United States Department of Agriculture
Forest Service

Rocky Mountain Research Station

Air, Water, and Aquatic Environments Program

Providing scientific knowledge and technology to sustain our nation's forests, rangelands, and grasslands

Science BRIEFING

February 24, 2014

WILDFIRE IMPACTS ON STREAM SEDIMENTATION

BACKGROUND

Sediment delivery to streams can be highly episodic as a result of the influence of high-magnitude, low-frequency disturbance events such as major storms or wildfires. Fires are catalysts for erosion and sediment transport in many landscapes, and a large portion of the total long-term erosion can be associated with short periods after fires. Intense fires result in loss of ground cover and reductions in infiltration rates due to ash or fine sediment, enhancing runoff and surface erosion. Landslides and debris flows in burned areas can also enhance sediment supply. Another aspect of sediment delivery after fires is the transport of ash into streams, which can have major impacts on water quality and aquatic communities.

RESEARCH

Research Activity: RMRS researchers examined the impacts of a wildlife (Boulder Creek burn) on stream sedimentation in the Little Granite Creek watershed in northwestern Wyoming. Pre-burn estimates of sediment loads were evaluated against post-fire sedimentation.

Management Implications: These findings suggest that the Little Granite Creek watershed is still responding to the large-scale forest disturbance. It is hypothesized that elevated suspended sediment yields are a result of channel destabilization in the burned area due to the introduction of large wood from burned riparian zones and hillslopes. These results provide insight into the longer-term geomorphic impacts of wildfire that are associated with large wood dynamics and increased bank and bed instability in the burned riparian environment.

Although there was no evidence of debris flows in the Little Granite Creek watershed, thunderstorms did trigger flows rich in ash and small pieces of charcoal. Normally, flows are clear and the channel bottom is visible.

Erosion is a major consequence of wildfires and subsequent rainfall. This channel has been incised by debris flows.

KEY POINTS

- Post-fire rainstorms can cause significant flooding, debris flows, and channel incision or aggradation.
- First year post-fire observations showed a five-fold increase in suspended sediment yield, followed the next two years by less elevated loads and a return to baseline values by 3 years post-fire.
- Recent work showed that suspended sediment loads 8 years post-fire were more than double the estimates obtained from the pre-burn period.
- Estimates of channel bank erosion indicate that up to half of the annual sediment load may be contributed from this source.

MORE INFORMATION

- fs.usda.govtreesearch/pubs/41472
- fs.usda.gov/treesearch/pubs/37604

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Keywords: *post-fire sediment yield, channel instability, instream large wood*