

After the Fire: ***Practical, Science-Backed Steps for Recovery***

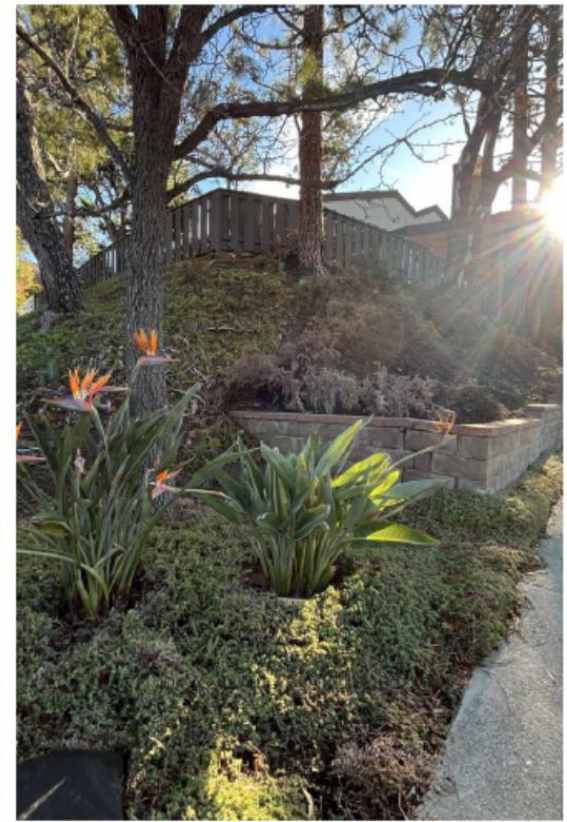
A part of the *After the Fire Webinar Series*

Welcome

The event will begin
shortly.

August 17, 2026

10:00 a.m. EDT



Welcome!



Andrew J. Whelton, Ph.D.

Moderator

Professor

***Lyles School of Civil and Construction
Eng.***

***School of Sustainability Eng.,
Environmental and Ecological Eng.***

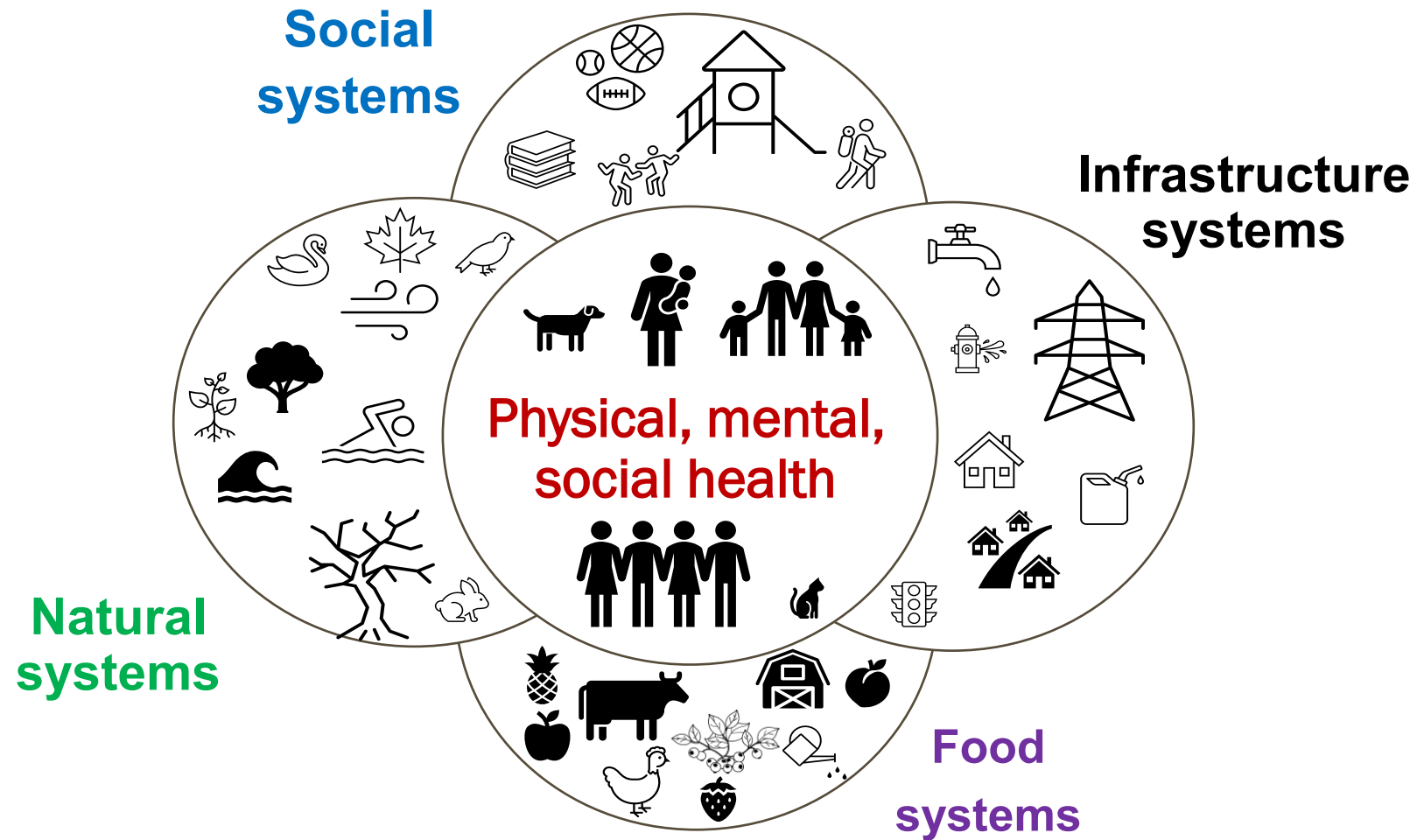
Purdue University, Indiana

General Overview

- 10:00** **Welcome and Introductions**
- 10:10** **Speakers**
- 10:30** **Question and Answer Period**
- 10:55** **Wrap Up**
- 11:00** **End**

A recording of this event will be posted at www.PlumbingSafety.org

Infrastructure, environment, & health



Fire Recovery Panel



***Todd
Thalhamer,
P.E.***

EDH Fire Lt/Cal EPA (ret.),
Hammer Consulting Svcs.,
Cameron Park, Calif.



***Kevin Philips,
CPA***

District Manager
Paradise Irrigation District
Paradise, Calif.



Eric Bollens

Chief Technology Officer
LightBox
N.Y./ Calif.



***Kevin Morley,
Ph.D.***

Senior Mngr. Fed.
Relations, AWWA
Washington, D.C.

PRESENTER

Todd Thalhamer, P.E.

President, Hammer Consulting Services

Registered civil engineer in California and Washington

B.S. in Environmental Resource Engineering, Humboldt State University

Firefighter/officer +15 years with the El Dorado Hills Fire Department / 3
Seasons with CalFire

Developed, designed, and implemented the first community-based wildfire
structural ash and debris removal program in California and the US

President, Hammer Consulting Services

Instructor for OSHA's HAZWOPER standard (29 CFR 1910.120)

Incident Management Trained ICS 100-400/700-800

Positions held for disaster debris operations: Area Commander, Incident
Commander, Operations Chief for CalRecycle/CalEPA

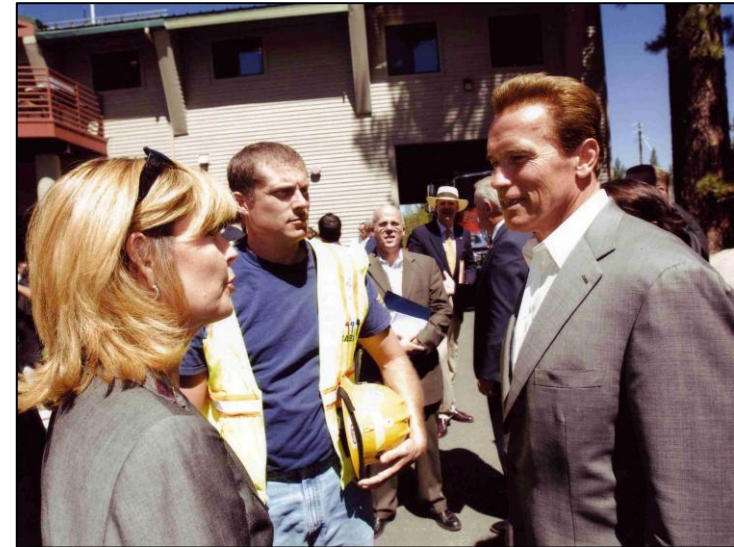
Developed and implemented the Camp Debris Operation Plan for
Paradise, CA



1st Coordinated Debris Removal

How? Five unique processes came together

1. Executive Order from Gov Arnold Schwarzenegger – Mandated comprehensive structural debris removal as a single coordinated debris removal project
2. County lead (El Dorado) Incident Management (All disasters are local incidents)
3. State funded (Cal/OES) / No FEMA funding
4. Cal/EPA -CalRecycle Remediation Contractors
5. Community buy-in (100%) / Owner was only responsible for insurance coverage for debris



- Use ICS and IMT to manage the process
- Developed a removal program not to impact a community a second time
- Project included: community air sampling, confirmation soil sampling, asbestos removal, HHW removal, erosion control, street cleaning and repair, tree removal



Haz Waste Operations

- Limit exposure to toxic metals and asbestos
- The ash area is the exclusion zone



- PPE Required
- Dust Control Required

Is the Residential Ash Toxic?

YES – Todd Thalhamer, P.E.

- *The ash is an immediate threat to public health and safety (source: Cal/EPA)*
- Asbestos is present (Do not rely on the 1989 Ban; it was overturned in 1991)
- Residual structural ash contains concentrated amounts of heavy metals, such as **arsenic**, barium, copper, chromium, cadmium, **lead**, lithium, zinc, as well as some Polynuclear Aromatic Hydrocarbons (PAHs)
- We have identified 21 metals that pose a health risk from residential structures. Use the Residential Ash Assessment Method (RAAM) for Destroyed Structures - Soil Cleanup Goals Worksheet 2026

Source: After a Fire: Considerations for Residential Property Soil Testing and Restoration

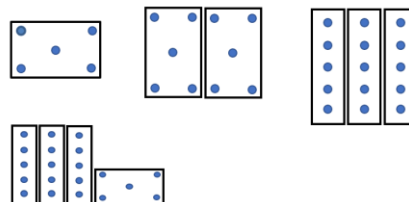
<https://docs.lib.purdue.edu/red/6/>

How to Rebuild

- Request local Govt to conduct a regional soil background study to determine appropriate cleanup goals
- Find your neighbors; group your efforts to save costs
- You need a community to rebuild
- Hire a removal contractor as a group
- Do not try to save your concrete foundations
- Scrape 3 to 6 inches under all surfaces (including slabs)
- Group hire a licensed professional to take confirmation soil samples to reduce costs
- Use small decision units to find hot spots

Five-Point Composite Confirmation Sampling	
Estimated Square Footage of Ash Footprint (Decision Unit)	Number of 5-Point Aliquots
0-100 square feet	1
101-1,000 square feet	2
1,001-1,500 square feet	3
1,501-2,000 square feet	4
2,001-5,000 square feet	5
>5,000 square feet	Sampling strategy will be discussed between the IMT and Environmental Consultant

Typical Confirmation Sampling Strategies for Decision Units.



2007 Angora Project Results

- 256 residential properties (100 percent participation)
- Angora Fire - 3,100 acres
 - Started June 24, declared out July 2, 2007
- HazWaste, asbestos, and debris removal operation
 - Started July 13 through August 24, 2007 (39 calendar days)
- Tree removal and erosion control operation
 - Started September 1 through October 23 (~40 calendar days)
- Entire project completed in 120 days from the fire start



Project Item	Cost
Environmental Support ¹	\$ 349,266.50
Health and Safety Monitoring and Air Sampling	\$ 560,702.80
Contractor Expenses (Removal Costs)	\$ 2,961,767.02
Transportation and Disposal	\$ 2,864,762.20
Erosion Control ²	\$ 555,299.80
Total	\$ 7,291,798.32

Cost Per Address - 256	
Mean	\$ 28,483.59
Median	\$ 28,382.70
Min	\$ 1,079.87
Max	\$ 79,994.23

2007 Angora Fire

- 100% Community Participation
- 39 Days to Remove 256 Structures
- 1 year: 50% of the homes were under construction

Contact: Todd Thalhamer, P.E.
Retired Operations Chief
ltfire88@gmail.com



Water service is the foundation beneath the response

When the system is compromised, every other mission becomes harder.

PUBLIC HEALTH



Safe water and contamination control

FIRE RESPONSE



Supply, pressure, access, and coordination

COMMUNITY



Shelter, sanitation, confidence, and return

RECOVERY



Rebuilding, permitting, financing, and growth



Kevin Philips, CPA

District Manager
Paradise Irrigation District
Paradise, Calif.



Eric Bollens

Chief Technology Officer, LightBox

Impacted by the Palisades Fire

Co-author, Purdue RED wildfire recovery guidance



Community recovery efforts after the Palisades Fire



On site in the Pacific Palisades

LIGHTBOX

Property, environmental and location intelligence

The fire is only the beginning.

The story of my family and so many others.

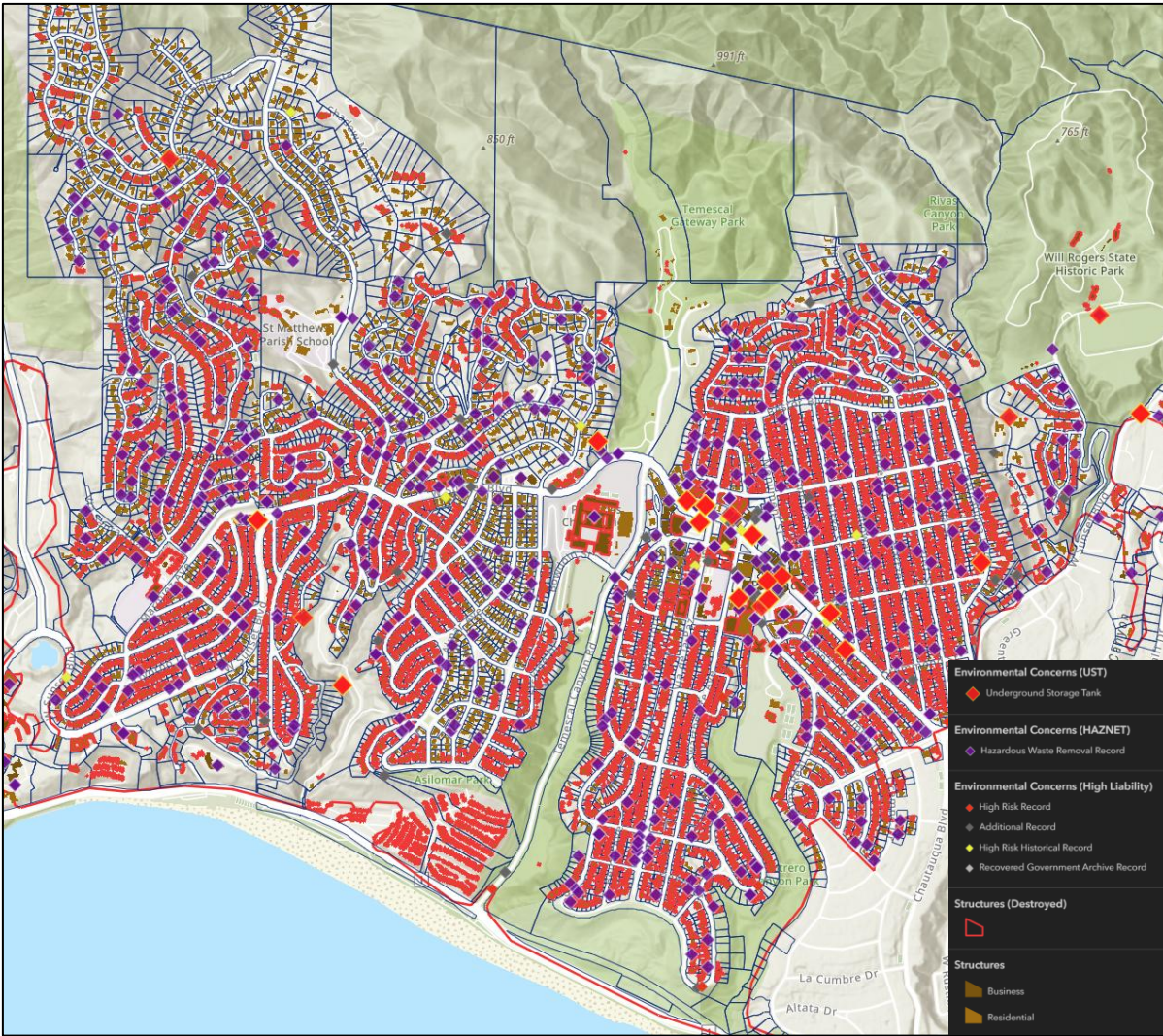


source: still frame from fire air intel video of the Palisades Fire, morning of January 8, 2025

At first, it was about the escape. Then, all we could do was hope. Somehow, our home survived, but it took 11 months to make it safely habitable again.

What burned matters.

Recovery decisions should start with sources, not assumptions.



LightBox hazard context map of parcels, burned structures and subset of known environmental indicators at time of the Palisades Fire. HAZNET records review demonstrated asbestos prevalence in community, footprints provided preliminary estimate of ash and debris, and other records identified additional environmental concerns. Does not account for battery/EV/solar infrastructure or non-reported sources on individual properties.

Prior use and present inventory shape the hazard picture. A map is not proof of property-specific contamination, nor are proximate burned materials, but they inform what the next inquiry must be.



Grocery stores and commercial properties
source: CAL FIRE Damage Inspection Database



Fuel systems



Building materials, contents, chemicals, and vehicles



Solar and battery infrastructure

Standing is not the same as safe.

Destroyed properties and standing homes follow different recovery paths. Neither is automatic.



Yellow: 250-yard perimeter. Red: burned parcels within perimeter. Green: subject property. Peer-reviewed studies use proximity to burned structures to evaluate risk. LA County Dept. of Public Health used 250 yards in hazard advisory.

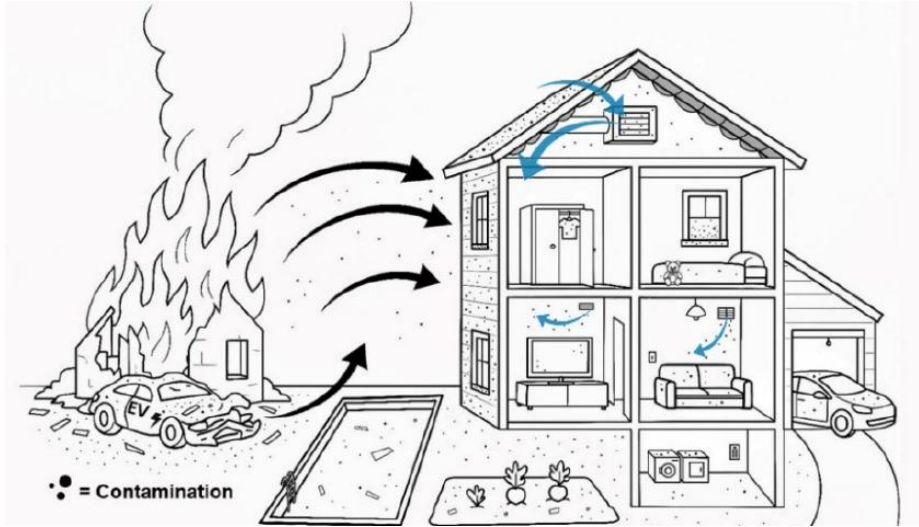


A story that played out many times over.



The two modalities of recovery. Both take work and time.

A standing home can still contain environmental damage.



Pathways: particles, gases and vapors can enter and move through surviving structures.

Why testing matters

- Contaminants may be solids, vapors and aerosols. Some are visible, some too small to see and some penetrate materials. **Sight and smell are not conclusive measures of contamination.**
- Conditions vary site-to-site: proximity to burn, plume shape, what burned nearby, water impacts, ventilation, building condition, etc. all have a significant influence on contamination loads.
- Test surfaces for **CAM-17 metals** and **asbestos**; sample air for **VOCs**; assess **microbial growth** if water impacts; consider other testing based on specific property condition. Testing only select combustion byproducts or proxy analytes is not sufficient to characterize all potential hazards.
- Look beyond living areas. Floors, windowsills, attics, garages, crawlspaces, HVAC systems, wall cavities, furnishings and personal contents may all be impacted.
- Depending on types and concentrations of contamination, it may be necessary to replace porous materials and personal contents. Professional assistance may be required.
- Use results to identify the type, location and magnitude of hazards before remediation, which should then inform work protocols, experience/certifications and protective measures.
- Conduct thorough post-remediation confirmation testing. **Let the data lead.**

Environmental assessment → Sampling and testing → Remediation → Post-remediation confirmation testing

What contamination can look like



Surface dust on windowsills and throughout interior



Surface dust in attics and other "hidden" areas



Microbial growth after water impacts

<https://docs.lib.purdue.edu/red/1>

Whelton, Bollens & Ferrarezzi, *After a Wildfire: Considerations for Building Environmental Testing*.

Permission to enter an area is not environmental clearance for an individual property.

Before you go

Confirm access. Tell someone your plan and expected return. Do not go alone. Do not bring children or pets. Consider heart, lung and heat-stress risks.

On site

Limit time. Work in pairs. Use protection matched to the hazard.

Smoke-damaged property: a NIOSH-approved half- or full-face respirator, with a cartridge/filter combination of particulate filter (P100) and Organic Vapors (OV), disposable jumpsuit like Tyvek, ANSI Z87.1 safety goggles, chemical-resistant gloves, long sleeves and pants, sturdy closed-toe boots, and shoe covers.

Destroyed structure or debris field: a NIOSH-approved full-face respirator, with a cartridge/filter combination of particulate filter (P100) and Organic Vapors (OV), disposable jumpsuit like Tyvek, an inner nitrile glove under an outer work glove, long sleeves and pants, and puncture-resistant boots. Consider skipping shoe covers/booties outdoors on debris as they can be a slip hazard. Dedicate a pair of boots to the site instead.

If symptoms occur

Leave immediately. Seek medical care for severe exposure, burning eyes, rash, dizziness, nausea, respiratory symptoms or major ash contact.

Before you leave

Decontaminate before entering the vehicle. Bag PPE and boots. Change if dusty or sooty. Launder separately and shower promptly. Do not bring ash home.

Do not rely on sight, smell, or what others are wearing.

The safety plan should prevent exposure on site and prevent contamination from returning with you.

Destroyed structures pose real risks to life and health. Many hazards may be difficult or impossible to identify without professional help. Hazards may also have originated from nearby properties. Use caution.

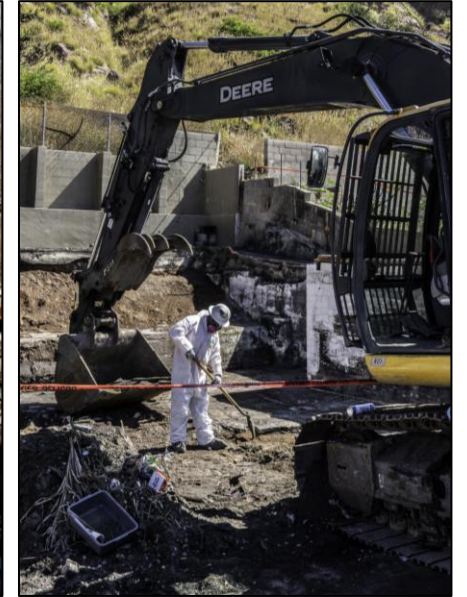
Physical hazards may include: underground fire; sharps & punctures; propane tanks & gas cylinders; wells, pools & septic tanks; animals; electrical & gas lines; EV, solar/battery systems & lithium-ion batteries; structural instability; hot spots; and falling hazards

Debris, ash and soil may contain environmental hazards. Inhalation or contact with skin or eyes may cause immediate or long-term harm. Use appropriate protocols and PPE.

Environmental hazards may include: asbestos; potentially toxic elements such as lead, arsenic, mercury, chromium, cadmium, lithium, etc.; and organic contaminants such as PAHs, PCBs, PFAS, benzene, tetrachloroethylene (perc), vinyl chloride, etc.



source: T. Thalhamer



source: C. Delano, U.S. Army Corps of Engineers

PPE matched to the hazards, not to appearances



Plan visit, gear and decontamination process before you go; ensure you can protect and support you and your partner(s)



Contaminated boot after a site visit

<https://docs.lib.purdue.edu/red/7>

Whelton, Thalhamer & Bollens, Considerations of Personal Safety When Visiting Fire-Damaged Property.



Wildfire: Impacts on Water System Risk and Resilience

Kevin M. Morley, PhD
American Water Works Association

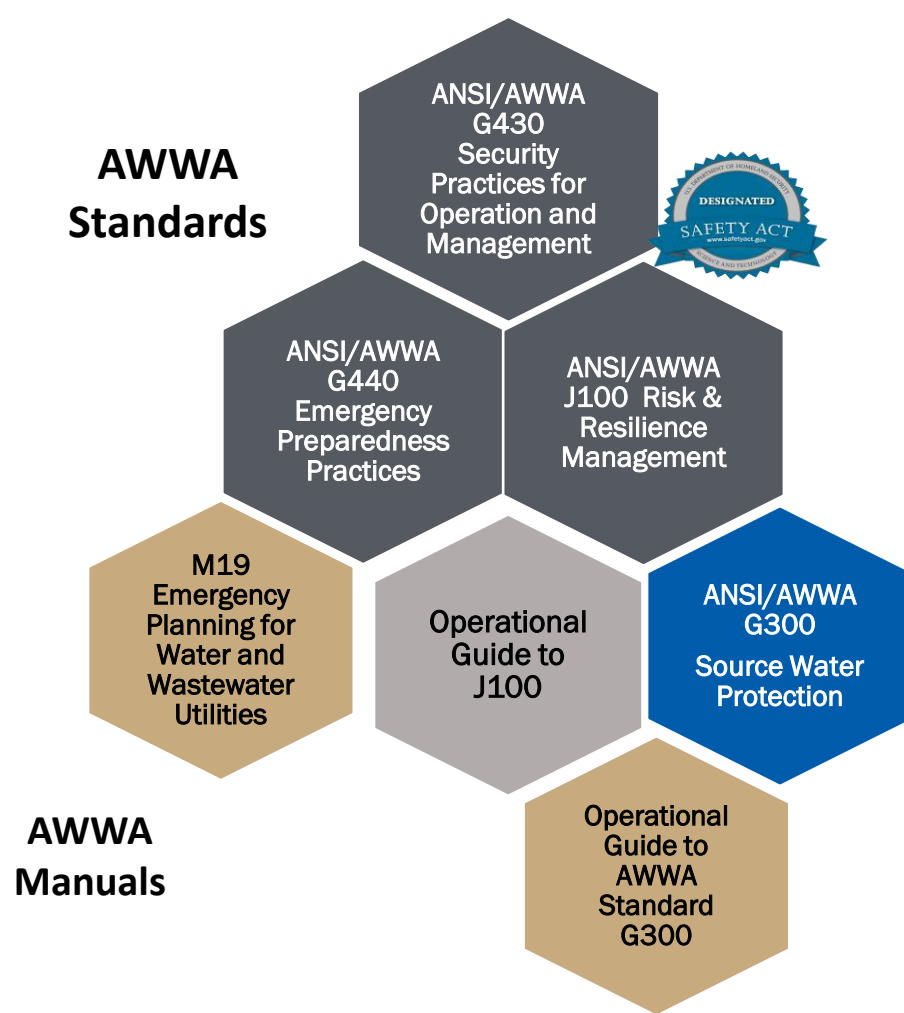


American Water Works
Association

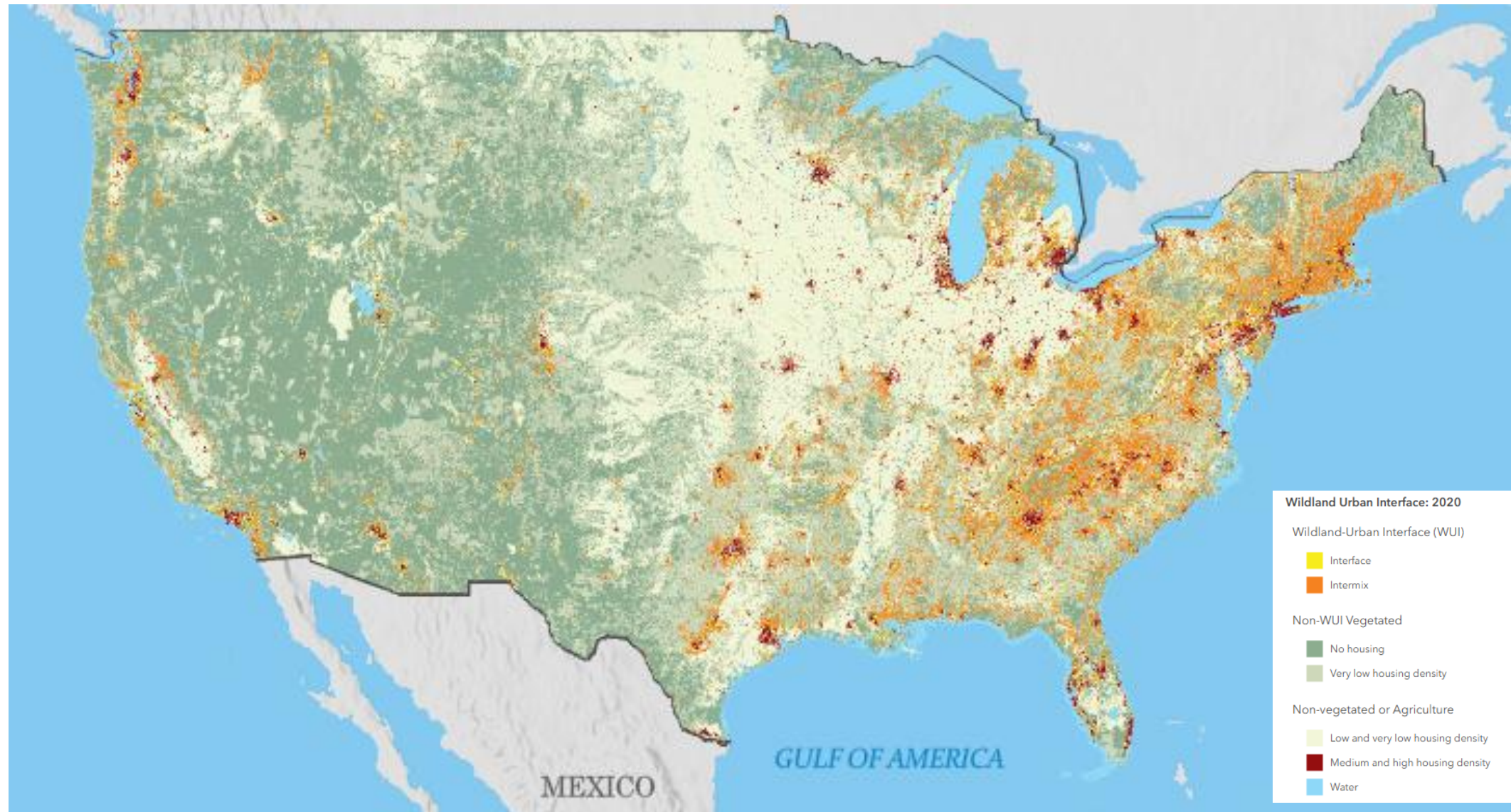
Risk & Resilience $\Leftrightarrow$ All-Hazards Approach



AWWA RISK & RESILIENCE RESOURCE SUITE



Wildland Urban Interface: 2020



Source: US Forest Service (2020) <https://data-usfs.hub.arcgis.com/documents/7804d89ed1094ccb9aae753228e8d89a/explore>

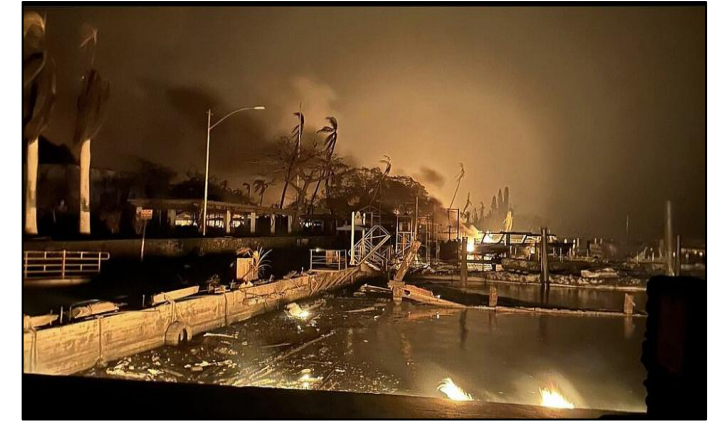
Urban-Wildland Interface Impact on Water Systems



2017 – Santa Rosa, CA



2021 – Marshall Fire, Boulder County, CO
(Credit: Hart Van Denburg/CPR, pool)



2023 – Lahaina, Maui
(Credit: U.S. Coast Guard Hawai'i Pacific District 14)



2018 – Camp Fire, Paradise, CA
(Credit: LiPo Ching/Bay Area News Group)



2025 – Pacific Palisades, LA County



2026 – Spokane, WA
(Credit: Kristina Marie)

Developments in Wildfire Response & Recovery

- **Source Water Quality**
 - **Water Research Foundation** has multiple analysis directed at helping utilities prepare for and recover from wildfires and identify mitigation strategies (<https://bit.ly/387nWfr>).
- **Distribution System Contamination Recognized Risk**
 - *Water Sector Specific Plan* (2007, 2010, 2015)
 - *Roadmap to a Secure & Resilient Water Sector* (2017, 2024)
 - ***Improve detection, response, and recovery to contamination incidents...***with focus on clarifying and clearly communicating (through training, quick guides, etc.) **incident response decision structures**, access to information on potential sources of contamination, and research and development related to **decontamination procedures**, key pathogens, and unknown contaminants.

Outlook on Recommendations

ON FIRE: The Report of the Wildland Fire Mitigation and Management Commission



September 2023

Wildland Fire Mitigation and Management Commission Report

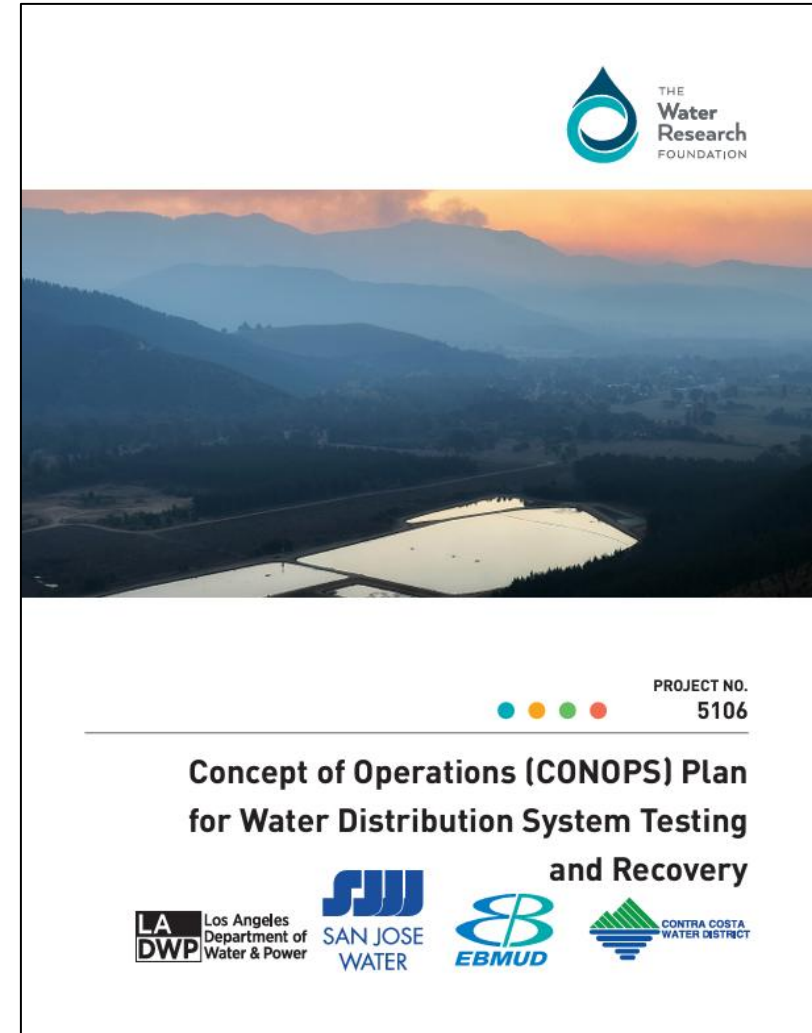
- #34: *Expedite funding for immediate and long-term recovery of drinking water utilities, including treatment upgrades, repairs, alternative water supplies, and recognition of secondary impacts such as contamination.*
- #38: *Support identification of public health risks associated with exposure to wildfire-contaminated water and development of evidence-based water use recommendations.*
- Pub. L. No. 117-58; § 40803, 135 Stat. 1097 (2021)
<https://www.usda.gov/sites/default/files/documents/wfmmc-final-report-09-2023.pdf>

Addressing a Critical Decision Gap

WRF – Project 5106

Utility driven effort to create an *evidence-based decision support framework*

- Goal is to mitigate potential acute public health risks, return to service, and public confidence
- Based on evidence from multiple wildfire incidents, targeted sampling of VOCs & SVOCs
- <https://www.waterrf.org/research/projects/post-wildfire-distribution-system-water-quality-impacts-and-potential-responses>

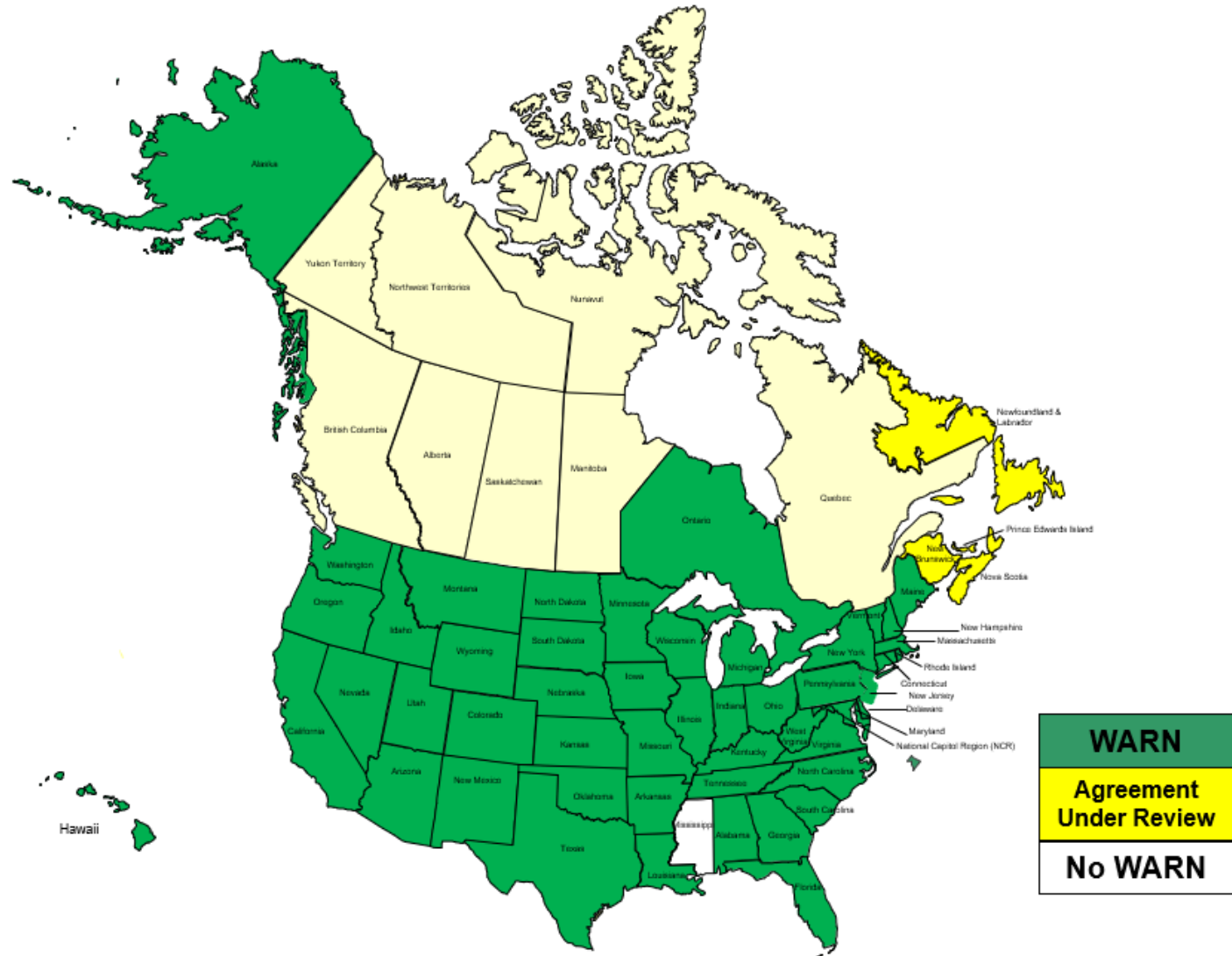


Utilities Helping Utilities



NationalWARN.org

Kevin M. Morley, PhD
Senior Manager, Federal Relations
AWWA – Government Affairs
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Fire Recovery Panel



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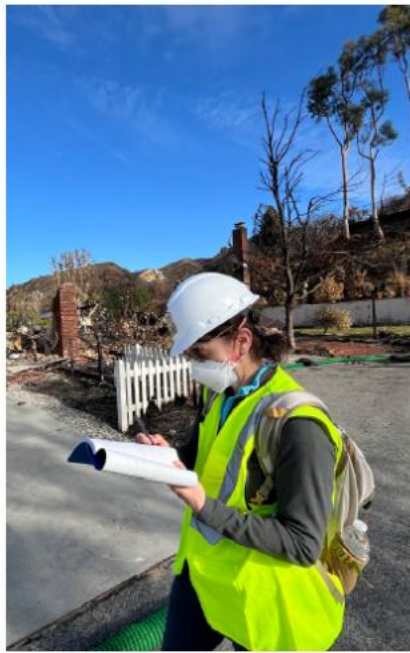
Senior Mngr. Fed.
Relations, AWWA
Washington, D.C.

Special thanks to....

- ♥ Our speakers for volunteering their time and expertise
- ♥ Households and business owners who have shared their experiences with us
- ♥ Officials and consultants who have shared their experiences with us
- ♥ Students and collaborators that helped us
- ♥ The U.S. National Science Foundation grant FIRE-2536797 supporting some of this work.

Webinar Series: *After the Fires*

Register for the webinars at
www.PlumbingSafety.org



Response and Recovery Lessons Learned from Fires

August 2025

The LA Pools Study:
What was in the
water?

September 2025

Soils, Debris, Fruit,
Gardens, and More

September 2025

The REBUILD Survey:
Overview and First
Look

October 2025

Physical and mental
health resources

August 2026

Practical, Science-
Backed Steps for
Recovery

Free guidance resources → Resilience to Emergencies and Disasters Series, Purdue University ←

HEART

Health-based Environmental Assess. & Re-Occupancy Testing

Evidence-based practices for safely restoring homes

100s of homes participating

ASHES

Fire Ash & Soil History Evaluation

Evidence-based practices for safely returning
property soil to pre-fire condition.

Ash & 100,000+ soil samples across multiple states

CRIBS

Chemical Risk In Baby Product Sorption

Evidence-based guidance on handling baby products
exposed to contaminated drinking water.

Designed with input from affected families

REBUILD

Recovery Efforts by Uniting Individuals, Listening, & Discovery

Household experiences with evac., housing, testing,
chemical exposures, insurance, & rebuilding.

1,229 households participating

L.A. Pools

Swimming Pool Fire Recovery

Evidence-based practices for restoring swimming
pools.

20+ households participating

MITIGATE

Mitigation of Impacts Through Innovative Guidance, Adaptation, & Technology

Evidence-based practices to reduce impacts and
expedite recovery.

10+ water utilities participating

Ongoing work...

After the Fire: Practical, Science-Backed Steps for Recovery

This event has ended

Thank you

A recording of this event will be posted at
www.PlumbingSafety.org

Questions about this event can be directed
to: Professor Andrew Whelton,
awhelton@purdue.edu



Additional Information

Evidence-Based Resources for Fire Recovery

Available from Purdue University: <https://docs.lib.purdue.edu/red/>

- ✓ Considerations for Personal Safety When Visiting Fire-Damaged Property
- ✓ Considerations for Building Environmental Testing
- ✓ Considerations for Residential Property Soil Testing and Soil Restoration
- ✓ Water Safety Considerations for Private Wells
- ✓ Water Safety Considerations Inside Buildings
- ✓ Water Safety Considerations for Agriculture Water Systems

Concept of Operations (CONOPS) Plan for Water Distribution
System Testing and Recovery. 2024. Prepared by Purdue
University for the Water Research Foundation. Denver, Colorado.
Request a free copy here: <https://www.waterrf.org/contact-us>