

The Toxic Footprint of California Wildfires: A Review of Inorganic and Organic Contaminants in Post-Fire Environments

By Joelle Padawer

Introduction

California wildfires are becoming more frequent and severe, creating environmental risks that continue after the flames are gone. Burning vegetation, homes, plastics, and other materials releases contaminants that can spread through air, soil, and water.

Research Question

How do wildfire-related contaminants affect California's ecosystems and human health after a fire?

Key Contaminants Studied

- Volatile Organic Compounds (VOCs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Hexavalent Chromium [Cr(VI)]
- Asbestos

Why It Matters

These contaminants can persist for months or years, affecting ecosystems and communities long after visible destruction ends.

Methods

This study used a literature review to synthesize findings from scientific studies, government reports, and environmental research.

4
Contaminants

3
Environmental
Pathways

3
Types of Effects

The review compared how each contaminant moves through post-fire environments and affects organisms, ecosystems, and people.



Results

Wildfire contaminants can persist across multiple environments.

Contaminant	Water	Soil	Air
VOCs	Can contaminate drinking water and enter food webs.	Disrupt soil microorganisms and slow recovery.	Irritate the respiratory system and worsen asthma.
PAHs	Harm aquatic organisms and affect fish reproduction.	Increase soil toxicity and interfere with plant growth.	Can damage lungs and affect birds' reproduction.
Cr(VI)	Can cause severe health effects after exposure.	Can remain in soil for months and reduce plant growth.	Can damage lungs and increase cancer risk.
Asbestos	Can contaminate groundwater and waterways.	Can damage plant roots and soil health.	Airborne fibers can cause serious respiratory disease.



How Contaminants Move After a Wildfire

AIR
Smoke & particles

SOIL
Ash & deposition

WATER
Runoff & leaching

Burning vegetation, buildings, plastics, and other materials releases contaminants.

Wind can spread smoke and ash. Rain can carry ash and pollutants into soil, streams, rivers, groundwater, and coastal ecosystems.

These pathways create opportunities for long-term exposure.

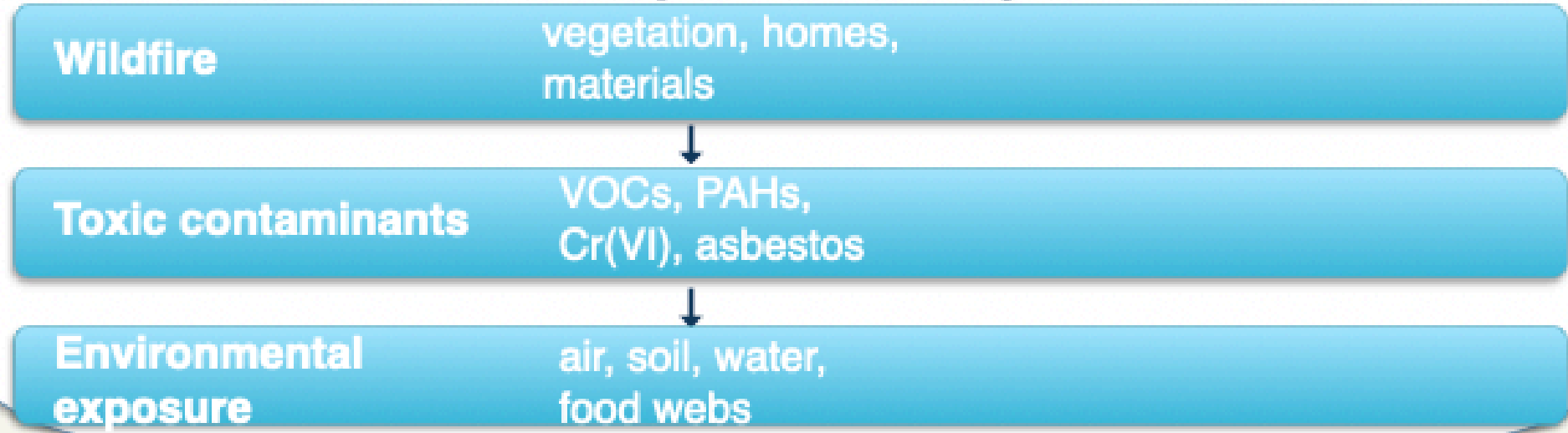
Discussion

Wildfire contamination can create a long-term cycle of environmental damage.



- Contaminants can enter food webs, disrupt plant and animal reproduction, and damage soil microorganisms.
- Human exposure can increase risks of respiratory disease and certain cancers.
- Cleanup efforts include debris removal, water monitoring, soil assessments, erosion control, and air filtration.
- Many approaches remain focused on immediate hazards rather than long-term contamination.

From Contaminants to People and Ecosystems



Conclusion

The fire may be over—but the contamination can remain.

VOCs, PAHs, Cr(VI), and asbestos can persist in air, soil, and water, threatening ecosystems and human health.

Future Research

Determine which remediation methods work best for specific contaminants and environments. Biochar and filtration-based approaches show promise, but more research is needed.

Selected References

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