Sussex Flow Initiative

Natural Flood Management Project

End of Year Report

2020/21

Lewes District Council

Sussex Wildlife Trust

WOODLAND TRUST

Environment Agency

Summary

The Sussex Flow Initiative (SFI) is a Natural Flood Management (NFM) project on the River Ouse catchment in East Sussex. The project began as a trial in 2012, and is a collaboration between Sussex Wildlife Trust, the Woodland Trust, and the Environment Agency. This report highlights the project's achievements in terms of NFM demonstration and advocacy during 2020-2021.

By working closely with landowners, local communities, and local authorities, the Sussex Flow Initiative has delivered NFM throughout the Ouse catchment, directly influencing approximately 537.25 hectares of land through NFM delivery, and providing advice to landowners on a total area of 1,727.6 hectares. The NFM techniques that have been utilised include tree planting (with over 13,381 trees being planted in 2020/21 in the form of 1,175 m of hedgerow and 3.91 ha of woodland), 11 leaky dams installed in streams, as well as the creation/restoration of 3.36 hectares of temporary flood water storage and wildlife habitat. The additional water storage created by this work is estimated to be approx. 6,665,385 L per flood event, and the hedgerow and woodland are expected to increase soil infiltration rates within fields by up to 60 times, helping to intercept surface runoff. The woodland and hedgerow planting are also estimated to sequester up to 103.85 tonnes of CO_2. The Sussex Flow Initiative has contributed 11.72 hectares to Environment Agency targets for the restoration/creation of priority habitat, and has also provided advice to riparian landowners alongside > 4.3 km of river/stream failing to meet Water Framework Directive (WFD) targets for phosphorous. Furthermore, the Sussex Flow Initiative's NFM delivery has taken place upstream of 17 properties (north of Lewes) considered by the Environment Agency to be at 'very significant risk' of flooding.

In addition to the delivery of NFM, SFI helps others to use and understand the approach, by sharing case studies, knowledge and experiences with other organisations considering NFM. By utilising best practice and disseminating our findings using a wide range of media, we try to positively influence the uptake of NFM throughout England and further afield. Through a combination of print (Sussex Wildlife Trust and digital (websites, blogs, Twitter, YouTube, Facebook) media, our message has potentially reached audiences of > 146,000.

The Sussex Flow Initiative continues to build on its previous work and the momentum provided by the launch of the Environment Agency's national programme of NFM in 2017, entitled 'Working with Natural Processes'. We will continue to deliver ambitious targets and to build new partnerships with organisations and local authorities with the shared goal of increasing the resilience of local communities to flooding.

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Introduction and project background

In 2012, the Sussex Wildlife Trust, the Environment Agency and the Woodland Trust began an innovative project on the River Ouse in East Sussex, called the Sussex Flow Initiative (SFI). The project aims to investigate ways that catchment-wide Natural Flood Management can help to reduce and delay flood peaks in areas vulnerable to flooding, whilst increasing biodiversity and providing multiple benefits at a landscape scale.

The Sussex Flow Initiative helps to develop new approaches to Natural Flood Management (NFM) across the 672 km² area and 1220 km of river in the Ouse catchment, and makes recommendations on how and where to target them. We are a pilot project to gauge the potential benefits of a wide range of NFM techniques in lowland UK rivers, delivering NFM measures in partnership with communities and landowners. We aim to demonstrate a best practice approach to NFM that can be followed by other organisations beginning to embrace the approach.

One of the key targets of SFI is to promote and integrate a holistic approach to water and land management across the catchment, and to make the catchment more resilient to flooding and drought, through a combination of demonstration and advocacy. Although the effects of NFM such as tree planting can take time to show their benefits, multiple actions taken now can provide positive natural capital benefits in the long term. We hope to inform people about the natural capital benefits of NFM, so that society can make the best choices for present and future generations.

This report provides a summary of the achievements of the SFI project over the last year (2020-2021). We hope that the information helps to provide further evidence of the opportunities for future work in lowland Natural Flood Management.

Figure 1. A tributary of the Ouse flowing onto the flood plain following heavy rainfall and reconnection work.

Project achievements 2020 – 2021

The Sussex Flow Initiative provides working examples of NFM techniques and best practice Natural Flood Management projects. We promote a landscape scale approach to reducing flood risk and water shortages, and to promoting the wider uptake of NFM in other suitable catchments.

Practical Delivery

Over the past year SFI has delivered a number of NFM projects, demonstrating a range of different NFM techniques. These provide case studies and working examples of how NFM can be practically applied in lowland catchments. The global Covid-19 pandemic has had a significant impact on the project, resulting from the changing restrictions, requiring certain works to postpone or modifying their delivery. The pandemic has particularly impacted on engagement face-to-face, as well as inhibiting volunteer opportunities. The NFM methods we use include:

- Planting of woodland and hedgerow, including across slopes and on floodplains
- Restoring and reconnecting river channels, meanders and floodplain washlands
- Using and managing woody material in watercourses to slow down flood flows
- De-gripping of heathland, woodland and other land
- Exposing and blocking land drains to slow the flow of water from farms
- Increasing surface water storage (e.g. offline ponds and Run-off Attenuation Features)
- Providing advice on land use and controlling excessive run-off and erosion
- Promoting swales, permeable surfaces and rain gardens to capture and store run off

Figure 2. Additional brash bundles added to the downslope edge of pond created in 2019 to stop soil erosion and enable vegetation establishment ahead of winter 2020--21.

Woodland and hedgerows

Planting trees in the right places can provide many natural benefits, including helping to slow the movement of water through the landscape, enhancing ecological networks and providing shelter for livestock. Floodplain woodlands, cross-slope hedgerows and shelterbelts physically intercept surface run-off and floodwater whilst increasing water infiltration and percolation into soils and groundwater, meaning that water reaches the catchments streams and rivers much more slowly.

Due to variations in topography, soil characteristics, root depth and morphology, there is no definitive figure of the contribution that trees make to NFM. However, infiltration rates have been shown to increase by 5 - 67 times[1] in tree planted enclosures compared to grazed pasture, and surface run-off was shown to reduce by up to 78% in two-year old tree planting plots in Pontbren, Wales[2].

Figure 3. Double fence line installed ahead of the planting of a 250m cross slope hedgerow [top left], tree saplings heeled in temporarily before being planted [top right], fencing and gate installed to enable natural regenerations above a gill stream [bottom left] and trees planted in 2019/20 without plastic protections are doing [bottom right].

In the last year we have planted 13,381 native trees and hedgerow plants across four sites. This includes 1,200 m of new cross-slope hedgerow[3] and 0.3 hectares of floodplain woodland. Additionally we have supported infrastructure to enable natural regeneration of a cross-slope copse to protect the source the headwaters of a gill stream within the Ashdown Forest, in the headwaters of the Ouse.

[1] Healey *et al.,* 2016. Trees, water storage and flooding in upland agricultural landscapes. Forest and Timber News.

[2] Healey *et al.,* 2016. Trees, water storage and flooding in upland agricultural landscapes. Forest and Timber News.

[3] Or over 5 hectares if counted as woodland at 2.5m spacing.

Floodplain washland storage

Floodplains offer fantastic opportunities for Natural Flood Management. When there is good connectivity between a river and its floodplain, the floodplain provides temporary storage for large volumes of water during a flood. Unfortunately the majority of rivers in the Ouse catchment have either official flood defence embankments or unofficial levees that prevent the river from interacting naturally with its floodplain. The unofficial levees are the result of spoil building up over decades of dredging and other river management. By removing small areas of these unofficial levees, the frequency of floodwater leaving the channel during flood events can be increased, whilst also allowing floodplains to drain freely once the flood has receded.

Once floodwater is out of the river channel and onto the floodplain, the greater surface area and vegetation 'roughness' of the floodplain slows the flow of floodwater and helps to reduce and delay the flood peak downstream. In addition, slowing down floodwater helps to drop silt and other flood debris out of the water column, naturally fertilising floodplain grasslands and helping to retain good soil structure. By creating seasonal scrapes on floodplains, flood water storage capacity can be further increased, and temporary freshwater habitat is also created, which is important habitat for a variety of aquatic invertebrates, birds, amphibians, and other wildlife.

In the past year we have:

Lowered unofficial embankments at six locations along the Cockhaise Brook and River Ouse, reconnecting the floodplain and opening up approximately 3.3 ha of additional washland storage (storing ~6,600,000L of Fwilderwater every flood event, at flood depths of 0.2 m).

Advised a number of other landowners on the importance of river-floodplain connectivity, the potential for lowering river embankments and the creation of floodplain scrapes.

Figure 4. Cutting through main river embankment [top], regraded spoil outside of floodplain from two cuttings [top middle] and two of six cuttings in progress [bottom middle and bottom].

Scrapes, ponds and temporary flood storage

In the right places, ponds, scrapes, silt traps and other temporary surface water storage bodies can contribute significantly to flood risk reduction downstream, and provide multiple other benefits to wildlife and society, such as reducing pollution inputs to rivers.

This year, the Sussex Flow Initiative has created 17 water storage features (totalling 0.06 ha) in an area, across five sites upstream of Lewes. The combine storage of these filter is approximately 132,513 L, which will be intercepted and attenuate surface water during and following heavy rainfall, rather than being rapidly transported into nearby watercourses.

We have advised numerous other landowners on the creation of other seasonal water storage areas, and the importance of temporary ponds.

Figure 5. Contractor start the creation of a storage feature to capture water coming of the field [left], completed storage feature in field corner [middle] and another complete storage feature filled following rainfall [right].

Leaky dams

By strategically introducing leaky dams (natural woody barriers) into streams and ditches, floodwater can be intercepted during heavy rainfall events. Leaky dams are emulating the dams built by beavers who have been absent from the catchment for more than 400 years. These natural leaky structures slow the speed of water along watercourses, temporarily backing it up and encouraging it out onto small floodplains, where greater surface roughness results in slower flows.

Sussex Flow Initiative has had to postpone leaky dams planned this year till next year as result of the pandemic and complying with national/organisational restrictions and guidance. Working with a trained and skilled landowner has enabled creation of 11 leaky dams on their land. These 11 leaky dams installed in 2020/21 are estimated to be storing around 1 m^3 (1,000 litres) of water per structure during each rainfall event – or at least 11,000 litres of water.

We continue to work with the University of Brighton and others to learn how leaky dams influence stream flows, flood storage, sediment, channel geomorphology, riparian soil moisture and plant diversity. Installing multiple water depth gauges on a section of the Cob Brook that we installed 70 leaky dams last year through funding from the Sussex Lund Fund. Depth gauges were also installed at a Woodland Trust site ahead of installing leaky dams next year to gain a year of base line data.

Subcatchment mapping

To identify the most effective places to use Natural Flood Management in the Ouse catchment, in previous years we have worked with the Ouse and Adur Rivers Trust and the Environment Agency to map and survey Longford Stream sub-catchments in the Ouse valley. This year we have produced targeted report for the Slaugham to Ardingly sub-catchment, which sits alongside the report produced by the Ouse and Adur River Trust in 2015. Sussex Flow Initiative have also produced a desk-based whole estate NFM report for Plumpton College, which sits within the Bevern Stream sub catchment.

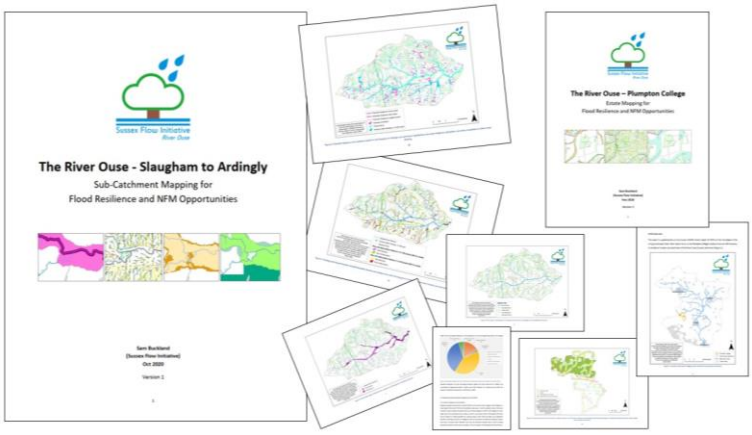


Figure 6. Screenshots of pages from the sub catchment report and whole estate plan written this year to target NFM delivery.

Benefitting properties at 'very significant risk of flooding'

The Environment Agency classify a property to be at very significant risk of flooding if it is in an area at risk of flooding in a 1 in 20 year flood event. There are 25 such properties north of Lewes in the Ouse catchment and the NFM work carried out by SFI in 2020/21 was upstream of 17 of these properties (Figure 7; Appendix B).

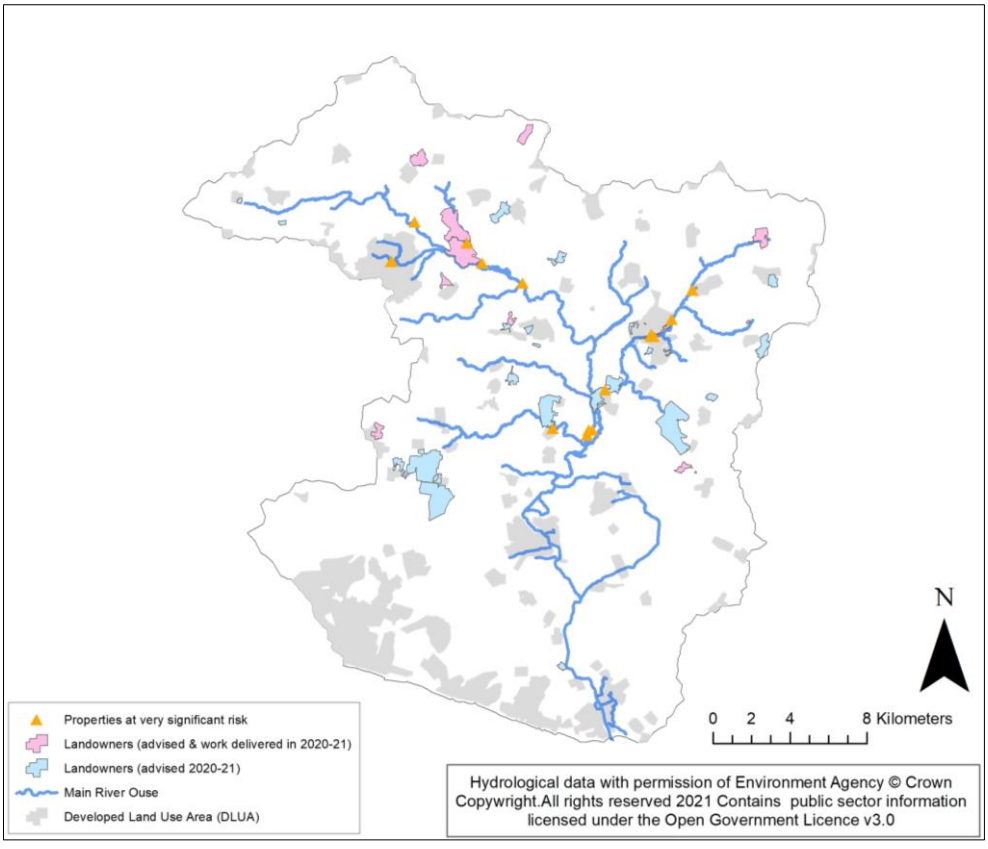


Figure 7. Overview of SFI's activities and the properties at very significant risk of flooding in the Ouse catchment.

Catchment-wide influence

Quantifying the effects of catchment-wide NFM interventions on a flood hydrograph is a challenging task, partly due to natural variability in precipitation over space and time, and variations in land cover/use. There is very limited gauging of flood levels across the wider Ouse catchment, which means that we can only estimate our upstream influence in reducing flooding. We can however measure our overall influence on parcels of land, and the river corridors which flow through them.

This year SFI has worked instream, and in riparian and floodplain areas, as well as in the wider catchment. We have given positive land management advice and delivery on over 1,727.6 hectares of land, and we estimate that our NFM interventions have had a positive influence on over 82.65 hectares of land[4]. Of the 1,192 ha advised, 105 hectares were in the floodplain, and we believe we have directly encouraged positive management of approximately 77.39 hectares of floodplain (Flood Zone 2). We have actively influenced at least 550 m of the river network using instream work[5] - at least 7.6 km through land-based activities[6]. We have potentially positively influenced over 50.5 km of the river network through our advice on land and habitat management[7].

This year, the Sussex Flow Initiative has also contributed to the restoration/creation of 11.72 hectares of priority habitat (8.36 ha of woodland[8] and 3.36 ha of open/standing water).

Figure 8. Looking downstream across the River Ouse towards Lewes Railway Land at Cliffe.

[44] Based on land between NFM measure and water course that will be influenced by the measure
[5] Based on an estimated 50 m of influence per woody structure
[6] Only including waterbodies downslope and adjacent to tree planting (i.e. not including downstream effects)
[7] Including a 100 m buffer of landowner boundaries
[8] Including hedgerow (320 m of hedgerow is equivalent to 1 Ha of woodland in terms of number of trees/shrubs planted)

Multiple Benefits of NFM

One of the most important features of natural flood management is that it delivers multiple benefits to society, not just benefits for flooding and drought. NFM measures help to reduce flood risk and increase drought resilience, but they also provide a whole range of other natural goods and services (see Appendix D) on which society rely.

The multiple benefits of different Natural Flood Management measures are documented in the Environment Agency's 'Working with Natural Processes' evidence base. This includes 'benefit wheels' for a wide range of techniques. Examples of these are shown below in Figure 9.

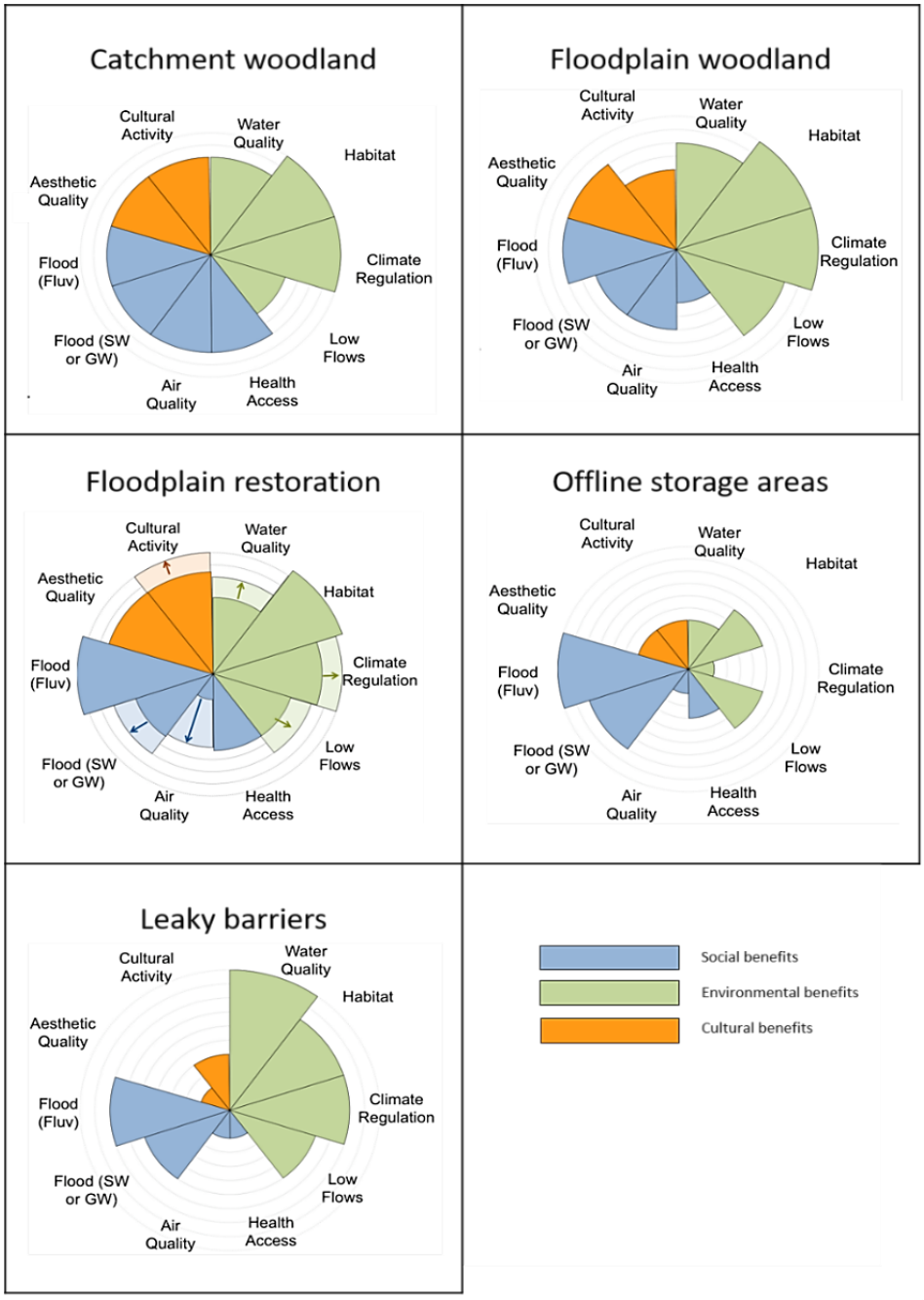


Figure 9. Multiple benefits provided by Natural Flood Management techniques (EA, 2017).

Sussex Flow Initiative helps to support human and environmental wellbeing by providing provisioning, regulating and cultural ecosystem services. These services include:-

Provisioning services

- ***Biodiversity:*** Woodlands, hedgerows, open water features and wetlands provide important habitat and food resources for a range of wildlife. Our work helps to improve the connectedness of local and regional habitat networks, and therefore the resilience of species to climate change. Rare, native tree species have been planted, adding to the potential genetic diversity and natural survival of these species.
- ***Shelter:*** Hedgerows and woodlands provide shelter for livestock and people from rain, wind and sun.
- ***Raw materials:*** The woodlands planted by SFI comprise species which can be coppiced (black poplar, willow, hazel, sweet chestnut, field maple) and used as a renewable source of timber and fuel.
- ***Food:*** Hedgerows and woodlands are an important source of fruit, nuts and berries for people and a range of wildlife. Improved in-stream habitat, reduced sedimentation and increased natural shading helps to ensure healthier populations of fish, and river shading helps buffer climate change impacts, and improving fish spawning habitat. Hedgerow forage can be an important source of food and natural medication for farm livestock.
- ***Freshwater:*** The work that we do helps to regulate the flow and purification of water. Vegetation and forests influence the quality and quantity of water available locally, and leaky dams, hedgerows and washlands help to clean local water sources.
- ***Medicinal resources:*** Ecosystems many plants used as traditional medicines as well as providing raw materials for the pharmaceutical industry. All natural habitats are a potential source of medicinal resources.

Regulating services

- ***Pollination:*** Pollination is a natural service provided by insects, birds and bats. Around 87 of the 115 leading global food crops depend on this pollination. This year, SFI have planted 13,381 native flowering trees and shrubs. 5,095 of these trees have been planted in a Buglife B-line pollinator corridor, providing a food source for a range of pollinators.
- ***Carbon Sequestration:*** Ecosystems regulate the global climate by storing and sequestering greenhouse gases. As trees and plants grow, they remove carbon dioxide from the atmosphere and lock it away in their tissues, acting as carbon stores. Through SFI's work this year, and every year until they are mature, the equivalent of 8.36 hectares of new

woodland/hedgerow will be providing carbon sequestration, with a predicted total of up to 114.532 tonnes of carbon dioxide-equivalent per year.[9]

- ***Water purification:*** We have provided advice on land adjacent to > 4.3 km of watercourse failing to meet Water Framework Directive (WFD) environmental quality standards for phosphorous. This has included advice on measures to reduce surface run-off and soil erosion, and riparian buffer strips, which help to reduce phosphorus delivery to these waterbodies.
- ***Water storage & flood regulation:*** Ecosystems and living organisms create buffers against natural disasters. For example, wetlands soak up flood water, and trees can stabilize slopes. By using flood storage ponds, de-gripping drains, creating seasonal water storage and installing leaky dams, we have created up to 3,462,300 litres of additional flood storage per flood event. Our NFM delivery has taken place upstream of 17 properties (north of Lewes) considered to be at "very significant risk" of flooding, according to the Environment Agency. Advice on flood water storage has been given on 53 sites, with these sites being upstream of 18 properties (north of Lewes), and in close proximity (< 150 m) upstream of eleven of the properties considered to be at "very significant risk" of flooding.
- ***Soil erosion and health:*** Soil erosion is a key factor in land degradation and desertification. Vegetation provides a vital regulating service by preventing soil erosion. Soil fertility is essential for plant growth and agriculture. Well functioning ecosystems supply the soil with nutrients to support plant growth. Hedgerows and woodlands help to break up compacted soils, allowing them to hold more water. Plant root structures help water to penetrate into the soil. Plants also help to reduce erosion by wind and water. Less intensively managed grass and woodland habitats support healthier populations of earthworms, beneficial bacteria and mycorrhizal fungi, which in turn increase soil structure, health and porosity.
- **Pollution regulation:** Ecosystems such as wetlands filter both human and animal waste and act as a natural buffer to the surrounding environment. Through the biological activity of microorganisms in the soil, most waste is broken down. Pathogens (disease causing microbes) are eliminated, and the level of nutrients and pollution is reduced.
- **Local climate and air quality:** Natural vegetation influences rainfall and water availability both locally and regionally. Trees or other plants play an important role in regulating air quality by removing pollutants from the atmosphere. Hedgerows & woodlands provide buffers to roads with benefits to air quality and local noise reduction. Our NFM measures & natural habitats also help to buffer, reduce and break down water and air pollution.

[9] Natural England. Carbon Storage by Habitat: 13.7 $tCO_2\text{-}e\ ha^{-1}\ yr^{-1}$ sequestered when land is changed from improved grassland to woodland (year 2 – 21)

Cultural Services

- ***Cultural benefits:*** SFI work has been delivered within two protected landscape, helping to protect culturally important meadow landscapes and we work with the High Weald Area of Outstanding Natural Beauty to conserve traditional historic, woodland and meadow landscapes. SFI work has also helped to conserve and enhance the special qualities of the South Downs National Park.
- ***Human health:*** We provide advice, support and funding to local communities, helping to create a more connected and diverse landscape with corresponding benefits to human health and welfare. Due to the Covid-19 pandemic, SFI hasn't been able to run the workshops that would have provided hundreds of people with opportunities to engage positively with the outdoors, supporting physical and mental health improvements, and increasing connection with nature.
- ***Connecting people with their local environment - recreation and aesthetic experiences:*** Many of the hedgerows and woodlands are adjacent to, or in close proximity to public rights of way, ensuring that these features can be appreciated by a large number of people.
- ***Restoring historic landscape features:*** Hedgerows have been a part of the British landscape for centuries, and are iconic features of rural areas. By planting hedgerows and woodland in areas where they were previously located, SFI are contributing to the conservation/restoration of rural landscapes and heritage in Sussex.

The Social Benefits of Natural Flood Management

The Sussex Flow Initiative (SFI) Natural Flood Management (NFM) project has been working to reduce flooding and drought since 2012. We know that it works to use simple, cheap and community led measures to store and manage flooding locally, but we've never really measured how much it works, or who it benefits. Each year SFI engages with hundreds, if not thousands of people on NFM, so this year we carried out a survey with the New Economics Foundation to measure the social benefits of the work that we do.

There are a number of headline impacts that the project has had over its eight year lifespan, social benefits from those completing the survey stated an:

- Increase in those surveyed understanding of flood risk (58% of participants in survey),
- Increase understanding of NFM issues and techniques (16% and 15% respectively of participants in survey).

The positive engagement we do in demonstrating and educating around NFM, seems to translate into a greater ability and a clearer motivation for people to take action to help mitigate flooding:

- Increase feelings of empowerment to make positive changes in their environment (+39% of participants in survey)
- Positive impact on enhancing their skills to undertake NFM (20%),
- Very strong intentions to undertake future NFM actions (+61% of participants in survey).

Many of the survey respondents also felt they derived personal well-being from participation in the project, including a:

- Stated their perception of their physical health improved and felt more positive in general (+25% of participants in survey),
- Feeling of being inspired and motivated (+48% of participants in survey).

Our NFM increases awareness about climate change, the finding show the importance of helping people manage their anxiety linked to that. The full report can be found on the SFIs website, we'll continue to keep engaging with local people and helping them take action to reduce local flooding.

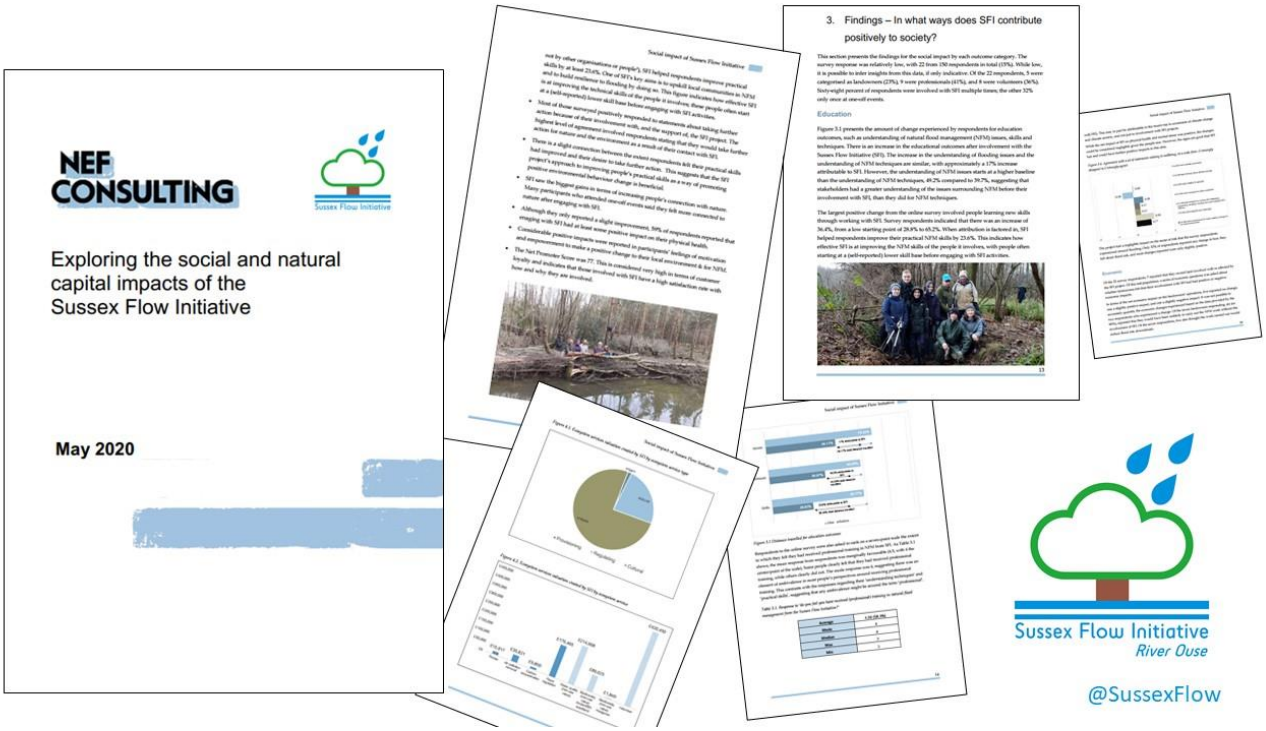


Figure 10. The NEF report ['Exploring the social and natural capital impacts of the Sussex Flow Initiative'*](), published in May 2020.*

Engaging and supporting local communities

A core role of the Sussex Flow Initiative is to support local people to take positive action to help reduce flooding in their local communities. We do this in a range of ways including working with local flood groups, training local people in NFM techniques, and by providing educational events and websites. Our advocacy work involves engagement with landowners, local district councils, county councils, the Environment Agency, NGO's, community groups and many more:

Landowners

- This year we visited or advised 40 landowners on 53 sites, covering over 3.7% of the land upstream of Lewes, on a total of at least 1,610.1 hectares of land (119.2 hectares downstream of Lewes).

- Of these 53 sites, 20 included floodplain areas on ‘main river’ or ‘ordinary watercourses’.

For a map showing the extent of the land that we advised over the last year, see Appendix A**.**

Contributing to the evidence base

The Sussex Flow Initiative continues to work with academics and students from universities, assisting with their research into aspects of NFM including:

- Influence of coarse woody material structures on the hydrograph, geomorphology and material accretion.
- Evaluation of methods of measuring/quantifying water storage and attenuation of different NFM measures during flood events.

Supported by funding from Lewes District Council and the University of Brighton, we were able to purchase and install ten depth gauges and one rain gauge. These were installed across two sites at the end of 2020 with lecturers from the School of Environment & Technology at the University of Brighton. The data collected will form part of future research project, increase the evidence base of natural flood management, and enable the quantification of the impact at individual measures.

We have also worked with, and been supported by other NFM projects.

We have also worked with local ecologists to gain baseline data on site biodiversity to monitor spatial and temporal changes following the installation of NFM measures.

Flood risk agencies and organisations

Sussex Flow Initiative works closely with Lead Local Flood Authorities (LLFA) and others who have a statutory duty to prevent flooding of residential properties, businesses, and infrastructure. By engaging with these groups, SFI is directly influencing the future of (natural) flood management, and

increasing the likelihood of sustainable flood risk management approaches being embraced. We have engaged with the following flood authorities and groups over the last year:

- Lead Local Flood Authorities;
- Lewes District Council;
- East Sussex County Council;
- West Sussex County Council
- Regional Flood and Coastal Committee;
- Flood and Coastal Risk Managers;
- Planning Authorities;
- DEFRA
- Local Flood Action Groups
- EA national FCRM consultations

Working in partnership

In the last year we have hosted a partnership visit with Lewes District Councillors. SFI has also provided information and expertise to projects and other policy makers outside the Ouse including:

- Wilder Horsham District
- Lost Woods of the Low Weald
- Woodland Trust
- Sussex Wildlife Trust
- Multiple landowners

We have worked with a range of local and national groups and stakeholders including:

Working with local communities

An important benefit of NFM is its ability to empower local people to increase the resilience of their communities to flooding. The Covid 19 pandemic has impacted hugely how natural flood management inventions have been delivered this as a result of national/organisational restrictions. Therefore, Sussex Flow Initiative hasn't run any group community events in line with guidance and best practice.

We work with a number of Catchment Partnerships and others to encourage wider uptake of NFM.

Events

The pandemic has inhibited the ability to disseminate the experiences and findings of SFI through face to face events/talks, we have undertaken the following:

- Adur and Ouse Catchment Partnership
- Lewes District Councillor site visit
- Upper and Middle Ouse Farmer Cluster Groups
- Lewes Climate Hub: Spring into Renaturing
- Plumpton College Talk
- Other Public talks

Through these events we have reached an audience of at least 400 people directly and recordings ae available to engage a wider audience.

Training and signposting

We have continued to work closely with other organisations and initiatives, providing information to facilitate the uptake of NFM approaches within the project area and further afield. The Covid-19 pandemics has meant that we have not been able to run practical training days for contractors or other organisations.

Close collaborative working with Catchment Sensitive Farming Officers has enable the sharing of best practice in NFM implementation for water quality as well as flood risk management.

Volunteers & 'in kind' support

Helping to empower communities to actively increase their resilience to flooding is a major part of the work and delivery. Without support from these local communities, landowners and volunteers, the delivery of NFM in the Ouse catchment would be significantly reduced. In 2020/21 we experienced the impact of not being able to delivery our NFM measure through the support of teams of dedicated and enthusiastic volunteers from local communities, project partners, and other stakeholders (e.g. government organisations and schools) due to the pandemic. A lot of practical delivery has even been postponed or undertaken via contractor complying with Covid 19 guidelines and risk assessments. Complying with restriction and guidelines the project has had:-

- Our main partner organisations contributing around £69,151 of their time 'in kind'[10]
- Landowners contributing at least £34,500 towards contractors, materials, and 'in kind'
- Funding from external sources (i.e. donations) of £995

Websites and social media

The Sussex Flow Initiative continues to build its online presence by maintaining a comprehensive website and blog, as well as a Sussex Wildlife Trust SFI page, and social media/networking accounts.

[10] Based on Woodland Trust, EA, Sussex Wildlife Trust & Sussex Biodiversity Records Centre including comms support

In the past year:-

- The SFI website has had >1,000 unique visitors, with >500 reading our blogs and case studies.
- The SFI twitter and Facebook following has increase to >680 and >150 followers respectively, an increase of 180 followers on tweeter this year, generating >143,000 impressions on twitter.
- SFI videos posted by Sussex Wildlife Trust on Twitter and Facebook have had >9,600 views and >740 engagements.

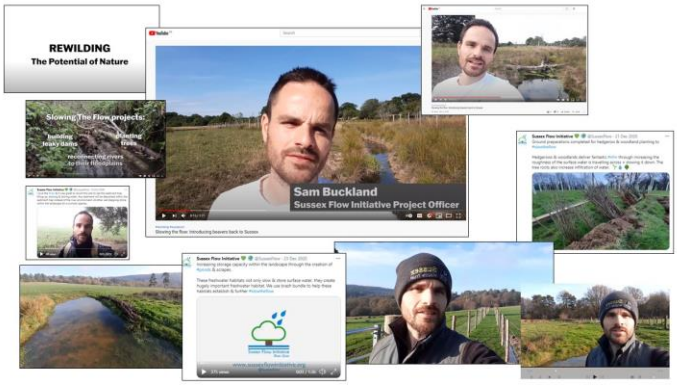


Figure 11. Screenshots from the Sussex University video series on Rewilding, as well as video updates on NFM intervention being delivered within the catchment.

- Seven blogs have generated over 500 unique page views.
- Creation of multiple videos focussing of a range of natural flood management measures.

Case studies

To encourage the uptake of a wide range of NFM techniques, SFI produces informative case studies. These are a growing resource for those wishing to explore the effectiveness of NFM techniques, and those interested in examples of collaboration and funding of NFM delivery. Historically there has been little information available on utilising NFM in lowland catchments, so these case studies can provide working examples of how lowland NFM can be used. Our case studies include using leaky dams in woodlands, washland restoration, woodland and hedgerow planting, land drain breaking, and whole farm NFM.

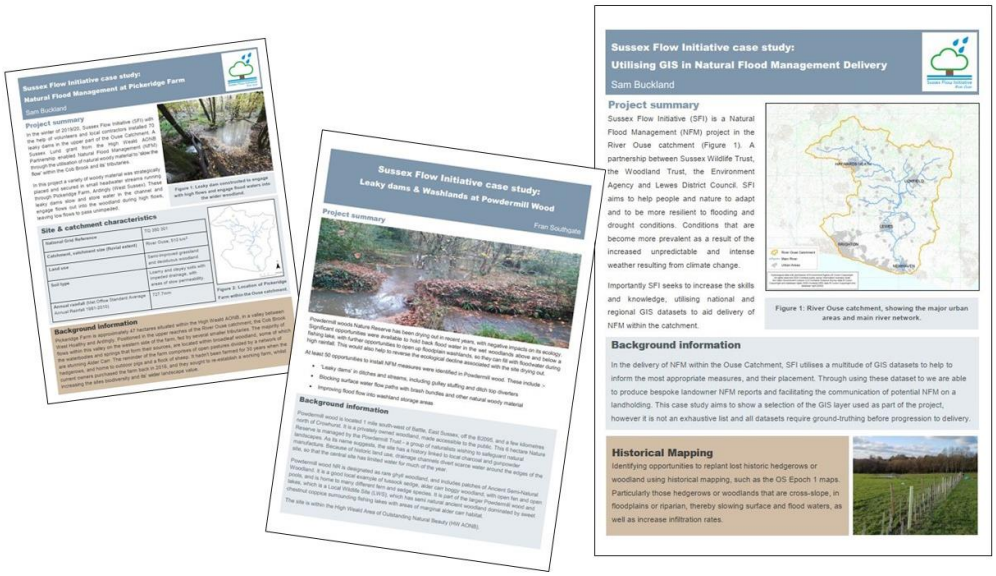


Figure 12. Case studies produced this year by SFI on NFM techniques.

Guidance Document

This Sussex Flow Initiative published an online guidance manual on the naturalistic types of leaky dams constructed by the project and some guiding principles that the projects follows. The advice within the manual not only draws on local experience, but brings together advice from leading NFM projects, and existing NFM resources/publications. It has proved to be a hugely useful resource in facilitating wider NFM undertake and delivery.

Figure 13. SFI published an online guidance document on creations of leaky dams within watercourses, comprising of information from national guidance, as well as delivery as part of the project.

Print Media

A number of articles have been published in magazines and newsletters, including the two articles in the Sussex Wildlife Trust's Magazine (readership of > 33,000), Lewes District News, Catchment Sensitive Farming newsletter, EA internal newsletter, the two Ouse Farmer Cluster groups and the project was mentioned in the Sussex Life article on 'Are beavers about to return to Sussex?'.

Figure 14. Articles published in the Sussex Wildlife Trust Magazine discussing natural processes and NFM (left) and article in Sussex Life of the return of the beaver to Sussex's waterways and ow it links with the work of SFI (right)

CPRE Award

Sussex Flow Initiative were hugely honoured to be nominated for, and awarded a Silver award (Figure 15) for Promoting Nature and the Countryside at CPRE's Sussex Countryside Awards. A huge thank you for the support and hard work of our partnership, volunteers and land owners, without whom we would not be able to have delivered the NFM that we have.

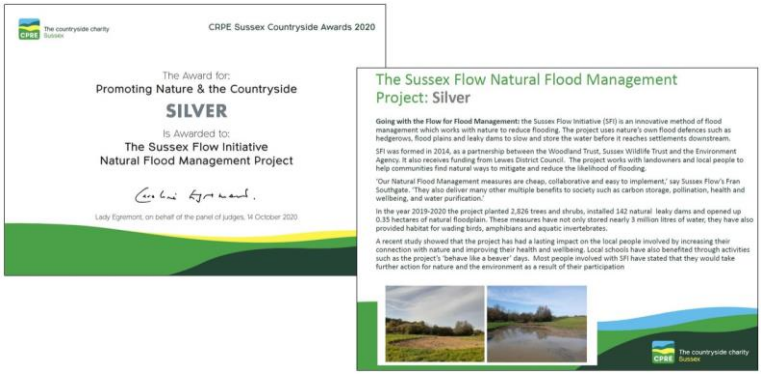


Figure 15. Certificate of the CPRE silver award received at their virtual award ceremony in October 2020 [left], and the information on the project and what it delivered in 2019/20 [right].

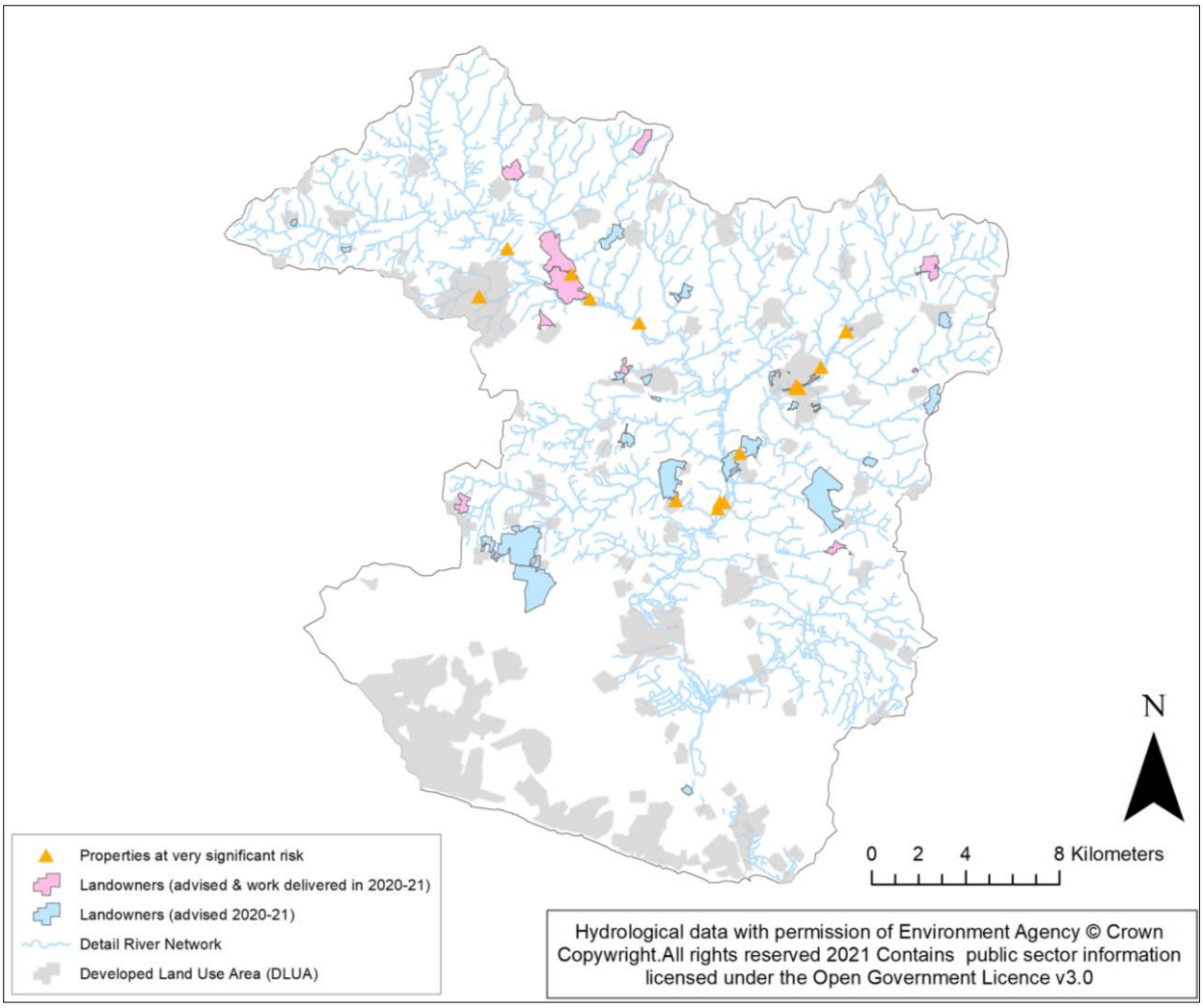
Sussex Beavers and wider Natural Flood Management across Sussex

Figure 16. Beaver photographer by ©David Parkyn as part of the Cornwall Wildlife Trust project.

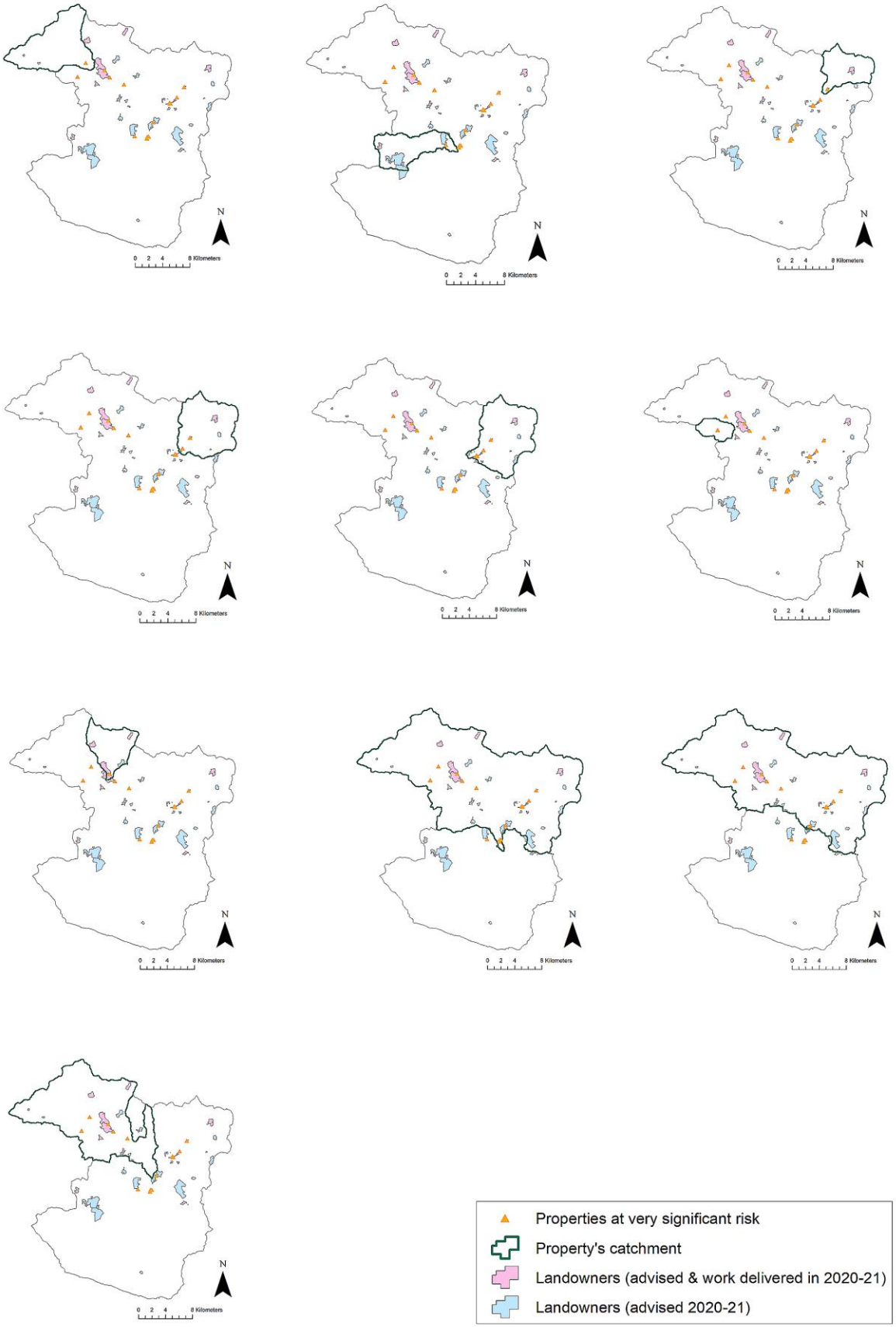
Sussex Wildlife Trust continues to support initiatives to reintroduce beavers, as natural ecosystems engineers into Sussex waterways in licensed projects and hopes that future reintroductions will be permitted without the need for fenced enclosures. We are now in the first phase delivery of a project with Professor Richard Brazier and his research team from University of Exeter to map suitable beaver habitat across Sussex and identify areas where potential positive benefits can be maximised as well as possible areas which may see negative contact. This is part of a larger country wide mapping project with other Wildlife Trusts, led by Devon Wildlife Trust. Despite a challenging start the licenced beaver reintroduction at Knepp Estate will go ahead in its next phase with the release of a bonded pair of beavers into a smaller enclosure within the rewilding project in the River Adur catchment, and the National Trust are imminently ready to release two beavers into their enclosure on the River Wey. We hope therefore, that learnings from these and other licensed releases, alongside a thorough habitat mapping exercise in Sussex will identify suitable areas on the River Ouse for other licensed introductions. The future of SFI should focus on identifying other opportunities to restore natural processes (WwNP) within the wider catchment, including natural regeneration, habitat restoration and working with all partners to establish a Nature Recovery Network (NRN) to create a better connected landscape. We are looking forward to progressing all work that had been held back by COVID-19 restrictions and remain focussed on delivering NFM in the fifth year of the SFI project.

Appendices

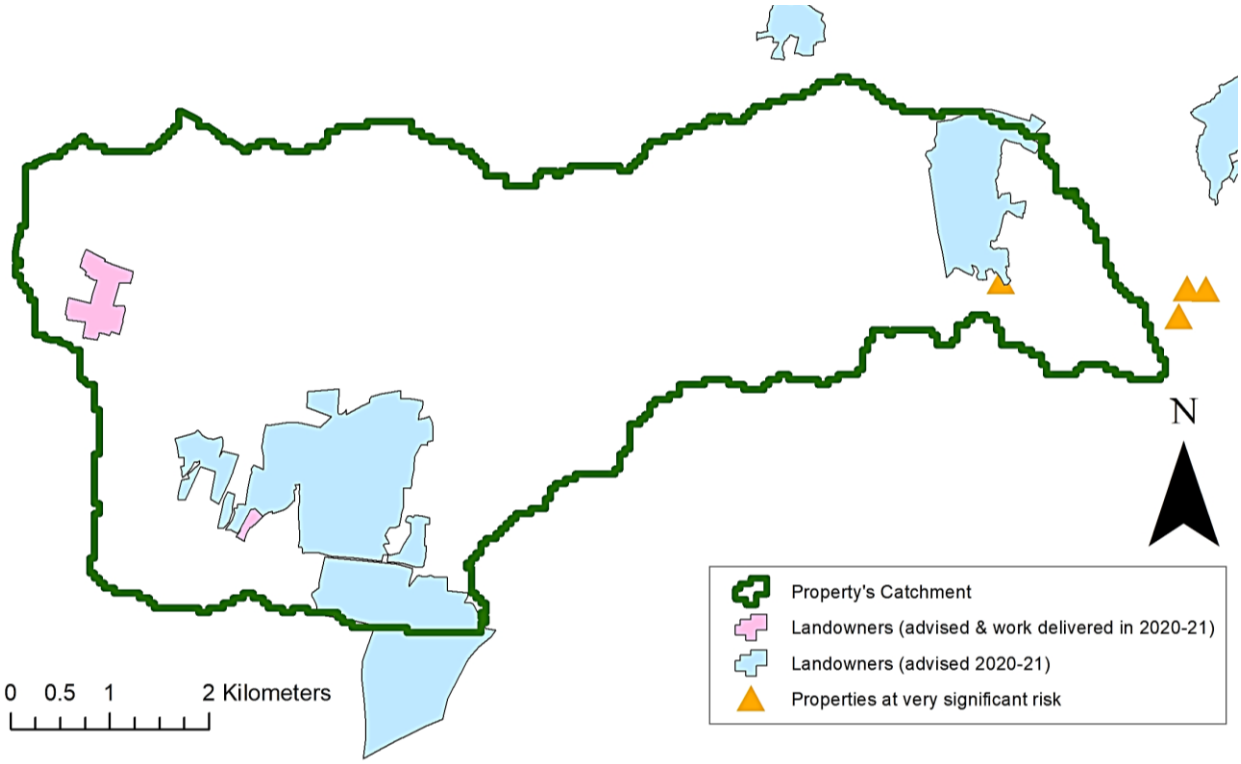
Appendix A. Landowner visits 2020/21



Appendix B. Properties at very significant risk of flooding and their catchments in the Ouse catchment north of Lewes.



Appendix C. Focus on a close-up of a properties at very significant risk of flooding and it's catchment in the Ouse catchment north of Lewes.



Appendix D. UK NEA services provided by the 3 main strands of SFI Project work

Ecosystem service	ES from SFI Semi Nat Grasslands / Washlands	ES from SFI Woodland	ES from SFI Fresh & Open waters, Wetlands & Floodplains
Food	●	●	●
Water	●	●	●
Timber		●	●
Wood fuel		●	
Biofuel (incl. Peat)			
Bioenergy			
Health Products			
Fibre			●
Species Diversity	●	●	●
Genetic Reserves	●	●	●
Disease and Pest Control			
Climate Regulation	●	●	●
Erosion Control	●	●	●
Water Regulation	●	●	●
Flood Regulation	●	●	●
Fire Hazard Regulation			
Air Quality Regulation	●	●	
Water Quality Regulation	●	●	●
Soil Quality Regulation	●	●	●
Noise Regulation		●	
Recreation	●	●	●
Tourism	●		
Aesthetic Values	●	●	●
Cultural Heritage	●	●	●
Employment	●	●	●
Spiritual Values	●		
Education	●	●	●
Sense of Place	●	●	●
Health Benefits	●	●	
Navigation			
TOTAL	**20**	**21**	**18**

Appendix D. Sussex Flow Initiative five-year targets

So far, the project has cumulatively achieved the following:-

Five-year targets (2017 – 2022)	Progress towards target in 2017 – 2021
High level targets	
In the long term (10 years +), to influence at least 20% of the catchment (13,430 ha) and to support the creation of 40% woody cover in the upper third of the catchment, and 20% woodland cover in the central third of the catchment and/or influence 20% of river length (240 km)	Advice on 8,309 ha of land, delivery on 2,004.25 ha. > 31.5 km of river/stream influenced (>250.5 km potentially influenced by advice given)
Aim to show a reduction in peak flows from intense rainfall events with a subsequent reduction in risk to existing properties in flood risk areas. Working from baseline hydrometric data (where available), work with EA to seek to quantify the reduction in flood flows and risk to existing properties	18 properties at very significant risk of flooding are downstream of NFM measures we have implemented
Aim to show a positive influence on water quality / WFD failing waterbodies	Advice given to landowners adjacent to >24.3 km of river/stream failing to meet WFD targets for phosphorous
Habitat Delivery and NFM	
At least 100 Large Woody Debris (LWD) dams installed	290 woody material structures installed
1,500,000 litres of additional seasonal water storage created	Between 11,721,462.5 L and 12,721,462.5 L created Reconnected floodplain able to store 9,896,750 L Scrapes storing 1,421,762.5 – 2,421,762.2L Sediment trap storing 111,750 L LWD slowing approx. 290,000 L 1,200 L stored in pocket ponds
25 ha of priority habitat created including : Minimum 10 ha woodland planting and Minimum 10 km hedgerow planting Open water – 15 ponds enhanced / restored and/or 10,000 m^2 of open water created	26.9 ha of priority habitat (if hedgerows counted as woodland): 7.49 ha of woodland created 6,180 m of hedgerow planted At least 9,206 m^2 of seasonal open water created
Strategic and Catchment Scale	
Two sub catchment plans written	Two full sub catchment plans (Longford Stream and Slaugham to Ardingly) and one short sub catchment report (Ringmer) written
At least one sub catchment plan implemented	
Flagship projects funded and initiated with EA, RFCC and at least one new Lead Local Flood Authority	

At least 30 people trained and upskilled in NFM techniques via river habitat workshops, staff training days, new comms/events	Training of 17 contractors and staff - digging wildlife scrapes, ponds and installing woody material
A further 15,000 tonnes of potential carbon dioxide storage created	Approximately 9,174.93 tonnes of carbon dioxide storage per year (after year one) created by hedgerow and woodland planting
Natural capital and multiple benefits of the work we have achieved clearly articulated for all	Case studies, blog posts and videos have been produced, highlighting the multiple benefits that SFI activities will result in
At least 10 external sites supported to carry out additional NFM works	
Engagement and Advocacy	
Engagement and influence of at least 5,000 people	Potentially >510,260[11] people reached with varying levels of engagement and influence. High level engagement includes community engagement with >170 volunteers, >1100 people at conferences and local events, >5,000 views to SFI articles/web pages. >2,200 views of SFI-related pages on SWT website and >155,860 interactions on twitter and Facebook
At least 10,000 ha of land advised and engaged with on NFM	> 8,829 ha of land advised
At least 20 events held or SFI represented	Twenty events; (CIWEM conference; WwNP event, Adur and Ouse Catchment Partnership, Lewes Tree Charter, Arun Valley Vision Group, Transition Town Worthing, SHRT summer fair, Tingles Way guided walk, Lewes District Councillor site visit, Plumpton College talk, Chailey Common Society talk, Eastbourne Carbon Neutral, East Chiltington talk, Landscape Innovation Conference, Sussex Wildlife Trust AGM, Sussex Wildlife Trust's staff day talk, Transition Lewes Spring into Renaturing, Upper & Middle Ouse Cluster Group, Plumpton College, Brighton University
At least two advisory leaflets written and published	
Publish information (TV, radio, external websites) which reaches potential audiences of at least 100,000	Reached an audience of approx. 230,000, plus a radio interview on BBC Sussex which has weekly listener numbers of > 260,000
Publish at least five case studies / National Guidance Documents on the work that we have achieved	Nine case studies have been produced highlighting project work, as well as national guidance document on leaky dam construction.
Budget and Finance	
Attract at least £200,000 of in kind funding	At least £236,750 (£81,151 in 2020/21) of in kind funding
Generate at least £50,000 of further income	£47,984 grant received from Banister Fund £28,100 Woodland Trust planting and fencing

[11] Including 37,000 listeners to the radio interview (260,000 weekly listeners divided by seven days)

	£34,500 contributed by landowners in 2020/21
Evidence and Research Generate a legacy of experimental research projects with key universities, CABA (Catchment Based Approach), the Environment Agency and others; at least 5 research projects supported Work with existing organisations who can assist with long term monitoring (e.g. Rivers Trusts)	
Others we have influenced to deliver KPI's Influence at least ten others to deliver on KPI's	The Woodland Trust Sussex Wildlife Trust Forestry Commission East Sussex County Council National Trust Lewes District Council Adur & Ouse Catchment Partnership Esus Forestry Dryad Tree Specialists Tilhill Forestry Strutt and Parker Wild Sussex Miscellaneous Adventures Mayfly Aquacare CLM Wilder Horsham District Lost Woods of the Low Weald