Post-Fire BAER Assessment

Burned Area Emergency Response (BAER)

Information Brief

Understanding Soil Burn Severity

We tend to think of wildfire burn severity in terms of the visual impacts to above-ground vegetation, but the post-fire landscape response (erosion, flooding, and mass movement) is generally more strongly correlated to *soil* burn severity. When characterizing soil burn severity, looking at the vegetation is a good starting place to understand the conditions on the ground.

Armed with that information, the BAER team's watershed specialists (soil scientists, hydrologists, and geologists) ground-truth different vegetation burn intensities to tease out patterns of how fire affected and changed the properties of the soil. Pre-fire ground cover, forest type, fire behavior, slope, aspect, and other factors all influence soil burn severity. After field observations are collected, specialists adjust the vegetation severity map to create the soil burn severity (SBS) map. The SBS is broken into four different classes: unburned (green), low severity (blue), moderate severity (yellow), and high severity (red).

So, what do these different classifications mean?

LOW severity areas generally have intact and recognizable litter layers (organic material on the forest floor, such as pine needles and twigs). These litter layers may be charred but are not consumed. Underlying topsoil is intact, and near-surface fine roots are unburned. These soils have enough cover to protect them from erosion during rain events because their natural porosity and structure allow rain to soak into the soil instead of running off, while fine roots provide stability. In low severity areas, burns may have been patchy islands of green vegetation and intact canopies may be present.

MODERATE severity areas generally have more—up to 80% of their pre-fire surface litter layers consumed by fire. Black or gray ash may be present on the soil surface. Fine roots near the surface may be scorched and killed. Topsoil layers are generally intact with minimal impacts to the soil's ability to absorb moisture. Soils with moderate severity are more susceptible to erosion in post-fire rain events because they have lost protective surface cover and may have less surface stability because of root mortality.

HIGH severity areas generally have had all their pre-fire surface litter layers consumed by fire. White or gray ash may be present on the soil surface. Fine roots are often fully burned/consumed within several inches of the soil surface, and even large tree roots may have burned deep into the soil. Soil may be powdery or grainy and loose, unable to bind together and retain water. These soils are very susceptible to erosion and often have high surface run-off during rainstorms.

So, what does the BAER team do with the SBS map?

The BAER team uses the SBS map to make predictions about how the landscape will respond after fires. Soil scientists consider where soil productivity will be degraded due to erosion losses and where sediment may move into stream channels. Hydrologists

use the SBS to predict watershed response—surface runoff from high SBS areas in rainstorms can produce more “flashy” behavior in stream systems. Geologists use the SBS to inform predictions for debris flow or other mass movement potential based on reduced soil stability in steep drainages.

BAER teams focus on emergency responses to stabilize burned areas that may impact Forest Service critical infrastructure or other values located within or immediately downstream of high soil burn severity areas.

BAER SAFETY MESSAGE: *Everyone near and downstream from the burned areas should remain alert and stay updated on weather conditions that may result in heavy rains and increased water runoff. Flash flooding may occur quickly during heavy rain events--be prepared to act. Current weather and emergency notifications can be found at* ***National Weather Service*** *website: www.weather.gov/lox/.*