



# The BAER Team: Responding to Post-Fire Threats

Greg Kuyumjian – Santa Fe National Forest

*Looking downstream in the Middle Fork of Rendija Canyon, burned in the 2000 Cerro Grande fire. Sediment deposition is about one meter deep; note scouring of bark from trees. Photo by John Moody, USGS.*

**M**any wildfires cause minimal damage and pose few threats to land or people, but some cause damage that requires immediate efforts to prevent later problems. These problems include soil erosion from loss of vegetation; flooding from increased runoff; and increased sedimentation downstream, which can damage houses or fill reservoirs, putting endangered species and community water supplies at risk.

The Burned Area Emergency Response (BAER) program of the U.S. Forest Service (USFS) is designed to address these emergency situations. BAER aims to prescribe and implement emergency

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treatments on federal land to minimize threats to life or property resulting from the effects of a fire, and to stabilize and prevent unacceptable degradation to natural and cultural resources.

The BAER team's work includes assessing

post-fire conditions, recommending and implementing treatments, and monitoring. The entire process happens very quickly, usually within two to five weeks. In the Southwest, speed is required to get emergency stabilization and flood control measures in place before the onset of monsoonal thunderstorms in mid-July.

### ***Assembling the Team***

In the Southwestern Region of the USFS (Arizona and New Mexico), a BAER team is required for all fires greater than 300 acres. The BAER team leader is typically selected by the Forest Supervisor in late spring, at the start of the fire season. This leader initiates action when the fire is about 60 percent contained. After quickly evaluating the types of risks present, the leader assembles a core team of professionals such as hydrologists, soil scientists, engineers, biologists, vegetation specialists, and archeologists, primarily from the local area. For large fires like the 195,000-acre Rodeo-Chediski (eastern Arizona, July 2002), or complex fires such as the Aspen Fire (more than 300 homes lost and 85,000 acres burned, southern Arizona, July 2003), experienced BAER team members are brought in from the Southwest region. Within a few days of arriving on site, the BAER leader

### **What BAER can do:**

- Install water or erosion control devices.
- Plant for erosion control or stability reasons.
- Install erosion control measures at critical cultural sites.
- Install temporary barriers to protect treated or recovering areas.
- Install warning signs.
- Replace minor safety related facilities.
- Install appropriate-sized drainage features on roads, trails.
- Remove critical safety hazards.
- Prevent permanent loss of threatened and endangered species habitat.
- Monitor BAER treatments.
- Plant grass to prevent spread of noxious weeds.

### **What BAER cannot do:**

- Replant commercial forests or grass for forage.
- Excavate and interpret cultural sites.
- Replace burned pasture fences.
- Install interpretive signs.
- Replace burned buildings, bridges, corrals, etc.
- Repair roads damaged by floods after fire.
- Replace burned habitat.
- Monitor fire effects.
- Treat pre-existing noxious weeds.

*The Cans and Cannots of BAER Rehabilitation Crews, from the Aspen BAER Web site.*

selects core team members, develops an organization chart, and drafts logistics. By 85 percent containment, the entire interdisciplinary team has been assembled.

### **Assessing Conditions**

The core team immediately begins gathering data about fire progression, fuels burned, and remote sensing imagery availability, and drafts a list of “values at risk.” For large fires, a critical first step is setting a target completion date for treatment before the first damaging storm. Working backward from that date, the size and pace of assessment is defined, along with the scope and extent of treatments. Assessment is usually completed in five to eight days, during which time full containment usually occurs.

First and foremost, the team must evaluate the potential for threats to public safety, life, and property associated with post-fire conditions. What critical transportation infrastructure must remain open? Might any power, water, or sewer lines be cut off or affected by runoff and debris? Are any populations of threatened and endangered species or heritage resource sites listed in the *Federal Register* in the area? Most importantly, can anything be done about it? To answer these questions, the team gathers available data from the USFS and contacts other federal agencies, state and county governments, flood control districts, emergency services, adjacent or affected tribal entities, and anyone else who might be affected.

The first tool developed during assessment is a burn-severity map, which identifies areas of the landscape similarly affected by the fire. Typically, the first draft will be developed using LANDSAT or other remote sensing platforms, and field-verified by soil and water specialists. Burn severity maps are overlain with other coverages to evaluate expected changes between pre-fire and post-fire conditions for the same magnitude storm event. A variety of models are used to evaluate hillslope erosion, sediment delivery, and changes in the timing, peak, and total stream discharge. Potential problem areas are identified and treatment scenarios evaluated.

### **Recommending Actions**

The USFS requires the BAER team to submit proposed actions (or a recommendation of no action) within seven days of containment. For the Rodeo-Chediski Fire, 35 individuals were involved in the assessment and recommendation process.

A variety of rehabilitation techniques may be recommended. The primary techniques used are reseeding of ground cover with quick-growing or native species; mulching with straw or chipped wood; constructing straw bale dams in small tributaries; placing fallen trees to catch sediments on steep slopes; and digging below-grade pits to catch runoff and store sediments. Recommendations may also include modifying drainage structures by installing debris traps; enlarging culverts; installing standup inlet pipes to allow drainage to flow if culverts become plugged; adding additional culverts; or constructing emergency spillways to keep roads and bridges from washing out during floods. The team may post warning signs and remove structures that could block flow, trap sediment, or impact water quality. Recommendations must be prioritized so the most critical threats are addressed first.

### **Ash Happens**

BAER treatments do not ensure problem-free post-fire precipitation events. Time, money, and terrain constraints may preclude sufficient treatment to make a difference. In the Southwest, closing an area during the monsoon or when heavy precipitation is forecast is not uncommon. Regardless of treatment, ash will run into the channel network. An early warning to downstream water users can reduce impacts. For example, water treatment facilities can be warned to close their intakes until ash-laden flows pass by.



*Trash rack constructed to prevent large debris from washing downstream in Carter Canyon, Santa Catalina Mountains, Arizona. Top: July 17, 2003, just after containment of the Aspen Fire. Bottom: Oct. 12, 2003, showing three months of regrowth. Photos from the Aspen BAER Treatment Monitoring Report, Appendix B.*

### **Implementing Treatment**

BAER cannot provide permanent solutions to temporary problems; the team must focus on immediate threats and the time available before storms arrive. The table at left shows the kinds of treatment BAER can and cannot do. In most cases, only a portion of the burned area is treated. Treatments focus on severely burned areas, very steep slopes, places where water runoff will be excessive, and fragile slopes above homes, businesses, municipal water supplies, and other facilities.

Where a dramatic increase in runoff and sediment load is expected, existing infrastructure can itself present a problem. Apparently harmless recreational features such as picnic tables or management tools such as riparian fencing can block drainages or trap sediment. In both the Rodeo-Chediski and Aspen fires, vault toilets

*See BAER, page 32*

*BAER, continued from page 15*

were threatened with post-fire flooding, in turn threatening water quality and potentially creating human health concerns. As part of BAER treatment, the toilets were pumped, sanitized, and shut down.

### ***Monitoring the Results***

Monitoring may be conducted during and after treatments to examine implementation, effectiveness, and results.

This process can include measuring the distribution density and mix of seed, photodocumenting the regrowth of vegetation, noting whether channels flow freely or become blocked once runoff begins, and noting how infrastructure holds up. Monitoring during the treatment period helps determine if additional efforts are necessary. After treatment, monitoring identifies successful methods as well as undesirable results.

The BAER process in the Southwest involves an intense work schedule, rapid decision-making, and a race against the weather. The team disperses once the emergency rehabilitation measures are in place, although some members may return a few months later for final monitoring.

*Details of the actions taken and results achieved by the 2003 Aspen BAER team can be found in the monitoring report at [www.volunteertaskforce.org/aspenbaer/Aspen\\_BAER\\_Monitoring\\_Home.htm](http://www.volunteertaskforce.org/aspenbaer/Aspen_BAER_Monitoring_Home.htm). Contact Greg Kuyumjian at [gkuyumjian@fs.fed.us](mailto:gkuyumjian@fs.fed.us).*