Runoff following the Cerro Grande Fire
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The Cerro Grande Fire of May, 2000 burned almost 43,000 acres of forested land near Los Alamos, NM. The fire burned nearly 7,400 acres on the Los Alamos National Laboratory (LANL or the Laboratory) and major portions of watersheds draining onto LANL from adjacent Santa Fe National Forest lands. In these Forest Service watersheds above the Laboratory, from 20 to 80 percent of acreage burned was considered "high severity burn". On LANL, most of the area burned was considered low severity burn, but numerous small structures burned and some inactive waste sites had cover vegetation at least partially burned.

It has been well established through studies around the world that runoff and sediment yields can dramatically increase following wildfires. Accompanying these physical changes are changes in the composition or quality of runoff water. At Los Alamos, these changes may be severe due to the steepness of the burned terrain and the high severity of the burn, creating water-shedding hydrophobic soils (BAER, 2000).

Immediately after the fire, these increases in predicted runoff and sediment yields raised concerns about erosion of contaminants that exist in soils on LANL, and about movement of these contaminants to offsite lands and potentially to the Rio Grande.

To understand the possible impact to downstream water bodies, runoff events after the fire were monitored and sampled by the Laboratory. An extensive network of automated samplers and stream gages served as the cornerstone of this effort (fig. 1). By the end of the year 2000 runoff season, over 90 separate runoff samples had been collected and submitted to outside commercial analytical laboratories. Additional complementary monitoring of the Rio Grande by the U.S. Geological Survey during flood events will provide considerable information to scientists about the contaminant risks from the runoff.

Due to a general lack of intense "monsoon" type rainfall during the summer of 2000, severe runoff passing across the Laboratory was limited to a single event on June 28. Record peak discharges were recorded for several drainages leading onto LANL during that event. For example, in Water Canyon above NM Highway 501, the estimated peak of 840 cubic feet per second (cfs) dwarfed the pre-fire maximum of 0.3 cfs. Fortunately, downstream property damage from this storm was minimized due to precautionary engineering. It remains to be seen what impacts will be felt during wetter rainy periods in later years.

Based on our review of the early results, the most significant aspects of the chemical quality of the runoff water appears to be in the contaminants being carried by the runoff, as opposed to those that are dissolved in the water. Samples of the sediment and ash being carried onto the Laboratory by the runoff contain higher levels of radionuclides and metals than those measured in local background soils and sediments before the fire. The radionuclides appear to be from decades of accumulation of radioactive fallout in trees and other plants, and in forest ground litter. The metals include mineral nutrients (like calcium and potassium) and trace concentrations of other metals that are naturally in soils. Several of these materials are 10 times higher than before the fire. Also, approximately one-half of the turbid water samples contained cyanide. Fortunately, we have detected little of the most biologically harmful form of cyanide.

Concentrations of most metals dissolved in stormwater are below the EPA or NM drinking water standards; however, a few (for example, aluminum, barium, manganese) are above the standards in many samples. Dissolved manganese concentrations increased by about 50 times above pre-fire levels; barium by 20. Concentrations of radionuclides dissolved in stormwater are slightly elevated or comparable to pre-fire levels.

Two separate scientific panels are working to formally evaluate the health risks, if any, posed by these contaminants. They hope to have some early results available to the public before the start of the second season of post-fire runoff. This is a considerable challenge. The health experts must not only review the concentrations of the many hundreds of chemicals tested for, but they also must determine the likelihood that some person or organism would come in contact with the chemicals. Then they face a difficult task of communicating the results of their studies to a public that may be very fearful of contacting any chemicals or pollutants at any level.

Reference:
Cerro Grande Fire Burned Area Emergency Rehabilitation Plan, by Interagency Burned Area Emergency Rehabilitation Team (BAER), June 9, 2000.