After The Fire: Drinking Water Contamination & Safety

After a wildfire, local drinking water delivered through system infrastructure can become contaminated, posing health risks to residents who rely on them. Infrastructure damage to pipes, pumps, treatment plants, meters and post-fire runoff can introduce harmful pollutants into both public water systems and groundwater that supplies wells. By understanding how wildfires affect drinking water quality, recognizing signs of contamination, and knowing which necessary actions to take, residents can better protect themselves and their households, ensuring access to safe and reliable drinking water in a post-fire environment.

How Do Wildfires Affect Drinking Water Quality

Wildfires can introduce harmful chemical and microbial contaminants into drinking water sources, damage water infrastructure, and alter the chemical properties of delivered water supply. One major concern is the contamination from hazardous chemicals, specifically, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and carcinogenic substances. VOC contamination frequently occurs due to the heat-induced breakdown of plastic piping materials (Figure 1) such as polyvinyl chloride (PVC) and high-density polyethylene (HDPE). When exposed to extreme heat, plastic pipes can degrade and release VOCs, such as benzene, directly into the drinking water supply.[1,2] For example, following California's 2018 Camp Fire, VOCs were detected in tap water samples from homes nearly a year post-fire, with some concentrations far surpassing established regulatory standards.[3] Additionally, significant drops in water system pressure, often caused by damage to pipes or infrastructure can lead to contaminants entering the water distribution system through compromised connections.[4]

Figure 1: Degraded plastic pipe post- wildfire. *PC: CA State Water Board Division of Drinking Water*

For wildfires in the wildland-urban interface (WUI), not only is contamination from burned infrastructure a concern, but also debris from natural vegetation as well. When wildfires burn the WUI, the combination of burnt and damaged natural vegetation and built structures can introduce suspended solids, heavy metals, and Polycyclic Aromatic Hydrocarbons (PAHs) into nearby bodies of water and reservoirs through runoff. These pollutants often enter waterways through increased erosion and flooding in fire-affected watersheds.[5]

Runoff after fire events, particularly the first rain (first flush), can send ash, debris, vegetation, and other contaminants to downstream watersheds. The influx of contaminants is intensified by increased soil erosion and flooding conditions that commonly occur in post-fire landscapes.[6] Significant contamination can increase demand on local water treatment facilities, hindering their ability to effectively remove contaminants and reliably provide safe drinking water.[7]

Damage at or near the point of use can result in increased risk of contamination, which poses health risks to humans and affects the aesthetic qualities (e.g., taste, odor, and clarity) of water.[8] Wildfires can directly damage critical water infrastructure, including pumps, storage tanks, pipes, and treatment plants. Destruction of these components can disrupt water delivery to residents and create prolonged periods

without reliable access to clean drinking water. Repairing and restoring wildfire-damaged water systems can be costly and time-consuming, often requiring extensive replacement of pipes, infrastructure upgrades, and thorough decontamination procedures to ensure the water is safe again.[9]

What are the Signs and Risks of Contamination?

Common indicators of contamination include changes in the physical properties of drinking water such as unusual taste, odor, or appearance. Cloudy or frothy water or water showing discoloration (e.g., orange, reddish-brown, blue) may indicate the presence of suspended particulates, detergents, or elevated concentrations of metals like iron or copper.[10] Additionally, distinctive odors such as a sulfuric- or turpentine-like smell may suggest contamination by hydrogen sulfide or other organic chemical compounds. Chemical taste in water can often be attributed to VOCs, which are contaminants commonly introduced into drinking water post-fire.[10] It should be noted that **many harmful contaminants cannot be detected through sensory methods alone and additional testing is recommended**.

Figure 2: Contaminated water from a faucet. *PC: CDC Environmental Health Services*

Exposure to common drinking water contaminants post-wildfire, such as benzene, can cause immediate health symptoms including dizziness, vomiting, convulsions, and unconsciousness, in addition to long-term health risks such as increased risk of cancer.[11]

What Steps Can You Take?

Post-fire, appropriate next steps to access safe drinking water depends on whether your water comes from a public or private water system. To find out who your water provider is, visit the California Institute for Water Resources' website (https://ciwr.ucanr.edu/Tools/Drinking_Water/fs2_e/index.cfm).

Post-fire, follow water advisories issued by local or state agencies.[12] Common examples of advisories include:

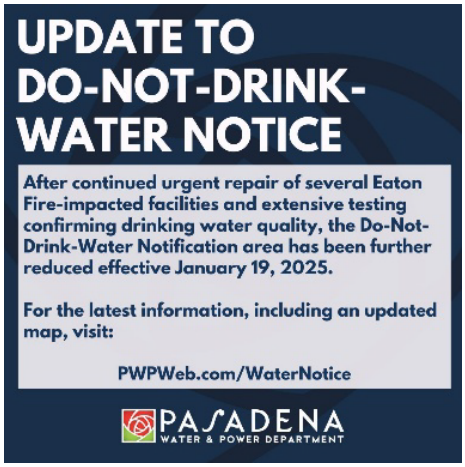

Figure 3: Example of a "Do Not Drink" water advisory. *PC: Pasadena Water & Power*

- **Do Not Drink:** Water should NOT be used for drinking or cooking, even if boiled. Boiling the water does NOT make it safer but poses no additional risk. It can be used for showering and flushing toilets (Figure 3).
- **Do Not Drink and Do Not Boil:** Water should NOT be used for drinking, cooking, or boiling, as boiling may pose inhalation risks. Cold or tepid water can be safely used for flushing toilets and showering.
- **Do Not Use:** Water should NOT be used for any purpose.
- **Boiled Water Notices:** Water should NOT be used for drinking or cooking unless boiled. It may be safely used for showering and flushing toilets.

What To Do If You Rely on A Publicly-Regulated or Private Water System

For California residents whose water is supplied by a local water utility, **the water provider is responsible for implementing testing and treatment procedures after a wildfire**[10]; however, it should be noted that there are no firm standards on when such procedures should be implemented post-fire. Additionally, if contamination occurs, standard treatment and disinfection methods may not adequately remove contaminants to meet California's public health standards.[13] It is recommended you visit your local water provider's website to review current water quality test results. If you experience health symptoms associated with water contaminant exposure (e.g., dizziness, vomiting, etc.), stop using potentially contaminated water sources and seek medical attention.

Residents can also take several proactive measures post-fire to enhance their safety including:

- **Immediately check local water quality notices upon returning home** before assuming tap water is safe.
- **Follow all advisories from your local water provider**. Advisories and instructions for safe water use can be found on their local website or social media platforms.
- **Check with your local water company about potential locations for clean or bottled water distribution** if you are under a water quality advisory.[12]
- **Flush all household fixtures (e.g., pipes, faucets, toilets) to remove residual contaminants from plumbing systems.** The Los Angeles Department of Water & Power website (https://www.ladwp.com/publications/newsletters/articles/guide-flushing-water-pipes) provides detailed instructions on flushing household fixtures.
    - For additional concerns, independent water testing by laboratories accredited by the Environmental Laboratory Accreditation Program (ELAP) is recommended, but can be expensive and results may be difficult to interpret. Accredited laboratories and interpretation resources can be found on the California State Water Resources Control Board website (https://www.waterboards.ca.gov/drinking_water/certlic/labs/).

What To Do If You Rely on a Private Well

For those who rely on private, domestic wells, **ensuring water safety after wildfires is the responsibility of the individual well-owner**. Private well users should independently test and remediate any contamination[10], utilizing the ELAP-accredited labs and interpretation resources mentioned above.

The most common issue affecting wells post-fire is loss of water pressure caused by inoperative pumps due to outages in power supply. To assess this, turn on a faucet. If no or intermittent flow comes from the faucet, this indicates pressure loss. If this occurs, you can prime the pump to recover some pressure if other components are broken. **If pressure loss occurs, do not drink the water until it has been tested, at minimum, for bacterial contamination.** If well components are damaged or constructed from synthetic materials, testing for VOCs and other contaminants is recommended.[14] If water pressure is normal, but water odor or appearance is abnormal, do not use the water. Instead, flush the water lines

until the smell or color returns to normal. Note that normal appearance or odor does not guarantee safety, so testing for bacterial contamination, heavy metals, PAHs and VOCs is strongly recommended before resuming use.[14]

Figure 4: Charred well pump and piping. *PC: Tennessee Department of Health*

If there is visible damage to your well equipment, indoor or outdoor pipes (Figure 4), or well's electrical components, contact a licensed well contractor for repairs and conduct appropriate testing. Additionally, if equipment is damaged, disinfecting and flushing your well is essential. **Well water is not safe to drink during the disinfection process.** You need to plan to have at least a 24-hour supply of safe drinking water before disinfecting your well, generally five gallons per person per day.[15] Disinfection is most effective if performed during low water-use times, such as late at night.[14] For detailed instructions on disinfecting your well, refer to the Centers for Disease Control and Prevention (CDC)'s water emergency website (https://www.cdc.gov/water-emergency/).

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