WILDFIRE IMPACT ON HORTICULTURAL CROPS: RESOURCES by: Trevor Suslow

In addition to the direct loss of natural lands, homes and property, domesticated animals, civilian and firefighter lives, especially hard hit are the communities and growers directly impacted by the devastating wildfires in the Napa and Southern California. Despite best efforts, both Linda Harris and I were hard-pressed to uncover specific and relevant information or guidance in response to multiple requests from wine grape growers, home gardeners, tree fruit growers, berry growers, and mixed cool season vegetable growers impacted by smoke, ash, and known or potential drift from fire-retardants. Increased animal intrusion into crop fields was also mentioned as a result of rapid wildfire spread. . Heidi Meier of the PTC and I arrived in Ventura, CA on the evening of Monday, December 4 to conduct a Produce Safety Alliance Grower Training on Tuesday for 95 growers. We watched the wildfire, looking immediately across Highway 101, develop from an orange glow at one spot on the hillcrest to raging flames across all the peaks in both directions. We are grateful for the list of the links to information provided by Samir Assar of FDA/CFSAN, which represent at least a starting point for some of the situational concerns. We certainly hope some more specific guidance for fresh horticultural foods and the associated production farms, high-tunnels, and greenhouse will be developed in the future.

- Food Contaminants & Adulteration (http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/default.htm)
- FDA Compliance Policy Guides, Chapter 5 – Foods, Colors, and Cosmetics (http://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm119194.htm)
- FDA Compliance Policy Guide Sec. 675.200: Diversion of Adulterated Food to Acceptable Animal Feed Use (https://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm074694.htm)
- Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed (https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ChemicalContaminantsMetalsNaturalToxinsPesticides/ucm077969.htm)

The following resources may help growers and testing laboratories determine appropriate testing methods for chemical and metal contaminants in foods:

- Toxic Elements, including cadmium, mercury, lead, and arsenic. Analytical testing methods for toxic elements can be found in FDA's Elemental Analysis Manual (EAM) for Food and Related Products (https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm2006954.htm).
- Polychlorinated Biphenyls (PCBs).

  For total PCB analysis, FDA recommends methods described in Volume 1 of FDA's Pesticide Analytical Manual (PAM), Chapter 3, Chapter 5, and Appendix I (https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm111455.htm).

  For individual PCB congener analysis, FDA recommends methods published by the US Environmental Protection Agency (EPA): Method 1668C. Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS, April 2010 (https://www.epa.gov/cwa-methods)

- Other contaminants as appropriate to the specific wildfire and crop situation. For example, if it is known that a significant amount of pesticide products were stored at an establishment burned by the wildfire, the grower may consider testing salvaged crop for possible pesticide contamination. Analytical testing methods for pesticides can be found in FDA's Pesticide Analytical Manual (PAM) (https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm2006955.htm).
- Tolerances for pesticides can be found in 40 Code of Federal Regulations (CFR) part 180 (https://www.ecfr.gov/cgi-bin/text-idx?SID=05968162fc1662ca234bf254bc344f39&mc=true&tpl=/ecfrbrowse/Title40/40cfr180_main_02.tpl).

Additional External Resources:

• U.S. Environmental Protection Agency, 2002. Emissions of Organic Air Toxics from Open Burning. Available online at: https://nepis.epa.gov/Exe/ZyPDF.cgi/P1001G31.PDF?Dockey=P1001G31.PDF. Last accessed on 11-07-2017.

• Arizona Department of Health Services Wildfire Emergency Response Plan. Available online at: http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/wildfires/adhs-wildfire-emergency-response-plan.pdf. Last accessed on 11-07-2017.

• Natural Resources Conservation Service, January 2006. Management after wildfire. Available online at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_001731.pdf. Last accessed on 11-07-2017.

• United States Department of Agriculture, Food Safety and Inspection Service. August 2013. Fires and Food Safety. Available online at https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/emergency-preparedness/fires-and-food-safety/ct_index. Last accessed on 11-07-2017.

• The Australian Wine Research Institute. Smoke Taint. Available online at https://www.awri.com.au/industry_support/winemaking_resources/smoke-taint/ Last accessed on 11-07-2017.

• Kennison, K.R., Wilkinson, K.L.; Williams, H.G., Smith, J.H., and Gibberd, M.G., 2017. Smoke-derived taint in wine: effect of postharvest smoke exposure of grapes on the chemical composition and sensory characteristics of wine. *Journal of Agricultural and Food Chemistry*, 55:10897-10901. Available online at: http://wineserver.ucdavis.edu/pdf/attachment/1123.%20Smoke%20taint%201.pdf. Last accessed on 11-07-2017.

• Estrellan, C.R., and Lino, F., Review: Toxic emissions from open burning. *Chemosphere,* 80(3), 193-207. Available online at http://www.sciencedirect.com/science/article/pii/S0045653510003711. Last accessed on 11-07-2017.

• Statheropoulos, M. and Karmaa, S., 2007. Complexity and origin of the smoke components as measured near the flame-front of a real forest fire incident: A case study. *Journal of Analytical and Applied Pyrolysis*, 78(2), 430-437. Available online at: http://www.sciencedirect.com/science/article/pii/S0165237006001409. Last accessed on 11-07-2017.

• Nakao, T., Aozasa, O., Ohta, S., and Miyata, H., 2002. Formation of dioxin analogs by open-air incineration of waste wood and by fire of buildings and houses concerning Hanshin Great Earthquake in Japan. *Chemoshere*, 46(3), 429-437. Available online at: http://www.sciencedirect.com/science/article/pii/S0045653501001424. Last accessed on 11-07-2017.