Sussex Flow Initiative case study:
Utilising GIS in Natural Flood Management Delivery

Sam Buckland

Project summary

Sussex Flow Initiative (SFI) is a Natural Flood Management (NFM) project in the River Ouse catchment (Figure 1). A partnership between Sussex Wildlife Trust, the Woodland Trust, the Environment Agency and Lewes District Council. SFI aims to help people and nature to adapt and to be more resilient to flooding and drought conditions. Conditions that are become more prevalent as a result of the increased unpredictable and intense weather resulting from climate change.

Importantly SFI seeks to increase the skills and knowledge, utilising national and regional GIS datasets to aid delivery of NFM within the catchment.

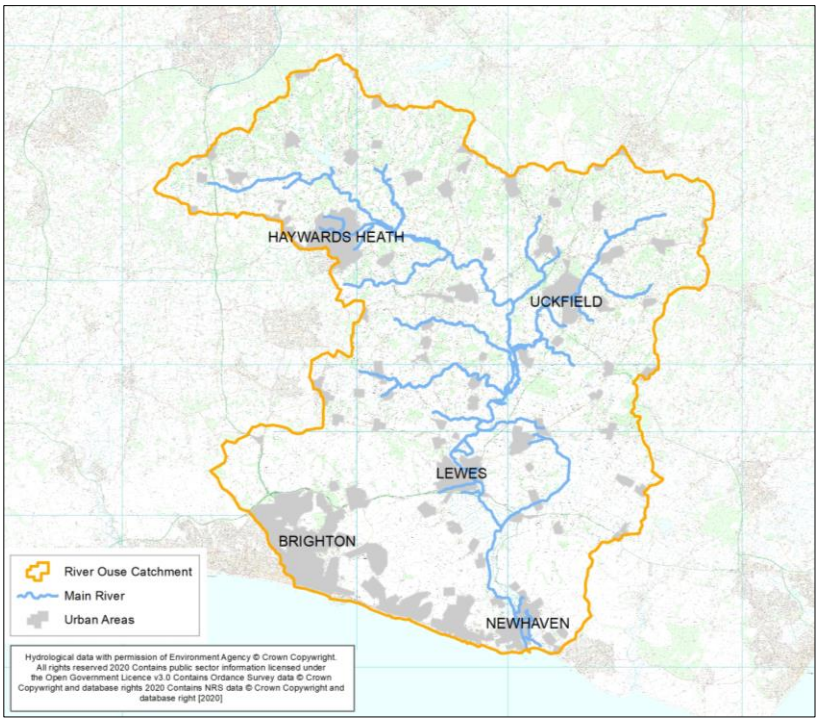


Figure 1: River Ouse catchment, showing the major urban areas and main river network.

Background information

In the delivery of NFM within the Ouse Catchment, SFI utilises a multitude of GIS datasets to help to inform the most appropriate measures, and their placement. Through using these dataset to we are able to produce bespoke landowner NFM reports and facilitating the communication of potential NFM on a landholding. This case study aims to show a selection of the GIS layer used as part of the project, however it is not an exhaustive list and all datasets require ground-truthing before progression to delivery.

Historical Mapping

Identifying opportunities to replant lost historic hedgerows or woodland using historical mapping, such as the OS Epoch 1 maps. Particularly those hedgerows or woodlands that are cross-slope, in floodplains or riparian, thereby slowing surface and flood waters, as well as increase infiltration rates.

Environment Agency WwNPs

The Environment Agency's 'Working with Natural Processes' strategic maps and GIS layers are consulted, and overlain on the sub catchments or landholdings, providing an indication on multiple NFM measures. The following layers are used:

Run-off attenuation features 1 % AEP and 3.3 % AEP: Areas with high flow accumulation across land or in small channels where there may be potential to temporarily store, and attenuate flood waters. Target areas are based upon the Risk of Flooding from Surface Water datasets, identifying areas of high flow accumulations for the 1 % and 3.3 % Annual Exceedance Probability (AEP) surface water maps (1 % AEP and 3.3 % AEP is the probability of the flood occurring in any given year) The areas of ponding or accumulation are labelled as opportunities for gully blocking where they fall on a slope steeper than 6%. The position of potential RAFs are constrained so that they do not coincide with urban areas, roads, rails or canals.

Floodplain, Riparian and Catchment Wide Woodland planting:
'Floodplain Planting' to attenuate flood waters on floodplains, identified as those areas which are not already wooded, but are within Flood Zone 2 (1 % - 0.1% AEP) of the Flood Map for Planning.

Creation of a 50m buffer on watercourse in the OS Open Rivers database as 'Riparian Planting'.

A 100m gridded version of 1:50k BGS Geology Survey data (superficial and bedrock data) highlights areas with slowly permeable soil were 'Wider Catchment Tree Planting' could increase infiltration rates. The target areas for all three types of planting are constrained by excluding urban areas, roads, rail, watercourses, and areas of peat.

Floodplain reconnection: Opportunities of floodplain reconnection (particularly during high flows) have been identified using the Risk of Flooding from Rivers and Sea probability maps, focusing on areas adjacent to watercourses where the probability of flooding is low/very low, and therefore floodplain connectivity is expected to be low (with flood waters confined to the channel). The target areas are free from residential properties and key services, but may contain other non-residential property.

Ouse catchment backwater buffers

The 'Assessing the potential hazards for using leaky woody structures for natural flood management' document[1] outlines the "backwater" effect, causing inadvertent flooding of land or property outside of the ownership boundary or onto rights of way.

The backwater buffer layers highlight areas where the addition of woodland or woody debris across the floodplain/river channel could lead to water backing up behind it, with potential detrimental flood impacts. SFI created buffers downstream of all roads (300m), railways (300m) and urban areas (500m) in order to identify where these potential impacts might occur (Figure 2).

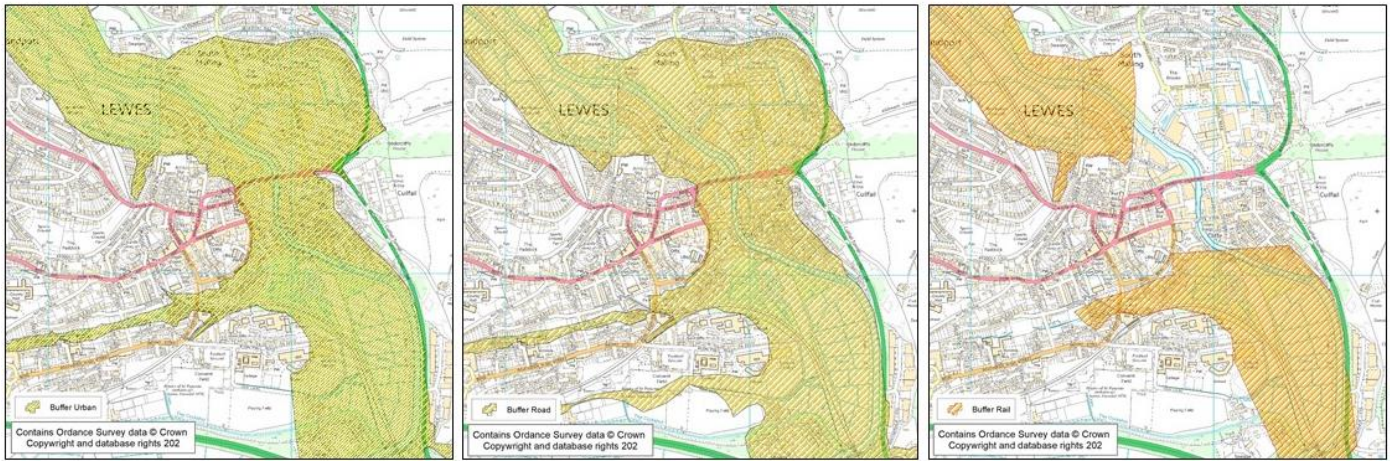
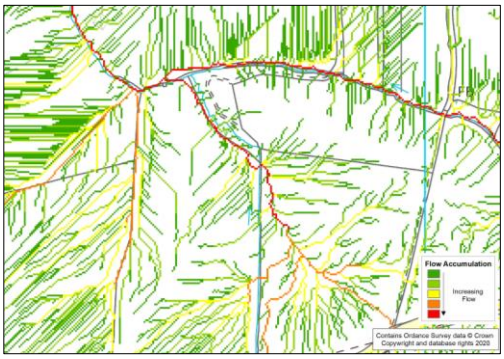


Figure 2. Maps showing the three backwater buffers on the town of Lewes, east Sussex.

Flow pathways model

Modelled using a Digital Terrain Model produced by LIDAR and the spatial analyst tool 'Hydrology' in ArcMap 10 identify where water flows and accumulates in the landscape. The resulting layer symbolised to show minor flows (green) that converge into yellow into orange and the major red flows. Thereby enabling the positioning of NFM measures to intercept and attenuated them.



Collaboration

The SFI relies on a strong relationship with the landowner, communities and close working between partners including Sussex Wildlife Trust, the Woodland Trust, the Environment Agency and Lewes District Council, as well as other organisations.

Sussex Wildlife Trust · WOODLAND TRUST · Environment Agency · Lewes District Council

[1] ADEPT (2019) Assessing the Potential Hazards of using Leaky Woody Structures for Natural Flood Management [accessed here: https://bit.ly/32Z3N80]

For more information please contact sussexflowinitiative@gmail.com or visit our website here