

Surface Water Quality Issues Associated with Wildfires

• Cooperative Extension Service •

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INTRODUCTION

Catastrophic wildfires such as the Hermit Peak fire can have effects on the physical, chemical, and biological properties of surface waters. Wildfires followed by monsoon rains can lead to flooding, and surface water bodies such as ponds and streams are susceptible to influxes of large quantities of sediment, organic debris, ash, fire retardant, nutrients from all the decaying vegetation, and other potential contaminants that may significantly degrade water quality and impair aquatic habitats. The decomposition process consumes oxygen, leading to drops undissolved oxygen, which can result in fish kills.

Impacts to Livestock Water

ASH: Ash often contains elevated levels of ammonium, nitrate, phosphate, and potassium, and may also contain trace levels of antimony, arsenic, copper, lead, mercury, or zinc, however concentrations in water that exceed guidelines for livestock drinking water have rarely been documented (Waskom et al.2013). Testing of the water is recommended prior to allowing livestock to drink if the producer suspects that the water has been impacted. Table 1 lists levels generally considered safe for some potentially toxic nutrients and contaminants in water for cattle. If livestock show signs of illness, a veterinarian should be consulted, and an alternative water source should be used until their drinking source has been tested. Water quality should improve in the pond is being recharged with clean stream water of groundwater.

Table 1. Contaminant levels generally considered safe

Element	ppm
Aluminum	5.0
Arsenic	0.2
Boron	5.0
Cadmium	0.05
Chromium	1.0
Cobalt	1.0
Copper	0.5
Fluorine	2.0
Lead	0.1
Mercury	0.01
Nickel	1.0
Selenium	0.05
Sulfate	1000.0
Vanadium	0.1
Zinc	25.0

NITRATES: Nitrate and phosphorus levels will increase in surface waters increase following a wildfire. The nitrates are not very toxic, but in the rumen the bacteria reduce them to nitrites that then get into the blood stream. Nitrites convert the red pigment, hemoglobin (responsible for carrying oxygen from the lungs to the tissues) to a dark brown pigment, methemoglobin, which will not carry oxygen. For more information on how nitrate can affect livestock refer to Guide M-114 (Sallenave, 2017). The maximum contaminant level (uppermost limit at which water is considered safe) of Nitrate-N is 100 mg/L (100 ppm).

TURBIDITY: Wildfires defoliate soils leaving them bare and susceptible to erosion. These soils and sediments will result in turbid (cloudy) waters caused by suspended particles. High turbidity may also affect the palatability and acceptance of livestock water.

CYANIDE: Cyanide can be of special concern after wildfires because it is a product of some types of the red fire-retardant slurry. Some cyanide is produced naturally in wildfires, but increased levels of cyanide are most likely due to the use of fire-retardant slurry. According to experts, this should rarely be a problem unless the livestock are in direct contact with the slurry, or the slurry is in or washed into livestock drinking water supplies (Surber, 2002).

CYANOBACTERIA: The increased water temperature and nutrients following wildfires will also increase algae growth in surface waters. Cyanobacteria, also known as blue-green algae can be toxic to animals. Refer to Guide W-106 (Sallenave, 2020) for more information about Blue-green algae and how to mitigate for their presence. The presence of blue-green algae does not necessarily indicate that toxins are being produced. There is no good method to predict whether or not the algae will produce the toxins. If you suspect algae toxicity, look for any dead animals around the water source, as nearly all animals are affected.

Impacts to Irrigation Water

Surface water bodies that have received runoff from a wildfire are usually dark in color, and may have a higher pH, and increased total salt, ash, and sediment concentrations. Irrigation water with pH greater than 8.5 is considered high and can affect the availability of certain plant nutrients. It can also increase the sodium hazard if the water has a high sodium adsorption ratio (SAR). However, high concentrations of ash and sediment generally pose more of a physical problem with irrigation infrastructure (by clogging filtration systems of sprinklers and drip systems, for example) and systems (restricting head gates and diversion structures) than a chemical hazard to crops.

References

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