

Natural England NFM Engagement Workshops 20-22 Feb 2018

Purpose

Three workshops designed to test some new approaches to engagement with farmers and catchment partners were set up in three communities by local Catchment Sensitive Farming Officer leads.

The primary purpose of the workshops was to test the efficacy of the JBA Trust *Augmented Reality Sandbox* (Figure 1) and a large touchscreen table, called *iCaptureFlood*, or more simply the *iTable* (Figure 2), to help community representatives (farmers, flood wardens, land-owners) choose sites for NFM measures across the landscape. Natural England funded the workshops and the setup of the *iTable* to facilitate capture of farmer data, and the models that were developed as demonstrators for 3 local catchments. The hydraulic models set up on the *iTable* provided modelled evidence on the potential to reduce flood peaks to inform refinement of site and measure selection.

The *iTable* was purchased using a grant from the *ensemble* group at Lancaster University, stemming from **JBA Trust** sponsored research, with both organisations seeking better ways of *integrating wider types of data and information into models*.

Attendees were first shown the national Working With Natural Processes (WWNP) Potential Area maps (<http://naturalprocesses.jbahosting.com>), along with other map layers in their catchment, using the open GIS software, QGIS. The idea was to use only openly accessible technology, so here QGIS was used for mapping, and HEC-RAS 2D was used for modelling, which is also freely available. The model assumptions and limitations were discussed before modelling.



Figure 1 AR Sandbox

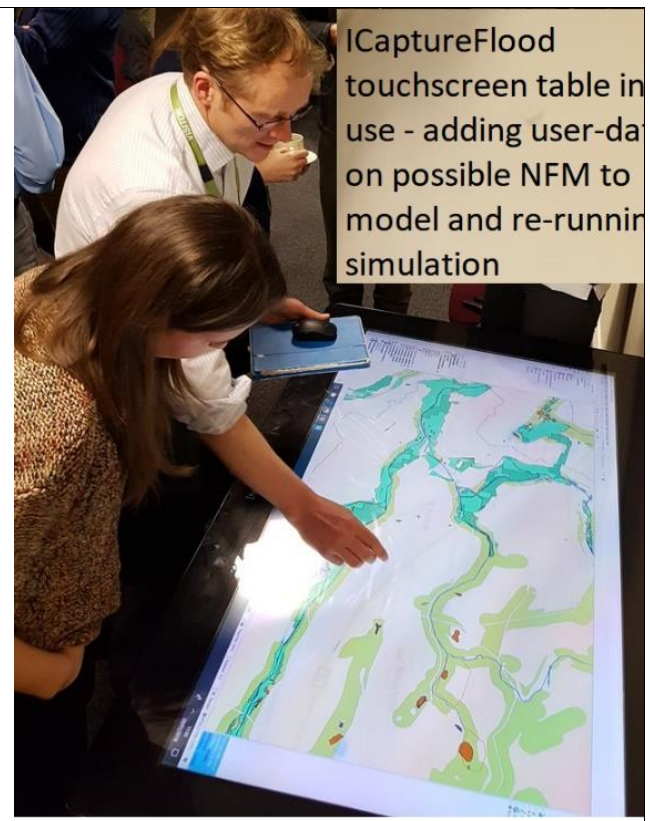


Figure 2: iCaptureFlood or iTable

Workshop 1: Somerset: Montacute Village Hall

Here we focussed on the Wellhams Brook catchment, a tributary of the River Parrett, where the main community at risk is Martock.

Attendees:

JBA – Barry Hankin, Jack Dudman

CSF – Roy Hayes, Louise Webb

National Trust, 3 Flood wardens, 1 local Farmer, 1 FWAG SW Adviser, 1 PhD Student working on a model of the catchment.

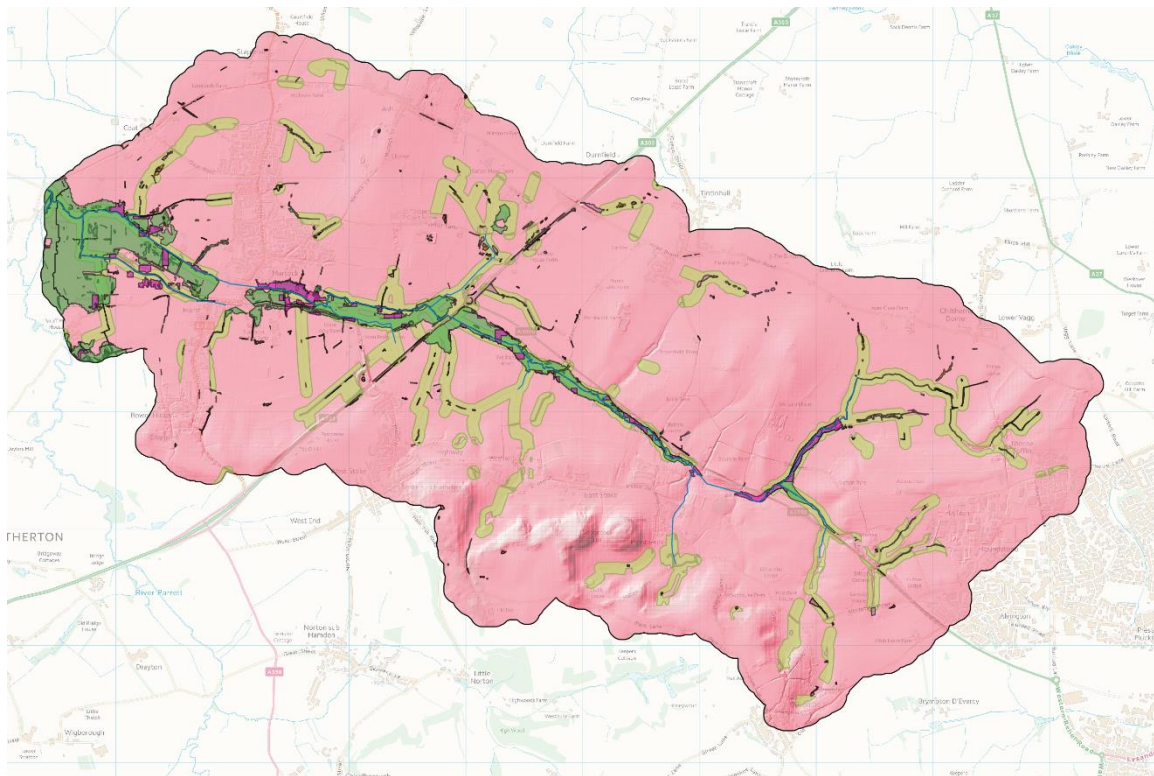


Figure 3: Overview Wellhams Brook catchment with national WWNP layers shown on iTable before discussion of practical locations

Flood wardens are very active, engaged and keenly observant of the impact of their work in this catchment. They are already convinced that they've noticed a slower response to rainfall and encouraged by the work. They had excellent understanding of the concepts, data and approaches used and the local agencies to influence and future pressures to address. They raised the issue of housing development in the upper catchment and the risk this poses to further increase runoff unless drainage is carefully considered.

Farmer 'A' is a significant landowner in the catchment, and has already implemented a lot of measures on his farm, been engaged in CSF since 2006 and PCP prior to this. Feedback was attendees experienced 'excellent engagement' and really enjoyed the day. The National Trust also own some relevant land, and have already implemented NFM. There was excellent engagement over this also.

The *iTable* worked well and captured people's attention fully.

Local knowledge was fantastic, rich discussions around where water moved, how the streams incised in some areas and exactly where water ponded / stood.

This enabled wider discussion around capturing data and data confidentiality. Three questions on this are needed to confirm each farmer's views on data sharing:

- Are they happy for FWAG SW to share data within their project only and with SRA?
- Are they happy for their data to be shared with EA /Consultants for modelling at national scale to assess efficacy?
- Are they happy for data to be shared on an open data platform such as AGOL?

Technology:

We did find that the *iTable* technology was a bit sensitive when editing, so participants pointed to where features should be added, and Barry did this in front of them. Ideally, we would all have been able to add measures, but it worked well and people were very impressed with the process. CSFOs and Flood Wardens could do with a mini table or Ipad with which to make the edits!

- LIDAR was a little hard to interpret and blanked out the more familiar OS map so slowed down identification of areas. Contours may be better visually.
- Flow pathway data could help site measures.(these were added in subsequent workshop)
- Sand table was really engaging and helpful introduce to the concept.
- Time is needed for the model to run so ideal to have lunch whilst it's running
- Need to limit catchment size to about 30km² enable processing time during lunch.

The background info from the NFM Potential maps was really useful, and seemed to coincide well with the eventual sites that were suggested (and installed) but it would help to have the existing woodland layer available as well.

There was time to add about 20 measures which when all implemented in the model showed a difference for the 1:30 year summer event (of around 3.5 hours rainfall storm duration). In a droughty catchment (note upper catchment is the Yeovil sands so irrigation is needed) this could support drought resilience.

Farmer 'A' has 5 irrigation reservoirs and would be happy for one of these to have a flow control structure and be drawn down before rainfall. This 'emerged' whilst discussing the map on the *iTable*, and it may well be that the format of discussion around the table was the **catalyst** for this important contribution, as the attenuation possible using a large pond/ reservoir drained down in advance of an event is likely to be significant. Since the farmer was initially not keen on using irrigation storage for flood attenuation given need in the summer and not being able to guarantee re-filling. However, at one of the locations, the farmer thought that the reservoir would not be a problem to re-fill as it was in a good location. Discussion of information around a table in this way is by itself valuable. Given more accurate RF prediction he might be happy to do this at more sites.

Feedback

All enjoyed the day and were captivated by the technology, which stimulated excellent discussions.

They asked for the outputs to be emailed and for us to return and walk the sites and confirm these but also build understanding of how the catchment functions in relation to the model.

Quotations.

Quote 1 from farmer: ***"It's been really good, very useful thank you"***

Actions

The only improvement would have been to have time to visit sites and add more measures.

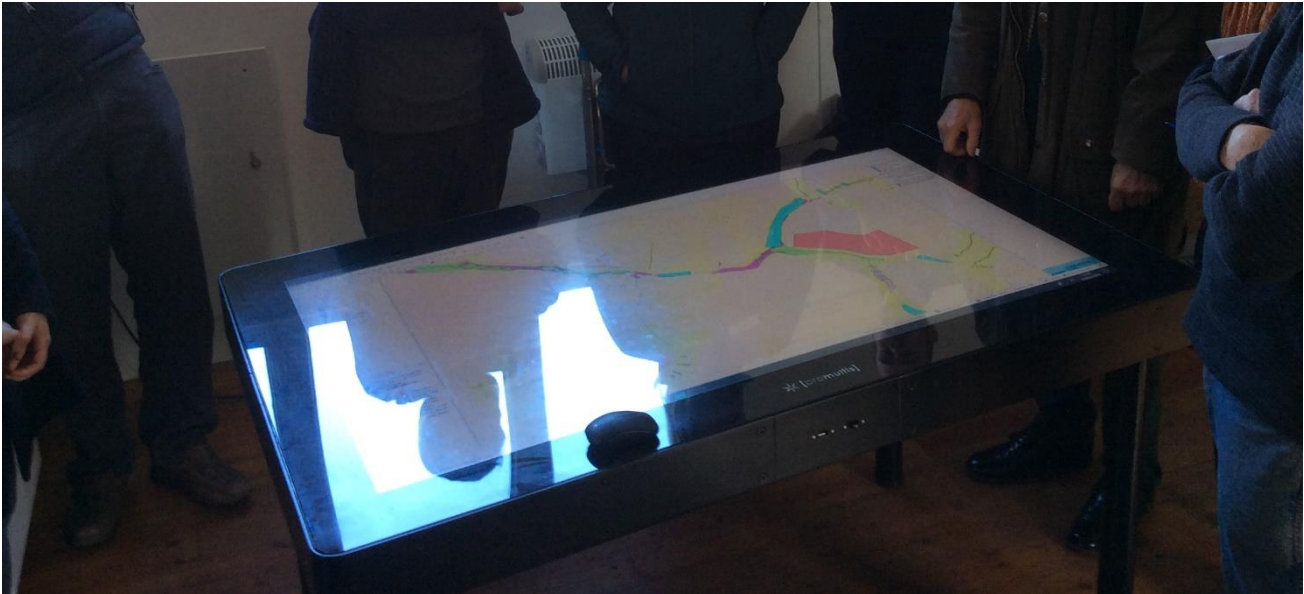


Figure 4. Workshop Attendees at Montacute Village Hall around iTable

The modelled changes to hydrograph using all partner NFM measures at base of catchment are shown in Figure 5:

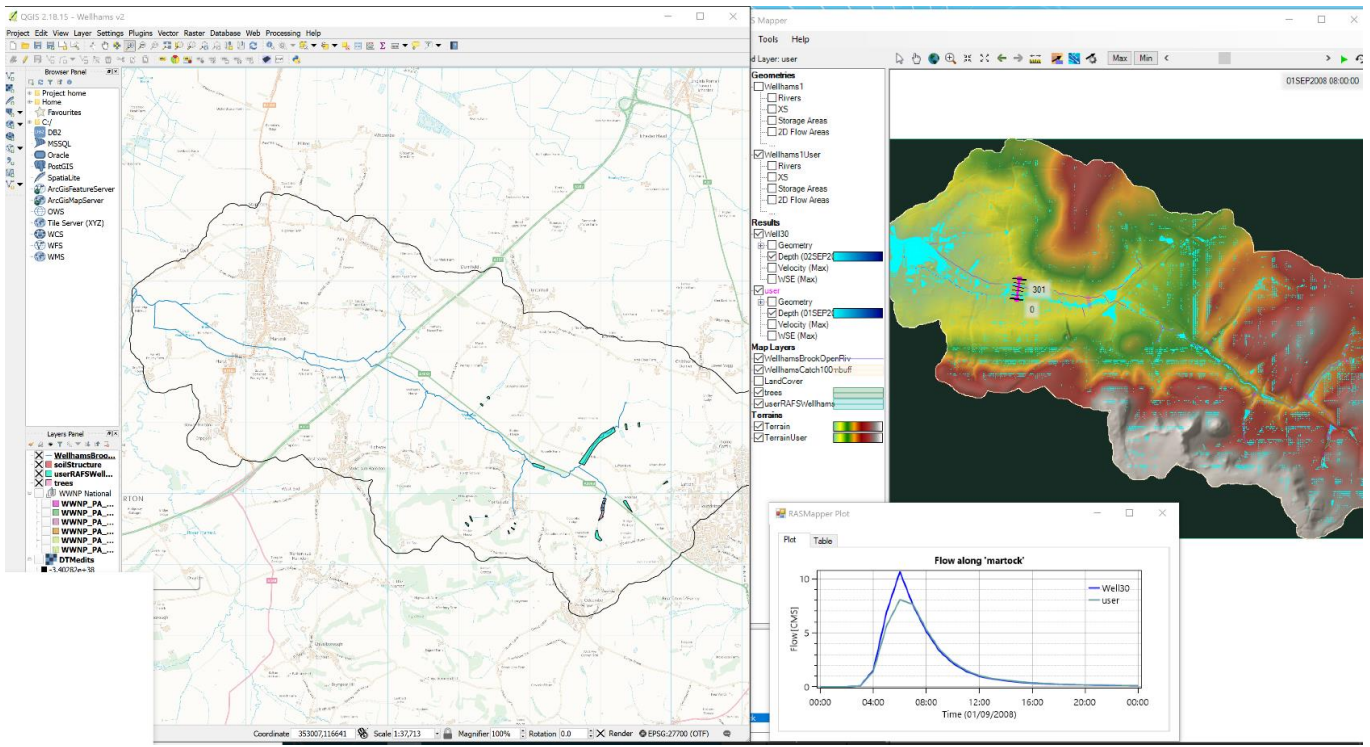


Figure 5 Screenshot from iTable from workshop 1: Partner NFM measures (Left) and 10% change to modelled runoff hydrograph at base of catchment (right).

Workshop 2 Anglia: Sub catchment of Alconbury brook called Coppingford Brook. Great Giddings Village Hall

Attendees: Larger group including around 6 farmers, 2 Cambridge CC, 2 EA staff, 2 CSFOs, 1 Drainage Engineer, 1 NE Adviser.

Community at risk: Alconbury

The Coppingford Brook catchment is a predominantly clay catchment extensively drained with incised streams and ditches (Figure 6).

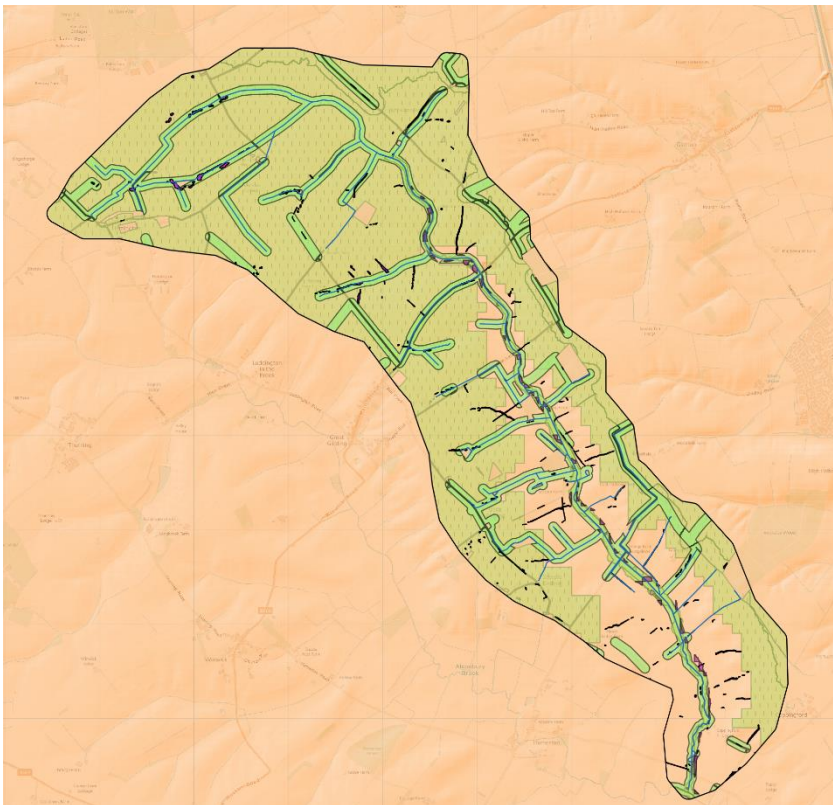


Figure 6: Overview Coppingford Brook catchment with national WWNP layers shown on iTable before discussion of practical locations

Split into two groups to accommodate larger numbers, which meant the sand table was used more than on day 1. This stimulated discussions on dredging and riparian planting in particular. Since EA stopped maintaining the river this has become so shallow it is almost dry in the summer and has lost its biodiversity which local farmer is concerned about. Large Woody Debris (LWD) were not welcome on the main stream as seen as an obstruction. Some surface storage was accepted and new hedgerows on banks would be considered.

Control of intelligent drainage would be considered BUT drainage is essential for the soil profile to function well.

One farmer has offered to meet with Andy to explore the use of 3d buffers and invite her neighbour as this would need to extend to his land to be effective. She would also consider setting up a Farmer Cluster to group and running some training (30 years of being a trainer)

Tree planting and the issue of economic impact – energy crops would be of interest depending on the revenue payment but recognise the risk that harvesting could pose to soil.

Interventions suggested did make a positive difference to the runoff response, potentially up to 4% (see Figure 9).

Feedback:

Farmer comments:

“This has been absolutely fascinating”

“It’s just about talking to each other”

“We need all the Agencies around the table too – so often they want us to do different things in conflict with each other.”

“We just need you / someone to tell us what to do and explain its value we are open to this but need to be confident we’re doing the right thing.”

“We need all farmers from the catchment around the table together.”

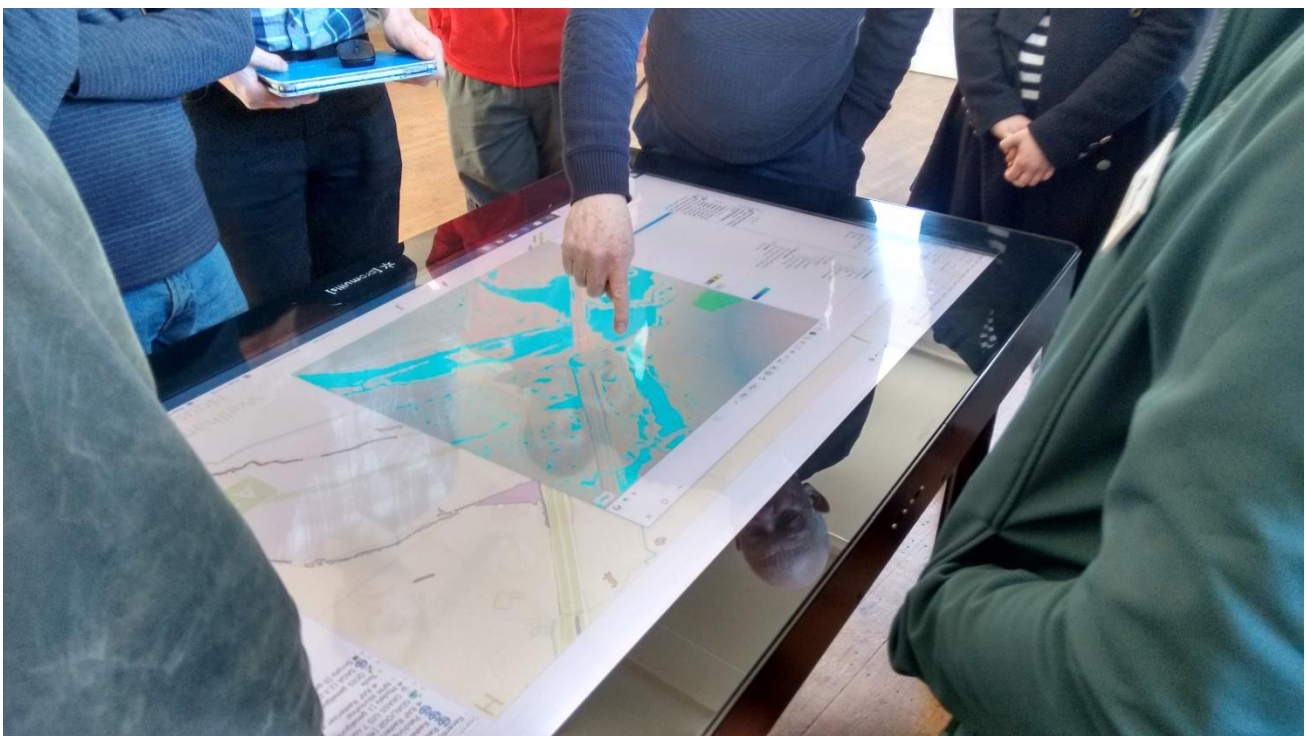


Figure 7: Discussion around the iTable understanding the storage possibilities



Figure 8: AR Sandbox set-up, Great Giddings Village Hall

Modelled changes to hydrograph using all partner NFM measures at base of catchment (Figure 9).

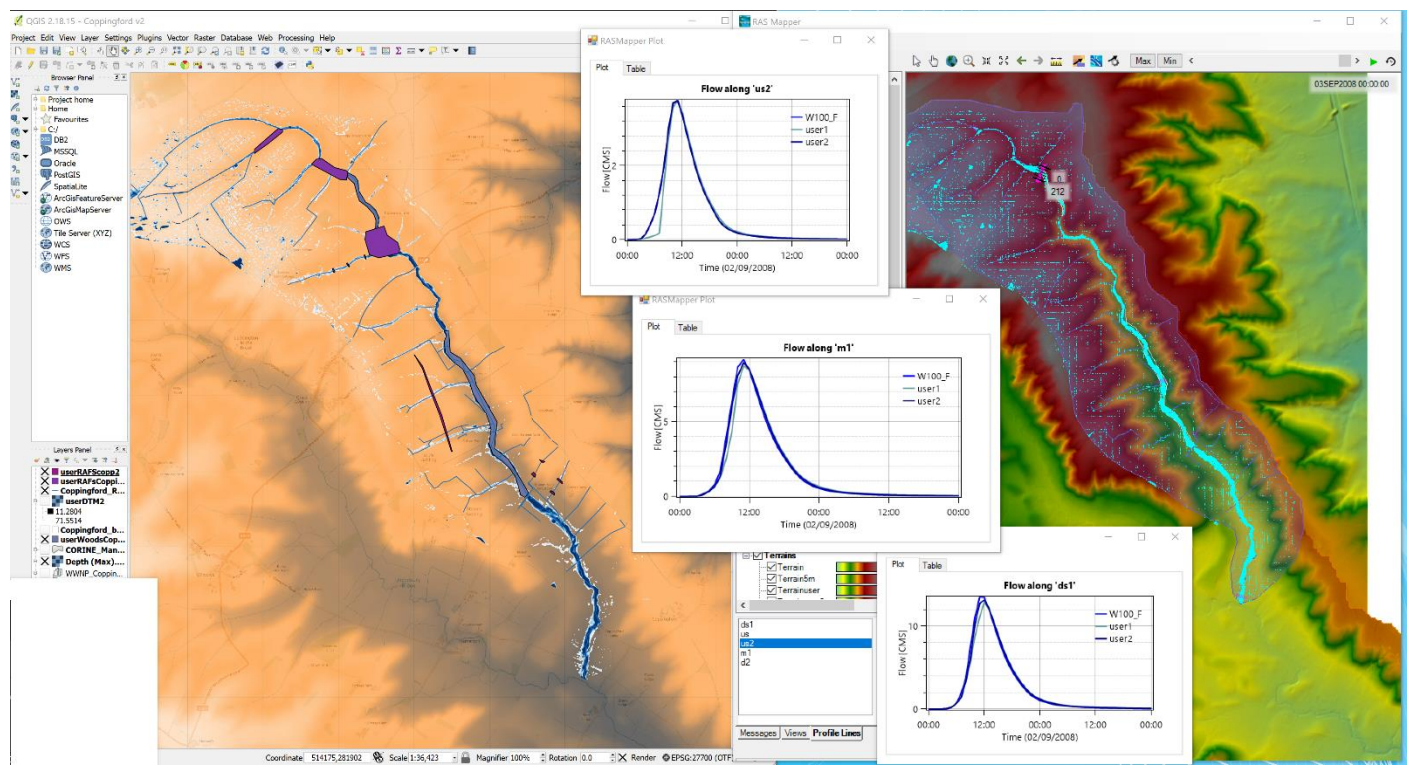


Figure 9 Screenshot of iTable from Workshop 2: Partner NFM measures (Left) and 4% change to modelled peak runoff hydrograph at different locations, including base of catchment (right).

Workshop 3 Eden: Crooks Beck. Stream Soulby Village Hall

Attendees: 2 CSFOs, 5 Farmers, MOD ecologist, NE Adviser

Community at risk: Warcop

The catchment is made up of two sections, the majority being steeper land running from some high moorland with blanket bog down through limestone cliffs incised by ghylls with steep streams running to the lower reaches (Figure 10). A second lower lying section covered about 25% of the catchment with a series of smaller tributaries divided by the A66.

Main opportunities suggested by the WWNP maps included tree planting – riparian and on heavy soils, stream re-connection, a few leaky dams and some RAFs. MOD had already done a lot of tree planting and more was planned – it would have been helpful to have this on a map on the day. Farmers suggested a number of areas for water storage on line but none off line. The DTM wasn't as good as we had hoped and farmers where unsure where we were on the map as they navigated by tracks and these were not shown this slowed the process down.

The suggested measures made a difference at the d/s point of $1\text{m}^3/\text{s}$ for the 1 in 30 year event of 6 hours duration.

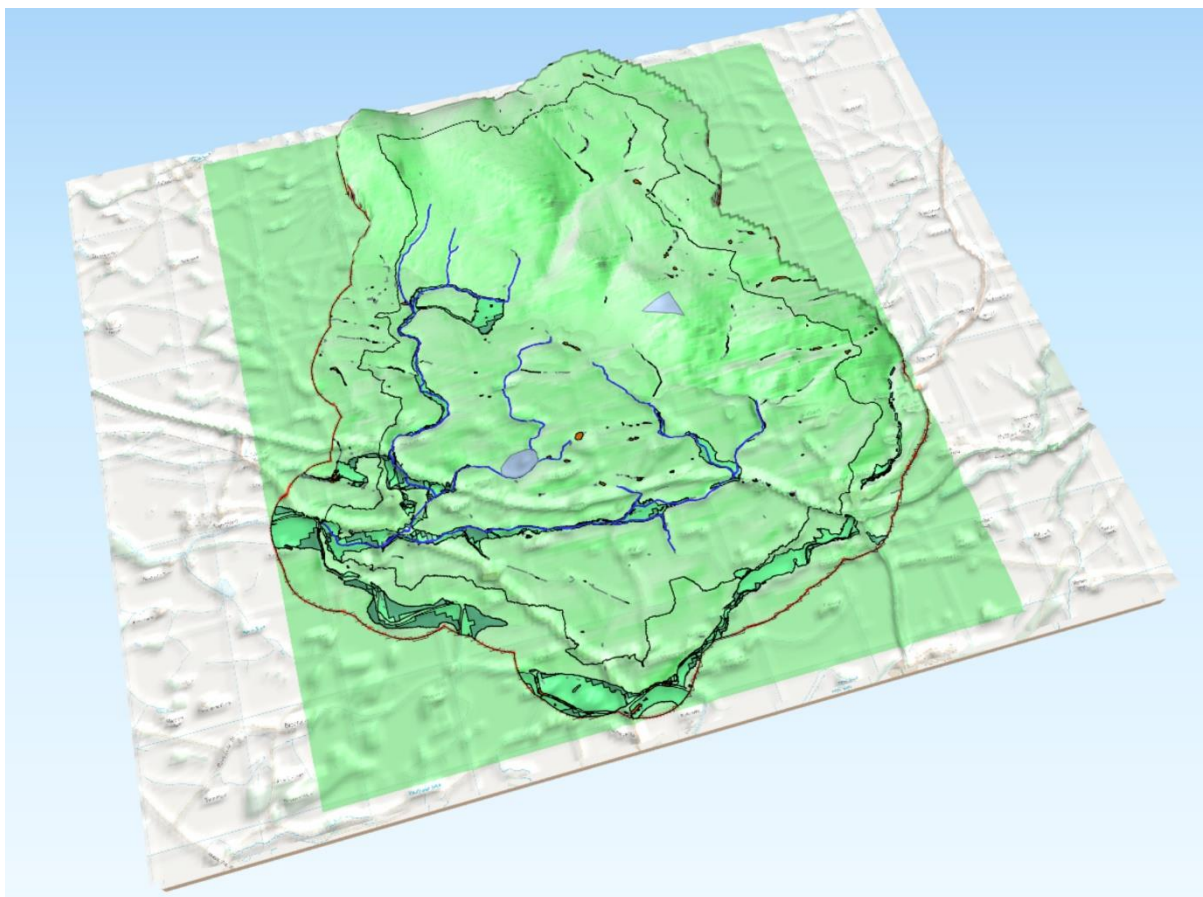


Figure 10: Overview Crooks Beck catchment in 3D, WWNP measures were shown on iTable before discussion of practical locations

Issues and discussion:

Tenancy – one tenant farmer would be happy for water to be held back on a stream in a really suitable site to enhance the throttle action of a railway culvert but his landlord may not agree. Also if there is a payment for income foregone in relation to this we need in the future to secure this for tenants. Can we develop a contract for these measures to ensure the land owner passes on income foregone payments to tenants?

MOD firing range – needs a clear line of sight in some areas so tree-planting plans need to be developed with them.

MOD ordinance in the ground in some areas would make it dangerous to install stakes etc under the ground to hold logs so LWD use is limited in some areas.

It would be useful to run the model with the max potential measures before a future meeting then compare with what we think is realistic but also with the storage needed to protect the CAR.

Roads and infrastructure, house building poses risks and already generates runoff that crosses farms causing erosion.

Dredging – no new discussion but excellent explanation of the river being a jerky escalator by Chris. Once discussed the conversation moved on.

One farmer is also a trustee of Eden R Trust and is already implementing NFM he has a neat design for slow the flow controlled discharge – a pipe that discharges in the stream and whose outlet is submerged at peak flows so it only discharges after the peak so very simply helps delay the volume travelling through.

A lot of queries and interest in the longer term policy framework post Brexit – strong views that hill farmers will not be able to sustain their businesses as payments reduce, anticipate habitat change on the hills which may benefit NFM

Reverse Auction approach describe (LW) farmers were interested and generally liked the concept.

Feedback

When viewing the area on the table some people are looking at it upside down and find it difficult to interpret / choose sites as they can't work out where specific areas are.

MOD would value the outputs and this info to help advise where their planting could make a difference.

Far better to engage people like this rather than just presenting slides – people quickly lose interest in powerpoint presentations.

The mapping available for this catchment was not as good as the previous 2 so it was harder for farmers to identify exactly where they wanted to cite measures.

Farmer: ***"It's been great – really very interesting"***

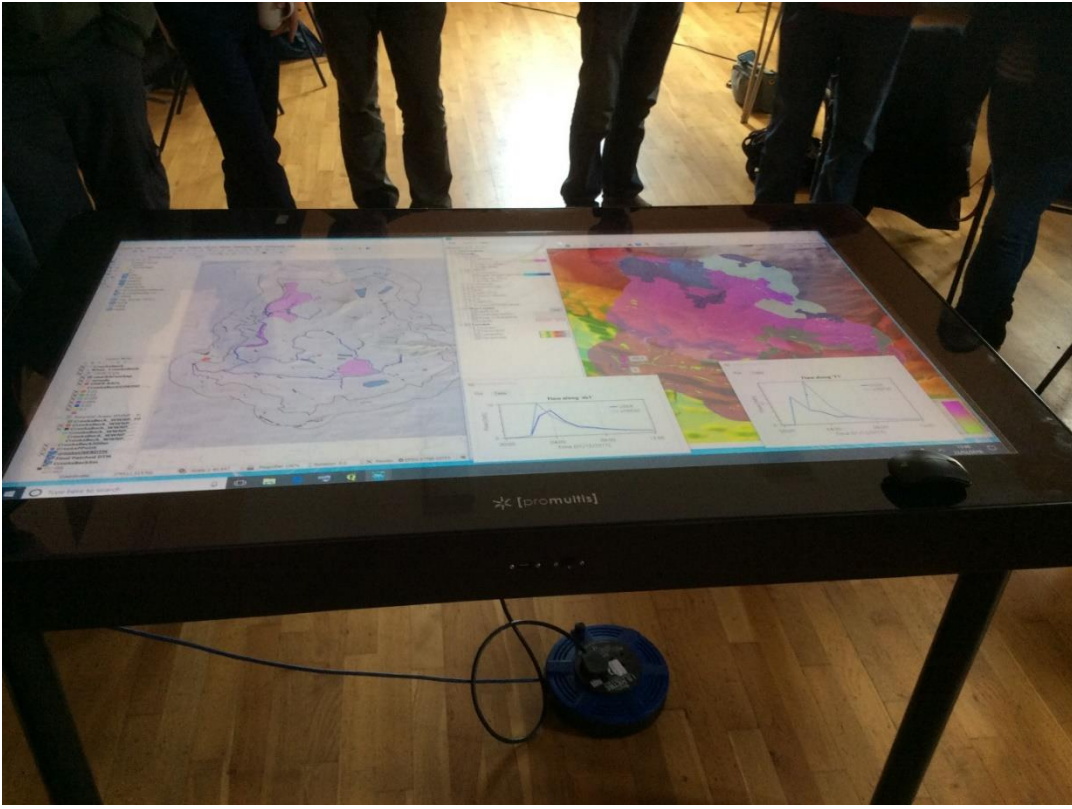


Figure 11 – Workshop 3 attendees viewing model results on iTable after lunch.

Modelled changes to hydrograph using all partner NFM measures at base of catchment (Figure 12)

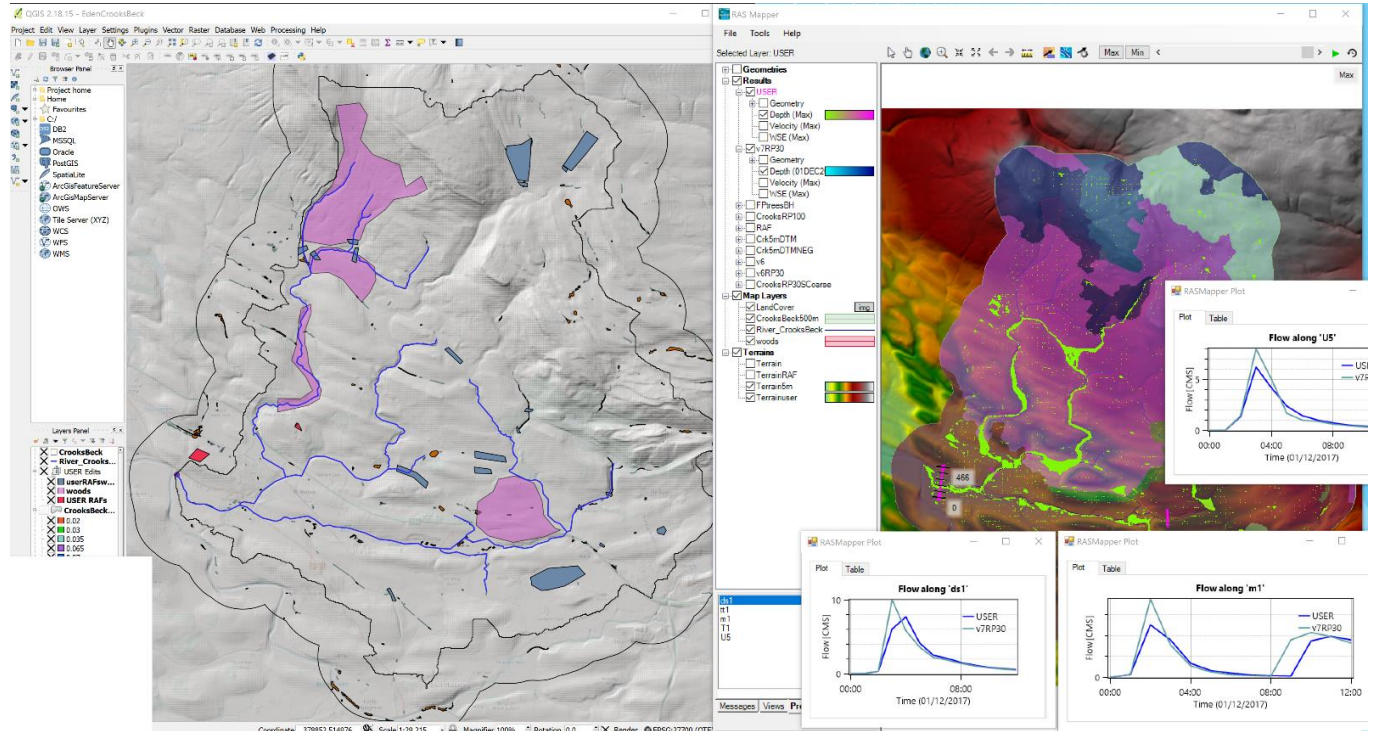


Figure 12 Screenshot of iTable from workshop 3: Partner NFM measures (Left) and change to modelled hydrograph at different locations, including base of catchment (marked 'ds1' on bottom right).

Recommendations

A bulleted list of recommendations was developed following the NFM engagement workshops:

- Engagement around maps with farmers and other partners present was very conducive to understand pressures on them and potential for realistic solutions.
- Potential areas for storage and attenuation emerged from the conversations:
 - Example 1 it became apparent that one of the 5 or 6 irrigation ponds could feasibly be drained down to provide some pre-winter storm storage
 - Example 2 – Some Farmers warmed to allowing ‘roughening up’ landscape in areas of HLS where they were opposed to tree planting. This could still represent a reasonable amount of attenuation over a large length of river.
- The maps, models and outputs were entirely based on Open Data. Extra detail on the background maps could help with identification – especially in the Crooks catchment.
- Logistically it was a lot of work because the 2 tables are heavy, but there was definitely ‘something about’ standing around a table together. It may not have helped to use a projector for instance as people get switched off by powerpoint etc.
- It would be useful to calibrate the iTable to be less sensitive so it was easier for other editors – as it was Barry did most editing on the instructions of others.
- Modelling assumptions – it is always very important to stress these, and that the model is only as good as the data – for example there was definitely better quality modelling where the DTM was higher resolution in the Wellhams Brook.
 - A flyer with model assumptions for the model in use should be prepared
 - Additional free-to-use models such as Dynamic Topmodel should be added
 - As soon as spatially variable rainfall can be used in HEC-RAS-2d, the editing of soil properties and potential for soil structure improvement scenarios could be added. As it was, users provided some spatial details on this type of potential.
- The measures we managed to edit in the time available are potentially far fewer than if there had been more time. The new ‘Open Layers’ website where people can edit features into a map could be used in advance of a workshop, or after a workshop to then take the features back to the office to model. However modelling in front of people did seem to help de-mystify the process.
- Editing the map to add storage, leaky barriers, areas of roughness, floodplain re-connection helped gather realistic spatial information on what is being done and what can be done
- Modelling in front of partners seemed to really help demystify the modelling processes and comments were very positive in the feedback we asked for.
- Partners were generally impressed with the flood animation on the interactive table from the HEC-RAS model.
- Partners confirmed with anecdotal evidence that areas flooded in the model had also flooded in reality so they were pleased with the accuracy of the model.

- A walk around the site or areas of interest before/after workshop to solidify thoughts about feature placement might be useful.
- A range of different storm events or sequential storm events could be modelled, although we were limited by time though so this may not be feasible.
- Reduction of flood energy is of particular importance to partners in Cumbria, for instance by sequential hedgerows perpendicular to the direction of flow.
- Some partners were frustrated by the imbalance of responsibility: building developers just shifting surface water downstream to farmers. Should we try to bring them and or landlords onboard somehow?