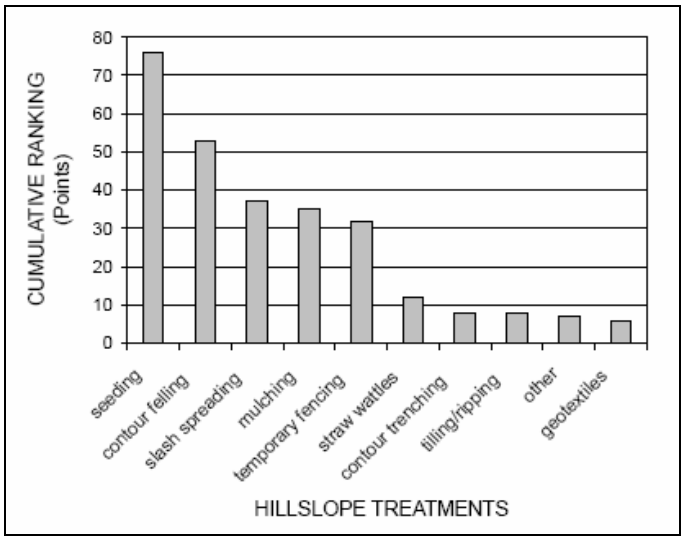
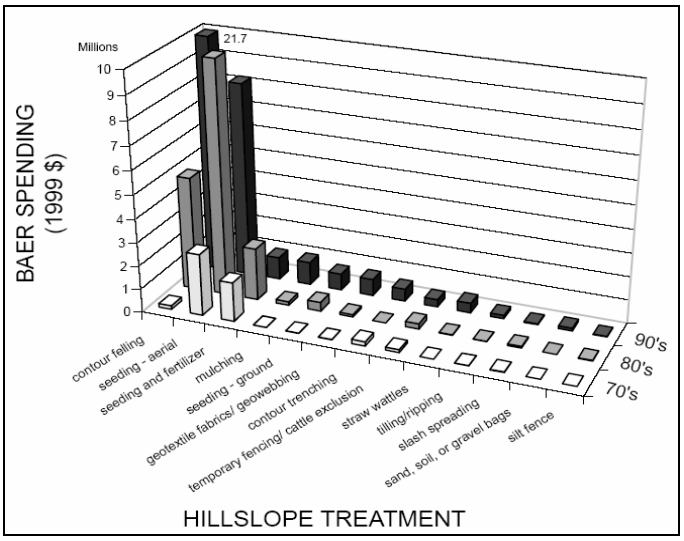
Burned Area Emergency Rehabilitation (BAER) and Forest Area Restoration[1]

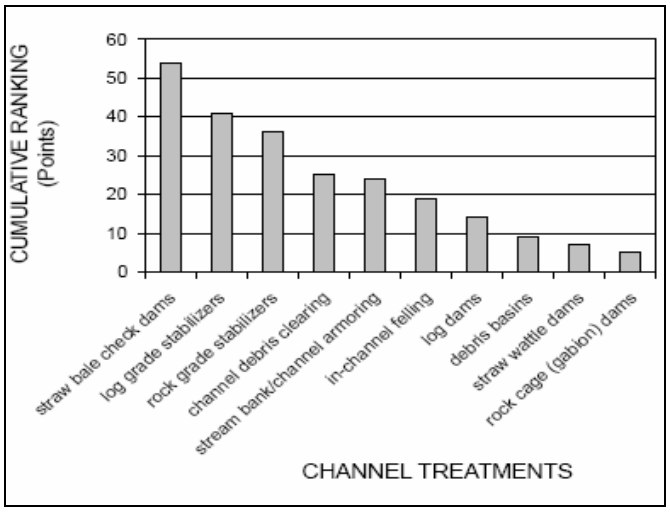
When wildfires produce hydrologic conditions that are poor (less than 10 percent of the ground surface covered with plants and litter), surface runoff can increase over 70 percent and erosion can increase by three orders of magnitude. BAER treatments can be classified into three categories:

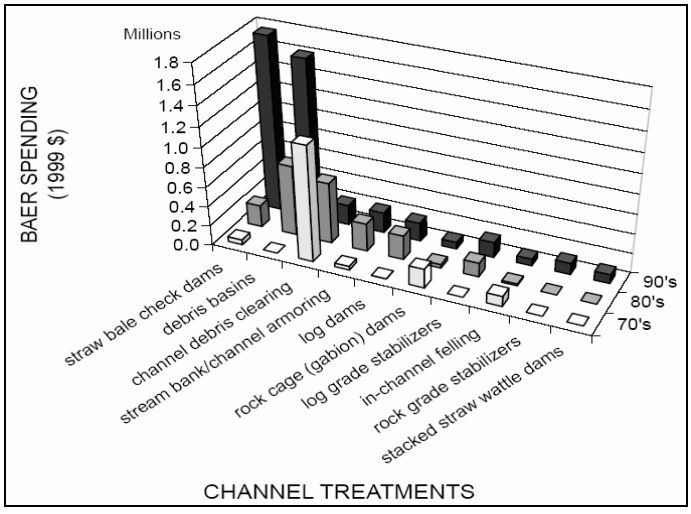
1. Hillslope Treatments—Treatments include ***grass seeding, contour-felled logs, mulch***, and other methods intended to reduce surface runoff and keep post-fire soil in place on the hillslope. These treatments are regarded as a first line of defense against post-fire sediment movement, preventing subsequent deposition in unwanted areas. Other hillslope treatments include ***tilling, temporary fencing, installation of erosion control fabric, use of straw wattles, lopping and scattering of slash, and silt fence construction*** are used to control sediment on the hill slopes. In regard to ground cover, literature indicates $\geq$ 60% ground cover reduces sediment movement to negligible amounts, and 30% cover reduced erosion by about half compared to bare ground.



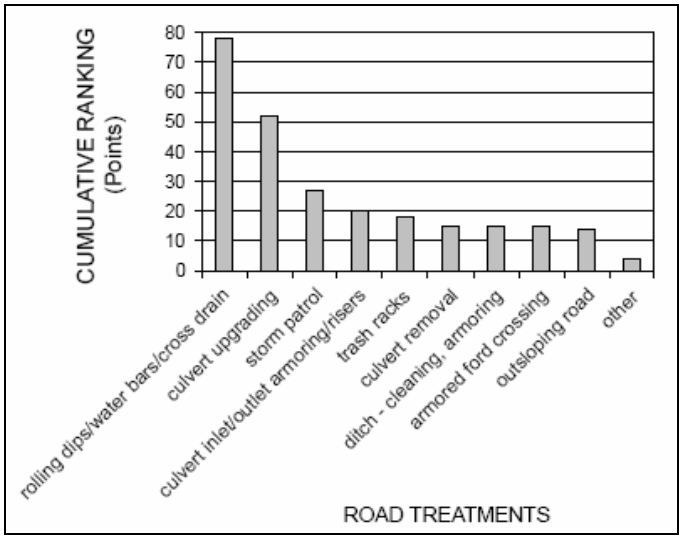


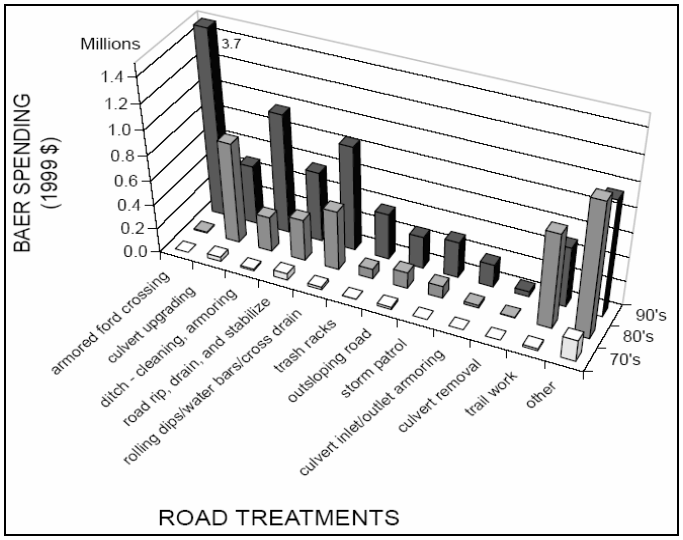
2. Channel Treatments—Treatments include ***straw bale check dams, log check dams, rock dams and rock cage dams***. They are implemented to modify sediment and water movement in ephemeral or small-order channels, to prevent flooding and debris torrents that may affect downstream values at risk. Some in-channel structures slow water flow and allow sediment to settle out; sediment will later be released gradually as the structure decays (e.g., straw bale check dams). ***Channel clearing*** is done to remove large objects that could become mobilized in a flood. Other treatments include ***straw wattle dams, log grade stabilizers, rock grade stabilizers, in-channel debris basins, and stream bank armoring***.

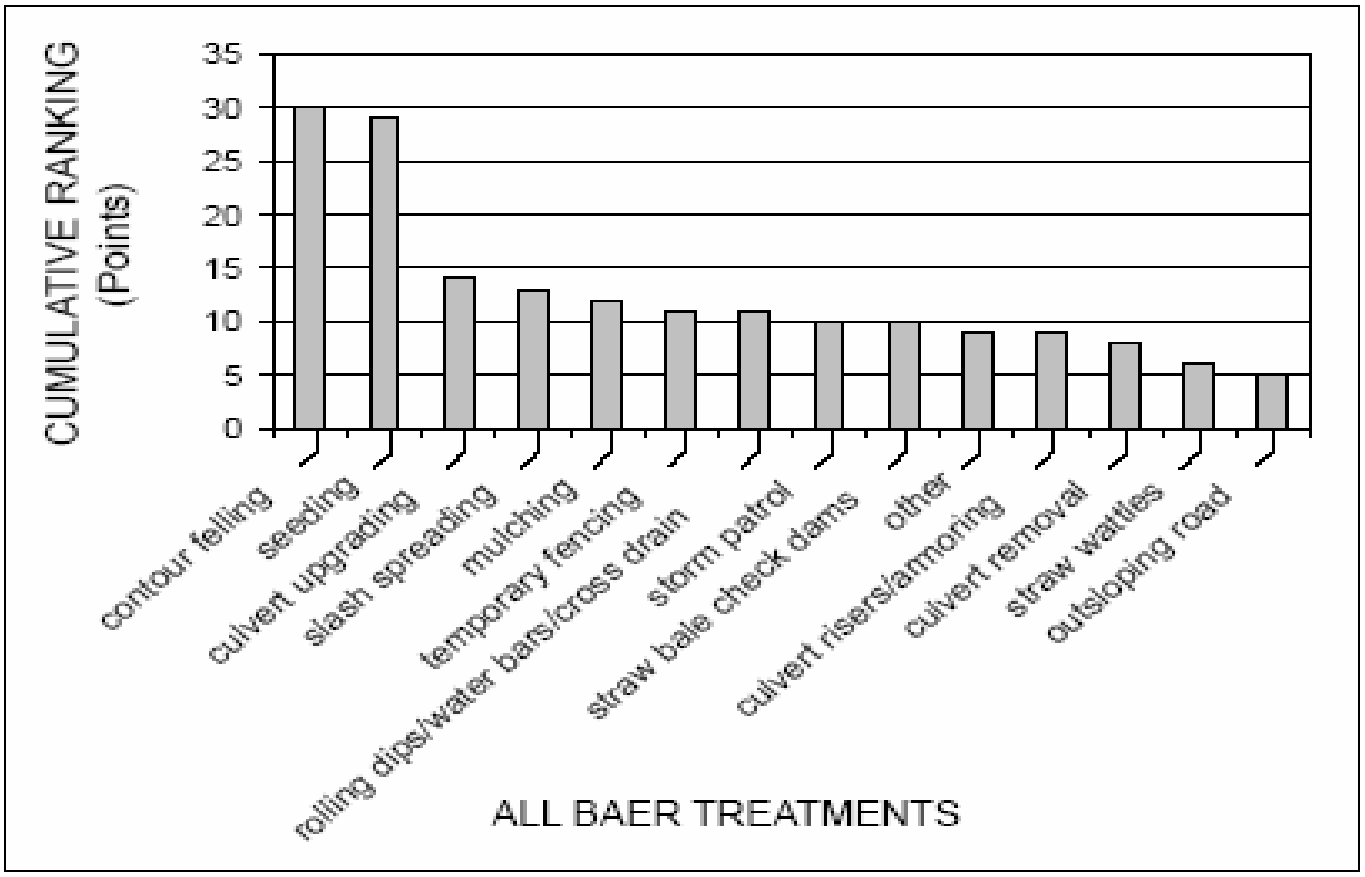




3. Road Treatments—There are a variety of practices aimed at increasing the water and sediment processing capabilities of roads and road structures, such as culverts and bridges, in order to prevent large cut-and-fill failures and the movement of sediment downstream. The functionality of the road drainage system is not affected by fire, but the burned-over watershed can affect the functionality of that system. Road treatments include ***outsloping, gravel on the running surface, rocks in ditch, culvert removal, culvert upgrading, overflows, armored stream crossings, rolling dips, and water bars***. The treatments are not meant to retain water and sediment, but rather to manage water's erosive force. ***Trash racks*** and ***storm patrols*** are aimed at preventing culvert blockages due to organic debris, which could result in road failure that would increase downstream flood or sediment damage.







Cumulative ranking of treatment effectiveness for all treatments combined. Cumulative rankings are taken from interviewees ranking of their top three treatment preferences. The top 14 treatment preferences are shown out of a total of 26 treatments.

Some Conclusions

- Rehabilitation should be done only if the risk to life and property is high since the amount of protection provided is assumed to be small. In some watersheds, it would be best not to do any treatments. If treatments are necessary then it is more effective to reduce erosion onsite (hillslope treatment) rather than collect it downstream (channel treatment).

- Contour-felled logs show promise as a relatively effective treatment compared to other hillslope treatments. This is considered to be true for areas where erosion rates are expected to be high because they provide protection during the first-year post-fire which has the highest erosion rates. In areas that do not have available trees, straw wattles may provide an alternative. However, the effectiveness of contour-felled logs or straw wattles has not been adequately documented in the scientific literature.

- Seeding has a low probability of reducing erosion the first wet season after a fire. There is a need to do other treatments in critical areas. Seeding can provide reasonable cover late in first season and in the second year.

- There is a need to better understand regeneration potential of natural vegetation. Seeding treatment may not be needed as often as currently thought.

- Because seeding is often not "successful," it may have little impact on natural regeneration. Persistent perennials are least effective at providing first year cover and most likely to interfere with later regeneration. Cereal grains (annuals) offer better first-year protection than perennials but generally do not interfere with later regeneration of natural vegetation. Little is known about the effectiveness of native annual grasses.

- To reduce the threat of road failure, road treatments such as rolling dips, water bars, and relief culverts properly spaced provide a reasonable method to move water past the road prism. Storm patrol attempts to keep culverts clear and close areas as needed. This approach shows promise as a cost effective technique to reduce road failure due to culvert blockage.

- Straw bale check dams, along with other channel treatments, should be viewed as secondary mitigation treatments. Sediment has already been transported from the slopes and will eventually be released though the stream system as the bales degrade, although the release is desynchronized.

[1]This synopsis was prepared by Lyn Townsend, Forester, NRCS and is based on Rocky Mountain Research Station General Technical Report 63 *[citation: Robichaud, Peter R.; Beyers, Jan L.; Neary, Daniel G. 2000. Evaluating the effectiveness of postfire rehabilitation treatments. Gen. Tech. Rep. RMRS-GTR-63. Fort Collins: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.]*

BAER Cover Estimation - Step-point Transect Method

The procedure for this exercise involves selecting a random transect through a representative part of a burned area. This transect will consist of 20 paces, resulting in 20 points sampled. One pace is two steps. The observer establishes a point at the end of each pace by lowering the toe of the boot to a 30^0 angle to the ground to avoid disturbing plants at the point. The type of vegetative cover encountered is recorded (grass, forb, shrub, tree). If no cover is hit, the type of surface cover (bare soil, rock, gravel, or litter) is recorded. Use the draft tally form* below.

Pace #	**Cover Type** ***(Grass, Forb, Shrub, Tree, Bare ground, Rock-gravel, Litter <1" diameter, Woody debris >1" diameter including snags)***	**Species** ***(if G, F, S, or T)***	**Pace-Point Notes** ***(e.g., potential for concentrated flow, invasive or non-native species, browsed by wildlife, grazed by livestock, plant in poor condition)***
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
	Bare ground "hits"	_____ ***x 5 =***	_____ ***Percent bare ground***
	Cover "hits"	_____ ***x 5 =***	_____ ***Percent total cover***
	G, F, S, T "hits"	_____ ***x 5 =***	_____ ***Percent vegetation cover***
	R, L, W "hits"	_____ ***x 5 =***	_____ ***Percent rock/litter/debris***

Site/Area Notes:

* A 100-pace transect is usually used by a single observer and repeated systematically throughout a burned area to better estimate actual cover. For large areas, sub-areas of similar slope, soils, and condition should be broken out and measured separately. Other techniques such as line-intercept are available.