Good morning. Thank you for the invitation to present this morning. My name is Jim Farrar. I am Director of the University of California Statewide Integrated Pest Management Program. Integrated pest management is a science-based approach to managing pests while minimizing economic, human-health, and environmental risks from pests and pest-management practices. Pests pose economic, human-health and environmental risks and pest management practices pose economic, human-health and environmental risks. Minimizing these risks while managing pests is the goal of integrated pest management. The Program began in 1979 at the direction of the state legislature and currently consists of 11 IPM Advisors located throughout California and 20 staff in Davis working to translate university science into safe, economical and effective pest management tools. We currently get over 30,000 website hits per day from people looking for solutions to pest problems. UC IPM is located in UC Agriculture and Natural Resources, which is the statewide, cooperative extension division of the university. ANR has several hundred academics located in over 50 county offices, on nine research and extension centers, and on four UC campuses. Some of the programs in ANR that you may recognize are Cooperative Extension, 4-H, Master Gardeners, California Institute for Water Resources, and, of course, Integrated Pest Management.

You asked me to give an update on pests and diseases in California winegrapes. I would like to start by setting the context of California winegrape production. In 2015, California agriculture produced a farm gate value of $47 billion - $20 billion more that the second agricultural state, Iowa. Grapes, that is table, raisin and winegrapes, are the third leading commodity in California, behind dairy and almonds, with a farm gate value of almost $5 billion. Half of the California grape value is winegrapes, or $2.5 billion. In 2015, $1.5 billion in wine was exported from California to other countries. Many people know the Napa/Sonoma region for

winegrape production, but there is significant winegrape acreage in the Central Coast, Lodi area, San Joaquin Valley, Central Sierra, and southern valleys.

Today, I am going to discuss powdery mildew, red blotch virus, grapevine leafroll associated virus and its vector – mealybugs, Bob Wynn from CDFA will discuss Pierce's disease and Glassy-winged sharpshooter, and I will touch on weed management with glyphosate.

Powdery mildew is caused by a fungus that grows on any green tissue on the grape plant. In winegrapes, more pounds of pesticide are applied to manage powdery mildew than any other pest or disease. Growers apply fungicides when a weather-based disease forecasting model indicates risk of infection. The most commonly used fungicide is sulfur, and the application rate is many pounds per acre, but there are several other fungicides that control the disease. In the past few years, the fungus has developed resistance to one of the commonly used classes of fungicides – the strobulurins. Recent surveys in the North Coast have found that 90% of the powdery mildew isolates collected were resistant. One potential solution is breeding winegrapes to be resistant to powdery mildew. Professor Andy Walker at UC Davis has succeeded in crossing winegrapes with a wild grape species that is naturally resistant to powdery mildew and then crossing the offspring back to the parent winegrape variety for several generations. The drawback is the wine industry is largely based on named varietals. Even if the new resistant variety is more than 95% the original parent, it is not 100% the original varietal and cannot be marketed under the same name. This is also true for traditional breeding for Pierce's Disease resistance. Let me just emphasize that this is traditional breeding for resistance, not genetic engineering to produce GM crops.

Red blotch is a relatively newly discovered disease caused by a virus. Red blotch was first identified in late 2008, a virus identified as the potential cause in 2011 and scientifically established in 2014. It was later found in herbarium specimens dating back to the 1940s. In 2016, researchers discovered that it was vectored by 3-cornered alfalfa hopper, and there may be others. For a virus disease this was incredibly rapid research progress. Red blotch causes delayed berry ripening and the sugar levels are lower – reducing quality of the grapes. The disease continues to be identified in new areas – either it is spreading by vectors that we have not identified yet or it was not recognized before. Several research labs are working on red blotch and management methods. Red blotch and the disease I will talk about next, leafroll, illustrate the importance of nursery transplants free of all known diseases.

Grapevine leafroll associated virus is transmitted by mealybugs. Leafroll and redblotch are the reason that grape leaves turn red in the fall – this is not normal fall color, but an indication of disease. We have had three mealybug species (grape, obscure and longtail) in grapes for a long time, but in the past 12 years have seen the continuing spread of the introduced vine mealybug. All four mealybugs vector leafroll virus. Leafroll does not kill plants but does reduce yields 10-20%, delays ripening by 3-4 weeks, and reduces sugar levels. Therefore, it is a drag on yield and quality year after year. Since mealybugs can spread the virus from neighboring infected fields or from just a few infected vines within a field – the problem gets worse every year. The best control is to start with certified nursery transplants that do not have the leafroll virus or mealybugs. The source for virus-tested, clean propagation material is Foundation Plant Services at UC Davis and the nurseries that propagate and sell registered and certified grapevine material. Then once the clean vines are in the field, it is important to prevent mealybugs from moving the virus from neighboring fields. In some cases, growers in a specific local region have

banded together to share trap counts and coordinate mealybug treatments for greater effectiveness.

Bob Wynn is going to discuss Pierce's disease and Glassywinged sharpshooter, and the expansion of the grower-funded PD/GWSS Program to other pests. I just wanted to emphasize the continued importance of native sharpshooters in Pierce's disease spread in the northern California regions that do not have GWSS.

The last issue I want to mention is unintended consequences of social pressure on glyphosate. In winegrape production, the soil directly under the vines needs to be free of weeds to avoid competition for water and nutrients. Growers try to avoid tillage in order to comply with Natural Resources Conservation Service and Salmon Safe guidelines. Therefore, the area under the vines is sprayed with a post-emergent (after the weeds have germinated) herbicide. Until recently the product of choice for effectiveness, price, and applicator safety was glyphosate (Roundup). Recent social pressure resulting from the International Agency for Research on Cancer labeling glyphosate a probable human carcinogen and news stories indicating detection of glyphosate in wine have caused some growers to look at other herbicides. The other choices are glufosinate, which is more risky to applicators, less effective, and more expensive, and paraquat which has similar price and effectiveness, but much greater risk to applicators. Paraquat is a restricted use pesticide that is highly toxic to humans – 3 teaspoons will kill an adult. It has a higher risk DANGER label in contrast to the lower risk CAUTION label for glyphosate. This is an increased risk to human health as a result of misplaced public perception of risk.

In conclusion, what can you do to help address these issues? The County Agricultural Commissioners and county-based University of California Cooperative Extension Advisors are

vital in the continued efforts to manage winegrape pests and diseases. They are the frontline support for growers and pest control advisors in this effort. Continuing or increasing support for these two groups is critical. University of California scientists have been central in understanding these pest and disease problems and developing management strategies. Foundation Plant Services and the nursery certification program are central to planting new vineyards with clean, disease-free transplants. The continued support for research from the PD/GWSS Program managed through CDFA is important for providing research funding and ensuring that research focuses on the avenues of inquiry most likely to lead to useful and effective controls.

Thank you for your attention and I am happy to answer any questions.