Texas Commission on Environmental Quality

Surface Water Quality Concerns from Wildfires in Texas

A fact sheet for the Lost Pines Recovery Team

What are the potential effects of wildfires on water quality in lakes, rivers, and streams?

Fire can have an impact on the physical, chemical, and biological structure of aquatic ecosystems. The effects of fire on water quality are dependent upon the fire size, intensity, severity, the proximity to surface water bodies, and the timing of fires in relation to rain events. The effects of fire on aquatic ecosystems can be divided into direct and indirect effects. Direct effects may include increases in temperature, ash, nutrients, and charcoal. The indirect effects of fire may include increases in sediment and nutrient loading, turbidity, and alteration of stream channel morphology.

When would we begin seeing impacts from wildfires on water quality?

The majority of water quality impacts from wildfires are not apparent until after a heavy rainfall that causes soil erosion and subsequent runoff into nearby lakes, rivers, and streams. Burned ground causes more of the rainfall to quickly run off into streams, rivers, and reservoirs. Frequent wildfires can alter soil chemistry and stormwater runoff characteristics, which can result in adverse effects to downstream water quality. Increased storm flow and sediment runoff following fires have been associated with increases in nutrients, metals, and certain organic pollutants.

What are the effects of increased nutrients in lakes, rivers, and streams?

Impacts from wildfire on the chemical composition of surface waters are not well documented, but studies suggest that nutrient loads, particularly phosphorus and nitrogen increase after fires due to elevated nutrients in runoff. Increased nutrients may cause long-term impacts such as increased plant growth, algae blooms, and oxygen depletion.

How do wildfires affect stream flow?

Burning that removes vegetation from a site can potentially alter stream hydrology. When an area has experienced significant vegetation loss and litter layer removal, runoff can cause serious erosion problems and result in higher stream discharges, increasing the potential for flooding. The high fire temperatures can also make the soils more susceptible to erosion and increase sedimentation in nearby water bodies.

How do wildfires affect stream sediments?

Extensively burned areas may contribute significant sediment loads by increasing overland flow and by leaving bare soil susceptible to direct rainfall impact. Rates of soil erosion are dependent on the topography of the site. Increased sediment loads following a fire can impact the ecological health of a river or stream by reducing available aquatic habitat and causing shifts in the number and type of aquatic organisms. Soil nutrients are carried with post-fire rainfall runoff into lakes, rivers, and streams. For example, phosphorus is a nutrient that readily binds to sediment and is commonly correlated with sediment loads in streams.

Do firefighting retardants pose a threat to aquatic life or the quality of lakes and streams?

Firefighting chemicals can have adverse impacts on water quality and ultimately on fishes and other aquatic life. Retardants can cause fish kills if applied directly over lakes and streams. This is because ammonia nitrogen is in many retardants and ammonia is very toxic to fish. Retardants may also contain large quantities of nitrogen and phosphorus which if flushed into a stream or lake can reduce oxygen in the water body. If retardant has not been sprayed directly over lakes and streams, the possibility of runoff will depend largely on the amount of rainfall, the steepness of the terrain, and the size of the receiving stream or lake.

Can people swim in water bodies in areas that have experienced wildfires?

Natural water bodies, especially where warm and stagnant, may contain organisms or contaminants that can cause illness in people. The additional runoff from burned areas can contribute to adverse water quality impacts, but the following should be taken into consideration before swimming in any natural water body. The Centers for Disease Control and Prevention and other health agencies do not recommend swimming in:

- stagnant water or water with dead fish or algae floating on the surface
- natural water bodies immediately after a heavy rain
- water near sewer pipes, discharge pipes, or storm drain outlets
- water frequented by livestock

Sources:

Arizona Department of Environmental Quality <azdeq.gov/environ/water/dw/download/wildfires.pdf>

Southern California Coastal Water Research Project (Post-Fire Runoff Monitoring Plan) <sccwrp.org>

Forest Encyclopedia Network <forestencyclopedia.net>

Centers for Disease Control and Prevention <cdc.gov>