Post-Fire Soil Remediation, Testing Resources and Best Practices

SoilWise

Soil Contaminants of Concern (COCs)

Heavy Metals

most common :

• Lead is from historic use of gasoline, house paint pre-1970's, and other industrial activities

• Arsenic can be naturally occurring, and also from pesticide use

Asbestos

• Historically used as insulation pre-1970's

• Natural mineral that doesn't decompose

• Cause of mesothelioma, cancer of the lung lining

Total Petroleum Hydrocarbons — TPH

• Mixture of hydrocarbons found in crude oil

Per-and Polyfluoroalkyl Substances — PFAS

• Used for water and grease-proof properties

• Teflon, Firefighting foam, Carpets, Upholstery, Insulation, Roofing

• "Forever" chemical, highly mobile through all systems (water, plants, animals, soil)

Polycyclic Aromatic Hydrocarbons — PAHs

• Naturally occurring in coal, crude oil, gasoline

• Released from burning of coal, crude oil, gasoline, wood, cigarettes, trash

Volatile Organic Compounds — VOCs

• Released by natural ecosystems

• Comes from home cleaning products, building products, industrial paints and adhesives, fossil fuel combustion, vehicle emissions, solvents and paints

Dioxins & Furans

• EPA Classified as a Persistent Organic Pollutant (POP), highly resistant to degradation

• Byproduct of waste incineration

• Combustion of PVC plastics, treated wood, chlorine-containing materials, coal, wood

• Accumulate in food

SoilWise

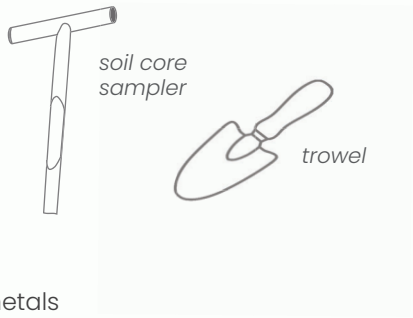
Soil Testing

Soil Sampling Options

A: Multiple sample areas (grids) on site

B: Representative or discrete sampling in most contaminated areas

Tools:



Testing Labs

	types of tests
Wallace Labs	soil fertility, pH, plant available heavy metals
SunStar Labs	pH, metals, PAHs, PCBs, asbestos, PFAS
Jones Labs	dioxins and furans

Safety Thresholds

CA DTSC (HHRA Note 3): https://dtsc.ca.gov/human-health-risk-hero/

Soil Bioremediation Principles

- Testing to Document Reductions/Progress
- Compost, Microbes, Biochar, Fungi, Plants, can all help in their own ways!
- Developing bioremediation strategy based on **five** mechanisms

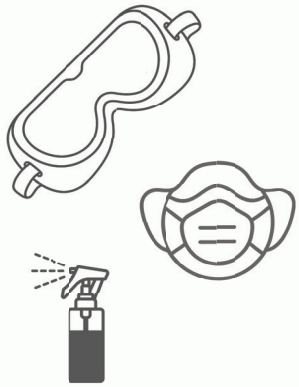
1. Sequestration (compost/biochar/fungi/zeolites)
2. Accumulation/Removal (plants/fungi)
3. Decomposition/Degradation (compost/biochar/fungi/microbes)
4. Detoxification (microbes)
5. Stabilization (plant roots)

- Post-processing of contaminated plants/soil

- Incorporate many tools (plants, compost, biochar, zeolites) to make a plan
- Most successful remediation approaches mimic nature (Multi Kingtom, multi phased, mimicking ecological succession)

- Increments:
    - Soil testing
    - Immobilize toxins: Ecological filter socks with compost, biochar, native soil, crushed shells, humic acids
    - Cultivate native soil fungi using native soil inoculants - feed with humic acids and crushed shells
    - Phytoremediator plants
    - After debris removal, deal with residuals
    - Biochar and zeolite sequestration

- PPE
    - N95 or P100, heavy duty nitrile gloves under work gloves
    - Boot covers, Tyvek coverall, goggles, respirator for working more directly in burned areas
    - Separate and wash work clothes. Tie up hair.
    - Keep a trash bag in your car trunk or garage
    - Wipe down seats
    - Spray bottle with soapy water to clean and wash tools



Additional Resources

- Lahaina Ash characterization showed elevated heavy metals: https://health.hawaii.gov/news/newsroom/lahaina-ash-characterization-testing-show-elevated-levels-of-toxicsubstances/

- Compost filter socks accumulate more metals, PFAS, dioxins in runoff water, compared to uninoculated straw wattles after the Camp Fire: https://docs.publicnow.com/viewDoc?filename=106995%5CEXT%5CF5EE64C7BA229244D986C2C70ACA8704BCA66A23_D58DF931EDAAE6199E89F0FA1CEADFCD9E87F539.PDF

- Low heavy metals accumulation in soil after Marshall Fire: https://static1.squarespace.com/static/6335d20acf80c5162c7e37fe/t/65da81ec27ece4123311edec/1708818927595/Jech_etal_MarshallFire_2024.pdf

- Metals and Polycyclic Aromatic Hydrocarbons (PAH's) in Wildfire: https://www.mdpi.com/2305-6304/10/1/31/pdf

- North Complex Fire (Butte, CA) and Lightning Complex Fire (Sonoma, CA) metals: https://www.sciencedirect.com/science/article/am/pii/S0304389422021057
    - The total major and trace metal (Ca + metals + metalloids) concentrations range from 2.4 to 47.0 wt.% and increase in the following order: soil < burned vegetation < structure < vehicles

• 1/3 of properties burned in Camp Fire had remaining contaminants in soil after top 6" was removed: https://www.latimes.com/environment/story/2025-02-12/feds-wont-test-soilafter-wildfire-cleanup-potentially-leaving-contamination-behind

• CoRenewal remediation in Camp Fire using inoculated straw wattles: https:// www.fenixsfungi.com/

• USC Soil Testing Map for Lead (Pb) in Palisades and Eaton Fires area https://publicexchange.usc.edu/la-wildfire-soil-testing/

• Eaton Fire Residents United https://www.efru.la/

• Fire Debris Cleanup LA Times

• If your home has been infiltrated by toxic ash

• Soil and ash toxicity, personal safety after LA fires

Bioremediation Resources

• SoilWise https://soilwise.earth/
• The Rot Squad
• Club Gay Gardens
• Altadena Seed Library https://www.altadenaseedlibrary.com/
• Seeds of Hope https://www.seedsofhopela.org/
• Fungal Solutions https://fungalsolutions.com/
• Fungi Fix https://www.fungifix.org/
• From Soil2Soul https://fromsoil2soul.com/
• Plant Community LA https://www.plantcommunityla.org/
• CoRenewal https://www.corenewal.org/
• CAER https://caer.earth/
• Mycelium Matters https://myceliumatters.org/
• Christine Hinkel 301 Organics https://www.301organics.com/
• LA Compost https://lacompost.org/
• Community Compound https://www.communitycompound.org/

For follow up questions and staying in touch:

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