What to Expect Following Storm Events

Flooding

- Damaging flooding following rainfall events with increased magnitude, intensity, and frequency of flooding
- Expect storm flows to be orders of magnitude greater than pre-fire stream flows
- In the first 2 years peak discharges can be up to 150 times normal pre-fire stream flows then diminish rapidly after that to about 3 to 5 times pre-fire flows
- While some watersheds may never recover to pre-fire conditions (significant changes in landscape; scouring to bedrock), within 4 to 6 years expect watersheds to recover as their capacity to absorb rainfall increases

Sediments and Stormwater

- Expect profound and extremely transient sediment movement and deposition
- Scouring of contaminants in sediments. In historic mining districts expect increases in cyanide and mercury concentrations.
- Increased pulses of alkalinity from ash laden sediments with an associated increase of uranium concentrations
- Expect concentrations of radionuclides (naturally occurring and fallout contaminants) and metals in ash from the burned area and in the stream sediments below the fire to be elevated above background
- Expect unfiltered gross alpha and unfiltered radium-226 and radium -228 to exceed irrigation and livestock watering standards
- Expect increased dioxins/furans (from incomplete combustion and chlorine compounds in burned areas)
- As time and distance from the burn area increases expect concentrations to decrease
- Expect ash (and contaminants in ash) to be flushed from the watersheds within two years
- Expect dissolved oxygen (DO) to be reduced and ammonia to be elevated to toxic levels (fish kills) in runoff from burned areas
- Recommend that people do not use ash as soil amendments in vegetable gardens

As ash inventories diminish in upper watershed reaches, contaminant concentrations in channels should decline. It might also be expected that large inventories of contaminated ash-laden sediments remain as over-bank deposits. This would be expected due to high-energy storm-water flows scouring the channel bottoms of ash and fine sediments and depositing a portion of these materials on the stream terraces as storm flows recedes. Observations of sediment packages on the banks of the Rio Grande indicate sediments are being mixed, deposited, and removed continuously.

Stormwater event in Peralta Canyon, above Cochiti Pueblo, Wednesday, August 17, 2011

On Wednesday afternoon August 17, 2011, a storm cell situated over a portion of the burned watershed above Peralta Canyon dropped about 1.5 inches of rain in a couple hours or less. The stormwater flow from that event destroyed our sampling station located on top of an old bridge abutment 12 feet above and about 20 feet to the side of the stream channel. Flow was estimated in excess of 5,000 cubic feet per second (cfs). Interestingly, flow in the Rio Grande at the San Felipe gage station showed a 600 cfs rise in response to the rain event which means the majority

of the flow dissipated in the vast flood plain between where we estimated the flow, through Tent Rocks National Monument (Kasha-Katuwe) and Cochiti Pueblo before reaching the big river.

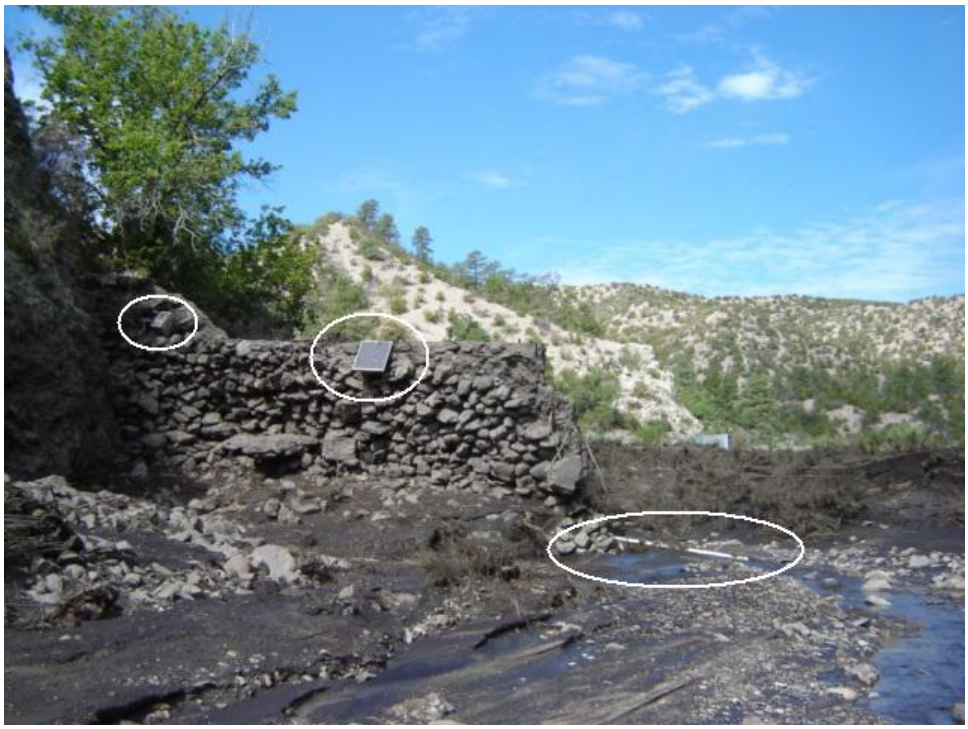

Figure 1 - Old bridge abutment in Peralta Canyon; upper left (circled) the flow meter; middle (circled) the solar panel; lower right (circled) the sampler suction line.

Figure 2 – the flow meter.

Figure 3 – lower left (circled) the suction line; middle (circled) the location of the solar panel; upper right (circled) location of the sampler, battery, and flow meter. The storm flow was estimated to be greater than 5,000 cubic feet per second (cfs).

Figure 4 – Installation of stormwater monitoring equipment at Dixon Apple Orchard, Cochiti Canyon on or about August 11, 2011. Flow meter is on tree above head height. Note tree stump and angled face of rock in center foreground as points of reference for next picture.

Figure 5 - Cochiti Canyon monitoring location at Dixon Apple Orchard, following Monday's flood, 8/22/2011. Note location of flow meter, tree stump and angled rock in lower left foreground.

Figure 6 - This image was taken on August 21, 2011, after Sunday's flood but before Monday afternoon flood (8/22/2011). This view is from the opposite direction as the two previous images (above).

Note the flow meter attached to the large pine tree on the right side of the image. Bureau staff estimate that the 8/21 flood rose about 10 feet. The Monday flood (8/22) came up about 12 feet. About 1/3 mile upstream where the canyon walls form a narrower channel, the flood level was estimated to be 30 feet. An important point to recognize is stage levels can be quite variable in relation to channel dimensions; floods in narrow channels with high banks might produce very high stage relative to the same flow in a channel that is very wide.

Figure 7 - Flow meter at Cochiti Canyon monitoring location (Dixon Apple Orchard) following Monday's flood, 8/22/2011.

Figure 8 – Storm flow event at Dixon's Apple Orchard on August 22, 2011. This flow event was estimated to be about 19,000 cfs and 12 feet high across the flood plain.

Figure 9 – Dixon's, the following day. About 1/3 of the orchard was lost.

Hydrophobicity can result from burning forest litter (organic matter such as leaves and needles), which contains lignin and other waxy compounds that vaporize. After the heat diminishes and the soil cools, the gases from the waxy compounds re-condense, forming waxy coatings on soil particles. These coatings create hydrophobic conditions in which water absorption into the soil is greatly diminished.

Large ponderosas, with their plate like bark, can sometimes survive small fires if the fire does not burn hot enough to destroy the root system. The roots of the Gambel oak often survive a fire as well, and the oak can sprout back within a few weeks with or without rain. Grasses often spring up with the first rain unless the fire intensity is severe.

New ponderosas grow only a few inches in their first few years, developing more taproot than aboveground growth. By 10-15 years, however, the trees can grow as much as 2 feet per year.

A recent visit to an area of the burn scar above Cochiti Pueblo revealed little or no regeneration and standing burned or dead timber. One member of the party commented on the efficiency of the fire as stands of ponderosa pine were reduced to tapering black spikes – like utility poles. No birds or animals were observed. Sporadic and infrequent insect life was observed in the area.