



Sussex Flow Initiative

Natural Flood Management Project



End of Year Report

2019/20



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 2019-2020.

By working closely with landowners, local communities, and local authorities, the Sussex Flow Initiative has delivered NFM throughout the Ouse catchment, directly influencing approximately 437 hectares of land, and providing advice to landowners of 1908 hectares of land. The NFM techniques that have been utilised include tree planting (with over 2,765 trees being planted in 2019/20 in the form of 415m of hedgerow and 0.2 ha of woodland), 142 natural woody structures installed in streams, as well as the creation/restoration of 0.43 hectares of temporary flood water storage and wildlife habitat. The additional water storage created by this work is estimated to be approx. 1,180,140 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 20.4 tonnes of CO₂. The Sussex Flow Initiative has contributed 1.61 hectares to Environment Agency targets for the restoration/creation of priority habitat, and has also provided advice to riparian landowners alongside > 3.6 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 Countryman, talks, and digital (websites, blogs, Twitter, YouTube, Facebook) media, our message has potentially reached audiences of > 150,000.

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 (2019-2020). We hope that the information helps to provide further evidence of the opportunities for future work in lowland Natural Flood Management.



Project achievements 2019 – 2020

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 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 1. Leaky dam holding back water in a woodland ditch (left), seasonal water storage and land drainage work: Scrape intercepting land drain (right).

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 times¹ 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, Wales².

In the last year we have planted 2,826 native trees and hedgerow plants across four sites. This includes 415 m of new cross-slope hedgerow³ and 0.2 hectares of floodplain woodland, and 60 rare black poplar trees. This planting builds upon previous years, experimenting with alternative ways to create woodland and hedgerows without the need for plastic.

We have also assisted landowners with Countryside Stewardship (CS). CS provided funding for hedgerows (150 m [723 shrubs] planted in December – not included in the above SFI figures) and fencing on the Cockhaise Brook floodplain, with SFI advising on the location of cross-slope hedges.



Figure 2. CS funded Cross-slope hedgerow and floodplain woodland planted 2018/19 (above), riparian planting (top-right) and cross-slope woodland (bottom-right) planting.

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:

Created one (0.1 ha) floodplain scrape which has increased the water storage capacity of the floodplain by approximately 241,650 L per flood event.

Lowered unofficial embankments at one location along the Cockhaise Brook, reconnecting the floodplain and opening up approximately 0.35 ha of additional washland storage (storing ~696,750 L of water every flood event, at flood depths of 0.2 m).

Revisited a section of embankment that was lowered in 2018/19 along the Cockhaise Brook, and made an alteration which enhanced the connectivity of the scrape with the floodplain and increased the frequency of operation of approximately 1.05 ha of washland storage (storing ~2,103,704 L of water 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 3. Cutting through main river embankments [left] and an floodplain scrape [right].

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 7 scrapes (totalling 0.12 ha) in an area of semi-improved acid grassland adjacent to Ashdown Forest. By intercepting & blocking land drains, we can ensure that additional water is temporarily stored during heavy rainfall, rather than being rapidly transported down land drainage pipes and into nearby watercourses. These scrapes are estimated to store approximately 483,390 L during each flood event.

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



Figure 4. Seasonal water storage and land drainage work: Scrape intercepting land drain [top left], scrape intercepting surface water [top right & bottom left], exposed blown land drain [bottom 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 effectively 'fake beaver dams' which help to 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.

We need to be careful where we place wood in watercourses, so that it doesn't back water up and cause floods where we don't want them. However, in woodlands and other habitats away from human infrastructure, it is easy to find areas which can store water using leaky dams.

Sussex Flow Initiative has experimented with a wide range of different natural woody structures, to show how different designs slow and temporarily store floodwater. In 2019/20 the we installed over 142 leaky dams, estimated to be storing around 1 m³ (1,000 litres) of water per structure during each rainfall event – or at least 142,000 litres of water.

We provided training to three contractors, so that they can help to deliver leaky dam work throughout Sussex and Kent. We also trained two East Sussex County Council Rangers on their nature reserve, Chailey Common, enabling them to deliver leaky dams work in their wider land management roles.

We continue to work with the University of Brighton, University of London and others to learn how Leaky dams influence stream flows, flood storage, sediment, channel geomorphology, riparian soil moisture and plant diversity. Following the installation of 70 leaky dams funded by the Lund Fund, we had Brighton University undertaking River Habitat and Morph surveys.



Figure 5. Leaky dams holding back water in woodland ditches and streams.

Multiple flood events

Following the heavy rainfall of Storm Brendan the floodplain scrape dug in October 2019 was seen filling at 13:00 on 15th January 2020. Modelled flows for the Cockhaise Brook put the peak flow for the day at 2.82 cumecs. Based on this, the scrape would have filled five times during the period 01/11/2019-20/01/2020, storing a total of 1,208,250 litres.

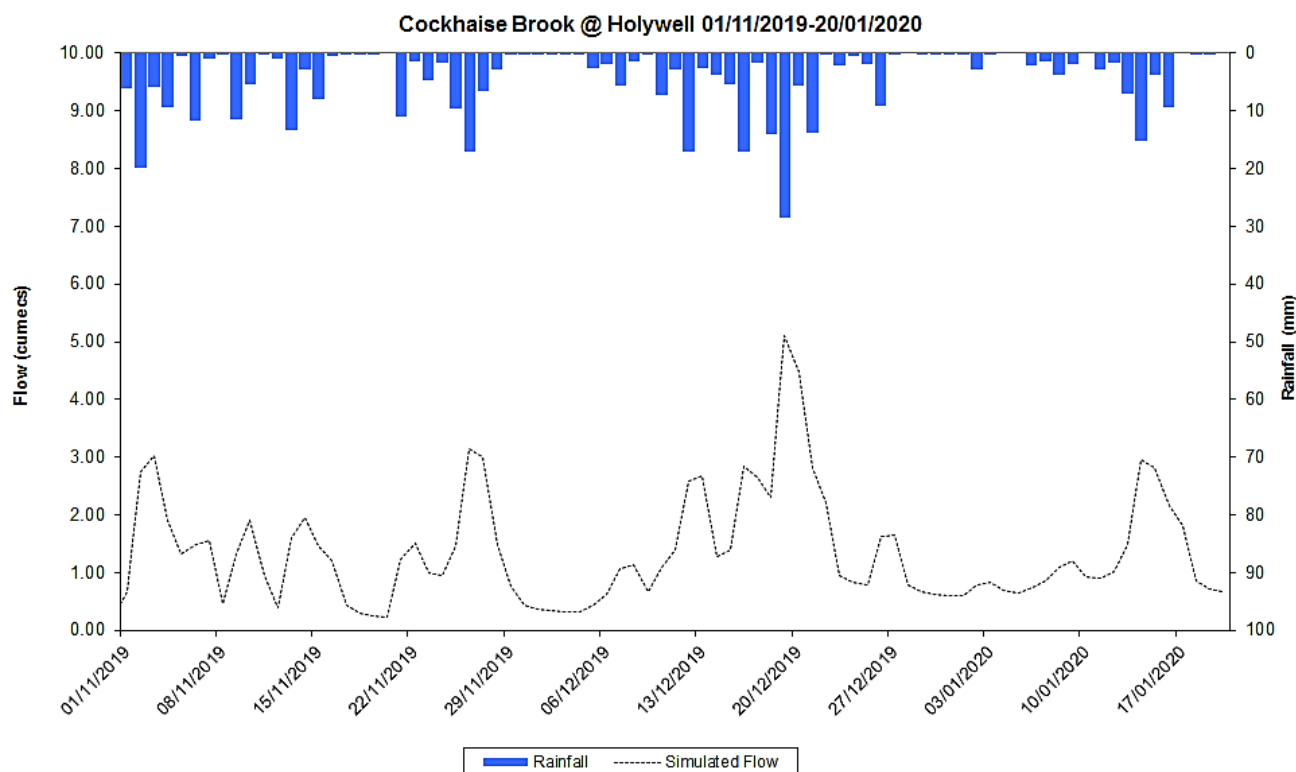


Figure 6. Plot with estimated modelled flow data for Cockhaise Brook for the period 01/11/2019 to 20/01/2020, created by EA.

Subcatchment mapping

To identify the most effective places to use Natural Flood Management in the Ouse catchment, we work with the Ouse and Adur Rivers Trust and the Environment Agency to map and survey target sub-catchments in the Ouse valley. This year we have not produced any sub-catchment reports, but we will be working on further reports next year.

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 2019/20 was upstream of 17 of these properties (Figure 7; Appendix B).

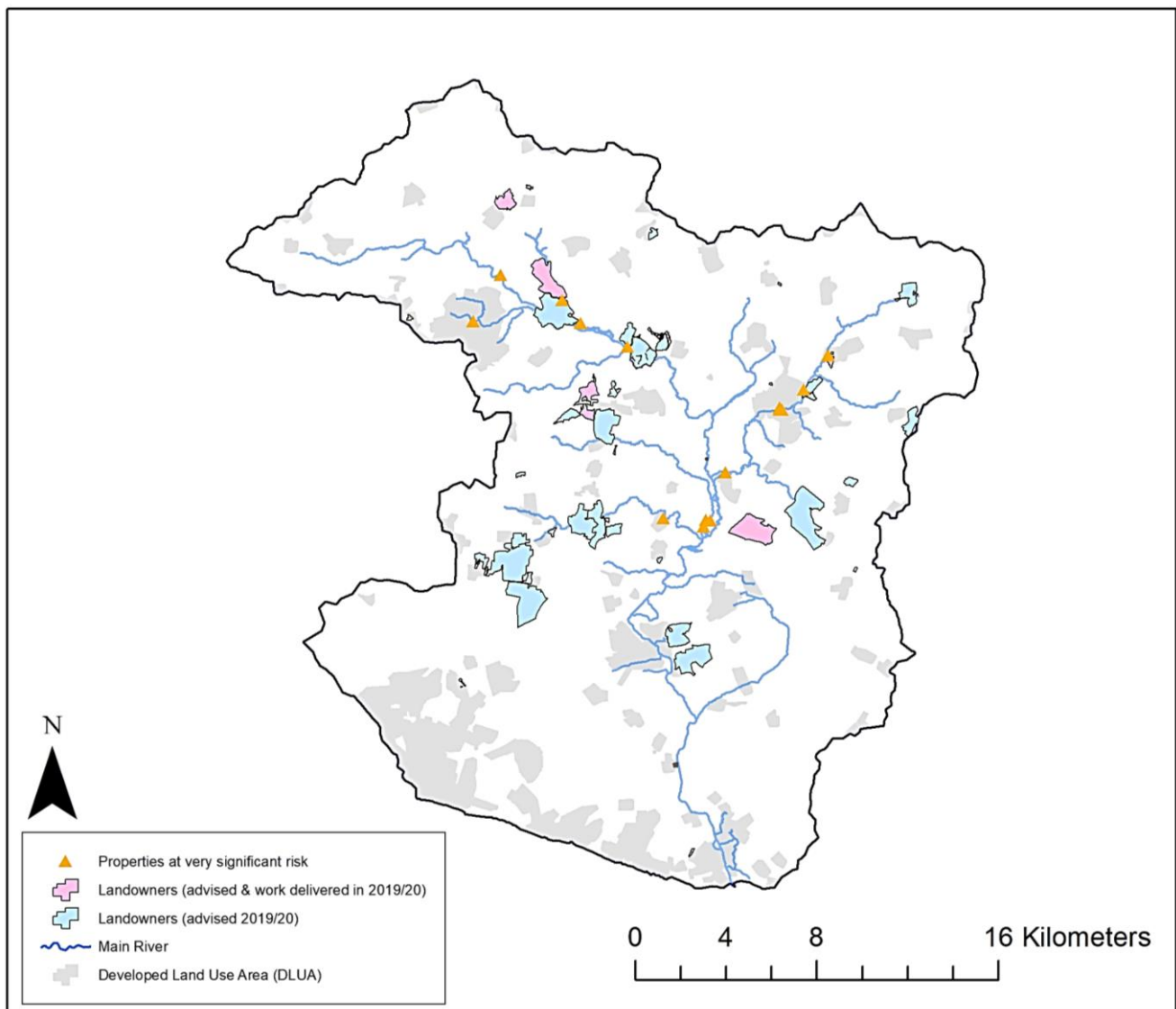


Figure 7. Overview of SFI's activities and the properties at very significant risk of flooding in the Ouse catchment.

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 on over 1,908 hectares of land, and we estimate that our NFM interventions have had a positive influence on over 437 hectares of land. Of the 1,908 ha advised, 144.81 hectares were in the floodplain, and we believe we have directly encouraged positive management of approximately 20.64 hectares of floodplain (Flood Zone 2). We have actively influenced at least 7,050 m (7 km) of the river network using instream work⁴ - at least

⁴ Based on an estimated 50 m of influence per woody structure

5 km through land-based activities⁵. We have potentially positively influenced over 70.5 km of the river network through our advice on land and habitat management⁶.

This year, the Sussex Flow Initiative has also contributed to the restoration/creation of 1.61 hectares of priority habitat (1.49 ha of woodland⁷ and 0.12 ha of open/standing water). We have also continued to support landowners whom we helped facilitate into Countryside Stewardship schemes.



Figure 8. Looking downstream across the River Ouse towards Lewes Railway Land at Cliffe on 13th December.

Providing ecosystem services through Natural Flood Management

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 C) 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.

⁵ Only including waterbodies downslope and adjacent to tree planting (i.e. not including downstream effects)

⁶ Including a 100 m buffer of landowner boundaries

⁷ Including hedgerow (320 m of hedgerow is equivalent to 1 Ha of woodland in terms of number of trees/shrubs planted)

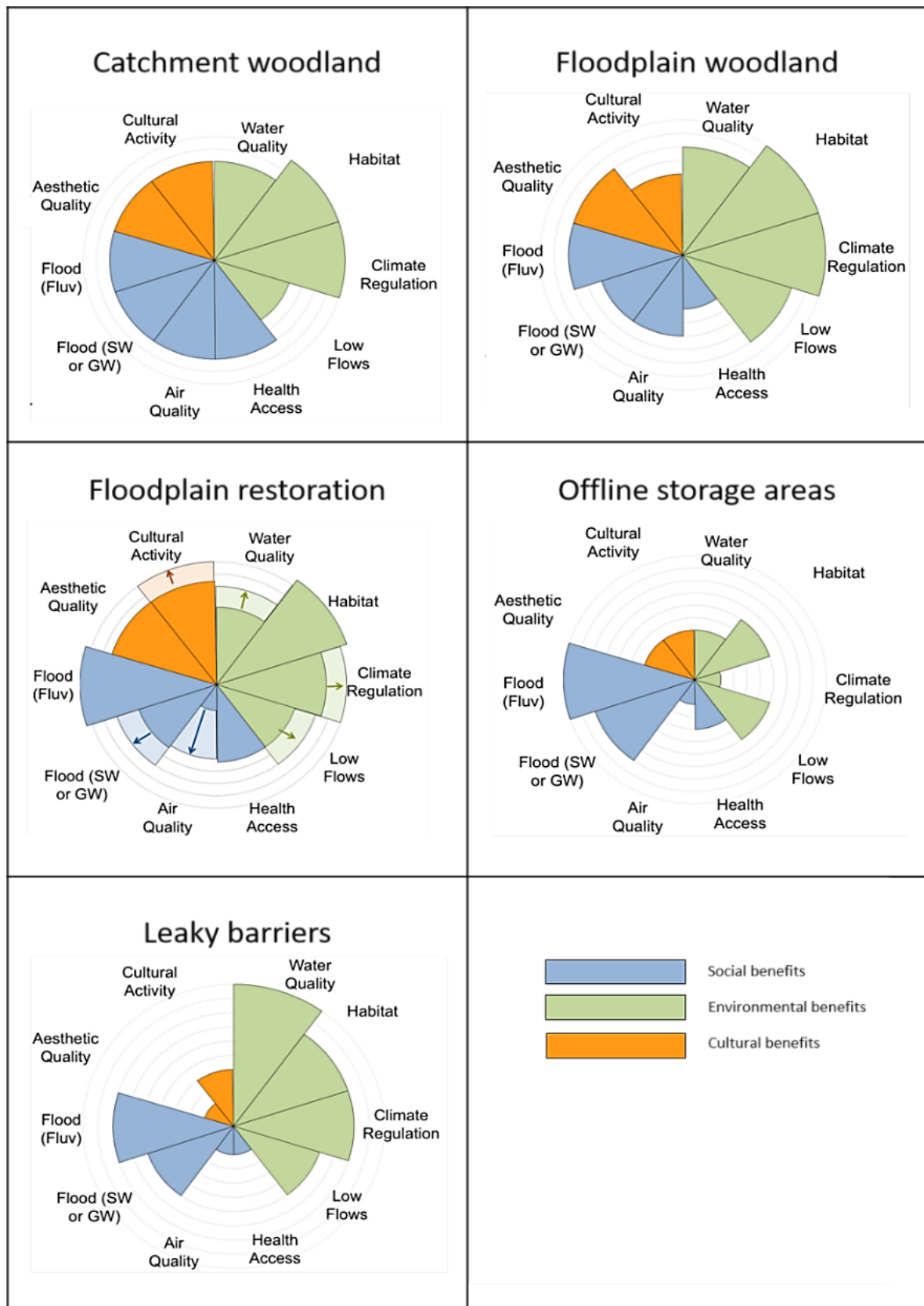


Figure 9. Multiple benefits provided by Natural Flood Management techniques (EA, 2017).

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 (Figure 10).
- **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.



Figure 10. Volunteers heeling in trees between planting days of riparian woodland (left) and Black Poplar planted as part of the Sussex Black Poplar Project (right).

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 > 2,765 native flowering trees and shrubs. > 675 of these trees have been planted in a [Buglife B-line](#) pollinator corridor, providing a food source for a range of pollinators. A further 723 shrubs were planted through CS applications we helped to support.
- **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 1.49 hectares of new woodland/hedgerow will be providing carbon sequestration, with a predicted total of up to 20.4 tonnes of carbon dioxide-equivalent per year.⁸ BHASVIC school also offset their carbon from travel to a school field trip through the SFI project.
- **Water purification:** We have provided advice on land adjacent to > 3.6 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 1,180,140 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 following 41 site visits, with these sites being upstream of 24 properties (north of Lewes), and in close proximity (< 150 m) upstream of five 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

⁸ [Natural England. Carbon Storage by Habitat](#): 13.7 tCO₂-e ha⁻¹ yr⁻¹ sequestered when land is changed from improved grassland to woodland (year 2 – 21)

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.



Figure 11. Leaky dam a week after construction, collect debris washing downstream and pushing high flows out into the adjacent woodland.

Cultural Services

- **Cultural benefits:** SFI helps 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.
- **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. Our river habitat / leaky dam workshops, and our tree planting, provide 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.



Figure 12. Volunteers installing woody bundles across surface water flow paths (left) and volunteers standing next to LWD they built during workshop at Vert Community Woodland (right).

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 8 year lifespan including notable changes in people's behaviour and wellbeing through the education and training work that we do. The results of our social benefits survey showed an improvement in the understanding of flood risk in over 58% of those surveyed, and improvements in their understanding of NFM issues and techniques of 16% and 15% respectively.

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. When people get involved with SFI, this results in a general improvement in participants' feelings of empowerment to make positive changes in their environment (+39%). 20% of respondents felt that the project had had a positive impact on enhancing their skills to undertake NFM, and in combination this lead to very strong intentions to undertake future NFM actions (+61%). Examples given of how

people would like to do this included further volunteering, promoting NFM in the work environment, working with fellow landowners/managers, and undertaking further NFM actions on their own land.

Many of the survey respondents also felt they derived personal well-being from participation in the project, with improvements in their perception of their physical health (+25%), feeling more positive in general (+25%), and feeling inspired and motivated (+48%). Our NFM obviously raised awareness about climate change too, though we need to be careful about how we help people manage their anxiety linked to that.

It's been a very interesting exercise to find out who benefits from our work, and the full report will be available soon on our website. In the interim, we'll continue to keep engaging with local people and helping them take action to reduce local flooding.

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 35 landowners on 41 sites, covering over 5.1% of the land upstream of Lewes, on a total of at least 2,345 hectares of land (112 hectares downstream of Lewes).
- Of these 41 sites, 9 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:

- Design of coarse woody material structures and their influence on channel flow and geomorphology
- Modelling of hydrological processes including surface water flow and groundwater flow



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;
- 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 for Lewes District Councillors. SFI has also provided information and expertise to projects and other policy makers outside the Ouse including:

- Powdermill NFM project
- Burstow Stream, GGS
- Vert Wood Community Woodland
- Gatwick Greenspace
- RSPB
- National Trust
- Aldingbourne NFM project
- Seven Sisters Country Park
- Milton gate marsh
- Multiple landowners

We also announced the expansion of the Powdermill NFM project, to a full time, 5 year funded Catchment scale NFM project covering the Cuckmere and Combe haven catchments.

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. Through three interactive leaky dam days with Chailey School, SFI has connected with local people, giving them an opportunity to take positive action to reduce flood risk, providing information on the projects objectives and the theory behind NFM. Our leaky dam days have also helped to give others more confidence in NFM delivery.

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

Events

To disseminate the experiences and findings of SFI, we have presented at national and local events including:

- Adur and Ouse Catchment Partnership
- Lewes District Councillor site visit
- Plumpton College Talk
- Chailey Common Society Talk
- Eastbourne Carbon Neutral
- East Chilmington Talk
- Landscape Innovation Conference
- Sussex Wildlife Trust AGM
- Sussex Wildlife Trust's staff day Talk
- Other Public talks



Figure 23. Sussex Flow Initiative display at the Sussex Wildlife Trust's AGM in Shoreham, attended by 200.

Through these events we have reached an audience of at least 700 people.

Training and signposting

By providing information to a variety of organisations, and by training contractors and staff who work across Sussex and beyond, SFI has facilitated the uptake of NFM approaches within the project area and further afield. (Figure 14)

This year we trained contractors in the installation of Leaky dams and we have worked with Wild Sussex to deliver naturalistic land-based NFM. We have carried out a day's training with East Sussex County Council Rangers, and supported a team of Environment Agency staff to learn about leaky dams. We are also working closely with Catchment Sensitive Farming Officers to share best practice NFM implementation for water quality as well as flood risk management.



Figure 14. Contractors being trained to install LWD ©WildSussex.

Volunteers & 'in kind' support

SFI helps to empower communities to actively increase their resilience to flooding. Without support from these local communities, landowners and volunteers, the delivery of NFM in the Ouse catchment would be significantly reduced. In 2019/20 we received huge support from a team of dedicated and enthusiastic volunteers from local communities, project partners, and other stakeholders (e.g. government organisations and schools). This included :-

- More than 343 volunteer hours from more than 32 volunteers, with a value in excess of £6,700⁹
- Volunteers from the Environment Agency's operational teams
- East Sussex County Council Ranger team training day
- LWD training day with Vert Wood
- Our main partner organisations contributing around £42,000 of their time 'in kind'¹⁰
- Landowners contributing at least £15,000 towards contractors, materials, and 'in kind'
- Funding from external sources (i.e. Lund Fund) of £60,203



Figure 15. Volunteers from stakeholder groups, local companies and residents [top left & right], residents [bottom left], and Chailey School pupils [bottom right].

⁹ Based on £100 per day for volunteers

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

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.

In the past year :-

- The SFI website was updated (Figure 16), and has had >1,500 unique visitors, with >1,000 reading our blogs and case studies.
- The SFI twitter and Facebook following has increase to >500 and >100 followers respectively, an increase of 260 followers on tweeter this year, generating >184,000 impressions on twitter.
- SFI videos posted by Sussex Wildlife Trust on Twitter and Facebook have had >9,600 views and >740 engagements.
- Six blogs have generated over 1,000 unique page views.

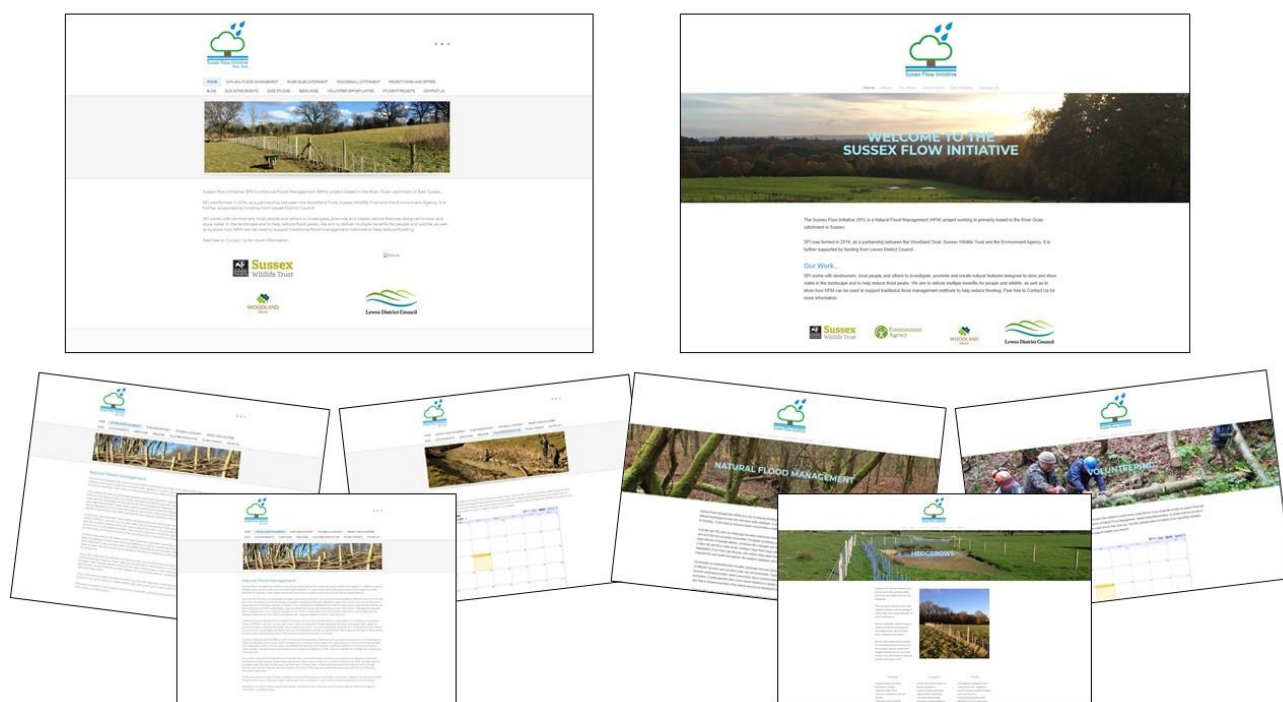


Figure 36. Website update on design, previous design [top left & bottom left three], new design [top right & bottom right three].

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.

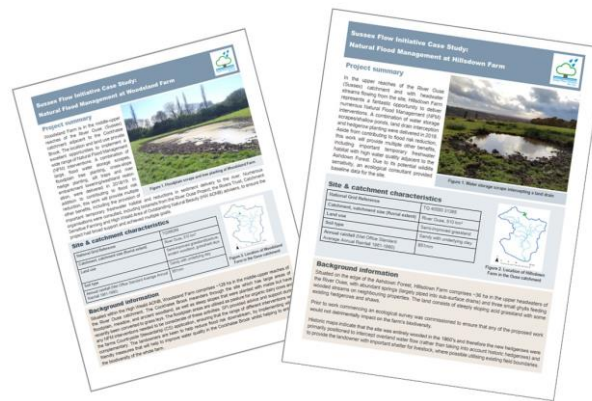


Figure 47. Case studies produced this year by SFI on NFM techniques.

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), Countryman Magazine (readership of 49,850), Lewes District News, Catchment Sensitive Farming newsletter, EA internal newsletter, Vert Wood News and Chailey School bulletin.



Figure 185. Articles published in the Sussex Wildlife Trust Magazine (left), six page article in October's edition of Countryman Magazine (middle) and Chailey School news page following three days of students constructing LWD on Chailey Common (right).

The future of Natural Flood Management and the Sussex Flow Initiative

This year, Sussex Wildlife Trust supported the Knepp Rewilding estate, on the River Adur to secure a licence to re-introduce beavers to Sussex after a 400+ year absence, following being hunted to extinction. The National Trust have also secured a licence to introduce beavers on the River Wey. Although not on the Ouse catchment yet, beavers are the obvious choice for progressing with natural flood management. These natural



Figure 19. Beaver with kit © Mike Symes.

ecosystem engineers can create leaky dams, pools and washlands much more efficiently and effectively than we humans can. We are currently in discussions with Lewes District Council and Exeter University around the feasibility of introducing them to the Ouse catchment, and are looking for a suitable site.

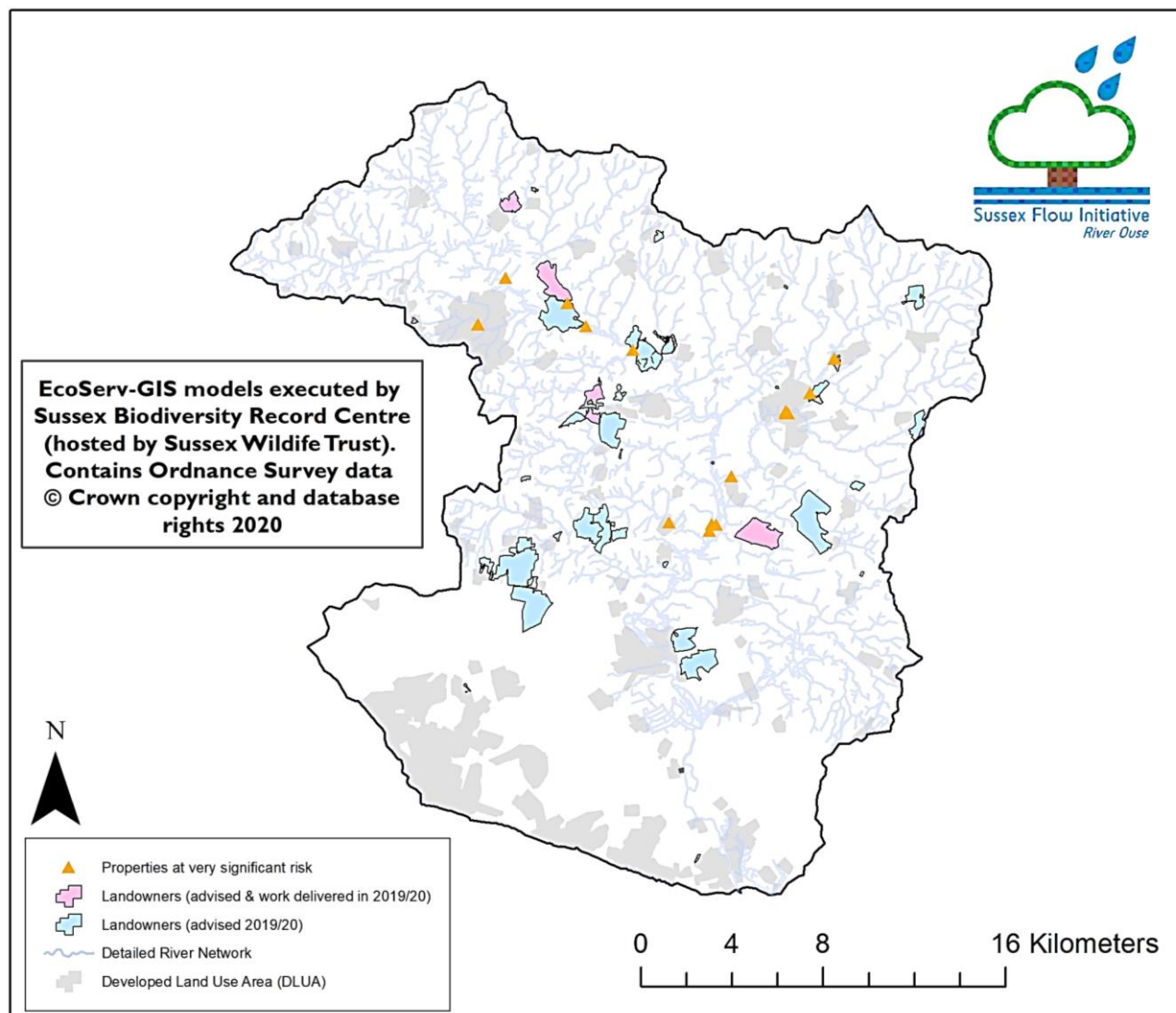
We will remain focused on delivering the ambitious targets our five-year SFI vision document. During 2019/20 we have made significant progress towards many of these targets (see Appendix D).

We are excited to further engage with the local communities in the Ouse catchment, and expand our volunteer base, ensuring that we continue to step up the delivery of NFM throughout the catchment. We will continue to strive to provide best practice examples of NFM in lowland catchments, foster collaboration with a variety of stakeholders, and maximise the dissemination of our work.

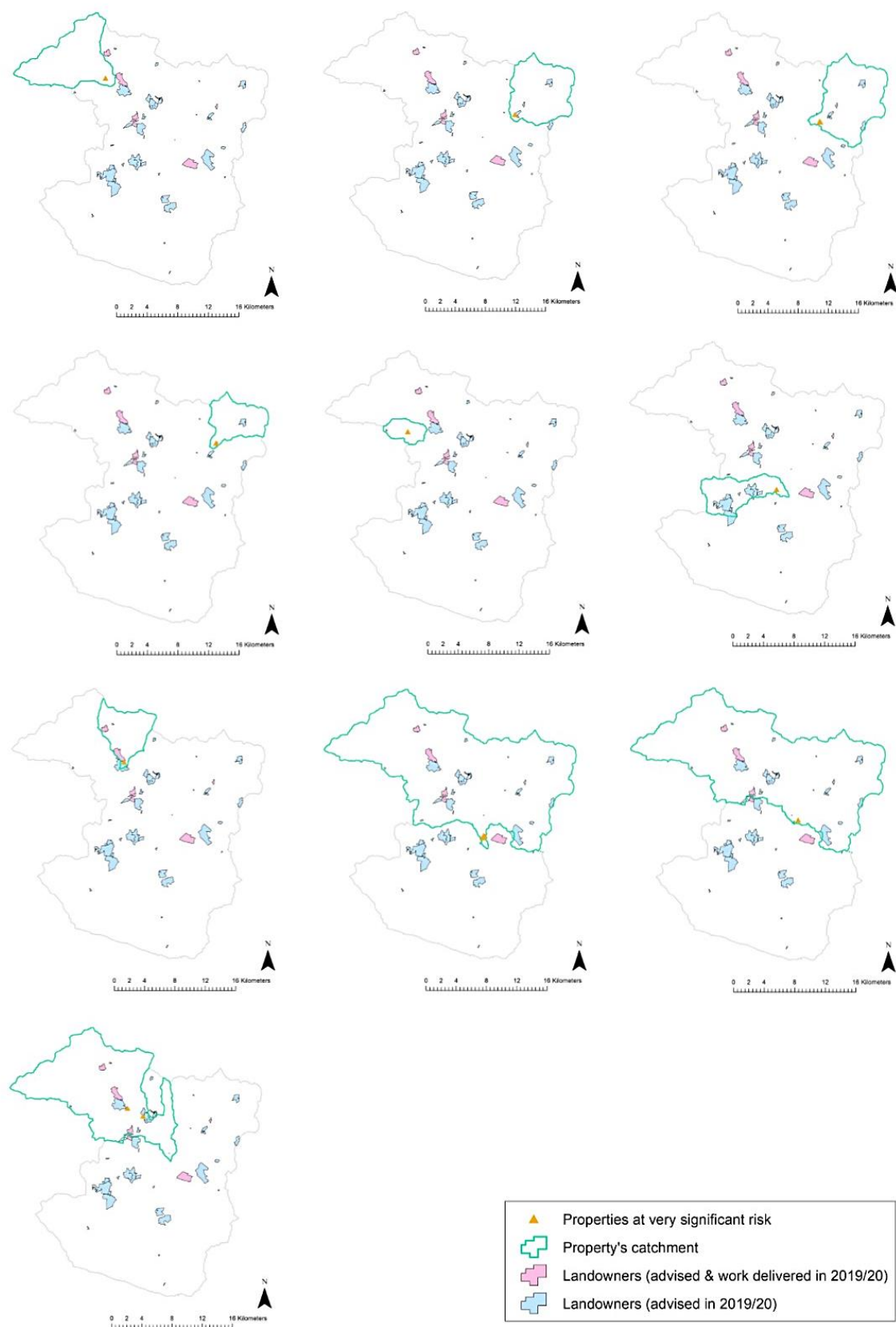
A huge thank you to all those who have volunteered for us and supported us.

Appendices

Appendix A. Landowner visits 2019/20



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



Appendix C. 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 – 2020
<p><i>High level targets</i></p> <p>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)</p> <p>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</p> <p>Aim to show a positive influence on water quality / WFD failing waterbodies</p>	<p>> 31 km of river/stream influenced (>200 km potentially influenced by advice given)</p> <p>Advice on 7,117 ha of land, delivery on 1,467 ha.</p> <p>18 properties at very significant risk of flooding are downstream of NFM measures we have implemented</p> <p>Advice given to landowners adjacent to >20 km of river/stream failing to meet WFD targets for phosphorous</p>
<p><i>Habitat Delivery and NFM</i></p> <p>At least 100 Large Woody Debris (LWD) dams installed</p> <p>1,500,000 litres of additional seasonal water storage created</p> <p>25 ha of priority habitat created including :</p> <p>Minimum 10 ha woodland planting and Minimum 10 km hedgerow planting Open water – 15 ponds enhanced / restored and/or 10,000 m² of open water created</p>	<p>279 woody material structures installed</p> <p>Between 4,977,950 L and 5,977,950 L created</p> <p>Reconnected floodplain able to store 3,296,750 L Scrapes storing 1,311,000 – 2,311,000 L Sediment trap storing 90,000 L LWD slowing approx. 279,000 L 1200 L stored in pocket ponds</p> <p>20.11 ha of priority habitat (if hedgerows counted as woodland): 3.58 ha of woodland created 5,005 m of hedgerow planted At least 8600 m² of seasonal open water created</p>
<p><i>Strategic and Catchment Scale</i></p> <p>Two sub catchment plans written</p> <p>At least one sub catchment plan implemented</p> <p>Flagship projects funded and initiated with EA, RFCC and at least one new Lead Local Flood Authority</p> <p>At least 30 people trained and upskilled in NFM techniques via river habitat workshops, staff training days, new comms/events</p> <p>A further 15,000 tonnes of potential carbon storage created</p>	<p>One full sub catchment plan (Longford Stream) and one short sub catchment report (Ringmer) written</p> <p>Training of 17 contractors and staff - digging wildlife scrapes, ponds and installing woody material</p>

<p>Natural capital and multiple benefits of the work we have achieved clearly articulated for all</p> <p>At least 10 external sites supported to carry out additional NFM works</p>	<p>Approximately 262 tonnes of carbon storage per year (after year one) created by hedgerow and woodland planting</p> <p>Case studies, blog posts and videos have been produced, highlighting the multiple benefits that SFI activities will result in</p>
<p><i>Engagement and Advocacy</i></p> <p>Engagement and influence of at least 5,000 people</p> <p>At least 10,000 ha of land advised and engaged with on NFM</p> <p>At least 20 events held or SFI represented</p> <p>At least two advisory leaflets written and published</p> <p>Publish information (TV, radio, external websites) which reaches potential audiences of at least 100,000</p> <p>Publish at least five case studies / National Guidance Documents on the work that we have achieved</p>	<p>Potentially >364,860¹¹ people reached with varying levels of engagement and influence. High level engagement includes community engagement with >155 volunteers, >700 people at conferences and local events, >4,000 views to SFI articles/web pages. >1,600 views of SFI-related pages on SWT website and >11,860 interactions on twitter and Facebook</p> <p>> 7,100 ha of land advised</p> <p>Sixteen 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 Chilmington talk, Landscape Innovation Conference, Sussex Wildlife Trust AGM, Sussex Wildlife Trust's staff day talk.</p> <p>Reached an audience of approx. 230,000, plus a radio interview on BBC Sussex which has weekly listener numbers of > 260,000</p> <p>Five case studies have been produced highlighting project work</p>
<p><i>Budget and Finance</i></p> <p>Attract at least £200,000 of in kind funding</p> <p>Generate at least £50,000 of further income</p>	<p>At least £167,250 (£42,000 in 2019/20) of in kind funding</p> <p>£47,984 grant received from Banister Fund £17,700 Woodland Trust planting and fencing Additional £3,424 LDC funding £60,203 from external sources in 2019/20 (including Lund Fund)</p>
<p><i>Evidence and Research</i></p> <p>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</p>	

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

Work with existing organisations who can assist with long term monitoring (e.g. Rivers Trusts)	
<i>Others we have influenced to deliver KPI's</i> Influence at least ten others to deliver on KPI's	Woodland 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