

After the Smoke Clears: Mitigating the Health Impacts of Toxic Exposure through Indoor Contamination Mapping, Education, Empowerment, & Advocacy

National Academies of Science, Engineering, & Mathematics



Nicole Maccalla, PhD

Jane Lawton Potelle

Dawn Fanning

June 15, 2026

About Eaton Fire Residents United

Eaton Fire Residents United is a coalition of concerned residents, formed in the wake of the devastating Eaton Fire of 2025.

Our mission is to ensure a safe, just, and transparent public health recovery process for the Eaton Fire-affected community. Through community organizing, public engagement, and education, we champion a resilient and empowered Altadena, Pasadena, and Sierra Madre. We promote thorough testing, clear remediation guidelines, insurance accountability, and universal distribution of resources for impacted businesses and residents, including children, homeowners, renters, insured, and uninsured.





Eaton Fire - A Wildland-Urban Interface (WUI) Fire

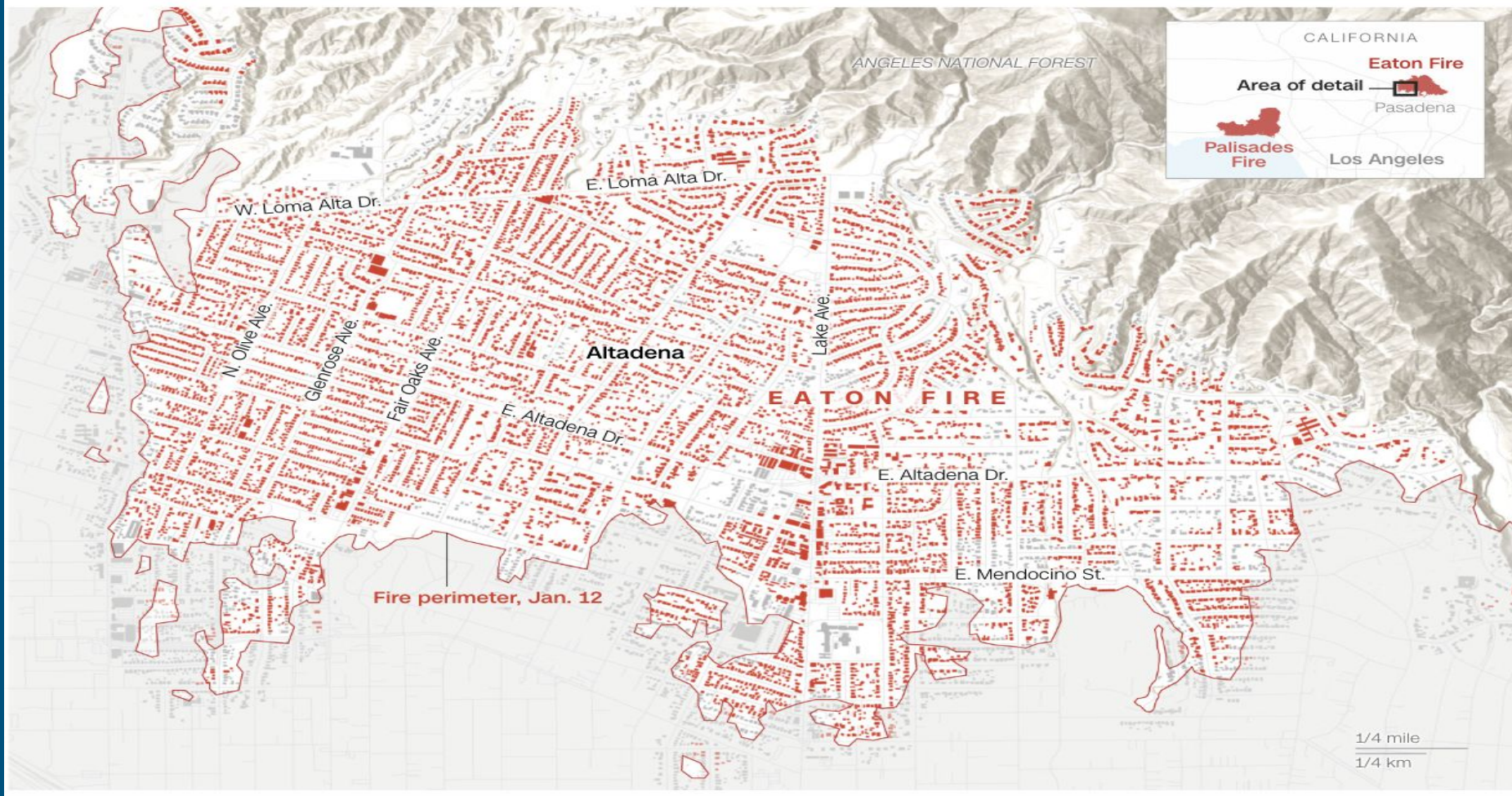
- WUIs pose significant dangers to human health
 - They release more toxic emissions into the air than fires burning natural vegetation
 - Treated Wood, Building Materials, Paint, Carpets, Cars (3,894), Appliances, Electronics, Rubber, Plastics, Batteries, Propane Tanks, Home Goods, Household Cleaners, Pesticides, etc.
 - They are closer to populated areas
- The Eaton Fire burned 14,021 acres, or a 22 square mile area (2nd most destructive in CA)
 - 19 people died
 - 9,418 structures were destroyed
 - 1,073+ structures were damaged
 - **1,310 commercial property claims**
 - **22,619 residential property claims**
 - 90% of Altadena homes were built prior to 1978



LA County Economic Development combines both:
The Eaton and Palisades wildfires destroyed more than 16,000 structures, including over **11,600 homes**, 100 schools, and nearly 200 commercial buildings.

Buildings likely damaged or destroyed

Buildings likely not damaged or destroyed



Toxic Exposure

- Toxic exposure happens when your body takes in harmful chemicals, heavy metals, or particles. The impacts range from mild (headaches and rashes) to severe (organ damage to your organs, reproductive harm, and cancer). The danger depends on the amount of the toxin and how long you are exposed.
- **After the smoke clears, what threats to public health remain?**

'Unsafe to Inhabit': The Toxic Homes of L.A.

By **Blacki Migliozi**, **Rukmini Callimachi** and **K.K. Rebecca Lai**

Reporters examined dozens of toxicology studies and interviewed homeowners. Mr. Migliozi spent over 100 hours inside toxic homes, shadowing industrial hygienists and documenting the damage.

June 24, 2025

The New York Times

A L T A D E N A

At first, the families whose homes were left standing thought they were the fortunate ones.

While their neighbors sifted through the ash and twisted debris left behind by devastating wildfires, they stepped through unbroken doors into living rooms where the throw pillows on the sofa rested exactly as they'd left them. "Relieved," some families said. "Blessed," others said. Just about everyone said, "Lucky."

But weeks later, a troubling realization set in: Their homes may have been damaged in ways that are invisible. Everyday items become poisons when they are set on fire. A plastic shower rod releases formaldehyde. Burning rubber, whether from a garden hose or a car tire, emits benzene. Polyester, found in fleece jackets and upholstered chairs, unleashes carcinogenic gases. Printers, plasma TVs and LED lights melt into a cloud of cyanide.

An aerial photograph of a city, likely Los Angeles, with a large plume of smoke or dust rising from the right side and another smaller plume on the left. The city grid is visible, and the surrounding terrain is hilly and brown. The text "After the smoke clears..." is at the top left, and "IS IT SAFE?" is repeated in red on the left and right sides of the smoke plumes.

After the smoke clears...

**“IS IT
SAFE?”**

**“IS IT
SAFE?”**

Using Real-Word Data to Understand Contamination & Respond to Health Risks

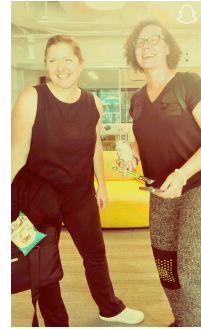
EFRU EATON
FIRE
RESIDENTS
UNITED

Protecting Families. Demanding Accountability. Driving Recovery.

Citizen science is when the public, or "citizen scientists," partner with professional researchers to help with scientific projects, often by collecting or analyzing real-world data (e.g., industrial hygienist reports), to advance scientific knowledge on topics (e.g., degree of indoor contamination), making science more inclusive and data collection scalable.

EFRU Activities:

- **Organize** – connect residents, create infrastructure, mobilize data collection, & build partnerships;
- **Educate** – maintain the contamination mapping project, share resources, and serve as a trusted source of fire recovery information;
- **Advocate** – amplify the voices of survivors and push for urgent protections



EFRUs Indoor Contamination Mapping Project

“Clearance before Occupancy”

We deserve a home free of WUI fire toxins and should not be forced to return home until all toxins have been remediated or cleared to a level that is “safe” for habitation.

“Verificar antes de Habitar”

EFRU's Indoor Contamination Maps



- Residents are facing various health and safety issues in the aftermath of the Eaton Fire, including inside standing homes
 - EFRU is a voice of the community
- The EFRU **Pre-Remediation Contamination Map** and **Post-Remediation Contamination Map** display reported **contamination levels** of heavy metals and pollutants in the interiors of structures, still standing after the Eaton Fire
- The maps include **peak levels & locations** for:
 - Wildfire Debris (ash, soot, char), Asbestos, Lead, and other CAM-17 heavy metals of concern
 - Testing locations include the Attic, Interior Floors, Interior Window Sills, Interior Hard Surfaces, Garage Floor, Garage Hard Surfaces, and HVAC
 - NO air, fabric, soil, or outdoor test results are currently included on the map



Eaton Fire Contamination Map (244 Pre-Remediation Homes Tested) - Updated 11/03/25

Eaton Fire Residents United

 This map was made with Google My Maps. [Create your own.](#)

Color coding represents peak
LEAD levels found within tested
homes. Click pins for more info.

74,951 views

Published on November 4

LEAD Contamination (ug/ft²)



-  250+
-  100-249
-  40-99
-  5-39
-  <5
-  Not Tested

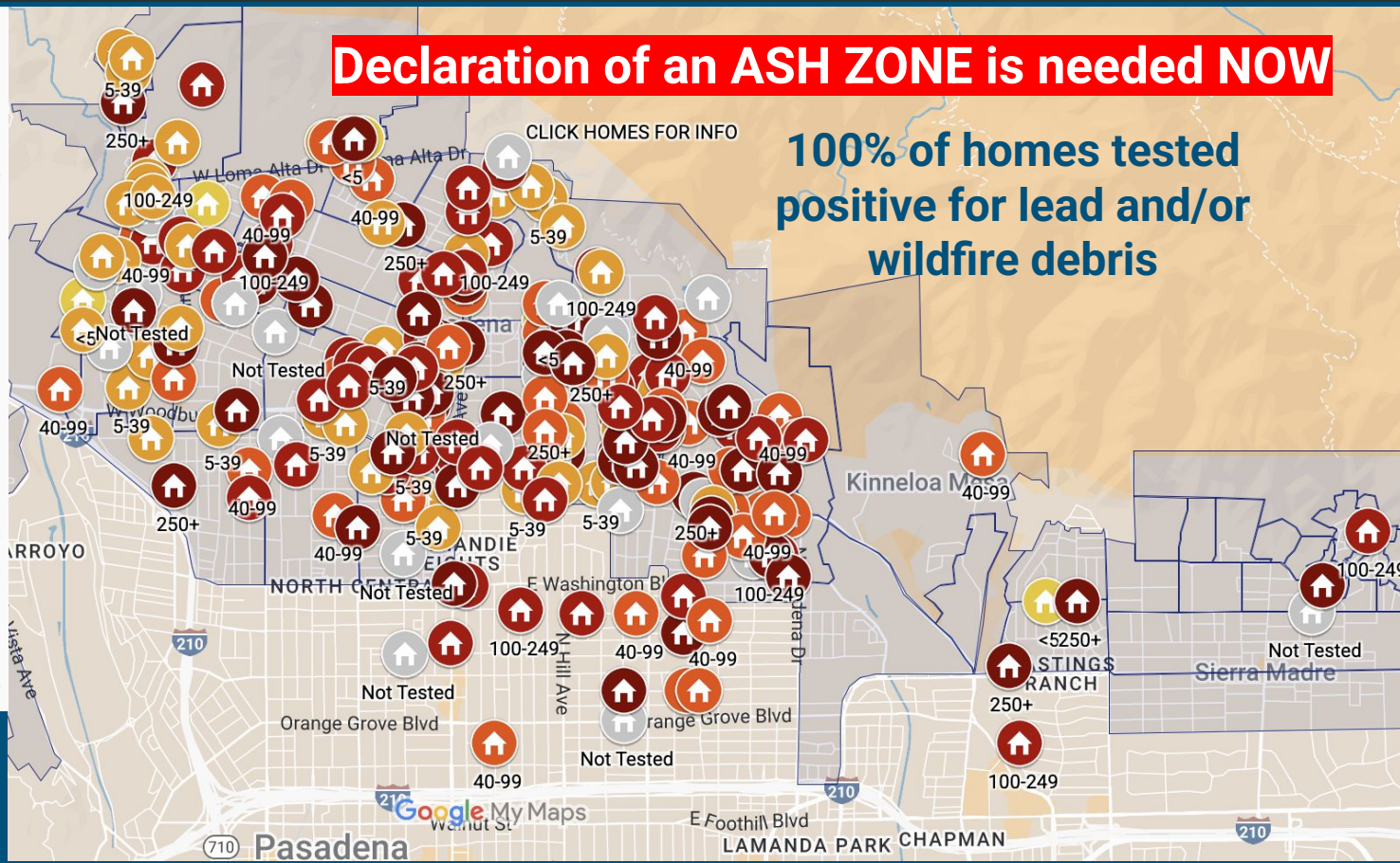
Evacuation Zones



-  All items

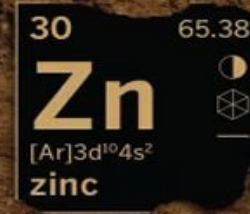
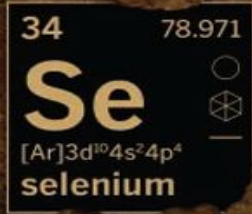
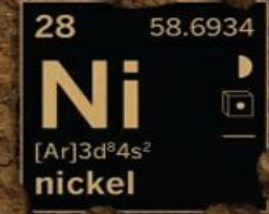
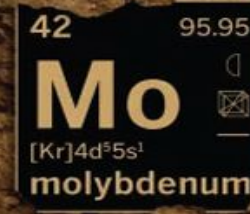
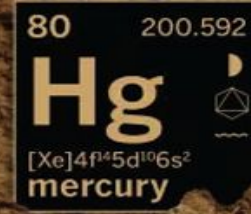
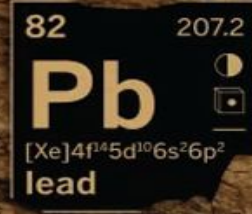
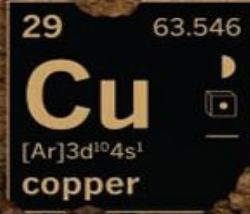
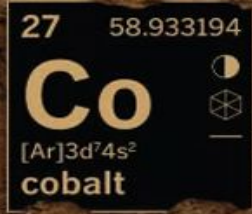
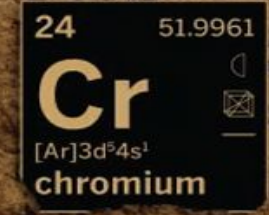
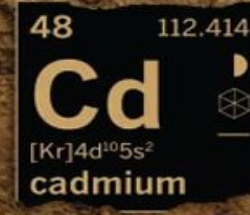
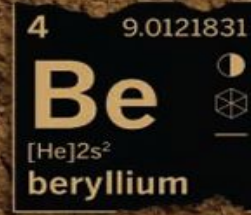
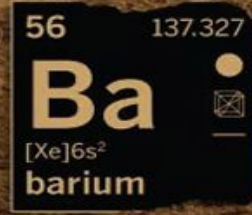
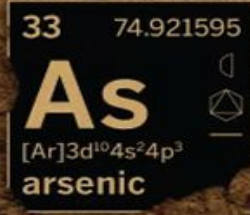
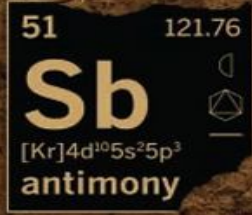
Declaration of an ASH ZONE is needed NOW

**100% of homes tested
positive for lead and/or
wildfire debris**



<https://www.efru.la/>

The L.A. Wildfires left lead and other toxic material in the soil of the burn zones. Here are the health risks.



**Heavy
Metals
(CAM-17)**

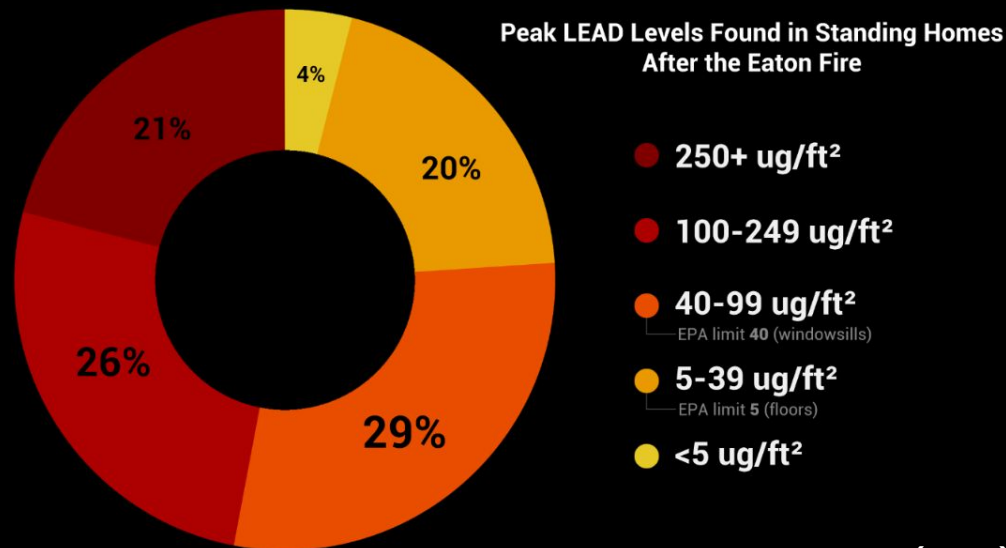
Why is it Important to Examine Contaminants in Homes?

Understanding what contaminants are in standing structures guides remediation and mitigation efforts (what we can do to make homes habitable & reduce health risks).

- **Toxin Type:** Many contaminants can be released from WUIs and travel far distances. Some toxins pose greater health risks than others.
- **Duration:** We spend a lot of times in our homes and are at a greater risk of chronic exposure.
- **Multiple routes of possible exposure:** Inhalation + Ingestion + Eye & Skin Contact: We breathe, eat, and drink a lot in our homes.
- **Dose/Strength:** If there is repeated exposure over time, toxins can accumulate in the body.
- **Individual Sensitivity:** Many of us have vulnerable populations living in our homes (e.g., babies, toddlers, young children, elderly, immunocompromised, health complications).

Toxic exposure leads to sickness and death. Information about contaminants in our community can also guide research, policy, and practice **informing** family medicine, public health departments, insurance companies, and elected officials for **action**.

Pre-Remediation Contamination Map



EPA Dust Lead Actionable Level (DLAL): 40ug/ft² for windowsills & 5ug/ft² for floors

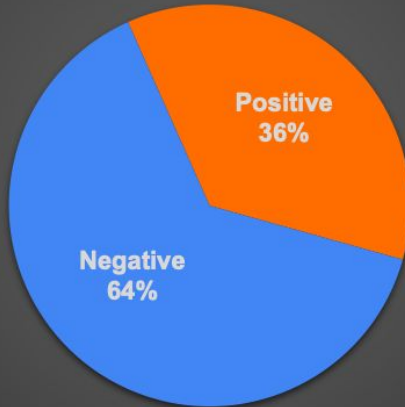
Of the 213 standing homes that were tested for LEAD, 100% tested positive. Professional remediation was recommended in all cases.

A home with high levels of lead is NOT SAFE to INHABIT.

Post Remediation - Contamination Results

Many homes still test **POSITIVE** for contaminants after remediation has been completed – posing serious health risks for residents

PERCENTAGE OF HOMES WITH ASBESTOS POST REMEDIATION



50% of homes (25/50) received access to asbestos testing. Of those, 36% tested positive for asbestos (9/25) post-remediation.

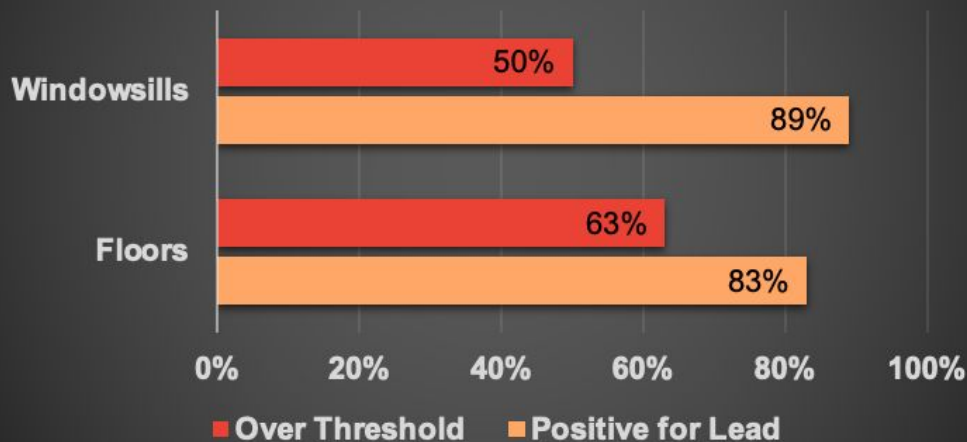
PERCENTAGE OF HOMES WITH LEAD POST REMEDIATION



90% of homes (45/50) received access to lead testing. Of those, 96% tested positive for lead (43/45) post-remediation.

Post-Remediation Contamination Map

PERCENTAGE OF HOMES OVER EPA DLAL POST-ABATEMENT



- DLAL: Dust Lead Action-Level is used by the EPA to determine when action is needed to address lead dust in a building.
- Mean lead levels in homes post-remediation
 - Overall: 341.37 ug/ft² (SD 784.74)
 - Windowsills: 148.03 ug/ft² (SD 334.40)
 - **4 times over EPA DLAL**
 - Floors: 287.19 ug/ft² (SD 946.78)
 - **57 times over EPA DLAL**

96% of homes (n=43/45) still test **POSITIVE for lead in some location (e.g., HVAC, attic, garage, indoors).**

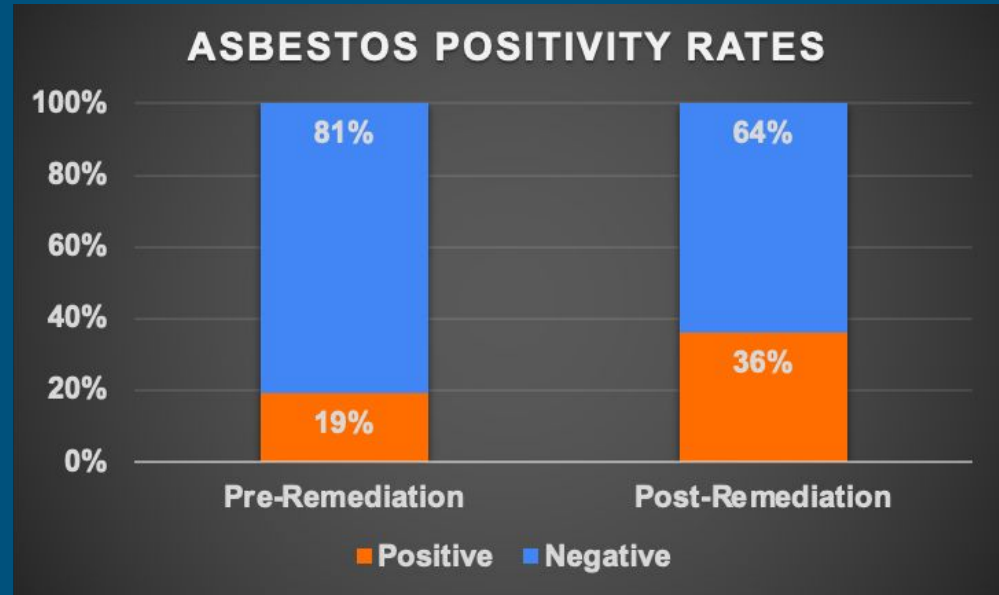
Not all homes are tested for the same contaminants or in the same locations. Windowsills: 18/45 tested, 16/18 positive, with 9/18 exceeding EPA DLAL. Floors: 24/45 tested, 20/24 positive, with 15/24 exceeding EPA DLAL thresholds for floors.

A home with high levels of lead is NOT SAFE to INHABIT.

How Bad Is It? Asbestos Levels in the Community

- **Many homes test positive for asbestos**, pre- and post-remediation (19% and 36%). Even AFTER remediation, one in three homes (n=9/25) still test POSITIVE for asbestos, a highly carcinogenic substance, known to cause lung disease and lung cancer.
- ONLY 64% of homes (n=129) were tested for asbestos (PRE) and half (50%, n=25) of the homes had access to asbestos testing post-remediation, raising questions of uncertainty for the rest of the residents.

Note: EFRUs cross sectional data, consist of independent samples, only 20% are matched cases.



A home with asbestos is NOT SAFE to INHABIT.

How Much Asbestos is Still Present?

- 89% of the homes still testing positive for asbestos were professionally remediated (n=8/9).
- Chrysotile asbestos is being found on interior floors and windowsills, in the attic and HVAC system, and on garage floors.
- On average, there were 8,623 chrysotile structures/cm², across peak samples.
 - EPA benchmark for voluntary action in settled dust is 5,000 S/cm².
 - PROFESSIONAL ABATEMENT REQUIRED!
 - EPA's Asbestos Hazard Emergency Response Act (AHERA) requires clearance levels for school AIR samples is 70 structures per cubic centimeter (700 S/cm²). If dust is disturbed it becomes airborne.
 - COMPREHENSIVE WUI CLEARANCE TESTING IN SCHOOLS NOW!

A home with asbestos is NOT SAFE to INHABIT.

Safe to Return after Remediation?

**ONLY 4/10 remediated homes reach
clearance for lead and/or asbestos.**



**Note: Clearance levels
for CAM-17 heavy
metals remain unknown.**



**6/10 remediated homes remain uninhabitable
due to lead and/or asbestos levels.**

What are the Implications for Human Health?

Potential Short-term Health Effects Due to Toxic Exposure

- Headaches, dizziness, & weakness
- Respiratory problems & sore throat
- Skin & eye irritation
- Chest pain & tightness
- Nausea & vomiting
- Asthma
- Reduced liver function
- Fungal infections (histoplasmosis)
- Strange taste in mouth, itchy or watery eyes, dry cough, sneezing & stuffy nose
- Compromise immune system
(making individuals more susceptible to infections like pneumonia & respiratory infections)



What are the Implications for Human Health?

Potential Long-term Health Effects Due to Toxic Exposure

- Lung inflammation, chronic bronchitis, chronic emphysema, lesions, cancer, & death
- Difficulty breathing, respiratory failure, & death
- Chronic headaches & decreased mental function
- Gastrointestinal, cardiovascular, immunological, pancreatic, liver, & kidney disease
- Reproductive problems
- Damage to babies in utero: impaired brain development, learning and behavioral problems, premature birth, & low birth weight
- Neurological symptoms such as seizures, coma, dermatological symptoms & death





Organize, Educate, & Advocate to Mitigate Threats to Public Health



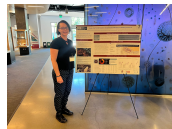
“Clearance before Occupancy”

“Verificar antes de Habitar”

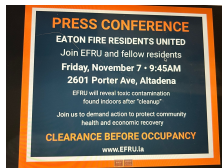


Health Education, Empowerment, & Advocacy

- Website & Newsletter
- Meetings & Presentations
- Citizen Science & Volunteers
- Research, Partnerships, & Working Groups
- Community & Speaker Events
- Training for DCMs
- Social Media & Print
- Multilingual Resources
- Fire Survivor Series
- Trips to Sacramento
- Policy & Legislation
- Leadership in LTRG
- Electeds & Press!



9:35
Beautiful Altadena (Official Group) · 2h · 11
When a 12 year old has the courage to speak up about her recently developed asthma & connects the dots between her school post fire & her illness, somebody better be listening ...



13
Like Comment Send

EFRU & FIRE RECOVERY

- [EFRU published the largest database of indoor contamination](#) in a POST-FIRE ENVIRONMENT
- 75K views of the [EFRU Pre-Remediation Contamination Map](#) & 6K views of the [Post-Remediation Map](#)
- 20+ EFRU speaker events with over 2K attendees and 3K views
- [80+ news stories, both national and international referencing EFRU data](#)
- 3000+ residents receive [EFРУs weekly newsletter](#)
- EFRU members run the Health & Safety channel of the 5500+ member EFSN Discord
- Academic institution collaborations - Caltech, Purdue, Harvard, UCLA, UC Davis, UC Irvine, UTA, USC, Chapman
- Member of LA Fire Health Consortium, Environmental Health Impacts WG LADPH, & Soils Working Team of LA County Environmental Health
- Leadership Team of the Fire-Resilient Bioremediation and Landscape Recovery Consortium
- Partnered with 50+ community organizations
- EFRU members lead the Health & Safety Committee & the Smoke Remediation Committee @Eaton Fire Collaborative (EFC) Long Term Recovery Group (LTRG)



Published August 23, 2025 | Version 0.1.0-beta

Dataset

Open

Eaton Fire Resident's United: Pre-Remediation Indoor Contamination Test Results

Wronkiewicz, Mark ; Maccalla, Nicole M. G. ; Potelle, Efram ;

Botica, Michelle ; Diniega, Serina ; Pearlman, Laura ;

Huang, Cathelin ; Potelle, Jane Lawton

Scope of this Dataset

The Eaton Fire in Southern California contaminated homes across Altadena, Pasadena, and Sierra Madre with hazardous ash and soot. Residents feared serious health risks prompting Eaton Fire Residents United (EFRU), a grassroots coalition of community members, to begin collecting, compiling, and publicly sharing residential contamination testing data taken by professional industrial hygienists.

This dataset contains anonymized, professionally collected contamination test results from over 200 affected homes. Researchers and advocates can leverage this dataset to study contamination patterns and support evidence-based policy improvements related to wildfire recovery and public health.

More information about EFRU as well as a live version of this information is available at www.efru.la

Datasheet for Dataset

The included Datasheet for Dataset provides comprehensive details about the dataset's contents, methods of collection, data anonymization practices, and suggested use-cases.

Standard Operating Procedures

The SOP document contains detailed procedures for processing the original resident-provided test reports to anonymize and compile the data.

Code Examples

A basic Python Notebook is included for loading, exploring, and visualizing the dataset. This script should facilitate researchers getting started with the dataset.

Data

The dataset includes contaminant levels measured inside 201 homes in CSV format. Each row in the CSV provides:

- Anonymized location (nearest cross-street)
- Peak measured concentrations of contaminants and other elements, including wildfire debris (ash, soot, char), asbestos, lead, arsenic, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.
- User-reported proximity to burned structures
- Damage and remediation status at testing time

Updates

The dataset will be updated periodically as additional residential testing results become available. Further releases as well as minor corrections are expected as this is an ongoing effort by community volunteers.

Acknowledgements

We express our profound gratitude to community members who have voluntarily shared their reports and helped us compile this dataset, all in pursuit of rebuilding a healthier, safer community. We also acknowledge Jennifer Cotton, Jordan Boye, and Dawn Fanning for their contributions as well as the entire EFRU community.

Files

 EFRUwww.efru.la

KNOW YOUR RIGHTS

What Every
Fire-Affected Resident
Needs to Do Now!

Swipe to learn how
to protect yourself
and your family



EFRU on Instagram & Facebook

 EFRU EFRUwww.efru.la

BREAKING:

MANY ALTADENA HOMES STILL UNSAFE EVEN AFTER PROFESSIONAL CLEANING

New findings reveal concerning
contamination in homes that
survived the Eaton Fire.

Swipe to see what we found



Eaton Fire Residents United (EFRU)

Newsletter

November 16, 2025

EFRU Needs Volunteers – Lend Your Skills to Support Our Community

As our community continues the long road to post-fire recovery, EFRU is expanding several key efforts – and we're reaching out to residents who can volunteer their time and skills to support this critical work.

If you've been wanting to get involved, this is the moment. [More information here](#)

Post-Remediation Reports Needed

EFRU is now developing a Post-Remediation Contamination Map and need more test results to complete it.

These reports will help evaluate which cleanup efforts have succeeded – and which haven't.

Submit test results here: efru.la/share-testing

Personal info is redacted; test locations are only mapped to nearest cross-street.

In The News

- Review the [News on the EFRU website](#) to see all the media coverage from the press conference.
- [Representative Judy Chu Announces Support for EFRU's Calls to Action](#)

EFRU Speaker Series This Week!

**SCE Compensation Program Overview for
Standing Homes**
Monday 11/17/25 @ 7PM

This session will provide:

- A framework for assessing the SCE Compensation Program
- An overview of payment categories related to standing homes and soil contamination
- A walk-through of an SCE "Fast Pay Offer Example" worksheet
- A preview of Andrew King's compensation calculator spreadsheet

[Register here](#)

**Indoor Contamination Levels After
Remediation - A Study of Community Test
Submissions to EFRU**
Wednesday 11/19/25 @ 5:30PM

Dr. Nicole MacCalla will share the latest results on indoor contamination after remediation, including the findings shared at this month's EFRU press conference and the new post-remediation map. Topics will include how much wildfire debris, asbestos, lead, and other heavy metals are being found in homes after clean up, highlighting the need for comprehensive testing and "Clearance Before Occupancy."

[Register here](#)

**EFRU Social Media & Flyer
Materials to Share with Your
Friends & Neighbors**

When we pass along important recovery information, we strengthen our ability to restore and protect our community.

- [Instagram Carousels](#)
- [Post Remediation Results Flyer](#)
- [FAQ on Indoor Contamination Flyer](#)
- [Soil Contamination Flyer](#)

**County Counsel Investigating
State Farm for Potential Unfair
Practices in Wildfire Claims**

LA County Counsel has launched an investigation into State Farm's handling of Eaton and Palisades Fire claims, citing possible violations of California's Unfair Competition Law amid rising complaints of delays and underpayments. State Farm has been warned to immediately cease any unlawful practices. [Read the announcement here](#)

**LA Fire Health Study:
Chromium-6 Levels Return
to Typical LA Lows**

New follow-up testing shows chromium-6 levels in Altadena and Pacific Palisades have returned to typical low LA levels. Researchers say earlier spikes likely reverted to the less-toxic chromium-3 form, but further investigation is still needed. [Read the data brief here](#)

Research & Medical Partnerships



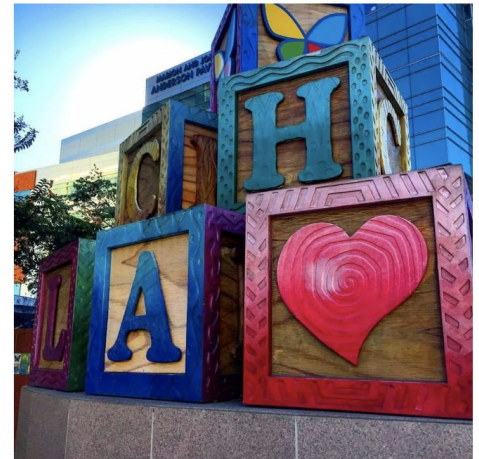
Environmental Medicine Education International



LA FIRE HEALTH STUDY



CEDARS-SINAI MEDICAL CENTER®



ASSEMBLYMEMBER
JOHN HARABEDIAN INTRODUCES THE

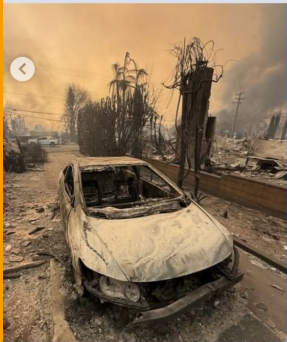
Wildfire Environmental Safety and Testing Act

AB 1642



Bill Summary

AB 1642 establishes statewide science-based standards for post-WUI fire remediation. This bill requires that decisions to return home are guided by public health, science, and engineering expertise rather than financial incentives or inconsistent private assessments.



Why it Matters

Families returning home after a wildfire should not be forced to gamble with their health. Yet more than a year after the Eaton and Palisades Fires, many residents are still living with uncertainty, fear, and risk because California lacks enforceable standards for post fire home testing.



AB 1642 WILDFIRE ENVIRONMENTAL SAFETY AND TESTING ACT

Passed in Assembly Environmental
Safety and Toxic Materials Committee

EFRU EATON
FIRE
RESIDENTS
UNITED

1 year.

Science.

Transparency.

A safe way home.

Assembly Committee on Environmental Safety & Toxic Materials
March 10, 2026

 **AB 1642
ADVANCES**

ADVOCACY UPDATE

IT PASSED!

WILDFIRE CONTAMINATION TESTING BILL MOVES FORWARD

Assembly Bill 1642 will require **science-based standards** for testing lead, asbestos, & toxic chemicals inside and outside standing homes after a WUI fire – for the first time in California history.

**One step closer to statewide standards
for indoor & soil contamination testing
after wildfires!**

Wildfire Environmental Safety & Testing Act



Eaton Fire Residents United
Protecting Families. Demanding Accountability. Driving Recovery.



www.efru.la

EFRU

efru.la

EFRU

efru.la AB 1642 just cleared the Assembly Committee on Environmental Safety and Toxic Materials. Our community was in that room — and the committee voted yes.

This bill, authored by Assemblymember Harabedian, would establish the first statewide standards for testing and clearing lead, asbestos, and toxic wildfire chemicals inside and outside of standing homes, schools, and workplaces after a Wildland Urban Interface (WUI) fire. Right now, no such standards exist anywhere in California law.

EFRU submitted testimony citing our own data: 6 out of 10 homes that have been professionally remediated are still not habitable due to lead and/or asbestos. Families moved back in. Children on contaminated floors. And no legal standard to hold anyone accountable.

Today, that started to change.

Thank you to [@asmharabedian](#) and every supporter who signed on — more than 80 organizations and 600 individuals. This is what community-powered science looks like.



Liked by **301organics** and **144 others**

March 10



Add a comment...

Post

Governor Newsom Signs Into Law Senator Pérez's Wildfire Legislation & More Laws

By News | The South Pasadenan - October 11, 2025



FILE PHOTO: senate.ca.gov | California State Senator Sasha Perez in the State Capital | Senator Pérez Represents Senate District 25 encompass Los Angeles and San Bernardino County. Cities that are found in this district include Claremont, East Pasadena, Glendale, Monterey Park, Pasadena, San Gabriel, Sierra Madre, Temple City, Rancho Cucamonga, San Antonio Heights, Uplands, and other cities in found in San Bernardino County.

A collection of bills authored by Senator Sasha Renée Pérez (D-Pasadena) to aid in wildfire recovery and make California more resilient to future natural disasters has been signed into law by Governor Newsom.

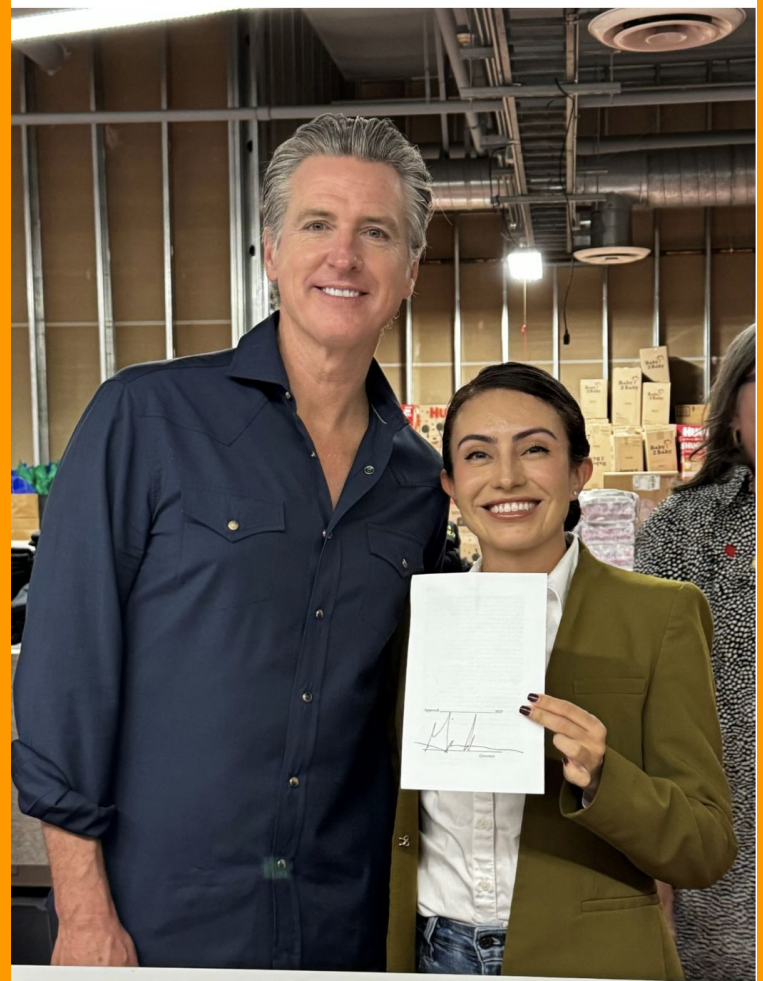


PHOTO Senator Pérez | The South Pasadenan | Governor Newsom signs into law Senator Pérez's wildfire legislation

Why is this Important to our Community?

Contamination affects our soil, schools, community spaces, homes, and health.

Residents with standing homes are the economic drivers of our community's recovery - they return first, spend and invest first, and drive the local economy's comeback.

- **These toxins could lead to a health crisis (e.g., respiratory and cardiovascular disease, cancer, death)**
- A healthy, thriving community cannot be rebuilt in a toxic environment
- Workers coming to the area need adequate protections (OSHA requirements)
- Unaddressed contaminants could leach into groundwater poisoning our aquifers
- Pets are already getting sick and dying
- Pets can be a source of recontamination, risking human health and safety when unaddressed contaminants are lurking inside and outdoors
- Untreated toxins can bring down the value of our homes and properties
- Inability to secure loans on contaminated properties
- Lawsuits & SCE payouts - Fix what they broke! Let's recoup the fees for decontamination!
- Many affected residents are underserved and lower-income; current state leadership is leaving them behind
- **If unaddressed, this will lead to mass illness, displacement, bankruptcy, and a deepening housing crisis**

CLEARANCE before OCCUPANCY!

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January 8, 2025
Downtown LA

Looking north towards Altadena,
15 miles downwind