Response to Referee #2

Please see our responses to each referee comment below (in blue):

Anonymous referee #2:   This manuscript reports on quantitative changes in erosion & deposition along 50–meter length channel sections of two stream networks that experienced wildfire and flooding in a mountainous region of Colorado. Using DEMs of difference calculations from 4 time intervals spanning a total of 3 years, they show that significant volume changes in the 50-meter valley segments from erosion or deposition were correlated to contributing area, channel width, burn severity, channel slope, and rainfall intensity. The value of the manuscript is two-fold, because they develop thoughtful methods for analyzing the spatial and temporal pattern of sediment storage from repeat DEM data (including a canopy interference correction), and their conclusions about the landscape and meteorological controls on valley response can be used to predict downstream risks in fire-prone landscapes. This is a very powerful paper with a nice dataset and is pretty close to being ready for publication.

We greatly appreciate the referee's positive comments about the two-fold value of our paper, and that it is "pretty close to being ready for publication". ☺

While the authors were transparent in how they approached the study, there are some aspects that could be clarified simply to help the reader follow the rich dataset and somewhat involved analytical approach. Here are some suggestions that may help the presentation of the work:

-How did the authors land on 50-meter channel sections? Clearly this is a balance of resolving power and obtaining analytical units with meaningful change, but a few lines explaining the rationale of this length scale would be helpful

As noted in our response to a similar comment from Reviewer 1, we will insert one or two sentences in the text to explain and justify why we divided the channel network into 50-m segments.

-Skin Gulch and Hill Gulch received significantly different volumes and intensities of precipitation over the study period: the magnitude of this difference should be generalized perhaps in a table (a row or two could be tacked on to Table 1) with maximum 30-minute rainfall rates measured over the time period or something that generalizes the total rainfall or intensity difference that the watersheds had. I appreciate the images in Figure 3 that show precipitation data in grids but I'm still left unclear on the magnitude of differences between the watersheds with regards to precipitation.

This again is something that Reviewer 1 noted, so we will add a short table to summarize the total rainfall and the maximum 30-minute intensities for each watershed and each time period.

-I'm interested in the relationship between fire intensity and erosion/deposition measured in the channel sections. Fire intensity appeared to be one of the more significant predictors of net volume change in the channel, yet I'm unclear as to how and over what scale Burn Severity was calculated.

We first note that fire intensity is heat lost per unit time per unit flame length, while severity is the effect on the vegetation ("vegetation burn severity") and soils ("soil burn severity"). We presume that the reviewer is concerned with burn severity, as there are no data on fire intensity. In the methods we specify that we did have a burn severity map and provide a reference for this. We also state in Section 3.2 of the methods that for each segment we determined the percent of the contributing area that was burned at high and moderate severity, respectively (p. 5, lines 29-31 in the original manuscript). In response to this comment we are altering the wording in this sentence to make it more explicit: "Percent area burned at both high and moderate severity were determined **for the contributing area** for each segment using **the** burn severity (BS) map …(Stone, 2015)." (changes in bold).

Brogan et al. find here that %burned at moderate to high intensity may be a good predictor of erosion/deposition measured in the channel; these results are consistent with the recent findings of Abrahams et al. 2018 (DOI:10.1002/esp.4348) showing that burn severity was the biggest predictor of hillslope erosion in Fourmile Canyon, central Colorado.

The fact is that researchers have long recognized the importance of burn severity for predicting hillslope runoff and erosion, and we have already referenced some of the most directly relevant papers (e.g., Benavides-Solorio and MacDonald, 2001; Wagenbrenner et al., 2006). The problem is that burn severity is a categorical variable, so it is generally better to relate erosion rates to percent bare soil, as percent bare soil is a continuous variable that can be plotted directly against erosion rates, which is another continuous variable. To make this point we also have cited Larsen et al. (2009), as this directly relates erosion to percent bare soil.
    We appreciate this new reference, and will consider adding it to either the introduction or the discussion.

Minor Comments:
The paragraph structure in several parts of the paper is weak, especially on pages 10-14: lots of small (2-4 sentence) paragraphs starting with the same word or phrase. Combine some of these short paragraph fragments into larger paragraphs that flow into one another.

Yes, there are a lot of short paragraphs. We separated the paragraphs in order to make it more clear that we were switching topics or locations. We are revising Section 4.2 in response to the first reviewer, and as we delete some of the details and focus on the broader story we will be consolidating some of the multiple short paragraphs that are a concern for the reviewer.

On Figures 8 and 9, the general shape of the canyons is given in the upper pane (A. longitudinal profile, slope, valley width, etc.)- which DEM sources was used for these initial data? Because so many DEMS are used here, just be clear about which one is used for various visuals.

We will modify the caption to make it clear that the data in the first panel are derived from the October 2013 DEM developed by the USGS.

Figure 12: the x-axis title should be "channel slope".

We appreciate this comment, and have changed both the x-axis labels and the caption so that slope is now explicitly labeled as "channel slope".