Opportunity Mapping of Natural Flood Resilience Measures

A case study from the headwaters of the Warwickshire-Avon

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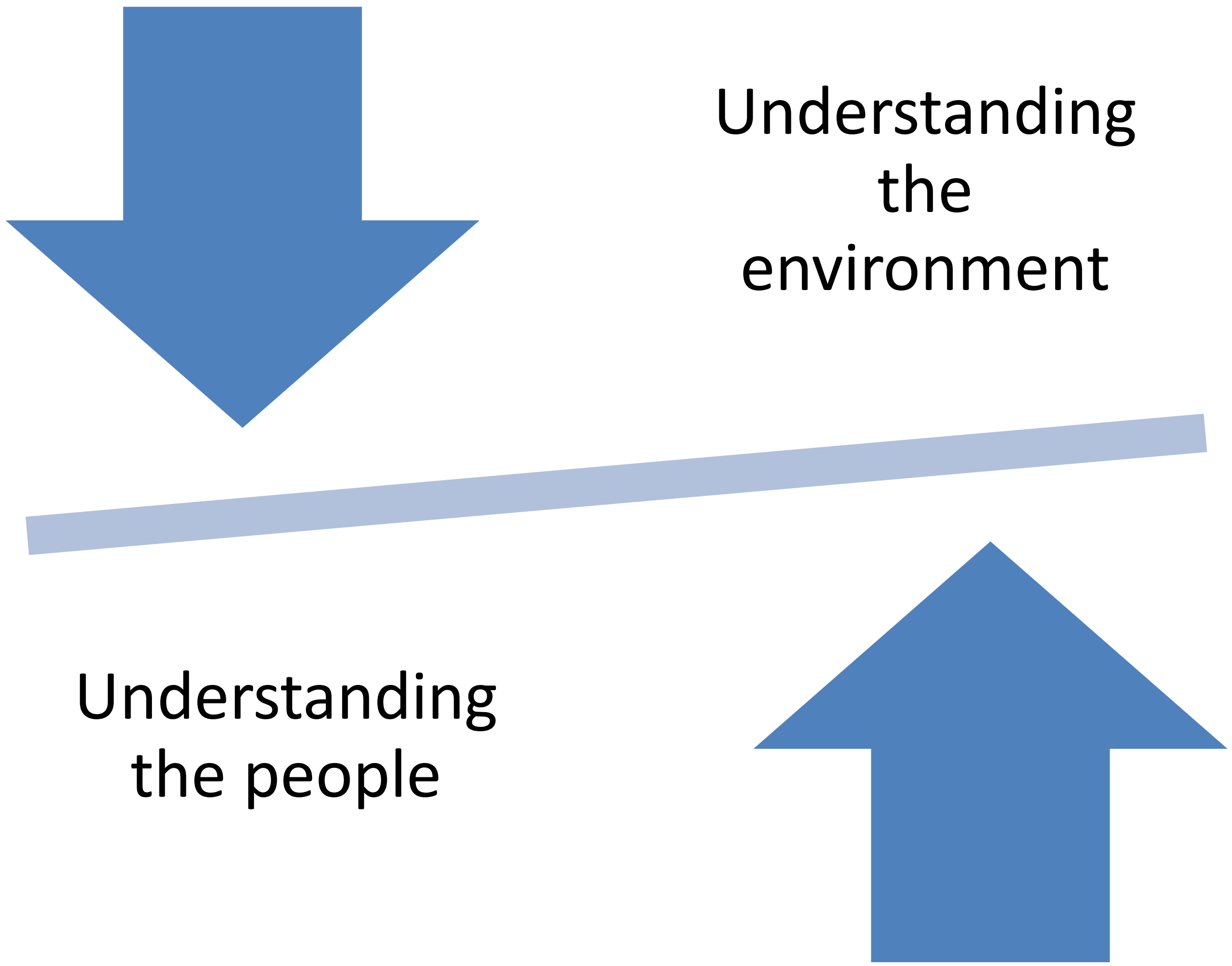
Natural Flood Resilience (NFR)



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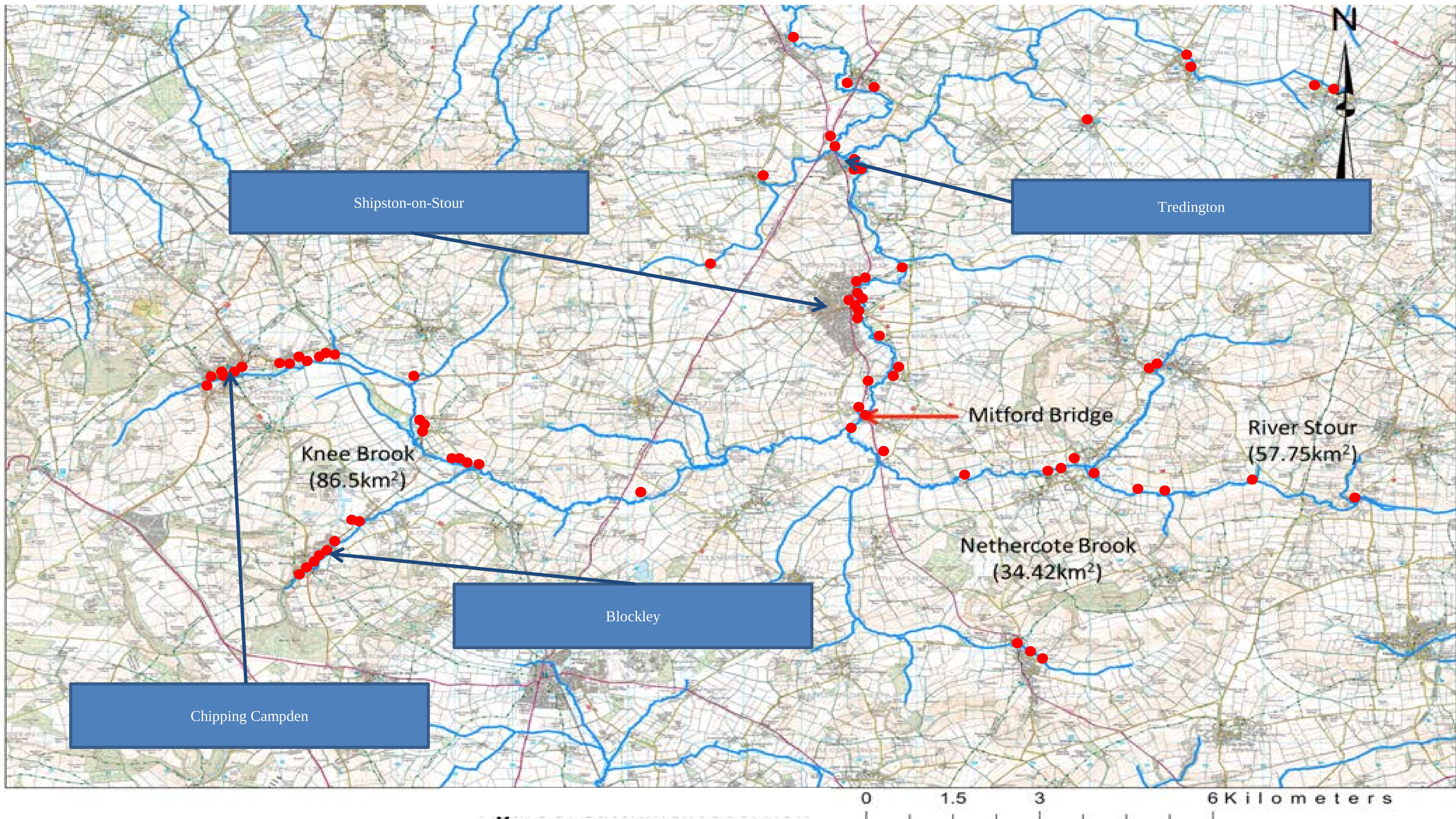
EVA and FRANK

(winter flood 2015-16)

EAC (2016)

Defra Multi-Objective Pilot Projects (2000)

EXCELLENCE WITH IMPACT


N
Shipston-on-Stour
Tredington
Mitford Bridge
River Stour
(57.75km²)
Knee Brook
(86.5km²)
Nethercote Brook
(34.42km²)
Blockley
Chipping Campden
0
1.5
3
6 Kilometers

“…the journey of a thousand miles begins with one step”

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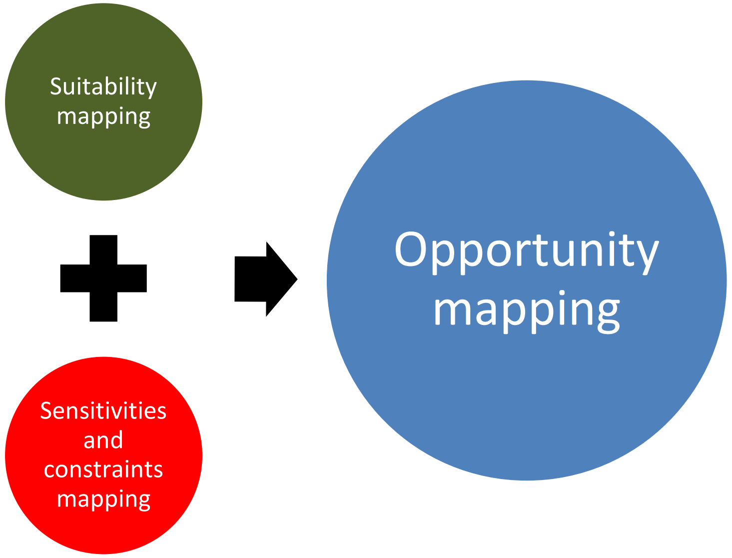
HOWEVER, THE ONE STEP CAN BE BACKWARDS…

“…the value of local knowledge” (Holstead *et al*. 2012)

Table 1. Data and input used for NFR Opportunity Mapping

Suitability mapping elements	Sensitives and constraints
Hydrology of Soil Types (HOST) (CEH 2009)	Grade 1 Agricultural Land
Updated Flood Maps for Surface Water (UFMfSW)	Urban/settlement buffer area (500m) and road networks (300m)
Fluvial Flood Maps (FFM)	National Flood Risk Assessment data (EA)
Digital Terrain Model (DTM)	Environment Agency washlands
LiDAR (1m and 2m resolution)	Ministry of Defence (MoD) land.
Potential new woodland (Broadmeadow, Thomas and Nisbet 2013)	Scheduled Ancient Monuments
Land Cover Map (LCM) 2007 (CEH 2014)	RAMSAR/ Sites of Special Scientific Interest (SSSIs)
Countryside Stewardship Targeting areas (Natural England)	Land Cover Map (LCM) 2007 (CEH 2014)
Community and Landowner/Farmer Engagement	



Mapping phases
DTM – Delineation – Hydrological/LiDAR

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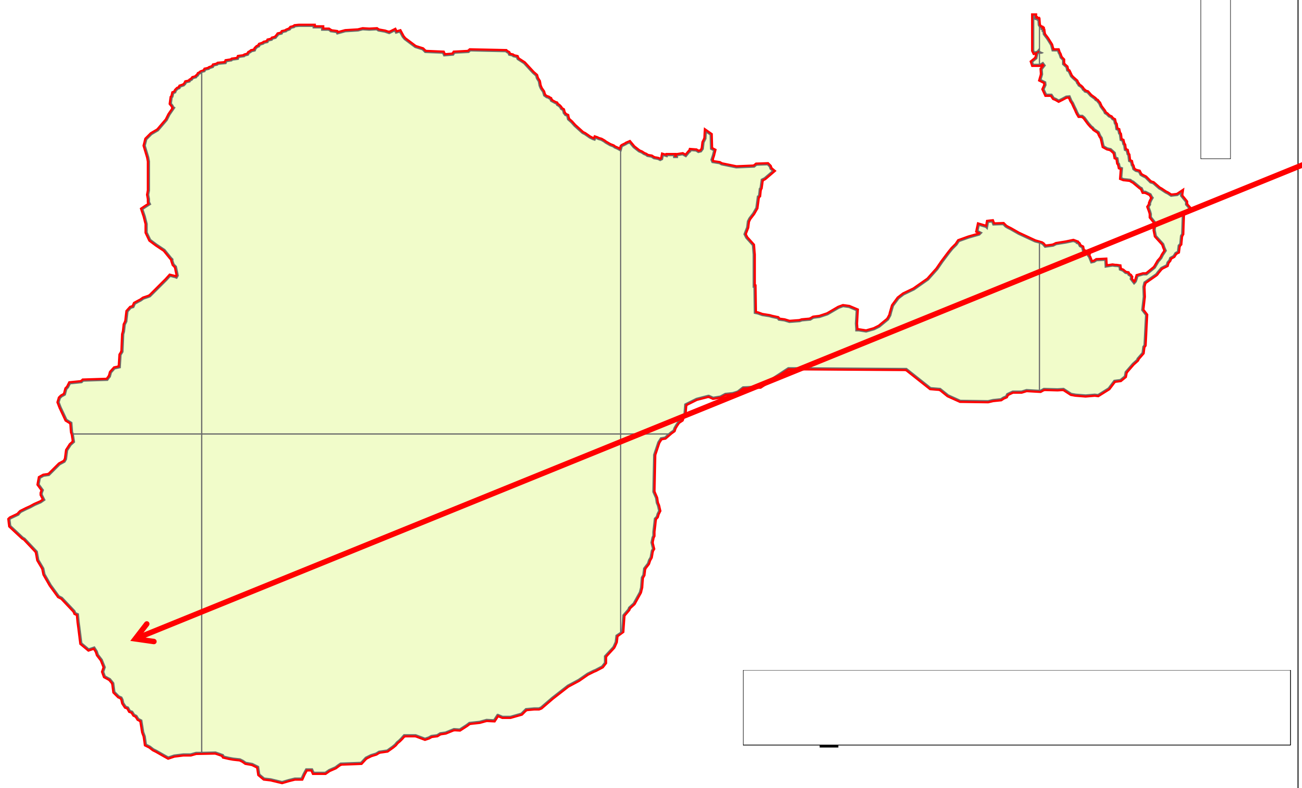
Mosaic LiDAR coverage
(LiDAR_1m_res.)

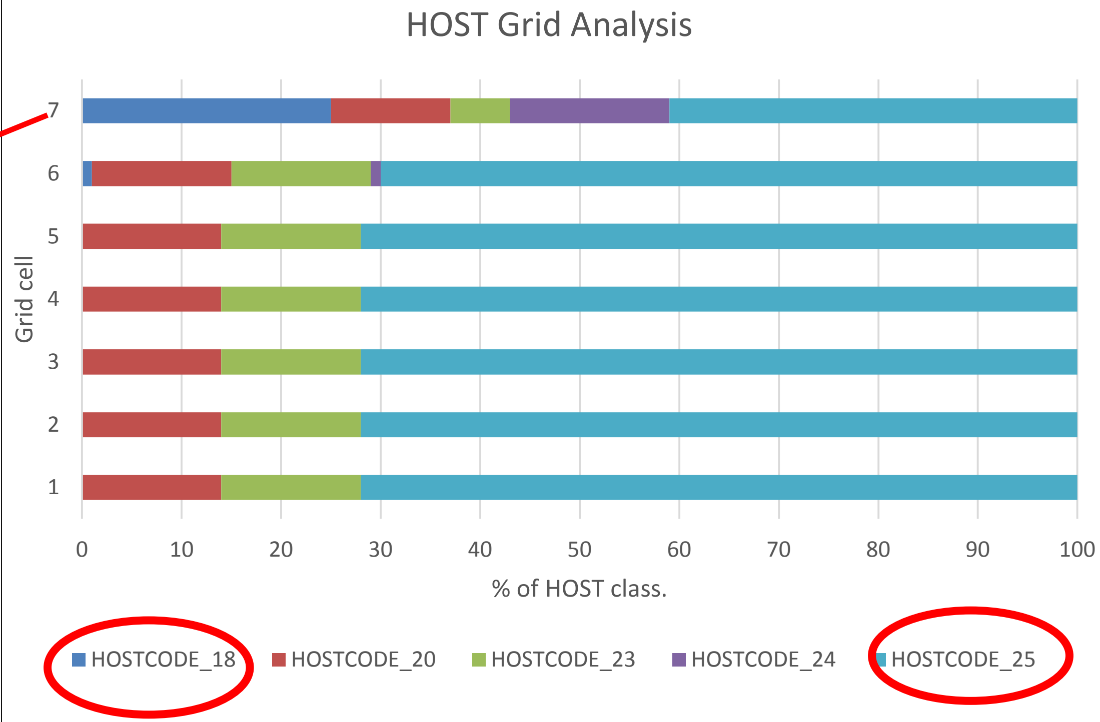
Use Arc Hydrology tools
Delineate sub-catchment

Verify flow pathways and discharge routes

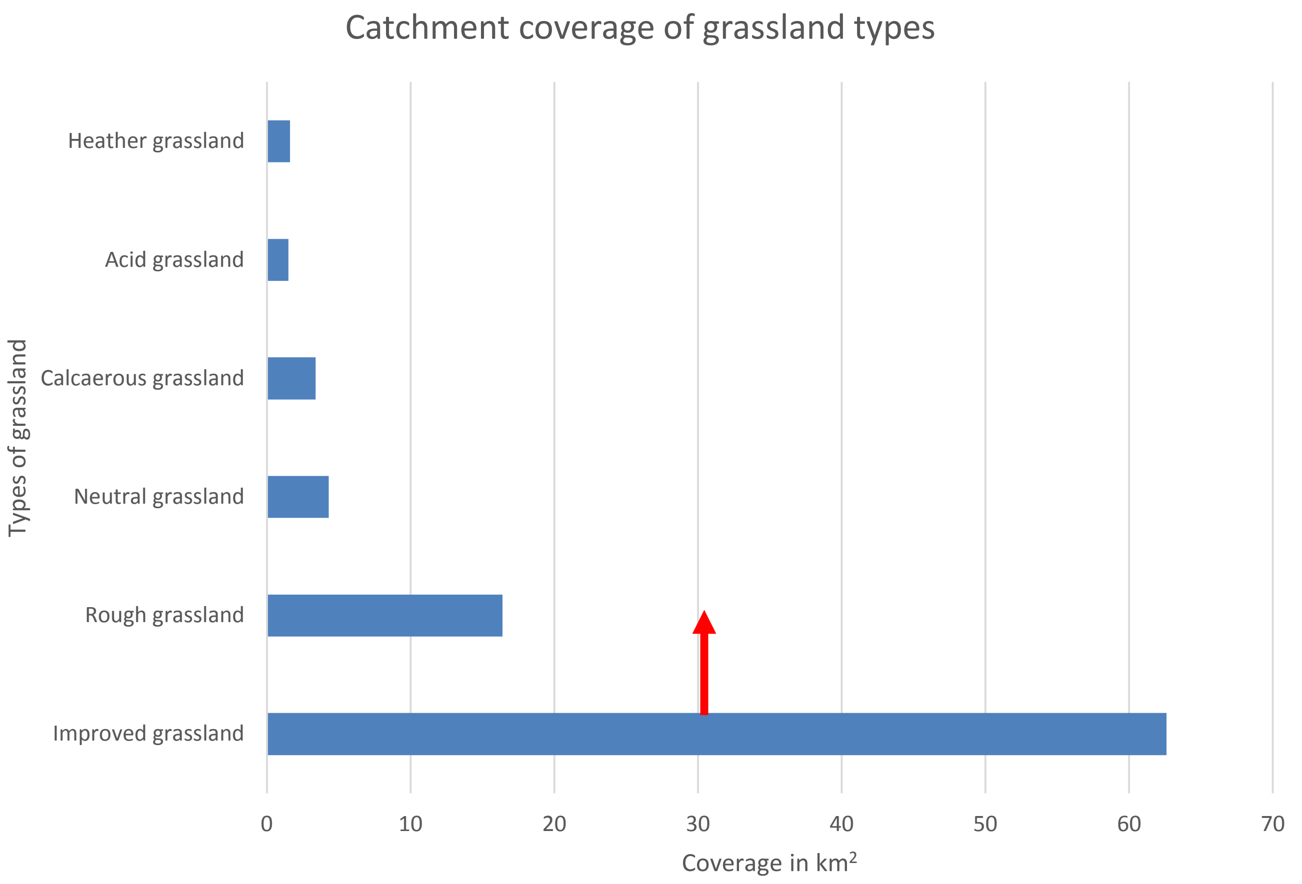
Drainage network	Key
Overland flow routes	(black)
Field/farm drainage	(red)
Pig Brook formation	(yellow)

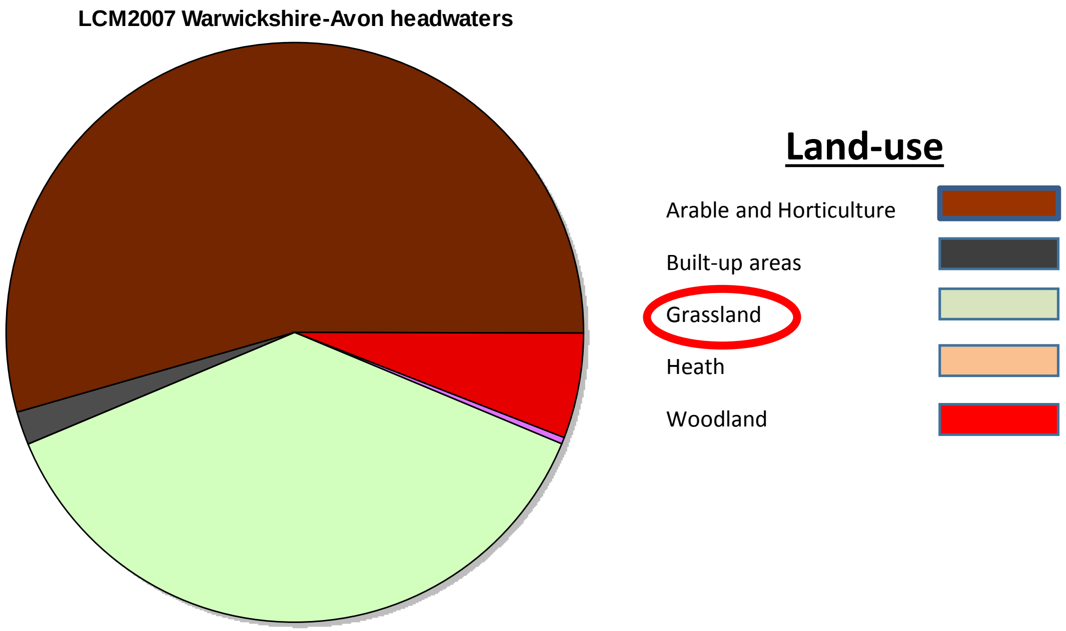
Pedology and Geology



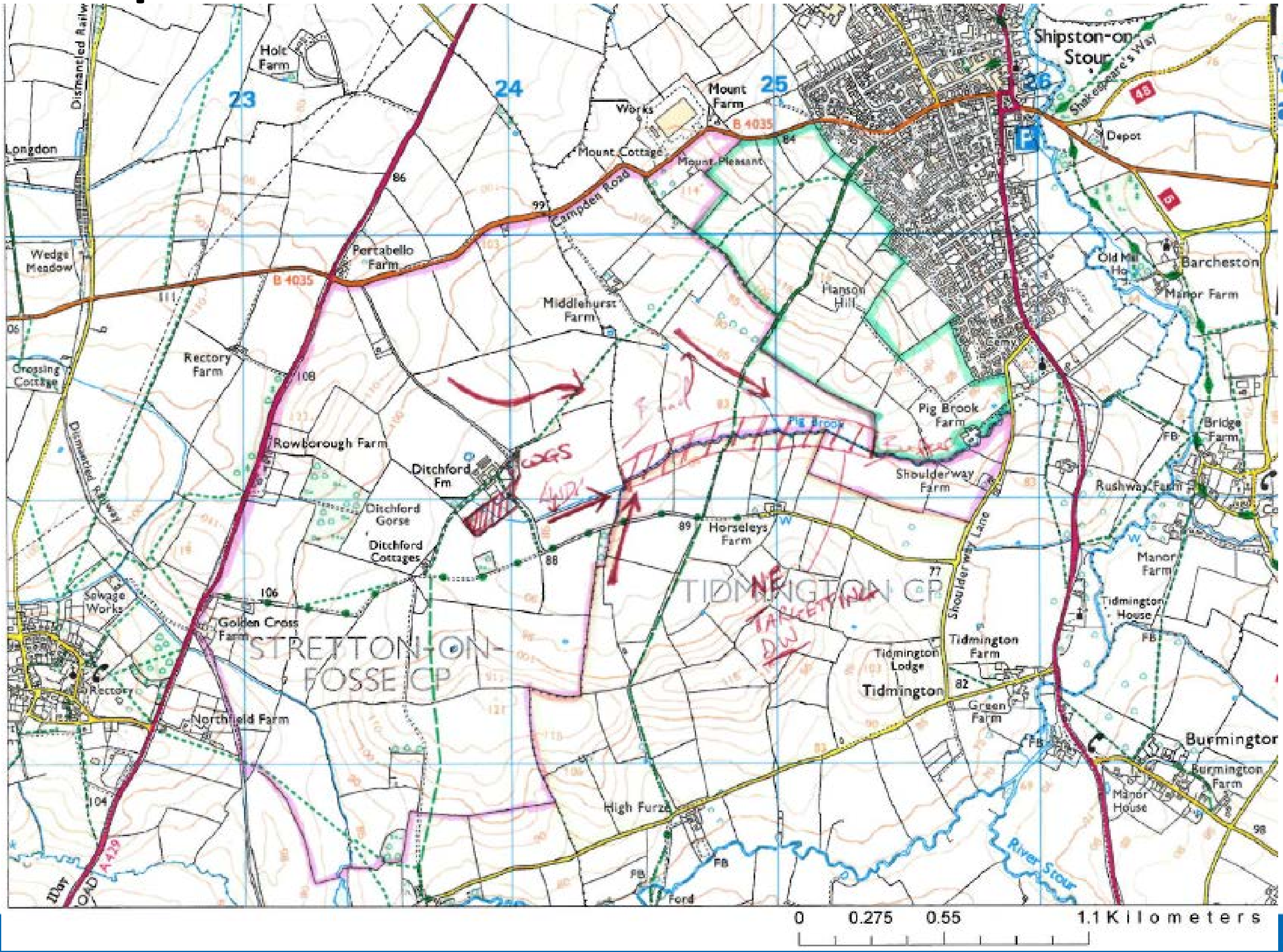


LCM2007 land-use





Engagement process



NFR measures mapping shp. files

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NFR Measure	Code
Potential new floodplain woodland (supported by FC 2013)	Green speckled area
Large Woody Debris Dams (LWDs)	Red line
Hedgerow reinstatement	Black dashed line
Clay bunding	Brown line
Offline pond	Blue ellipse

Opportunities across the catchment

NFR measures	Knee Brook	Nethercote Brook	River Stour
Forested Water Retention Areas	50800m^2	4800m^2	8400m^2
Wider catchment afforestation	6700m^2	2400m^2	4900m^2
Hedgerows	400m	200m	280m
Soil aeration	84400m^2	21000m^2	31200m^2
Large/Coarse Woody Debris Dams	96	49	38
Riparian buffer	570m	230m	120m
Floodplain and riparian afforestation	32700m^2	2800m^2	21300m^2
Clay bunding	15	5	6
Offline pond	16	8	7
Offline retention pond	4	1	2

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Conclusions

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- Great opportunity to WwNP across the catchment to slow, store and filter flow (to a lesser degree). With the potential to attenuate the storm peak by de-synchronising peaks.
- Environmental Audit data indicates these measures can have wider remunerations through ecosystem services, supported by engagement.
- Engaging with landowners and farmers has given an unrivalled insight into local hydrological and land-based influences to fluvial/pluvial activity.
- NFR has allowed farmers to consider how to use water more ***efficiently*** across their farm holdings.

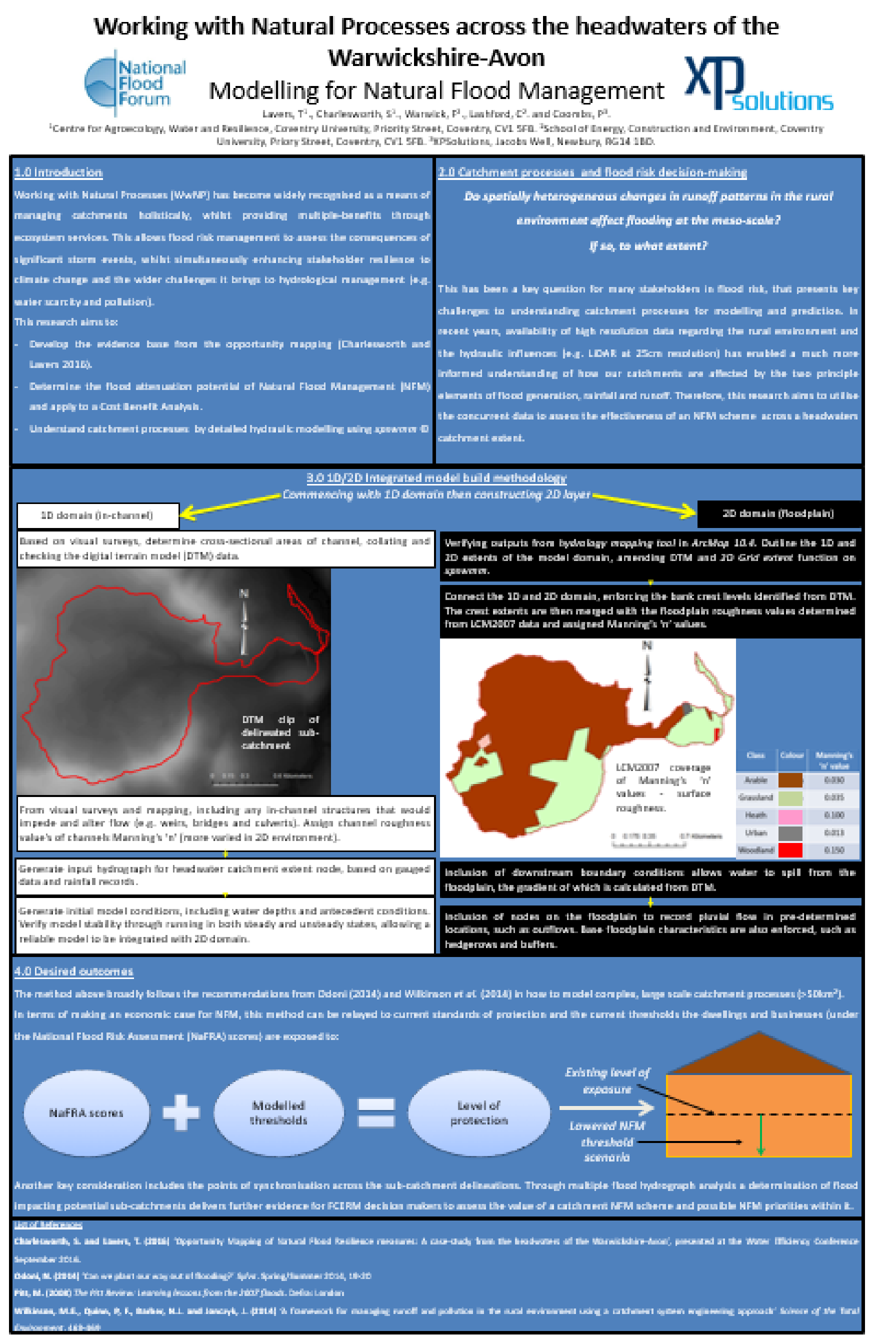
Further works

Modelling the effectiveness of the NFR scheme and determine costs to benefit

- What are the most contributing sub-catchments? Why?
- What are the most effective measures? Why?
- NFR cost-benefit analysis.

Undertake workshops with community, farmers and landowners regarding attitudes towards NFR modelled results and possible challenges faced

- Give a further practical insight, future research needs.



Any questions?

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