Policy Brief

August 8, 2024

Local Air Quality Monitoring During Wildfire Events: Reducing Hazardous Exposures for Farmworkers

Overview

In Sonoma County, California, wildfires are increasing in frequency and severity, posing significant health risks to farmworkers. The Agricultural (Ag Pass) program allows farmworkers to enter and labor in mandatory evacuation zones with lax oversight and inadequate air quality monitoring. Our study shows that relying on a single AirNow monitor is inadequate compared to other community-science networks. Recommendations include mandatory emergency plans, local real-time air quality monitoring, hazard pay, post-exposure health screenings, and improved accountability.

Introduction to the Issue

There is growing concern for environmental justice and labor rights during extreme wildfire events and those subjected to Sonoma's Agricultural (Ag Pass) program. Our previous research highlighted the program's lack of oversight, emergency and occupational safety protocol inconsistencies, and insufficient farmworker monitoring of hazardous air quality in the impacted regions. [1] This offered us data to analyze further the air quality risks, health impacts, and structural inequalities the program imposes on farmworkers, particularly those who are undocumented. [2]

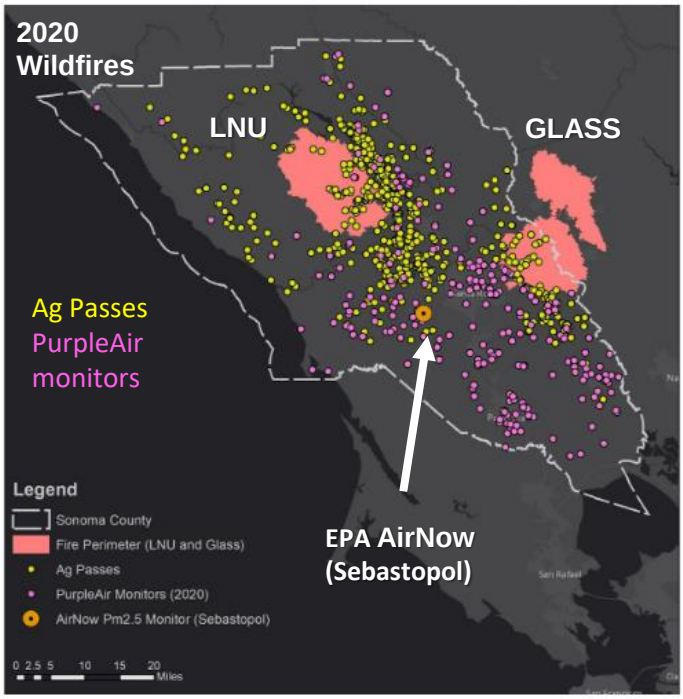

Figure 1: Location of AirNow and Purple Air Monitors

Figure 1 provides a map of Sonoma County, outlining the county location and critical locations affected by wildfires. It shows that the AirNow monitor is located in Sebastopol and the positions of various PurpleAir monitors throughout the County. The map marks the burn areas by the LNU Complex and Glass fires and indicates where Ag Passes were issued during these fires.

Main Points

- The Agricultural Pass program challenges the safety of migrant farmworkers during extreme wildfires, especially those who are undocumented.
- Regional variabilities in air quality emphasize the importance of localized measurements.
- The use of local, low-cost sensor data, recommended filtering and smoke correction enhances air quality monitoring for occupational health and safety.

Health Implications

The increasing frequency and severity of wildfires, resulting from both climate change and human activities (i.e., fires started intentionally or accidentally), have heightened the dangers faced by migrant farmworkers, raising their exposure to hazardous wildfire smoke. Wildfire smoke contains tiny combustion particles that can enter the lungs through the nose or throat, causing irritation or long-term damage. The most dangerous particles, PM2.5, can enter the bloodstream and cause significant health damage. Studies have shown evidence that exposure to wildfire smoke can increase mortality rates within a few days of exposure. [3,4] Moreover, PM2.5 from wildfire smoke is more harmful than car exhaust. [5]

Undocumented agricultural farmworkers often face a high risk of wildfire smoke exposure and are particularly vulnerable to environmental hazards. [6,7] Their pre-disaster marginalized status is influenced by an array of factors, including limited English proficiency, lack of health and unemployment insurance, racial discrimination, and labor exploitation. [8,9,10]

The Importance of Low-cost Air monitors

In 2019, the California Occupational Safety and Health Standards Board (Cal/OSHA) adopted an emergency regulation (CCR § 5141.1) requiring employers of outdoor workers to provide respiratory masks when the Air Quality Index (AQI) due to PM2.5 exceeds 150 (i.e., PM2.5 > 55.5 µg m−3) for more than 1 hr. [11, 12] An AQI above 150 corresponds to the United States Environmental Protection Agency's (US EPA) "unhealthy" health hazard level." [13] Research indicates the need for improvement and standardization in these systems, particularly air quality monitoring.

In Sonoma County, the sole wildfire smoke for PM2.5 monitor, AirNow, is in Sebastopol, where conditions may not represent the air quality at individual job sites throughout the county (often miles away). Therefore, we explore the use of the low-cost PurpleAir monitor network, which collects and shares PM2.5 data for public use. The number of PurpleAir monitors brought online in wildfire-prone regions has increased rapidly in recent years, likely due to residents' growing concern over worsening air quality. California and the Sonoma County region have the highest technology adoption in the country. [14]

Policy Brief

August 8, 2024

Results

We compared data from the AirNow monitor in Sebastopol and smoke-corrected data from PurpleAir monitors across the County. From July 31 to November 6, 2020, Sebastopol had the only AirNow station monitoring PM2.5 in Sonoma County. Meanwhile, 359 PurpleAir Monitors also capture air quality data throughout the County. Our study focused on the regions affected by the LNU Complex and Glass fire, as shown in the accompanying map.

During this period, the World Health Organization's health guideline for PM2.5 (15 µg/m³) was exceeded on 18 days, according to AirNow data, and on 34 days, according to PurpleAir data(see Figure 2).PM2.5 levels above the EPA threshold for "Unhealthy for Sensitive Groups" (35.5 µg/m³) and "Unhealthy" (55.5 µg/m³) were also recorded more frequently by PurpleAir monitors than by AirNow.

We also examined how well the PurpleAir data matched the AirNow data. The PurpleAir monitors near Sebastopol strongly correlate with the AirNow monitor, indicating that the data from these monitors are reliable, even though they tend to show slightly lower PM2.5 levels on a countywide basis.

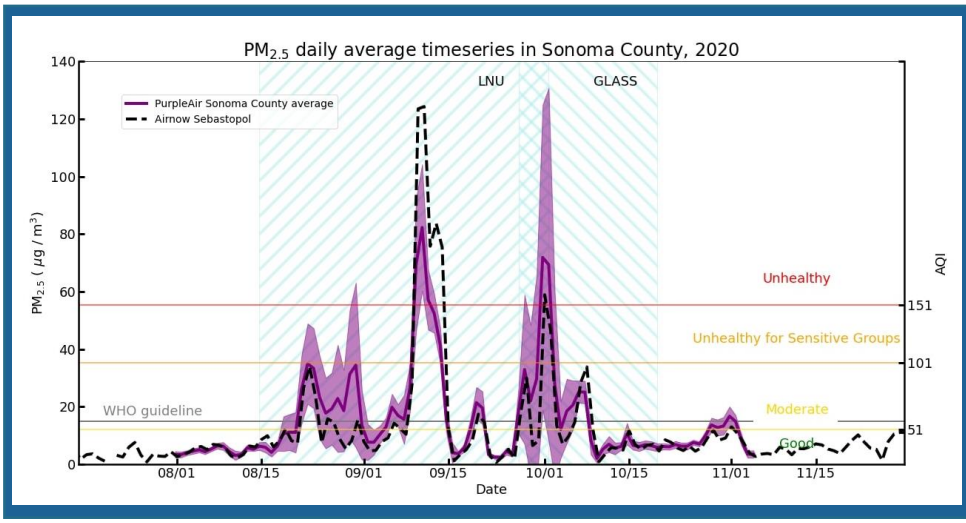

Figure 2: Daily PM2.5 readings

Figure 2 compares the daily PM2.5 readings from the Sebastopol AirNow monitor (black dashed line) with the county-wide average from PurpleAir monitors (purple line). The shaded purple area shows the range of PM2.5 levels across different parts of the County, indicating significant variations.

Key Findings in Evacuation Zones

To understand the urgent impact of wildfires on farmworkers, we conducted a thorough analysis of air quality in regions where Ag Passes were issued. These passes allowed employers to enter mandatory evacuation zones, exposing farmworkers to hazardous conditions. We meticulously reviewed permit records to identify worksite locations, and the number of workers affected.

Our analysis revealed alarming variations in air quality across different regions. In the LNU Complex and Glass Fire areas, PurpleAir monitors consistently showed significantly higher and more variable PM2.5 levels compared to the AirNow monitors in Sebastopol. For Instance, during the peak of the LNU Complex fires, PM2.5 levels in the Ag Pass region surpassed the “Unhealthy” threshold on multiple days, while levels at the AirNow monitor remained relatively lower (see Table 1).

We also observed differences between day and night air quality. For Instance, during the Glass fire, PM2.5 levels in the Ag Pass region were higher at night, which is significant because many farmworkers harvest grapes at night. Our research underscores the inadequacy of relying on a single AirNow monitor to assess air quality during wildfires. A more comprehensive monitoring system is needed to accurately gauge the air quality conditions in all parts of Sonoma County. The data from PurpleAir monitors provide a more comprehensive picture of the pollution levels that farmworkers are exposed to, highlighting the need for improved air quality monitoring and protective measures for outdoor workers.

- Air quality was **UNHEALTHY** on 4 more days during the Glass fire, but 1 less during LNU Fire, when Ag Passes were issued. On multiple occasions, smoke levels remained high overnight, with PM2.5 exceeding levels considered unhealthy or worse.
- PM2.5 levels often exceed the World Health Organization’s 15 µg/m³ air quality guideline, highlighting the health risks associated with wildfire smoke.
- The graphs show EPA thresholds for PM2.5, making levels harmful to sensitive groups and the general public.
- During the LNU complex and Glass Fire events (light blue hatched shading in Figure 2), PM2.5 levels spiked, demonstrating the severe impact of these fires on air quality.
- The county-wide average PM2.5 from PurpleAir monitors generally tracked the AirNow monitor’s readings but with more significant variability, underscoring the importance of having multiple monitoring points to accurately assess air quality across different regions (see Table 1).

Wildfire	AirNow	PurpleAir in LNU Ag Pass region	PurpleAir in Glass Ag Pass region
LNU	**11**	**10**	0
Glass	**3**	0	**7**

Table 1: Number of Days hourly $PM_{2.5}$ > 55.5 µg/m³ (EPA UNHEALTHY)

The air quality was UNHEALTHY on 14+ more days during the 2020 wildfire events when Ag Passes were issued.

Policy Brief

August 8, 2024

Policy Recommendations

1. Mandatory Employer Emergency Plans and Training

Employers should be required to create comprehensive emergency plans to protect outdoor workers. Collaborative protocols should be developed with emergency response agencies and farmworkers' rights groups to ensure efficient evacuation. Farmworkers should be offered training in multiple languages on disaster awareness, health and safety issues, entrapment avoidance, fire behavior, and collaboration with emergency personnel.

2. Improve Protocols on Identifying Workers and Locations

Accurate documentation of the number of workers entering worksites and the location of each site is necessary for safety. This information should be readily accessible to emergency personnel. Regular visits to previously accepted permit locations should be conducted to keep information up to date and ensure worker safety.

3. Real-Time Local Air Quality Monitoring

Local real-time air quality monitors should be placed within worksites to provide farmworkers, employers, and policymakers with more accurate and timely information on air quality. This will enable informed decisions regarding the use of Ag Pass permits and access to mandatory evacuation zones. This is particularly important when local air quality monitors indicate hazardous events not reflected in the nearest regulatory AirNow monitor.

4. Provide Hazard Pay

In recognition of the Ag Pass program's risks to agricultural workers, employers should provide time-and-a-half hazard pay. This should be instituted for a complete 6-hour shift if the AQI is above 150 at any point within the previous 24 hours, a level considered unhealthy for everyone. Notably, three wineries in Sonoma and Napa Counties have agreed to such terms in recent labor contracts. [15, 16]

5. Post-Exposure Health Screenings

State and County governments and employers should work together to provide funding to workers for post-exposure healthcare and well-being monitoring. These screenings should include initial health assessments, ongoing medical check-ups, and specialized tests focused on respiratory functions and potential toxicological effects of smoke inhalation. Additionally, regular health check-ups and mental health evaluations are essential to detecting early signs of smoke-related illnesses and addressing mental health impacts. [17] Defining wildfire smoke exposure, based on intensity and duration, would ensure targeted and effective health intervention.

6. Post-Incident Accountability and Data Transparency

Following wildfire events during which Ag Passes are issued, the County should thoroughly evaluate the program's accuracy and effectiveness. This analysis is critical for ensuring compliance and assessing the program's implementation risks. The resulting data and analysis should be publicly available to enhance transparency and enable future research.

Conclusion

The findings of our study emphasize the urgent need for systemic reforms in the Agricultural Pass program and its associated occupational safety measures. The inadequacies in air quality monitoring, particularly the reliance on a single AirNow monitor, have been highlighted through our comparative analysis with the more comprehensive PurpleAir network. [18] Our research shows that undocumented farmworkers are disproportionately exposed to hazardous air quality during wildfire events, exacerbating existing vulnerabilities and health risks. The regional variability in PM2.5 levels during significant wildfire events like the LNU Complex and Glass Fire further emphasizes the necessity of localized and accurate air quality data.

Addressing these issues requires a multi-faceted approach. Our policy recommendations call for the development of mandatory emergency plans, real-time air quality monitoring at worksites, and the provision of hazard pay and post-exposure health screenings for farmworkers. These measures are critical for farmworkers' immediate safety and well-being and for fostering long-term resilience and health equity. By implementing these policies, Sonoma County can set a strong precedent for safeguarding the health and rights of agricultural workers in the face of increasing wildfire risks.

Policy Brief

August 8, 2024

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