Catastrophic wildfires impact water quality across the Delta watershed

2025 State of Bay-Delta Science

Delta Science Program

DELTA STEWARDSHIP COUNCIL

How are wildfires changing?

Wildfires around the world are becoming more frequent and more destructive. Climate change is increasing fire risk by driving higher temperatures, drier air, and earlier snowmelt.

In California, the fire season is now almost year-round. The total area burned in the state in just two recent years (2020 and 2021) was greater than all large wildfires combined for nearly the previous century (1932-2019). And California's eight largest wildfires in modern history all occurred in the Sacramento-San Joaquin Delta (Delta) watershed between 2018 and 2024.

How do wildfires affect water quality?

Wildfires affect **water quality** across entire watersheds. Wildfire smoke carries pollutants and other particles downwind, while storms immediately after a fire can cause significant erosion and runoff that carries contaminants and other materials downstream.

Water quality effects include higher stream temperatures, lower oxygen levels, changes in water chemistry, cloudier water filled with sediments, and increased nutrients and other contaminants. In urban areas, wildfires release heavy metals and other toxic materials when human infrastructure burns.

Trends

Wildfires are increasing in frequency, size, and severity across the world as temperatures rise and other climate change impacts are felt.

Challenges

Limited monitoring data affects our ability to detect and manage post-fire water quality impacts.

? Uncertainties

80% of California's water supply passes through reservoirs, but we know relatively little about reservoir water quality after major wildfires.

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What are we learning?

In general, the larger and more intense a wildfire, the greater its impact on water quality. Runoff and erosion on burned areas allows sediments, nutrients, and other contaminants to quickly move downstream to reservoirs and other waterways. Post-fire weather conditions strongly influence the types of water quality impacts that occur, while how long impacts are felt depends on how quickly vegetation recovers. As climate change creates hotter, drier conditions, vegetation regrowth may be slower and water quality impacts longer lasting.

Research is shedding light onto how wildfires occurring in the Delta watershed are affecting water quality and ecosystems. Higher levels of nutrients and wildfire smoke are linked to harmful algal blooms. Loss of adjacent vegetation can raise stream temperatures to lethal levels for fish. More sediments and nutrient loads in reservoirs reduce water clarity, alter water chemistry, and disrupt food webs. Accumulation of sediments in reservoirs is also projected to reduce their future storage capacity.

As wildfires grow in size and severity in the future, threats to water quality and ecosystems will also rise. Improving monitoring systems to provide continuous and timely data is critical for us to better understand and address water quality impacts when and where they occur.

Three key takeaways

As future wildfires grow in size and severity, threats to water quality and ecosystems will also rise.

Strong storms immediately after intense wildfires can create severe water quality impacts.

Continuous monitoring systems are critically needed to improve detection of and responses to water quality impacts.

About the State of Bay-Delta Science

The State of Bay-Delta Science is a synthesis and communication project coordinated by the Delta Science Program to summarize the scientific understanding, or "state of the science," of important topics in the Bay-Delta system. For more information, visit the SBDS website at https://sbds.deltacouncil.ca.gov.

This summary is based on the 2025 State of Bay-Delta Science article by Dahm et al. (2025).

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