Name of Applicant Organization: Oregon State University			
Address: Office for Sponsored Research and Award Administration **A312 Kerr Administration Building**			
City: Corvallis	**State: Oregon**	**Zip: 97331-2140**	
Contact Name: Tuba Ozkan-Haller		**Title:** Assoc. VP for Research & Develop	
Phone: (541) 737-4933	**E-mail:** sponsored.programs@oregonstate.edu		
Federal Tax ID: 61-1730890		**DUNS Number:** 053599908	
ODA SCBGP Grant Request: $ 178,608	**Cash Match: $ 0**	**In-Kind Match: $0**	**Total Project Cost: $178,608**

Commodities: *Check all that apply* (e.g. Fruits: Blueberries)

☒ Fruits: Apples, Pear, Cherry ☐ Vegetables: (list them) None ☒ Tree Nuts: Hazelnut, Walnut	☐ Medicinal Herbs: (list them) ☐ Culinary Herbs or Spices: (list them) ☒ Nursery, Floriculture or Horticulture Crops: Blueberry, Strawberry, Blackberry, Raspberry, Wine-grape

Check the main SCBGP funding priority as defined in https://oda.direct/SCBGP

☒ Market Development and Access, International ☒ Market Development and Access, Local/farm-direct, regional and domestic ☒ Cross commodity collaboration ☐ Food safety and traceability	☒ Address regulatory burden ☒ On-farm labor needs ☒ Productivity enhancements and innovation ☐ Agriculture/rural economic development as defined under Governors Regional Solutions Teams (must have a letter of support and must meet additional SCBGP priorities)

In ten (10) words or less - Project Title:
New alternatives to replace chlorpyrifos in tree and small crops

List Project Partners:
Oregon Hazelnut Commission, Oregon Blueberry Commission, Oregon Blackberry and Raspberry Commission, Columbia Gorge Fruit Growers Association, Oregon Sweet Cherry Commission, Oregon Wine Board, Oregon State University, Oregon State University Extension, Pacific Northwest Canned Pear Service

1. **Grant proposal requirements**
   A. Cover Page – not included in total page limit
   B. Project proposal 15 page or less preferred including budget
   C. Matching Funds Attachment (A) not included in total page limit
   D. Work Plan Attachment (B) not included in total page limit
   E. Must be submitted in a **Microsoft Word** (**font size of 12 & Times font) and will not be accepted in any other format**.
   F. Deadline for submission: **Tuesday, January 31, 2020 • 12 pm (noon)**

2. **Letter(s)** of support and/or participation from industry – limited to 5 letters. PDF preferred - Sending letters **as a single PDF package** is preferred.
3. **Submission**
   A link to an FTP is up on the website for you to upload your submission.
   http://www.oregon.gov/ODA/ADMD/pages/grants_spec_crops.aspx#
4. Deadline for submission: **Friday, January 31, 2020 • 12 pm (noon)**

5. To expedite the process, submit your proposal prior to the deadline. Waiting until the deadline to submit may cause unusually long wait times.

Contact: Gabrielle Redhead
Specialty Crop Block Grant Program Coordinator
Market Access & Certification
(503) 986-6473
(541) 913-3440
gredhead@oda.state.or.us

TITLE

New alternatives to replace chlorpyrifos in tree and small crops

DURATION OF PROJECT

Start Date: 9/1/2020 **End Date**: 8/31/2022

PROJECT PARTNER AND SUMMARY

Organization: Oregon State University

Summary (one sentence). We will focus on developing new alternative controls for key insect pests including spotted-wing drosophila (SWD), brown marmorated stink bug (BMSB), codling moth (CM), and filbertworm (FBW). We will focus using behavioral tools and sterile insect technique (SIT) to minimize dependence on toxic agrochemicals, while maintaining chlorpyrifos for emergency conditions in order to protect financial viability of these industries.

Summary (250 words or less). We will help with the development of effective management programs that improve production efficiency through reduced labor and agrochemical dependence, the two highest input factors in fruit production systems. This is critically important for achieving the priority of enhancement of economic/environmental/social sustainability of agricultural systems. We propose alternative synergistic options to reduce these dependencies while enhancing their sustainability. We believe that continued development of novel bio-rational horticultural and crop protection techniques will increase fruit quality, productivity, and production efficiencies while decreasing cost and pesticide dependence. These technologies must however be effective, economical, and socially acceptable and environmentally friendly, integrating smoothly into a whole production system. We assembled a multidisciplinary team who will support the research and extension activities. Synergistic disciplines include entomology, chemical ecology, and horticulture. These synergistic specialties together with extension will help to catalyze adoption. Our team has been instrumental in developing a number of alternative control tactics (see Table 1). We will conduct laboratory and controlled field trials focusing on SWD, BMSB and FBW. We plan to improve and assess economic feasibility of codling moth SIT in US orchards, and a new SWD arrestant under larger field conditions. These technologies have had promising early results and have the potential to significantly enhance IPM for growers. Ultimately, this project strives to aid development and implementation of currently feasible technologies.

PROJECT PURPOSE

A great number of effective brand-name products (> 50) contain Chlorpyrifos (Lorsban®) as an active ingredient. Chlorpyrifos can be used on an extensive variety of specialty crops grown in Oregon including hazelnut, pear, sweet cherry, blueberry, cane berry and wine grape. These crops are very valuable to the state and have a combined farmgate value of ~$784 million. For a number of new invasive species, Chlorpyrifos is considered to be a critically important tool for successful crop production. Currently, Chlorpyrifos is mainly used to manage emergency pest management conditions. Our growers would have been out of business had we not had compounds such a Chlorpyrifos in our toolbox to protect these valued fruit crops. In particular, the invasive pests BMSB, and spotted lanternfly are key concerns. Our industries fear continued

expansion of pests such as BMSB, an insect that already is resulting in economic losses in hazelnut, apple and pear. Spotted Lanternfly is another quarantined pest in Pennsylvania, and several other eastern states, which continues to spread, despite substantial government efforts to eradiate this insect. According to a recent risk modeling article by USDA-ARS (Wakie et al. 2019) the mid-Columbia fruit growing and Willamette Valley regions are considered to be at high risk from this devastating pest. Without effective tools like Chlorpyrifos, we will not be able to mount an emergency response to this pest.

Since the arrival of Spotted-Wing Drosophila (SWD) in 2009, the cherry industry has needed to revert back to weekly sprays thus losing the biorational control of Western Cherry Fruit Fly by attract-and kill. SWD has fundamentally changed the business model of affected industries, but it has also resulted in a significant reduction in the quality of life of agriculturists. It is imperative that the fruit industry has effective tools to protect against new invasive pests. The loss of attract-and-kill in cherries has resulted in IPM programs that basically just rely on calendar sprays of insecticides. In many cases, growers acted in order to protect their crops, resulting in rejections of fruit because of Minimum Residue Levels (MRL's) that were exceeded in countries where fruit are exported. For blueberry, raspberry, and blackberry growers have gone from one insecticide spray per season to an average of seven (Figure 1).

Figure 1. Repeated sprays for *Drosophila suzukii* has resulted in severe scale insect breakouts in in Oregon blueberries. Scale insects are notoriously difficult to control with insecticides, necessitating alternative controls including biocontrol (Lee et al 2019).

The same rule holds true for other pests, such as scale insects. These pests are directly related to the presence of SWD, because the repeated use of pesticides to control the fruit-fly disrupts the populations of natural enemies that otherwise would keep aphids and scale insects below the economic action threshold (Lee et al 2019). Damage from these secondary pests has increased to alarming proportions in recent years. Large populations of scale insects weaken and devitalize plants, and stunt new growth causing yellowed foliage and deformed leaves.

In the meantime, our industries have responded by funding alternative control strategies and behavioral controls (e.g. arrestants, deterrents, Sterile insect technique, and mating disruption). Over the last 20 years, new technologies supported by our industries have aided to reduce the dependency and use of Chlorpyrifos for key pests (Table 1). Together, we have almost halved application rates, partly through adoption of new softer technologies.

Table 1. Key insect pests and chlorpyrifos alternative technologies developed, last 20 years.

Crop	Pest	Management Technique	Reference
Apple and pear	Codling moth	Mating disruption, Sterile Insect Technique	Gut et al. 2019 Miller et al. 2010
Winegrape, Blueberry, Cherry, Caneberry	Spotted-wing drosophila	Arrestant, Deterrents, Biocontrol	Tait et al. 2018, Tait et al. 2020, Lee et al. 2019
Hazelnut	Filbertworm, Aphids	Mating Disruption, Biological Control	Miller et al. 2019
Apple, Pear, Cherry, Hazelnut,	BMSB	Biocontrol	Lowenstein et al. 2019
Cherry	Western Cherry Fruit fly	Attract-and Kill	Yee 2010
Pear	Scale (Psylla)	Mating disruption, and repellants	Guedot et al. 2009, Westigard et al. 1984

These newer technologies are non-toxic, significantly improving crop quality, quality of grower's life and environment health. Studies have shown significant reductions in Chlorpyrifos residues in drinking water of millions of Oregonians. Many of these new technologies are specific to key insect pests of the crops listed (Table 1). As an example, the hazelnut industry has spent significant resources developing monitoring and mating disruption technologies for filbertworm, resulting in a 75% reduction of pyrethroid use, and improving biocontrol for secondary pests such as scale insects and aphids (Miller et al 2019).

For spotted-wing drosophila, we developed a novel food-grade arrestant and also a deterrent that will result in significant reductions in insecticide and labor dependency and improved biocontrol (Lee et al. 2019, Tait et al. 2018, 2020). Thanks to these advances, growers are less dependent on broad-spectrum insecticides such as Chlorpyrifos to control secondary pests such as leafrollers, aphids, and scale insects. It is these secondary pests that are often most difficult to control, often requiring the use of compounds such as Chlorpyrifos. Mating disruption for codling moth and filbertworm could become the management technique of choice in many growing regions. This and other techniques, such as SIT, provide new opportunities to diversify grower's control options. These alternative control tactics not only reduce the number of primary pests, but also reduce the number of secondary pests by preserving beneficial insects.

To summarize, the purpose of this project is to develop new management tools to provide producers enough Chlorpyrifos alternatives to successfully control current and invasive pests.

Why is the project important and timely?

Our industries are plagued by a continued onslaught of key and invasive insect pests, which have completely disrupted Integrated Pest Management (IPM) as we know it. This project is designed to assess and improve the economic feasibility of new innovative technologies and further reduce the dependence on Chlorpyrifos. Our growers support the development of alternative tools as we

realize that Chlorpyrifos use results in less sustainable production. The most important risk behind chlorpyrifos use is related to human health, and has been linked to neurotoxicity concerns, lower childbirth weights and IQ (Rauh et al. 2006). The Oregon Department of Agriculture (ODA) is taking into consideration the risks associated with the continued chlorpyrifos use. ODA established a workgroup to evaluate chlorpyrifos use in Oregon agriculture. The potential for additional chlorpyrifos use restriction or complete revocation is especially concerning to our growers. We believe that the loss of chlorpyrifos to Oregon fruit growers could result in substantial crop and job losses. Stakeholders outline the concerns regarding this change (Mamane et al. 2015, see EPA Exerpts). Part of their concern stems from perceptions that no satisfactory alternatives are available.

California and Hawaii were the first states to ban the use of the product for household use, and the prohibition has expanded for agricultural purposes. In Oregon, we have taken into consideration these regulatory changes in other states, and urge the state to help our industries to accelerate this process, allowing us to protect our livelihood. Taking into account the risks associated with the continued Chlorpyrifos use, ODA has indicated the potential revocation of this product in the near to medium future. Thus, it is imperative to provide sound scientific data to replace the potential loss of a product that has been part of producers' toolbox for many decades. Our team has been successful at developing several new technologies in the last ten years, and we believe that additional investment in this group will result in acceleration of commercialization of these techniques.

What do you hope to accomplish?

We hope to accomplish the following objectives (See work plan, Appendix B):

Objective 1: Evaluate new behavioral, SIR and alternative tools for key pests.

Objective 2: Evaluate field effectiveness of currently available options for spotted-wing drosophila and codling moth at the farm-scale.

Objective 3: Assess economic feasibility of new management programs.

Objective 4: Extend knowledge from project to stakeholders. As alternatives are identified, pest management recommendations will be revised.

Who are the beneficiaries and what is the overall impact to sales of Oregon agriculture, rural economy, creating/retaining jobs or careers etc. of the project work?

Our team has developed alternative technologies to reduce chlorpyrifos dependence. We propose implementation of these techniques within commercial farm systems, but also propose to develop strategically important tools for key and invasive pests. The direct beneficiaries of this project are growers/producers, who will have substitutes for pest control; these alternatives could include less-toxic products or biological approaches. In Oregon these beneficiaries include (in 2017) a total of ~4,500 farmers and ~152,000 acres. These are 821 sweet cherry farmers with a total of 10,358 acres; 967 pear farmers on 14,884 acres; ~350 blueberry farmers on 13,500 acres; ~1,000 hazelnut growers on 80,000 acres; and 1,200 wine grape farmers on 33,000 acres. Many of these production areas fall within highly populated regions and areas where water quality is impacted by grower practices. We therefore assert that the bulk of Oregon populations will be affected by a continued push towards development for Chlorpyrifos alternatives.

References

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Miller, J.R., McGhee, P.S., Siegert, P.Y., Adams, C.G., Huang, J., Grieshop, M.J., Gut, L.J. 2010. General Principles of attraction and competitive attraction as reveled by large-cage studies of moths responding to sex pheromone. PNAS, 107: 22-27.

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Tait, G., K. Park, R. Nieri, M. C. Crava, S. Mermer, E. Clappa, G. Boyer, D. T. Dalton, S. Carlin, L. Brewer, V. M. Walton, G. Anfora, and M. V. Rossi-Stacconi. 2020. Reproductive Site Selection: Evidence of an Oviposition Cue in a Highly Adaptive Dipteran, *Drosophila suzukii* (Diptera: Drosophilidae). Environmental Entomology Journal 10.1093/ee/nvaa005.

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Yee, W. L. 2010. Oviposition in Sweet Cherry by Reproductively Mature Western Cherry Fruit Fly (Diptera: Tephritidae) Fed Spinosad and Neonicotinoid Insecticide Baits.Journal of Economic Entomology. 103: 379–385.

Xu, X. and Fountain, M., 2019. Integrated management of diseases and insect pests of tree fruit. Burleigh Dodds Science Publishing.

PROVIDE A LISTING OF THE OBJECTIVES THAT THIS PROJECT HOPES TO ACHIEVE

Objective 1: Evaluate new behavioral, SIT and alternative tools for key pests.
Objective 2: Evaluate effectiveness of currently available options for spotted-wing drosophila, and codling moth at the farm-scale.
Objective 3: Assess economic feasibility of new management programs
Objective 4: Extend knowledge from project to stakeholders. As alternatives are identified, pest management recommendations will be revised.

PROJECT BENEFICIARIES

Estimate the number of project beneficiaries: ~4,500 growers + most Oregon citizens

Does this project directly benefit socially disadvantaged farmers as defined by the USDA?
Yes ☑ No ☐
Does this project directly benefit beginning farmers as defined in the RFA?
Yes ☑ No ☐

STATEMENT OF SOLELY ENHANCING SPECIALTY CROPS

By checking the box to the right, I confirm that this project **solely** enhances the competitiveness of specialty crops in accordance with and defined by 7 U.S.C. 1621. Further information regarding the definition of a specialty crop can be found at www.ams.usda.gov/services/grants/scbgp. ☑

CONTINUATION PROJECT INFORMATION

This is a new project. Lessons learned will be incorporated into future projects if other products face the same fate as chlorpyrifos. The likelihood in obtaining financial support from the private industry may be high if they are already working on new alternatives to be incorporated in pest management programs.

OTHER SUPPORT FROM FEDERAL OR STATE GRANT PROGRAMS

The SCBGP will not fund duplicative projects. Did you submit this project to a Federal or State grant program other than the SCBGP for funding and/or is a Federal or State grant program other than the SCBGP funding the project currently?

Yes ☐ **No** ☑

IF YOUR PROJECT IS RECEIVING OR WILL POTENTIALLY RECEIVE FUNDS FROM ANOTHER FEDERAL OR STATE GRANT PROGRAM

Identify the Federal or State grant program(s).

Currently Funded Federal: Management of Brown Marmorated Stink Bug in US Specialty Crops (USDA-SCRI, Walgenbach et al. 2016)

Pending funding Federal: Moving from crisis response to long-term integrated management of SWD: a keystone pest of fruit crops in the United States (USDA-SCRI, Sial et al 2020)

Currently funded Industry: Washington Tree Fruit Commission: A novel attract-and kill technique to manage Spotted-Wing Drosophila (WFTC, Walton and Adams 2019).

Oregon Blueberry Commission: A novel attract-and kill technique to manage Spotted-Wing Drosophila (OBC, Walton 2019).

Describe how the SCBGP project differs from or supplements the other grant program(s) efforts.

The currently funded USDA-SCRI (Walgenbach et al 2016) on BMSB deals with understanding the biology and biocontrol of BMSB as well as surveys of parasitoids that are released throughout the state. That grant also looks at BMSB modeling, chemical control and testing of impacts of chemicals on natural enemies. Here we propose to look at novel volatiles and deterrents against BMSB.

The pending federal USDA-SCRI SWD grant (Sial et al 2020), is focused on economic modeling and a social aspects of SWD pest management. That project also looks at conventional use of insecticides, pest modeling and how chemical control techniques can be improved, other behavioral tools (SWD-Hook), and release of imported (Currently quarantined) biocontrol agents specifically on SWD that is not covered in this grant. The SCRI grant will also deal with insecticide resistance monitoring and management.

The grants submitted to the cherry (WTFC, Walton and Adams 2019) and blueberry (OBC, Walton 2019) industries do not deal with formulation and identification of biologically relevant volatiles, as is proposed on this grant. Those proposals only focus on SWD, with refinement activities planned regarding including of a toxicant,

This proposal will be complementary in that it also addresses new controls for other insect pests such as FBW, BMSB and Codling moth.

PI C. Adams and CoPI V. Walton’s proposals will complement the SCBGP grant.

EXTERNAL PROJECT SUPPORT

Several commodity groups such as the Oregon Hazelnut Commission, Oregon Blueberry Commission, Washington Tree Fruit Commission, and the Oregon pear industry. These groups have indicated that more studies are needed to demonstrate the benefit of alternative products. These grants are aimed at better understanding biology and overall production practices as they relate to IPM.

EXPECTED MEASURABLE OUTCOMES

SELECT THE APPROPRIATE OUTCOME(S) AND INDICATOR(S)/SUB-INDICATOR(S)

OUTCOME MEASURE(S)

Select the outcome measure(s) that are applicable for this project from the listing below.

- ☑ **Outcome 1**: Enhance the competitiveness of specialty crops through increased sales (required for marketing projects)
- ☑ **Outcome 2**: Enhance the competitiveness of specialty crops through increased consumption
- ☐ **Outcome 3**: Enhance the competitiveness of specialty crops through increased access
- ☑ **Outcome 4**: Enhance the competitiveness of specialty crops though greater capacity of sustainable practices of specialty crop production resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources
- ☐ **Outcome 5**: Enhance the competitiveness of specialty crops through more sustainable, diverse, and resilient specialty crop systems
- ☑ **Outcome 6**: Enhance the competitiveness of specialty crops through increasing the number of viable technologies to improve food safety
- ☑ **Outcome 7**: Enhance the competitiveness of specialty crops through increased understanding of the ecology of threats to food safety from microbial and chemical sources
- ☑ **Outcome 8**: Enhance the competitiveness of specialty crops through enhancing or improving the economy as a result of specialty crop development

Outcome 4. Indicator 2a
Number of growers/producers indicating adoption of recommended practices.

Outcome 4. Indicator 2b
Number of growers/producers reporting reduction in chlorpyrifos use.

Outcome 4. Indicator 2c
Number of growers/producers reporting yield increase.

Outcome 7. Indicator 2
Increased safety of all inputs into the crop chain.

MISCELLANEOUS OUTCOME MEASURE

NA

DATA COLLECTION TO REPORT ON OUTCOMES AND INDICATORS

In all objectives, please refer to the workplan and timelines, which describes outcomes and indicators (Logic model) for each objective over the two-year period of the proposal (Attach. B).

Objective 1: Evaluate new behavioral and alternative tools for key pests.

Outcomes and indicators include identification of active volatiles for each of the target insect species. Determination of reduced crop loss under small controlled laboratory and field trials. Additional indicators include field longevity/persistence, cost and ease of implementation. Key pests of interest include SWD, BMSB and FBW.

Objective 2: Evaluate effectiveness of currently available options for spotted-wing-drosophila and codling moth at the farm-scale.

The arrestant for spotted-wing drosophila will be trialed in replicated field trials, at various rates of application to find the optimal cost per acre rate. Fruit injury and non-target affects will be measured. 2) Sterile insect release for codling moth can provide an environmentally friendly control of this key pest of apple, pear and walnut. Reducing or eliminating sprays will enhance the complex of beneficial predators and parasitoids. Sterile CM will be released at various rates and fruit injury and relative abundance of beneficials will be quantified in replicated trials.

Objective 3: Assess economic feasibility of new management programs. Many control tactics work well in the lab or on small-scale experiments field trials at the research stations. Scalability and affordability are the next logical problems to be solved to transform theoretical science to applicable solutions for growers. Our objective is to understand and quantify costs associated with taking these products to market. Where necessary we will identify private partners and facilitate brining products to market to help improve profitability of growers through the novel new control tools.

Objective 4: Extend knowledge to project stakeholders. As alternatives are identified, pest management recommendations will be revised. As efficiencies in application of these new technologies are identified we will communicate this information back to stakeholders at professional industry meetings, and extension outreach meetings. Revised recommendations will be published through the Pacific Northwest Pest Management Handbook, extension publications, and scientific journals articles. In addition to publications, project results will be presented at appropriate industry related meetings and field days hosted by OSU. In order to optimize our outputs as they relate to target insects in each of the respective crops, we have prioritized field versus laboratory activities. Laboratory activities are focuses on newer development, including formulation improvement. Field activities are focused on already developed products that can be implemented in the shorter term (Figure 2).

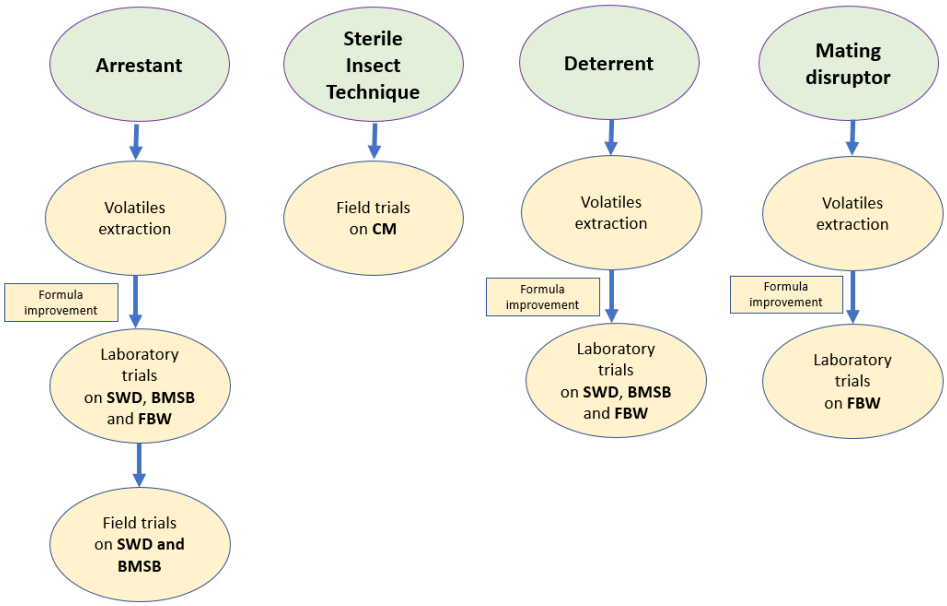

Figure 2. Development plan for new technologies to replace chlorpyrifos with focus on key insects affecting fruit and nut crops in Oregon.

BUDGET NARRATIVE

Budget Summary	
Expense Category	Funds Requested
Personnel	$98,031
Fringe Benefits	$64,389
Travel	$4,008
Equipment	$0
Supplies	$12,180
Contractual	$0
Other	$0
Direct Costs Subtotal	
Indirect Costs	
Total Budget	$178,608

PERSONNEL

#	Name/Title	Level of Effort (# of hours OR % FTE)	Funds Requested
1.	Postdoc MCAREC (Unidentified)	0.3714	$47,618
2	Postdoc Corvallis (Gabriella Tait)	0.4776	$50,413
	Personnel Subtotal		$98,031

PERSONNEL JUSTIFICATION

Personnel 1: Dr. Christopher Adams is the PI of the proposal, will coordinate all the group activities, conduct extension activities, data collection at the end of trials for reporting purposes; he will present and be the lead in tree crops, cherries, pear and apple.
Personnel 2: Dr. Vaughn Walton is the Co-PI and will be responsible for trials conducted in the Western Oregon on blueberries, hazelnut, winegrape and caneberries. He will collect data, and write reports, coordinate and conduct extension activities. He will provide information to identify the viability for future use of alternatives to chlorpyrifos for these crops.
Personnel 3: Dr. Gabriella Tait, a postdoctoral scientist has the balance of her salary paid by other federal and industry grants. She will be responsible for selection and formulation of new formulations for SWD, and BMSB. She will conduct formulation and screening of new active ingredients.
Personnel 4: Betsey Miller is the hazelnut IPM specialist who will conduct evaluations on BMSB and filbertworm, as well as coordination of mating disruption trials for filbertworm. Her salary is paid by hazelnut commission and other educational resources. She will conduct extension activities specifically related to hazelnut.

FRINGE BENEFITS

#	Name/Title	Fringe Benefit Rate	Funds Requested
1.	Postdoc MCAREC (Unidentified)	69.49%, 3% increase year 2	$33,593
2.	Postdoc Corvallis (Gabriella Tait)	60.17%, 3% increase year 2	$30,796
		Fringe Subtotal	$64,389

TRAVEL

#	Trip Destination	Type of Expense (air, car, hotel, meals, mile, etc.)	Unit of Measure (d, n, m)	# of Units	Cost per Unit	# of Travelers Claiming Expense	Funds Requested
1	Oregon – various	Motor Pool Rental	1 vehicle	6	$22	2	$264
2	Oregon – various	Motor P Mileage	446 miles	6	$0.25	2	$1,344
3	Oregon – various	Lodging	1 night	6	$140	2	$1,680
4	Oregon – various	Meals	1 days	6	$60	2	$720
				Travel Subtotal			$4,008

TRAVEL JUSTIFICATION

Regional travel is requested for travel throughout Willamette Valley and Columbia Gorge areas.

CONFORMING WITH YOUR TRAVEL POLICY

By checking the box to the right, I confirm that my organization's established travel policies will be adhered to when completing the above-mentioned trips in accordance with 2 CFR 200.474 or 48 CFR subpart 31.2 as applicable. ☑

EQUIPMENT

#	Item Description	Rental or Purchase	Acquire When?	Funds Requested
1				
		Equipment Subtotal		

EQUIPMENT JUSTIFICATION

None requested

SUPPLIES

Item Description	Per-Unit Cost	# of Units/Pieces Purchased	Acquire When?	Funds Requested
MCAREC – Field and lab related materials	Varies			$7,105
OSU Horticulture – Field and lab related materials	Varies			$5,075
		Supplies Subtotal		$12,180

SUPPLIES JUSTIFICATION

We request funds each year to procure materials and supplies for conducting the field and lab experiments such as sugar, fruit firmness, caliper, pH, lab reagents, microscope slides, Testors paints, insect rearing and collection, licenses for scientific software etc.

CONTRACTUAL/CONSULTANT

ITEMIZED CONTRACTOR(S)/CONSULTANT(S)

#	Name/Organization	Hourly Rate/Flat Rate	Funds Requested
1			
		Contractual/Consultant Subtotal	

CONTRACTUAL JUSTIFICATION

None requested

CONFORMING WITH YOUR PROCUREMENT STANDARDS

By checking the box to the right, I confirm that my organization followed the same policies and procedures used for procurements from non-federal sources, which reflect applicable State and local laws and regulations and conform to the Federal laws and standards identified in 2 CFR Part 200.317 through.326, as applicable. If the contractor(s)/consultant(s) are not already selected, my organization will follow the same requirements. ☑

OTHER

Item Description	Per-Unit Cost	Number of Units	Acquire When?	Funds Requested
		Other Subtotal		

OTHER JUSTIFICATION

None requested.

PROGRAM INCOME

Program income is gross income—earned by a recipient or subrecipient under a grant—directly

Source/Nature of Program Income	Description of how you will reinvest the program income into the project to solely enhance the competitiveness of specialty crops	Estimated Income
	Program Income Total	