



NYU

SCHOOL OF GLOBAL
PUBLIC HEALTH

Wildfire Science, PHEER, and Research Incubators

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The Public Health Extreme Events Research Network

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Public Health Emergency Preparedness Evidence Base

- *... the science underlying the nation's system of response to public health emergencies is seriously deficient, hampering the nation's ability to respond to emergencies most effectively to save lives and preserve well being."*



Figure 1: National PHEPR Science Framework

National Academies of Sciences, Engineering, and Medicine. 2020. Evidence-Based Practice for Public Health Emergency Preparedness and Response. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25650>."

Reference: National Academies of Sciences, Engineering, and Medicine. 2020. Evidence-Based Practice for Public Health Emergency Preparedness and Response. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25650>."

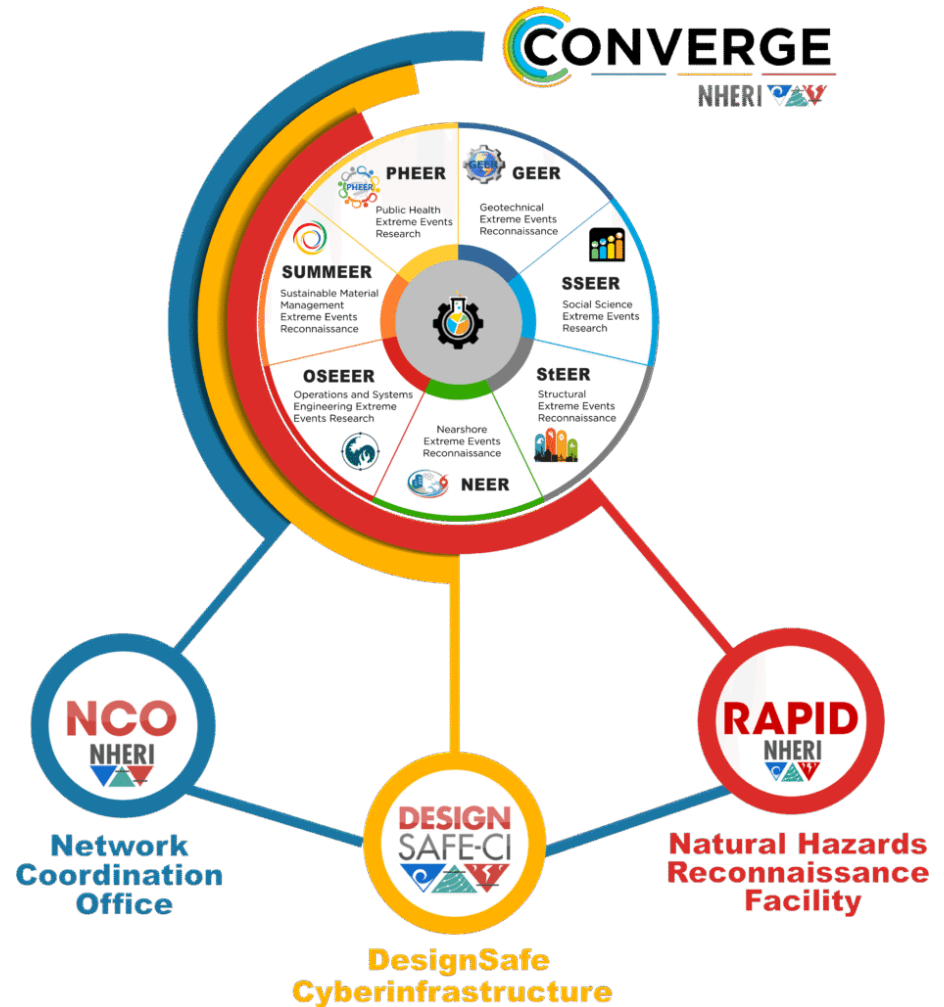
A New Approach is Needed

- The **Public Health Extreme Events Research (PHEER) Network**
 - A unique researcher-led network that can
 - mobilize rapidly
 - inform evolving disaster research agendas and funding decisions
 - advance the field of public health disaster science
 - Seed funding provided by the Center for Preparedness and Response through an Interagency Agreement with the National Science Foundation
 - Coordinated via a collaboration with four academic institutions

The purpose of PHEER

is to coordinate the public health research response to extreme events and advance the field of public health disaster science by supporting and coordinating a community of practice that can mobilize rapidly to conduct time-sensitive disaster investigations.

Integration with Interdisciplinary Disaster Science Community





PHEER Activities To Date, 2022-2025

- Developed an initial Concept of Operations Plan (CONOPs)
- Presentations at researcher and practitioner conferences
- Initiated recruitment of public health disaster researchers as PHEER members
- **Maui Wildfire (Aug 2023) Virtual Data Dashboard** Use Case
- Successfully competed as partner in National Center for Disaster Medicine and Public Health Preparedness Research Ecosystem
- Multi-disciplinary tabletop exercise at CDC (Apr 2024), Cascadia Subduction Zone case
- **Hurricane Beryl (July 2024) PHEER mobilization**
- **Hurricane Helene (Sep 2024) PHEER mobilization**
- **Hurricane Milton (Oct 2024) PHEER mobilization**
- **LA Wildfires (Jan 2025) PHEER mobilization**



Virtual Data Dashboard Maui Wildfire “Use Case”





- 99 People died in the fire or drowned in the ocean attempting to escape
- Approximately 3,000 of 3,562 households (86%) lived in homes that were considerably damaged or destroyed
- Approximately 7,200 residents of 12,700 were displaced
- Most lethal US wild fire in a century
- Estimated cost to rebuild \$5 billion

Immediate Phase (exposure focus: Days 1-7)

Research domain	Research question(s)	Potential data sources	Data owners and data access issues
Exposure to fire	Who was directly exposed? Can we draw a disaster footprint? Where and when did people evacuate?	-- Geospatial data on wildfire area, overlaid on planning maps -- mobility data (cell phone)	-- State and county planning -- State and county fire, emergency management -- Bandwidth / willingness to provide -- cell providers will sell data
Vulnerability	What population vulnerabilities are there in disaster footprint?	-- Census data -- Social vulnerability -- EMPOWER data (Medicare recipient use of out pt durable medical equipment)	-- Census and SoVI data easy to obtain at county level, some characteristics down to census block group -- EMPOWER avail as de-identified at zip code; identifiable only avail to gov't
Exposure x Vulnerability	Patterns of exposure by vulnerability?	-- Cross-tab geospatial disaster footprint and vul. data	-- Data sets above
Secondary exposure	Cascading exposures, such as smoke, toxins?	-- Air quality models -- Toxins, bldg. material	-- EPA, NCAR, PurpleAir network, NIOSH, NIST, CDC

Short-term Phase (early health signals: Days 8-30)

Research domain	Research question(s)	Potential data sources	Data owners and data access issues
Cascading / compounding effects	Where is displaced population? Health effects of displacement?	-- FEMA and ARC shelter systems -- Emergency management -- Mobility data (cell phone)	-- Privacy issues -- Reluctance to share -- Expensive phone data
Emerging vulnerabilities	Has displacement led to new vulnerabilities? Has system disruption? Loss of medical continuity or access to meds?	-- Medicare / Medicaid data -- Hospitalization / ER data -- Pharmacy data -- Overlay with displacement data from above	-- Challenge matching data to where people displaced -- Health and pharm data generally not available in this timeframe, difficult to get indiv. data
Health outcomes	What are early physical and mental health effects? Specialized treatment disruptions (e.g., dialysis, MMTP, chemotherapy)?	-- Medicare / Medicaid data -- Hospitalization / ER data -- Pharmacy data -- Specialized care data (registries, claims, in addition to CMMS and pharm data)	-- Health and pharm data generally not available in this timeframe, difficult to get individual data
Response and recovery system effects	Effective physical and mental health care? Evident system effects of housing, case mgmt., and other interventions?	-- Psychological First Aid program data -- Clinical/pharm data, as above -- DMAT data -- Case management data	-- Individual data from programs (housing, CM) generally not available to researchers, not associated with health data



Lessons from Maui Use Case

- Build relationships with data owners in Blue Sky periods
- Identify PHEER members interested and able to work with these data sets
- Seek priority access to health data, including at individual level data, with appropriate Data Use Agreements to protect privacy and abide by data governance rules
- Explore data owners of novel data sets – cell phone data, credit card data, Internet search data
- Develop core table shells
- Develop crowd -sourcing infrastructure on website so can be easily stood -up in aftermath of extreme event



2024 Hurricanes: Beryl, Helene, and Milton



Research Questions

1. How can Location-Based Data (LBD) be used to illustrate indirect health effects such as system and supply-chain disruptions, population or workforce movement, and resource losses or constraints?
2. Can LBD serve as an early warning signal of later health effects and be incorporated into complex analyses of indirect effects of extreme event exposure and later health outcomes?
3. What are productive and innovative ways of identifying, assembling, manipulating, analyzing, and presenting LBD and their implications for population health and well-being?



2025 Los Angeles Wildfires

PHEER Network's 2025 Wildfire Exposure Map



The Public Health Extreme Events Research Network (PHEER) developed [an exposure map](#) that is freely available to the research, practice, and policy communities, as well as those directly affected by the 2025 California wildfires.

Goal:

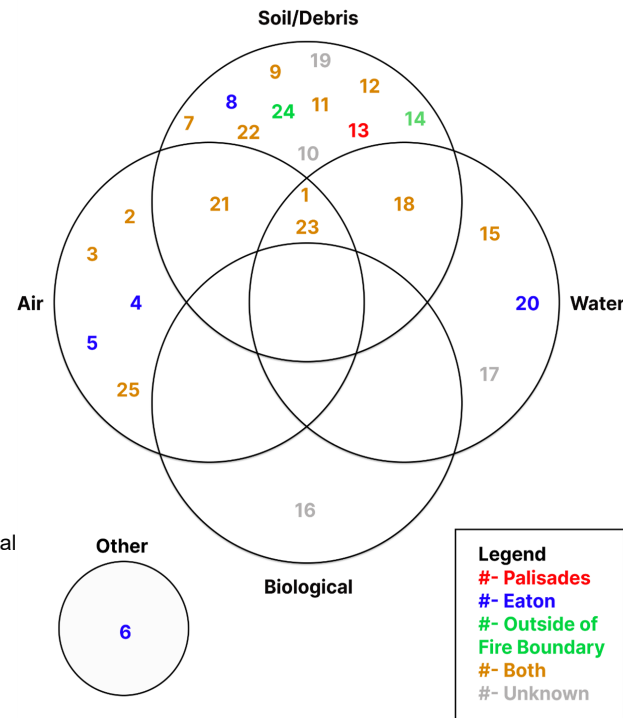
- To establish a web -based geospatial platform to collect and curate critical exposure measures related to the initial fire and wildfire smoke, as well as secondary hazards associated with contaminated soil, air, water, or debris. Freely available to researchers conducting dose -response health impact studies.

Coordinating the post research ecosystem

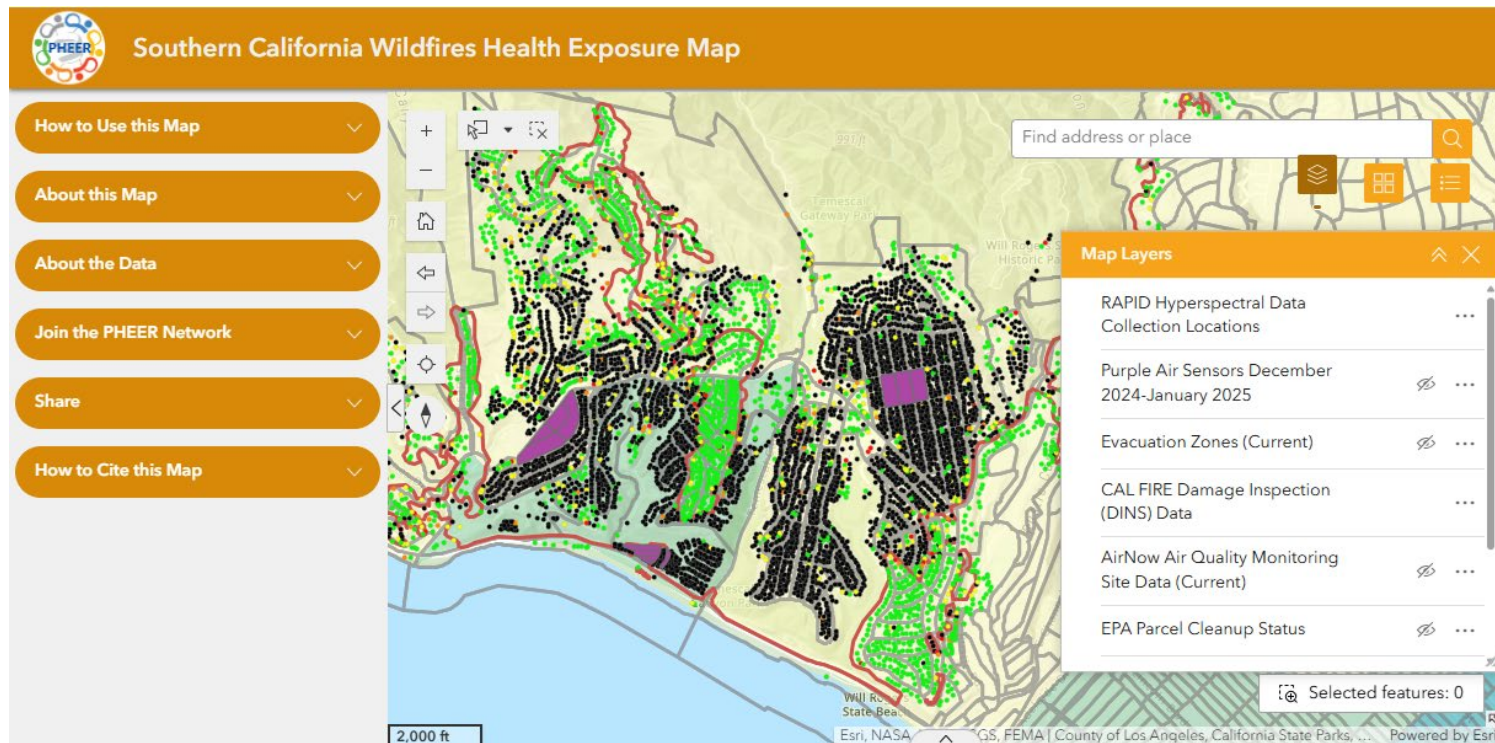
-event



1. L.A. Fire HEALTH Study
2. South Coast AQMD Wildfire Response
3. UCLA Outdoor Air Quality Study
4. JPL Air Quality Monitoring
5. PHOENIX
6. CA DOH / CLS Environmental Health Lab Indoor Contaminants
7. LA County Department of Public Health Soil Testing
8. CSUN Soil Testing
9. DTSC Soil Testing
10. CA DOH / CLS Environmental Health Lab Soil and Ash Testing
11. UCLA Soil and Ash Testing
12. LA County Department of Public Health Soil and Ash Testing
13. LACDPW Beach Sediment Testing
14. LARWQCB 2025 PostFire Water Quality Monitoring
15. LARWQCB 2025 PostFire Water Quality Monitoring
16. LA County Department of Public Health - Blood lead level testing
17. Heal the Bay Post-Fire Water Quality Investigation
18. CAP.LA
19. Contaminant Level Evaluation and Analysis for Neighborhoods (CLEAN) / LA Fires Heavy Metal
20. San Gabriel Valley Mosquito and Vector Control
21. LACDPH Debris Task Force- Air Quality Subgroup
22. Soil Monitoring Team - CDPH
23. RAPID/PHEER Hyperspectral Imagery
24. Using air samplers to assess the risks of air pollution during and after urban wildfires
25. Air Quality Impacts of the January 2025 Los Angeles Wildfires

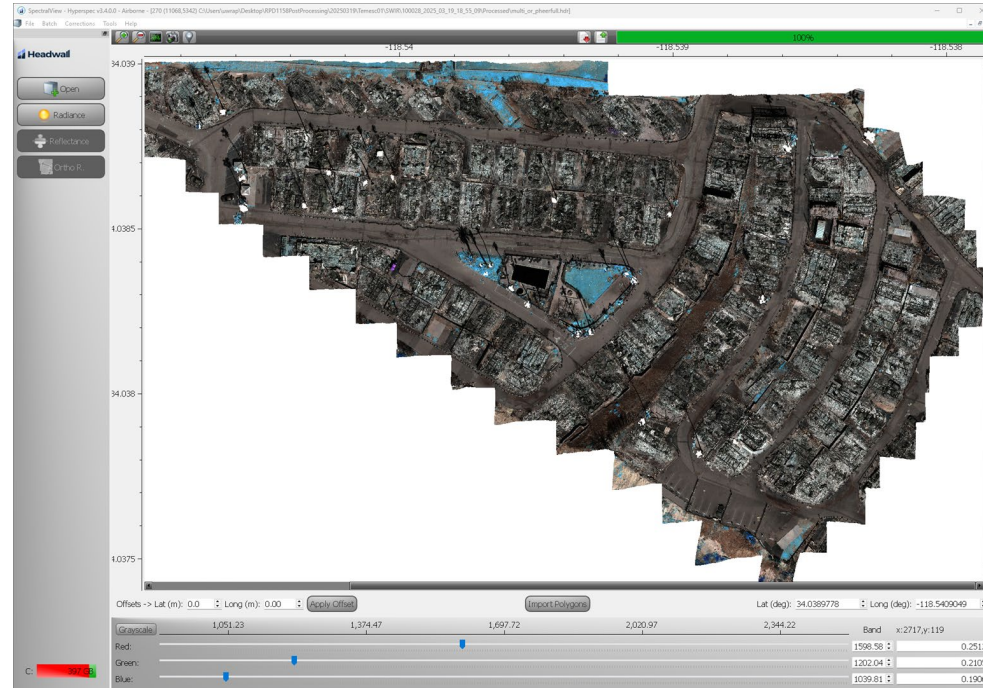


2025 Wildfire Exposure Map



Hyperspectral data

- Collected hyperspectral data encompassing 23 sampled census blocks
- These data can identify different materials, gases, and chemicals in air, soil, or water at a 2-cm resolution





Rapid Research Award

- Call for researchers to work with the hyperspectral data
- Award to Derek Manheim and Kris Isaacson of Cal Poly (engineers associated with SUMMEER research network)
- Research Objectives
 - Process the hyperspectral dataset to classify pixels or clusters with pollutants of interest, such as arsenic, cadmium, lead, PAHs, pesticides, brominated flame retardants, VOCs, dioxins, etc.
 - Produce journal article(s) based on one or more of the following research questions:
 - **Are certain toxins and contaminants more prevalent the closer they are to significantly burned areas?**
 - **Is there a relationship between population social vulnerability and the presence of toxins?**
 - **Are specific toxins and contaminants the residual products of burned electric vehicles (EVs)?**
 - **What is the prevalence of toxins and contaminants at schools/playgrounds/green spaces?**
- Final curated data set will be available via DesignSafe

Target Chemicals

Chemical Class/Family	Chemical Species	Source/Origin(s)	Rationale for Selection
Organic/Alkanes	Methane	Natural gas leaks, soils, incomplete combustion	Could be a surrogate for other toxic hydrocarbon emissions, readily quantified/assessed using QDOAS framework (for algorithm testing/validation).
Organic/Aromatic Hydrocarbon	Benzene	Plastics, petroleum-based consumer products, fuels	Listed as a HAP (acute and/or chronic toxicity), readily volatilized, combustion byproduct, detectable within SWIR, field measurement data readily available
Organic/Aldehydes	Acetaldehyde	Treated wood, surrogate for formaldehyde (furniture, structural/non-structural components)	
Organic/Halogenated Hydrocarbons	Trichloroethylene (i.e., TCE)	Solvents, paint thinners (HHW)	
Organic/PAHs	Naphthalene	Petroleum based consumer products, fuels	
Organic/Furans	Furan	Combustion byproduct	
Inorganic	Asbestos	Insulation, flooring and ceiling materials	Criteria air pollutant or HAP, reference spectrum available, easily detected, field measurement data readily available
Inorganic	PM 10	Combustion byproduct (Ash)	
Inorganic	Arsenic	Pressure treated wood, electronics	
Inorganic	Lead	Electronics, batteries, paint, piping	

