

## Matthew Patrick Daugherty

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### EDUCATION

Ph.D. Integrative Biology (2006), University of California, Berkeley

M.S. Biological Sciences (2000), Illinois State University

B.S. Biological Sciences (1995), University of California, Davis

### PROFESSIONAL APPOINTMENTS

2018-present **Cooperative Extension Specialist**, Department of Entomology, University of California-Riverside

2015-2018 **Associate Cooperative Extension Specialist**, Department of Entomology, University of California-Riverside

2009-2015 **Assistant Cooperative Extension Specialist**, Department of Entomology, University of California-Riverside

2006-2009 **Postdoctoral Researcher**, Department of Environmental Sciences, Policy & Management, University of California-Berkeley

### PUBLICATIONS & MANUSCRIPTS

Grafton-Cardwell, E.E., Gu, P., and M.P. Daugherty. 2022. Impact of citricola scale *Coccus pseudomagnoliarum* (Hemiptera: Coccidae) on Valencia orange, *Citrus sinensis*, production and fruit quality. *Journal of Economic Entomology* 115:2121-2124

Grafton-Cardwell, E.E., Gu, P., and M.P. Daugherty. 2022. Impact of *Icerya purchasi* (Hemiptera: Monophlebidae) on navel orange, *Citrus sinensis*, production and fruit quality. *Journal of Economic Entomology* 115:1627-1636

Bayles, B.R., Thomas, S.M., Simmons, G.S., and M.P. Daugherty. 2022. Quantifying spillover of an urban invasive vector of plant disease: Asian citrus psyllid (*Diaphorina citri*) in California citrus. *Frontiers in Insect Science* 2:783285.

Beal, D.J., Adams, A.G., Cooper, M.L., Varela, L.G., Smith, R.J., Kron, C.R., Almeida, R.P.P. and M.P. Daugherty. 2021. Assessment of nymphal ecology and adult *Xylella fastidiosa* transmission biology of *Aphrophora* nr. *permutata* (Hemiptera: Aphrophoridae) in California vineyards. *Environmental Entomology* 50:1446-1454

Grafton-Cardwell, E.E., Leonard, J.T., Daugherty, M.P., and D.H. Headrick. 2021. Mating disruption of the California red scale, *Aonidiella aurantii* (Hemiptera: Diaspididae) in Central California citrus. *Journal of Economic Entomology* 114:2421-2429

Grafton-Cardwell, E.E., Daugherty, M.P. 2021. Impact of insecticide treatments for *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) on growth and yield of young *Citrus reticulata* mandarins. *Journal of Economic Entomology* 114:1226-1233

Beal, D.J., Cooper, M.L., Daugherty, M.P., Purcell, A.P., Almeida, R.P.P. 2021. Seasonal abundance and infectivity of *Philaenus spumarius* (Hemiptera: Aphrophoridae), a vector of *Xylella fastidiosa* in California vineyards. *Environmental Entomology* 50:467-476

- Schartel, T.E., Cooper, M.L., May, A., Daugherty, M.P. 2021. Quantifying *planococcus ficus* (Hemiptera: Pseudococcidae) invasion in Northern California vineyards to inform management strategy. *Environmental Entomology* 50:138-148
- Zorzenon, F.P.F., Tomaseto, A.F., Daugherty, M.P., Lopes, J.R.S., Miranda, M.P. 2021. Factors associated with *Diaphorina citri* immigration into commercial citrus orchards in Sao Paulo State, Brazil. *Journal of Applied Entomology* 145:326-335
- Simmons, G. S., Varela, L., Daugherty, M., Cooper, M., Lance, D., Mastro, V., Cardé, R. T., Lucchi, A., Ioriatti, C., Bagnoli, B., Steinhauer, R., Broadway, R., Stone Smith, B., Hoffman, K., Clark, G., Whitmer, D., Johnson, R. 2021. Area-wide eradication of the invasive European grapevine moth, *Lobesia botrana* in California, USA, pp. 581–596. In J. Hendrichs, R. Pereira and M. J. B. Vreysen (eds.), *Area-wide integrated pest management. Development and field application*. CRC Press, Boca Raton, FL, USA.
- Byrne, F., Daugherty, M.P., Grafton-Cardwell, E.E. 2020. Rapid uptake and retention of neonicotinoids in nursery citrus trees as a safeguard against Asian citrus psyllid (*Diaphorina citri*) infestation. *Crop Protection* 138:105345
- Schartel, T.E., Bayles, B.R., Cooper, M.L., Simmons, G.S., Thomas, S.M., Varela, L.G., and M.P. Daugherty. 2019. Reconstructing the European grapevine moth (Lepidoptera: Tortricidae) invasion in California: insights from a successful eradication. *Annals of the Entomological Society of America* 112:107-117
- Daugherty, M.P., and R.P.P. Almeida. 2019. Understanding how an invasive vector drives Pierce's disease epidemics: seasonality and vine-to-vine spread. *Phytopathology* 109:277-285
- Lillian, S., Redak, R.A., and M.P. Daugherty. 2019. Assessing the role of differential herbivore performance among plant species in associational effects involving the invasive stink bug *Bagrada hilaris* (Hemiptera: Pentatomidae). *Environmental Entomology* 48:114-121
- Lillian, S., Redak, R.A., and M.P. Daugherty. 2018. Associational susceptibility of a native shrub induced by context-dependent attraction of an invasive herbivore. *Ecosphere* 9:e02442
- Del Cid, C., Krugner, R., Zeilinger, A.R., Daugherty, M.P., and R.P.P. Almeida. 2018. Plant water stress and vector feeding preference mediate transmission efficiency of a plant pathogen. *Environmental Entomology* 47:1471-1478
- Sicard, A., Zeilinger, A.R., Vanhove, M., Schartel, T.E., Beal, D.J., Daugherty, M.P., and R.P.P. Almeida. 2018. *Xylella fastidiosa*: insights into an emerging plant pathogen. *Annual Review of Phytopathology* 56:181-202
- Daugherty, M.P., Almeida, R.P.P., Smith, R.J., Weber, E.A., and A.H. Purcell. 2018. Severe pruning of infected grapevines has limited efficacy for managing Pierce's disease. *American Journal of Enology and Viticulture* 69:289-294
- Cooper, M. L., Daugherty, M.P., Jeske, D.R., Almeida, R.P.P., and K.M. Daane. 2018. Incidence of grapevine leafroll disease: effects of grape mealybug (*Pseudococcus maritimus*) abundance and pathogen supply. *Journal of Economic Entomology* 111:1542-1550
- Byrne, F.J., Grafton-Cardwell, E.E., Morse, J.G., Olguin, A.E., Zeilinger, A.R., Wilen, C., Bethke, J., and M.P. Daugherty. 2018. Assessing the risk of containerized citrus contributing to Asian citrus psyllid (*Diaphorina citri*) spread in California: residence times and insecticide residues at retail nursery outlets. *Crop Protection* 109:33-41
- Tofangsazi, N., Morales-Rodriguez, A., Daugherty, M.P., Simmons, G.S., and E.E. Grafton-Cardwell. 2018. Residual toxicity of selected organic insecticides to *Diaphorina citri* (Hemiptera: Liviidae)

- and non-target effects on *Tamarixia radiata* (Hymenoptera: Eulophidae) in California. *Crop Protection* 108:62-70
- Thomas, S.M., Simmons, G.S., and M.P. Daugherty. 2017. Spatiotemporal distribution of an invasive insect in an urban landscape: introduction, establishment and impact. *Landscape Ecology* 32:2041-2057
- Daugherty, M.P., Zeilinger, A.R., and R.P.P Almeida. 2017. Conflicting effects of climate and vector behavior on the spread of a plant pathogen. *Phytobiomes* 1:46-53
- Cassone, B.J., Kay, R.G., Daugherty, M.P., and B.J. White. 2017. Comparative transcriptomics of malaria mosquito testes: function, evolution, and linkage. *G3* 7:1127-1136
- Bayles, B.R., S.M. Thomas, G.S Simmons, E.E. Grafton-Cardwell, and M.P. Daugherty. 2017. Spatiotemporal dynamics of the Southern California Asian citrus psyllid (*Diaphorina citri*) invasion *PLoS One* 12:e0173226
- Byrne, F., Daugherty, M.P., Grafton-Cardwell, E.E., Bethke, J., and J. Morse. 2017. Evaluation of systemic neonicotinoid insecticides for the management of the Asian citrus psyllid *Diaphorina citri* on containerized citrus. *Pest Management Science* 73:506-514
- Poudel, M., E. Grafton-Cardwell, M. Daugherty, J. Almanzor, A. Washburn, G. Simmons, and J. Morse. 2016. Evaluation of Selected Insecticides for Asian Citrus Psyllid Control, 2014. *Arthropod Management Tests* 41:1-2
- Conlisk, E., Swab, R., Martínez-Berdeja, A., and M.P. Daugherty. 2016. Post-fire recovery in coastal sage scrub: seed rain and community trajectory. *PLoS One* 11:e0162777
- Coletta-Filho, H.D., Bittleston, L.S., Lopes, J.R.S., Daugherty, M.P., and R.P.P. Almeida 2015. Genetic distance may underlie virulence differences among isolates of a bacterial plant pathogen. *Journal of Plant Pathology* 97:465-469
- Rathé, A.A., Pilkington, L.J., Spohr, L.J., Hoddle, M.S., Daugherty, M.P., and G.M. Gurr 2015. Invasion pathway risk analysis for the glassy-winged sharpshooter (*Homalodisca vitripennis*): survival and reproductive success following simulated air transportation. *Biological Invasions* 17:2963-2973
- Daugherty, M.P., O'Neill, S., Byrne, F., and A. Zeilinger 2015. Is vector control sufficient to limit pathogen spread? *Environmental Entomology* 44:789-797
- Zeilinger, A., and M.P. Daugherty 2014. Vector preference and host defense against infection interact to determine disease dynamics. *Oikos* 123:613-622
- Coletta-Filho, H., Daugherty, M.P., Ferreira, C., and J. Lopes. 2014. Temporal progression of *Candidatus Liberibacter asiaticus* infection in citrus and acquisition efficiency by *Diaphorina citri*. *Phytopathology* 104:416-421
- Rathé, A.A., Pilkington, L.J., Hoddle, M.S., Spohr, L.J., Daugherty, M.P., and G.M. Gurr 2014. Feeding and development of the glassy-winged sharpshooter, *Homalodisca vitripennis*, on Australian native plant species in the USA and implications for Australian biosecurity. *PLoS One* 9:e90410
- Rashed, A., Kwan, J., Baraff, B., Ling, D., Daugherty, M.P., Killiny, N., and R.P.P. Almeida 2013. Relative susceptibility of *Vitis vinifera* cultivars to vector-borne *Xylella fastidiosa* through time. *PLoS One* 8:e55326
- Gruber, B.R., and M.P. Daugherty 2013. Predicting the effects of seasonality on the risk of pathogen spread in vineyards: vector pressure, natural infectivity, and host recovery. *Plant Pathology* 62:194-204

- Rathé, A.A., Pilkington, L.J., Gurr, G.M., Hoddle, M.S., Daugherty, M.P., Constable F.E., Luck, J.E., Powell, K.S., Fletcher, M.J., and O.R. Edwards 2012. Incursion preparedness: anticipating the arrival of an economically important plant pathogen *Xylella fastidiosa* Wells (Proteobacteria: Xanthomonadaceae) and the insect vector *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae) in Australia. *Australian Journal of Entomology* 51:209-220
- Rathé, A.A., Pilkington, L.J., Gurr, G.M., and M.P. Daugherty 2012. Potential for persistence and within-plant movement of *Xylella fastidiosa* in Australian native plants. *Australasian Plant Pathology* 41:405-412
- Tsai, C.W., Daugherty, M.P., and R.P.P. Almeida 2012. Seasonal dynamics and virus translocation of *Grapevine leafroll-associated virus 3* in grapevine cultivars. *Plant Pathology* 61:977-985
- Daugherty, M.P., Gruber, B.R., Almeida, R.P.P., Anderson, M.M., Cooper, M.L., Rasmussen, Y.D., and E.A. Weber 2012. Testing the efficacy of barrier plantings for limiting sharpshooter spread. *American Journal of Enology and Viticulture* 63:139-143
- Daugherty, M.P. 2011. Host plant quality, spatial heterogeneity, and the stability of mite predator-prey dynamics. *Experimental and Applied Acarology* 9:311-322
- Daugherty, M.P., Rashed, A., Almeida, R.P., and T. Perring 2011. Vector preference for host infection status: sharpshooter movement and *Xylella fastidiosa* transmission. *Ecological Entomology* 36:654-662
- Rashed, A., Daugherty, M.P., R.P.P. Almeida 2011. Grapevine cultivar susceptibility to *Xylella fastidiosa* does not affect vector transmission success. *Environmental Entomology* 40:1192-1199
- Lopes, J.R.S., Daugherty, M.P. and R.P.P. Almeida 2010. Strain origin drives virulence and persistence of *Xylella fastidiosa* in alfalfa. *Plant Pathology* 59:963-971
- Daugherty, M.P., Lopes, J.R.S. and R.P.P. Almeida 2010. Strain-specific alfalfa water stress induced by *Xylella fastidiosa*. *European Journal of Plant Pathology* 127:333-340
- Daugherty, M.P., Lopes, J.R.S. and R.P.P. Almeida 2010. Vector within-host feeding preference mediates transmission of a heterogeneously distributed pathogen. *Ecological Entomology* 35:360-366
- Prado, S.S., Hung, K.Y., Daugherty, M.P. and R.P.P. Almeida 2010. Indirect effects of temperature on stink bug fitness via maintenance of gut-associated symbionts. *Applied and Environmental Microbiology* 76:1261-1266
- Daugherty, M.P., Bosco, D. and R.P.P. Almeida 2009. Temperature mediates vector transmission efficiency: inoculum supply and plant infection dynamics. *Annals of Applied Biology* 155:361-369
- Daugherty, M.P. and R.P.P. Almeida 2009. Estimating *Xylella fastidiosa* transmission parameters: decoupling sharpshooter number and feeding period. *Entomologia Experimentalis et Applicata* 132:84-92
- Lopes, J.R.S., Daugherty, M.P., and R.P.P. Almeida 2009. Context-dependent transmission of a generalist plant pathogen: host species and pathogen strain mediate insect vector competence. *Entomologia Experimentalis et Applicata* 131:216-224
- Prado, S.S., Golden, M., Follett, P.A., Daugherty, M.P., and R.P.P. Almeida 2009. Demography of gut symbiotic and aposymbiotic *Nezara viridula* L. (Hemiptera: Pentatomidae). *Environmental Entomology* 38:103-109

- Daugherty, M.P. 2009. Different herbivore feeding modes promote coexistence: insights from a metabolic pool model. *Environmental Entomology* 38:667-676
- Daugherty, M.P., Welter, S. C., and C. J. Briggs 2007. Top-down and bottom-up control of pear psylla (*Cacopsylla pyricola*): Plant quality and the efficacy of the predator *Anthocoris nemoralis*. *Biological Control* 43:257-264
- Daugherty, M.P., and C.J. Briggs 2007. Multiple sources of isotopic variation in a terrestrial arthropod community: challenges for disentangling food webs. *Environmental Entomology* 36:776-791
- Daugherty, M.P., Harmon, J.P., and C.J. Briggs 2007. Trophic supplements to intraguild predation. *Oikos* 116:662-677
- Lloyd-Smith, J.O., Cross, P.C., Briggs, C.J., Daugherty, M.P., Getz, W.M., Latto, J., Sanchez, M.S., Smith, A.B., and A. Swei 2005. Should we expect population thresholds for wildlife disease? *Trends in Ecology & Evolution* 20:511-519
- Daugherty, M.P., and S.A. Juliano 2003. Leaf-scraping beetle feces are a food resource for *Ochlerotatus triseriatus*. *American Midland Naturalist* 150:181-184
- Daugherty, M.P., and S.A. Juliano 2002. Testing for context-dependence in a processing chain interaction among detritus-feeding aquatic insects. *Ecological Entomology* 27:541-553
- Daugherty, M.P., and S.A. Juliano 2001. Factors affecting the abundance of scirtid beetles in container habitats. *Journal of the North American Benthological Society* 20:109-117
- Daugherty, M.P., Alto, B.A., and S.A. Juliano 2000. Invertebrate carcasses as a resource for competing *Aedes albopictus* and *Aedes aegypti* (Diptera: Culicidae). *Journal of Medical Entomology* 37:364-372

#### **PROFESSIONAL AWARDS & RECENT GRANTS**

- Outstanding Faculty Award, UC Riverside Entomology Graduate Student Association, 2015.
- Plant-Insect Ecosystems Award from the Pacific Branch of the Entomological Society of America, April 2014
- PI, USDA-APHIS, "Refining estimates of effective detection trap density for the box tree moth, *Cydalima perspectalis*", 06/2022 - 05/2023
- PI, USDA-APHIS, "Measuring impact of residential & biocontrol activities on ACP populations in HLB quarantine & commercial citrus buffer treatment areas", 09/2021 - 09/2022
- PI, USDA-APHIS, "Analysis and program support for the European Grapevine Moth, *Lobesia botrana*, and related moth pests of grapevines", 09/2020 - 08/2023
- PI, California Department of Food & Ag, "Temecula valley glassy-winged sharpshooter monitoring program", 07/2015 - 06/2023

#### **PROFESSIONAL ACTIVITIES**

##### **Selected recent conference presentations and seminars**

- "Understanding the effects of climate on Pierce's disease epidemiology", American Phytopathological Society Annual Conference, Pittsburgh, PA, 08/2022
- "Careers in cooperative extension", UCR Ecology Group, Riverside, CA, 04/2022
- "Using geospatial tools to understand the factors driving insect invasions", Geospatial Meetup, UC Riverside, 01/2022

- “Revisiting the role of *Graphocephala atropunctata* in Pierce's disease dynamics”, The Xylella Files, UC Berkeley, 09/2021
- “Revisiting the role of the blue-green sharpshooter (*Graphocephala atropunctata*) in Pierce's disease dynamics”, Pacific Branch Meeting of the Entomological Society of America, 04/2021
- “Pierce's disease and the California north coast: assessing the role of spittlebug vectors”, Co-author, Pacific Branch Meeting of the Entomological Society of America, 04/2021
- “Exploring the ecology and transmission biology of *Aphrophora permutata* in California North Coast vineyards”, Co-author, Entomological Society of America, 11/2020

### **Selected recent extension presentations**

- “An update on invasive landscape pests in Southern California”, IPM for Landscape Professions Workshop, San Diego, CA, 05/2022
- “Update on glassy-winged sharpshooter & other invasive vineyard pests”, Temecula Valley Grape Day, 04/2022
- “An update on invasive insects in California: some successes, but more new problems”, Redlands Horticultural Improvement Society, Redlands, CA 03/2022
- “Asian citrus psyllid and the citrus disease huanglongbing”, UC Master Gardener Emerging Tree Pest Workshop, 02/2022
- “Understanding vine mealybug invasion dynamics”, Silverado Sustainable Viticulture Summit, 01/2022
- “Impact of residential control activities on ACP in HLB quarantine & commercial buffer treatment areas”, ACP Biocontrol Taskforce Meeting, 01/2022
- “Taking a closer look at the ‘other’ Pierce’s disease vectors in the North Coast”, Pierce’s Disease Research Symposium, Sacramento, CA, 12/2021
- “Scouting for Pierce’s disease”, Temecula Valley Small Winegrowers, 08/2021
- “Pierce’s disease and PD vectors; sharpshooters and spittlebugs”, Napa County Pest and Disease Field Day, 6/2021
- “Insect pest management: impacts of climate change and extreme weather”, UCCE San Diego Climate Action and Agriculture Symposium, 4/2021
- “Sharpshooter monitoring in Southern California vineyards”, Temecula Valley Small Winegrowers, 2/21

### **Selected recent extension publications or public outreach**

- Leonard et al. 2022. Mating Disruption Eases California Red Scale Problems. *Citrograph*, Winter 2022, pp. 36-40
- Grafton-Cardwell and Daugherty. 2022. Citrus Leafminer Affects Growth and Yield of Young Tangos. *Citrograph*, Winter 2022, pp. 42-48
- Byrne, Grafton-Cardwell, Daugherty. 2020. Rapid uptake of imidacloprid in containerized nursery citrus. *Citrograph*, Fall 2020, pp.60-64.
- Temecula Valley GWSS Newsletter, biweekly, 05/2012 to present
- San Diego GWSS Newsletter, biweekly, 03/2021 to 11/2021
- Extension handout: Asian citrus psyllid distribution and management, 2 p., 11/2021
- Interview, Progressive Crop Consultant, citrus leafminer IPM, 06/2022

Interview, Civil Eats, <https://civileats.com/2021/06/02/a-tiny-pest-a-big-crossroads-for-california-citrus/>, 06/2021

Interview, Undark Magazine, <https://undark.org/2021/07/12/california-fight-grapevine-killing-bacteria/>, 04/2021

Interview, Inside Climate News, <https://insideclimatenews.org/news/17022021/warmer-california-winters-may-fuel-grapevine-killing-pierces-disease/>, 02/2021

Interview, Good Fruit Growers, <https://www.goodfruit.com/lessons-in-eradications/>, 01/2021

*Online extension resources:*

ACP/HLB Distribution and Management. <http://ucanr.edu/sites/ACP/>

Temecula GWSS and Pierce's disease blog. <https://temeculagwss.ucr.edu/>

Napa County-wide monitoring for blue-green sharpshooter.

<https://ucceviticulturenapa.wixsite.com/uccevitnapa/data-dashboards>

ACP and HLB online course for retail nurseries:

<https://campus.extension.org/enrol/index.php?id=1680>

Center for Invasive Species Research, species accounts:

- European Grapevine Moth [http://cizr.ucr.edu/european\\_grapevine\\_moth.html](http://cizr.ucr.edu/european_grapevine_moth.html)
- Brown-marmorated stinkbug [http://cizr.ucr.edu/brown\\_marmorated\\_stinkbug.html](http://cizr.ucr.edu/brown_marmorated_stinkbug.html)
- Vine mealybug [http://cizr.ucr.edu/vine\\_mealybug.html](http://cizr.ucr.edu/vine_mealybug.html)
- Sudden oak death [http://cizr.ucr.edu/sudden\\_oak\\_death.html](http://cizr.ucr.edu/sudden_oak_death.html)
- Chytrid fungus [http://cizr.ucr.edu/chytrid\\_fungus.html](http://cizr.ucr.edu/chytrid_fungus.html)
- Argentine ant [http://cizr.ucr.edu/argentine\\_ant.html](http://cizr.ucr.edu/argentine_ant.html)

**Synergistic activities**

Member, Citrus Research Board's Asian Citrus Psyllid Biological Control Taskforce

Member, Citrus Research Board's HLB Data Analytic Tactical Operations Cell

Member, USDA-APHIS European Grapevine Moth Technical Working Group

Editorial Board Member & Review Editor, Frontiers in Insect Science, Invasive Insect Species Section

Panel Member, CDFA Specialty Crops Block Grant Program