

***Interactive comment on “Before the fire:
Assessing post-wildfire flooding and debris-flow
hazards for pre-disaster mitigation” by
Ann M. Youberg et al.***

Anonymous Referee #3

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Thank you for the opportunity to review this interesting manuscript. It is an original work on an increasingly important problem in environmental management that attempts to assess the potential flooding and debris flow hazards following a wildfire in mountainous northern Arizona and how these hazards might be mitigated by pre-fire fuels treatments. The authors do a good job in the discussion of noting some of the modelling limitations as well as noting some of the social issues in applying this methodology. Overall, this is a well-organized and well-written manuscript, but there are some problems that need to be addressed.

Major issues in no particular order of priority:

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• There are many terms that need to be better defined: o On Page 2, how is a ‘full-cost accounting’ different than an accounting? o On Page 2, what is a ‘reasonable-scenario wildfire’ as opposed to any other kind of wildfire? The 2010 Schultz Fire is used as a metric throughout this paper because of proximity and the post-fire data available from various studies. The Schultz Fire is commonly referred to as a ‘devastating’ wildfire. Is the Schultz Fire a ‘reasonable-scenario’ wildfire? o On Page 2, what does it mean to define the extent and severity of post-wildfire risks at the ‘planning-level’? o First occurring on Page 13, what is a ‘non-regulatory’ risk zone map and how does it differ from a risk zone map? o On Pages 15 and 16, what does it mean to ‘increase the resiliency’ of the City of Williams should a fire occur? o On Page 16, what is a ‘Table Top Exercise’?

• Specific mitigation measures or fuels treatments desperately need to be defined. There are tangential references to mechanical thinning and controlled burning, but nothing about exactly what has changed as a result of these treatments to reduce post-fire hazards. Presumably, biomass has been reduced and fuel loads have been reduced, but how and to what degree? Has stand density been altered? What about stand structure? Dead and down removed? We get no picture of what the landscape will look like, only that the model input parameters have somehow changed. Also, on Page 4, how will the study results and hazard maps identify potential mitigation measures?

• More needs to be presented about the existing vegetation in both Fort Valley and Bill Williams Mountain. We are told generally about the vegetation types in the Colorado Plateau, but virtually nothing about the specific study areas. Fort Valley has a meadow at the bottom and BWM has watersheds with heavily forested slopes, but no other details are provided. Better information must be out there in order to create the burn severity maps, so please share these details with the reader.

• A much better case needs to be developed to equate Crown Fire Activity with Soil Burn Severity. A crown fire will definitely affect residual canopy percentage and tree

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mortality, but there are many examples of the soil surface being unaffected by a crown fire. Perhaps something like biomass consumption and energy release along with the height of the canopy would help here. Or just say that 'this is our proxy and we're sticking to it' so the reader can understand the potential limitations.

â€” It would be helpful to know if the model FLO-2D PRO has been verified for this area by citing other studies (not your own) where it has been successfully used.

â€” The flood modelling uses the 2/10/100 year rainfall events and the debris flow modelling uses the 1/2/5 year rainfall events. It would be helpful to know the magnitude of these values, the length of record that exists, and the methodology by which these storm classes were derived.

â€” It is unclear how the runoff curve numbers were assigned. It seems pretty qualitative ('we know there is going to be a lot of runoff, so we will just pick big numbers'). You might also provide a sentence about what this means for the non-specialists who will likely read this paper.

â€” For the debris flow modelling, it is unclear how the design storms and the peak I15 relate (if at all).

â€” On Page 11, debris flow hazard rankings are based on probability and potential magnitude. More information is needed here to understand how these factors were combined to arrive at these rankings.

â€” Why are debris flow volumes of 104.5 and 105 m³ topographically unrealistic (Page 13 and Figure 10)?

Minor issues in no particular order of priority:

â€” In some cases, the text is too detailed: o On Page, does it matter that the Schultz Fire burned most of its area in the first 24 hours? o On Page 3, does it matter that the peak directly above Fort Valley is Agassiz Peak? o On Page 3, does it matter that BWM is a cluster of Pliocene dacite, andesite, and benmoreite (whatever that is) domes? â€”

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On Page 3, does Cataract Creek really originate on the south side of BWM?

â€” On Page 5, a reference is needed for the Scott/Reinhardt crown fire calculation method.

â€” On Page 6, Line 1, this should be the topic sentence for the next paragraph.

â€” In the text, one of the Fort Valley sub-areas is Treated8200; on Figure 4 it is TreatedNW.

â€” Table 3 is missing a hyphen in one of the columns.

â€” On Page 14, the text labels (Post-fire Debris Flow; Post-fire Hyperconcentrated Flow) do not match those in Figure 11. Also, the legend in Figure 11 is way too small.

â€” On Page 16, Lines 8-9, the structural damage that would be sustained in the City of Williams would result from the flooding and erosion.

â€” On Page 18, Line 27, the authors had 'not anticipated some of the difficulties local entities have encountered with some of these measures'. Please explain what this means.

Overall this manuscript needs a bit more work. Hopefully these changes will not prove too onerous.

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