Review of …

General Comments

I really enjoyed this paper. It was novel, innovative and thought provoking.

I do have a number of fundamental detailed points that I will outline below.

Overall I am concerned that the RAF/Flood features being shown are not really good features to build or simulate. However, the theoretical analysis suggested that small networks of barriers can have a huge impact on flood reduction. This needs a number of clarification points. Firstly the feature shown are small and create small volumes of temporary storage. The features are trapped within the channel and hence seem to have little capacity to store flow. Hence the conclusion must be that it is the roughness that is slowing the flow???? This type of feature works better when the water is forced onto a floodplain and into extra storage areas. So I would be suggesting that RAF design is key, i.e. using the barriers in combination with other storage and velocity reducing zones, e.g. shallow flow across floodplains. A criticism of the Metcalf work is that the features did not allow flow onto to the farmland next to the channels.

However, let's go with the network of within channel features and discuss that.

One more 'picky' thing the author uses the term 'we' a lot. In the past this would not be allowed but I know we live in enlightened times and we can now use 'we'. I do think we have an overzealous use of the term 'we', especially when occurs 4 or 5 times in paragraph.

'We have formulated a network method…' could be 'A network method has been formulated…'

I think earlier work on network models could be included and referenced. E.g Nicholson et al., 2019, Quinn et al., 2015 which was included in the WWNP report. I think Bhoko et al., 219/20? Could be added.

The work of Nicholson included observations and this study has used a theoretical approach and this may need to be highlighted.

Detailed Comments

Bhoko comments on beavers and the impact on flood flow. It is also important to stress that beaver dams are full of water all the time. So that is why they are useless to flooding!

I think your model is not simulating a typical leaky dam, even though figure 1 is a little leaky.Most leaky dams are usually large woody debris that are very porous/leaky. You are thus assuming that all leaky dams operate as a sluice gate. This may not be a good assumption. But, let's go with the impact of a network of sluice gates on flood flow.

Fig 2 is crucial as is section 2.2. What is the size of the catchment? Add a scale to fig 2. I know you want it to be a dimensionless model, but surely a catchments size would help. You need to state the density of barriers. I deduced later that the model had 100m lengths between nodes.

Later you show the model resulting as being based on Fig 2b, so this means the length of channel is 500m, This means the catchment is about 1km2? SO, how do you get a flow of 15 m3/s (fig 7). This

would be a flow rate for a 10-20km2 catchment. That catchment area would require 100 RAFs. Can the authors sort this out or address my misunderstanding.

The model result then suggest a huge reduction in flow caused by 5 barriers?? 15m3/s down to 6m3/s. But the storage behind these barriers must be tiny. Surely they would be overwhelmed by such high flows. SO I may have missed something. SO what is causing the reduction? Is it roughness? Could the authors show some sensitivity analysis of Mannings 'n' on the model output?

I like the analysis introducing branches, but again I do worry about scale and flows. The point being made about branches have less danger is good, as this reflects that a scale appropriate positioning of RAFs is needed, as they work better and have less problems in smaller channels.

Overall I was less impressed with the analyses and cascade failures. I am not addressing the analysis which is good, but a NFM team would either design in the failure so that lower dams trap debris or if there is a threat than a debris traps would be built.

SO, now we look at Penny Gill, the flow rate is 0.4m3/s. This analysis section is interesting. However, it reinforces my point about the flow rates used above. You really have a chalk and cheese comparison. The features in Penny Gill should have been better designed, i.e. to use zones with active floodplains (if appropriate) or maybe the wood should have been distributed over larger areas to create more roughness, thus could be more tree planting in the channel, e.g. willow.

I hope the authors do not think I am being over critical. I really did enjoy the paper. I may not fully understand the model, the scale, the flows, the volumes and the RAF density assumptions. If you sort this out then this paper can be published. If it is a simple clarification of the model and the assumptions then this would be just a minor edit. If there is a fundamental issue with the flow and the impact then major corrections are needed.