

# UCCE North Coast Viticulture

Prescribed burn risks to vineyards

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# Fire Risk in California

An average of  $\approx 5,000$  acres burn to wildfire in CA each year (CalFire/ USFS)

$\approx 70,000$  acres of land are burned in a controlled/prescribed manner each year to limit wildfire risk (CalFire/ USFS)

Removing ground litter and fuel source build up is essential to reduce wildfire intensity and frequency

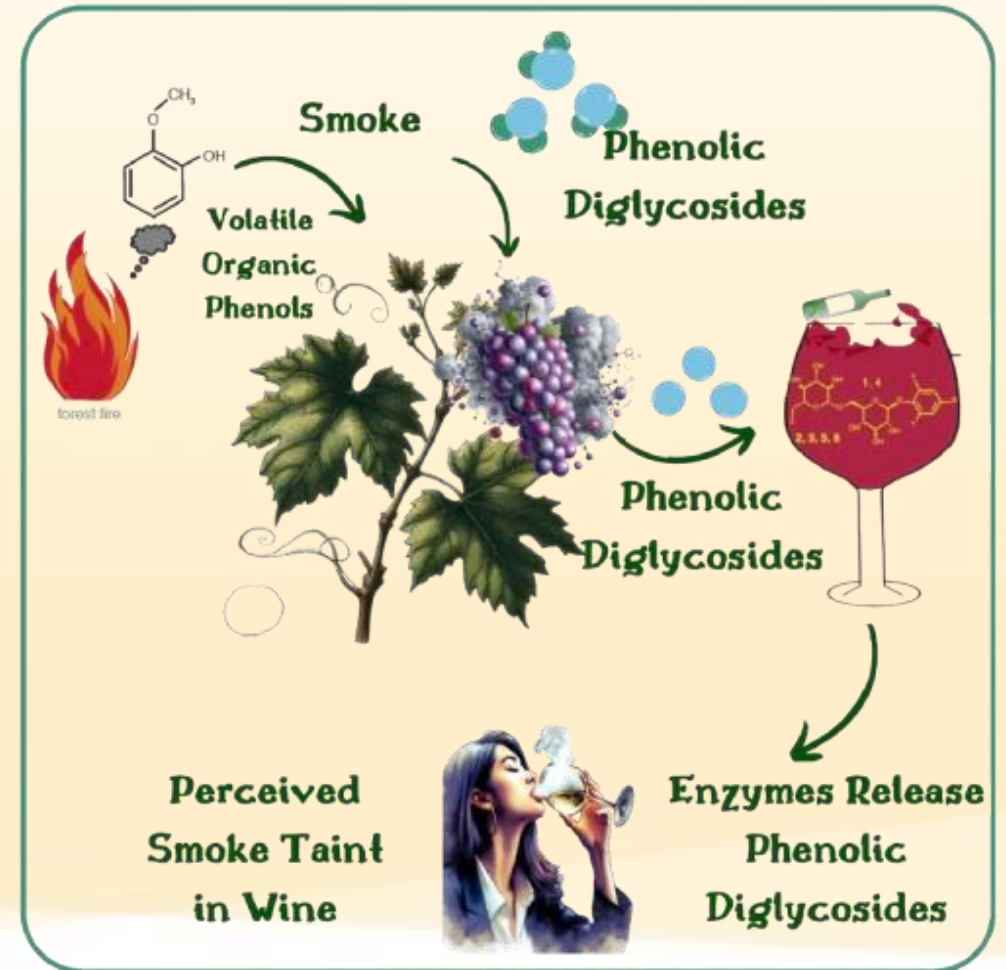


# Smoke Taint in Vineyards

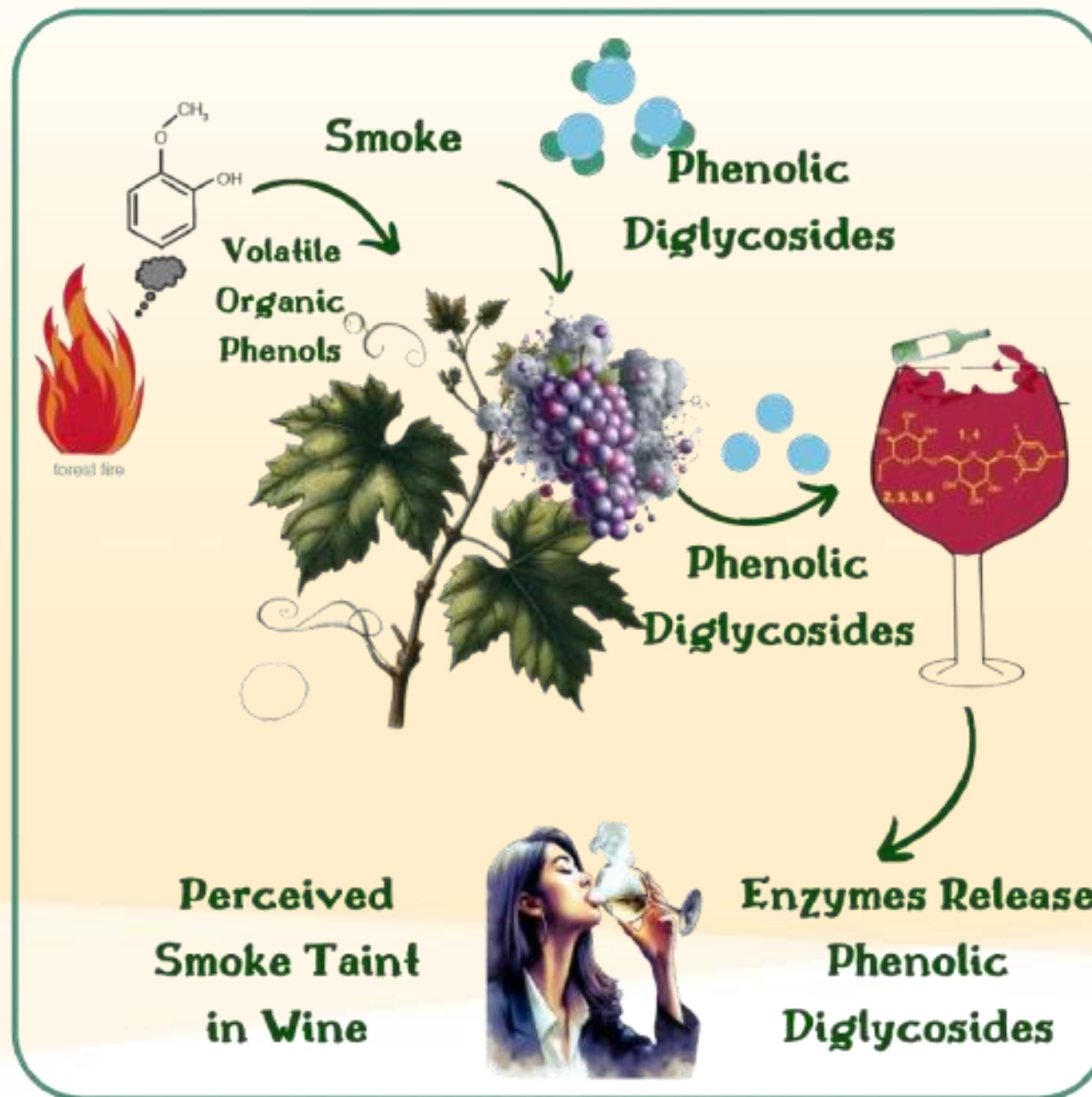
Smoke taint in grapes can result in significant losses to harvestable fruit

- 2020 smoke damage resulted in 165,000-325,000 tons unharvested CA
- Each year, fruit is damaged beyond salvage due to smoke exposure

Volatile organic compounds (VOCs) in smoke bind to plant tissue and impart an “ash tray” like flavor to the wine

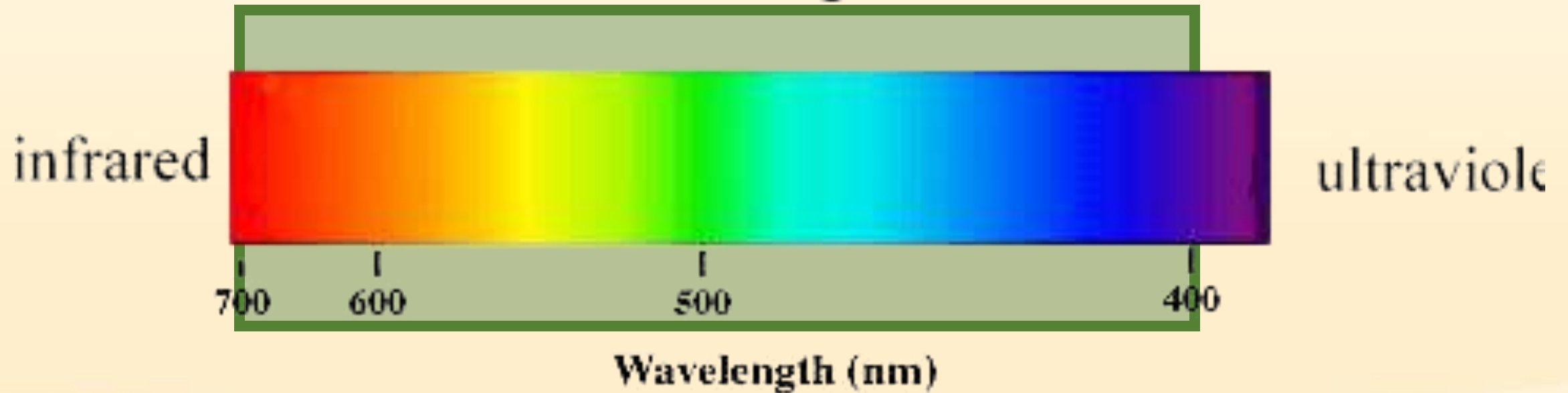


UCCE Viticulture Handout (2024)





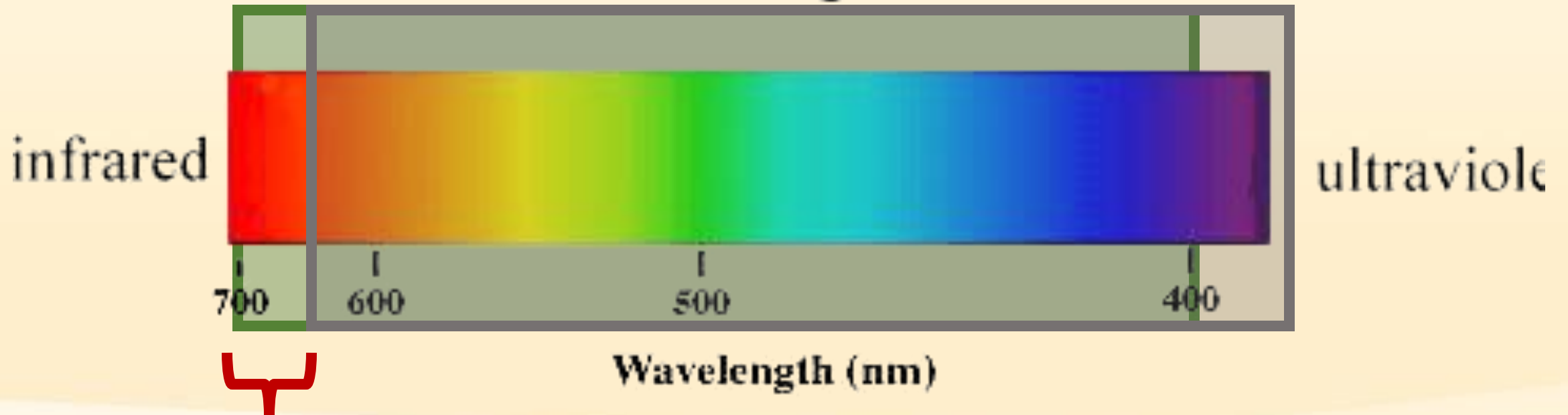
# The visible spectrum



**Photosynthesis**

Wavelengths reduced  
from wildfire smoke

## The visible spectrum

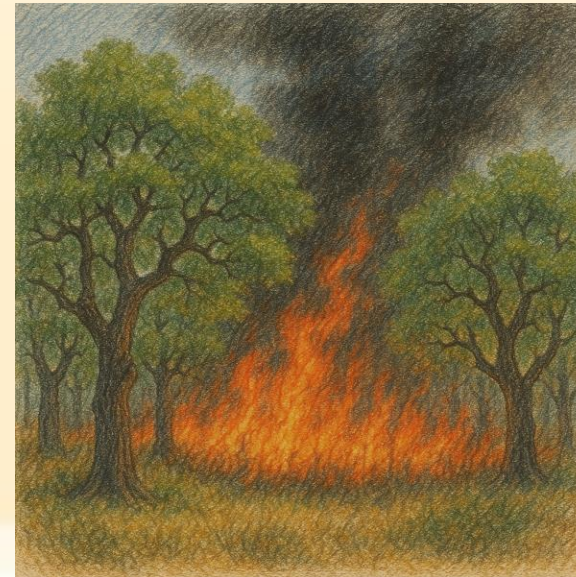
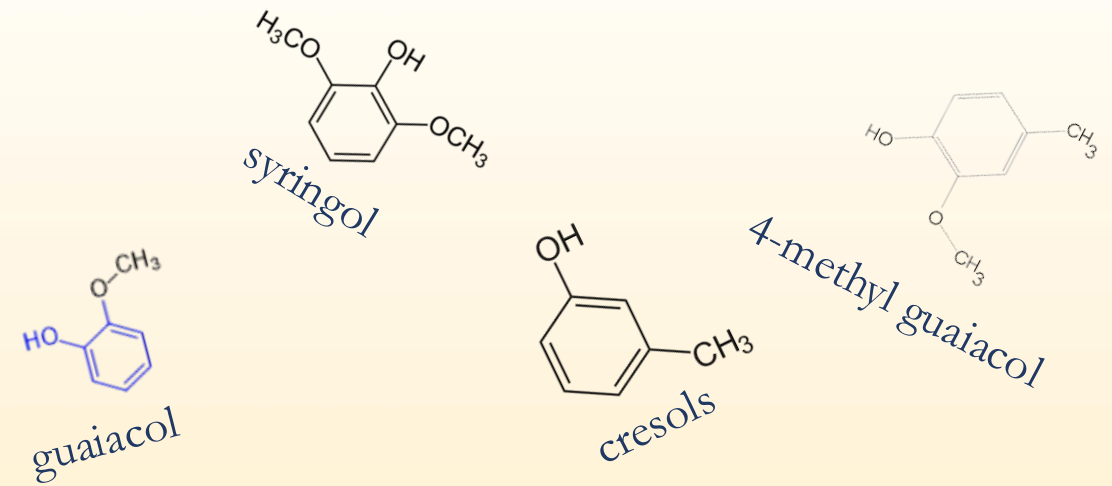


Wavelengths responsible for  
most temperature gains

Photosynthesis

# Existing Knowledge

- Fuel source lignocellulose content affects VOC production
- Trees and woody species have more lignocellulose than vegetative species
- Increasing distance and time suspended in air affects smoke taint risk in grapevines



Woody and Vegetative  
Tissues



Only Vegetative  
Tissues



# Preliminary Study Hopland REC

I've received calls each year from concerned clientele whenever a prescribed burn occurs nearby their vineyard

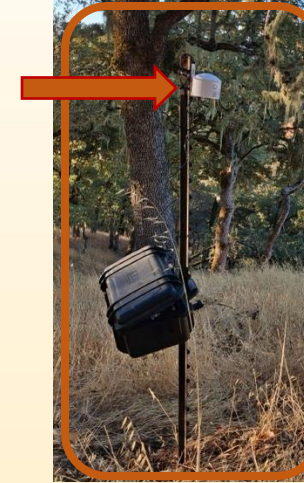
Actual risk to vineyards needed to be assessed

Preliminary study conducted in Autumn 2024

Grass and forb fuel sources

- Less lignocellulose than hardwoods

PurpleAir Flex™  
Smoke Sensor



Before



After



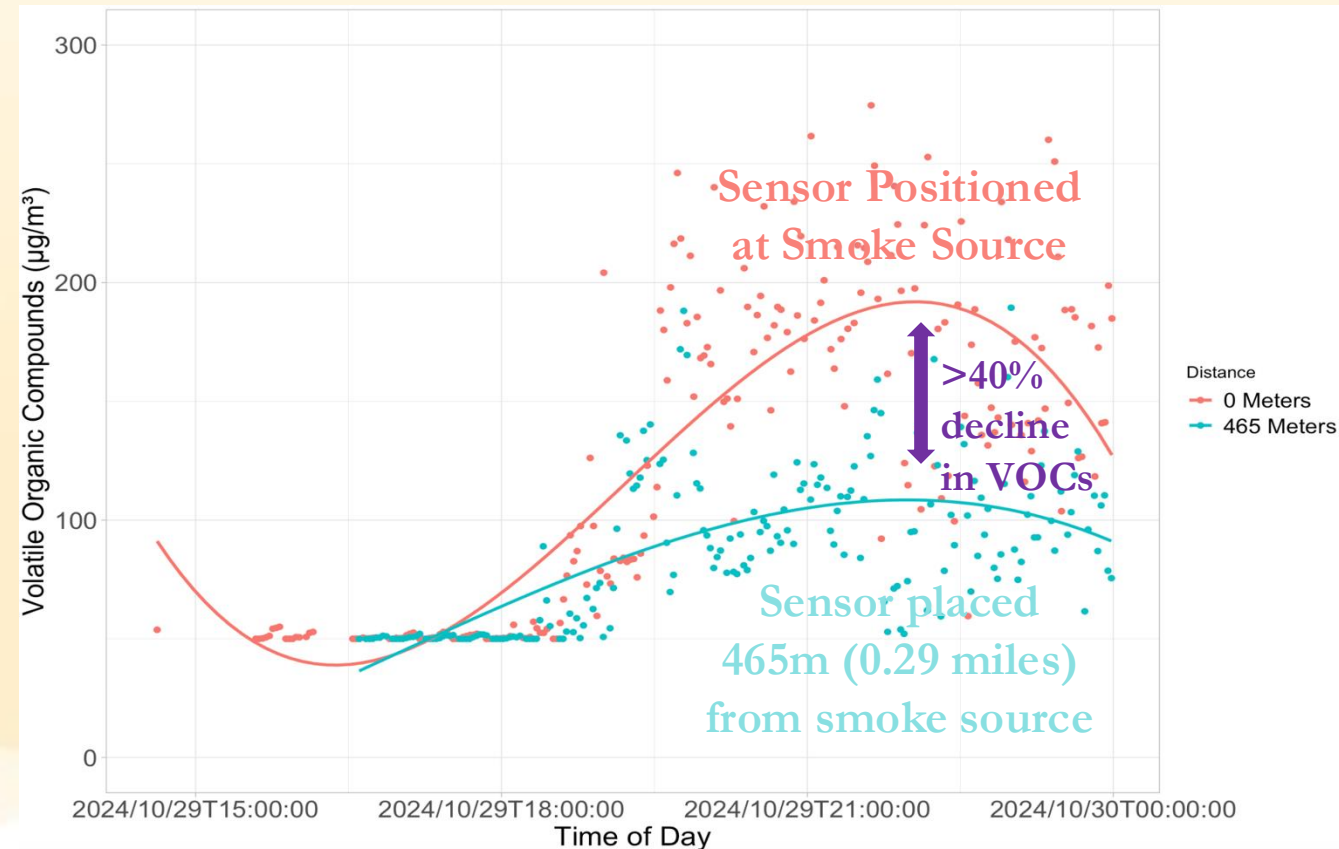
# Results – HREC Prescribed Burn

Concentration of VOCs reduced by 31% on average at 465 meters (0.29 miles) away from smoke source

> 40% decline in airborne VOCs at time of maximum smoke output

Still a significant risk to vineyards

Decline in VOCs at <0.5 miles from source of smoke is a useful finding for CA vineyards to assess risk



# Impacts to local stakeholders

Helps growers estimate their risk when prescribed burns occur

Allows those burning to better understand the impact of distance and fuel sources

Alleviates some fear of crop damage from fire-safety practices



UC Davis Oakville Research Station (2017)

# Future Plans

Seeking funding for larger assessment in 2025-2026 cycle to occur at HREC

Will assess VOC production of various vegetative-species compositions commonly burned

Plan to assess the influence of foliar barriers and quantify the reduction in VOCs by distance from source





# Summary

1. Prescribed burns are a valuable tool for limiting the impacts of wildfire
2. Smoke exposure has short-term impacts on photosynthesis and gas exchange in vines and can cause direct fruit damage via smoke-taint
3. Binding of volatile organic compounds as phenolic diglycosides makes the smoke characteristics stable in the fruit
  - Often these PDs are released by enzymes in the mouth of humans
4. Preliminary work at HREC measured a significant reduction in smoke-carried VOCs at short distances during a prescribed grassland burn event
5. Future work will include a better assessment of the effect of distance as well as influence of foliar barriers on airborne VOC persistence

# Downloadable Presentation

You can find this presentation at:

1. <https://ucanr.edu/sites/chenlab>
2. Speaker Presentations
3. “2025 UC Cooperative Extension” section



# References

- Adeboye, P. T., Bettiga, M., & Olsson, L. (2014). The chemical nature of phenolic compounds determines their toxicity and induces distinct physiological responses in *Saccharomyces cerevisiae* in lignocellulose hydrolysates. *AMB Express*, 4(1), 46. <https://doi.org/10.1186/s13568-014-0046-7>
- CALFIRE. (2025). Statistics. California Department of Fire and Forest Protection, Sacramento, CA. <https://www.fire.ca.gov/our-impact/statistics>
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- Zhu, X., Han, Y., Feng, Y., Cheng, P., Peng, Y., Wang, J., Cai, J., & Chen, Y. (2022). Formation and emission characteristics of intermediate volatile organic compounds (IVOCs) from the combustion of biomass and their cellulose, hemicellulose, and lignin. *Atmospheric Environment*, 286, 119217. <https://doi.org/https://doi.org/10.1016/j.atmosenv.2022.119217>





Thank You