

### Tubbs and Nuns Fires

In October 2017, the Tubbs and Nuns Fires burned a combined 93,363 acres. This amounted to 8% land coverage of the Russian River watershed and 28.5% of the Laguna-Mark West Creek sub-watershed<sup>1,2</sup>. More than 8,000 structures were damaged or destroyed, elevating the potential for toxics-laden runoff within these watersheds. Surface waters within and downstream of the Tubbs and Nuns Fires include impaired waterbodies, endangered species habitat, and source water for drinking water systems.

### Post-Fire Pollutants

During storm events, surface waters and streambed sediments may be adversely affected by fire-related pollutants contained in runoff from burned areas. Many of these pollutants can become attached to suspended particles and enter the streams as storm runoff. In addition to immediate impacts, research has shown that elevated levels of sediment, nutrients, trace metals, and polycyclic aromatic hydrocarbons (PAHs) can be measured in surface waters following fire events for several years post fire<sup>3</sup>.

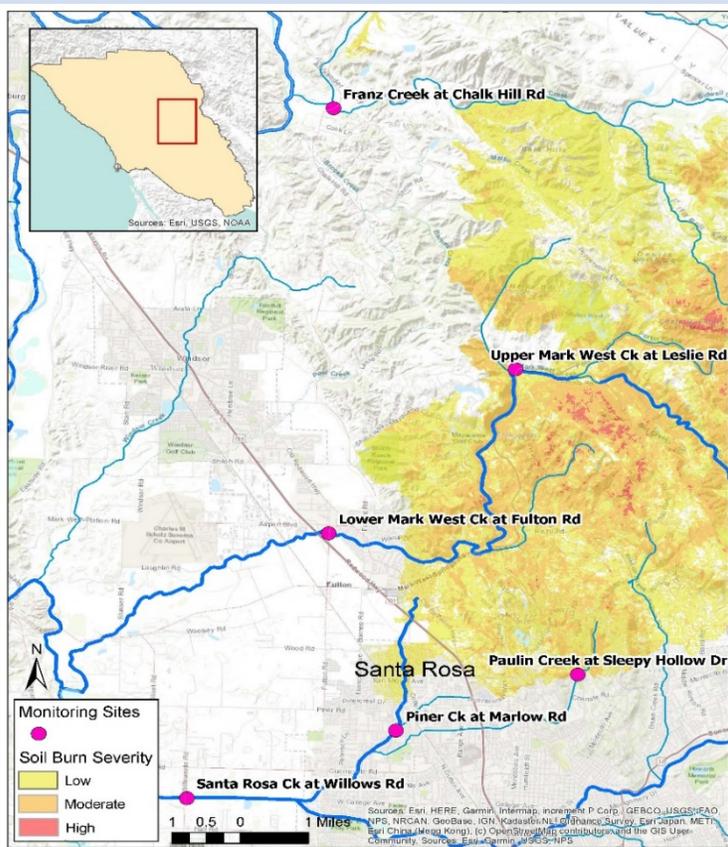


Figure 1. Post-fire water quality monitoring sites along Franz Valley Creek, Mark West Creek, Paulin Creek, Piner Creek, and Santa Rosa Creek.

### Monitoring Activities

Regional Water Board staff assessed potential impacts to surface waters downstream of burned areas by monitoring surface water runoff during five storm events over two winters and streambed sediments collected over two consecutive years.

Surface water monitoring:

Regional Water Board staff conducted surface water monitoring at four locations in November 2017 and March 2018. A [fact sheet](#) summarizing the surface water results and conclusions was released in 2018. Two additional monitoring locations were added in 2019, one in Franz Creek in the Maacama Creek watershed and another in Paulin Creek in the Mark West Creek watershed. In total, six locations (Fig. 1) were monitored during two rainfall runoff events on January 6 and January 16, 2019.

Streambed sediment monitoring:

After the release of the 2017-18 fact sheet, Regional Water Board staff collected streambed sediment samples at all six monitoring locations during the dry season following the winters of 2017-18 and 2018-19.

- Citations:
1. Tubbs Fire Watershed Emergency Response Team Final Report. (November, 15 2017). [http://www.fire.ca.gov/communications/downloads/Watershed\\_reports/20171115\\_TubbsWERT.pdf](http://www.fire.ca.gov/communications/downloads/Watershed_reports/20171115_TubbsWERT.pdf)
  2. Nuns Fire Watershed Emergency Response Team Final Report. (November, 15 2017). [http://www.fire.ca.gov/communications/downloads/Watershed\\_reports/20171115\\_NunsWERT.pdf](http://www.fire.ca.gov/communications/downloads/Watershed_reports/20171115_NunsWERT.pdf)
  3. Stein ED and Brown J (2009). *Effects of Post-fire Runoff on Surface Water Quality: Development of a Southern California Regional Monitoring Program with Management Questions and Implementation Recommendations* (Technical Report 598). Southern California Coastal Water Research Project. <http://www.sccwrp.org>
  4. MacDonald DD, Ingersol CG, Berger TA (2000) *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems*. Arch Environ Contam Toxicol 39:20–31

### Data Evaluation

Evaluation guidelines were developed from the North Coast Regional Water Quality Control Board Basin Plan, U.S. EPA Water Quality Criteria, and Maximum Contaminant Levels published by the State of California. Additionally, monitoring results were compared to baseline samples as well as historical data from Santa Rosa Creek and the greater Russian River watershed.

**Water samples** were assessed for more than 60 parameters, including nutrients, metals, polycyclic aromatic hydrocarbons (PAHs), and toxicity endpoints.

- Metal concentrations exceeded evaluation guidelines in some instances, though were within the historic range of concentrations observed during runoff storm events (Fig. 2)
- Low level concentrations of PAHs were detected in November 8-15, 2017 and January 6, 2019 on Piner Creek downstream of the Coffey Park urban area, and minimally detected at 3 other locations on January 6, 2019 Mark West Creek did not have any PAH detections.
- All water column samples were negative for toxicity.

**Sediment samples** were assessed for more than 70 parameters, including metals, PAHs, dioxins, and toxicity endpoints.

- In 2019, observed metals concentrations exceeded consensus based probable effects concentrations<sup>4</sup> for chromium (3 of 6 sites), nickel (5 of 6 sites), and zinc (2 of 6 sites), though sediment toxicity was not observed at these locations.
- PAHs were detected at 4 of 6 sites in 2018 and at every location in 2019, with the highest concentrations observed on Piner Creek, downstream of the Coffey Park urban area. Three of the four PAH constituents exceeded consensus based probable effects concentrations in 2018, though sediment toxicity was not observed at Piner Creek.
- Toxicity tests were performed on every sediment sample. Paulin Creek in 2018 and Franz Creek in 2019 exhibited reduced survival (acute toxic response) in the test species, however no causal factors were identified.

### Conclusions

- Water Year (WY) 2018-2019 was an above average year for precipitation with storm intensities and the number of storms being greater than in WY 2017-2018, a below average year for precipitation. The higher intensity storm of March 2018 did document the greatest concentrations of metals in surface water (Fig 2).
- Analysis of streambed sediments in November 2018 suggest that deposition of fire related residues may have taken place as a result of stormwater runoff from municipal areas in the Santa Rosa Creek watershed. The highest pollutant concentrations were recorded in streams within the urban dominated Santa Rosa Creek watershed.
- Widespread deposition of fire related residues and elevated streambed metal concentrations in October 2019 suggests that the increased precipitation and associated erosion was much greater during the storms of WY2018-2019, however these residues were not at levels that caused aquatic toxicity or threats to human health.

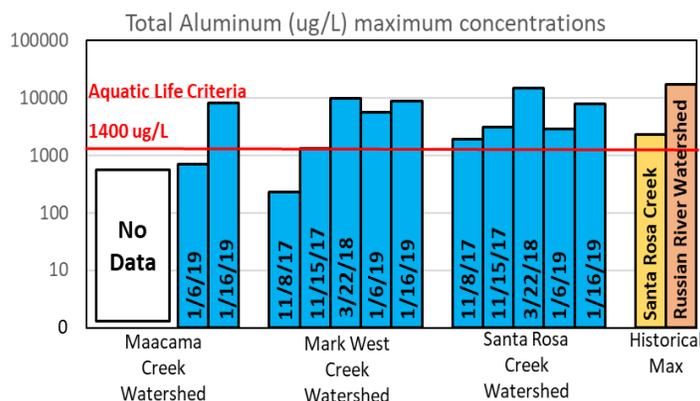


Figure 2. Comparison of post-fire total aluminum concentrations to historical data.

### Kincade Fire Monitoring

Planned sampling of surface waters within the footprint of the Kincade fire for WY 2019-2020 has not occurred due to the lack of storms meeting our sampling criteria. The Water Board will be consulting with our state and local partners to determine next steps for potential future sampling to assess impacts from the Kincade Fire.