR; reclassify species as reproductive host in consultation with PSHB/FD experts
Non-Reproductive Host (no infestation)	Monitor - Preventative treatment not recommended.
Tree Removal	Remove tree and grind or bury stump. Treat stump with bifenthrin or *Bacillus subtilis*.
Agricultural Trees	Monitor, remove infested branches, or remove tree.

Invasive Shot-Hole Borers + Fusarium Dieback
Prioritizing Management Efforts

HOW TO USE THIS CHART

This chart is intended to help inform ISHB (Polyphagous and Kuroshio Shot-Hole Borers) management decisions. Consider potential safety hazards, tree value (economic and ecological), available resources, and other factors unique to each situation when using this tool.

REPRODUCTIVE HOSTS

A reproductive host is a species that supports 1) ISHB reproduction and 2) growth and development of the beetle's symbiotic fungi. These species are currently the priority for control efforts as they can produce more beetles that may spread the infestation. Some of the more susceptible reproductive hosts appear to be box elder, castor bean, valley oak, Engelmann oak, coral, and several species of sycamore, willow, and cottonwood.

Visit pshb.org for the full host list.

LIMB FAILURE HAZARD

The branch collar is the point of attachment between a tree branch and the main stem. ISHB infestation in this area is a serious safety hazard and creates potential for limb failure, as a weakened collar may not be able to support the weight of the branch.

Infested trees—including those that have been treated or pruned—must be regularly monitored so that hazards can be identified and removed. When monitoring, consider beetle attacks in the branch collar as part of the branch.

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IDENTIFYING + MANAGING ISHB: SUGGESTED STEPS

Identify the pest. Does the tree have multiple entry-holes with staining, gumming, frass, and/or sugar exudate?

- Yes → Scrape away the bark. Is the entry-hole about the size of the tip of a ball point pen? (~.85mm)
  - No → Symptoms may be caused by other factors. Consult a licensed arborist or Pest Control Advisor.
  - Yes → Is the tree a known reproductive host?
    - No → Visit www.pshb.org **for current reporting information and the most recent list of reproductive hosts.**
    - Yes → View the map at ucanr.edu/sites/pshb/map. Has ISHB been found in your city?
      - No → Visit www.pshb.org **for current reporting information and the most recent list of reproductive hosts.**
      - Yes → **Assess the damage.** Where is the infestation located? Examine both the trunk and branches for gallery holes.
        - **Branches** → Prune branches, treat cuts, and monitor*
        - **Trunk** → How many active gallery holes are there?
          - <150 → Treat and monitor tree*
          - ≥150 → Does the tree have branch dieback?
            - Yes → Is the tree 1) of special value and 2) **not** an isolated infestation?
              - Yes → **Choose one:**
                - Solarize with clear tarp
                - Compost at commercial facility
                - Burn at biogeneration facility
                - Send to landfill for use as Alternative Daily Coverage
                - Chips that are not solarized, composted, or kiln-dried may only be used as mulch in ISHB heavily infested areas
              - No → **Choose one:**
                - Remove entire tree and follow-up with stump grinding
                - Remove tree to soil level, treat stump, allow to re-sprout, and monitor
            - No → Treat and monitor tree*

* *Tree removal (and follow-up stump grinding) is an option for trees of any infestation level.*

Dispose of all infested material. Are plant parts small enough to chip?

- Yes → Chip wood parts to less than 1" in diameter
- No → **Choose one:**
  - Solarize with clear tarp according to guidelines
  - Disinfect wood by kiln drying (60 min at 60°C)

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Figure 6. Fusarium dieback – invasive shot hole borers guide to prioritizing management.

Survey, Detection, and Rapid Response Cost Summaries

Table XII. Summary of estimated survey, detection, and rapid response costs by priority

Priority	Annual	Three Years
Priority 1		
Trap and Data Coordinator (CDFA/UC)	$ 150,000	$ 450,000
Training Program (UC/CAL FIRE/USFS)	$ 200,000	$ 400,000
Leading Edge (CAC)	$ 215,600	$ 646,800
Large Tree Nurseries (CAC)	$ 124,432	$ 373,296
Tree Removals Leading Edge (CAC)	$ 100,000	$ 300,000
Contiguous Counties (CAC)	$ 62,832	$ 188,496
Tree Removals Contiguous (CAC)	$ 20,000	$ 60,000
Priority 2		
Tree Removals Infested Zone (CAC)	$ 40,000	$ 120,000
Other Non-infested Counties (CAC)	$ 415,800	$ 415,800
Total	**$1,328,664**	**$3,154,392**

Table XIII. Summary estimated survey, detection, and rapid response costs for each county

Tier	Annual	Three Years
Leading Edge Counties	$ 75,440	$ 226,320
Contiguous Counties	$ 41,416	$ 124,248
Infested Counties	$ 51,416	$ 154,248
Other Non-infested Counties	$ 9,240	$ 9,240

Table XIV. Recommendation for Block Grant Distribution to CAC's

Activity	Annual	Three Years
Leading Edge (CAC)	$ 215,600	$ 646,800
Large Tree Nurseries (CAC)	$ 124,432	$ 373,296
Tree Removals Leading Edge (CAC)	$ 100,000	$ 300,000
Contiguous Counties (CAC)	$ 62,832	$ 188,496
Tree Removals Contiguous (CAC)	$ 20,000	$ 60,000
Tree Removals Infested Zone (CAC)	$ 40,000	$ 120,000
Other Non-infested Counties (CAC)	$ 415,800	$ 415,800
Total	**$ 978,664**	**$2,104,392**

Survey, Detection, and Rapid Response Cost Justifications

Priority 1

Survey

Leading Edge – Five counties, surveyed over eight months at maximum by one full-time trapper in each county at approximately 1,400 hours per county. Costs will vary between counties. Estimating an average of $22 per hour including benefits for a seasonal trapper, the total cost would be approximately $30,800 per county per year. Overhead is capped at 25% for a total cost of $7,700 per county per year. Mileage and supplies estimated at 15% of personnel costs is $4,620 per year. The cost per county would be $43,120. The annual cost for all five counties would be approximately **$215,600**.

Contiguous to the Leading Edge – Two Counties, eight months, one trapper for each county three-four days per week, approximately 1020 hours each.

At an average of $22 per hour including benefits for a seasonal trapper, the total cost would be approximately $22,440 per county per year. Overhead is capped at 25% for a total cost of $5,610 per county per year. Mileage and supplies estimated at 15% of personnel costs is $3,366 per year. The cost per county would be $31,416. The annual cost for both counties would be approximately **$62,832**.

Large Tree Nursery Trapping – The five Leading Edge Counties conduct routine inspections at large tree nurseries under the Glassy-winged Sharpshooter quarantine and could pick up the additional trapping required with the leading-edge trapper. An additional 400 hours of staff time per county should be adequate for the trapping in large tree nurseries per year. The cost for additional trapping would be **$61,600** for the five counties.

Orange County and San Diego County would also need to trap their large tree nurseries, Greenwaste processing facilities and firewood lots. Due to a large number of trapping sites in these counties, it is estimated they will need at least one half-time trapper for the full year, 1020 hours each. This would cost approximately **$62,832** annually for both counties.

Rapid Response

Tree Removals on the Leading Edge: The Survey, Early Detection and Rapid Response subcommittee recommends that at least **$100,000** be set aside per year for tree removals along the leading edge of the known infestation. This funding could be distributed by CAC's.

Tree Removals Contiguous Counties: If infested trees are found in the contiguous counties, they should be removed to prevent further spread of ISHB. It is recommended that **$20,000** be set aside per year for tree removals in these counties. Funding to be distributed by the CAC's.

Trap – Visual Survey and Data Coordinator

A statewide trapping coordinator is needed to coordinate data collection and mapping and to help establish trapping protocols and placement locations. CDFA Pest Detection/Emergency Projects coordinates trapping and cooperative agreements with counties. This may require a dedicated coordinator position from CDFA.
Estimated Cost: **$150,000**

Training Program

In coordination with the Outreach and Education Subcommittee, develop and deliver training programs for visual surveys and trapping protocols utilizing experts such as UC Agriculture and Natural Resources, CAL FIRE, US Forest Service, and other trainers. A series of workshops will be conducted for county trapper/surveyors, other agency staff, and volunteers. These workshops will train surveyors on how to properly place and service traps at high-risk sites, identify FD - ISHB symptomatic host trees, and properly screen and submit samples to the appropriate diagnostic labs. Identification kits should be prepared for each student. Once developed, ongoing training costs should be reduced.
Estimated Startup Cost: **$200,000**

Rapid Response Kit Development

In coordination with the Outreach and Education Subcommittee, develop and deliver a Rapid Response Kit to define and direct priorities for tree removals, treatments, and monitoring at the leading edge and within the infested zone. This might be able to be combined with the Training Program.

Priority 2

Survey

Beyond the Leading Edge – Forty-five counties, four months, two plus days per week, approximately 300 hours for each county. Funding for Other Non-infested Counties is for one year of activities. If ISHB are detected, finding needs will be reassessed.

Average $22 cost per hour salaries and benefits, cost per year per county equals $6,600. Overhead is capped at 25% for a total cost of $1,650 per county per year. Mileage and supplies estimated at 15% of personnel costs is $990 per year. The cost per county would be $9,240. The annual cost for all counties would be approximately **$415,800**.

Rapid Response

Tree Removals: The Survey, Early Detection Rapid Response Committee recommends that **$40,000** be set aside per year for high-hazard/amplifier tree removals within the known infestation zone.

Survey, Detection, and Rapid Response Subcommittee Summary

The **Survey** – Early Detection and Rapid Response Sub-Committee and the **Pathways** – Including Greenwaste and Firewood Sub-Committees both recommend the following trapping by counties be funded as soon as possible. They recommend providing **$1,624,392 total for three years** to counties across all land ownerships for the following activities:

- Hire one full-time Trap – Visual Survey and Data Coordinator per county in Five leading-edge counties (Los Angeles, San Bernardino, Ventura, Santa Barbara, Riverside) each doing 10 to 15 traps per day March through October to track and slow the spread of ISHB.
- Place 48 to 50 traps in 2nd tier counties of Kern and San Luis Obispo. Even though these counties do not have current infestation, they have increased vulnerability.
- 20-24 traps in remaining counties with bi-weekly or monthly servicing to track if leapfrogging.

This activity to be funded through CAL FIRE:

- Provide funding for high-hazard safe tree removal and disposal and possible treatments by professional, California Environmental Quality Act compliant, and insured tree removal companies through contracts with counties. **$200,000 x 3 years = $600,000**

Additional funding should be allocated for:

- A centralized trapping/visual survey coordinator to help prioritize the trapping locations and density, including around Greenwaste facilities and firewood stockpiles and distribution sites. Additionally, this position would be a liaison with the local enforcement agencies in Los Angeles, Orange, and Ventura Counties to identify Greenwaste facilities and understand host greenwaste pathways through our communities and final destinations. **$120,000 x 3 years = $360,000 + 25% overhead ($90,000) for a total of $450,000**

Greenwaste and Firewood as Pathways

Subcommittee Co-chairs:
Kevin Turner, Southern California Pest Coordinator, CAL FIRE
Thomas Smith, Ph.D., Forest Pest Management Specialist, CAL FIRE

Movement of greenwaste and firewood are documented invasion pathways for pests and facilitate their establishment into new areas over long distances (Haack et al., 2010; Reid & Marion, 2005; USDA APHIS, 2010). Chipping and solarization methods to manage areas with extensive FD – ISHB damage produce large amounts of woody material and biomass that must remain on site until the composting and solarization processes are complete or the material has been transported to a facility that has earned the U.S. Composting Council's Seal of Testing Assurance (STA) (Paine et al., 2019). Often the amount of space or equipment required for such an operation is expensive or unavailable, leaving infested material untreated. As with other tree-killing insects and diseases, ISHB and their fusaria pathogens can lurk in or on firewood and initiate new infestations hundreds of miles from an infested location via recreational travel (Koch et al., 2010). The Greenwaste and Firewood as Pathways Subcommittee determined the best way to utilize the $5 million from AB 2470 to address the role of plant material processing and movement in the spread of FD – ISHB, given the current understanding of the problem. The subcommittee consisted of representatives from city, county, and state regulatory agencies, land managers representing government and non-government agencies, arborists, researchers, and UC Extension representatives. Participants formed two working groups to determine appropriate actions concerning greenwaste and firewood movement, respectively (Table XV). What follows are the outcomes of subcommittee efforts.

Greenwaste

Data from 2017 shows that ISHB were detected in traps within 100 – 200 yards of greenwaste disposal sites in Ventura and Los Angeles Counties, raising concern over implications for spread via greenwaste transportation. Yet, the severity and extent of beetle activity at these facilities is unknown, making it difficult to pursue and determine the appropriate mitigation actions in line with the magnitude of the problem. The Greenwaste Working Group also concluded that even if effective control treatments for greenwaste are well developed, application procedures in various settings are not. For example, most facilities need to move greenwaste within two to seven days, making post chipping procedures like solarization difficult to carry out. Moreover, very few handlers have compliance agreements or regulatory requirements to take appropriate action when ISHB is detected at a site. Finally, processors' operational constraints and knowledge gaps need to be better understood through outreach to tailor FD – ISHB educational content so that it meets their needs. For these reasons, the Greenwaste Working Group determined that collaboration with the other three subcommittees is necessary to address those gaps. As such the Research and Technology Development Subcommittee reached a consensus to prioritize more studies on post processing treatments during chipping activities, the Survey, Detection, and Rapid Response Subcommittee included Greenwaste and Firewood Storage Facilities in their monitoring plan, and the Outreach and Education Subcommittee deemed greenwaste processors to be a high priority target audience in need of more training.

Table XV. Responsibilities and participants for each working group in the Greenwaste and Firewood as Pathways Subcommittee.

Working Groups	Responsibility	Coordinator	Participants
Greenwaste	• Develop Best Management Practices and Procedures for greenwaste sites • Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies • Discuss potential pilot programs • Identify potential other utilizations of wood products	Keith Okasaki	Bob Horowitz Darren Ross David C. David Pegos Ed Williams Gina Libby Jeffrey Esquivel Jennifer Van Dyke Julie Clark De Blasio Kathryn Cross Kevin Turner Larry Swan Milan Nawal Sharma Neil Edgar Nick Condos Rebecca Lustig Sheri Smith Shikari Nakagawa-Ota Tom Smith Waste Hauler and Composter Organizations
Firewood	• Identify potential resources and solutions	Kevin Turner	Andrea Hefty Curtis Ewing David Pegos Faith Campbell Helena Roberts Katie Harrell Leigh Greenwood Sheri Smith Tom Smith

Firewood

The Firewood Working Group recognized similar gaps in knowledge and communication identified by the Greenwaste Working Group. The group addressed these gaps by fortifying partnerships between relevant agencies and stakeholders (see below) and reviewing existing work at the state and federal level (Table XVI). Many educational materials concerning firewood movement have already been developed through the California Firewood Taskforce in response to other tree killing pests such as the goldspotted oak borer (*A. **auroguttatus***). To improve existing resources, the group agreed to collaborate with Education and Outreach and work with CDFA to update the website and incorporate maps and information about firewood regulation. The working group also collaborated with the Education and Outreach subcommittee to prioritize the development of 1) firewood policy templates for campgrounds, and 2) more firewood management training courses on pests for woodworking professionals, campground managers, and the general public.

Table XVI. Existing firewood programs

Program	Link	Entity	Purpose	Gaps	Solution
Don't Move Firewood	www.dontmovefirewood.org	The Nature Conservancy	North America: Education and Outreach on firewood rules, regulations, recommendation, and pests of concern		
The Firewood Scout	www.firewoodscout.org	Sustainable Resource Institute	Nationwide: Directory to help users buy and use firewood locally. Vendors register their business on the site; 462 vendors are registered within California's database.	Mostly big box stores in directory, and less smaller dealers.	Incentivize Agriculture Commissioners to build lists of local dealers and collaborate with Education and Outreach to encourage businesses to register on the site.
California Firewood Taskforce	http://firewood.ca.gov	County, State and Federal Agencies and Organizations; University of California	Statewide: Education and Outreach	Needs maps and information about firewood regulations	Collaborate with Task Force, Education and Outreach, and CDFA to update website

Regulatory Gaps

The working group noted several barriers to actions to slow the spread of FD – ISHB via firewood movement. There is currently no internal or external quarantine to prevent the spread of FD – ISHB through firewood movement. In addition, California does not have a certification program for heat-treated firewood, which is needed to make it commercially viable. Thus, there is no mechanism precluding FD – ISHB infested wood from being moved within or out of the state. Western states cannot use federal certification programs on firewood because there are no federally quarantined pests throughout the region (other than fire ants in small areas). David Pegos (CDFA), Thomas Smith (CAL FIRE), and Leigh Greenwood (The Nature Conservancy) agreed to address these concerns to the Western States Firewood Taskforce. In the meantime, the working group plans to draw from different models that have been used by other states to certify firewood (https://www.dontmovefirewood.org/map/) and develop a strategy for California. Programs could be called Best Management Practices Awareness trainings for California instead of a certification program due to lack of regulatory authority. The working group also agreed to work with the California Firewood Taskforce over the long term to create regulations similar to Orange County Parks for other counties in the state (http://www.ocparks.com/parks/ronald/news/details?NewsID=5127&TargetID=43).

Partnership Establishment

The majority of the Greenwaste and Firewood Working Group efforts subsequently focused on developing ways to strengthen partnerships between Agricultural Commissioners, county Local Enforcement Agencies (LEAs), and UC Agriculture and Natural Resources (UC ANR). These partnerships aim to improve communication with greenwaste processors and firewood handlers and expand capacity to conduct studies, surveys, and developing action plans in Los Angeles, Orange, and Ventura Counties. Representatives from Cal Recycle, LEAs, Waste Hauler Associations, Composter organizations, and Agriculture Commissioner Staff developed a scope of work to amend an existing contract with LEAs. The scope of work for county LEAs and UC ANR below includes measuring greenwaste volume and tracking its movement between various sites, documenting current actions to mitigate FD – ISHB spread, determining potential low risk sites to store waste, and using existing quarantines for other pests (e.g., huanglongbing) to access various facilities for research, monitoring, and outreach and education. Similar efforts for firewood are incorporated into the scope of work as appropriate.

Scope of Work for Local Enforcement Agencies and UC ANR

Local Enforcement Agencies

The County Local Enforcement Agencies agree to perform the following survey and investigative activities for the California Department of Food and Agriculture (CDFA) in accordance with the California Invasive Species Advisory Committee (CISAC). Authorized expenses under this invasive shot hole borer (ISHB) cooperative agreement include personnel activities, non-personnel expenses (e.g., supplies, vehicle mileage), and reporting and invoicing.

Personnel Activities

The County agrees to perform the following information collection and survey activities in cooperation with the CDFA and University of California, Agriculture and Natural Resources (UCANR):

Site Identification
Sites include registered, permitted, and non-registered green waste Composters, Transfer Stations, Chip and Grind Facilities, and other miscellaneous establishments handling greenwaste in the defined survey project area.

Identification
Identify all green waste composters, transfer stations, chip and grind facilities, and other miscellaneous establishments in the defined survey project area and input data into a provided spreadsheet.

Communication
- Coordinate with UC ANR to approach identified establishments.
- Conduct initial contact and visit establishments to introduce UC ANR staff to issue and explain the survey project and benefits of the establishment's cooperation.
- Assist UCANR staff in discussions with the establishment.

Other Activities:
Conference Calls
Personnel hours associated with attendance at and participation in conference calls regarding the ISHB green waste survey project.

Meetings
Personnel hours associated with attendance at and participation in meetings associated with the ISHB green waste survey project.

Administrative Support
Personnel hours associated with administrative activities such as data entry or invoicing for ISHB green waste survey project work.

Reporting
Personnel hours associated with reporting any survey project data or information required. Use of ISHB green waste survey project forms for reporting and inspections is required. The forms will be provided by CDFA. Forms created by the County will not be accepted, and incomplete forms will be returned.

Non-Personnel
Supplies/Equipment
Supplies
In accordance with 2 CFR 200.94 (http://www.ecfr.gov/), supplies are considered articles having a useful life of less than one year. Only supplies directly related to administering and conducting ISHB green waste project survey activities will be reimbursed. Examples of supplies include materials from a general supply or stockroom, fabricated parts, paper, stationery, general office goods, ink and toner cartridges, and organization tools.

Equipment
In accordance with 2 CFR 200.33 (http://www.ecfr.gov), equipment is considered articles having a useful life of more than one year. Only equipment directly related to administering and conducting ISHB green waste project survey activities will be reimbursed. Articles with a unit cost of $5,000 or more must have prior approval for reimbursement. Examples of equipment include

microscopes, spectrometers, office equipment, office furnishings, modular offices, telephone networks, information technology equipment and systems, air conditioning equipment, reproduction and printing equipment, and motor vehicles.

The County must maintain all records substantiating that the supplies and equipment are used for the ISHB green waste survey project.

Vehicle Mileage

The mileage reimbursement rate used on the monthly invoice must be the same as the rate in the Work Plan (budget). If the federal mileage reimbursement rate (http://www.irs.gov) fluctuates during the Agreement period, counties must submit invoices for the current federal rate.

Substantiation of Vehicle Mileage Costs

Counties must maintain a single vehicle log per vehicle, and all mileage must be recorded daily with an indication of which project the vehicle was used for and the name of the driver. Vehicle logs must be submitted as requested.

Reporting and Invoicing

Personnel hours associated with the compilation, submittal, and maintenance of the following:

Monthly Activity Report

The County must submit a "Monthly Activity Report" utilizing the "Monthly Activity Report" template provided by CDFA to report all authorized ISHB green waste survey project activities. Monthly activity reports must be submitted with the monthly invoice to Keith Okasaki (keith.okasaki@cdfa.ca.gov) and Kelly Thornburg (kelly.thornburg@cdfa.ca.gov) **no later than 30 days** after the end of the coinciding reporting period. Questions about the reporting can be directed to Keith Okasaki at the email listed above or by calling (916) 654-0312.

Invoicing and Reimbursement

The County must submit a monthly itemized invoice using the provided template (Appendix J), on County letterhead and submit to CDFA **no later than 30 days** after the end of the coinciding reporting period. Completed official ISHB green waste survey project forms must be submitted with or prior to invoicing. Invoices will not be processed without current ISHB green waste survey project forms.

Allowable Costs

All invoiced expenses must fall within the parameters of this "Scope of Work" and must be directly related to administering and conducting ISHB green waste survey project activities.

Monthly Activity Report Required for Reimbursement

Invoices will not be paid until submission of the "Monthly Activity Report" for the invoicing period has been submitted by the County and verified by CDFA. Personnel hours on the Monthly Activity Report must match the hours on the invoice.

Hourly Rate(s) on Invoices

Invoices must reflect the actual hourly rates (salary and benefits) for each personnel classification listed on the Work Plan (budget) that conducted ISHB green waste survey project activities.

Personnel on Invoice Must Match Work Plan (Budget)
Invoices must reflect work performed by personnel classifications listed on the Work Plan (budget).

Documentation
Documentation (including purchase receipts) for expense reimbursement does not need to be submitted to CDFA but must be retained by the County and shall be made available upon request for audit purposes.

Substantiation of Costs
All personnel salary costs must be properly tracked or allocated to the cooperative agreement in accordance with the Office of Management and Budget (OMB) requirements and Federal cost principles. Please be sure that personnel costs can be traced back to original documents detailing the account to which personnel hours are billed. In addition, all invoiced personnel costs must match the scope of work (work plan).

If the County plans to seek reimbursement for vehicle mileage, the documentation for mileage reimbursement must be tracked separately from all other projects and documentation must be available to support the reimbursement. In addition, all invoiced vehicle costs must match the scope of work (work plan). On a related note, mileage rates used on invoices must be the same as contained in the work plan. CDFA will send an email that will notify Counties of new rates (current rate $0.58) if the federal mileage rate changes during the term of the agreement.

All other expenses (travel, supplies, communications, etc.) for which the County will seek reimbursement under the cooperative agreement must be directly related to the cost of administering and conducting the project, and documentation must be available to support the reimbursement. In addition, all invoiced expenses must match the scope of work (work plan).

The following citations are requirements outlined in OMB Circulars and Federal Cost Principles applicable to your agency/organization.

State, Local and Indian Tribal Governments:

- 2 CFR 200 (http://www.ecfr.gov), Uniform administrative requirements, cost principles, and audit requirement for federal awards.
- 2 CFR 225, Cost Principles (formerly OMB Circular A-87), see Cost Allocation Plans and Attachment B, 8. Compensation for personal services, h. Support of Salaries and wages.

Submission of Monthly Invoice
Invoices with the Monthly Activity Report must be emailed to Keith Okasaki (keith.okasaki@cdfa.ca.gov) and Kelly Thornburg (kelly.thornburg@cdfa.ca.gov).

University of California Agriculture and Natural Resources
This scope of work by UC ANR covers mapping movement of greenwaste and firewood and potentially tracking those materials using radio frequency identification (RFID) tags. The scope of work additionally covers assessments of mitigation, which would be an expansion of the research done on the ability to kill the beetle through post processing of chipped wood.

The University of California Agriculture and Natural Resources (UCANR) agrees to perform the following survey and investigative activities for the California Department of Food and Agriculture

(CDFA) in accordance with the California Invasive Species Advisory Committee (CISAC). Authorized expenses under this invasive shot hole borer (ISHB) cooperative agreement include: personnel activities, non-personnel expenses, and reporting and invoicing.

Personnel Activities

UC ANR agrees to perform the following information collection and survey activities in cooperation with the CDFA and County or City Local Enforcement Agency (LEA):

Site Identification

Greenwaste

Identify all arborists, tree removal companies, yard maintenance companies and landscapers in the defined survey project area and input data onto a provided spreadsheet.

Firewood

Identify all firewood distributers in the defined survey project area and input data onto a provided spreadsheet.

Survey

Green Waste Establishments

Includes registered, permitted, and non-registered green waste composters, transfer stations, chip and grind facilities, arborists and tree removal companies, yard maintenance companies and landscapers, and any other green waste handlers in the survey project areas.

Firewood Sites

Includes firewood storage lots, firewood processing sites, campgrounds, small firewood dealers, wood yards, and big box stores, in the defined survey project areas.

Communication

- Conduct initial visit with LEAs to explain the survey project, educational outreach regarding the ISHB, and the benefits of the establishment's cooperation.
- Assist LEA staff in discussions with the establishment.

Information Collection

- Identify from where the establishments collect or receive green waste and firewood, how it is handled, and to where it is moved.
- Map the movement of greenwaste and firewood to and from identified establishments and provide information to CDFA and LEAs.

Trapping

- With permission from the establishment, place and service ISHB traps every 30 days at a density of no more than one trap per five acres.

Mitigation Assessment

Chip and Grind Facilities

Includes all establishments chipping and/or grinding green waste in or from the survey project areas.

Survey

- Assess establishment's current chipping and/or grinding equipment, capacity, and standard operating procedures and mapping the movement of green waste for direct land application or final disposition.

Sample collection and study

- Collect chipped/ground material.
- Safeguard material and evaluate chip size and mitigation's effectiveness.

Incentives for Establishment

Includes all establishments handling green waste in or from the survey project areas.

Survey

- Assess establishment's standard operating procedures.
- Survey to determine incentives for chipping greenwaste to an appropriate chip size.
- Survey to determine incentives for directing material to composting or a low risk area for final disposal.

Other Activities

Conference Calls

Personnel hours associated with attendance at and participation in conference calls regarding the ISHB green waste survey project.

Meetings

Personnel hours associated with attendance at and participation in meetings associated with the ISHB green waste survey project.

Administrative Support

Personnel hours associated with administrative activities such as data entry or invoicing for ISHB green waste survey project work.

Reporting

Personnel hours associated with reporting any survey project data or information required. Use of ISHB green waste survey project forms for reporting and inspections is required. The forms will be provided by CDFA. Forms created by UC ANR will not be accepted and incomplete forms will be returned.

Non-Personnel

Supplies and Equipment

Supplies

In accordance with 2 CFR 200.94 (http://www.ecfr.gov/), supplies are considered articles having a useful life of less than one year. Only supplies directly related to administering and conducting ISHB green waste project survey activities will be reimbursed. Examples of supplies include materials from a general supply or stockroom, fabricated parts, paper, stationery, general office goods, ink and toner cartridges, and organization tools.

Equipment

In accordance with 2 CFR 200.33 (http://www.ecfr.gov), equipment is considered articles having a useful life of more than one year. Only equipment directly related to administering and

conducting ISHB green waste project survey activities will be reimbursed. Articles with a unit cost of $5,000 or more must have prior approval for reimbursement. Examples of equipment include microscopes, spectrometers, office equipment, office furnishings, modular offices, telephone networks, information technology equipment and systems, air conditioning equipment, reproduction and printing equipment, and motor vehicles.

All records substantiating that the supplies and equipment are used for the ISHB green waste survey project must be maintained by the UC ANR.

Vehicle Mileage

The mileage reimbursement rate used on the monthly invoice must be the same as the rate in the Work Plan (budget). If the federal mileage reimbursement rate (http://www.irs.gov) fluctuates during the Agreement period, counties must submit invoices for the current federal rate.

Substantiation of Vehicle Mileage Costs

UC ANR must maintain a single vehicle log per vehicle, and all mileage must be recorded daily with an indication of which project the vehicle was used for and the name of the driver. Vehicle logs must be submitted as requested.

Reporting and Invoicing

The scope of work for reporting and invoicing is the same as described for LEAs.

Greenwaste and Firewood as Pathways Subcommittee Summary

The **Greenwaste and Firewood as Pathways** subcommittee and Greenwaste Working Group developed a scope of work to amend an existing contract with local enforcement agencies (LEA). This addition helps to identify and access Greenwaste facilities in Los Angeles, Orange, and Ventura Counties for trapping and visual survey activities. The collaboration between LEAs and county agricultural commissioners in Los Angeles, Orange, and Ventura Counties will help the survey coordinator, researchers, county trappers, and CDFA and CAL FIRE staff track host greenwaste movement from origin to end, and determine current actions being used to mitigate the spread of FD – ISHB. $50,000 to LEAs in Los Angeles, Orange and Ventura counties for one year = $150,000

Outreach and Education

Subcommittee Chair:
Beatriz Nobua-Behrmann, Ph.D., Urban Forestry and Natural Resources Advisor, UC Cooperative Extension – Agricultural and Natural Resources

Lack of public awareness on FD – ISHB and movement of plant material can enhance the artificial spread of the beetle-fungal complex. In addition, control measures are continually evolving based on new insights from research. As such, a well-coordinated, centralized Outreach and Education program that evolves in its messaging, training, and delivery mechanisms is an essential component to controlling and slowing the spread of the beetles and pathogens. The Outreach and Education subcommittee determined ways to integrate and add to existing outreach and education efforts concerning FD – ISHB for a cohesive statewide Outreach and Education program. The subcommittee formed three working groups to 1) identify and categorize target audiences to identify the breadth of outreach and education needs; 2) identify gaps in existing outreach materials; 3) produce the scope of work for a full-time FD - ISHB Education and Outreach Coordinator (Table XVII). The outcomes produced by each working group are outlined below and informed a consensus on Outreach and Education priorities deemed appropriate for AB 2470 support.

Table XVII. Working groups, responsibilities, coordinators, and participants in the Outreach and Education subcommittee.

Working Group	Responsibility	Coordinator	Participants
Target Audiences	Identify and categorize target audiences Prioritize reach efforts into short and long term Group target audiences by needs: Outreach and/or Training	Katie Harrell	Kevin Turner John Kabashima Beatriz Nobua-Berhmann Madeleine Rauhe Kim Corella Curtis Ewing Sheryl Landrum Zachary Kantor-Anaya Jan Gonzales Abigail Barraza
Outreach Material Gaps	Identify gaps in printed and online outreach materials to high priority target audiences	Kim Corella	Anabele Cornejo Beatriz Nobua-Berhmann
Education and Outreach Coordinator	Determine the scope of the position Identify funders able to contribute to the position	Jan Gonzalez	John Kabashima Sabrina Drill Madeleine Rauhe Katie Harrell Julie Clark De Blasio

Target Audiences Working Group

The Target Audiences Working Group developed a list of target audiences in need of training for either information dissemination (Table XVIII) or Best Management Practices (BMP) (Table XIX). Target audiences were then grouped and prioritized under four training categories: 1) Land Management and Greenwaste Processing; 2) Landscaping and Gardening; 3) Naturalist, Camping, and Recreation; 4) General Public. The group also identified areas of emphasis within training categories that would have the most impact on target audiences. Funds from AB 2470 will focus on support to train high priority target audiences.

Table XVIII. Training category, prioritized organizations that disseminate information within categories, and area of emphasis within the scope of training for each that benefits target organizations.

Training Category/ Information Sharing Organization	Priority Level	Area of Emphasis
Land Management and Greenwaste Processing		
Caltrans	High	Categorize with Utilities/Like Issues
California Association of Sanitation Agencies	High	Greenwaste
California Compost Coalition	High	Greenwaste
CalRecycle	High	Greenwaste
US Composting Council	High	Greenwaste
California Association of Recreation and Park Districts	High	Land Management and Greenwaste
California Association of Resource Conservation Districts	High	Land Management and Greenwaste
California Conservation Corps	High	Land Management and Greenwaste
California Urban Forests Council	High	Land Management and Greenwaste
Fire Safe Councils	High	Land Management and Greenwaste
Forest Stewardship Council	High	Land Management and Greenwaste
Riparian Habitat Joint Venture	High	Land Management and Greenwaste
Tribes	High	Land Management and Greenwaste
California Urban Forestry Advisory Committee	High	Land Management and Greenwaste
California Municipal Utilities Association	High	Utilities
California Farm Bureau Federation	Med	Agriculture
CAL FIRE	Med	Land Management and Greenwaste
California Department of Corrections and Rehabilitation Conservation (Fire) Camps	Med	Land Management and Greenwaste
California ReLeaf	Med	Land Management and Greenwaste
Demonstration State Forests	Med	Land Management and Greenwaste
California Society of American Foresters	Med	Land Management and Greenwaste
CHIPDROP	Med	N/A - provide outreach materials
County fire departments, fire districts	Low	Land Management and Greenwaste
Timber companies	Low	Land Management and Greenwaste
Advertisers (e.g., Craigslist, Nextdoor.com, YouTube)	High	N/A - provide/post outreach materials
County Agricultural Commissioners	High	Land Management, Agriculture, Pesticide Application
California State Association of Counties	High	N/A - provide outreach materials
Southern California Council of Governments	High	N/A - provide outreach materials
Volunteer fire departments	Low	N/A - provide outreach materials
Landscaping and Gardening		
American Society of Landscape Architects	High	Landscape and Garden
California Horticultural Society	High	Landscape and Garden

Table XVIII. Continued.

Training Category/ Information Sharing Organization	Priority Level	Area of Emphasis
Landscaping and Gardening Continued		
California Landscape Contractors Association	High	Landscape and Garden
California Native Plant Society	High	Landscape and Garden
Society of Municipal Arborists	High	Landscape and Garden
Tree Care Industry Association	High	Landscape and Garden
UC Master Gardeners	High	Landscape and Garden
Western Chapter International Society of Arboriculture	High	Landscape and Garden
League of Cities	High	N/A - provide outreach materials
California Association of Pest Control Advisers (CAPCA)	High	Pesticide Application
Pesticide Applicators Professional Association (PAPA)	High	Pesticide Application
Garden clubs	Med	Landscape and Garden
Nurseries	Med	Landscape and Garden
American Association of Woodturners	High	N/A - provide outreach materials
Naturalist, Camping and Recreation		
Firewood distributors	High	N/A - provide outreach materials
Firewood wholesalers	High	N/A - provide outreach materials
Bureau of Land Management campgrounds	High	Naturalist/Camping
City park campgrounds	High	Naturalist/Camping
County park campgrounds	High	Naturalist/Camping
National Forest campgrounds	High	Naturalist/Camping
National Park campgrounds	High	Naturalist/Camping
State Park campgrounds	High	Naturalist/Camping
Private campgrounds	High	Naturalist/Camping or provide outreach materials
Advertisers (e.g., Craigs list, Nextdoor.com, YouTube)	High	N/A - provide/post outreach materials
Campground concessionaires	Med	N/A - provide outreach materials
iNaturalist	Med	Naturalist/Camping
Audubon Society	Low	Naturalist/Camping
Sierra Club	Low	Naturalist/Camping
General Public		
Small plane users	Low	N/A - provide outreach materials
Boy/Girl Scouts	Low	Public Training - Youth and Adults
Boys and Girls Club	Low	Public Training - Youth and Adults
California FFA Association	Low	Public Training - Youth and Adults
Forestry Challenge	Low	Public Training - Youth and Adults
Forestry Institute for Teachers	Low	Public Training - Youth and Adults
Schools	Low	Public Training - Youth and Adults
Home Owners Associations	High	N/A - provide outreach materials
Advertisers (e.g., Craigs List, Nextdoor.com, YouTube)	High	N/A - provide/post outreach materials

Table XIX. Best Management Practices training categories, prioritized target audiences in need of BMP training within each category, and area of emphasis within the scope of training for each category that benefits target audiences.

Training Category/ Target Audience Per Category	Priority Level	Area of Emphasis
Land Management and Greenwaste Processing		
Farmers with susceptible crops	High	Agriculture
Biomass facilities	High	Greenwaste
Caltrans tree trimming crews	High	Greenwaste
Composters	High	Greenwaste
County waste management	High	Greenwaste
Greenwaste facilities	High	Greenwaste
County and city weed abatement (hazard clearance programs)	High	Greenwaste and Pesticide Application
City arborists, public works, urban foresters	High	Land Management and Greenwaste
Riparian Habitat Joint Venture	High	Land Management and Greenwaste
Tribes	High	Land Management and Greenwaste
CAL FIRE chipping crews	Med	Greenwaste
Foresters	Med	Land Management and Greenwaste
Timber companies	Med	Land Management and Greenwaste
California Department of Corrections and Rehabilitation Conservation (Fire) Camp crews	Med	Land Management and Greenwaste
Local enforcement agencies/county health agencies	Med	Greenwaste or Outreach materials
Sawmills	Low	Greenwaste
County fire departments, fire districts	Low	Land Management and Greenwaste
Contractors (unmilled timber framing)	Low	N/A - provide outreach materials
Landscaping and Gardening		
County road public works departments	High	Categorize with Utilities/Like Issues
Arborists (certified or non-certified) and tree trimmers	High	Landscape and Garden
Landscape architects	High	Landscape and Garden
Landscape gardeners (independent or associations)	High	Landscape and Garden
Landscapers	High	Landscapers and Garden
Nursery managers	High	Landscape and Garden
Tree removal and chipping services	High	Landscape and Garden, Greenwaste
Tree service contractors	High	Landscape and Garden, Greenwaste
Pest control advisors and applicators	High	Pesticide Application
Utility tree trimming crews (e.g., PG&E, SCE, SDG&E)	High	Utilities
Gardeners	Med	Landscape and Garden
Naturalist, Camping, and Recreation		
Campers	High	N/A - provide outreach materials
CHIPDROP	High	N/A - provide outreach materials
Firewood consumers	High	N/A - provide outreach materials
Firewood distributors	High	N/A - provide outreach materials
Firewood producers (non-regulated or licensed)	High	N/A - provide outreach materials
Firewood wholesalers	High	N/A - provide outreach materials
National Forest firewood permittees	High	N/A - provide outreach material
Outdoor recreationists	Med	Naturalist/Camping
General Public		
Woodworkers	High	N/A - provide outreach material
Homeowners and landowners	High	Public Training - Adults
Ranchers (timber fencing)	Low	N/A - provide outreach material

Outreach Material Gaps Working Group

The Outreach Material Gaps Working Group compiled an inventory of existing online and printed outreach materials for target audiences (Table XX). The group used this inventory to determine what new materials need to be developed or enhanced for specific audiences. After reviewing the existing inventory of educational materials, the working group reached a consensus on the short and long term needs listed below. Short term needs will be given priority for the use of AB2470 funds.

Short Term Needs:

Location of Education Materials:

1. Centralize all currently existing outreach materials on www.pshb.org and cross-pollinate websites (e.g., Don't Move Firewood, Eskalen Lab) so they contain links to all the outreach materials.
2. Organize information by date within topics for easier access to the most current information.
3. Provide an existing FD – ISHB presentation to the Speakers Bureau

Insert Information into Existing Materials or Activities:

1. Information on the difference between mulch and compost and recommended use for each.
2. Information on how to detect FD – ISHB in areas that do not yet have infestations.
3. Incorporate content into statewide Society of Arborist trainings

Develop New Content

1. Field workshops to train surveyors involved in Early Detection programs.
2. A Rapid Response toolkit for leading edge of the infestation.
3. More accessible materials that present a simpler message for target audiences (e.g., less text, more visual aids, English and Spanish on the same content).
4. New and existing outreach materials, translated into other languages.
5. Printable Consumer Questions on the California Firewood Task force website to incentivize the purchase of firewood from reputable sources.
6. California Naturalists training consisting of a class paired with a field training. Include a self-certification or certification of completion quiz at the end of trainings.

Collaborate with other Organizations to Expand Reach

The subcommittee brainstormed relevant entities with large audiences they could reach out to for future collaborations. The examples below exhibit a start of a growing list of potential collaborators:

1. Urban Forest Council and Urban Forestry groups in Los Angeles and other counties
    a. Tree People
    b. LA Beautification
    c. Conservation Corps
    d. Alliance for Community Trees
2. California Invasive Plant Council
3. California Native Plant Society
4. The Nature Conservancy
5. Local Water Boards
6. California Forest Pest Council

7. Southern California Edison

Long Term Needs:

1. Develop an overall strategy to monitor and measure the efficacy of outreach efforts.
2. Develop a Best Management Practices course in collaboration with the Greenwaste and Firewood as Pathways subcommittee.
3. Acquire funding to revamp www.pshb.org to be user-friendly for a broad audience and contain more dynamic content.
4. Create a series of online courses building off the general FD – ISHB Online Course, but tailored towards target audiences.
5. Establish a mechanism for stakeholders to earn Continuing Education Credits when taking FD – ISHB online courses.
6. Identify advertising platforms used by smaller local entities; insert FD – ISHB educational materials into those platforms to reach these specific audiences.
7. Under the direction of CDFA, create a 15-second radio, YouTube, or Public Service Announcement commercial targeting 1) audiences who are unaware of FD – ISHB; 2) homeowners in particularly vulnerable areas. Commercial will promote the purchase and use of firewood locally and encourage audiences not to move mulch and greenwaste.
8. Under the direction of CDFA, purchase targeted advertisements using keywords about firewood.
9. Develop a social media presence.
10. Develop outreach activities for Scouts and Girl Scouts
11. Incorporate outreach activities into K-12 curriculum
12. In collaboration with Cal Recycle and the California Invasive Species Council, develop ways to educate consumers and state air and water boards about hiring practitioners who use BMPs.
13. Expand Outreach and Education efforts to other counties beyond the leading edge of the infestation.

Education and Outreach Venues

In addition to identifying short and long term needs, the Outreach Materials Gaps Working Group created a list of venues presenters and participants can use to identify opportunities for different Education and Outreach activities:

1. Society of Municipal Arborists
2. International Society of Arboriculture (ISA)
3. City Managers
4. League of Cities
5. Public Works
6. SCAG
7. CSAC
8. County Events
9. California Association of Pest Control Advisors (CAPCA)
10. Pesticide Applicators Professional Association (PAPA)

Table XX. Existing FD – ISHB education and outreach materials linked to high priority target audiences.

Target Audience	Title	Format	Language	Purpose	Source	Date Published
Arborists, general public	Sycamore assessment	Handout	English	How to assess infestation in sycamores	Eskalen Lab	Jun-17
Arborists, general public, monitoring crews	ISHB/FD: Identifying symptoms and look-alike pests	Handout	English	ID information	pshb.org	Sep-17
Arborists, land managers, monitoring crews	Identifying Signs of ISHB attack and Fusarium Dieback (FD) in Trees	Printed and online field guide	English	ID symptoms in many tree species	pshb.org	Apr-17
Arborists, monitoring crews	Identifying symptoms and look-alike pests in willows	Handout	English	ID symptoms in willow	Eskalen Lab	Jun-17
Arborists, monitoring crews	ISHB/FD: How to sample a suspect tree	Handout	English	How to take wood samples for fungal ID	pshb.org	Dec-14
Arborists, land managers	Invasive Shot Hole Borers Threatening Trees in Southern California	Article	English	Description and BMPs	Eskalen lab UC IPM	Dec-16
Arborists, land managers	Managing Invasive Shot Hole Borers in Southern California	Article	English	Description and BMPs	UCCE UC IPM	Oct-18
Avocado growers	Best Management Practices for ISHB/FD in avocado	Handout	English	ID symptoms and BMP in avocado	Eskalen Lab	Unknown
Avocado growers, general public	A pest disease complex on Avocado in CA	Handout	English	ID symptoms and BMP in avocado	pshb.org	Jul-18
Avocado growers, general public	Una compleja plaga-enfermedad en los Aguacates de CA	Handout	Spanish	ID symptoms and BMP in avocado	pshb.org	Dec-14
Avocado growers, general public	Alerta de plaga. PSHB en Aguacate	Handout	Spanish	ID symptoms in avocado	Eskalen Lab	Unknown
General public	Urban trees are under attack!	Handout	English	General information	California Urban Forests Conference	Apr-18

Table XX. Continued.

Target Audience	Title	Format	Language	Purpose	Source	Date Publishe
General public	Hiring a Landscape Contractor: What you should know before you start	Handout	English	Guidelines to hire a landscape contractor	UCCE San Diego	Unknown
General public	Que necesita saber si va a contratar una compania de jardineria	Handout	Spanish	Guidelines to hire a landscape contractor	UCCE San Diego	Unknown
General public	Help stop the spread of invasive species (2)	Poster	English	Firewood: buy it where you burn it	Firewood Task Force	Unknown
General public	Help stop the spread of invasive species	Poster	English	Firewood: buy it where you burn it	Firewood Task Force	Unknown
General public	Ayuda a detener la diseminacion de especies exoticas invasivas	Poster	Spanish	Firewood: buy it where you burn it	Firewood Task Force	Unknown
General public	Buy it where you burn it	Poster	English	Firewood: buy it where you burn it	Firewood Task Force	Unknown
General public	Compre la lena donde se va a usar	Poster	Spanish	Firewood: buy it where you burn it	Firewood Task Force	Unknown
General public	Invasive pests killing our trees in california	Video	English	General information	California ReLeaf	Unknown
General public - Spanish speakers	Los arboles urbanos bajo ataque!	Handout	Spanish	General information	California Urban Forests Conference	Apr-18
General public - Spanish speakers	Compre la lena donde se va a usar	Poster Handout	Spanish	Buy it where you burn it; firewood awareness	Firewood Task Force	Unknown
General public, arborists, greenwaste facilities	FD-ISHB: How to handle infested material	Handout	English	Greenwaste handling	pshb.org	Apr-17
General public, arborists, greenwaste facilities	FD-ISHB Que hacer con los restos de planta infectados?	Handout	Spanish	Greenwaste handling	pshb.org	Apr-16

Table XX. Continued.

Target Audience	Title	Format	Language	Purpose	Source	Date Published
General public, land managers	FD-ISHB: Prioritizing management efforts	Handout	English	BMPs	pshb.org	Apr-17
General public, land managers	FD-ISHB Como priorizar los esfuerzos de manejo?	Handout	Spanish	BMPs	pshb.org	Apr-16
General public, land managers	ISHB detection assessment tool	Online interactive tool	English	BMPs	pshb.org	Unknown
General public, politicians	ISHB/FD: A devastating threat to California trees	Handout	English	General information	pshb.org	Apr-17
General public, politicians, Spanish speakers	FD-ISHB: Una devastadora amenasa para los arboles de California	Handout	Spanish	General information	pshb.org	Apr-16
Homeowners	Fusarium dieback disease and the Polyphagous Shot Hole Borer: A serious pest/disease complex of avocados and landscape trees	Handout	English & Spanish	ID and BMPs in avocados and other trees	Eskalen Lab	Unknown
K-12	Polyphagous Shot Hole Borer Activity Book - Advanced	Activity book for kids	English	General information Games and activities	American Public Garden Association	Unknown
K-12	Polyphagous Shot Hole Borer Activity Book - Beginner	Activity book for kids	English	General information Games and activities	American Public Garden Association	Unknown
K-12	Polyphagous shot hole borer Field Guide	Field Guide for kids	English	General information	American Public Garden	Unknown
Land managers	Monitoring trap guidelines	Handout	English	Trapping options	pshb.org	Sep-17
Land managers, monitoring crews	Polyphagous Shot Hole Borer and Fusarium Dieback Disease on Palms	Article	English	ID symptoms in palm trees	Donald Hodel	2017

Table XX. Continued.

Target Audience	Title	Format	Language	Purpose	Source	Date Published
Land managers, survey crews	Kuroshio and Polyphagous Shot Hole Borer in Southern California Wildlands Associated Host Identification Guide	Handout	English	ID symptoms in many tree species	CA Dept. Fish and Wildlife	Jan-07
Spanish speaking land managers	ESCARABAJO BARRENADOR POLÍFAGO Euwallacea sp.	Article	Spanish	Description and BMPs	Mexican Secretariat of Agriculture and Rural Development	Mar-16
Spanish speaking land managers	FICHA TÉCNICA Euwallacea sp.	Fact sheet/article	Spanish	Description, distribution in Mexico and management	Mexican Secretariat of Agriculture and Rural Development	Sep-14

Education and Outreach Coordinator Working Group

The need for an Education and Outreach Coordinator emerged from a public process to determine the best strategy that would meet the Education and Outreach Subcommittee objectives. To form a cohesive statewide FD – ISHB Outreach and Education program, subcommittee participants voted on their top three priorities of agreed-upon strategies (Table XXI). The group consensus for the most critical elements of this statewide Outreach and Education program are 1) a FD – ISHB Communications Coordinator; 2) Regional Outreach Coordinators; 3) Communication Operations funds to develop and produce materials for long-term education priorities. The group agreed that other funding sources will be sought after to support the Regional Outreach Coordinators once the statewide coordinator has developed and implemented a centralized communication plan.

Table XXI. Outreach strategies ranked in order of priority.

Priority	Vote Count
Statewide FD – ISHB Communication Coordinator	11
Regional Outreach Coordinators	9
Communication Operating Program	8
Online, Field, Roadshow Training Program	3
Printed Material and Power Point Development for Different Audiences	1
Develop/Translate Non-English Education Materials	1
Website and Social Media Development	1
Online Outreach (e.g., ad buys)	0

Invasive Shot Hole Borer Communications Coordinator

The Education and Outreach Coordinator Working Group developed the scope of work of the Invasive Shot Hole Borer Communications Coordinator (ISHB CC) to communicate information concerning FD – ISHB to the broad range of target audiences associated with the problem. The overall responsibility of the ISHB CC will be to design and develop, implement, manage, and analyze education and outreach strategic communications for FD – ISHB and related issues (risks and impacts of tree mortality, firewood movement, greenwaste management, etc.). The ISHB CC will work in coordination with members of the California Invasive Species Advisory Committee (CISAC) and FD – ISHB subcommittees as well as public and private stakeholders (i.e., government agencies, industry representatives, academic/research institutions and non-governmental organizations). The ISHB CC will develop and manage ISHB strategic communications that build support for message consistency, educate key communications cooperators and stakeholders on their roles as key messengers, and provide support information to promote message consistency and use. The ISHB CC will execute specific duties detailed below to design and develop a communication strategy, implement and coordinate a statewide ISHB communication plan, and assess the efficacy of the FD – ISHB communication plan to refine as appropriate.

Design and Develop Communication Strategy

- Identify and outline ISHB education and outreach goals and target groups at local community, county, regional, statewide, and federal levels. Establish and foster communication with key contacts for each group.
- Determine behavior change goals for ISHB communications and engagement.
- Assess opportunities and barriers for communication, engagement, and community action.
- Analyze what has and has not been effective in past communications and media engagement both for ISHB and other pests.
- Assess whether important target audiences have been missed, search for gaps in messaging (e.g., small resource-poor cities and communities, non-English speakers, etc.)
- Develop key immediate and long-term messaging for each target group identified, including policy-makers, regulators, affected industries, non-government organizations, the public-at-large, and others.
- Identify key audiences within each target group, which will require specific communication messaging and tactics (e.g., age, location, language, education, supporting resource availability, etc.).
- Research and identify best communication methods and channels for each target group (e.g., traditional in-person methods and mass media: print, broadcast, and Internet.
- Identify communications resource and material needs (print, broadcast, and Internet, training and mapping tools, etc.).
- Develop an ISHB statewide strategic communications budget and calendar.
- Develop templates and advise on toolkit components for ISHB strategic communications and budget for County and local County public and private organizations (including templates for measuring and reporting) (e.g., forms, print materials with space to add self-identification, boilerplate messages, etc.).

Execute and Coordinate Statewide FD – ISHB Communication Plan

- Identify opportunities for community engagement in science and management.
- Identify tactics, stakeholder partners, and contacts for various communication methods/channels included in strategy.
- Coordinate media campaigns.
- Coordinate the design and development of new communications resources (print and digital).
- Coordinate (e.g., promote, engage, and assist) stakeholder partners in implementing education and outreach tactics/resources to specific audiences.
- Coordinate and assist with statewide ISHB digital communications (website and social media).
- Coordinate and manage media subcontractors if external services required (e.g., develop RFPs, coordinate selection, procurement, serve as primary contact, etc.).

Assess Efficacy of FD – ISHB Communication Plan

- Present and report on ISHB strategic communications plan, resources, activities, and accomplishments to internal and external stakeholders.
- Monitor, collect, synthesize, and report analytics data for all components of ISHB strategic communications plan.
- Analyze strategic communications activity – efforts and impacts – and present recommended adjustments to messaging and plan.

- Coordinate the distribution of information resources to internal and partner stakeholders.
- Stay abreast of information needs, information resource data (e.g., new research results), target audiences, and potential ISHB education and outreach partners (participate in multiple joint-stakeholder and industry meetings).
- Identify potential funding sources for ISHB strategic communications.
- Develop and or contribute to grant proposals.

Outreach Activities

Per deliverables committed to state officials managing AB 2470, members of the Outreach and Education subcommittee performed various activities throughout the statewide FD – ISHB Outreach and Education planning process. These activities were designed to educate high priority target audiences and are outlined in Table XXII. Outreach engagement in applied settings helped members refine short and long term needs in the statewide plan.

Date	Outreach Activity	Audience	Number of Attendees	Location	Presenter	Affiliation
4/3/19				Camp California	Curtis Ewing	CDFA
4/13/19	Educational Booth	General public	500 - 1000	Sepulveda Basin Wildlife Refuge	Rosi Dagit	Santa Monica Mountains RCD
4/13/19	Educational Booth	Intertribal Earth Day Event: General Public	~200	Pauma Valley	Anabele Cornejo	US Forest Service
4/18/19	Presentation	Pesticide Applicators Professional Association	300	Escondido	Kim Corella	CAL FIRE
4/25/19	Educational Booth	Graze at the Fields: General Public	~300	Carlsbad Flower Fields	Abigail Barraza	UC ANR
4/26/19	Workshop	Arborists; Land Managers	~35	San Diego	Beatriz Nobua-Behrmann & Abigail Barraza	UC ANR
4/26/19	Educational Booth	City of San Diego Official Arbor Day Celebration	~100	Balboa Park	Abigail Barraza	UC ANR
4/30/19	Presentation Conference	Western Chapter of the International Society of Arboriculture	~300	Honolulu; Hawaii	John Kabnashima	UC ANR
4/30/19	Presentation	Western Chapter of the International Society of Arboriculture	~300	Honolulu; Hawaii	Jesika Mitchel; Rhonda Wood	Davey Resource Group; Disneyland
4/30/19	Presentation	Ventura County Board of Supervisors: Elected officials; government staff; general public	40	Ventura	Annemiek Schilder; Ed Williams	UC ANR; Ventura County Agricultural Commissioner
5/7/19	Presentation	Decorative Hardwood Association of North America	~30	Santa Rosa	Thomas Smith	CAL FIRE
5/9/19	Lecture	Pasadena City College: Students	25	Pasadena	Tim Thibault	The Huntington
5/9/19	Educational Booth	Sportsman Expo: General Public	~100	Redding	CDFA Staff	CDFA

Table XXII. Outreach activities conducted during Fusarium dieback – invasive shothole borers statewide strategic initiative efforts.

Table XXII. Continued

Date	Outreach Activity	Audience	Number of Attendees	Location	Presenter	Affiliation
5/9/19	Presentation	La Verne Garden Club	65	La Verne	Jeff Warner; Tim Constantine	Los Angeles County Master Gardeners
5/9/19	Workshop	Arborists; municipalities; local agencies; Master Gardeners; conservancies; academia	55	San Luis Obispo	Kim Corella; Beatriz Nobua-Behrmann; John Kabashima	CAL FIRE; UC ANR
5/10/19	Presentation	Los Angeles Urban Center Research Fellowship symposium; urban planners	30	Los Angeles	Shelley Bennett	UCSB
5/14/19	Presentation	City Council ; General Public	40	Irvine; California	Beatriz Nobua-Behrmann	UC ANR
5/21/19	Workshop	The Getty; Irvine Company; Santa Ana Zoo; Lego Land; UC Riverside; UC Davis; CDFA; Disney; LA Arboretum; San Diego Botanic Garden; San Diego Zoo; Sherman Library & Gardens Staff	40	San Marino	Dan Berry; Tim Thibault	The Huntington
5/23/19	Presentation	Pesticide Applicators Professional Association: Arborists; Land managers	150	Santa Maria	Kim Corella	CAL FIRE
5/31/19	Print Materials	General public; arborists; government; academics	12,000	Statewide	Julie Clark De Blasio; Sabrina Drill	UC ANR
5/31/19	Conference Presentation	Desert Horticulture Conference: Horticulturists		Tucson AZ	Anabele Cornejo	US Forest Service
6/1/19	Educational Booth	General public	6000	Oxnard	Julie Clark De Blasio; Anna Howell; Sabrina Drill; Anthony Luna; Ventura County Master Gardeners; Anabele Cornejo	UC ANR; US Forest Service
6/4/19	Webinar	Interested general public and volunteers for Invasive species awareness week	15	California	Beatriz Nobua-Behrmann	UC ANR
6/5/19	Presentation	Insect and Disease Training: Land Managers	35	Redding	Kim Corella	CAL FIRE
6/11/19	Presentation	California Association of Pest Control Advisors: Land managers; arborists; pest control advisors		Palm Desert	Anabele Cornejo	US Forest Service

Table XXII. Continued

Date	Outreach Activity	Audience	Number of Attendees	Location	Presenter	Affiliation
Jun-19	Tour	English Forest Commission Presidents	2	San Marino	Dan Berry	The Huntington
Jul-19	Online Training	General Public; Master Gardeners; Volunteers; Arborists; Land Managers	Unlimited: permanently available online since July 2019	Worldwide	Beatriz Nobua-Behrmann; John Kabashima; Abigail Barraza; Benjamin Dianna	UC ANR
7/12/19	Workshop and Presentation	Landscape Supervisors; County officials; Arborists; Land Managers; Volunteers; Bay Area UF Regional Council	50	San Jose	Beatriz Nobua-Behrmann	UC ANR
7/18/19		Street Tree Seminar: Arborists; Land Managers; Landscape supervisors	120	Pomona	Beatriz Nobua-Behrmann	UC ANR
8/13/19	Conference Presentation	International Society of Arboriculture	Unknown	Knoxville; TN	Jesika Mitchel; Christopher Shogren	Resource Group; Disneyland

Outreach and Education Summary

The **Outreach and Education** subcommittee did an inventory of current materials and target audiences and created a list of venues to address various audiences through different formats.

The sub-committee achieved consensus on the top three priorities:

- ISHB Communications Coordinator: Jan Gonzales of UC ANR along with the Outreach Coordinator Working Group have developed a scope of work for a potential statewide outreach coordinator and have begun looking at potential funding sources and administering agencies. This outreach coordinator will augment work already being done by the sub-committee members, including speaking at conferences, creating informational videos and training courses.
  $120,000 x 3 years = $360,000 + 25% overhead ($90,000) for a total of $450,000

- Regional Outreach Coordinators. (To be funded when additional resources are identified.)
- A training program, communication operations funds, and rapid response (online trainings, field trainings, roadshow trainings). Five main categories of trainings have been identified, based on the needs of the audiences: Land Management and Greenwaste, Landscape and Gardeners, Campground and Recreation, Public Training, Staff of CA agencies and other conservation officers, including county staff. Communication operations funds for the development and production of outreach materials for different audiences and languages as well as creation and augmentation of existing ISHB training activities, including development of training videos/materials. Funds may be used to travel to different venues and for fees associated with securing booth space at events or other outreach expenditures. Finally, the development of a rapid response kit for leading-edge counties. $80,000 x 3 years = $240,000

Other priorities identified by the sub-committee are:

- Website and social media development: including rehabbing the PSHB.org website (Currently been done by UC ANR)
- Online outreach (ad buys for the video that is in production by CDFA)

The sub-committee also recognized the imperative need of developing specific printed materials and trainings to be used as an important component of projects identified as priorities by the **Survey** and **Pathways** sub-committees. The subcommittee identified other long-term goals.

FEDERAL ROLES AND RESPONSIBILITIES

The coordination of activities related to FD – ISHB across the landscape involves Federal agencies in addition to state and local agencies. Land management agencies (e.g., USDA Forest Service; National Park Service; U.S. Fish and Wildlife Service), and regulatory agencies (e.g., USDA Animal and Plant Health Inspection Service) all can play an important role in FD – ISHB management. As FD – ISHB tree mortality impacts the landscape, these agencies must respond and coordinate activities with each other and with state and local agencies to effectively deal with the problem.

As part of the California FD – ISHB Strategy, Federal agencies have defined their roles and responsibilities to align them with state and local activities better. Within the strategic framework for management of FD – ISHB, each agency has identified its role in conducting research to develop tools to detect and manage infestations, conducting surveys to detect and delimit the distribution of the FD – ISHB, responding to management needs, identifying pathways for FD – ISHB movement, and providing outreach to minimize its spread.

USDA Forest Service

The Forest Service has been involved with detection and assessment of FD – ISHB since it was found damaging trees in the Los Angeles basin in 2012. The Forest Service continues to work on management options to mitigate impacts. Forest Service staff in Southern California have worked closely with local authorities and universities to survey, assess impacts, provide outreach materials, and develop tools for survey and management of FD – ISHB.

Forest Service Roles

Research and Technology Development

The Forest Service will:

- Work with university and other research groups to better understand the biology and impacts of FD – ISHB.
- Support development of management tools.
- Examine potential ecosystem effects and other impacts of ISHB-caused tree mortality on wildlife.

Survey, Detection, and Rapid Response

The Forest Service will:

- Continue to deploy and monitor traps within national forests (NFS) in Southern California, and coordinate with state, local, and other Federal agencies to survey for FD – ISHB.
- Conduct ground surveys on NFS and other Federal lands to assess impacts.

Education and Outreach

The Forest Service will:

- Provide trainings to tribes and state, local, and other Federal agencies (including NFS) to detect, report, and manage FD – ISHB.
- Develop educational materials to aid trapping and management efforts.

U.S. Fish and Wildlife Service Roles

Research and Technology Development

The U.S. Fish and Wildlife Service (USFWS) will:

- Coordinate with university and other researchers to better understand the biology and impacts of FD – ISHB.
- As applicable and in accordance with laws, regulations, and policies, allow researchers to utilize USFWS managed lands to pilot test control and deterrent techniques.
- Evaluate the potential FD – ISHB ecosystem effects and impacts on wildlife throughout USFWS managed lands and high-value areas hosting federally listed threatened or endangered species.

Survey, Detection, and Rapid Response

The USFWS will:

- Coordinate with state and other Federal agencies to survey locations for ISHB
    - Deploy and monitor traps on USFWS managed lands in high-value and high-risk areas, as appropriate.
- Work with state, academic, and other Federal agencies to deploy and monitor traps throughout high-value areas (e.g., designated Critical Habitat or habitat for federally listed threatened or endangered species).
- Coordinate with state and other Federal agencies to assess impacts to wildlife and natural resources on USFWS managed lands or other high-value areas at risk.
- Provide management recommendations on lands with habitat for USFWS trust resources (e.g., threatened and endangered species, migratory birds).
- Review and comment on a national Incident Response Plan, if initiated.

Education and Outreach

The USFWS will:

- Inform USFWS staff of and encourage participation at training opportunities for FD – ISHB symptom identification, detection, monitoring, and control.
- Distribute educational materials to national wildlife refuges (NWRs) within the potential range of FD – ISHB that are accessible to the public and Service staff.
- Keep staff in infested and non-infested NWRs updated on the status and distribution of FD – ISHB.
- Continue to work with state, local, and other Federal agencies to provide outreach to affected land managers.

Regulatory

The USFWS will:

- Facilitate efficient coordination for Federal Endangered Species Act compliance with other Federal agencies to encourage active management and minimize impacts to trust resources.

National Park Service Roles

The National Park Service (NPS) became engaged in the national FD – ISHB efforts in 2019, but local units worked with Forest Service staff and other partners in Southern California prior to that. Staff at the Santa Monica Mountains National Recreation Area has been involved with detection and assessment of FD – ISHB for several years and has engaged with local partners on outreach, education, detection, and implementation of best management practices.

Research and Technology Development

The NPS will:

- Coordinate with university and other researchers to better understand the biology and impacts of FD – ISHB.
- Evaluate the potential FD – ISHB ecosystem effects and impacts on wildlife in NPS units.
- Review research proposals and reports as needed.

Survey, Detection, and Rapid Response

The NPS will:

- Identify high priority NPS units that are within, or adjacent to high-risk areas.
- Coordinate with state and other Federal agencies to survey locations for ISHB
    - Deploy and monitor traps on NPS managed lands in high-value and high-risk areas, as appropriate.
- Coordinate with state and other Federal agencies to assess potential FD – ISHB impacts on cultural and natural resources on high-risk and high priority NPS managed lands.
- Review and comment on a national Incident Response Plan, if initiated.
- Participate in calls and meetings, as appropriate.

Education and Outreach

The NPS will:

- Inform NPS units about and encourage their participation in training opportunities for FD – ISHB symptom identification, detection, monitoring, and control.
- Distribute educational materials to priority NPS units within the potential range of FD – ISHB.
- Communicate with priority NPS units on the potential impacts, status, and distribution of FD – ISHB.
- Continue to work with state, local, and other Federal agencies to provide outreach to affected land managers and private landowners, as appropriate.

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APPENDICES

Appendix A. Meeting agendas and minutes for all CISAC subcommittee meetings.

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borer Sub-Committee

Research

Meeting Agenda
Thursday, March 21, 2019

2:00pm – 4:00pm

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/9027972725253626371

Dr. Stacy Hishinuma, Co-Chair
(909) 382-2620
Shannon Colleen Lynch, Co-Chair
(951) 534-2819

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Identify key players that need to be involved.
- Identify issues, concerns and opportunities as they relate to Invasive Shot Hole Borer research.
- Identify action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Monday April 4, 2019 from 2:00pm-4:00pm

3:30 p.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(7) ADJOURNMENT**

To request special accommodations for those persons with disabilities, please contact David Pegos at (916) 654-0317

AMERICANS WITH DISABILITIES ACT
All Board meetings must be accessible to the physically disabled. Any person needing a disability-related accommodation or modification in order to attend or participate in any Committee meetings may request assistance by contacting David Pegos at (916) 654-0317.

ACTION IS POSSIBLE ON ANY ITEM CONTAINED IN THIS AGENDA. ITEMS LISTED ON THE AGENDA MAY BE CONSIDERED IN ANY ORDER AT THE DISCRETION OF THE COMMITTEE.

POSTED 3/8/2019

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING
Invasive Shot Hole Borers Sub-Committee - Research
Monday, March 18, 2019
2:00pm – 4:00pm
Meeting Minutes

Meeting Action Items

- **Next Meeting: Wednesday, April 3rd from 2pm to 4pm**

Short Term

- **All** review SANDAG Document prior to the next meeting.
- **David Pegos** will send out the Link SANDAG Document again with a reminder to review prior to next research subcommittee meeting.
- **Sheri Smith** to reach out to Larry Swan regarding research on BioChar.
- Identify social scientist in California that are looking at the behavior of moving wood from South to north.
    - **Shannon Lynch** will reach out to Patricia Winter.
    - **John Kabashima** will reach out to Amanda Crump.
    - **David Pegos** will reach out to John Boland.
- **Tabled to Tree Pests Working Group**
    - Develop a mechanism for collaboration between researchers and county staff.
- Figuring out how small the chips needs to be to remove the bug completely.

Long Term

- Pluralize Invasive Shot Hole Borer (ISHB) to Invasive Shot Hole Borers.
- UCI Study of already infested trees. Needs to be a follow-up that includes non-infested trees.
- Research into Management strategies other than tree removal.
- Restoration, which species are resistant and should be planted.
- Identify someone to continue McPherson's work on economic impacts 5-10 years showing impacts of 50% mortality rate and 80% mortality rate.

Meeting Proceedings

Background

David Pegos of CDFA presented background for the convening of the subcommittee. In January of 2018 the CISAC convened a statewide summit. Out of the summit came suggestions which were incorporated into AB 2470, signed by the governor in 2018. The bill allocated $5 million for a coordinated statewide effort against invasive shot hole borers (ISHBs). The funds are ready to be disbursed and these subcommittees are tasked with advising how the funds should be allocated and helping develop the RFPs. Each sub- committee will meet four times at two-week intervals, while taking actions between meetings to make progress. The consensus of the subcommittees will be compiled by Shannon Lynch into a single report document. Simultaneously the subcommittees will utilize boilerplate RFP language from CDFA and CAL FIRE to begin developing the RFPs. Mr. Pegos noted that the prioritization of this subcommittee may also help inform the farm bill suggestion process.

OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

Subcommittee Co-chair Shannon Lynch convened the meeting at 2:04 PM. Dr. Stacy Hishinuma reviewed the subcommittee mission. This funding will be focused on short term goals. Once we have built a list of priorities we will rank them and then propose a budget to meet those priorities.

- Between now and 2nd meeting the committee will develop list of research topics
- Between 2nd and 3rd meeting the committee will do ranking of the research topics
- At 3rd meeting the committee will discuss the ranking results of prioritizing
- At the final meeting the committee will review and begin drafting write-up

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS

SANDAG Overview

Mrs. Lynch gave a brief description of the SANDAG Document that she developed in collaboration with San Diego County. The document outlines a series of action items that could be implemented in the strategy. These include creating a leadership oversight coalition and distribution and density surveys; as well as short term management, outreach, and research leading to long term management. The SANDAG document identifies both opportunities and obstacles.

Discussion

Mrs. Lynch lead a brainstorm around research needs. During the discussion current research was brought up and discussed as well as some key people that may need to be involved.

- Identify social scientists in California that are looking at the behavior of moving wood from south to north.
- Resistance
    - There was no consensus on whether Genetic Resistance was needed.
        - Jason Stajich of UC Riverside is doing research on the strains of the fungus.
    - Mrs. Lynch is researching tree “immunity” via host microbial communities.
- Deterrents
    - Richard Stouthamer is working on a deterrent. Preliminary work shows it is effective but not over large distances or over long periods of time (currently lasts about 2 weeks).
- More accurate to pluralize ISHB
    - Examination of the differences of the two.
    - They seem to be able to switch and consume each other’s fusarium.
- Climatic Controls
    - Shannon Lynch is doing this on a broad scale.
- Water Potential studies and nutrients that might affect health of the plants
    - UCI Study of already infested trees. Needs to be a follow-up that includes non-infested trees.
    - Shelley Bennett of UC Santa Barbara is doing research on high nutrient content that is beneficial for the fungus and the beetles.
    - Shelley Bennett did research on water potential and found no effects but could replicate study if needed.
- Restoration

    - Would be useful to have a list of which species are resistant and should be planted.
- Shannon Lynch is Modeling Risk of ISHB at particular sites.
- John Boland, not present, has a soft density wood hypothesis that may be useful.
- Rapid Identification tools
    - Eskalen labs has been working on early detection tools that identify fungi and pieces of the beetle from wood pieces. How can we apply these early detection tools for the public?
- Shannon Lynch is monitoring rate of spread. She has 260 Plots in the 3 counties started in 2017 and is monitoring it overtime.
    - Research what factors increase rate of spread.
    - Creating a model to predict which areas are most vulnerable.
    - Preliminary analysis shows that there is a stronger likelihood to be susceptible based on shared evolutionary history and abundance.

There was some discussion regarding the importance of disseminating data more rapidly to those tasked with responding within the counties. Initially a working group of Shannon Lynch and Rosi Dagit were going to discuss this; however, it was decided instead to table it to the Tree Pests Working Group which meets quarterly. During this discussion some items were highlighted:

    - The need for more outreach and education materials.
    - Several reports will be published within next couple weeks include data.
        - Natural Communities Coalition of Orange County report will be very helpful.
        - ISHB interactive map could be updated to include new data.
    - Dr. Nobua-Behrmann has survey park data that may be helpful to Mrs. Lynch.
- Research on Chipping
    - Figuring out how small the chips needs to be to remove the bug completely.
- Mrs. Lynch has data on number of holes versus health of tree.
- Many ISHBs attack the tree they were born on. High mortality rate when they are traveling. Warm weather (above 68 degrees) and dry trees lead migrations.
- Old Study of Tea SHB. Flight range of beetle is about an hour. Average 38 feet, max 8 miles per generation.
- Continuing to understand the host range and any potential new hosts, specifically agricultural hosts.
    - Current research on Almond trees.
    - Pecan trees have been heavily damaged in South Africa.
    - Tom Coleman did no choice tests on logs.
- Long term Action Item: Economic Impacts 5-10 years showing impacts of 50% mortality rate and 80% mortality rate by McPherson. Look for someone to continue that work.
- Lower priority research lure replacements.
    - Current lures are effective for a month which can be utilized during key spreading time.
- Biocontrol fungi that inhibit the growth the fusarium in-vitro, greenhouse and field setting.
    - Need to come up with a delivery method.
- Healthy Citrus Trees and Olive trees are showing resistance. Unhealthy trees are still at risk.

- Look at interactions with other fungal pathogens with this pest disease complex.

Public Comment

- Gretchen Heimlich has research capacity.
- Have we looked at hybridization of resistant trees with non-resistant? London Planes and Western Sycamore.
- Matthew Abbott asked if Stone Fruit is a potential host. Low priority item to confirm resistance of Stone Fruit.
- Monika Sowinska is curious if painting stumps be as effective as grinding.
- Shelley Bennett asked how will beetles affect reforestation efforts?
    - Mrs. Lynch doing research on endophytes on restoration sites.
- Sheri Smith is looking forward to seeing the research list.

Adjourn

Dr. Stacy Hishinuma reviewed the next steps and action items. Shannon Lynch adjourned the meeting at 4:16pm. The next meeting will be Wednesday, April 3rd from 2pm to 4pm.

Meeting Participants

First	Last	Affiliation
Co-Chairs		
Dr. Stacy	Hishinuma	UC Davis
Shannon	Lynch	UC Santa Cruz
Participants		
Matthew	Abbott	USDA
Dorothy	Abeyta	Davey Tree Company
Laura	Arellano	Imperial County
Shelley	Bennett	UC Santa Barbara
Mark	Berninger	City of San Diego
John	Boland	Boland Ecological Services
Gregg	Bratcher	CAL FIRE
Kyle	Burke	California Department of Food and Agriculture (CDFA)
Corin	Choppin	Consensus and Collaboration Program (notetaker)
Kim	Corella	CAL FIRE
Rosi	Dagit	RCD of the Santa Monica Mountains
Akif	Eskalen	Eskalen Labs, UC Davis
Mel	Graham	Santa Barbara Ag Commission
Nathan	Gregory	Irvine Ranch Conservancy
Donald	Grosman	Arbor Jet
Katie	Harrell	Board of Forestry

Andrea	Hefty	U.S. Forest Service
Gretchen	Heimlich	Disneyland
Stacy	Hishinuma	U.S. Forest Service
Ann	Hope	
Anne	Jarque	City of San Diego
John	Kabashima	UC ANR Emeritus
Kalee	Koeslag	Irvine Ranch Conservancy
Danielle	Lefer	State Parks
Dario	Lombardo	County of San Diego Parks and Recreation
Martin	MacKenzie	U.S. Forest Service
Beatriz	Nobua-Behrmann	UC ANR
Pat	Nolan	San Diego County Agricultural Commissioner
Mike	Parker	Alliance Land Care
Bronti	Patterson	State Parks
David	Pegos	CDFA (Convener and facilitator)
Mark	Porter	Arborist
Madeleine	Rauhe	Disneyland
Joe	Scheele	U.S. Customs and Border Protection
Michael School	Scholl	CDFA
Matt	Slattengren	Contra Costa County Ag Commission
Tom	Smith	CAL FIRE
Sheri	Smith	U.S. Forest Service
Monika	Sowinska	U.S. Forest Service
Jason	Stajich	UC Riverside
Richard	Stouthamer	UC Riverside
Jim	Suero	State Parks
Kevin	Turner	CAL FIRE
Jerrold	Turney	Los Angeles County Ag Commission
Mayra	Valdez	Mexico
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Research

Meeting Agenda
Wednesday, April 3, 2019

2:00pm – 4:00pm

Location: CDFA, Auditorium
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/1399013495334719491

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Continue identifying issues, concerns and opportunities as they relate to Invasive Shot Hole Borers research.
- Continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Wednesday, April 17, 2019 from 2:00pm-4:00pm

3:30 p.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(7) ADJOURNMENT**

To request special accommodations for those persons with disabilities, please contact David Pegos at (916) 654-0317

AMERICANS WITH DISABILITIES ACT
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ACTION IS POSSIBLE ON ANY ITEM CONTAINED IN THIS AGENDA. ITEMS LISTED ON THE AGENDA MAY BE CONSIDERED IN ANY ORDER AT THE DISCRETION OF THE COMMITTEE.

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING
Invasive Shot Hole Borer Sub-Committee
Pathways – Including Greenwaste and Firewood
Meeting Minutes
Wednesday April 3rd, 2019
9:00pm – 11:00am

Meeting Action Items

Next Meeting: Wednesday April 16th 9am to 11am

Working Groups	Charge	Participants
Greenwaste	**Develop Best Management Practices and Procedures for Greenwaste Sites** **Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies** **Discuss potential pilot programs** **Identify potential other utilizations of wood products**	**Coordinator:** Keith Okasaki **Participants:** Bob Horowitz, Kathryn Cross, Sheri Smith, Ed Williams, Nick Condos, Larry Swan. **Requested Adds:** Julie Clark De Blasio, Kevin Turner, Neil Edgar
Firewood	**Identify potential resources and solutions**	**Coordinator:** Kevin Turner **Participants:** Leigh Greenwood, Faith Campbell, Curtis Ewing, Sheri Smith, Helena Roberts and Andrea Hefty **Requested Add:** Katie Harrell

Short Term Action Items

- **Greenwaste Working Group** work with Local Enforcement Agencies (LEAs) in Ventura county to identify smaller entities (mom and pop shops).
- **Greenwaste Working Group** develop scope of work for LEAs.

Long Term Action Items

- **California Firewood Taskforce** to get Orange County Parks template for other counties and the state.

***Other Action Items**:*

- **Keith Okasaki** will retrieve a copy of report, hours, footprint and cost of LA County Local Enforcement Agencies (LEAs) where they took quarantine maps and overlayed with Greenwaste facilities.
- **Keith Okasaki will reach out to Bob** to identify LEAs Ventura county and affirm that they are interested.
- **Beatriz Nobua-Behrmann** send solarization BMP to Keith. **- DONE**
- **Julie Clark De Blasio** will reach out to Ag Commissioners to identify LEAs in Ventura County.
- **Firewood Working Group** and **Education and Outreach Committee** will provide information to CDFA to modify the Firewood Task Force website to include maps and firewood regulations.
- **Leigh Greenwood** will lead discussion at Western Plant Board in May. Discuss next steps in EAB/federal certification of firewood to help facilitate western states working together.
- **Matt Abbott** will get us a contact for the Emerald Ash Borer project.
- **Bob Horowitz** to provide current outreach poster for Greenwaste.
- **Table to Survey Sub-Committee** Sampling large box tree nurseries in infested areas to confirm that they are not a problem.
- **Tabled to Education and Outreach Sub-Committee**: Information about untreated wood for pallets.
- **Tabled to Education and Outreach Sub-Committee**: Hobby wood.
- **Tabled to Research Sub-Committee**: Examine the pathway repurposing urban wood with kiln ovens.

Meeting Proceedings

Subcommittee Co-Chair Kevin Turner convened the meeting at 9:04. The committee dispensed with the flag salute since the majority of attendees were remote. Mr. Turner reviewed the notes from the previous meeting. We will vote to approve the minutes for both first and 2nd meeting at the next meeting. He noted that it was important that the Outreach Committee tackle Hobby/repurposed wood which was an action item from the previous pathways meeting.

Background

David Pegos, CDFA, gave a brief overview of the committee purpose and goals. AB2470 required the CISAC to develop a plan and allocated to implement a response plan to utilize the $5 million allocated for suppression of the invasive ~~s~~hot hole borers. CDFA on behalf of CISAC has scheduled 4 meetings, 2 weeks apart so we can move quickly on the plan and execute the plans with the funds available. Goal is to have consensus by the 4th meeting so that Shannon Lynch can pull the four pieces together. This is the 2nd meeting and the goal by the next meeting we will have a full list of potential options. Simultaneously we will be working on RFPs at a 5th meeting. This committee is tasked with determining how much of the $5 million will be utilized by the pathways sub-committee and how many RFPs will it be divided by. We have draft RFP language from CDFA and CAL Fire to start with.

Greenwaste

Keith Okasaki reported back from the working group that met last Thursday, March 28th. There was plenty of active participation and they identified a couple goals and action items.

Action Item from Greenwaste Working Group:

1. Determine how much Greenwaste from high-risk areas to analyze what if any additional mitigation efforts need to be done.

- Develop a scope of work with the LEA to conduct this work and evaluation.
- **Action Item: Mr**. **Okasaki** will get a copy of report, hours, footprint and cost of LA County Local Enforcement Agencies (LEAs) when they took quarantine maps & overlaid with Greenwaste facilities.
- Suggestion to use Ventura county as a pilot program.
- Action Item: **Julie Clark De Blasio** will reach out to Ag Commissioners to identify LEAs in Ventura County.
- **Action Item: Mr**. **Okasaki will reach out to Bob Horowitz** to identify LEAs Ventura county and affirm that they are interested.
- In Ventura we would start at the destination and work back to the origin
- Ventura County concern will be informal tree & gardening communities is harder to track
- **Short Term Action Item Greenwaste Working Group** work with LEAs in Ventura county to identify smaller entities.
- On HLB quarantine LEAs were very helpful identifying smaller entities.

2. Currently have quarantined areas for other pests. Need to look at what areas are not currently covered.

- Utilize UC Riverside's detection map.
- Partner with the survey committee.
- Contract with LA and Orange County LEAs.
- Outside the HLB quarantine area.

3. Contract with receiving counties and confirm how materials are being dealt with from high-risk areas.

- Solarization (may not work for all smaller entities)
  - Temperature and durations are listed on PSHB.org.
  - Dr. Nobua-Behrmann contacted Tim Paine to join the research committee.
  - **Action Item: Dr. Nobua-Behrmann** send solarization BMP to Keith.
    - Currently targeted towards homeowners in both English and Spanish
    - May need to be modified for Greenwaste Operators.
- **Tabled to the Research Subcommittee** to report back to Greenwaste Working group on treatments for smaller entities that will make Greenwaste safe.
  - Grinding to one-inch minus.
    - 95% kill rate is not enough if the material is going to be moved to an uninfested area.
  - Safer disposal site.

- Low probability of infestation due to the absence of susceptible host trees or other environmental conditions.
  - There was some discussion on covering loads.
- Transfer stations
  - Tiered tipping fees.
  - Lack of quarantine means we will have to use positive incentives.
- **Tabled to Survey and Detection** the importance of trapping around Greenwaste Facilities.

Firewood

Kevin Turner reviewed some slides from Wisconsin on Firewood. The California Firewood Task force has been working on this issue for a few years. Wisconsin has the advantage of having quarantined pests; there is no quarantine for ISHB in California. Even without quarantine, examining Wisconsin's certification, labeling, state and federal land regulations, and quarantine maps may be useful to this sub-committee. After reviewing Wisconsin's website Mr. Turner reviewed the California Firewood Task Force website.

- Suggestion that we call any training we create a BMP Awareness program instead of a certification due to regulatory issues.
- Firewood scout site has mostly big box stores, it is difficult to populate it with smaller dealers.
- Maintain the list.
- Suggestion to incentive Ag commissioners to build lists of local dealers.
- Leigh greenwood, 462 registered vendors within California's firewood scout database. New Hampshire has 510.
  - New Hampshire is exceptional in that they have a staff member who has worked very hard on it.
  - Firewood scout allows Batch Adds.
  - New Hampshire has EAB so they can make federally certified firewood.
  - Western States cannot use federal certification because we do not have a federally quarantined pest (other than fire ants in small areas).
  - **Action Item: Leigh Greenwood** will lead discussion at Western Plant Board in May, discuss next steps in EAB/federal certification of firewood.
- There was discussion of commercial firewood, and
  - Commercial firewood suppliers can and are heat treating their wood. It does not reliably remove all pests because . heat treatment can be to many different levels/durations, and in California there is no set standard nor certification process of heat treatment.
  - It was suggested that Bundled wood is not a priority as it is not known to be contributing to the issue.
  - Currently there are strong regulations for bringing wood into the state.
- Campground Regulations
  - **Action Item:** Firewood Working Group and Education and Outreach Committee will provide information to CDFA to modify the Firewood task force website to include maps and firewood regulations.

- There is a map on Don't Move Firewood website. *www.dontmovefirewood.org/map/*
- There is also a list of regulations on the Don't Move Firewood website for each state, click on the above map to find each state summary.
  - Orange county parks has a firewood regulations. http://www.ocparks.com/parks/ronald/news/details?NewsID=5127&TargetID=43
- Can other counties adopt regulations? Part of Rapid Response.
- **Long Term action Item**: Work with the California Firewood Taskforce to create regulations similar to Orange County Parks for other counties and the state.

Public Comment

- Curtis Ewing: Gave a suggestion that for mapping that we try to break the counties up by ecotype.
- Dr. Beatriz Nobua-Behrmann: Partner with the education and outreach committee to get out information about firewood.
- Dr. John Kabashima: Large box tree nurseries are inspected once a year.
- Julie Clark De Blasio: Wants to make sure pallets and hobby wood are made sure they are moved to hobby wood.
- Leigh Greenwood: Southern California has a large pallet creation and pallet recyclers.
- Neil Edgar noted that Cal recycle does not have any regulations requiring tarping. However many operators require tarps. Most facilities need to move within 2 to 7 days so solarization is difficult.

Adjourn

Kevin Turner adjourned at 11:14. Next meeting will be **Wednesday April 16th 9am to 11am**

Meeting Participants

Participant		**Affiliation**
Co-Chairs		
Kevin	Turner	CAL FIRE
Tom	Smith	CAL FIRE
Participants		
Faith	Campbell	Center for Invasive Species Prevention
Corin	Choppin	Consensus and Collaboration Program, CSU Sacramento (notetaker)

Julie	Clark De Blasio	UC ANR
Nick	Condos	CDFA
Kim	Corella	CAL FIRE
Ariel	De La Paz	City of Irvine
Curtis	Ewing	Firewood Task Force
Dawn	Fluharty	Arbor Jet
Leigh	Greenwood	The Nature Conservancy
Aimee	Halligan	Orange County Waste and Recycling
Katie	Harrell	Board of Forestry
John	Kabashima	UC ANR Emeritus
Jason	Leathers	CDFA
Jennifer	Nguyen	Cal Recycle
Beatriz	Nobua-Behrmann	UC ANR
David	Pegos	CDFA (Convener and facilitator)
Michael	Scholl	CDFA
Christopher	Showgren	UC Riverside
Sheri	Smith	Forest Service
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Research

Meeting Agenda
Thursday, April 18, 2019

9:00am – 11:00am

Location: CDFA, Room 133
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/767579360904342017

Dr. Stacy Hishinuma, Co-Chair
(909) 382-2620
Shannon C. Lynch, Co-Chair
(951) 534-2819

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Review and continue identifying issues, concerns and opportunities as they relate to Invasive Shot Hole Borers research.
- Review and continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday, April 30, 2019, from 9:00am-11:00am

10:30 a.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee
Research and Technology Development

CDFA, Room 220
April 18, 2019 2pm to 4pm

Meeting Minutes

Meeting Action Items

- **Next Meeting:** Wednesday, May 8th from 9am to 11am
- **Working Groups:**

Working Groups	Charge	Participants
Biology	● Compile list of research questions ● Develop a list to be prioritized by whole sub-committee	**Coordinator:** Shelley Bennett **Participants:** Akif Eskalen Richard Stouthamer Shannon Lynch Add: Adam
Monitoring	● Compile list of research questions ● Develop a list to be prioritized by whole sub-committee	**Coordinators:** Chris Shogren Richard Stouthamer **Participant**: Kyle Beucke
Control	● Compile list of research questions ● Develop a list to be prioritized by whole sub-committee	**Coordinators:** Akif Eskalen Richard Stouthamer

Epidemiology	● Compile list of research questions ● Develop a list to be prioritized by whole sub-committee	**Coordinator:** Shannon Lynch
Integrated Pest Management (IPM)	● Compile list of research questions ● Develop a list to be prioritized by whole sub-committee	**Coordinators:** Akif Eskalen John Kabashima **Participant:** Shannon Lynch

Other Action Items:

- **Dr. Hishinuma** will add Richard Stouthammer clarification on Individual Climate Research Question in the Biology subsection.
- **Biology working group** will meet to flush out the questions for the next meeting.
- **Christopher Shogren & Richard Stouthamer** will add Monitoring Working Group research questions to Research Technology Development needs assessment working document.
- **All Working groups** finalize their section of working document by May 1st for review by our last meeting so people can rank priorities.
- **Shannon Lynch** will connect working groups through email to clarify what research questions fit under which questions so that there is not duplication.
- **Shannon Lynch** will reach out to Dr. Kabashima and coordinate what we can add to Epidemiology with Amanda Crump and also regarding economic impacts.
- **Shannon Lynch** is on a working group with Jiri Huler at the University of Florida.
- **Shannon Lynch** will contact Darci Oishi from Hawaii Department of Agriculture.
- **All** Finalize all research questions by May 1st then meet on May 8th to prioritize research questions.

Suggested Requests For Proposals:

- Amanda Crump could look at behavior of moving wood from south to north.
- Tim Paine could follow infested chip material and look at the survivability in real world situations.

Meeting Proceedings

Shannon Lynch called the meeting to order at 9:05am. Dr. Hishinuma led introductions. Dr. Hishinuma reviewed the agenda and proposed objectives and schedule for the sub-committee meeting. Hishinuma proposed two scenarios, one where people vote between this meeting and the next meeting and another scenario where the voting will occur between May 4th and May 14th.

- Dr. Stouthamer recommended the 2nd scenario.
- David Pegos of CDFA noted the 1st scenario fit the timeline asked by the legislature appropriately.

- There was a suggestion that we push back the next meeting by a week to allow for 3 weeks for people to review the meeting and then have the vote occur at the next meeting in a public process.
- Sheri Smith with the US forest service wanted to make sure the group was aware that not all RFPs could be funded by certain funders due funding restrictions so not the ranking will help inform but not completely decide what will be funded.
- Ms. Smith asked for clarification as to whether federal agencies can submit proposals.
    - Mr. Pegos did not know of any rule precluding federal agencies submitting RFPs and noted that if they have matching funds available that would strengthen their proposal.
- Shannon Lynch asked for clarification as to whether RFPs should include the total cost, not just costs eligible for CDFA AB 2470 funding.
    - Mr. Pegos clarified that proposals could include full project with line items that need to be funded within the first 3 years which are eligible for AB 2470 funding.
- Co-Chair Shannon Lynch wanted to remind everyone of the constrained timeline.

Action Item: Finalize all research questions by May 1st then meet on May 8th to prioritize research questions.

- It was noted that all committees should look to tapping into additional funding.

Draft Minutes from both the March 18th and April 3rd meetings were sent out previously to approval of minutes from March 18th. Akif Eskalen moved, Shelley seconded the motion. Eskalen moved to approve the April 3rd minutes. Shelley seconded. The minutes were approved unanimously.

Requests For Proposal: Amanda Crump looking for the behavior of moving wood from south to north.

Requests For Proposal: Tim Paine could follow infested chip material and look at the survivability in real world situations.

Tabled to Outreach and Education: Mark Porter suggested adding to the BMP protocol for testing blades of chippers to ensure the less than 1 inch chip.

Response back to the Pathways Sub-Committee: Michelle Jones confirmed she has a published study showing 98% kill rate of ISHB.

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS

At the last Sub-Committee meeting time ran out prior to having all the labs present on their research.

Dudley lab research

Shelley Bennett presented on past and current research being done by Dudley lab. Dudley lab is doing further research to look at the effect of ISHB on restoration projects.

- Dr. Eskalen asked about cuttings that they are seeing attacked.
    - Shelley 3 to 8 centimeters and ISHB are attacking the full range.

Jason Stajich

Shannon Lynch presented on some work done by Jason Stajich, a Fungal Genomist at UC Riverside.

- Dr. Kabashima asked about *Grasium peracramonium*.
    - Shannon Lynch responded that some of that is captured in the research questions.

Michele Jones

Michele Jones from Paine Lab presented on the work that their lab has been doing. Paine lab is looking at pesticides (combinations of pesticides work best), climate modeling, watering effects, and avocado species (Zutano preferred by ISBH). Ms Jones discussed over 10 ongoing projects that Paine lab is currently has going.

- Dr. Hishinuma asked which of the projects are priorities for Paine labs.
- Michele Jones responded research on barricades and host preferences are two.

Research and Development Needs Assessment:

Shannon Lynch presented on the sub-committees working document on research questions. She noted that there was some overlap between the different working groups. The Working Group list links to the full list of research questions being developed.

Biology Working Group

Shelley Bennett read through the current list of Biology Research Questions.

- Tom recommended that the questions be reorganized to make them a more coherent research program.

Action Item: Dr. Hishinuma will add Richard Stouthamer's clarification on Individual Climate Research Question in the Biology subsection.

- Shannon Lynch noted that the last questions are still being flushed out.
- Dr. Stouthammer noted that their lab has already looked at the differences between the microbial of the two species of ISHBs.
    - Shannon followed up and asked if this was an area that needed further study.

Action item: Biology working group will meet to flush out the questions for the next meeting.

Monitoring Working Group

Chris Shogren and Dr. Stouthammer did meet to discuss potential research questions; however, neither had the questions available so had to discuss from memory.

- Trap size
- Optimum trap height
- Different lures
- Combination Lure

Action Item: Christopher Shogren & Richard Stouthamer add monitoring research questions to Research Technology Development needs assessment working document.

Control Working Group

Richard Stouthammer reviewed the Control Working Group's research questions.

- David Pegos asked why research was focused on Taiwan
- Dr. Stouthamer noted that in Vietnam they did not discover any natural enemies and Taiwan also has operational advantages.
- Mr. Pegos asked how studies were currently being funded.
    - Funded through farm bill, CDFW, and SANDAG. Some funding to end soon.

- There was discussion of tabling restoration to the biology working group.

Action Item: Shannon Lynch will connect working groups through email to clarify what research questions fit under which questions so that there is not duplication.

Epidemiology Working Group

Action Item: Shannon Lynch will reach out to Dr. Kabashima and coordinate what we can add to Epidemiology with Amanda Crump and also regarding economic impacts.

Integrated Pest Management (IPM) Working Group

Dr. Kabashima suggested the working group take the methods we have and then integrate them into the 3 scenarios: native forests, urban forests and woodlands. Over the next 6 months compile current knowledge on best management practices. Then a 2 year project to evaluate the effectiveness of IPM programs.

Action Item: All Working groups finalize their section of working document by May 1st for review by our last meeting so people can rank priorities.

Public Comment

- Mark Porter asked that recordings of the sub-committees be posted.
- Dr. Kabashima spoke with Dr. McPherson. He suggested a few people who may be able to do economic studies.
- David Pegos suggestion to reach out to Michigan Anthony Cognato regarding their expertise on beetles. Also look to partner with Hawaii and Florida and our great relationship with them to potentially get some farm bill funds.
    - o **Action Item: Mrs. Lynch** is on a working group with Jiri Huler at the University of Florida.
    - o **Action Item: Mrs. Lynch** will reach out to Darci Oishi of the Hawaii Department of Agriculture.
- Sheri Smith asked about adding a 4th category to the IPM list of agricultural crops.
- Sheri Smith reported from a conference call that she was just on that there is a federal preference that proposals be vetted by this group prior to being vetted by federal agencies.

Adjourn

Dr. Hishinuma reviewed the next steps and action items. Mrs. Lynch adjourned the meeting at 11:16am. The next meeting will be Wednesday, May 8th from 9am to 11am.

Meeting Participants

First	Last	Affiliation
Co-Chairs		
Dr. Stacy	Hishinuma	UC Davis
Shannon	Lynch	UC Santa Cruz
Participants		
Dorothy	Abeyta	Davey Tree Company
Abby	Barraza	UC ANR
Shelley	Bennett	UC Santa Barbara

Charlie	Branan	UC Santa Barbara
Corin	Choppin	CCP CSU Sacramento (notetaker)
Andrew	Cline	CDFA
Kim	Corella	CAL FIRE
Tom	Dudley	UC Santa Barbara
Akif	Eskalen	Eskalen Labs
Steve	Gaimari	CDFA
Curtis	Ewing	CAL FIRE
Katie	Harrell	Forest Service
Gretchen	Heimlich	Disneyland
Michele	Jones	UC Riverside
John	Kabashima	UC ANR Emeritus
Adam	Lambert	UC Santa Barbara
Jessika	Mitchell	Davey
David	Pegos	CDFA (Convener and facilitator)
Mark	Porter	Arborist
Madeleine	Rauhe	Disney
Michael	Scholl	CDFA
Chris	Shogren	Disney
Tom	Smith	CAL FIRE
Sheri	Smith	US Forest Service
Jason	Stajich	UC Riverside
Richard	Stouthamer	UC Riverside

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Research and Technology Development

Meeting Agenda
Wednesday, May 8, 2019

9:00am – 11:00am

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/795688376069014787

Dr. Stacy Hishinuma, Co-Chair
(909) 382-2620
Shannon C. Lynch, Co-Chair
(951) 534-2819

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Finalize and approve issues, concerns and opportunities as they relate to Invasive Shot Hole Borers research and technology development.
- Finalize and approve action items and potential request for proposals (RFP) concepts.
- Next Meeting to discuss RFPs – Tentatively, Wednesday, May 22, 2019, from 2:00pm-4:00pm

10:30 a.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(8) ADJOURNMENT**

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ACTION IS POSSIBLE ON ANY ITEM CONTAINED IN THIS AGENDA. ITEMS LISTED ON THE AGENDA MAY BE CONSIDERED IN ANY ORDER AT THE DISCRETION OF THE COMMITTEE.

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING
Invasive Shot Hole Borer Sub-Committee
Research and Technology Development

CDFA, Room 220
May 8, 2019 2pm to 4pm

Meeting Minutes

Meeting Action Items

Potential drafters of Request for Proposal (RFPs) for top six priorities:

- **Curtis Ewing:** *Can we introduce parasitoid wasps from the native range of the beetles into California as a biological control measure?*; *+ Can we introduce nematodes from the native range of the beetles into California as a biological control measure?*
- **Curtis Takahashi:** How can current knowledge of ISHB be integrated into an effective IPM program for both urban and riparian forests? What are the metrics of success to evaluate the effectiveness of the IPM program?
- **Kevin Turner:** *How can chipping procedures be optimized to effectively kill the beetles in applied settings (i.e. post-processing treatments)?*
- **Dr. Kabashima and Gregg McPherson:** *What economic impact will ISHB-FD have on the major forest systems in California by region and host species?*
- **No potential drafter identified yet***. Do endophytes (micro-organisms living inside the tree) prevent ambrosial fusaria from colonizing mature plants, saplings, or cuttings in greenhouse and field settings?*

Working Groups	Charge	Participants
Biology	● Compile list of research questions	**Coordinator:** Shelley Bennett **Participants:** Akif Eskalen Richard Stouthamer, Shannon Lynch, Adam Lambert
Monitoring	● Compile list of research questions	**Coordinators:** Chris Shogren Richard Stouthamer **Participant**: Kyle Burke

Control	● Compile list of research questions	**Coordinators:** Akif Eskalen Richard Stouthamer
Epidemiology	● Compile list of research questions	**Coordinator:** Shannon Lynch
Integrated Pest Management (IPM)	● Compile list of research questions	**Coordinators:** Akif Eskalen John Kabashima **Participant:** Shannon Lynch

Meeting Proceedings

Dr. Stacy Hishinuma called the meeting to order at 9:03am. Dr. Hishinuma led introductions. Dr. Hishinuma reviewed the agenda for the meeting. Keith Okasaki moved to approve the minutes from the previous meeting, Chris Shogren 2nded. The minutes were passed unanimously.

Dr. Hishinuma presented a draft list of research questions developed by the Research Sub-Committee's working group.

- Dr. Richard Stouthamer prefaced that some of the titles for the research questions may not be in depth enough to understand the question so it is important that people read the research question description so that you understand why the question is asked.
- Dr. Kabashima updated the sub-committee that he met with the city of Irvine and it increased his priority of Question 25 as the City of Irvine is willing to let us test three IPMs.
- Dr. Kabashima asked a clarifying question about whether the ranking done today is just for short-term projects.
    - Dr. Hishinuma responded that no we are ranking all research questions based on priority and then the working groups will determine which ones are short and long-term and what funding source may be best to fund them.
- Dr. Karen Jetter noted that there is a linkage between all the questions prior to 29 and 29.
- Dr. Amanda Crump discussed a tool that she has developed that may be of use in tacking research question 29.

Dr. Hishinuma went through each research question one by one. Some questions and clarifications were asked during a few of the questions they are listed below the question.

Epidemiology

1. **Research Question:** *What are the patterns of disease dynamics throughout Southern California, and what processes influence those patterns?*

2. **Research Question:** *What is the influence of beetle expansion by flight versus human-assisted long distance dispersal?*
3. **Research Question:** *Individual climatic models: can climate matching programs and day degree models help in accurately predicting the ultimate distribution in California?*

- Kyle Burke: Does it include other information than just climate?
    - Dr. Stouthamer said it could be included and discussed a method for making the data more relevant to California climate.
    - Mrs. Lynch said research question 1 addresses microclimate and other important variables; question 3 fine-tunes the climate question to incorporate within tree temperatures to improve predictions associated with question 1.

Biology

4. **Research Question:** *Do other borer species facilitate or antagonize ISHB colonization, or affect ISHB population dynamics and/or disease progression?*
5. **Research Question:** *What is the beetles' flight behavior?*
6. **Research Question:** *Does host tree water potential affect ISHB preference or reproductive success? Does host tree water potential affect fungal growth?* (Contributes to category 4)
7. **Research Question:** *How does nutrient availability affect ISHB preference, growth rates and the success of the symbiotic fungi?* (Contributes to categories 1&4)
8. **Research Question:** *What is the role of irrigation and fertilizer interactions in beetle establishment on urban trees.*
    - *Paine labs has interest in this question and will develop a way to study it.*
9. **Research Question:** *Why are the resprouting willows in the Wet Forests not being reinfested by KSHB? Does the chemical composition of the recovering infested tree change?*
10. **Research Question:** *What are the patterns of genetic diversity of the beetles' pathogenic fungi and can monitoring of those patterns inform origins, introductions, and dispersal of disease?*
11. **Research Question:** *How do microbial communities change over time in diseased and non-diseased trees? Do microbial communities within galleries influence beetle fitness?*
12. **Research question:** *Can we exploit the role of the different microbial communities for controlling both the fungal and beetle population growth?*

Monitoring

13. **Research Question:** *How can traps be optimized for ISHB monitoring?*
14. **Research question:** *How can we reliably and efficiently detect species composition of PSHB and KSHB beetles caught in survey traps?*

- For clarification a participant asked does this help visually detect the species?

- Dr. Stouthamer responded that if you get a trap with 50 beetles it is too difficult to assess them all visually so you can extract DNA from the group and identify the species from the DNA.

15. **Research Question:** *Which agricultural crops (including stone fruits), ornamentals, hybrids, or CA native tree species are potential new hosts?*
16. **Research Question:** *Can canine detection teams be used for early detection of ISHB and/or for preventing the movement of infested wood in the event of a quarantine? Under what settings could this approach be applied?*

Control

17. **Research Question:** *How do we control the spread of the infestation at the frontier?*
    a. What is defined as the frontier?
        i. Dr. Stouthamer responded that the frontier is the edges of the infestation. This research question deals with the natural dispersal of the beetles.
18. **Research question:** *How can chipping procedures be optimized to effectively kill the beetles in applied settings (i.e. post-processing treatments)?*
    a. Kevin Turner clarified that this question was asked by the Pathways Sub-Committee.
19. **Research question:** *Can we introduce parasitoid wasps from the native range of the beetles into California as a biological control measure? Can we introduce nematodes from the native range of the beetles into California as a biological control measure?*
20. **Research question:** Was combined into Question 19.
21. **Research Question:** *Do endophytes (micro-organisms living inside the tree) prevent ambrosial fusaria from colonizing mature plants, saplings, or cuttings in greenhouse and field settings?*
22. **Research Question:** *Do plant defense activators impede ambrosial fusaria and beetle establishment in field settings? How do hosts respond to beetle attack and/or fungal colonization when treated with defense activators?*
    a. Already identified several beneficial organisms, this will allow us to apply them in the field and to confirm that they work.
23. **Research question:** *Can applying biorational pesticides in combination with Barricade Fire Gel increase the viability of biological agents to aid in shot hole borer control?*
24. **Research question:** *Can chemical spot treatments be applied to lightly infested trees as a control measure?*

Integrated Pest Management (IPM)

25. **Research Question:** How can current knowledge of ISHB be integrated into an effective IPM program for both urban and riparian forests? What are the metrics of success to evaluate the effectiveness of the IPM program?

Restoration biology of affected riparian areas

26. **Research Question:** *How does beetle/fungal attack affect survival and growth of riparian tree species planted as part of restoration efforts?*
27. **Research Question:** *What are the impacts of ISHB-induced tree mortality and subsequent loss of habitat (nesting locations, food resources, etc.) on obligate riparian species (such as least Bell's vireo and southwest willow flycatcher)?*

Other (Sociology and Economics)

28. **Research Question:** *What are the limiting factors that discourage people from buying firewood locally (or buying where they burn it)?*
29. **Research Question:** *What economic impact will ISHB-FD have on the major forest systems in California by region and host species?*

Prioritization

- Ed Williams listed research questions 15, 16, 18, 24, 25 as his highest priorities.
- Adam Lambert listed research questions 1, 4, 7, 19 (very critical), 26 as his highest priorities.
- Akif Eskalen listed research questions 1, 21, 22, 11, 19 as his highest priorities.
- Beatriz Nobua-Behrmann listed research questions 12, 22, 23, 24, 25 as her highest priorities.
- Chris Shogren listed research questions 9, 13, 24, 25, 29 as his highest priorities.
- Madeline Rauche listed research questions 11, 17 25 27 29, as highest priorities but noted they were in no particular order.
- Curtis Ewing listed research questions 13, 15 18, 24, 2 as his highest priorities.
- Curtis Takahashi listed research questions 3, 13, 17, 25, 27 as his highest priorities.
- Danny Fry listed research questions 1, 11, 17, 21, 25 as his highest priorities.
- Greg Johansen listed research questions 8, 12, 16, 28, 19 as his highest priorities.
- Jason Stajich listed research questions 1, 11, 12, 19, 29 as his highest priorities.
- Joe Scheele recused himself.
- John Kabashima listed research questions 1, 5, 19, 24, 25, as his highest priorities.
- Karen Jetter, all really good projects 1, 29 as her highest priority.
- Kevin Turner listed research questions 19, 18, 17, 6, 25 as his highest priorities.
- Amanda Crump, UC Davis, former Western IPM Director, listed research questions 28, 2, 29, 25, 18 as her highest priorities.
- Laura Arellano listed research questions 2, 15, 19, 25, 29 as her highest priorities.
- Matthew Slattengren listed research questions 24, 15, 19, 9, 29 as his highest priorities.
- Michele Jones listed research questions 19, 23, 25, 8, 5 as her highest priorities.
- Milan Mitrovich listed research questions 21, 11, 17, 19, 1 as his highest priorities.
- Richard Stouthamer listed research questions 1, 5, 18, 19, 21 as his highest priorities.
- Shelly Bennett listed research questions 1, 4, 7, 21, 26 as her highest priorities.
- Tom Dudley listed research questions 4, 7, 21, 19, 26 as his highest priorities.
- Steve Gaimari listed research questions 19, 25, 15, 14, 10 as his highest priorities.
- Shannon Lynch listed research questions 1, 11, 19, 21, 22 as her highest priorities.
- Andy Cline listed research questions 1, 13, 18, 19, 25 as his highest priorities.
- Kyle Burke listed research questions 3, 15, 19, 25, 13 as his highest priorities.
- David Pegos listed research questions 19, 25, 28, 13, 18 as his highest priorities.
- Michael Scholl listed research questions 3, 19, 25, 28, 2 as his highest priorities.

Rank	Vote Count	Research Question Number	Projected cost	Description
1	18	19	$600,000	biocontrol
2	16	25	$200,000	ipm
3	11	1	$413,000	epidemiology
4	7	18	$75,000	chipping
5	7	21	$208,000	endophytes
6	7	29	$150,000	economic impacts
7	6	11	$150,000	microbial community changes
8	6	13	$150,000	optimize traps
9	6	15	$85,000	ag crops
10	6	24	$75,000	chemical spot treatments
11	5	17	$200,000	control spread at frontier
12	4	2	$40,000	flight vs human dispersal
13	4	28	$56,170	social-firewood
14	3	3	$40,000	individual climate models
15	3	4	$190,000	beetle/insect interactions
16	3	5	$220,000	flight behavior
17	3	7	$80,000	nutrient availability
18	3	12	$60,000	mycangia microbial communities
19	3	22	$165,000	defense activators
20	3	26	$150,000	beetle/fungal attack affect survival and growth of riparian tree species as part of restoration efforts
21	2	8	$150,000	irrigation
22	2	9	$100,000	re-sprouting
23	2	16	$40,000	canine detection
24	2	23	$100,000	biorational pesticides
25	2	27	$350,000	shb-induced tree mortailty impacts
26	1	6	$60,000	host tree water potential
27	1	10	$150,000	genetic diversity patterns
28	1	14	$30,000	batch identification

Discussion on highest rank priorities:

- ***Research Question 19*** of identifying parasitoids and nematodes that could be used to kill ISHB was the highest ranked question and was identified as a vital question to create an RFP for at the May 20th meeting. **Potential drafter of this RFP: Curtis Ewing.**
    - Mr. Ewing agreed that if this research succeeds it will be the best solution; however, he is concerned with the low chances of success.
    - Dr. Stouthamer noted that it is the only plausible method to battle the beetle in riparian areas.

    - Mr. Ewing noted there are also a lot of regulatory hurdles.
    - David Pegos suggested that Michigan State expertise be brought in to help.
- ***Research Question 25*** will look at Integrated Pest Management (IPM) programs and is listed as the 2nd highest priority.
    - Dr. Kabashima recommended examining 3 IPM Strategies to see which was the most effective against ISHB. Monitoring would be important to answering this question. This question can help us be more cost effective on treatment of infested areas. **Potential RFP drafter for this is Curtis Takahashi.**
    - Dr. Eskalen has been applying the program to a small-scale area including Disneyland and we have had some success in these smaller areas.
- ***Research Question 1*** was the third highest priority.
    - Shannon Lynch discussed how she is working on a research study that is already 2 years into its progress. Mrs. Lynch believes that 3 more years for a total of 5 years of monitoring would give a good data set to work with.
    - Milan Mitrovich from the Natural Communities Coalition of Orange County noted that the current work being done in Orange County has been very helpful in predicting hotspots to focus management. **Potential RFP drafter Milan Mitrovich** offered to help draft the RFP for Research Question 1.
- ***Research Question 29*** was the fourth highest priority.
    - Dr. Kabashima developed this question with Greg McPherson and feels that Amanda Crump has a lot of knowledge about how to answer this question.
    - Ms. Crump responded existing models that are well developed and there are other models that need to be developed. Good model for urban forest but not for riparian areas. It would be helpful to flush out what are short and long term goals. May be able to be joined with a weeds model in the delta that looks at the economic costs based on different management models.
    - Dr. Kabashima noted that the legislature really needs to know the economic impact of the ISHB spreading into northern California.
    - **Dr. Kabashima and Gregg McPherson** may be helpful in writing this RFP.
- **Research Question 18** came out of the Greenwaste Working group of the Pathways subcommittee.
    - The Greenwaste Working Group is working on an RFP around Greenwaste facilities. What technology can be employed to make the treatment safer.
    - The research needs to include field research to consider sharpness of chippers.
    - Dr. Stouthamer suggested that adding pathogens during the chipping process.
    - **Potential drafter for this RFP: Kevin Turner.**
- **Research Question 21** tied with research question 18 and and 29 as the fourth highest priority. Due to time constraints we were not able to discuss this question in more depth.

At the next meeting we will identify people to draft the RFP; not including anyone who may bid on it. We will also use this list of questions to try to identify other potential funding sources including the Britton Fund and the US Forest Service.

Public Comment:

- Danny Fry commented on the fuel reduction grant Orange County got from CAL FIRE to remove trees. This research will be very helpful in that program, especially regarding research questions 18 and 25.
    - There was a suggestion that some of those trees may be a source of infested trees for the chipping study.
    - Kevin Turner thanked Danny Fry for the collaboration between CAL FIRE and Orange County.

Adjourn

Dr. Hishinuma reviewed the next steps and action items. Mrs. Lynch adjourned the meeting at 11:27am. At the next meeting we will try to put together RFPs for the top 11 ranked questions.

Meeting Participants

First	Last	Affiliation
Co-Chairs		
Dr. Stacy	Hishinuma	UC Davis
Shannon	Lynch	UC Santa Cruz
Participants		
Laura	Arellano	Imperial
Abby	Barraza	UC ANR
Shelley	Bennett	UC Santa Barbara
Kyle	Burke	CDFA
Corin	Choppin	CCP CSU Sacramento (notetaker)
Andrew	Cline	CDFA
Amanda	Crump	UC Davis
Akif	Eskalen	Eskalen Labs
Curtis	Ewing	CAL FIRE
Danny	Fry	OC Conservation
Steve	Gaimari	CDFA
Dustin	Harrison	San Diego River Conservancy
Karen	Jetter	UC Davis
Greg	Johansen	City of San Diego
Michele	Jones	UC Riverside
John	Kabashima	UC ANR Emeritus
Adam	Lambert	UC Santa Barbara
Shannon	Lynch	UC Santa Cruz
Milan	Mitrovich	OC Conservation

Shikari	Nakagawa-Ota	LA County
Beatriz	Nobua-Behrmann	UC ANR
Keith	Okasaki	CA Dept. of Food and Agriculture
David	Pegos	CDFA (Convener and facilitator)
Madeleine	Rauhe	Disney
Joe	Scheele	US Customs and Border Protection
Michael	Scholl	CDFA
Chris	Shogren	Disney
Matthew	Slattengren	Agricultural Commissioner’s Office
Jason	Stajich	UC Riverside
Richard	Stouthamer	UC Riverside
Curtis	Takahashi	CDFA
Kevin	Turner	CAL FIRE
Ed	Williams	Ventura County

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borer Sub-Committee

Survey – Early Detection and Rapid Response

Meeting Agenda
Tuesday, March 19, 2019

2:00pm – 4:00pm

Location: CDFA, Room 133
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/7580035758240057091

Dr. Andrea Hefty, Co-Chair
(909) 382-2871
Ed Williams, Co-Chair
(805) 388-4343, ext 2

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Identify key players that need to be involved.
- Identify issues, concerns and opportunities as they relate to Invasive Shot Hole Borer survey, including early detection and rapid response.
- Identify action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday April 2, 2019 from 2:00pm-4:00pm

3:30 p.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(7) ADJOURNMENT**

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POSTED 3/8/2019

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)
Invasive Shot Hole Borer Sub-Committee
Survey – Early Detection and Rapid Response

Tuesday, March 19, 2019
2:00pm – 4:00pm
Meeting Notes

Meeting Action Items

- **Next Meeting: Tuesday, April 2, 2019, 2:00pm-4:00pm**
- **Sub-Sub-Committees:**

Sub-Sub-Committee	Charge	Participants
Trapping	Develop plan for trapping, including: • Where – high-priority areas • Where data should go, and who will get it there • Actions/response to new detections	**Coordinator:** Andrea Hefty **Participants:** Curtis Takahashi, John Kabashima, Madeleine Rauhe, Matt Kaiser, Ed Williams, Curtis Ewing, Richard Stouthamer, Tom Smith
Visual Surveys	Develop protocol for tiers of surveys, including: • Expertise for each tier • Tools • Reporting mechanisms • Where data should go, and who will get it there	**Coordinator:** Rosi Dagit **Participants:** Kim Corella, Sabrina Drill, Gretchen Heimlich, Beatriz Nobua-Behrmann, Jamie Whiteford, Abigail Barraza, John Kabashima

Other Action Items:

- **CDFA** to invite Orange County Parks to April 2 meeting
- **Rosi** will contact Rose, an arborist, to invite her participation and background her
- **Kevin** will share Mountain Area Task Force incident action plans
- **All**: send Rapid Response Plan examples to Rosi and David Pegos
- **Rosi/David**: distribute RRP examples to Survey Sub-Committee members, including Oregon example
- **Rosi** will share her draft RRP once prepared (by end of April)
- **Kyle** will share an RRP example
- **Matt** will share an RRP example
- **David** will identify for April 2 if the CDFA lab has capacity to handle samples
- **David** will work with Sean and Curtis T. to determine whether a draft version of statewide insect trapping guide content regarding SHB is sufficiently finalized to share
- **Working Group:** Report out initial discussions on April 2
- **All**: identify any concerns, opportunities, missing stakeholders, resources (local, grants, etc.) for discussion at the April 2 meeting

- **All**: Others interested in participating in a working group can contact Andrea Hefty, Ed Williams, David Pegos, or Rosi Dagit.

Meeting Proceedings

4. REVIEW OF THE SUB-COMMITTEE MISSION
Background
David Pegos of CDFA said AB 2470, signed by the governor in 2018, allocated $5 million to a coordinated statewide effort against invasive polyphagous and Kuroshio shot hole borers (SHB or ISHB). One section of the plan addresses surveys, early detection and rapid response. Interested individuals are invited to participate in this and other sub-committees, if they desire. Each sub- committee will meet four times at two-week intervals, while taking actions between meetings to make progress. The goal is for the sub- committees to produce information in two months, which Shannon Lynch will develop into a single report document. Tasks for the Survey Sub- Committee will include:

- Identifying how much of the $5 million is needed for short-term projects to achieve SHB survey and rapid response goals; and
- Helping to determine how many RFPs are needed, and the associated dollar amounts for each.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan
Identify key players that need to be involved
Sub-Committee members identified the following stakeholders or experts who may be missing and deserving of outreach to participate in this Sub-Committee:

- Santa Barbara County
- Shannon Lynch
- Agricultural commissioners from uninfested areas
- Are Central and Northern California sufficiently covered? Curtis T. has trapped in the North Bay.
- Ed represents Pest Prevention and keeps the chair (from Napa County) updated
- Border counties – is CDFA Santa Barbara represented?
    - Individuals who have trapped in both Santa Barbara and Ventura counties include Shelly Bennett, a graduate student, and Tom Dudley, head of that lab
    - Mike Pitcairn
    - Tamara Kleeman with San Luis Obispo County Agricultural Commissioner's Office, which caught one SHB in a trap, surveyed around that area and did not recover the beetle
- National Park Service – we have started talking with them regarding Channel Islands National Park
- Trapping in federal/state parklands requires going through a lengthy permitting process. We should have those agencies represented so they can do the trapping.
- Regarding local/county parks, we are reaching out to Ventura County Parks representatives. Bea has contact with Orange County Parks, and it would be helpful to include them in the next call.
- Arborists: The Society of Municipal Arborists could be invited.
- Regarding land conservancy groups/NGOs, Doug is representing that sector.

Identify issues, concerns and opportunities as they relate to Invasive Shot Hole Borer survey, including early detection and rapid response

Ed Williams noted that the Pathways/Greenwaste and Firewood Sub-Committee had identified the following issues:

- The need for trapping as an early detection tool
- The need for a strong understanding of where infestations exist now to limit the expansion of infested areas
- How to accomplish identification?
- It would be helpful to trap around Greenwaste/mulching facilities
- We need additional ideas around trapping

Andrea Hefty reviewed an online map of the current distribution of polyphagous and Kuroshio SHB, showing positive results from tissue samples for PSHB-related fungi and all results from trapping. (https://ucanr.edu/sites/pshb/Map/)

Dr. Hefty reviewed two trapping protocols:

- The UC Cooperative Extension/UC Riverside trapping guidelines, available on pshb.org at https://ucanr.edu/sites/pshb/files/271363.pdf. With a panel trap, a semiochemical is used to lure the beetles in. A lure lasts for four weeks. The Forest Service protocol is to leave the trap out for four weeks and either sample from it or leave it out for another flight window.
- Stacy Hishinuma's draft protocol. It includes websites for purchasing items, and additional details on how to set up a trap. One potential addition to this protocol is information from a document Richard Stouthamer provided on DNA testing of samples to identify polyphagous or Kuroshio species.

Sub-Committee members discussed surveying and trapping issues and other protocols that serve as templates.

- Should we be looking for other potential pests, which would require multiple lures?
  - I understood this was just for SHB
  - The goal of making this useful for Hawaii and Florida was regarding treatment and actions, not surveying.
  - We need to start with ISHB – maybe we could survey for other invasive pests as resources become available.
  - This is in response to legislation, which is why it is species-focused.
- Visual surveys are always preferred over traps
- Trapping and visual surveys are both part of early detection. Do we have a statewide early detection/rapid response template, addressing who is responsible in every jurisdiction, who does the incident action plan, who reports, how effectiveness is determined? We are working on one for Los Angeles County and I don't want to reinvent the wheel. I would like to put tiers into a bigger framework or schematic plan.
- There is a lot of experience among County agricultural commissioners regarding pest detections, and a general protocol. The quarantine rating for a particular insect determines response. Because the SHB is widespread, much work is necessary to clarify location issues in regard to our established protocols.

- A good example: in Ventura and Santa Barbara counties, until we do a real survey, we don't know if/how the infestation has spread. Santa Barbara County is the leading edge, and there, the Agricultural Commissioner has the ability to take action. Not in LA County.
- For a statewide survey, would it be regulatory or non-regulatory? The leading edge should be the first focus.
- We could hybridize that idea: 1. Start at the leading edge. 2. Then spread traps to other parts of the state to see what shows up. Akif, Shannon and Shelly have done work on this.
- We have done a trap and ground survey in most of Southern California. In Ventura County, we identified some areas – the beetle was not found except in traps. What is done when it is found in new locations? We don't yet have an action plan.
- What is our capacity to handle samples? Does it differ for polyphagous and Kuroshio?
- The different costs of regulatory and non-regulatory detection need to be identified.

Decision: The Sub-Committee created and populated a working group to develop a plan for trapping and response.

Discussion on visual surveying

- We need risk assessments, tools to determine risk. I have some climax models.
- I want to focus on volunteer visual surveys. Should that issue go to the Outreach/Education Sub-Committee? It's a really important tool. It can be difficult to identify all at-risk areas, including residential areas. I am thinking of the data that can be generated.
- The website could be used to provide volunteers with information on confirmation of visual surveys, or, alternatively, there could be a specific group of people who check out areas of highest risk.
- Citizen science versus representatives from each county doing a visual survey of the areas of highest risk. The latter is more useful.
- Rosi Dagit discussed her desire to develop a useful model of visual surveying. She identifies three tiers:
  1. Random, iNaturalist types of surveying
  2. Sabrina and Abby do an online certification program. Once "trained," people get a link to a web-based tool that the RCD funds and manages. Abby developed a tool, but only a few people are doing it. At this point, there aren't sufficient resources to handle many people being involved.
  3. As suggested, each county surveying areas of high-risk or high-value/importance – targeted, regular checks of these areas.

  She recommended a more coordinated/organized place to send all data, both visual surveys and trapping. Make it clear where to send data, and decide how to fund it.
- It could be an internal website.
- We are doing a survey of San Luis Obispo high-risk areas – a student crew is surveying County parks.
- Ventura County RCD is seeking funding for a Tier 1 approach.
- In Tier 2, if the area is leading edge, it would go to the regulatory arena.
- We need to place our own traps, with each county doing the work.
- The procedure to shave bark and sample tissue that Akif and Richard developed to identify K or P – it is a big difference, it's either from Southern California, or is naturally spreading its territory.

- The protocol needs to address how to confirm sightings, and where to go from there.

Decision: The Sub-Committee created and populated a working group to develop a protocol for varying tiers of visual surveying.

Mr. Pegos asked both committees to consider where the data will go: to the UC system? Who would take responsibility for getting the data to where it needs to go?

Discussion on rapid response

- A rapid response plan needs to identify which trees to take out.
- Orange County has a management matrix, a decision guide in relation to level of infestation, about what to do with a tree.
- Cooperative Extension does not have BMPs, nor a formal "rapid response" plan. We are recommending tree take if there are more than 150 entry-holes and die back, and have a list of susceptible and preferred species. We have tools to easily make a rapid response plan.
- Does CDFA have rapid response plans for other invasives, such as alder, gypsy moth, that we could adapt o SHB?
    - CDFA representatives were not aware of any rapid response plans for wood boring species.
- We need to identify the management effort for an infested tree – how to deal with it, and need a protocol for the beetle in new non-infested areas. In Ventura County, if I found an infested box elder tree, it was removed immediately as it could bring thousands of beetles to a new location.
- Fortunately in that case, there was a land conservancy trust that could pay the cost of taking out the tree, as the property owner did not have sufficient funds. For rapid response, what to do if the tree is on private land, a large tree, and there are no private funds available? If we have no quarantine and no quarantine authority. Even with the quarantine, there are issues about actions on private property.
- What about fire control as a rationale?
    - A tree almost needs to be dead before we could use nuisance abatement, but we could look at nuisance abatement.
- One rapid response idea: identify the key players before the infestation arrives, and funding for private property owners. Example: Mountain Area Task Force had agencies all working together on the bark beetle, Caltrans, etc., so we could immediately take action on the goldspotted oak borer.
- Where could we get funding for removals?
- Yes, that could be the most expensive part of the SHB issue.
- Do a pilot project in a high-risk area, the results go back to the Legislature, we seek funding to do it statewide.
- LA County has done a pilot GSOD project in Green Valley.
- Another issue is proper disposal once the trees are taken down.
    - The Pathways/Greenwaste Committee looked at identifying potential locations – all GSOD trees go to one facility, with a grinder reducing wood to less than 1 inch.
- Can we use the funding to buy equipment?
    - We could try with a pilot to test the concept.
- We had chippers and could chip them down.

- A natural area with endangered species, we need to address the impacts. CDFW and USFWS need to be brought in early so that is not a stumbling block.
- Look at other states with rapid response experience. There are USDA programs, but I've not heard success stories there.
- One Example: Oregon Department of Agriculture had another ambrosia beetle, crassiusculus, which was trapped in a high-risk area where they had imported railroad ties. They used a gypsy moth protocol to implement a trapping grid. They identified that the populations were very localized, and then followed an eradication protocol. This is an example of how other protocols can serve as templates.
- The glassy-winged sharpshooter is another insect without a good trap. Through visual surveys, we've been able to eliminate incipient infestations.
- Can infested trees be transported?
  - They need to be chipped on site ideally. They could be loaded up.
  - Los Angeles and Ventura counties are pretty much infested. The trees could probably be chipped in Los Angeles County.
- How difficult is it to move the chipper?
  - It's a trailer. If it is close to the tree, it could work.
- The arboretum has a stationary tub grinder that can handle very large trees.

Co-Chairs asked Sub-Committee members whether a rapid response subgroup should be created to consider the process for reviewing protocols already being used, in order to avoid reinventing the wheel if BMPs are working. There was not interest in creating another subgroup. Instead, it was decided that the full committee could look at protocols and consider, on the side, developing a pilot to prove.

The group agreed that members will identify concerns and opportunities to bring to the next meeting for discussion.

Additional crossover issues to refer to other committees:

- To Pathways/Greenwaste:
  - Potential transport methods for removed trees
  - Handling of chipped material needed to avoid spread of infestation
- To Research:
  - Handling of chipped material needed to avoid spread of infestation
- To Control/Suppression:
  - What to do when you find an infestation

Next Meeting – Tentatively, Tuesday, April 2, 2019 from 2:00pm to 4:00pm
Participants confirmed the date for the next meeting.

Agenda items for that meeting will include:

- The two sub-sub-committees sharing preliminary findings
- Additional discussion and resolution on those topics
- Discussion on what a statewide survey might look like
- Participation from regulatory and lab representatives

At Meeting 3, participants will flesh out remaining issues and tie up loose ends. At Meeting 4, the group will develop consensus on content for the report. At both Meeting 3 and 4, the group

will work to identify costs, including lab and non-regulatory survey costs, and will consider how the plan would be addressed through RFPs, including NGO involvement.

6. PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA
David Pegos offered each participant an opportunity to provide general comments. The following comments were recorded:

- **Curtis Ewing** is available as needed to work on surveying or trapping
- **Curtis Takahashi**: If there is statewide surveying, we need to identify who will look at the specimens. CDFA lab is a possibility, depending on the volume.
- **Dario Lombardo** can help trap in county parks
- **Evonne Fell** will share a CDFA document about removing HLB and trays
- **Hans Sin:** Endorses the comments about preparing for surveys on critical habitat and threatened and endangered species, to allow surveying to move more rapidly. Also, a rapid response plan should incorporate Akif's work with pesticides and small solutions.
- **John Kabashima:** Endorses Hans' comments. Rapid response will include different levels: tree treatment, tree removal, etc. We need funds for removal of trees from private lands. We are waiting for a proposal from CDFA labs on their ability to do determinations.
- **Julie Clark De Blasio**: For disadvantaged property owners, a possible RFP idea is a trust fund at the county or NGO level, which would be more expedient, to qualify people for assistance in treatments
  - **David:** Possible NGOs include Tree People, Urban Forest Council
- **Madeleine Rauhe**: A lot of our efforts focus on removing trees, not other potential options, nor what to do after. What about treatment, preventive pruning, reactive pruning, soil/trunk injections? Or are those actions the responsibility of the property owner?
  - **David:** Good point – is that part of early detection/rapid response? It will be part of the toolkit. This item is for this group as well as the Research Sub-Committee.
- **Patrick Gower**: Please keep USFWS updated on activities and endangered species areas
- **Sean Farnum**: We have a draft document not in the 2013 statewide Insect Trapping Guide with regard to SHB trapping, both species. CDFA will determine if this is at the stage where it could be shared**.**

7. ADJOURNMENT
Andrea Hefty and Ed Williams thanked everyone for their participation.
Dr. Hefty acknowledged the hard work that several participants have done on survey protocols, and encouraged anyone feeling stuck to reach out to them or the sub-committee Co-Chairs, who can connect them with a surveying expert.

Meeting Participants

Participant	Affiliation
Co-Chairs	
Dr. Andrea Hefty	U.S. Forest Service
Ed Williams	Ventura County Agricultural Commissioner
Participants	
Matthew Abbott	USDA, San Diego
Sara Allen	City of San Diego Parks And Recreation Department
Ariel Ambruster	Consensus and Collaboration Program, CSU Sacramento (notetaker)
Paige Anderson	City of San Diego
Abigail Barraza	UC Cooperative Extension
John Beall	Ventura County
Kyle Beucke	CDFA
Douglas Chudy	The Wildlands Conservancy, San Bernardino Mountains
Julie Clark De Blasio	UC Cooperative Extension
Kim Corella	CAL FIRE
Rosi Dagit	RCD of the Santa Monica Mountains
Sabrina Drill	UC Cooperative Extension, Los Angeles and Ventura counties
Amber Durant	CDFA
Akif Eskalen	UC Davis
Evonne Fell	CDFA
Jan Gonzales	UC Cooperative Extension, San Diego
Patrick Gower	US Fish and Wildlife Service
Gretchen Heimlich	Disneyland
Stacy Hishinuma	U.S. Forest Service
John Kabashima	UC Cooperative Extension
Khoa Lam	Los Angeles County Agricultural Pest Control Division
Daniel (Cheol MIn) Lee	CDFA
Dario Lombardo	County of San Diego Parks and Recreation
Beatriz Nobua-Behrmann	UC Cooperative Extension
Pat Nolan	San Diego County Agricultural Commissioner
Christopher Oesch	Dudek Environmental
David Pegos	CDFA (Convener and facilitator)
Madeleine Rauhe	Disneyland
Max Regis	Los Angeles County Agricultural Weights and Measures
Andrew Richards	CDFA
Kim Smith	SANDAG
Sheri Smith	U.S. Forest Service
Curtis Takahashi	CDFA
Nicole Tamura	Irvine Ranch Conservancy
Kevin Turner	CAL FIRE
Jerrold Turney	Los Angeles County Agricultural Weights and Measures
Jamie Whiteford	Ventura County RCD
Travis Whitney	City of San Diego
Sophia Yun	Orange County Agricultural Commissioner' s Office
Mark Berninger	City of San Diego
Curtis Ewing	CAL FIRE

Sean Farnum	CDFA
Chris Kallstrand	Dudek Environmental
Margo Sanchez	Imperial County
Hans Sin	CDFW
Richard Stouthamer	UC Riverside
Dorothy Abeyta	Davey
Gregg Bratcher	CAL FIRE
Ken Devore	CDFW
Anne Jarque	City of San Diego
Matt Slattengren	Contra Costa County Agricultural Commissioner's Office
Mike Parker	Alliance Land Care
Katie Herald	Board of Forestry
Joe Scheele	U.S. Customs and Border Protection
Tom Smith	CAL FIRE
Matthew Kaiser	CDFA
Michael Scholl	CDFA

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Survey – Early Detection and Rapid Response

Meeting Agenda
Tuesday, April 2, 2019

2:00pm – 4:00pm

Location: CDFA, Room 333
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/1588862869474690306

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Continue identifying issues, concerns and opportunities as they relate to Invasive Shot Hole Borers survey, including early detection and rapid response.
- Continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday, April 16, 2019 from 2:00pm-4:00pm

3:30 p.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(7) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)
Invasive Shot Hole Borer Sub-Committee
Survey – Early Detection and Rapid Response

Tuesday, April 2nd, 2019

Meeting Notes

Meeting Action Items

- **Next Meeting: Tuesday, April 16, 2019, 2:00pm-4:00pm**
- **Working Group:**

Sub-Sub-Committee	Charge	Participants
Trapping **Next meeting:** **April 9th 2019** **2-3pm.**	Develop plan for trapping, including: ● Where – high-priority areas ● Where data should go, and who will get it there ● Actions/response to new detections	**Coordinator:** Andrea Hefty **Participants:** Curtis Takahashi, John Kabashima, Madeleine Rauhe, Matt Kaiser, Ed Williams, Tom Smith, Jessika Mitchell, Curtis Ewing, Richard Stouthamer, Hans Sin
Visual Surveys. **Will continue via Email.**	Develop protocol for tiers of surveys, including: ● Expertise for each tier ● Tools ● Reporting mechanisms ● Where data should go, and who will get it there	**Coordinator:** Rosi Dagit **Participants:** Kim Corella, Sabrina Drill, Gretchen Heimlich, Beatriz Nobua-Behrmann, Jamie Whiteford, Abigail Barraza, John Kabashima, Curtis Takahashi
Rapid Response: **Next meeting:** **April 11th 2019** **10am.**	● Develop protocols for removal of highly infested trees in wildlands. ● Public outreach ● Regulator authority ● Funding	**Coordinator:** Ed Williams **Participants:** John Kabashima Chris Shogren, Rosi Dagit, Madeleine Rauhe, Andy Cline, Kim Corella

Other Action Items:

- **Tom Smith** will look at Calflora data for a Box Elder layer (amplifier tree).
- **Trapping Working Group** Collaborate with Greenwaste Pathways Working Group to develop protocols regarding trapping around Greenwaste Facilities.
- **All** review Visual Surveys Working Group report and send Rosi Dagit comments on the document by the end of next week (April 12th)
- **Alexey Tishechkin** loop in Dr. Stephen D. Gaimari
- **Kim Corella** will investigate CAL FIRE's ability to remove infested trees.
- **Michael Scholl** Set up Webinar for Subcommittee meetings. RRP
- **Rosi Dagit** will contact Rose, an arborist, to invite her participation and background her.

- **Kevin Turner** will share Mountain Area Task Force incident action plans. – Sent to Ventura, will send to Andrea Hefty, Ed Williams and Rosi Dagit.
- **All**: send Rapid Response Plan examples to Rosi Dagit and David Pegos **– DONE**
    - **Matt Kaiser and Curtis Takahashi** developed draft protocols and sent them to Andrea Hefty and Ed Williams. **- DONE**
- **Rosi Dagit/David Pegos**: distribute RRP examples to Survey Sub-Committee members, including Oregon example – Stacy Hishinuma sent it to Rosi Dagit
- **Rosi Dagit** will share her draft RRP once prepared (by end of April)
- **Kyle Beucke** will share an RRP example **- DONE**
- **Matt Kaiser** will share an RRP example **- DONE**
- **David Pegos** will identify for April 2 if the CDFA lab has capacity to handle samples
- **David Pegos** will work with **Sean Farnum** and **Curtis Takahashi** to determine whether a draft version of statewide insect trapping guide content regarding SHB is sufficiently finalized to share.

Meeting Proceedings

4. REVIEW OF THE SUB-COMMITTEE MISSION

Background

David Pegos of CDFA presented background for the convening of the subcommittees. In January of 2018 the ICSAC convened a statewide summit. Out of the summit came suggestions that were incorporated into AB 2470, signed by the governor in 2018. The bill allocated $5 million for a coordinated statewide effort against invasive shot hole borers (ISHB). The funds are ready to be disbursed and four subcommittees are tasked with advising how the funds should be allocated and helping develop the RFPs. Each subcommittee will meet four times at two-week intervals, while taking actions between meetings due to the tight timeline. This is the second of the four meetings. After the fourth meeting Shannon Lynch will compile the consensus of the subcommittees into a single report document. Simultaneously the subcommittees will utilize boilerplate RFP language from CDFA and CAL FIRE to begin developing the RFPs which will be discussed in a fifth meeting.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Trapping Working Group

Email Andrea Hefty if you are interested in joining the trapping working group.
Created a list Actions/response to new detections. Andrea Hefty walked the subcommittee through Climate Map model that could be used to decide placement of traps. Values above 20 are areas where the insect can survive well. The map showed Red and Orange areas where they climate is modeled to be good for the bug while yellow and blue areas are areas where it would have a harder time surviving. Andrea Hefty noted that the map helps define a northern edge that may be good to focus on. The data is getting refined so that the northern edge can be more clarified.

- Is the model based on experimental data or current distribution?
    - The model currently uses both experimental and current distribution
- Concerns about the climate model
    - There was concern that using current distribution data may not encompass the fact that the species has not reached equilibrium yet.

    - There was a further concern that since the beetle reproduces inside the tree that it may not be as subject to climate effects.
    - A climate based model may not accurately look at how the beetle is moved by human locomotion.
- If we are not going to prioritize by climate then what method will we use to prioritize?
    - It was suggested that host suitability should be included in the modeling.
    - NASA may have area satellite data that has tree types.
    - **Action Item: Tom Smith** will look at Calflora data for a Box Elder layer (amplifier tree).
- **Action Item: Dr. Kabashima** will reach out to Dr Paine regarding risk models
- Trapping group will continue work on trapping map.
- **Action Item:** Collaborate with Greenwaste Pathways Working Group to develop protocols regarding trapping around Greenwaste Facilities.
    - Suggestion that firewood dumps and campgrounds be added to the list of trapping areas.
    - Previous trapping in state parks found that increased infestations around camp grounds and maintenance yards.
    - Biomass facilities in Fresno area bringing biomass waste from Los Angeles area pose a risk and need trapping.
    - Visual surveys to fill in the gaps.
- The working group felt that trapping in Wildland riparian corridors and using visual survey more in the urban forest. The Ag Commissions may have the infrastructure for this as they trap for other invasives.
- People currently doing trapping in Riparian areas:
    - Boland
    - Fish and Wildlife
    - Lynch
    - Forest Service
- **Sheri Smith** asked if the map at PSHB.org is up to date with current trapping.
    - There has been some interagency surveys to figure out gaps in trapping.
    - Beatriz Nobua-Behrman is updating the map with data that is being sent to her and it is up to date with all the information they have received.
    - The map does not use a grid or transact system, it uses the information that is reported to UC ANR.
    - Some traps are set up in a grid, such as traps along the El Capitan River and Shannon's data.
        - Shannon Lynch's system might be a good model to use as protocols for riparian areas.
        - High-value trees, sensitive species, erosion control, protected native fish, historical value.
    - **Matt Kaiser**: wood boring survey focuses on ports of entry, campgrounds, and Greenwaste receivers.
        - Clarifying question, is there a protocol for spacing the traps. The traps usually have a spacing for the lures to not to interfere with each other.

Visual Survey Working Group
Started by thanking everyone in the sub-committee. The report represents a great collaborative effort. **Action Item**: All please send Rosi Dagit comments on the document by the end of next week.

Targeting trained professionals and training them regarding material already developed by UC ANR And Emerald Ash materials developed by Purdue University. Create an online tool similar to the Emerald Ash tool produced by Purdue. Have a lead agency identify areas of concern vs opportunistic reports.

- Jessika presented on TreeKeeper 8 a Davey proprietary tool can be used as a reporting tool.
    - 8th version. Jessika Mitchell has unlimited licenses. Admins can control people's permissions.
    - Data Layers, trap, map, county layers
    - Add polygons
    - Madeleine Rauhe and Christopher Shogren from Disney both use TreeKeeper 8. Christopher expressed concerns that Treekeeper8 will need someone experienced to manage it.
- Community Science. Naturalists may provide a lot of data that then needs to be sifted through.
    - Sycamore Protocol that was done with Master Gardeners.
    - Reporting tools could either be iNaturalists or Qualtrics Survey.
- **Action Item:** Kim Corella will look into CAL FIRE's ability to remove infested trees.
- Suggestion to use weed abatement ordinances.

Rapid Response Working Group
Ed Williams discussed templates that they pulled together. Mr. Williams Suggested that a Rapid Response Working group be added to focus in on turning the templates into protocols. Mr. Williams offered to lead the Working Group. Those interested in joining the working group were: Dr. Kabashima, Chris Oesch, Rosi Dagit, Madeleine Rauhe, Andy Richards, Kim Corella. Any others interested in joining the working group should contact Mr. Williams. Mr. Williams asked for feedback on the potential scope of the working group.
Suggestions included:

- Develop protocols for removal of highly infested trees in wildlands.
- Public outreach
- Regulator authority
- Funding

6. PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA

- Alexey Tishechkin had audio issues. Please email in comments.
- Chris Shogren will try to get Collin from the Climax modeling in on the next call.
- Jessika Mitchell is excited about building momentum.
- Madeleine Rauhe wanted to make sure she was getting emails regarding working groups that she is on.

Next Meeting – Tentatively, Tuesday, April 16, 2019 from 2:00pm to 4:00pm

7. ADJOURNMENT
Meeting adjourned at 4:02 pm.

Meeting Participants

Participant	Affiliation
Co-Chairs	
Dr. Andrea Hefty	U.S. Forest Service
Ed Williams	Ventura County Agricultural Commissioner
Participants	
Kyle Beucke	CDFA
Kim Corella	CAL FIRE
Rosi Dagit	RCD of the Santa Monica Mountains
Sabrina Drill	UC Cooperative Extension, Los Angeles and Ventura counties
Curtis Ewing	CAL FIRE
Katie Harrell	Board of Forestry
Gretchen Heimlich	Disneyland
Stacy Hishinuma	U.S. Forest Service
John Kabashima	UC Cooperative Extension
Matt Kaiser	CDFA
Bill Kirk	Orange County Parks
Andy Cline	CDFA
Jessika Mitchell	Davey
Beatriz Nobua-Behrmann	UC Cooperative Extension
David Pegos	CDFA (Convener and facilitator)
Madeleine Rauhe	Disneyland
Joe Sheele	Customs and Border Protection
Michael Scholl	CDFA
Chris Shogren	Disney
Tom Smith	CAL FIRE
Sheri Smith	U.S. Forest Service
Robert Suzuki	
Alexey Tishechkin	CDFA
Kevin Turner	CAL FIRE
Jamie Whiteford	Ventura County RCD
Rhonda Wood	Disney
Sophia Yun	Orange County Agricultural Commissioner's Office

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Survey – Early Detection and Rapid Response

Meeting Agenda
Tuesday, April 16, 2019

2:00pm – 4:00pm

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/5004275367242241

Dr. Andrea Hefty, Co-Chair
(909) 382-2871
Ed Williams, Co-Chair
(805) 388-4343, ext 2

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Review and continue identifying issues, concerns and opportunities as they relate to Invasive Shot Hole Borers survey, including early detection and rapid response.
- Review and continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Monday, April 29, 2019, from 2:00pm-4:00pm

3:30 p.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)
Invasive Shot Hole Borer Sub-Committee
Survey – Early Detection and Rapid Response

Tuesday, April 16th 2019

Meeting Notes

Meeting Action Items

- **Next Meeting: Monday, April 29, 2019 from 2:00pm to 4:00pm**
- Laboratory Working Group established 4/16/19

Working Groups:

Sub-Sub-Committee	Charge	Participants
Trapping:	Develop plan for trapping, including: ● Where – high-priority areas ● Where data should go, and who will get it there	**Coordinator:** Andrea Hefty **Participants:** Curtis Takahashi, John Kabashima, Madeleine Rauhe, Matt Kaiser, Ed Williams
Visual Surveys:	Develop protocol for tiers of surveys, including: ● Expertise for each tier ● Tools ● Reporting mechanisms ● Where data should go, and who will get it there	**Coordinator:** Rosi Dagit **Participants:** Kim Corella, Sabrina Drill, Gretchen Heimlich, Beatriz Nobua-Behrmann, Jamie Whiteford, Abigail Barraza, John Kabashima, Curtis Takahashi
Rapid Response:	● Develop protocols for removal of highly infested trees in wildlands. ● Public outreach ● Regulator authority ● Funding	**Coordinator:** Ed Williams **Participants:** Dr. Kabashima Chris Oesch, Rosi Dagit, Madeleine Rauhe, Andy Richards, Kim Corella

Laboratory Working Group	● Develop a system for laboratory Identification that would involve initial screenings and follow-up official identification for action. ● Report at the next meeting	**Coordinator:** Shannon Lynch **Participants:** Steve Gumari, Alexey Tishechkin, Richard Stouthammer, Akif Eskelon, John Kabashima, Curtis Takahashi. Suzanne Latham, Sheryl Blomquist and Nick Condos.

Other Action Items:

- **Dr. Kabashima** get rapid response matix to Rosi Dagit, Andrea Hefty, and Ed Williams.
- **Rosi Dagit** is heading out of town Friday 4/26 so all feedback on the protocols needs to be submitted to her by then.
- **Rosi Dagit** will add to the trapping document we include months for general trapping that are higher elevation.
- **Tom Smith** will hold meeting of key stakeholders in the data, including Sabrina Drill and Shannon Lynch.
- **David Pegos** will reach out to Parks and Rec and Martha Volkov with CDFW about collaboration.
- **Tabled to Education and Outreach Sub-Committee** develop outreach materials for the leading edge.
- **Tabled to research Committee** agreement that it would be worth looking at effect of removal of amplifier trees in a larger context.
- **Tabled to the Pathways Sub-Committee** to identify areas of leap frog risk such as Greenwaste facilities, nurseries, campgrounds and firewood distribution points, for trapping.
- **Tabled to the IPM Working Group:** Effectiveness Evaluation.

Consensus Reached:

- Remove section on specific reproductive hosts from the protocols.
- FRAP to the protocols as the centralized data and reporting.

Suggested Requests For Proposals:

- Risk Assessment and data management input and reporting in order to track effectiveness.
- Augment AG Commissions contracts to include ISHB trapping.
- US Forest Service trapping.

Meeting Proceedings

Sub-Committee co-chair Commissioner Ed Williams called meeting to order at 2:07 pm. Commissioner Williams reviewed the minutes from the first meeting on March 19th asked for a motion to approve the minutes. Tom Smith moved to approve the minutes. Kevin Turner seconded the motion. There were no objections so the minutes were approved by consensus. Commissioner Williams reviewed the April 2nd meeting minutes. Tom Smith moved to approve the minutes, Kevin Turner seconded. With no objections, the minutes were approved by consensus.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Laboratory Services

David Pegos of CDFA introduced Dr. Steve Gumari who

- Dr. Gumari recommended that captured bugs be cleaned of sticky stuff and also noted that there may be a lot of bugs.
    - There was some discussion of whether it is needed to identify the fusarium.
    - A suggestion that only a sample of specimens be taken to do DNA analysis or fusarium analysis.
- Dr. Richard Stouthammer has been identifying beetles on a pro-bono basis we have been identifying which ISHB. Their costs have been about $1 per identification.
    - Shelley Bennett is applying for a grant to get machinery to also do the identification.
    - Dr. Kabashima and Mrs. Lynch were both supportive of identifying the kind of beetle PSHB vs KSHB.
    - Stouthammer Laboratory has a capacity of doing about 240 identifications per day.

There was discussion of whether there needed to be an official CDFA identification for potential tree removal.

- Commissioner Williams suggested a two-pronged approach, one for the leading edge and one for already infested areas.
    - Mr. Pegos suggested that there was value in doing a regulator sample before talking to the homeowner.
    - There was a suggestion that since all ISHB are all rated B so they do not need to be distinguished for action.
- There a question regarding of the removal of amplifier trees.
    - Disney has removed amplifier trees with great success.
    - Dr. Kabashima also noted the success of removing box elders in Ojai.
    - There was discussion of whether the data from Disney and Ojai were anecdotal or causal.

Tabled to research Committee agreement that it would be worth looking at effect of removal of amplifier trees in a larger context.

- **Action Item:** Laboratory Working Group established
    - Develop a system for laboratory Identification that would involve initial screenings and follow-up official identification for action.
    - Working Group Report at the next meeting
- There was a suggestion that Risk Assessment and Data Management be grouped into one person or agency.
    - Shannon Lynch is working on a regional statewide assessment.
    - **RFP:** Risk Assessment and Data management input and reporting in order to track effectiveness
        - Davey is willing to offer a pilot program of their software.

        - Fire Resource Assessment Program (FRAP) has agreed to be the host for data.
- **Action Item: Tom Smith** will hold meeting of key stakeholders in the data, including Sabrina Drill and Shannon Lynch.

Visual Survey Working Group

Rosi Dagit reported on the updated draft of the Survey Working Group Protocols included edits from working group members. Items of the plan highlighted in yellow are areas that need to be addressed.

- Do we want to develop a specific protocol on identifying specific reproductive hosts?
    - Dr. Eskalon is keeping a list of reproductive hosts.
    - **Consensus** removing section from the protocols.
- **Consensus** to add FRAP to the protocols as the centralized data and reporting.
- **Action Item: Rosi Dagit** is heading out of town Friday 4/26 so all feedback on the protocols needs to be submitted to her by then.
- **Tabled to the IPM Working Group:** Effectiveness Evaluation.

Trapping Working Group

Commissioner Williams reported that the Trapping Working groups primary focus be identifying the leading edge and high-risk areas within those counties. Trapping would be deployed twice a year, spring and fall. Looking to develop protocols for number of traps and distance between traps.

- There was discussion of whether there was a proven method to prevent spread even if the leading edge.
- There was a suggestion that the leading edge may not be as important to spread as human assisted pathways like firewood.
- **Tabled to the Pathways sub-committee** to identify areas of leap frog risk such as Greenwaste facilities, nurseries, campgrounds and firewood distribution points, for trapping.
    - There was discussion of whether the climax could be used to limit the leap frog risk area.
- Discussion of whether we can collaborate with other trapping that is going on.
    - Current trapping going on in Santa Cruz and offers to trap around firewood transfer areas in northern California.
- **RFP**: Augment AG Commissions contracts to include ISHB trapping.
- **RFP**: US Forest Service trapping
- Hanz with CDFW does mostly visual surveys but would be happy to collaborate to do more trapping.
- **Action Item**: David Pegos will reach out to Parks and Rec and Martha Volkov with CDFW about collaboration.

Rapid Response Working Group

Rosi Dagit reported that the Rapid Response Working Group has asked Dr. Kabashima and UC ANR to develop a Rapid Response Protocol for Leading Edge areas. She stressed the importance of outreach and education regarding getting the public on board on why tree removals will be important.

- Grantees will have to be CEQA requirement.

- Kim Corella is working on researching zones of infestation language.
    - Suggestion to make an interagency agreement between CDFA and CAL FIRE to remove trees.
- **Tabled to Research Sub-Committee**: Discussion of whether was a need to build the KSHB host list.
    - Look at botanical gardens in San Diego.

6. PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA

- Curtis Takahashi asked the timeline for rapid response, hours days weeks, months.
- Dr. Kabashima **Action Item:** get rapid response matix to Rosi Dagit, Andrea Hefty, and Ed Williams.
- Kevin Turner **Tabled to Education and Outreach Subcommittee** develop outreach materials for the leading edge.
- Sheri Smith suggested **Action Item: Rosi Dagit** will add to the trapping document "best months for general trapping at higher elevation."

Next Meeting – Tentatively, Monday, April 29, 2019 from 2:00pm to 4:00pm

7. ADJOURNMENT

Commissioner Ed Williams thanked everyone and reminded everyone that the by the 29th the Sub-Committee needs to have some well-defined plans to vote on. Meeting was adjourned at 4:20pm.

Meeting Participants

First Name	Last Name	Affiliation
Co-Chairs		
Andrea	Hefty	U.S. Forest Service
Ed	Williams	Ventura County Agricultural Commissioner
Participants		
Abigail	Barraza	UC ANR
Julie	Clark De Blasio	UC ANR
Kim	Corella	CAL FIRE
Nick	Condos	CDFA
Corin	Choppin	CSUS CCP (notetaker)
Rosi	Dagit	Santa Monica Mountains RCD
Steve	Gaimari	CDFA
Gretchen	Heimlich	Disney

Katie	Harrell	Board of Forestry
John	Kabashima	UC ANR Emeritus
Matt	Kaiser	CDFA
Shannon	Lynch	UC Santa Cruz
Jessika	Mitchell	Davey
David	Pegos	CDFA (Convener & Facilitator)
Beatriz	Nobua-Behrmann	UC ANR
Madeleine	Rauhe	Disney
Christopher	Shogren	UC Riverside
Michael	Scholl	CDFA
Hans	Sin	CDFW
Sheri	Smith	US Forest Service
Richard	Stouthammer	Stouthammer Labs
Curtis	Takahashi	CDFA
Alexey	Tishechkin	CDFA
Kevin	Turner	CAL FIRE
Jamie	Whiteford	Ventura County Resource Conservation District
Rhonda	Wood	Disney
Sophia	Yun	Orange County Ag Commissioner's Office

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Survey – Early Detection and Rapid Response

Meeting Agenda
Monday, April 29, 2019

2:00pm – 4:00pm

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/5655984968652793603

Dr. Andrea Hefty, Co-Chair
(909) 382-2871
Ed Williams, Co-Chair
(805) 388-4343, ext 2

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Finalize and approve issues, concerns and opportunities as they relate to Invasive Shot Hole Borers survey, including early detection and rapid response.
- Finalize and approve action items and potential request for proposals (RFP) concepts.
- Next Meeting to discuss RFPs – Tentatively, Monday, May 20, 2019, from 2:00pm-4:00pm

3:30 p.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)
Invasive Shot Hole Borer Sub-Committee
Survey – Early Detection and Rapid Response

Tuesday, April 29th 2019

Meeting Notes

Meeting Action Items

- **Next Meeting: Monday, May 20th, 2019 from 9:00 am to 11:00 am**

Working Groups:

Sub-Sub-Committee	Charge	Participants
Trapping:	Develop plan for trapping, including: ● Where – high-priority areas ● Where data should go, and who will get it there	**Coordinator:** Andrea Hefty **Participants:** Curtis Takahashi, John Kabashima, Madeleine Rauhe, Matt Kaiser, Ed Williams, Tom Smith, Jessika Mitchell, Curtis Ewing, Richard Stouthamer, Hans Sin
Visual Surveys:	Develop protocol for tiers of surveys, including: ● Expertise for each tier ● Tools ● Reporting mechanisms ● Where data should go, and who will get it there	**Coordinator:** Rosi Dagit **Participants:** Kim Corella, Sabrina Drill, Gretchen Heimlich, Beatriz Nobua-Behrmann, Jamie Whiteford, Abigail Barraza, John Kabashima, Curtis Takahashi
Rapid Response:	● Develop protocols for removal of highly infested trees in wildlands ● Public outreach ● Regulator authority ● Funding	**Coordinator:** Ed Williams **Participants:** Dr. Kabashima Chris Oesch, Rosi Dagit, Madeleine Rauhe, Andy Richards, Kim Corella

Laboratory Working Group	• Develop a system for laboratory Identification that would involve initial screenings and follow-up official identification for action • Report at the next meeting	**Coordinator:** Shannon Lynch **Participants:** Steve Gumari, Alexey Tishechkin, Richard Stouthamer, Akif Eskalen, John Kabashima, Curtis Takahashi, Suzanne Latham, Sheryl Blomquist and Nick Condos

Other Action Items:

- **David Pegos** will inquire regarding a trapping coordinator (Matt Kaiser).
- **Shannon Lynch and Tom Smith** will confirm with Akif Eskalen that there are no new costs associated maintenance of current map.
- **Tabled to Research** need to identify protocols that nurseries can take to be declared free from ISHB.

Consensus Reached:

- Dr. Akif Eskalen's current map located on PSHB.org will be the unified map.
- Requests for proposals' will use sticky traps.
- Counties will do the initial screening.
- CDFA will be the centralized place samples are sent to. New locations will trigger samples that need molecular analysis will be sent to Dr. Stouthamer's lab.

Suggested Requests For Proposals:

- One full-time trapper and visual inspector each doing 10 to 15 traps per day March through October in 5 leading edge counties (Los Angeles, San Bernardino, Ventura, Santa Barbara, Riverside).
- 48 to 50 traps in Tier 2 counties Kern and SLO (contiguous to the leading edge counties).
- 20-24 traps bi-weekly servicing per county in remaining counties.
- A coordinator to help prioritize the trapping locations and density. (Dr. Stouthamer)
- Training Program for visual surveys with one trapper and visual inspector.
- Trapping program at large tree nurseries in GWIS infested areas.
    - Follow-up survey work when there is a detection to determine the source of the trap find.
- Homeowner permission tree removals as long as they are CEQA compliant.
- In Coordination with Outreach and Education Sub-Committee develop a Rapid Response Kit for Leading Edge Counties. PR, Education, etc.

Meeting Proceedings

Sub-Committee Co-chair Commissioner Ed Williams called meeting to order at 2:06 pm. Commissioner Williams reviewed the minutes from the meeting on April 16th and asked for a

motion to approve the minutes. Shannon Lynch moved to approve the minutes. Curtis Takahashi seconded the motion. There were no objections so the minutes were approved by unanimously.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan
Laboratory Services
Shannon Lynch reported that the laboratory working group met to come to a consensus regarding labs.

The working group had many questions regarding:

- Who is doing the sampling?
- How many samples they will need to process?
- Who will be sending the samples?
- If the samples will be needed for a regulatory purpose.

Ms. Lynch clarified that CDFA has the equipment to do molecular analysis but it may be more efficient to forward samples that need molecular analysis to Dr. Stouthamer's lab.

In future working group meetings the labs will coordinate to set up protocols. The laboratory services working group, who will be sending the samples, and if the samples be needed.

It is their working group recommendation that regulatory samples will be sent first to CDFA but then can also be shared with other labs as needed.

Trapping working group is developing a leading edge.

Consensus that Akif Eskalen's current map located on PSHB.org will be a unified map.

Trapping Working Group

- **RFP**: one full-time trapper and visual inspector each doing 10 to 15 traps per day March through October in 5 leading edge counties (Los Angeles, San Bernardino, Ventura, Santa Barbara, Riverside)
- **RFP**: 48 to 50 traps in Tier 2 counties contiguous to the leading edge counties 48 to 50. Kern and SLO.
- **RFP**: 20-24 traps bi-weekly servicing per county in remaining counties.
- **Consensus** around using sticky traps.
- **Consensus** that the counties will do the initial screening.
- **Consensus** CDFA be centralized place samples get sent to.
- Dr. Stouthamer's lab could do batching of samples to see percentages of each species.
- Molecular identification could be useful in identifying pathways.
- CalMap grid developed by Los Angeles County.
- There was some discussion about UC ANR continuing to be the mapping hub.
- **Action Item: Shannon Lynch and Tom Smith** will confirm with Akif Eskalen that there is no new costs associated maintenance of current map.

- It was agreed if the beetle is a new site then the beetle should be sent to Dr. Stouthamer's lab for further analysis.
- Shannon stated that in Topanga Canyon they spaced traps 1 mile apart.
- Augment existing contracts and create new contracts where no current trapping contract exists.
- **RFP** a coordinator to help prioritize the trapping locations and density. (Dr. Stouthamer)
- **Action item:** David Pegos will inquire regarding a trapping coordinator. (Matt Kaiser).
- U.S. Forest Service will continue to do trapping and will submit trapping data to Beatriz Nobua Behrman (current online map)
- **RFP**: For county Agricultural commissioner's sets up grid trapping program at each of the large tree nurseries.

Tabled to Research need to identify protocols that nurseries can take to be declared free from ISHB.

Visual Survey Working Group
Done by county or NGOs as a follow up to trap finds. UC ANR has Master Gardeners for Urban areas and CDFW has team for forested area.

RFP Training Program for Visual surveys one trapper and visual inspector.
Citizen Scientist Observers in Leading Edge Counties similar to what Rosi Dagit is developing.

Rapid Response Working Group
Ed Williams went over the rapid response matrix developed by Dr. John Kabashima. There was discussion regarding regulatory hurdles of removing trees on private property. Those receiving RFP funds will be required to be CEQA compliant. CDFA has had a lot of success with voluntary compliance with citrus trees.

6. PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA

- Curtis Ewing had a concern that it will be hard to train people in the north state in visual survey. He requested that there be funds both to transport people into the infested areas so they can see the pest or send up samples of infested trees to northern California ag commissioners offices.
- Sophia Yun received clarification why we are using the GWIS infested area nurseries.

Next Meeting – Tentatively, Monday, 20th, 2019 from 9:00am to 11:00am

7. ADJOURNMENT
Meeting was adjourned at 4:33pm.

Meeting Participants

First Name	Last Name	Affiliation
Co-Chairs		
Andrea	Hefty	U.S. Forest Service

Ed	Williams	Ventura County Agricultural Commissioner
Participants		
Elizabeth	Brusati	Fish and Wildlife Service
Julie	Clark De Blasio	UC ANR
Kim	Corella	CAL FIRE
Corin	Choppin	CSUS CCP (notetaker)
Curtis	Ewing	CDFA
Matt	Kaiser	CDFA
Shannon	Lynch	UC Santa Cruz
Ericka	Mora	City of Santa Rosa
David	Pegos	CDFA (Convener & Facilitator)
Joe	Scheele	Customs and Border Protection
Christopher	Shogren	UC Riverside
Michael	Scholl	CDFA
Tom	Smith	CAL FIRE
Curtis	Takahashi	CDFA
Kevin	Turner	CAL FIRE
Sophia	Yun	Orange County Ag Commissioner's Office

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borer Sub-Committee

Pathways – Including Green Waste and Firewood

Meeting Agenda
Monday, March 18, 2019

2:00pm – 4:00pm

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/2640391809526117891

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Identify key players that need to be involved.
- Identify issues, concerns and opportunities as they relate to the Artificial Movement (Pathways) of ISHB via Green Waste and Firewood
- Identify action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Monday April 1, 2019 from 2:00pm-4:00pm

3:30 p.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(7) ADJOURNMENT**

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POSTED 3/8/2019

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING
Invasive Shot Hole Borer Sub-Committee Pathways – Including Greenwaste and Firewood
CDFA, Room 220
Monday, March 18, 2019 2:00pm – 4:00pm Meeting Minutes

Meeting Action Items
Next Meeting: Wednesday April 3rd 9am to 11am
Working Groups:

Sub-Sub-Committee	Charge	Participants
Greenwaste	• **Develop Best Management Practices and Procedures for Greenwaste Sites** • **Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies.** • **Discuss potential pilot programs** • **Identify potential other utilizations of wood products**	**Coordinator:** Keith **Participants:** Bob, Nick, Justin Milan, Shikari Ota, Neill Edgar, Nawal, Darren Ross, Kathy, Sheri, Ed, David C., Larry Swan, Waste Hauler & Composter Organizations
Firewood	• **Identify potential resources and solutions**	**Coordinator:** Kevin **Participants:** Leigh, Faith, Curtis E., Sheri, Helene and Andrea

Other Action Items:

- ***Leigh Greenwood*** *email Kevin Turner regarding Western Plant Board meeting in San Diego in May. Kevin will distribute.*
- ***Matt Abbott*** *will get us a contact for the Emerald Ash Borer project.*
- *Bob Horowitz to provide current outreach poster for Greenwaste.*
- ***Tabled to education and outreach meeting****: information about untreated wood for pallets.*
- ***Tabled to research committee****: Examine the pathway repurposing urban wood with kiln ovens.*
- ***Tabled to education and outreach meeting****: hobby wood.*
- ***Tabled to research committee****: solarizing wood*

Meeting Proceedings

Background

Subcommittee Co-Chair Kevin Turner, CAL FIRE called the meeting to order at 2:02 pm. David Pegos, CDFA, gave a brief overview of the committee purpose and goals. AB2470 allocated 5 million for suppression of shothole borer. He has scheduled 4 meetings, 2 weeks apart so we can move quickly on the plan and execute the plans with the funds available. Goal is to have consensus by the 4th meeting so that Shannon Lynch can pull the 4 pieces together.

Simultaneously we will be working on RFPs at a 5th meeting. This committee is tasked with determining how much of the $5 million will be utilized by the pathways sub-committee and how many RFPs will it be divided by. We have draft RFP language from CDFA and CAL Fire to start with. The goal of this first subcommittee meeting is to identify key action items and players. Upcoming subcommittee meetings on survey, research and education and outreach are scheduled for later this week.

Greenwaste

Mr. Turner lead a discussion on Greenwaste within counties.

- Transportation of Greenwaste.
- Recent data to show that ISHB were being found around Greenwaste disposal sites.
    - *Rosi Dagit further clarified that they trapped around several Greenwaste sites in LA within 100 to 200 meters of Greenwaste facilities in 2017.*
- Recommendation that waste management facilities have a protocol on trapping.
    - Additionally, there is a need to address landscapers who have yards.
    - Mr. Turner asked if we have best management practices for Greenwaste Facilities?
        - Dr. Horowitz thinks that would be good to develop. – Action Item
    - Very few handlers have compliance agreements. There are not that many known facilities. Not all are permitted.
    - Potentially need to expand regulations to include chip and grind facilities – *notification requirements.*
    - Recommendation that Local Agricultural Commissioners Partner with LEAs. Santa Clara did joint inspections. Utilization and disposal options.
- Create a working group of Cal Recycle, LEAs, Waste Hauler Associations, Composter organizations, Ag Commissioner Staff.
    - If interested in joining the subcommittee email kevin.turner@fire.ca.gov.
- Concerns on scope there a vast range of chipping sites.
- Identify a budget from the different groups to create the added capacity as well as making future requests to local and state governments.
- There was discussion over whether quarantine might be useful.
    - Discussion that an ISHB/FD quarantine is not feasible and that there is currently a lack of capacity to deal with all of the infested Greenwaste produced with in infested areas.
- Suggestion to move Greenwaste to areas that are not great habitat for ISHB.

- Difficult to regulate chip and grinds. Many "chip and grinds" we are not currently regulating that we could regulate. They are not permitted and under a voluntary notification system.
- LEAs can help reach out to local chip and grinds.
- Shannon Lynch is developing a model for predicting the most vulnerable to identify locations of highest risk.
- Bio generation plants are going out of business which could have been beneficial in destroying infested Greenwaste.
    - California forest fire task force are looking at increasing capacity of disposal and utilization, potential partner.
- 1-inch chipping has been shown to be over 90% effective in killing ISHB, suggestion of buying chippers in high-risk areas
- Beatles are still present in dead trees, they even live in stumps as long as beetles have something to feed on

Firewood

The discussion on firewood revolved around some of the great work already being done and the importance of compiling a list of current programs.

- "Don't move firewood" movement through nature conservancy.
- California Firewood taskforce has an education and outreach focus.
- There is no mechanism to preclude ISHB/FD infested wood from being moved outside of the state.
- Concern that EAB quarantine is going to be lifted and may lead to to a greater chance that EAB could be introduced into California
- Western Plant Board meeting in San Diego in May. Will be a significant portion dedicated to their firewood project seeking a common approach to firewood.
    - Mr. Pegos noted that unfortunately we will need to wrap up this process prior to that meeting.
- There was consensus to include Wisconsin method including firewood dealer certification, best management practices
- California does not have a certification for heat treated firewood which is needed to make it commercially viable
- Suggestion to create park regulations for firewood.
- Research needed on how the wood is being moved.
- Current legislation AB 257 adds a requirement for Bio mass drop offs that would then have to go to Bio Mass. CISAC may want to comment. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB257

- *Next Meeting scheduled for Monday April 3, 2019 from 9:00am-11:00am*

The Sub Committee adjusted the next meeting from April 1st to April 3rd due to Caesar Chavez Day.

Public Comment

- Buying people equipment that would reduce the risk. Help people get the chipper.
- Tracking firewood dealers would help with our biggest weakness. Get people to buy firewood more locally. Track and register firewood dealers.
- Working groups should be looking at other resources.
- Consider different costs of the solutions in the subcommittees. Who are the different target audiences for education and outreach? What are the economics involved for those target audiences may help get them to change their behaviors?
- Like the idea of the particle size down to one inch then they could ship to where ever they wanted; are county use permits a part of this process?
- They do need a use permit, to do composting, they need a temporary permit that triggers CEQA, then they will get a solid waste, and they need air quality permits.
- We could look at conditions for permits. Contracts with existing environmental agencies.

BMPs into those.

- Increase traps around waste facilities.
- Do not focus on the ISHB biology as we should prepare for future pests.
- There are probably a lot of funds that we are not getting because we are not asking for them.
- Can parks regulate which firewood are entering their properties.
- Should Water Board and Air Board be involved due to permitting.
- Needs to be a partnership of LEA and local agriculture boards
- Clarify what products you want the two working groups to come up with. Will also miss the outreach education meeting tomorrow, and the April 3rd meeting.
- New test for the fungus. Paper was just accepted. Now we need to implement it.
- Compost facilities are highly desired, have a compost pilot program, take in 600 tons in orange county Greenwaste. Ab 1381 that may increase that. Not currently tracking the haulers.
- We could work on Greenwaste reduction through drought tolerant landscaping.

Adjourn

Tom Smith, adjourned at 4:15. Next meeting will be Wednesday April 3rd 9am to 11am.

Meeting Participants

Participant		Affiliation
Co-Chairs		
Kevin	Turner	CAL FIRE

Tom	Smith	CAL FIRE
Participants		
Matthew	Abbott	USDA, San Diego
Dorothy	Abeyta	Davey Tree Expert Company
Lisa	Andreano	State Parks
Abby	Barraza	UC ANR
John	Beall	Ventura County
Kyle	Beucke	CDFA
Gregg	Bratcher	CAL FIRE
Ronald	Bray	Riverside County
Faith	Campbell	Center for Invasive Species Prevention
Corin	Choppin	Consensus and Collaboration Program, CSU Sacramento (notetaker)
Douglas	Chudy	The Wildlands Conservancy
Julie	Clark De Blasio	UC ANR
Nick	Condos	CDFA
Kim	Corella	CAL FIRE
Kathryn	Cross	Orange County
Timothy	Crothers	West Coast Arborists, Anaheim
Rosi	Dagit	Santa Monica Mountains RCD
Weena	Dalby	Orange County Waste and Recycling
Amber	Durant	CDFA
Rose	Epperson	Western Chapter ISA
Curtis	Ewing	Firewood Task Force
Ben	Faber	UC ANR
Jan	Gonzales	UC ANR
Mel	Graham	Agricultural Commission
Leigh	Greenwood	The Nature Conservancy

Steven	Halligan	Orange County
Andrea	Hefty	USDA
Katie	Harrell	Board of Forestry
Bob	Horowitz	Cal Recycle
Anne	Jarque	San Diego
John	Kabashima	UC ANR Emeritus
Jason	Leathers	CDFA
Shannon	Lynch	UC Santa Cruz Doctoral Student
Mariah	Mills	San Diego
Warisa	Niizawa	Orange County
Beatriz	Nobua-Behrmann	UC ANR
Keith	Okasaki	CDFA
Mike	Parker	Alliance Land Care
Max	Regis	Los Angeles County
Amit	Sandhu	Stanislaus County
Joe	Scheele	Customs and Border Protection
Michael	Scholl	CDFA
Matt	Slattengren	Contra Costa County Ag Commission
Sheri	Smith	Forest Service
Brian	Stark	The Ojai Valley Land Conservancy
Curtis	Takahashi	CDFA
Jonathan	Trumbull	Orange County Parks
Jerrold	Turney	Los Angeles County Ag Commissioner
Jennifer	VanDyke	CDFA
Ed	Williams	Ventura County Ag Commission
Karey	Windbiel-Rojas	UC ANR
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borer Sub-Committee

Pathways – Including Green Waste and Firewood

Meeting Agenda
Wednesday, April 3, 2019

9:00am – 11:00am

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/2206477242494120706

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Continue identifying Issues, Concerns and Opportunities as they relate to the Artificial Movement (Pathways) of ISHB via Green Waste and Firewood
- Continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Wednesday, April 17, 2019 from 9:00am-11:00am

10:30 a.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(7) ADJOURNMENT**

To request special accommodations for those persons with disabilities, please contact David Pegos at (916) 654-0317

AMERICANS WITH DISABILITIES ACT

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ACTION IS POSSIBLE ON ANY ITEM CONTAINED IN THIS AGENDA. ITEMS LISTED ON THE AGENDA MAY BE CONSIDERED IN ANY ORDER AT THE DISCRETION OF THE COMMITTEE.

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Pathways – Including Green Waste and Firewood
Meeting Minutes
Wednesday April 3rd, 2019
9:00pm – 11:00am

Meeting Action Items

- **Next Meeting: Wednesday April 16th 9am to 11am**

Working Groups	Charge	Participants
Green Waste	**Develop Best Management Practices and Procedures for Green Waste Sites** **Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies** **Discuss potential pilot programs** **Identify potential other utilizations of wood products**	**Coordinator:** Keith Okasaki **Participants:** Bob Horowitz, Kathryn Cross, Sheri Smith, Ed Williams, Nick Condos, Larry Swan. **Requested Adds:** Julie Clark De Blasio, Kevin Turner, Neil Edgar
Firewood	**Identify potential resources and solutions**	**Coordinator:** Kevin Turner **Participants:** Leigh Greenwood, Faith Campbell, Curtis Ewing, Sheri Smith, Helena Roberts and Andrea Hefty **Requested Add:** Katie Harrell

Short Term Action Items

- **Green Waste Working Group** work with Local Enforcement Agencies (LEAs) in Ventura county to identify smaller entities (mom and pop shops).
- **Green Waste Working Group** develop scope of work for LEAs.

Long Term Action Items

- **California Firewood Taskforce** to get Orange County Parks template for other counties and the state.

Other Action Items:

- **Keith Okasaki** will retrieve a copy of report, hours, footprint and cost of LA County Local Enforcement Agencies (LEAs) where they took quarantine maps and overlayed with Green Waste facilities.
- **Keith Okasaki will reach out to Bob** to identify LEAs Ventura county and affirm that they are interested.
- **Beatriz Nobua-Behrmann** send solarization BMP to Keith. **- DONE**
- **Julie Clark De Blasio** will reach out to Ag Commissioners to identify LEAs in Ventura County.
- **Firewood Working Group** and **Education and Outreach Committee** will provide information to CDFA to modify the Firewood Task Force website to include maps and firewood regulations.
- **Leigh Greenwood** will lead discussion at Western Plant Board in May. Discuss next steps in EAB/federal certification of firewood to help facilitate western states working together.
- **Matt Abbott** will get us a contact for the Emerald Ash Borer project.
- **Bob Horowitz** to provide current outreach poster for green waste.
- **Table to Survey Sub-Committee** Sampling large box tree nurseries in infested areas to confirm that they are not a problem.
- **Tabled to Education and Outreach Sub-Committee**: Information about untreated wood for pallets.
- **Tabled to Education and Outreach Sub-Committee**: Hobby wood.
- **Tabled to Research Sub-Committee**: Examine the pathway repurposing urban wood with kiln ovens.

Meeting Proceedings

Subcommittee Co-Chair Kevin Turner convened the meeting at 9:04. The committee dispensed with the flag salute since the majority of attendees were remote. Mr. Turner reviewed the notes from the previous meeting. We will vote to approve the minutes for both first and 2nd meeting at the next meeting. He noted that it was important that the Outreach Committee tackle Hobby/repurposed wood which was an action item from the previous pathways meeting.

Background

David Pegos, CDFA, gave a brief overview of the committee purpose and goals. AB2470 ~~allocated~~ required the CISAC to develop a plan and allocated to implement ~~that~~ a response plan to utilize the $5 million allocated for suppression of the Invasive ~~shot~~ Shot H~~h~~ole B~~b~~orers. ~~He~~ CDFA on behalf of CISAC has scheduled 4 meetings, 2 weeks apart so we can move quickly on the plan and execute the plans with the funds available. Goal is to have consensus by the 4th meeting so that Shannon Lynch can pull the four pieces together. This is the 2nd meeting and the goal by the next meeting we will have a full list of potential options. Simultaneously we will be working on RFPs at a 5th meeting. This committee is tasked with determining how much of the $5 million will be utilized by the pathways sub-committee and how many RFPs will it be divided by. We have draft RFP language from CDFA and CAL Fire to start with.

Green Waste

Keith Okasaki reported back from the working group that met last Thursday, March 28th. There was plenty of active participation and they identified a couple goals and action items.

Action Item from Green Waste Working Group:

1. Determine how much green waste from high risk areas to analyze what if any additional mitigation efforts need to be done.
   - Develop a scope of work with the LEA to conduct this work and evaluation.
   - **Action Item: Mr**. **Okasaki** will get a copy of report, hours, footprint and cost of LA County Local Enforcement Agencies (LEAs) when they took quarantine maps & overlaid with Green Waste facilities.
   - Suggestion to use Ventura county as a pilot program.
   - Action Item: **Julie Clark De Blasio** will reach out to Ag Commissioners to identify LEAs in Ventura County.
   - **Action Item: Mr**. **Okasaki will reach out to Bob Horowitz** to identify LEAs Ventura county and affirm that they are interested.
   - In Ventura we would start at the destination and work back to the origin
   - Ventura County concern will be informal tree & gardening communities is harder to track
   - **Short Term Action Item Green Waste Working Group** work with LEAs in Ventura county to identify smaller entities.
   - On HLB quarantine LEAs were very helpful identifying smaller entities.

2. Currently have quarantined areas for other pests. Need to look at what areas are not currently covered.
   - Utilize UC Riverside's detection map.
   - Partner with the survey committee.
   - Contract with LA and Orange County LEAs.
   - Outside the HLB quarantine area.

3. Contract with receiving counties and confirm how materials are being dealt with from high risk areas.
   - Solarization (may not work for all smaller entities)
     - Temperature and durations are listed on PSHB.org.
     - Dr. Nobua-Behrmann contacted Tim Paine to join the research committee.
     - **Action Item: Dr. Nobua-Behrmann** send solarization BMP to Keith.
       - Currently targeted towards homeowners in both English and Spanish
       - May need to be modified for Green Waste Operators.
   - **Tabled to the Research Subcommittee** to report back to Green Waste Working group on treatments for smaller entities that will make green waste safe.
     - Grinding to one-inch minus.
       - 95% kill rate is not enough~~.~~ if the material is going to be moved to an uninfested area.
     - Safer disposal site.

        - Low probability of infestation due to the absence of susceptible host trees or other environmental conditions~~.~~
    - There was some discussion on covering loads.
- Transfer stations
    - Tiered tipping fees.
    - Lack of quarantine means we will have to use positive incentives.
- **Tabled to Survey and Detection** the importance of trapping around Green Waste Facilities.

Firewood

Kevin Turner reviewed some slides from Wisconsin on Firewood. The California Firewood Task force has been working on this issue for a few years. ~~They~~Wisconsin ~~have~~ has the advantage of having quarantined pests; there is no quarantine for ISHB in California. Even without quarantine, examining Wisconsin's certification, labeling, state and federal land regulations, and quarantine maps may be useful to this sub-committee. After reviewing Wisconsin's website Mr. Turner reviewed the California Firewood Task Force website.

- Suggestion that we call any training we create a BMP Awareness program instead of a certification due to regulatory issues.
- Firewood scout site has mostly big box stores, it is difficult to populate it with smaller dealers.
- Maintain the list.
- Suggestion to incentive Ag commissioners to build lists of local dealers.
- Leigh greenwood, 462 registered vendors within California's firewood scout database. New Hampshire has 510.
    - New Hampshire is exceptional in that they have a staff member who has worked very hard on it.
    - Firewood scout allows Batch Adds.
    - New Hampshire has EAB so they can make federally certified firewood.
    - Western States cannot use federal certification because we do not have a federally quarantined pest (other than fire ants in small areas).
    - **Action Item: Leigh Greenwood** will lead discussion at Western Plant Board in May, discuss next steps in EAB/federal certification of firewood.
- There was discussion of commercial firewood, and
    - Commercial firewood suppliers can and are heat treating their wood. It does not reliably remove all pests because ~~.~~ heat treatment can be to many different levels/durations, and in California there is no set standard nor certification process of heat treatment.
    - It was suggested that Bundled wood is not a priority as it is not known to be contributing to the issue.
    - Currently there are strong regulations for bringing wood into the state.
- Campground Regulations
    - **Action Item:** Firewood Working Group and Education and Outreach Committee will provide information to CDFA to modify the Firewood task force website to include maps and firewood regulations.

        - There is a map on Don't Move Firewood website. www.dontmovefirewood.org/map/
        - There is also a list of regulations on the Don't Move Firewood website for each state, click on the above map to find each state summary.
    - Orange county parks has a firewood regulations. http://www.ocparks.com/parks/ronald/news/details?NewsID=5127&TargetID=43
        - Can other counties adopt regulations? Part of Rapid Response.
        - **Long Term action Item**: Work with the California Firewood Taskforce to create regulations similar to Orange County Parks for other counties and the state.

Public Comment

- Curtis Ewing: Gave a suggestion that for mapping that we try to break the counties up by ecotype.
- Dr. Beatriz Nobua-Behrmann: Partner with the education and outreach committee to get out information about firewood.
- Dr. John Kabashima: Large box tree nurseries are inspected once a year.
- Julie Clark De Blasio: Wants to make sure pallets and hobby wood are made sure they are moved to hobby wood.
- Leigh Greenwood: Southern California has a large pallet creation and pallet recyclers.
- Neil Edgar noted that Cal recycle does not have any regulations requiring tarping. However many operators require tarps. Most facilities need to move within 2 to 7 days so solarization is difficult.

Adjourn

Kevin Turner adjourned at 11:14. Next meeting will be **Wednesday April 16th 9am to 11am**

Meeting Participants

Participant		**Affiliation**
Co-Chairs		
Kevin	Turner	Cal Fire
Tom	Smith	Cal Fire
Participants		
Faith	Campbell	Center for Invasive Species Prevention
Corin	Choppin	Consensus and Collaboration Program, CSU Sacramento (notetaker)

Julie	Clark De Blasio	UC ANR
Nick	Condos	CDFA
Kim	Corella	Cal Fire
Ariel	De La Paz	City of Irvine
Curtis	Ewing	Firewood Task Force
Dawn	Fluharty	Arbor Jet
Leigh	Greenwood	The Nature Conservancy
Aimee	Halligan	Orange County Waste and Recycling
Katie	Harrell	Board of Forestry
John	Kabashima	UC ANR Emeritus
Jason	Leathers	CDFA
Jennifer	Nguyen	Cal Recycle
Beatriz	Nobua-Behrmann	UC ANR
David	Pegos	CDFA (Convener and facilitator)
Michael	Scholl	CDFA
Christopher	Showgren	UC Riverside
Sheri	Smith	Forest Service
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Pathways – Including Green Waste and Firewood

Meeting Agenda
Tuesday, April 16, 2019

9:00am – 11:00am

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/4448649732698342401

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Review and continue identifying issues, concerns and opportunities as they relate to the Artificial Movement (Pathways) of ISHB via Green Waste and Firewood.
- Review and continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Monday, April 29, 2019, from 9:00am-11:00am

10:30 a.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Pathways – Including Green Waste and Firewood
Meeting Minutes
April 16th, 2019
9:00am – 11:00am

Meeting Action Items

- **Next Meeting:** Monday May 6th 9am to 11am

Working Groups	Charge	Participants
Green Waste	● **Develop Best Management Practices and Procedures for Green Waste Sites** ● **Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies** ● **Discuss potential pilot programs** ● **Identify potential other utilizations of wood products**	**Coordinator:** Keith Okasaki **Participants:** Bob Horowitz, Kathryn Cross, Sheri Smith, Ed Williams, Nick Condos, Larry Swan, Jennifer Van Dyke, Julie Clark De Blasio, Kevin Turner, Neil Edgar, Tom Smith, David Pegos **Add**: Rebecca Lustig, Gina Libby, Jeffrey Esquivel.
Firewood	● **Identify potential resources and solutions**	**Coordinator:** Kevin Turner **Participants:** Leigh Greenwood, Faith Campbell, Curtis Ewing, Sheri Smith, Helena Roberts and Andrea Hefty, Katie Harrell, Tom Smith, David Pegos

Other Action Items:

- **Jennifer Vandyke** will reach out to Scotts and Miracle Grow.
- **Dr. Kabashima** will reach out to Kellogg Garden Products.
- **Curtis Ewing** on behalf of CA Firewood Taskforce sending out email form for people to fill out campgrounds.
- **Tom Smith** will reach out to Dr. Nobua-Behrmann to update her on mapping.
- **Tom Smith connect with Shannon Lynch** to coordinate with those doing the mapping as there may be overlap with her research.
- **Curtis Ewing, Tom Smith and David Pegos** will connect regarding funding for outreach materials.
- **Tabled to Green Waste Working Group Ed Williams** noted LEAs are getting inquiries about farm composters and digesters to coordinate working together.

- **Rebecca Lustig** offered to give information regarding green waste facilities in their area.
- **Gina Libby** will get back to working group regarding Ventura County's interest in being part of a pilot program.
- **Tom Smith** will reach out to Dr. Nobua-Behrmann to update her. Tom Smith reached out to Fire Mapping GIS (FRAP) and help us develop a map of known locations, areas of high risk, riparian areas, species of high risk, and areas of known composting sites. They would create and store the permanent database.

Consensus Reached:

- 98% kill rate was sufficient for chipping.

Suggested Requests for Proposals:

- Survey of current chipping and the kill rate of current chip grinding to find optimal level.
- There was a suggestion for a purchase of a tub grinder.
- LEA contract for some treatment of materials.
- Interested researchers to come up with ideas of what to do with bioproduct.
- Hire green waste facility to identify ISHB and compost.
- Dedicated populator of Firewood Scout.
- Work with Briton Fund or others who can get lower overhead with UC Cooperative Extension to see if more courses could be developed.

Meeting Proceedings

Sub-Committee Co-Chair Kevin Turner convened the meeting at 9:02 and welcomed everyone. The committee dispensed with the flag salute in accordance with the online meeting format. Kevin Turner reviewed the minutes from the first meeting and suggested changes that he received through email. The changes were accepted, and the minutes were approved.

Background

Mr. Turner Reviewed the subcommittee mission of looking at pathways focusing on Green Waste and on Wood (both firewood and other kinds of wood).

Green Waste

Keith Okasaki reported back from the working group that met April 15th. The working group developed 2 action items. Larry Swan and Shikari Nakagawa participated in the working group and were invaluable.

- Develop a scope of work with Local Enforcement Agencies (LEAs) in conjunction with UC ANR or CSU to work on a pilot program.
    - Ms. Nakagawa will provide information from the 2017 survey.
    - Suggestion that one pilot be inside the HLB quarantine area.
    - Working through LEAs because they have already existing relationships with local Green Waste facilities.
    - **Action Item: Rebecca Lustig** offered to give information regarding green waste facilities in their area.
    - **Action Item: Gina Libby** will get back to working group regarding Ventura County's interest in being part of a pilot program.

- Study evaluated solarization and chipping.
    - Grinding was highly effective in the case study. Less than 5 centimeters killed 98% of the beetles.

There was consensus that the 98% kill rate was sufficient.

- S**uggested Request for Proposal (RFP)**: Survey of current chipping and the kill rate of current chip grinding to find optimal level.

    - Dr. Kabashima suggested that Dr. Nobua-Behrmann would like to be involved in the application of this action item.
    - Once we find out where materials are being chipped, we can see if we need to use BMPs to get it moved to low risk areas.
- **Suggested RFP** There was a suggestion for a purchase of a tub grinder.
    - There was discussion over timing as this should be done after grinding research.

Suggestion that we look at current existing equipment.

- **Suggested RFP**: LEA contract for some treatment of materials.
- **Suggested RFP**: Interested researchers to come up with ideas of what to do with bioproduct.
    - Cal Recycle is trying to incentive a composting facility that mixes green waste with cow manure.
    - Air Curtain Burner as a potential means of disposal
    - If we stay under the 100 cubic yards and 75 square feet would require only a notification instead of a permit.
    - Chino has two of the biggest wood processing sites near dairy.

- **Suggested RFP:** Hire Green Waste facilitator to identify issues related to ISHB/FD and composting facilities.
    - 3 known composters in Orange County that may be in areas susceptible to ISHB.
    - 6 known composters in Ventura county.
    - Could be a tool for rapid response.
    - Dr. Kabashima said that OC Waste and Recycling is very interested in doing a pilot project.
    - Dr. Kabashima asked if we had reached out to composters in Orange County composters regarding their ability to market the compost.
        - **Action Item: Jennifer Vandyke** will reach out to Scotts and Miracle Grow.
        - **Action Item: Dr. Kabashima** will reach out to Kelloggs.
    - Composters are not lacking for materials so key will be to get potentially infested materials to move to the front of the line.
    - Green waste may be a cleaner source of compost than some other sources.
    - Green waste that does not include Palm.
    - Gina Libby wanted to clarify whether we are focusing on already known contaminated material?
        - David Pegos clarified that we will be focusing on areas that are likely infested but not necessarily known contaminated.
        - Gina Libby brought up the concern of Green Waste facility fear of cross contamination.

Tabled to Research Committee Is fire-resistant coated chips and/or mulch more resistant to ISHB than non-coated?
Dr. Kabashima asked if the tumbling of the chips in the coating process may kill beetle.
Dr. Kabashima asked if the coloring of the chips also might kill ISHB.

Firewood: Firewood Working group met towards the end of last week.

- Update CA Firewood Task force Website
    - **Action Item**: CA Firewood Task Force is sending out email form for campground owners/operators to fill out.

- Encouraging all campgrounds to adopt firewood policies, providing them with boilerplate language. Developing rules regarding local sources of firewood.
    - PDFs of existing firewood posters for easier distribution.
    - Create a simple form that could populate Firewood Scout database.
    - May ask for help from the Outreach and Education sub-committee.

- **Suggested RFP**: Dedicated staff person to help populate and maintain Firewood scout.

Tabled to Outreach Coordinator: Can contract with a private entity regarding.

- Reach out to campgrounds that do not already have a policy.
    - **Action Item: Tom Smith** will reach out to Dr. Nobua-Behrmann to update her. Tom Smith reached out to Fire Mapping GIS (FRAP) and help us develop a map of known locations, areas of high risk, riparian areas, species of high risk, and areas of known composting sites. They would create and store the permanent database.
    - **Action Item: Tom Smith** will reach out to Sabrina Drill regarding mapping.
    - **Action Item: Tom Smith connect with Shannon Lynch** to coordinate with those doing the mapping as there may be overlap with her research.
- Mr. Smith clarified that the data will be coded as public source and private source.

Firewood Best Management Practices (BMP)

- The working group brainstormed some targeted courses towards local government agencies, arborists, campground managers.
    - UC Cooperative Extension is uploading a course to e-extension regarding ISHB with monies from the Britton Fund.
    - The test in the course requires 80% correct rate within 2 attempts prior to it resetting, and it displays a report card at the end.
    - There was some discussion over format. There was support for short quizzes and test at the end for completion.
    - CDPR has a 1 hour of training minimum for CEUs.
    - There was some discussion of International Society of Arboriculture (ISA) and what other potential incentives to get people to take the course.

- **Suggested RFP:** Work with Britton Fund or others who can get lower overhead with UC Cooperative Extension to see if more courses could be developed.
    - Suggestion that there was a voucher for tipping fees to cover preferred processors.

Tabled to the Firewood Task Force and CISAC Summit: Suggestion to make it a citation or fine to transport ISHB a long-term action item.

- Public Resources Code 4714.5. makes it a misdemeanor to transport Eucalyptus Long-Horned Borer.
- There was some discussion that it may be outside the scope of these sub-committees.
- There was some resistance to the suggestion due to the lack of enforcement ability.

- There was a question of whether we could fund enforcement through funds.
    - The LEAs clarified that there would likely not have enough staffing.
- **Action Item: Curtis Ewing, Tom Smith and David Pegos** will connect regarding funding for outreach materials.

Public Comment

- Christopher wanted some discussion focus on nurseries
    - Dr. Kabashima asked Ed Williams about adding to the existing Glassy-winged Sharpshooter Inspection of Nurseries to also include inspections for ISHB.

Tabled to Green Waste Working Group Ed Williams noted LEAs are getting inquiries about farm composters and digesters to coordinate working together.

Adjourn

Kevin Turner adjourned at 11:12am. Next meeting will be Monday May 6th from 9am to 11am.

Next Steps: Will have Working Groups meeting prior to the next sub-committee meeting.

Meeting Participants

Participants		Affiliation
Co-Chairs		
Kevin	Turner	Cal Fire
Tom	Smith	Cal Fire
Participants		
Abby	Barraza	UC ANR
Faith	Campbell	Center for Invasive Species Prevention
Corin	Choppin	CSUS CCP (notetaker)
Julie	Clark De Blasio	UC ANR
Nick	Condos	CDFA
Kim	Corella	Cal Fire, Southern Region
Jeffrey	Esquivel	Cal Recycle
Curtis	Ewing	Firewood Task Force
Jan	Gonzales	UC ANR
John	Kabashima	UC ANR Emeritus
Jason	Leathers	CDFA Pest Detection and Emergency Projects
Gina	Libby	Ventura County
Rebecca	Lustig	Ventura County
Shannon	Lynch	UC Santa Cruz
Curtis	Okasaki	CDFA
David	Pegos	CDFA (Convener and facilitator)
Madeleine	Rauhe	Disneyland Resorts
Helena	Roberts	Santa Clara County

Michael	Scholl	CDFA
Christopher	Shogren	UC Riverside
Sheri	Smith	Forest Service
Tom	Smith	CAL FIRE
Mike	Villaraza	Ventura County
Ed	Williams	Ventura County Ag Commissioner
Jennifer	VanDyke	CDFA
Sophia	Yun	Orange County Ag Commissioner's Office

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Pathways – Including Green Waste and Firewood

Meeting Agenda
Monday, May 6, 2019

9:00am – 11:00am

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/9007217245276937219

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Finalize and approve issues, concerns and opportunities as they relate to Invasive Shot Hole Borers pathways, including green waste and firewood.
- Finalize and approve action items and potential request for proposals (RFP) concepts.
- Next Meeting to discuss RFPs – Tentatively, Monday, May 20, 2019, from 9:00am-11:00am

10:30 a.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Pathways – Including Green Waste and Firewood
Meeting Minutes
May 6th, 2019
9:00am – 11:00am

Meeting Action Items

- **Next Meeting:** Thursday May 23rd 2pm to 4pm

Working Groups	Charge	Participants
Green Waste	● Develop Best Management Practices and Procedures for Green Waste Sites ● Increase collaboration between Local Agricultural Commissions and Local Enforcement Agencies (LEAs) ● Discuss potential pilot programs ● Identify potential other utilizations of wood products	**Coordinator:** Keith Okasaki **Participants:** Bob Horowitz, Kathryn Cross, Sheri Smith, Ed Williams, Nick Condos, Larry Swan, Jennifer Van Dyke, Julie Clark De Blasio, Kevin Turner, Neil Edgar, Tom Smith, David Pegos, Rebecca Lustig, Gina Libby, Jeffrey Esquivel.
Firewood	● Identify potential resources and solutions	**Coordinator:** Kevin Turner **Participants:** Leigh Greenwood, Faith Campbell, Curtis Ewing, Sheri Smith, Helena Roberts and Andrea Hefty, Katie Harrell, Tom Smith, David Pegos

Other Action Items:

- **Shannon Lynch** provide Ventura County LEAs with infested areas/higher risk areas so that they can identify green waste facilities in those areas.
- **Bob Horowitz** will send John Kabashima information regarding RFID tracking.
- **Julie Clark DeBlasio** is going to show the draft scope of work to others at UC ANR to get feedback.
- **Keith Okasaki** will add Firewood Sites to UCANR RFP.
- **Kevin Turner** change updating the firewood website to short term.
- **Leigh Greenwood** will send the 9 different models that have been used by other states to certify firewood.

Consensus Reached:

- Remove enforcement from the scope of work LEA RFP.

- More data needs to be gathered through trapping around Green Waste Facilities before a plan could be formed.

Suggested Requests for Proposals:

Meeting Proceedings

Sub-Committee Co-Chair Kevin Turner convened the meeting at 9:02am and welcomed everyone. The committee dispensed with the flag salute in accordance with the online meeting format. This is the 4th meeting of the Pathways Sub-Committee. Kevin Turner reviewed the minutes from the first meeting and suggested changes that he received through email. Faith Campbell moved to approve the minutes as amended. Madeline Rauhe seconded the motion. Minutes were approved without objection.

Background

Mr. Turner reviewed the subcommittee mission of looking at pathways focusing on Green Waste and on Wood (both firewood and other kinds of wood).

Green Waste

Keith Okasaki reported on the progress of the Green Waste Working Group.

The working group put together a scope of work for an RFP work with LEAs in coordination with UC ANR to do surveys at Green Waste Facilities.

Mr. Okasaki presented the draft scope of work developed for the three county LEAS. The scope included site identification and communication with Green Waste Facilities. The working group has not been able to assign a cost figure to the RFP, however they have gotten information from similar projects. Identified more infested areas in LA, Orange County and Ventura County. Working group recommended three contracts; one with each county LEA and a contract with UC ANR.

- Ventura County LEAs asked for information of more infested and higher risk ISHB areas of Ventura County. **Action Item: Shannon Lynch** provide Ventura County LEAs with infested areas/higher risk areas so that they can identify green waste facilities in those areas.
- Rebecca Lustig asked what facilities were included.
    - Mr. Okasaki responded that in the scope they kept it broad.
    - Ms. Lustig noted that they only cover permitted sites.
    - Bob Horowitz offered that the broader language would be helpful if direct land app sites were identified.
    - Ventura County asked that the scope be cleaned up to clarify if enforcement was within the scope or a separate activity.
        - Mr. Okasaki suggested that they may remove that section to increase clarity.
    - There was discussion as to whether enforcement should be part of the contract.
    - **Area of Consensus** to remove enforcement from the scope of work LEA RFP.

Keith Okasaki presented the scope of work for the coordination to ask UC ANR could do. This scope covered mapping movement of Green Waste and assessment of mitigation. This would be an expansion of the research done on the ability to kill the beetle through wood chipping.

- There was discussion of where this RFP may overlap with RFPs being developed by the Trapping Working group.
- Jeffrey suggested that we may want to provide suggested incentives rather than simply asking green waste facilities what they would like.
- John Beall asked what trapping thresholds would trigger action.
    - Currently there are no actions automatically triggered and the survey is for information.

    - **Tabled to Survey Sub-Committee** Mr. Horowitz asked if finding ISHB at a green waste facility could trigger doing trapping at the destinations.
    - There was some discussion about the lure strength and potential false negatives.
    - Mr. Horowitz suggested that we could try to follow the green waste with RFID tags.
    - There was discussion of tracking known infested tree.
    - **Action Item: Bob Horowitz** will send John Kabashima information regarding RFID tracking.
- Dr. Kabashima noted that they have done a lot of research regarding what happens under ideal situations. More research is needed on "real world conditions" including if chippers were not configured properly.
- **Action Item: Julie Clark DeBlasio** is going to show the draft scope of work to others at UC ANR to get feedback.
- **Area of Consensus** that more data needed to be gathered through trapping around green waste and testing of chipping equipment before a plan could be formed.

Firewood:

Kevin Turner brought up the suggestion to combine into the green waste trapping contract to include firewood sites. This would save having to have an additional contract focusing only on firewood sites. **Action Item: Keith Okasaki** will add Firewood Sites to UC ANR RFP.

Mr. Turner reported that the Firewood Working Group was working on RFPs to identify, evaluate and educate wood yards.

- Suggestion to ask dealers who they are distributing firewood to.
    - Will be taken care of by the Green Waste Contract.

Mr. Turner discussed the RFP regarding a course for Wood Professionals and Campground Managers, and for the average user.

- Mr. Esquivel recommended that a course may not be viable for average users and that a short video may be better.
    - Mr. Pegos reported that CDFA has some funds that were made available from the US Forest Service to develop a video. Mr. Pegos suggested that video however may not fully meet the educational needs of users and that separate video may need to be created.
    - Dr. Nobua-Behrmann noted that the class developed by UC ANR has videos in it that may work for the general public however she did think that there may be a need to develop some new targeted courses. The course currently developed is for arborists and land managers.
    - Mr. Horowitz asked for clarification as to who the campground managers are.
    - Owner of Private Campgrounds or Government entities including the people running the gate.
    - Suggested there be an RFP through Briton fund to build a course for Campground Managers.
    - Question regarding what the incentive would be to get campgrounds managers to take the course.
        - Possible incentive could be that they are firewood safe trained similar to firewood scout.

Action Item: Kevin Turner change updating the firewood website to short term.

- Leigh Greenwood suggested that we add the California Firewood Awareness to Firewood Scout.
- Discussion of whether we can suggest preferred fire waste handlers or certification.
    - There is no certification system so there was recommendation not to use certified but just use awareness training.

Mr. Turner discussed the action item of providing campgrounds with templates of firewood policies.

- There was strong support for creating the template
- There are an increasing number of private concessionaires' campgrounds.

- Leigh Greenwood discussed Kiln dried wood vs heat treated wood. Heat treated does have a verification and certification process. It can only be created in quarantined areas that require a certification. Kiln dried is not a legal term and is just a marketing tool.
    - California does not have a method for certifying heat treated wood.
    - Montana is using a workaround to create a user fee and create their own standard for heat treated wood.
- If the Emerald Ash Borer Quarantine is lifted it would also remove the current certification process and a new one would have to be created.

Action Item: Leigh Greenwood will send the 9 different models that have been used by other states to certify firewood.

- Mr. Pegos, Mr. Smith, Mrs. Greenwood will share our concerns regarding lack of a national firewood certification at the Western States Firewood Taskforce.

Mr. Turner went over the agreement from previous meetings to develop an RFP regarding nursery inspections.

- John Beall asked that multiple visits be covered.

Public Comment

- Kathryn Cross noted that it was a good discussion.
- Rebecca Lustig asked yes if she could get a copy of the amended minutes.

Adjourn

Kevin Turner adjourned at 11:07 am. Next meeting will be Monday May 23rd.

Meeting Participants

Participants		**Affiliation**
Co-Chairs		
Kevin	Turner	Cal Fire
Tom	Smith	Cal Fire
Participants		
Abby	Barraza	UC ANR
John	Beall	Ventura County
Faith	Campbell	Center for Invasive Species Prevention
Corin	Choppin	CSUS CCP (notetaker)
Julie	Clark De Blasio	UC ANR

Kim	Corella	Cal Fire, Southern Region
Kathryn	Cross	Orange County
Timothy	Crothers	West Coast Arborists
Jeffrey	Esquivel	CalRecycle
Curtis	Ewing	Firewood Task Force
Anne	Fege	Board of Forestry
Angela	Fong	CalRecycle
Jan	Gonzales	UC ANR
Leigh	Greenwood	The Nature Conservancy
John	Kabashima	UC ANR Emeritus
Gina	Libby	Ventura County
Rebecca	Lustig	Ventura County
Beatriz	Nobua-Behrmann	UC ANR
Curtis	Okasaki	CDFA
David	Pegos	CDFA (Convener and facilitator)
Madeleine	Rauhe	Disneyland Resorts
Helena	Roberts	Santa Clara County
Michael	Scholl	CDFA
Joe	Sheele	US Customs and Border Protection
Christopher	Shogren	UC Riverside
Matthew	Slattengren	Contra Costa County
Jonathan	Trumbull	Orange County Parks
Mike	Villaraza	Ventura County
Ed	Williams	Ventura County Ag Commissioner

Carlie	Wyatt	CDFA
Jennifer	VanDyke	CDFA
Sophia	Yun	Orange County Ag Commissioner's Office

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borer Sub-Committee

Outreach and Education

Meeting Agenda
Tuesday, March 19, 2019

9:00am – 11:00am

Location: CDFA, Room 220
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/3897596771895946 27

Dr. Beatriz Nobua-Behrmann, Chair
(949) 301-9182 x1006

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Identify key players that need to be involved.
- Identify issues, concerns and opportunities as they relate to Invasive Shot Hole Borer outreach and education.
- Identify action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday April 2, 2019 from 9:00am-11:00am

10:30 a.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(7) ADJOURNMENT**

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POSTED 3/8/2019
Correction made to time on agenda items: 3/11/2019

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Committee Outreach and Education

Meeting Agenda Tuesday, March 19, 2019
9:00am – 11:00am

Meeting Minutes

Meeting Action Items

- **Next Meeting: Wednesday, April 2nd from 10am-noon**
- **Working Groups:**

Working Group	Charge	Participants
Education Outreach Coordinator	● Identify Potential Funders ● Scope: BMPs, Website, Trainings, Social Media ● One or many ● Forestry has some funds available	**Coordinator:** Jan **Participants:** Sheri, Sabrina, Madeleine, Faith, Julie
Targets	● Brainstorm list of target audiences ● Categorize them ● Prioritize into short and long term	**Coordinator:** Katie **Participants:** Kevin, John, Beatriz, Madeleine, Kim, Curtis, Sheryl, Zachary and Jan or Abby

Other Action Items:

Short Term

- **David Pegos, Michael Scholl, and Joe Sheele** will create a list of venues to have speakers make an address at or have an outreach booth presence: Municipal Arborists, ISA, city Managers, League of cities, Public Works, SCAG, CSAC, County Events, California pest control advisors (CPCA).
- **David Pegos** will create Speakers Bureau from Subcommittee Participants.
- **David Pegos** will work with the rapid response committee on that Early Detection, rapid response toolkit.
- **Sabrina Drill** to reach out to local water boards about how we can collaborate as they educate public on mulch.
- **Julie Clark De Blasio** will distribute accomplishments of UC ANR.
- **Curtis Ewing** will distribute accomplishments reports of firewood taskforce.
- **Curtis Ewing** will forward Firewood audiences to Katie who will distribute.
- **Jan Gonzales** send Shot Hole Borer curriculum for high school science students.

- **Tabled to Survey Sub Committee:** Move the Map Discussion to the Survey Subcommittee.
- **Tabled to the Research Committee:** Will check on Fusarium and its spores survivability.

Long Term

- Figure out how mom and pop shops are advertising. If they are using one main platform for their advertising then we can use that medium to reach them.
- Outreach to the Boy Scouts/Girl Scouts.
- Insert ISHB into K-12 Curriculum.
- Educate consumers about hiring people who use best practices.
- Utilize Cal Recycle and Cal Invasive Species Council to engage state air and water boards in this process.

Meeting Proceedings

Background

David Pegos of CDFA presented background for the convening of the subcommittee. In January of 2018 the ICSAC convened a statewide summit. Out of the summit came suggestions that were incorporated into AB 2470, signed by the governor in 2018. The bill allocated $5 million for a coordinated statewide effort against invasive shot hole borers (ISHB). The funds are ready to be disbursed and these subcommittees are tasked with advising how the funds should be allocated and helping develop the RFPs. Each subcommittee will meet four times at two-week intervals, while taking actions between meetings to make progress. Shannon Lynch will compile the consensus of the subcommittees into a single report document. Simultaneously the subcommittees will utilize boilerplate RFP language from CDFA and CAL FIRE to begin developing the RFPs.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Identify key players that need to be involved

Sub-Committee members identified the following stakeholders or experts who may be missing and deserving of outreach to participate in this Sub-Committee:

- Target Audiences
    - People who could help disseminate to the public
        - Master Gardeners
        - Water Districts who are speaking to end users like homeowners
        - Nurseries
        - Campground Sites
        - Arborist certification trainings
        - Children coming home and educating their parents can be very effective
    - Those who need to know best practices
        - Waste processing facilities
        - Tree companies
        - Pesticide applicators groups
        - Greenwaste haulers

Identify issues, concerns and opportunities as they relate to Invasive Shot Hole Borer outreach and education.

Dr. Beatriz Nobua-Behrmann lead a discussion to Identify key concerns, opportunities and action items regarding Outreach and Education on ISHB. During the discussion two working groups were formed one to examine the possibility of hiring an Education Outreach Coordinator and one to compile the target audience list. During the discussion the subcommittee brainstormed the following:

- PSHB.org should contain more information
    - We will be migrating the website so we may want to wait till after the migration before adding information to the PSHB website.
    - Need to decide who will house and update map.
        - Add to the map infestations or just keep the map to having genetic confirmations.
        - Which infestation information we want to include (trusted).
        - An unrealistic expectation that we will come out and determine if a tree is infested for every person who asks. If the area is already known to be infested, then there is no reason to make a determination if a tree is infested and people who report should then take action and make a self-determination. We are focusing our testing on areas that may help show the spread of the pest.
            - Suggestion that those asking for testing in already infested areas get a reply with a link to the website with suggested treatments.
- Unanswered questions
    - Is there pressure from the gardening communities on avocado wood mulching.
    - Noted that as we generate large quantities of the material who are the end users going to be.
    - Demand for compost.
- Brainstormed solutions
    - Can we incentivize treated wood?
    - There has been a lot of promotion of mulch. Instead of starting a new conversation how do we insert information into the already existing conversation.
        - Kevin Turner noted a paper coming out on smaller sized mulch burning slower and lower intensity.
        - We also need to educate between the difference between mulch and compost and the recommended depths.
        - Still have to worry about the fusarium in the smaller mulch.
- It needs to be composted to avoid the fusarium and is not sure if fusarium without the beetle is not able to infect the tree. Research item?
- social media presence.
        - Target Southern California
- Boy Scouts main organization is unresponsive need to work through local Packs
- A lot of HOAs that John has not reached yet. Sandy can do PowerPoint presentations. There is a problem with the reporting mechanism being overwhelmed.
- A lot of people are not using certified arborists. How do we reach the non certified arborists?
    - Cal Poly has labor centers that target mom and pop gardening community.
    - Free advertisement on Craigslist.
- There is a lot of good work already being done but it would be helpful to create an overall strategy and materials available and how we are going to monitor and measure.

- An outreach effort on how to detect in areas that do not have infestations yet.
- We have been working on creating a toolkit Rapid Response for leading edge of the infestation. Ventura county is currently the leading edge.
- UC ANR has developed some materials on ISHB – Action item
    - David would like a copy of those materials, so he does not have to reinvent.
- Noted that bordering counties are currently receiving trainings. Moving north with more information is a longer-term goal but he immediate goal is infested areas and areas bordering infested areas. Broader approach the further away from the current infestation
    - Box Elder Tree all over the state are in danger. Society of arborists has already having trainings statewide.
    - Making materials available for other states could make materials available for other states (i.e. Arizona).

Public Comment

- Anabele: Important to see the action Plans for the other sub committees.
- Curtis: 95% at the one-inch mulching is not eradication.
- Julie: thanked everyone for their input and insight.
- Kim: wants to be involved in rapid response.
- Madeleine: Please keep in touch through email with action items.
- John Beall: Outreach to Cities is a concern. Doing well with CACP and ag boards. Utilize CNPS and Nature Conservancy. Do we need to have a lobby day?
    - NGO community has done a great job lobbying the legislature which is why they are engaged.
    - CISAC Planning to have another summit later this year.
- Matt Slattengren: felt that social media is a key.
- Sabrina: asked about platform, federal partners cannot use Zoom.
- Max: sent STEAM info to David Pegos.

Next Meeting – Tentatively, Tuesday April 2, 2019 from 9:00am-11:00am

The group checked the calendar. John Kabashima asked to move from 10-12. Sabrina will not be able to make it but will send info in advance of April 2nd. Abigail asked a clarifying question if the link changes for each meeting. Amber Durant confirmed that it will be a new link and, in the meantime, to use email to discuss.

Meeting Participants

First Name	Last Name	Affiliation
Chair		
Dr. Beatriz	Nobua-Behrmann	UC ANR
Participants		
Abigail	Barraza	UC ANR
John	Beall	County of Ventura
Kyle	Burke	CDFA
Keoni	Calantas	ICF
Faith	Campbell	Center for Invasive Species Prevention
Julie	Clark De Blasio	UC ANR
Kim	Corella	CAL FIRE
Corin	Choppin	Consensus and Collaboration Program (notetaker)
Anabele	Cornejo	US Forest Service
David	Pegos	CDFA
Sandy	DeSimone	Audubon Society
Sabrina	Drill	UC ANR
Curtis	Ewing	CAL FIRE
Jan	Gonzales	UC ANR
Katie	Herald	Board of Forestry
Nicole	Hill	Irvine Company
Anne	Jarque	City of San Diego
John	Kabashima	UC ANR Emeritus
Zachary	Kantor-Anaya	The Wildlands Conservancy
Sheryl	Landrum	San Diego Resource and Conservation District
Mike	Parker	Alliance Land Care
Madeleine	Rauhe	Disney
Max	Regis	Los Angeles County
Michael	Scholl	CDFA
Joe	Scheele	Customs and Border Protection
Matt	Slattengren	Contra Costa County Ag Commission
Sheri	Smith	US Forest Service
Tom	Smith	CAL FIRE
Kevin	Turner	CAL FIRE
Jerrold	Turney	Los Angeles County
Mayra	Valdez	Mexico
Jennifer	Van Dyke	CDFA
Jamie	Whiteford	Ventura County Resource Conservation District
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Outreach and Education

Meeting Agenda
Tuesday, April 2, 2019

10:00am – 12:00pm

Location: CDFA, Room 333
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This Meeting Will Also Be Held via Webinar at:
https://attendee.gotowebinar.com/register/8344331579762976002

Dr. Tom Smith, Co-Chair
(916) 599-6882
Kevin Turner, Co-Chair
(951) 212-1148

10:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borer (ISHB) – Development of Action Plan

- Continue identifying Issues, Concerns and Opportunities as they relate to Invasive Shot Hole Borers Outreach and Education
- Continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday, April 16, 2019 from 9:00am-11:00am

11:30 a.m. **(6) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

12:00 p.m. **(7) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Committee Outreach and Education

Meeting Agenda Tuesday, April 2, 2019
10:00am– 12:00pm
Meeting Minutes

Meeting Action Items

- **Next Meeting: Friday, April 19th 9am to 11am**
- **Everyone** will send outreach materials to Dr. Beatriz Nobua-Behrmann and she will compile master list.
- **Jessika Mitchell** will develop a list or reach out to Nancy at Urban Forest Council to get us a list of Urban Forestry groups in Los Angeles (Tree People, LA Beautification, Conservation Corps, Alliance for Community Trees)
- **Katie Harrell** Add to target audiences list chainsaw repair shops and equipment supply stores to the target audience medium under information disseminator audiences; Nextdoor.com in advertisers; League of Cities and/or Southern California Council of Governments to disseminators.
- **Katie Harrell** will reach out to California Invasive Plant Council about collaboration.
- **Dr. John Kabashima** send has a GSAB flyer about hiring reputable tree care services and/or hiring a pest control company.
- **Dr. John Kabashima** send video from IS summit to David Pegos.

Short Term

- Create a presentation for speakers' bureau.

Long Term

- Put together a Best Management Practices course in collaboration with Pathways Subcommittee.

Meeting Proceedings

Background

David Pegos of CDFA presented background for the convening of the subcommittees. In January of 2018 the ICSAC convened a statewide summit. Out of the summit came suggestions that were incorporated into AB 2470, signed by the governor in 2018. The bill allocated $5 million for a coordinated statewide effort against invasive shot hole borers (ISHB). The funds are ready to be disbursed and four subcommittees are tasked with advising how the funds should be allocated and helping develop the RFPs. Each subcommittee will meet four times at two-week intervals, while taking actions between meetings due to the tight timeline. This is the second of the four meetings. After the fourth meeting Shannon Lynch will compile the consensus of the subcommittees into a single report document. Simultaneously the subcommittees will utilize boilerplate RFP language from CDFA and CAL FIRE to begin developing the RFPs which will be discussed in a fifth meeting. Minutes will be sent out minutes and the committee will approve at the next subcommittee meeting.

Dr. Beatriz Nobua-Behrmann reviewed the minutes from the previous meeting including the two working groups and action items. The committee agreed to review minutes and approve at the next meeting.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Identify Opportunities

Julie Clark De Blasio sent most completed accomplishment list and suggested developing a working group to create outreach materials. The materials will be needs based depending on further discussion. *Outstanding questions*: Who will lead? Are we developing a working group to create outreach materials?

- CDFA will do first outreach at the Redding Sportsman Expo this weekend. Will have some targeted outreach for the ISHB at event.
- April 13th outreach to an infested basin—the Upper Los Angeles Sepulveda Basin Wildlife Refuge. There will be approximately 500-1000 people in attendance.
- Curtis Ewing is doing outreach to Camp California on April 3rd.

This led to a discussion of materials it would be helpful to have at these events.

- Printable Consumer Questions from Firewood Task force
- Buy it don't burn it
- Firewood scouts Application from Don't Move Firewood
- Verbally tell people to purchase firewood from reputable sources
  - Potentially include a quiz for self-certification or certification of completion.
  - There was a discussion about possible incentives.
- Discussion regarding a national standard for firewood. The discussion included thoughts on a voluntary program vs regulation. The Plant Right voluntary program was brought up as a potential model.
- John Kabashima asked about targeting homeowners.
  - Katie Harrell responded that the state is targeting firewood and home heating burning.
  - Four or five years ago there were mailings targeting homes around city of San Diego Parks about the danger to state parks.
- Suggestion to send information to homeowners in particularly vulnerable areas.
  - Rhonda from Disney suggested social media is a good way to distribute information

Katie Harrell gave a report on the Target Audiences Subcommittee list which they ranked as high, medium and low. She suggested reviewing the subcommittee review the high priority targets and provide feedback.

- There was a discussion of the importance of having outreach materials translated into other languages. Spanish chapter of Western ISA.
- Spanish Tree workers associations.
- Where are these materials hosted?
- Firewood.ca.gov
- PSHB.org (both English and Spanish materials)

- Suggestion that all materials be made including pictures/visual aids so they would be accessible and easily understood by all.
- Suggest an RFP to create materials. Current materials are high level, need to create a simpler message.
- Curtis Ewing: currently working on redesigning posters, less text and Spanish and English on same time, more pictograms.
- California Urban Forest Council has more user-friendly materials.
- Suggestion to develop simplified messages for targeted audiences.
- Suggestion to centralize all currently existing outreach materials.
- Suggestion that the information be organized by date so that the most current information is easily accessed.
- There is a video that was created from the invasive species summit.

Outreach Working Group

- Jan will be back April 15th
  - Sabrina and Jan are looking for outreach coordinator job descriptions.
  - Rosie Suggested Watershed Coordinator positions

Public Comment

- Kevin Turner suggested the creation of a short video for Social Media and Information
  - Greenwaste information targeted to haulers that could be shared on a billboard
- Sabrina Drill was unable to find manufacturers, but the search continues
- Dr. John Kabashima suggested that we identify short term and long-term funding sources for the outreach coordinator position
- Rhonda Wood likes the target audience's spreadsheet. Create a list of what are the questions that we want to answer.
  - What do we need, what is out there, what can be improved on?
  - Dr. Kabashima suggested it be divided into North and South. How do we prevent infestation? vs How do we deal with infestation?
- Sheri Smith wants to remind everyone that there is already a lot of outreach and education is already being done. Sheri is supportive of having a coordinator.
- Sandy DeSimone added CAL FIRE Bush Crews as High Priority on Target Audience List.
- Ms. Rauhe wants to keep a broad interpretation of the target audience.
  - Suggested Community Based Social Marketing
- Ms. Clark De Blasio asked if the target list would be distributed.
  - David responded that it would be distributed with a list of opportunities.
- Ms. Clark De Blasio noted that the messaging is constantly evolving as the research is evolving

Next Meeting – Tentatively, Friday, April 19, 2019 from 2:00pm to 4:00pm

Meeting Participants

First Name	Last Name	Affiliation
Chair		
Dr. Beatriz	Nobua-Behrmann	UC ANR
Participants		
Abigail	Barraza	UC ANR
Faith	Campbell	Center for Invasive Species Prevention
Julie	Clark De Blasio	UC ANR
Kim	Corella	CAL FIRE
Corin	Choppin	CSUS CCP (notetaker)
Anabele	Cornejo	US Forest Service
Rosi	Dagit	Santa Monica Mountains RCD
Sandy	DeSimone	Audubon Society
Melody	Graham	UC ANR
Katie	Harrell	Board of Forestry
Dustin	Harrison	San Diego River Conservancy
John	Kabashima	UC ANR Emeritus
Bill	Kirk	Orange County Parks
Jessika	Mitchell	Davey
David	Pegos	CDFA (Convener & Facilitator)
Mark	Porter	
Madeleine	Rauhe	Disney
Michael	Scholl	CDFA
Joe	Scheele	Customs and Border Protection
Sheri	Smith	US Forest Service
Robert	Suzuki	
Kevin	Turner	CAL FIRE
Sophia	Yun	Orange County Public Works

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Outreach and Education

Meeting Agenda
Friday, April 19, 2019

9:00am – 11:00am

Location: CDFA, Room 333
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/2903590704580150785

Dr. Beatriz Nobua-Behrmann, Chair
(949) 301-9182 x1006

9:00 a.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Review and continue identifying issues, concerns and opportunities as they relate to Invasive Shot Hole Borers outreach and education.
- Review and continue identifying action items and individuals to accomplish the action items in between Sub-Committee meetings.
- Next Meeting – Tentatively, Tuesday, April 30, 2019, 2:00pm-4:00pm

10:30 a.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

11:00 a.m. **(8) ADJOURNMENT**

To request special accommodations for those persons with disabilities, please contact David Pegos at (916) 654-0317

AMERICANS WITH DISABILITIES ACT
All Board meetings must be accessible to the physically disabled. Any person needing a disability-related accommodation or modification in order to attend or participate in any Committee meetings may request assistance by contacting David Pegos at (916) 654-0317.

ACTION IS POSSIBLE ON ANY ITEM CONTAINED IN THIS AGENDA. ITEMS LISTED ON THE AGENDA MAY BE CONSIDERED IN ANY ORDER AT THE DISCRETION OF THE COMMITTEE.

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Outreach and Education

Meeting Agenda Friday, April 19th, 2019

9:00am– 11:00am

Meeting Minutes

Meeting Action Items

- **Next Meeting: Friday, May 10th 2pm to 4pm**
- **Working Groups:**

Working Group	Charge	Participants
Education Outreach Coordinator	- Identify Potential Funders - Refine scope	**Coordinator:** Jan Gonzales **Participants:** Sabrina Drill, Madeleine Rauhe, Julie Clark De Blasio, John Kabashima, Katie Harrell
Target Audiences	- Group target audiences that need to be trained	**Coordinator:** Katie Harrell **Participants:** Kevin Turner, John Kabashima, Beatriz Nobua-Behrmann, Madeleine Rauhe, Kim Corella, Curtis Ewing, Sheryl Landrum, Zachary Kantor-Anaya and Abby Barraza
Gaps in Outreach Materials	- Identify gaps in printed and online outreach materials to high priority target audiences.	**Coordinators**: Kim Corella **Participant**: Anabele Cornejo

Other Action Items

- **Jessika Mitchell** will send action plan to Dr. Nobua-Behrmann who will share with the subcommittee.
- **Jessika Mitchell** will reach out to Igor Lacan of UC ANR San Mateo Urban Forestry.
- **Gretchen Heimlich** will invite Rachel O'Leary with City Plants.
- **Sabrina Drill** is talking with Wendy Powers regarding ways to avoid the overhead issues.

- **Outreach Education Coordinator Working Group Added:** Dr. Kabashima, Katie Harrell. Removed Faith Campbell and Sheri Smith.
- **Dr. Beatriz Nobua-Behrmann** will add a publication date column to the outreach materials list.
- **Tom Smith** will keep Jessika Mitchell in the loop on mapping.
- **Faith Campbell** will send feedback to Sabrina Drill about PSHB.org website.
- **Curtis Ewing** will make sure that Firewood Task Force Website is linked to Eskalen labs if it is not already.
- **Jan Gonzales** will add to the scope of Outreach Coordinator: Reach out to the public to make them aware of the risks associated with getting mulch from unknown sources.
- **Katie Harrell** will group target audiences that need to be trained.
- **Katie Harrell** will add iNaturalist to the Target Audiences.
- **David Pegos** will have CDFA purchase targeted ads on keyword firewood.
- **David Pegos** will explore 15 sec video/commercial regarding not moving firewood.
- **John Bell** will present at Glassy Winged Sharpshooter (GWSS) at nurseries.
- **Shannon Lynch** will collect activities for final report.

Long Term Action Items:

- Cross pollinate PSHB.org and Don't Move Firewood so both contain links to all the outreach materials.
- Find Funding Revamp PSHB.org to be user friendly and contain more active content.
- CFA will create a 15 sec video/commercial regarding not moving Mulch and Greenwaste

RFPS

- Outreach Education Coordinator either as a consultant or through a funding mechanism like UC ANR.
- Train the Trainer Course
- California Naturalists training which is still in development could include training on ability to identify. Completed the ISHB class paired with a field training. This would allow them to do visual surveys.
- Field Work Training

Meeting Proceedings

Dr. Beatriz Nobua-Behrmann called the meeting to order at 9: 00 am and lead a round of introductions. Dr. Nobua-Behrmann reviewed the minutes from the two previous meeting and they were approved without objection. Dr. Nobua-Behrmann did a brief check in with the sub-committee regarding ideas and concerns which generated a few action items.

- **Action Item:** Jessika Mitchell will send action plan to Dr. Nobua-Behrmann who would share with the sub-committee.
- **Action Item:** Gretchen Heimlech will invite Rachel O'Leary with City Plants.
- **Action Item**: Jessika Mitchell will reach out to Igor Lacan UC ANR San Mateo Urban Forestry.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Outreach Education Coordinator Working Group

Jan Gonzales with UC ANR presented a draft SHB outreach coordinator duties: Design and development, implementation and coordination, and management analysis. The working group suggested that this position could be broadened up if other tree pests may be founded. Ms. Gonzales has done some analysis on salary requirements for a position like this on a statewide level.

- Sabrina Drill wanted to make sure we were doing long term thinking regarding establishing a social media presence. She reiterated Jan Gonsalves' point that we should not pigeonhole the presence to just ISHB as it may be limiting in the future.
- Julie Clark De Blasio thanked Jan Gonsalves and Sabrina Drill for their work as it helps creates a template.
- Katie Harrell offered to help the Outreach Education Coordinator Working group with her experience on Sudden Oak Death.
    - Ms. Harrell suggested that the position be under CISAC.
    - Ms. Drill recommended the position be hosted at UC ANR as they have the scientific background.
        - There was some discussion of UC overhead.
        - **Action Item:** Sabrina Drill is talking with Wendy Powers regarding ways to avoid the Overhead issues.
- Jan Gonzales wanted to make sure that there was not just budgeted money for the position but budgeted for overhead materials for the coordinator to utilize.
- **RFP**: Outreach Education Coordinator either as a consultant or through a funding mechanism like UC ANR.
- **Action Item:** Outreach Education Coordinator Working Group Added: Dr. Kabashima, Katie Harrell. Remove Faith Campbell and Sheri Smith.
    - Curtis Ewing said the firewood task force can provide budget for supplies.
- David Pegos reported that he and Curtis Ewing attended to the Redwood Sportsman Expo. Mr. Pegos is continuing to build a list of venues and will be relying on sub-committee members to be a speakers Bureau.

Outreach Materials List

Dr. Nobua-Behrmann went over the list of already created outreach materials.

- It was asked if the publication date could be added to the list
    - **Action Item: Dr. Nobua-Behrmann** will add a publication date column to the outreach materials list.
- Mr. Pegos recommended that the outreach materials be all listed on all three current sites: "Don't move firewood", "PSHB.org", and FRAP's new mapping website.
    - Dr. Drill expressed a concern that if the materials were on all three separate sites that it would be difficult to keep them all up to date.
    - Mr. Pegos clarified that the tree sites contain links rather than the actual materials so that as materials were updated.
    - Dr. Nobua-Behrmann noted that PSHB and Don't Move Firewood could also link to the new map created by FRAP.
    - **Action Item: Leigh & Dr. Nobua-Behrmann** cross pollinate information on both PSHB.org and Don't Move Firewood websites so they both contain links to all the outreach materials.

    - Most documents are already cross pollinated between PSHB.org and Eskalen Labs but there were a few items missing.
    - **Action Item: Tom Smith** will keep Jessika Mitchell in the loop on mapping.
    - **Action Item: Faith Campbell** will send feedback to Sabrina Drill about PSHB website.
    - Julie Clark De Blasio noted that one of the reasons PSHB.org has not been updated recently is that University is updating its site builder software.
    - **Consensus Reached** Long Term Goal: Find funding to revamp PSHB.org to be user friendly and contain more active content.
    - **Action Item: Curtis Ewing** Make sure that Firewood Task Force Website is linked to Eskalen Labs if it is not already.

Target Audiences

Dr. Nobua-Behrmann reviewed the target audiences list and their prioritization. Dr. Nobua-Behrmann suggested that potentially we try to link target audiences to outreach materials and see if any new materials needed to be developed for certain target audiences.

- Discussion Confirming different types of gardeners were all covered in the target audience list.
- Suggestion that an outreach coordinator would be helpful in identifying gaps.
- There was some discussion about an example target audience of “Chip Drops” and the challenges of working with for-profits.
- **Action Item:** Jan Gonzales add to the scope of Outreach Coordinator and reach out to the public to make them aware of the risks associated with getting mulch from unknown sources and companies who use mulch.

Establish Working Group to identify **gaps** in printed and online **outreach materials** to high priority target audiences. Coordinators: Kim Corella & Katie Harrell. Participant: Anabele Cornejo.

- Julie Clark De Blasio clarified that PSHB.org is meant for the public, so it is not supposed to be as scientific so it is more approachable for a larger audience.
- Katie Harrell spoke with Doug Johnson who apologized for not being able to be involved in the sub-committee but provided some recommendations to the committee on outreach matters. Mr. Johnson was impressed with the texasinvasives.org website and how they displayed information on invasive pests.
- Dr. Nobua-Behrmann discussed how UC ANR developed a course on ISHB and how that may meet one of the sub-committee’s needs.
- Dr. Nobua-Behrmann has a presentation that was developed for on invasive species that includes ISHB as well as a few other invasive pests that can meet the short term goal of having a presentation for the Speakers Bureau.
- **RFP:** “Train the Trainer” Course
- **RFP:** California Naturalists training which is still in development could include training on ability to identify. Completed the ISHB class paired with a field training. This would allow them to do visual surveys.
- **RFP:** for Field Work Training
- **Action Item:** Add iNaturalist to the Target Audiences
- **Action Item:** Group target audiences that need to be trained.
- Suggestion to create a 15 second commercial. The current video that we have is long enough that only those who have an interest in ISHB will watch the whole video. Need to develop a video that can be placed in front of audiences that do not already know about ISHB.

- **Action Item: David Pegos** working on some targeted ads on keyword firewood.
- **Action Item: David Pegos** will explore 15 sec video/commercial regarding not moving firewood.
- **Long Term Action Item: David Pegos** will create a 15 sec video/commercial to promote not moving Mulch and Greenwaste
    - "Don't Move Firewood" used to have some good videos to use as examples.
    - Suggestion that we consider looking at radio ads as well.
    - CDFA has been able to play Public Service Announcements in the past.
- Presentation on May 9th in San Luis Obispo.
- Suggestion to glean information and resources from existing programs in Hawaii and Florida.

Public Comment

- **Action Item:** John Bell will present on Glassy Winged Sharpshooter (GWSS) at nurseries. Working with Warren Nichols with CDFA and will include information about ISHB. Suggested Monterey, SLO, San Jose and clean-up groups for targeted ads.
- Suggestion that we also bring up surveying and monitoring
- Suggestion to add it to trapping contract
- Sandy Raperian assistance are doing trapping and no sign of tree pests.
- Tom Smith is giving a talk decorative hardwood association of North America on May 7th.
- **Action Item:** Shannon Lynch will collect activities currently being conducted for final report.

7. ADJOURNMENT

Dr. Nobua-Behrmann adjourned the meeting at 11:36am.

Next Meeting – Wednesday May 10th from 2:00pm to 4:00 pm in Room 333.

Meeting Participants

First Name	**Last Name**	**Affiliation**
Chair		
Dr. Beatriz	Nobua-Behrmann	UC ANR
Participants		
Abigail	Barraza	UC ANR

John	Beall	Ventura Agricultural Commissioner's Office
Faith	Campbell	Center for Invasive Species Prevention
Julie	Clark De Blasio	UC ANR
Kim	Corella	CAL FIRE
Corin	Choppin	CSUS CCP (notetaker)
Anabele	Cornejo	US Forest Service
Sandy	DeSimone	Audubon Society
Sabrina	Drill	UC ANR
Curtis	Ewing	CAL FIRE
Jan	Gonzales	UC ANR
Katie	Harrell	Board of Forestry
Gretchen	Heimlich	Disneyland Resort
John	Kabashima	UC ANR Emeritus
Shannon	Lynch	UC Santa Cruz
Jessika	Mitchell	Davey
Tasha	Newman	Pacific Policy Group
David	Pegos	CDFA (Convener & Facilitator)

Madeleine	Rauhe	Disneyland Resort
Michael	Scholl	CDFA
Joe	Scheele	Customs and Border Protection
Chris	Shogren	UC Riverside
Tom	Smith	CAL FIRE
Rhonda	Wood	Disneyland Resort

CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC)

Invasive Shot Hole Borers Sub-Committee

Outreach and Education

Meeting Agenda
Friday, May 10, 2019

2:00pm – 4:00pm

Location: CDFA, Room 333
1220 N Street
Sacramento, California 95814

Contacts: David Pegos, Exec. Dir.
(916) 654-0317

This meeting will also be held via webinar at:
https://attendee.gotowebinar.com/register/3285563243493380099

Dr. Beatriz Nobua-Behrmann, Chair
(949) 301-9182 x1006

2:00 p.m. **(1) CALL TO ORDER**

(2) FLAG SALUTE

(3) ROLL CALL and INTRODUCTIONS

(4) OPENING REMARKS and REVIEW OF THE SUB-COMMITTEE MISSION

(5) APPROVAL OF MINUTES, HOUSEKEEPING, UPCOMING MEETING DATES

(6) SUB-COMMITTEE BUSINESS/DISCUSSIONS
Invasive Shot Hole Borers (ISHB) – Development of Action Plan

- Finalize and approve issues, concerns and opportunities as they relate to Invasive Shot Hole Borers outreach and education.
- Finalize and approve action items and potential request for proposals (RFP) concepts.
- Next Meeting to discuss RFPs – Tentatively, Friday, May 24, 2019, 9:00am-11:00am

3:30 p.m. **(7) PUBLIC COMMENT ON ITEMS NOT ON THE AGENDA**

4:00 p.m. **(8) ADJOURNMENT**

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CALIFORNIA INVASIVE SPECIES ADVISORY COMMITTEE (CISAC) MEETING

Invasive Shot Hole Borer Sub-Committee

Committee Outreach and Education

Meeting Agenda Friday, May 10th, 2019

2:00pm– 4:00pm

Meeting Minutes

Meeting Action Items

- **Next Meeting: Monday, May 20th 2pm to 4pm**
- **Working Groups:**

Working Group	Charge	Participants
Education Outreach Coordinator	- Identify Potential Funders - Refine scope	**Coordinator:** Jan Gonzales **Participants:** Sabrina Drill, Madeleine Rauhe, Julie Clark De Blasio, John Kabashima, Katie Harrell
Target Audiences	- Group target audiences that need outreach and/or training	**Coordinator:** Katie Harrell **Participants:** Kevin Turner, John Kabashima, Beatriz Nobua-Behrmann, Madeleine Rauhe, Kim Corella, Curtis Ewing, Sheryl Landrum, Zachary Kantor-Anaya and Abby Barraza
Gaps in Outreach Materials	- Identify gaps in printed and online outreach materials to high priority target audiences.	**Coordinators**: Kim Corella **Participant**: Anabele Cornejo

Other Action Items:

- Julie DeBlasio send quarterly report to Sheryl Landrum

Consensus reached:

The top three priorities of the Outreach and Education Sub-Committee to design RFPs for:

1. ISHB communications coordinator
2. Regional outreach coordinators and
3. Communication operations funds for the development and production of materials.

Suggested Requests For Proposals Prioritized

1. ISHB Statewide Communication Coordinator - scope designed by working group
2. Regional Outreach Coordinators
3. A communication operating program
4. A training program (online trainings, field trainings, roadshow trainings)
5. Website and social media development
6. Developing/translating materials in languages other than English
7. Development and production of printed material and PowerPoints (targeted to different audiences)
8. Online outreach (ad buys for the video that is in production)

Meeting Proceedings

Dr. Beatriz Nobua-Behrmann called the meeting to order at 2:10pm and lead a round of introductions. Dr. Nobua-Behrmann reviewed the minutes. There were some minor adjustments made to the minutes including a correction of a last name spelling and removing Katie Harrell as a coordinator of the Gaps in Outreach Materials Working Group. Sabrina Drill moved to approve the minutes as amended. Matt Slattegren seconded the motion. The minutes were approved without objection.

5. SUB-COMMITTEE BUSINESS/DISCUSSIONS: Development of ISHB Action Plan

Outreach Education Coordinator Working Group

Jan Gonzales presented the scope of work of a potential communication coordinator position developed by the Working Group. The scope expands beyond just ISHB and allows for preparing for other potential pests.

- Sabrina Drill suggested changing the name to not have ISHB in the position title to allow the position to have more longevity.
    - Ms. Drill asked know if the position has to be done through RFP or can it be housed at another organization.
    - The Sub-Committee agreed that ISHB would remain in the job title for now due to funding issues.
- David Pegos responded that ISHB funding is limited to working on ISHB however the group can try to get other funding from other.
- Mr. Pegos clarified that these funds can be allocated for up to three years.

Target Audiences

Dr. Nobua-Behrmann reviewed the target audiences list and their prioritization. The working group felt that the current list of target audiences was too large to create a training targeted at each. Dr. Nobua-Behrmann categorized the target audiences into four categories:

1. Land Management and Greenwaste
2. Landscape and Gardens
3. Naturalists/Camping
4. Public Training

- Suggestion to add a column of who might carry out the trainings.
- Faith Campbell noted that it is important not just to focus on trainings that outreach materials were important as well. She recommended that we increase the number of categories.

Discussion of Potential Requests for Proposals (RFP)

- Ms. Gonzales suggested that we create a separate RFP item for communications operating program.
- Julie Clark de Blasio recommended that maybe the RFPs be divided into outreach materials, online courses, in-person courses.
- Ms. Gonzales recommended that the outreach coordinator determine which training courses were needed.
- Ms. Drill asked if there should be a pot of money for the coordinator's salary and a pot for their materials.
- Dr. Nobua-Behrmann noted it is important to identify such as the need to develop a field workshop that will help identify.
- Mr. Pegos noted per this committee's suggestion funds have been identified from the US forest Service to create a video.
- Ms. Campbell noted that it is importance of focusing on Greenwaste Haulers and Firewood Dealers.
- Abigail Barraza suggested that we would a statewide lead and regional coordinators.
- Communication Coordinator's duty includes addressing our targeted audiences with materials.

The Sub-Committee determined that sub-committee strategies to be prioritized should be:

1. ISHB Communication Coordinator (Statewide)
2. Regional Outreach Coordinators
3. Website and social media development
4. A Communication Operating Program
5. A Training Program (Online trainings, field trainings, roadshow trainings)
6. Online Outreach (ad buys for the video that is in production)
7. Development and production of printed material and PowerPoints (targeted to different audiences)
8. Developing/translating materials in languages other than English

There was some discussion regarding sequencing and the coordinator position. Dr. Nobua-Behrmann brought up the importance of certain outreach materials be developed as soon as possible per the request Pathways and Survey Sub-Committee.

- Dr. Kabashima brought up the Citrus Pest Disease and Prevention Committee website as a good model.
    - Mr. Pegos said it was a private contractor hired by the committee
    - Ms. Barazza noted that it is going to take a lot of time to transition PSHB.org from the old format to the new design currently being used by UC.
    - It was agreed that PSHB.org could be hosted by a firm that specialized in web

Prioritization

Dr. Nobua-Behrmann opened the floor up to have each participant list their top three priorities from the strategies that had been agreed on. These priorities did not necessarily imply that the other listed priorities were not important and may not be covered by other listed strategies as some of the strategies had overlap but rather would help inform focus for the next sub-committee meeting which was to be focused on developing requests for proposals.

- Sabrina Drill 1, 2, 4
- Abigail Barraza 1, 2, 4
- David Pegos 1 2 3
- Faith Campbell 1 2 4
- Jan Gonzales 1 2 4, remove word position in number 3:
- John Kabashima 1 2 4
- Julie Clark De Blasio 1 2 4
- Madeleine Rauhe 1 4 5
- Gretchen Heimlich 1 2 5
- Rhonda Wood 1 5 8
- Sheryl Landrum 1 2 4 and 7 due to immediate need for some outreach materials
    - Jan Gonzales responded that materials to fill immediate needs were already in development.

It was the **consensus** of the group that the top priorities of the Outreach and Education Sub-Committee is a ISHB Communications Coordinator, Regional Outreach Coordinators and Communication Operations funds for the development and production of materials.

- Members of the sub-committee gave a workshop in SLO on ISHB yesterday May 9th. It had great participation from all over the state.
- Members of the Sub-Committee will be putting on a workshop in July.
- **Action Item:** Julie DeBlasio send quarterly report to Sheryl Landrum.

Public Comment

Public comment was done in conjunction with the prioritization as participants were asked to include any comments they had in their rankings.

7. ADJOURNMENT

Dr. Nobua-Behrmann adjourned the meeting at 4:15 pm. Next meeting will focus on RFP development.

Next Meeting – The next sub-committee will be scheduled for May 20th 2pm to 4pm.

Meeting Participants

First Name	**Last Name**	**Affiliation**
Chair		
Dr. Beatriz	Nobua-Behrmann	UC ANR

Participants		
Abigail	Barraza	UC ANR
Elizabeth	Brusati	CDFW
Faith	Campbell	Center for Invasive Species Prevention
Julie	Clark De Blasio	UC ANR
Corin	Choppin	CSUS CCP (notetaker)
Anabele	Cornejo	US Forest Service
Sandy	DeSimone	Audubon Society
Jon	Detka	UC Santa Cruz
Sabrina	Drill	UC ANR
Jan	Gonzales	UC ANR
Gretchen	Heimlich	Disneyland Resort
John	Kabashima	UC ANR Emeritus
Sheryl	Landrum	City of San Diego
David	Pegos	CDFA (Convener & Facilitator)
Madeleine	Rauhe	Disneyland Resort
Michael	Scholl	CDFA

Viviana	Ruiz	US Forest Service
Matthew	Slattengren	Contra Costa County
Rhonda	Wood	Disneyland Resort

Appendix B. Fusarium dieback – Invasive shot hole borer monitoring trap guidelines.

Invasive Shot-Hole Borers + Fusarium Dieback
Monitoring Trap Guidelines

WHEN TO TRAP

Monitoring for Invasive Shot-Hole Borer (ISHB), *Euwallacea* spp., and Fusarium Dieback can be challenging: the invasive pest complex has attacked over 260 different species, including common native, landscape, and agricultural trees.

Visual surveys are effective for identifying ISHB symptoms on individual trees, but may not be practical for several acres of inaccessible forest. In this case, monitoring traps can be installed to detect ISHB presence. A lure called quercivorol helps attract beetles to the trap. This document describes trap options and the process of trap installation and maintenance.

An adult female beetle[1] is 1.8-2.5 mm (0.07-0.1 inches) long

VISUAL SURVEYS

Whenever possible, visual tree surveys are preferred over monitoring traps. Trapping is a passive detection method that is useful for large or inaccessible areas. However, regular inspections of individual trees are recommended for homes or managed landscapes. If time and resources allow, this is a more accurate and precise way of detecting ISHB.

Visit www.pshb.org for the full ISHB host list and photos of symptoms on a variety of tree species.

TRAP OPTIONS

Trap Type	Lindgren/Funnel Trap (A)	Panel Trap (B)	Bottle Trap (C)
How it Works	Insects encounter trap, tumble down through funnels, and fall into cup of preservative*	Insects that fly into trap become stuck on the sticky surface of the panel	Insects encounter upper bottle and tumble down into lower bottle of preservative*
Pros	• Lasts for multiple field seasons • Easy to service and maintain • Insects will be easier to identify	• Less expensive than Lindgren/Funnel trap • Less frequent service required, as beetles are preserved well on surface	• Less expensive than Lindgren/Funnel trap
Cons	• More expensive than other traps • More frequent service required to prevent trap cup from overflowing or drying out • Requires regular cleaning (dust, spider webs) • Possibility of vandalism	• Samples need to be individually removed from trap surface • Insects are sticky and harder to identify • Traps are not re-usable (good for ~1 field season)	• Lower trap catches expected compared to other trap options • Requires assembly and multiple parts

*see Trap Preservatives section on reverse side

Authors: Akif Eskalen, Ph.D.[1]; John Kabashima, Ph.D.[2]; Monica Dimson[2]; Jan Gonzales[2]; Stacy Hishinuma, Ph.D.[3]; Richard Stouthamer, Ph.D.[1] **Photographs:** female beetle[1] - Gevork Arekalian/LA County Dept of Agriculture; bottle trap - Benjamin DiAnna[2]; all other images - Monica Dimson[2]

[1] UC Riverside; [2] UC Cooperative Extension; [3] USDA Forest Service, Forest Health Protection

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TRAP PLACEMENT

- Location: Consider placing traps near riparian areas, green waste facilities, firewood vendors, golf courses, or botanical gardens.
- Host material: Place traps where ISHB's reproductive (most preferred) host species are available (e.g. sycamore, willow, cottonwood, box elder, castor bean).
- Quantity/density: Traps may be placed at 25 to 35 yard intervals throughout the monitored area (or 2-5 traps per acre). A higher concentration of traps/lures is not advised.
- Public visibility: Traps should be accessible for maintenance, but away from high-traffic areas.
- Do NOT hang traps: in or under tree canopies, in areas exposed to high winds, or where traps may get wet (i.e. irrigated lawns or planters).
- If possible, collect x-/y-coordinates for each trap to facilitate maintenance and inspection.

TRAP INSTALLATION

1. Hang trap approximately 5 feet high (a simple stand can be constructed from a rebar stake and a 5' length of EMT or sturdy PVC). Panel traps can be clipped to the stand using binder clips.
2. Fasten lure near the top of the trap (4-5' above ground) with a zip-tie or twist-tie.
3. Always attach contact information and "Do Not Disturb" notices to each trap. If placing more than one trap in an area, assign each one a number and label the traps.

MAINTENANCE AND INSPECTION

Inspect and empty traps every 1-2 weeks, depending on the liquid used and whether ISHB is in the area. Remove debris and non-target insects from trap cups or panels as needed.

We recommend retrieving trap contents from the field for examination in a lab or indoor workspace. Use sealable sampling bags to store trap contents.

Do not transport live insects: PSHB/KSHB can chew through plastic. Transport samples in a sealed container. To guarantee that insects are dead, and to prevent decay, place samples in a freezer until they can be inspected.

Lindgren/Funnel and Bottle Traps

1. For each trap, label a sampling bag and paint strainer with trap number and collection date.
2. Remove the collection cup/bottle from the bottom of the trap. Filter the contents by pouring the antifreeze through a paint strainer and into another container (e.g. bucket, jar).
3. Place the paint strainer in the labeled sampling bag. The contents of each trap should be sealed in a separate one quart bag. Make sure that any insects collected have drowned in the antifreeze.
4. Return the antifreeze to the collection container. If needed, top off container to be ~1/3 full of antifreeze.

Panel Traps

1. For each trap, label a sampling bag with the trap number and collection date.
2. Using a pair of forceps/tweezers, gently remove insects from the surface of the panel trap and place them in the sampling bag.
3. Sticky panel traps will eventually require replacement.

Alternatively, the entire panel can be removed and examined in an indoor space. However, one-time use of each panel makes this method more costly.

ISHB RESOURCES

www.pshb.org - UC Cooperative Extension ISHB website

www.eskalenlab.ucr.edu - Eskalen Lab, UC Riverside

www.ipm.ucanr.edu - UC Statewide IPM Program

HOW TO USE THE LURE

Quercivorol is a plant-based chemical lure that attracts ISHB and other insects. It is not strong enough to be used to trap and kill ISHB in large numbers, but it is useful in confirming the presence of the tiny beetle.

Some tips to help maximize the effectiveness of the lure include:

- **Replace** lures every 6-8 weeks. No special procedures are required for lure disposal.
- **Only use 1** lure per trap; a high concentration of lures can actually make them less effective.
- **Store** lures in the freezer until you are ready to use them. Otherwise, the chemical may be released before being installed in the field.

TRAP PRESERVATIVES

The collection cup/bottle at the bottom of **Lindgren/Funnel and bottle traps** should be ~1/3 full of soapy water OR a propylene-glycol-based antifreeze. Antifreeze preserves the beetles better than soapy water (which will need to be inspected more often).

Avoid ethanol-based formulas (i.e. ethanol, ethyl alcohol, ethylene glycol). Ethanol attracts many species of ambrosia beetle, which will make identification of ISHB more difficult.

REPORTING ISHB

If you recover suspected ISHB from a trap, please visit www.pshb.org for current reporting information.

Appendix C. Existing survey protocols for Tier 1 surveyors

Invasive Shot Hole Borer (Polyphagous or Kuroshio) Visual Surveys of Riparian Areas
California Department of Fish and Wildlife – South Coast Region (Region 5)
June 2017

Invasive Shot hole borer (ISHB) will be surveyed by a crew of at least 2, for purposes of increased detectability and safety. The goal of the visual inspection surveys is for presence/absence of ISHB and to what extent and is not meant to determine population size but can possibly give an indication of level of infestations. Surveys will be thorough to determine if an area is clear for ISHB with the wandering transect visual survey method. However, if the tree stand is deemed too thick in vegetation density to survey in an efficient manner (visibility <2m) or is deemed unsafe then a spaced visual survey will be conducted.

Equipment

ISHB survey observers would need the following equipment and supplies before conducting survey;

1) First aid kit
2) Water
3) Sunscreen
4) Proper clothing (i.e., boots, long sleeve shirts, etc.)
5) GPS and SPOT if needed, hand held radios for perimeter survey
6) Data sheet with clip board and pen/pencil
7) Poison oak post contact wipes
8) Spray bottle of disinfectant liquid for knife
9) Knife (dis-infect after every sample)
10) Collection vials and labels
11) Tweezers
12) Magnifying Loupe (16X minimum)
13) Camera
14) ISHB field guide

Survey Method: Dependent on terrain, density, and species present, either a wandering transect or spaced visual survey method will be used.

At end of the survey be sure **no beetles, or other invasive species,** are on you or gear, clothing or boots, by visual inspection before entering the vehicle. This is very important to ensure we are not transporting the beetle or other invasive species.

Wandering Transect Visual Survey Method

Suitable applications include survey areas that are fairly open with relatively lower amounts of host species present.

Depending on terrain, observers will spread out perpendicular to riparian area. Observer closest to riparian area will be spaced far enough from riparian to cover 2-3 trees. The vegetation will determine these distances with safety being the most important factor. As such spacing can be as short as 1-2m and as long as 20m depending on how thick the cover is. Observers should look for obvious signs and symptoms of infestations opportunistically as they proceed throughout the

study area. Periodically, host plants should be inspected more thoroughly (i.e., 5-10min) and record data on observations.

Spaced Visual Survey Method
IF the area to be surveyed is deemed too thick in vegetation density (i.e., visibility less than 2 meters), or unsafe due to topography and/or water bodies than a perimeter search of the tree stand with random interior point will be conducted.

Specifically, a survey will be conducted every 100 meters around or within the tree stand. In cases where 100 meter spacing is not possible due to access, or other limitations, points with 50 m spacing may be used as an alternative. When possible interior points will have a 50m radius buffer and be randomly distributed within the stand. These random interior points will cover the tree stand but not open spaces. Often, riparian stands may be too narrow to have both permitted and interior survey points.

The points will be laid out spatially on an aerial photo made by the Research Program Specialist. The survey points will also be uploaded onto each observer's GPS unit to easily navigate to survey points.

At the survey point, up to four trees will be surveyed for ISHB. Due to fine scale spatial differences between the map and on ground distribution of trees the GPS point might be outside the stand of trees. If the GPS point is not in close proximity to trees the observer will proceed to the tree stand in a perpendicular direction until reaching the tree stand perimeter. At each survey point the four closest host plants will be surveyed *until* ISHB infestation is observed. After an infestation is observed at a survey point, the observer will move to the next survey point.

In all cases safety is paramount and do not proceed to a survey point if safety is compromised due to terrain or other relevant factors.

Data collection
Once the spacing is determined to start the survey, track logs of GPSs will be turned on to see movement of observers. Observers inspect both main stem and branches of trees for ISHB sign. Be sure to cover all sides of tree for inspection to ensure nothing was missed. Shrubs will not be inspected unless there are questionable symptoms or no other host trees are within the survey area.

If a tree is found to have ISHB or is in question, take a GPS point, a picture, mark the tree with flagging or dot with tree spray paint, and sample the tissue and/or beetle for verification. Be sure to disinfect knives for fungus. Tissue samples will be taken from trees with green cambium with procedures laid out in University of California Agriculture and Natural Resources website http://ucanr.edu/sites/pshb/files/204933.pdf No more than 10 minutes will be devoted to collect tissue samples to reduce overall survey time on host trees.

And to reiterate for good practice, at the end of survey be sure **no beetles or other invasive species** are on you or gear, clothing or boots, by visual inspection before entering the vehicle. This is very important to ensure we are not transporting the beetle or other invasive species.

Data management
GPSs and datasheets will be given to Non-game staff (Research Program Specialist) for managing data and mapping.

Ventura County SHB Early Detector Observational Survey

Thank you for becoming a Ventura County Urban SHB Early Detector! Thanks also to the Thelma Hansen Fund for supporting this project.

Polyphagous shot hole borer was detected in early 2016 in avocado groves in the Santa Paula area, and in riparian areas in the Santa Clara River in late 2016. In addition, a single beetle was detected in a trap in Ojai, and the closely related Kuroshio shot hole borer was identified in Montecito. Researchers from the Ventura County Agricultural Commissioner's office, UC Riverside, and UCSB are continuing to monitor traps set in these areas, but this will be the first methodical survey of urban and residential areas in the county.

This early detection survey will allow us to get a clearer picture of the spread of polyphagous shot hole borer in these settings, and plan for management. While this beetle/disease complex can affect hundreds of tree species (there are over 50 known reproductive hosts among the two pest complexes), we are focusing in sycamore trees. That is because our two common sycamores, California sycamore (*Platanus racemosa*) and London plane (*Platanus x acerifolia*) are common in both native and urban settings, are highly susceptible to the pest, and both the trees and the pest damage are easy to see.

Site identification and description – Establish monitoring location and stand:

1) Choose a location close to you from our list, or let us know if you have another location in mind where there is a stand of mature sycamore trees. The ideal stand for monitoring is 3-6 trees, but could be an individual tree in your back yard, or a stand of 10 trees in a park.
    a. *Make sure your access to the stand and photo point is safe! Be aware of traffic – cars, bikes, etc. and uneven surfaces.*
2) Determine if you want to monitor multiple stands in one site (for example, Harmon Park in Ventura has sycamores on both sides of a flood control channel, I would call each group of 4-5 trees a separate stand).
3) For each stand at the site, choose a photo point that you can easily locate again and take a picture. You will want to return to the same point to take a picture each month. Good candidates for photo points are street corner, specific addresses, or features at along a sidewalk – bend in the walk, near bathrooms/water fountain/tennis court/playground, etc.). NOTE: If you are using a cellular phone to take photos, please make sure location services are turned on. If you are using a digital camera that has GPS capability, please have that capability turned on. We should be able to collect that information from the photo files you submit.
4) Number trees from left to right, or clockwise if that makes more sense. The numbering scheme is to help you locate the same trees again, so make sure it makes sense to you.
5) Measure the diameter at breast height (DBH) of each tree in the stand – you will only need to do this at your initial visit.

a. Measure 4.5 ft from the base of the tree up the trunk. HINT – if it's easier, measure 4.5 feet on yourself at home, then use that as your reference point. Also, take note of where 4.5 feet is on you to use for your monthly survey.
b. Wrap either the measuring tape or a piece of string around the trunk – then measure the length of the string.
c. You've now measured the circumference of the tree – divide by 3.14 to get diameter (who said you'd never use trigonometry!)

2) Note ground conditions around the tree – clear dirt, maintained grass, mulch, etc.
3) If your photo of the stand can't capture each tree, you'll be able to upload photos of each tree later on. Try to take photos with the sun behind you, and please make sure they are as clear as possible.

Monthly survey

4) Repeat photo/s of the entire stand
5) Walk around the tree looking for signs of staining and any visible bore holes. Pay special attention to the north side of the tree, but do walk around the entire tree. Focus your effort 2 feet above and below (for a total of 4 feet) 4.5 ft (breast height). This does not need to be super exact. On sycamore, often the first signs of infestation are conveniently found right about at eye height, but ideally you should examine from about 2 feet-6 feet off the ground.
6) Take photos of the part of the tree where you suspect shot hole borers. Follow these steps
   a) **The image must be very clear** (we can't tell anything from an image that is out of focus). If you are using a cellular phone to take photos, *please make sure location services are turned* on. If you are using a digital camera that has GPS capability, please have that capability turned on.

   b) **The image should include the point of a pen or pencil** pointing out the exact location of the borer. Make sure not to cover the hole itself, but be within ¼ inch of the hole.
   c) In the photo below, the black roundish thing poking out of the hole is actually a beetle abdomen. **Note if you see actual beetles either in holes, climbing the trunk, or in flight.**
7) If you see numerous holes, note the density – please count individual holes up to 24, then tic 25-49, 50-149, >150. If you can, please note the aspect as well (we're trying to test the idea that they initially prefer the North side of trees)

DATA ENTRY:

There are three possible ways to record the information you collect.

1. Fill out the paper data sheets. There is a sheet for your initial site visit, and a different sheet for each subsequent monthly visit.
   a. Upload your data at a computer using the online surveys, and upload photos.
   b. Upload your data at a computer with the online survey, and email your photos to Julie Clark deBlasio, jdclarkdeblasio@ucanr.edu. Please rename your photos with the

sitename.stand romannumeral.treenumber.ddmmyyyy.letter if more than one pic of that tree

i. Ex: arroyoverde.standIII.tree2.12042017.c

2. Scan and email your data sheet, or mail it, or bring it into the CE office and Julie will enter it. Digital photos are still preferred though and ideally emailed, ask Leah, Julie, or Sabrina if you need assistance downloading from your camera.
3. Record your data in the field using a smart phone and the online survey. The link to the survey is http://ucanr.edu/vcurbanshb

NOTE: if you attended the April 2017 training, we switched to a single survey. Once sites are established, we will update the survey so that site names will be available in a dropdown menu.

Appendix E. Sample Processing Protocols to Identify ISHB beetles and their pathogenic fungi.

Specimen Removal from Sticky Traps

A maximum of 10 beetles from each trap will be individually tested for ISHB. If it is possible to do the beetle identification without the need of first cleaning the beetles of the sticky material that would remove one step in the identification process. It is not clear at this point if this is possible but this could be determined easily.

Materials

Sticky trap
Dissecting microscope
Sterile brush or toothpick
100% d-Limonene (can be purchased for ~$80 per gallon on Amazon)
Vortex
Pipette and tips
80% and ≥ 95% ethanol
glass storage vials

Methods

- Collect sticky traps that have been deployed for no longer than four weeks and return to laboratory
- Under a dissecting microscope, locate suspected ISHB specimens and add a small drop of d-Limonene. Allow to soak for 2-3 minutes and then remove specimen with a sterile brush or toothpick
- Transfer specimen to a vial containing ~ 100 µl d-Limonene and incubate at room temperature for 2 hours (gently vortex the specimen approximately every 30 minutes).
    - Specimens from an individual trap card can also be treated as a "bulk" sample. For example, 20 specimens on a single trap could be placed in one vial with ~1 ml of d-Limonene
- Remove the d-limonene using a pipette and add 80% ethanol
- Remove 80% ethanol and replace with ≥ 95% ethanol
- Store in the refrigerator or freezer until ready for DNA extraction

Specimen Preparation for DNA Extraction Prior to Morphological Vouchering

Materials

One sterile and LABELED 0.5 mL microcentrifuge (PCR) tube per specimen
Extraction buffer (1:3 ratio of 100 mM NaOH : 0.267 mM Na_2EDTA at pH 8.0)
Fine paint brush
Centrifuge
40 mM Tris-HCl (pH 5.0)
Pipette and tips
>70% EtOH

Methods

- If specimen is in alcohol, remove and dry briefly (~1 min) on a kim wipe
- Wet a fine paint brush with the extraction buffer and use to pick up the specimen
- Place specimen into the labeled PCR tube containing 100 µl extraction buffer and cap

- Briefly spin tubes in centrifuge to ensure specimen is in contact with the buffer (ideally submerged)
- Incubate tubes at 95°C for 30 minutes
- Allow to cool to room temperature and briefly centrifuge tubes again.
- Add 100 µl of 40 mM Tris-HCl (pH 5.0) to the tube and vortex to mix
- Store extract at -20°C
- Specimen can remain in the DNA extract, **but** to retrieve it for morphological study and minimize the chances of contaminating the extract, transfer the liquid to a new labeled tube using a pipette, leaving the specimen behind. Then, add >70% EtOH to the specimen in the original tube.

Fungal identification

Materials

Lyophilizer
FastPrep
Nanodrop
Sterile 1.5 mL microcentrifuge tubes
Sterile 2.0 mL stainless steel metal microcentrifuge tubes
2 mm diameter sterile stainless steel beads
Sterile cotton blugs
AP1 buffer
Sterile plastic pestle
DNeasy plant mini kit
AE Elution buffer

Methods

Extract DNA from Mycelium of Fungal Cultures

- Harvest mycelium from fully colonized clean fungal cultures
- Place them in into sterile 1.5 mL microcentrifuge tubes containing 25 µl of AP1 buffer then freeze at -80°C and then macerate with a plastic pestle.
- Once the tissue is macerated, use the DNeasy plant mini kit protocol to extract DNA.
- Suspend all the samples in 50 µl AE elution buffer.

Extract Fungal DNA From Symptomatic Woody Tissue

- Lyophilize samples with a bench top freeze dryer at -50°C under 0.01 mbar vacuum for 24 hours.
- Transfer wood samples to sterile 2 mL stainless steel metal microcentrifuge tubes containing 2 mm diameter sterile stainless steel beads, cover with a sterile cotton plug and re-freeze at -80°C for 30 min.
- Cap frozen samples with a sterile impact resistant plastic plug and bead beaten for 30 sec at 4.0 m/s using a FastPrep.
- Use macerated wood dust for DNA extraction using DNeasy plant mini kit protocol.
- Suspend all the samples in 50 µl AE elution buffer and DNA concentration quantify using Nanodrop 2000c.

Appendix F. How to handle infested plant material.

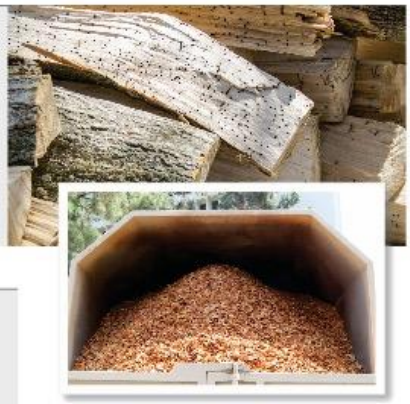
Invasive Shot-Hole Borers + Fusarium Dieback
How to Handle Infested Plant Material

CURRENT OPTIONS

Live ISHB can continue to live in and emerge from infested wood - including the stump left behind after tree removal. **Always follow-up tree removal with stump grinding. If relocating infested material, cover in-transit to prevent beetles from escaping.**

Options for handling ISHB-infested plant material include:

- Chip (less than 1") + compost
- Chip (less than 1") + solarize
- Chip (less than 1") + use as mulch (only in areas already heavily infested by ISHB)
- Chip (less than 1") + deliver to landfill for use as Alternative Daily Coverage
- Cut logs + solarize
- Cut logs + kiln-dry



SOLARIZATION GUIDELINES

Solarization is a suitable method for handling either infested chips or logs. When done properly, solar energy will heat plant material until both the beetle and fungi are killed. It is most effective during the peak of summer, when temperatures are higher and days are longer, but may be used during the rest of the year as long as time and space can be committed. Follow these tips for proper solarization:

- Use sturdy plastic sheeting/tarp (clear is recommended) that can withstand rain/wind
- Fully contain chips/logs by wrapping plastic both underneath and over the material
- During July - August: cover chips/logs with sturdy plastic for **at least 6 weeks**
  - Temperatures during these months should be regularly above 95°F
- During September - June: cover chips/logs with sturdy plastic for **at least 6 months**
- **Keep log/chip layers as thin as possible** (2 logs deep maximum) to ensure even heating throughout the pile

COMPOSTING GUIDELINES

When done correctly, composting can effectively control the plant pathogens that cause Fusarium Dieback. Composted, chipped plant material may then be repurposed as mulch or added back into soil to improve texture and water retention.

Requirements for adequate decomposition

If transporting chipped material is not an option, you can compost chips yourself. These general composting guidelines will help assure the destruction of pathogenic fungi.

- Woody material should be chipped to less than 1 inch.
- A mixture of equal volumes of green plant and dry plant material will normally achieve a proper carbon-to-nitrogen ratio of 30 to 1.
- Do not add soil, ashes from a stove or fireplace, dairy or meat products, or manure from meat-eating animals.
- A pile should be in bins at least 36 x 36 x 36 inches to assure adequate heating. Maintain a temperature of 160°F, turn the pile every 1-2 days, and add nothing to it once the composting process has begun. If temperatures do not get up to 160°F within 1-2 days, the pile is too wet or dry. If too dry, add water. If not enough nitrogen, add green material.
- Healthy compost has a pleasant odor, gives off heat as vapor when turned, has a white fungal growth on the decomposing material, gets smaller each day, and changes color to dark brown. Compost is ready when it no longer produces heat.

Source: UC IPM, ipm.ucanr.edu/PMG/GARDEN/FRUIT/ENVIRON/composting.html
Read more about composting at uccemg.com/files/78738.pdf and calrecycle.ca.gov/Organics/

PRUNING BMPS

Poor pruning practices can facilitate the spread of plant disease. For pruning and tool sterilization tips, see UC Riverside's "Best Management Practices for Disease in Oak Woodlands" (Lynch and Eskalen 2014).

TRUSTED COMPOST FACILITIES

It is **recommended** that chipped material be taken to a composting facility that has earned the US Composting Council's Seal of Testing Assurance (STA). Facilities in the STA program are tested for proper decomposition and pathogen control.

Find your local STA Compost Facility at: compostingcouncil.org/participants

ISHB RESOURCES

For ISHB research updates and news:
www.pshb.org
ucanr.edu/sites/eskalenlab

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University of California
Agriculture and Natural Resources

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Appendix G. Zone of Infestation For ISHB

For a zone of infestation to be implemented, clear and definitive evidence needs to be provided on how the insect or disease has and is significantly impacting the forests in the infested areas. Information supporting the insect and disease impacts and what has been done so far to stop the spread of the ISHB needs to be included. These items would include: outreach & education, trainings, research, biology, damage done to trees, status of the outbreak, number of parcels and acres of landowner's ownerships affected, significant economic costs, distribution of tree species affected, proposed management and control options and cost/benefit analysis of doing and not doing management, ecological, cultural, and aesthetic losses to the region. Also, a description of the proposed zone with corresponding maps will need to be included in the packet of information.

Once the document is completed, which has been reviewed by the affected CAL FIRE unit foresters, the document can move forward in the approval process. This document usually comes up through the chain of command starting at the unit level and then brought up to the Director of CAL FIRE. If the Director sees this is a need and important he will make a recommendation to the Board of Forestry for approval. Then the pest management staff, accompanied by other essential personnel will present the information to the Board of Forestry at one of their monthly meetings for approval. Seeing as this encompasses all units in the southern region this will probably be brought up the chain of command at the region level to the Director, while keeping the units involved every step of the way.

Tom Smith met with CAL FIRE FRAP and Mark Rosenberg stated that developing maps for priority areas for trapping and surveying, showing potential spread (layers for vegetation, riparian areas, green waste facilities and other high-risk sites, parcel ownership and known existing infestation sites) is their main priority. They also want to develop the permanent data base of both positive and negative trap sites, tree positives, etc. that a select group can update as new information comes in.

VALUE OF CREATING A ZONE OF INFESTATION FOR ISHB

The value of establishing a Zone of Infestation for the invasive shot hole borers is linked to:

- Fostering collaborative efforts with both current and potential local, state and federal agency partners working on ISHBs prevention, containment, control and remediation.
- Communicating the concern of both the Department and the Board for the ISHBs issue and its current and potential impact in California to the public.
- Showing support from both the Department and the Board for efforts to seek funding, research, education outreach, best management practices for control, management efforts in managing ISHBs-infested wood, and other ISHB related activities.
- Creating a directive that ISHBs suppression and control measures be feasibly addressed in Timber Harvesting Plans within the ZOI (applicable only in mixed conifer stands where susceptible hosts are being harvested incidentally along with commercial species of conifers and a THP would be required).

- Establishing an official mapped boundary of the known ISHBs infestation which can serve to notify communities within the current infested area and to alert communities in neighboring non-infested areas of proximity, spread and threat of ISHBs.
- Expressing the concern to the state legislature and governor's office about the potential impact and harm that ISHBs could have statewide.
- Partnering with local governments in efforts to help stop the spread.
- Supporting the use of California Conservation Camp crews in control or management projects for ISHBs on private and state lands.

PUBLIC RESOURCE CODE, ARTICLE 5, SECTION 4712-4718

Section 4712.

(a) "Owner" includes any individual, partnership, corporation, or association.

(b) "Timberland" means any land which has enough timber, standing or down, to constitute, in the judgment of the board, an insect or pine beetle infestation breeding ground or plant disease hazard of a nature to constitute a menace, injurious and dangerous to timber or forest growth.

Section 4713.

Pine beetles and other insect pests or plant diseases which are harmful, detrimental and injurious to timber and forest growth are a public nuisance.

Section 4714.

Every owner of timber or timberlands shall control or eradicate such insect pests or plant diseases on lands owned by him or under his control. If he does not do so the work may be performed as provided in this article.

Section 4715

The department, in accordance with policy established by the board, may enter into agreements with any owner and with any agency of government, including the federal government, for the purpose of controlling or eradicating forest insects or plant diseases damaging or threatening destruction to timber or forest growth, and it may make expenditures for that purpose.

Section 4716

(a) Whenever the director determines that there exists an area that is infested or infected with insect pests or plant diseases injurious to timber or forest growth and that the infestation or infection is of such a character as to be a menace to the timber or timberlands of adjacent owners, the director, with the approval of the board, may declare the existence of a zone of infestation or infection, and describe and fix its boundaries.

(b) If the director declares the existence of a zone of infestation or infection pursuant to subdivision (a), the department or its agents may go upon state and private lands within the

zone of infestation or infection and shall cause the infestation or infection to be eradicated or controlled in a manner that is approved by the board.

(c)(1) Within a zone of infestation or infection, the department may remove live vegetation directly adjacent to dead or dying vegetation that is substantially at risk of infestation or infection.

(2) The department may also remove soil that harbors or could reasonably harbor insects or pathogens injurious to timber or forest growth, and that have the potential to facilitate the spread of insects or pathogens to live trees or could substantially increase the risk of subsequent infestations or infections.

Section 4717

The department may make the necessary surveys and appraisals to obtain pertinent data and information on insect infestations and disease infections. The department may make expenditures for that purpose.

Appendix H.1. CDFA Fusarium dieback – invasive shot hole borers Incident Action Plan form

PHOTO OF TARGET PEST	**INVASIVE SHOT-HOLE BORERS – VENTURA COUNTY INITIAL INCIDENT UPDATE** **Agenda – 1:00 PM, Monday, August 12, 2019** **UC Cooperative Extension** **California Room** **669 County Square Drive, Suite 100** **Ventura, CA 93003**

Meeting called by:	**Incident Commanders**	**Type of Meeting:**	**Initial Incident**
Facilitator:	**J. Beall**	**Project Code**	

Please review:	**Please Note**

----- Agenda Topics -----

Roll Call	**J. Beall**	
Incident Command Comments **Detection/Survey/Treatment** **Lab Status** **Regulatory** **Permits/Regulations/Environmental Compliance** **PIO**	**I. Commander**	
Legal **Safety** **Agencies . . .** **Ventura County**		
Next Meeting Date:		

ISHB – Ventura County Meeting Roll Call, Monday, August 12, 2019 at 1:00 PM

County:	Person(s)	Comments
UC Cooperative Extension:		
CDFA:		
CalFire:		
RCD:		
Parks:		
Public Works:		
LEA:		
Land Conservancy:		
Other Organization:		

INITIAL INCIDENT OBJECTIVES Ventura County	Incident Name:	Date Prepared	Time Prepared
Operational Period:			

General and Strategic Objectives:

New Objectives:

Detection/Survey/Treatment:

Regulatory:

Permits/Regulations/Environmental Compliance:

PIO:

Safety:

Ventura County:

TREE MORTALITY TASK FORCE

In Response to the State of Emergency Proclamation

Incident Action Plan 2016

www.treetaskforce.org

Updated September 20, 2016

TREE MORTALITY TASK FORCE

The Tree Mortality Task Force is comprised of state and federal agencies, local governments, utilities, and various stakeholders that will coordinate emergency protective actions, and monitor ongoing conditions to address the tree mortality resulting from four years of unprecedented drought and the resulting bark beetle infestations across large regions of the State.

Management Objectives:

- Provide for public health and safety of persons and property in identified high hazard zones.
- Ensure efforts associated with implementation of the directives contained in the Governor's State of Emergency Proclamation remain coordinated.
- Ensure continuous communication among state, federal, tribal and local governments, as well as with other non-governmental organizations assigned to the task force.
- Provide consistent and coordinated messaging between task force member agencies and the public.
- Manage projects and programs in a financially responsible and efficient manner.

Working Group Objectives:

- Identify existing efforts to mitigate tree mortality in high hazard zones.
- Identify an organizational structure and plan of action.
- Establish working groups, as appropriate, to address various aspects identified in the Governor's State of Emergency Proclamation.
- Facilitate the information flow between state, federal, tribal and local governments, utilities, and other non-governmental organizations on efforts towards meeting the items addressed in the Governor's State of Emergency Proclamation.
- Ensure project activities and resources are coordinated.
- Identify potential funding sources.
- Coordinate with other state-level initiatives, such as the Forest Climate Action Team and California Forest Biomass Working Group.
- Identify and evaluate the availability of wood products markets, and determine whether expanded wood products markets can be developed.
- Develop and maintain a website for the dissemination of information.

ORGANIZATION ASSIGNMENT LIST

1. INCIDENT NAME

TREE MORTALITY TASK FORCE

2. Date	3. Time
09/20/16	0700

4. Operational Period

01/01/16-12/31/16

Position	Name
5. Multiagency Coordination Group	
Governor's Office	Vacant
CAL FIRE	Ken Pimlott
Cal OES	Mark Ghilarducci
6. Task Force Leader and Staff	
Task Force Leader	Gabe Schultz
Deputy	Rick Carr
Safety Officer	
Information Officer	Daniel Berlant
County Liaison	Cara Martinson
County Liaison	Staci Heaton
Southern Region	Jeff Isaacs
7. Agency Representative	
8. Planning Section	
Chief	
Deputy	
9. Logistics Section	
Chief	Whitney Bray
Deputy	
Equipment Tech Specialist	Jack Ogletree

10. Working Groups	
a. Group - Forest Health and Resilience	
Group Leader	Pete Cafferata
Group Leader	Stewart McMorrow
b. Group - Mapping and Monitoring	
Group Leader	Mark Rosenberg
Group Leader	Chris Fischer
b. Group - Pubic Outreach	
Group Leader	Daniel Berlant
Group Leader	Staci Heaton
d. Group - Regulations	
Group Leader	Matthew Reischman
Group Leader	Sandy Goldberg
e. Group - Resource Allocation	
Group Leader	Thom Porter
Group Leader	Tom Lutzenberger
f. Group - Utilization - Bioenergy	
Group Leader	Angie Lottes
Group Leader	*vacant*
g. Group - Utilization - Market Development	
Group Leader	Evan Johnson
Group Leader	*vacant*
11. Finance Section	
Chief	
Deputy	

Prepared by (Deputy Task Force Leader)

Rick Carr

TREE MORTALITY TASK FORCE WORKING GROUP ASSIGNMENTS	FOREST HEALTH AND RESILIENCE GROUP

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Group Objectives

1. Develop a strategy to reforest areas deforested by bark beetles. Investigate which species and genotypes should be replanted considering elevation zones and seed zones, areas with high rates of mortality, and other considerations (e.g., climate change) in the high hazard counties.
2. Utilize all relevant scientific investigations and analyzes to develop the reforestation strategy for the high hazard counties. [new objective]
3. Coordinate with the CAL FIRE LA Moran Seed Bank, the USFS Placerville Nursery, and other private nurseries to determine seed/seedling availability for the appropriate conifer species and genotypes in the high hazard counties. Work to expand collection of seed from seed zones impacted from high rates of tree mortality.
4. Prepare for implementation of the reforestation strategy at the appropriate time (i.e., plan the recovery phase).
5. Coordinate the reforestation strategy with the Private Landowner Assistance sub-group of the TMTF Resource Allocation Working Group.

Special Instructions

- Work assignments are consistent with Directives 2 and 19 of the State of Emergency Proclamation.
- Work with other federal, state, local, tribal, private and non-governmental entities as needed.

Prepared By (Deputy Task Forece Leader)	**Date Prepared**
Rick Carr	**September 20, 2016**

TREE MORTALITY TASK FORCE WORKING GROUP ASSIGNMENTS	MAPPING AND MONITORING GROUP

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Group Objectives

1. Identify areas of the state that represent high hazard zones for wildfire and falling trees associated with elevated tree mortality and a corresponding threat to public safety, community assets and related infrastructure.
2. Work with CAL FIRE Units, USFS, and other stakeholders to validate, refine and finalize high hazard zones at the local level.
3. Provide a web viewer and other GIS tools as needed to support tracking tree mortality and tree removal projects. Coordinate the tracking of treatment projects through CAL MAPPER for CAL FIRE and other data entry systems used by agency partners. Explore the use of web-based data entry tools for local entities.
4. Gather geospatial data from Caltrans and DGS where wood chips can by utilized as mulch at state facilities as well as on highway and road corridors.
5. Coordinate with the Regulations Group to map storage/utilization locations for woody biomass.
6. Address monitoring needs to update information on changes in the extent of tree mortality.
7. Identify areas where additional research and development or new technologies are needed and make recommendation to full task force for appropriate delegation and action.
8. Provide maps and other needed updates at regular Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.

Special Instructions	
• Work assignments are consistent with Directives 1, 5 and 19 of the State of Emergency Proclamation. • Work with other federal, state, local, tribal, private and non-governmental entities as needed.	
Prepared By (Deputy Task Force Leader) Rick Carr	**Date Prepared** September 20, 2016

TREE MORTALITY TASK FORCE - ICS 204

TREE MORTALITY TASK FORCE WORKING GROUP ASSIGNMENTS	PUBLIC OUTREACH

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Group Objectives

1. Provide for coordinated communications and public information program for the public, elected officials and involved entities.
2. Utilize social media (website, twitter, facebook, etc.) for information dispersal.
3. Distribute and post Guidelines, Frequently Asked Questions, etc.
4. Use existing public education materials and deveop new public education materials based on needs of the incident.
5. Assist local groups with messaging and communications to ensure a consistent message at the local level.
6. Act as clearinghouse for information.
7. Provide regular updates at Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.
8. Coordinate communication and tours with legislative staff at the local, state and federal levels.

Special Instructions	
• Work with other federal, state, local, tribal, private and non-governmental entities as needed.	
Prepared By (Deputy Task Forece Leader) Rick Carr	**Date Prepared** September 20, 2016

TREE MORTALITY TASK FORCE - ICS 204

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Group Objectives

1. Support local-level identification of community storage locations for removed trees by:
   a. Providing resources to assist local entities with regulations, agreements and policies associated with storage facilities.
   b. Developing guidelines to limit liability related to the use of storage facilities.
   c. Identifying applicable safety regulations associated with the use of such storage sites.
2. Encourage local entities to consider storage locations that can also act as utilization sites for various wood products and bioenergy production as appropriate.
3. Coordinate with the Resource Allocation Group and Bioenergy Group on distribution and location of portable equipment across high hazard zones.
4. Develop emergency guidelines setting forth the relevant criteria to remove dead and dying trees and incidental vegetation in high hazard zones (CAL FIRE).
5. Conduct public meetings as appropriate on regulations and guidelines developed pursuant to the Directives in the Proclamation.
6. Provide regular updates at Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.

Special Instructions

- Work assignments are consistent with Directives 2, 3, 7, 15 and 17 of the State of Emergency Proclamation.
- Suspension of regulations are specific to high hazard zones.
- Work with other federal, state, local, tribal, private and non-governmental entities as needed.

Prepared By (Deputy Task Forece Leader)	Date Prepared
Rick Carr	September 20, 2016

TREE MORTALITY TASK FORCE - ICS 204

TREE MORTALITY TASK FORCE WORKING GROUP ASSIGNMENTS	RESOURCE ALLOCATION

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Group Objectives

1. Coordinate efforts with local entities to remove dead or dying trees in high hazard zones that threaten power lines, roads and other evacuation corridors, critical community infrastructure, and other existing structures.
2. Work with impacted counties to distribute portable equipment based on local and regional priorities.
3. Encourage isolated communities to use portable equipment to remove and process wood waste locally.
4. Provide local government assistance as appropriate under the authority of the California Disaster Assistance Act (Cal OES).
5. Request immediate assistance through the Federal Highway Administration's Emergency Relief Program to obtain federal assistance for removal of dead and dying trees adjacent to highways (Caltrans).
6. Develop and maintain an inter-agency funding matrix displaying all potential sources of funding and landowner assistance programs.
7. Engage impacted local communities with funding fairs.
8. Appropriately pursue, manage, utilize and distribute future funding sources consistent with the Directives within the Proclamation.
9. Provide regular updates at Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.

Special Instructions

- Work assignments are consistent with Directives 2, 4, 6, 16 and 18 of the State of Emergency Proclamation.
- Work with other federal, state, local, tribal, private and non-governmental entities as needed.
- Approval by the Department of Finance is required prior to execution of any contract entered into pursuant to the State of Emergency Proclamation Directives.

Prepared By (Deputy Task Forece Leader)	**Date Prepared**
Rick Carr	September 20, 2016

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Group Objectives

1. Extend contracts on existing forest bioenergy facilities receiving feedstock from high hazard zones (CPUC).
2. Ensure contracts for new forest bioenergy facilities that receive feedstock from high hazard zones can be executed within six months (CPUC).
3. Initiate targeted renewable auction mechanism and consideration of adjustments to the BioMat Program (CPUC).
4. No later than six months after the BioMat program begins, evaluate the need for revisions to the program to facilitate contracts for forest bioenergy facilities (CPUC).
5. Prioritize facilitation of interconnection agreements for forest bioenergy facilities in high hazard zones (CPUC).
6. Prioritize grant funding from the Electric Program Investment Charge for woody biomass-to-energy technology, consistent with direction from CPUC (CEC).
7. Work with bioenergy facilities that accept forest biomass from high hazard zones to identify potential funds to offset higher feedstock costs (CAL FIRE, CEC).
8. Work with land managers to estimate biomass feedstock availability, storage locations, and volumes that may be available for use as bioenergy feedstock at existing and new facilities.
9. Identify and develop new energy technologies for biomass (e.g., biofuels, etc).
10. Create and expand markets for bioenergy by-products (e.g., biochar, heat, etc).
11. Provide regular updates at Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.

Special Instructions

- Work assignments are consistent with Directives 8, 9, 10, 11, 12 and 13 of the State of Emergency Proclamation.
- Work with other federal, state, local, tribal, private and non-governmental entities as needed.

TREE MORTALITY TASK FORCE WORKING GROUP ASSIGNMENTS	UTILIZATION- MARKET DEVELOPMENT GROUP

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Vacant			

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Charll Stoneman	Forest Landowners of CA	877-326-3778	stoneman_forestry@sbcglobal.net
Craig Thomas	Sierra Forest Legacy	916-708-9409	craig@sierraforestlegacy.org
Cedric Twight	SPI	530-378-8000	ctwight@spi-ind.com
Stephen Bakken	State Parks	916-654-9934	Stephen.bakken@parks.ca.gov
Matthew Plummer	PG&E	415-973-3477	M3Pu@pge.com
Vance Russell	Natl Forest Foundation	530-758-2609	vrussell@nationalforests.org
Matt Henigan	Cal Gov Ops Agency	916-651-9011	Matt.henigan@govops.ca.gov
Angie Lottes	CA Forest Biomass Working Group	314-610-2237	angie@thewatershedcenter.com
Jenny Moffitt	CDFA	916-403-6706	Jenny.LesterMoffitt@cdfa.ca.gov
Brian Nowicki	Center for Bio Diversity	916-201-6938	bnowicki@biologicaldiversity.org
Patrick Nevis	GO-Biz		Patrick.Nevis@gov.ca.gov

Group Objectives

1. Work with affected counties and existing wood product markets to determine the feasibility for expanded wood product markets in California.
2. Provide for highest and best use of wood products.
3. Identify and develop new technologies for biomass products (laminated wood products, etc.)
4. Identify rules or regulations which may block the development of a utilization market.
5. Provide regular updates at Task Force meetings to ensure effective communication and geographic coordination among all task force groups and stakeholders.

Special Instructions

- Work assignments are consistent with Directive 14 of the State of Emergency Proclamation.
- Work with other federal, state, local, tribal, private and non-governmental entities as needed.

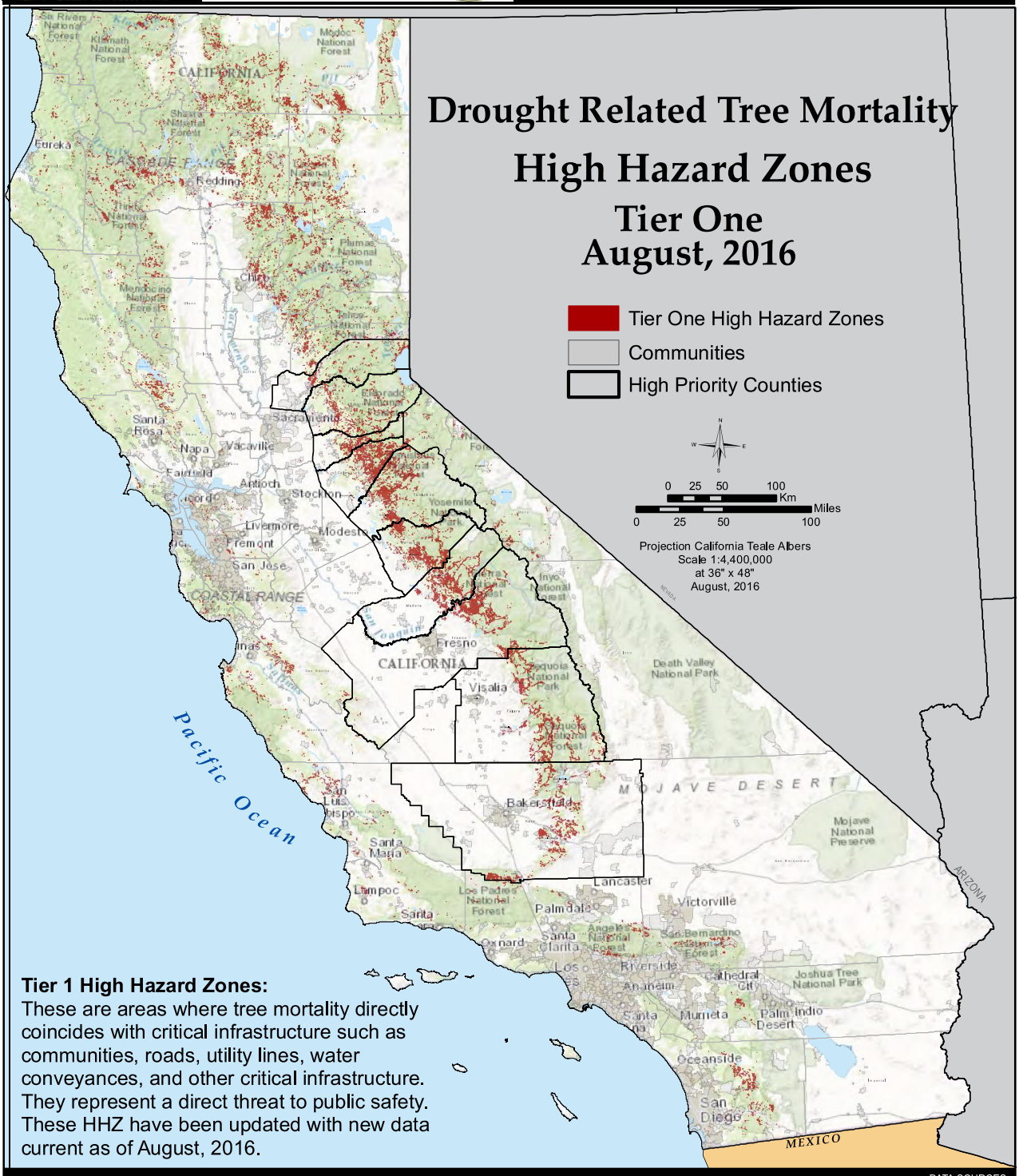
Prepared By (Deputy Task Forece Leader)	Date Prepared
Rick Carr	September 20, 2016

TREE MORTALITY TASK FORCE - ICS 204

FRAP
Fire and Resource Assessment Program
California Department of Forestry and Fire Protection

USDA U.S. FOREST SERVICE
Caring for the land and Serving the people
United States Department of Agriculture

STATE of CALIFORNIA



Tier 1 High Hazard Zones:
These are areas where tree mortality directly coincides with critical infrastructure such as communities, roads, utility lines, water conveyances, and other critical infrastructure. They represent a direct threat to public safety. These HHZ have been updated with new data current as of August, 2016.

Edmund G. Brown Jr., Governor, State of California
John Laird, Secretary for Resources, The Natural Resources Agency
Ken Pimlott, Director, Department of Forestry and Fire Protection

DATA SOURCES
Communities (FRAP, v13_1)
Tier One High Hazard Zones
(FRAP, August 2016), utilizing:
Aerial Detection Survey (USFS, 2012 - May, 2016),
various asset layers (FRAP, Dec 2016)

Appendix I. Sample Environmental Checklist

California Department of Forestry and Fire Protection
Urban Forestry Program

ENVIRONMENTAL CHECKLIST

Part 1: ADMINSTRATIVE INFORMATION

1. Project Title: _____
2. Project Applicant's Name: _____
3. Name and title of checklist preparer: _____

This checklist is intended for use by applicants for California Department of Forestry and Fire Protection (CAL FIRE) Urban Forestry Program projects. It is modeled after the California Environmental Quality Act (CEQA) Environmental Checklist, which has been modified to more closely focus on the types of actions and impacts expected to occur while conducting urban forestry tree planting projects. As the lead agency under CEQA, CAL FIRE must make a determination as to a project's potential environmental impacts, develop mitigations if necessary and determine the level of environmental documentation and review required. The completion of this checklist will assist CAL FIRE in identifying impacts of the proposed project prior to approval. To meet that need someone that is intimately familiar with the project and knowledgeable on potential environmental consequences must complete this checklist. The information in the checklist is meant to supplement the information provided in your application. Maps and photos supplied with your application will assist in CAL FIRE's review. This checklist is available electronically (MS Word 97) or may be completed by hand. If you need assistance please contact CAL FIRE's Urban Forestry Program personnel.

It is the intent of CAL FIRE and the Urban Forestry Program to approve tree-planting projects that are categorically exempt from further environmental review under CEQA. In order for a project to qualify for a categorical exemption CAL FIRE must find that there are no "unusual circumstances" associated with the project that lead to the project having impacts on environmental resources (e.g., threatened or endangered species, aesthetics, cultural resources, water quality, etc). CEQA does not allow for a project's impacts to be minimized or compensated under a categorical exemption; avoiding impacts to resources is the only mitigation permitted. To meet that end, the following questions were designed to identify environmental impacts that may occur in various tree-planting settings and encourage project applicants to develop measures to avoid those impacts. In the event that potential impacts to a resource are identified it is recommended that the project applicant redesign or reconfigure their project proposal to avoid impacts to the resource. Failure to fully avoid impacts will result in your project requiring a "higher level" of environmental review such as the preparation of a negative declaration or environmental impact report. This could be costly and delay your project. Because of the time and cost associated with the preparation of a negative declaration or environmental impact report CAL FIRE encourages you to change your project in order to qualify for a categorical exemption.

A brief explanation is required for "Yes" responses to the following questions. Responses must be supported by facts, not merely the personal opinion of the checklist preparer.

All responses must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
Earlier analyses may be used where an impact has been adequately analyzed in an earlier EIR or negative declaration. In this case, a brief discussion should identify the earlier analysis, describe the mitigations that

were developed and supply copies of relevant sections/pages. A source list should be attached and other sources used or individuals contacted should be cited in the discussion sections where necessary.

Part 2: PROJECT DESCRIPTION

1. Project Location:
(City, County, Nearest Town, etc.) _____

2. Description of Project: Describe the entire project, including but not limited to size and numbers of trees, size and depth of excavations, planting site preparation (i.e., land clearing), equipment to be utilized in planting and preparing the planting site (e.g., backhoes, power augers, heavy equipment), later phases of the project, and any secondary, support, or off-site features necessary for the project's implementation. Emphasis should be placed on activities that will potentially impact the environment rather than describing project benefits.

_____

3. Identify the type(s) of setting(s) where your project will be located.

- ☐ Street (parkways, medians, sidewalks, etc.)
- ☐ Existing landscaped city/county park
- ☐ Existing landscaped school grounds
- ☐ Urban trail, bike trail
- ☐ Public building grounds
- ☐ Other similar urban or developed setting. Describe setting: _____
- ☐ Undeveloped land
- ☐ New or rural park
- ☐ New school grounds
- ☐ Agricultural land
- ☐ Historic district, railroad right-of-way
- ☐ Riparian area (within 100 ft of a stream, lake or wetland)
- ☐ Other similar rural, undeveloped or wildland setting. Describe setting: _____

Projects confined to <u>urban</u> or <u>developed</u> settings must address questions in Checklist, Part 4.

Projects that include <u>rural</u>, <u>undeveloped</u> or <u>wildland</u> settings must address questions in Checklist, Parts 3 and 4.

Part 3: ENVIRONMENTAL IMPACT ANALYSIS FOR PROJECTS IN RURAL, UNDEVELOPED OR WILDLAND SETTINGS

Projects, or portions of projects, planned for rural, undeveloped or wildland settings may have impacts on various resources (e.g., threatened or endangered species, cultural resources, water quality, etc.). Therefore, project applicants must conduct the following resource studies to determine if resources exist that warrant protection.

Resource Studies:

Conduct a Natural Diversity Data Base Search

Contact CAL FIRE, Urban Forestry Program staff to determine how to conduct a Natural Diversity Data Base (NDDB) Search. Submit a copy of the search results along with this Environmental Checklist. If the NDDB search identifies any threatened or endangered species of animals or plants that may be present describe avoidance measures in the appropriate discussion section.

Conduct an archaeological records check

Contact CAL FIRE, Urban Forestry Program staff to determine how to conduct an Archaeological Records Check. Submit a copy of the results along with this Environmental Checklist. If the Records Check identifies cultural resources within the project site describe measures to avoid impacts in the appropriate discussion section.

Conduct an archaeological survey

Contact CAL FIRE, Urban Forestry Program staff to determine how to conduct an archaeology survey. Submit a copy of the survey results along with this Environmental Checklist. If the archeological survey identifies cultural resources within the project site describe measures to avoid impacts in the appropriate discussion section.

Based on the results of the resource studies please respond to the following questions for projects located in rural, undeveloped or wildland settings.

1. Discuss the results of the resource studies and briefly describe the archaeological and biological resources identified within your project site.

_____

Will the project:

2. Require the removal of native vegetation (trees, shrubs) prior to planting, thereby potentially impacting threatened or endangered plant or animal species or cultural resources?

   ☐ Yes ☐ No

3. Require extensive soil disturbance, thereby potentially causing soil erosion and impacting, threatened or endangered species or cultural resources?

   ☐ Yes ☐ No

4. Require the use of large equipment (i.e. backhoe) thereby potentially impacting threatened or endangered species or cultural resources?
   ☐ Yes ☐ No

5. Occur within 100 feet of a perennial watercourse, riparian zone or wetland thereby potentially impacting threatened or endangered species, cultural resources or riparian values?
   ☐ Yes ☐ No

6. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use?
   ☐ Yes ☐ No

7. Discuss any "Yes" responses and describe measures to avoid impacts.

   _____

Part 4: ENVIRONMENTAL IMPACT ANALYSIS FOR ALL PROJECTS

Please answer the following questions for all projects and discuss all "Yes" responses.

Will the proposed project:

1. Require approval from other public agencies (e.g., permits, financing approval, or participation agreement (e.g., grading permits, CALTRANS encroachment permits, right-of-way easements, etc.))
   ☐ Yes ☐ No

   _____

2. Include activities that were identified in other environmental documents or analyses and support findings of no significant impact (e.g., CEQA documents, environmental surveys, general plans, studies, reports, etc.)
   ☐ Yes ☐ No

   _____

3. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to general plans, specific plans, local coastal programs, or zoning ordinances)?
   ☐ Yes ☐ No

   _____

4. Conflict with any ordinances protecting biological resources, such as tree preservation ordinance, Habitat Conservation Plan, or other policy?
   ☐ Yes ☐ No

   _____

5. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?
   ☐ Yes ☐ No

   _____

6. Result in trees, once mature, coming into contact with power lines?
   ☐ Yes ☐ No

   _____

7. Expose people or structures to the risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?
   ☐ Yes ☐ No

   _____

8. Have sufficient water supplies available to serve the project from existing entitlements and resources or substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
   ☐ Yes ☐ No

   _____

9. Result in substantial adverse impacts to public services for tree pruning and maintenance?
   ☐ Yes ☐ No

   _____

10. Substantially increase the use of existing neighborhood and regional parks or other recreational facilities or require the construction of additional recreational facilities resulting in significant environmental impacts?

☐ Yes ☐ No

_____

11. Include trees known to produce pollen/allergens/odors that are irritants or objectionable to large numbers of people?

☐ Yes ☐ No

_____

12. Substantially damage a scenic resource or vista or degrade the existing visual character or quality of the site and its surroundings including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

☐ Yes ☐ No

_____

13. Result in, once trees are mature, undesirable shading of nearby property, including residences, offices, swimming pools, solar energy collectors, recreational facilities, etc. or subject adjoining properties to excessive amounts of litter and/or debris?

☐ Yes ☐ No

_____

14. Obscure public safety improvements such as streetlights, traffic signals, signs, etc.?

☐ Yes ☐ No

_____

15. Greenhouse Gas Emissions
☐ This topic does not apply to this project and was not evaluated further.
☐ Yes ☐ No Would the project generate significant greenhouse gas (GHG) emissions?
☐ Yes ☐ No Would these GHG emissions result in a significant impact on the environment? Discuss below:
☐ Yes ☐ No Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?
Discuss below:

If you checked "No" to all preceding questions or checked "Yes" and have provided the required Resource Studies and identified measures sufficient to protect all resource values the project <u>may be</u> categorically exempt from further environmental review. Sign the Certification, below, and submit this Checklist with your application to the CAL FIRE, Urban Forestry Program office. CAL FIRE will review your responses and determine whether additional environmental review is necessary prior to project approval.

Part 5: CERTIFICATION

I certify that I have reviewed the proposed project's description and inspected the project site(s). I have provided accurate and factual responses to the questions and have supplied accurate information when requesting database searches. In my opinion the proposed project will not have any negative impacts on the environment.

Signature of Checklist Preparer

Date

Part 6: DETERMINATION

DETERMINATION (To be completed by CAL FIRE, Urban and Community Forestry Program Staff)

As a representative of CAL FIRE and as lead agency for environmental review under CEQA I have determined that an environmental impact evaluation for the proposed project has been satisfactorily completed.

On the basis of this evaluation:

☐ *I find that the proposed project will not have a significant effect on the environment and meets the Class 4 (Minor Alterations to Land) categorical exemption requirements. This project is therefore exempt from the requirement for the preparation of environmental documents. CAL FIRE will prepare a Notice of Exemption (NOE).*

☐ I find that the proposed project could not have a significant effect on the environment and does not meet the Class 4 categorical exemption requirements; therefore, a negative declaration will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the applicant. A mitigated negative declaration will be prepared.

☐ I find that the proposed project may have a significant effect on the environment, and an environmental impact report is required.

☐ I find that the proposed project may have a “potentially significant impact” or “potentially significant unless mitigated impact” on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An environmental impact report is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or Negative Declaration pursuant to applicable standards and (b) have been avoided or mitigated pursuant to an earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature of Authorized CAL FIRE Reviewer

Print Name	Title	Date

Appendix J. Invoicing template for invasive shot hole borer green materials survey project.

(County Letterhead)

California Department of Food and Agriculture
Attn: Kelly Thornburg
kelly.thornburg@cdfa.ca.gov

Invasive Shot Hole Borer Green Materials Survey Project
Agreement #
July 1, 2019 - June 30, 2020
Invoice for Period from [Month, Date, Year]

Personnel Services

Name and Classification	Hours	Hourly Rate	Total Salaries
	0.00	0.00	0.00
	0.00	0.00	0.00
Total Hours:	0.00	Total Salaries:	0.00
		Total Personnel Services:	0.00
		Indirect (up to 25% of Personnel Services):	0.00
		Total Personnel Costs:	0.00

Operating Expenses

Supplies			0.00
Equipment			0.00
		Total Operating Expenses:	0.00

Vehicle Usage	**Miles**	**Rate**	
Vehicle Mileage	0.00	0.580	0.00
		Total Mileage Cost:	0.00

Total Operating Expenses	0.00
Grand Total:	0.00

Agreement Amount	0.00
Billed to Date	0.00
Balance	0.00