Wetlands for flood resilience

Creating wetlands to slow the flow of flood water and protect communities and businesses.

A Route Map

WWT
For wetlands. For life.

By harnessing the power of nature alongside our traditional flood defences, we can not only help keep communities safer, but also create wildlife havens and tackle the climate emergency.

James Bevan,
Chief Executive, Environment Agency[1]

Contents

Incredible things happen when land and water meet to create wetlands. Wetlands teem with biodiversity, providing homes for endangered and much-loved species. They are vital 'service stations' for millions of migratory birds, enabling them to rest and refuel. For us, they provide essential protection against the impacts of the climate crisis, floods, droughts and pollution. Living near or visiting a wetland and its wildlife is also good for our wellbeing.

Wetlands are the lifeblood of the planet, but they need our help. They are disappearing at a rate three times faster than forests[2].

The UK's wetlands need strong and effective laws to protect them from harm. They need careful and well-resourced approaches to manage them and they also need restoring. Over the last 300 years the UK has lost over 75% of its wetlands[3].

In more recent times their continuing absence – coupled with further loss and degradation – has helped to fuel some of the greatest challenges we face: the escalating climate crisis, plummeting levels of biodiversity, a rapid decline in our own wellbeing, as well as increased flood risk.

But there's hope: WWT are pioneers in wetland conservation. We bring species and wetlands back from the brink and restore, protect and create wetlands around the world.

In 2020 WWT joined calls for a green recovery to build back better out of the COVID-19 pandemic and, crucially, for a 'blue recovery' to be at its heart. We have set out proposals for the creation and restoration of 100,000 hectares (ha) of wetland in the UK on the advice of the Government's advisers, the Natural Capital Committee. Every single hectare will be filled with wildlife, providing a much-needed boost to biodiversity and to the Government's pledge to halt and reverse the decline of our natural world by 2030.

We are now setting out further details of how this blue recovery needs to happen. This route map is the fourth to be published in our series. It follows route maps on creating wetlands for urban wellbeing, carbon storage and water quality.

Each route map sets out our proposals, the purpose the wetlands will serve, the potential they offer, and the partnerships and policy frameworks required to make them happen.

WWT hopes you enjoy reading our route maps. We look forward to working with you, so that together we can create and restore wetlands that encourage economic prosperity, build resilient communities, protect our wellbeing and improve the health of our planet.

Sarah Fowler, Chief Executive, WWT


Over the last 300 years
the UK has lost over 75%
of its wetlands.

Executive summary

The risk of flooding is increasing and the UK is not equipped to deal with the impacts. Creating more wetlands can build our flood resilience by helping us manage the flow of water more effectively. Creating wetlands for this purpose is known as Natural Flood Management (NFM).

The UK is experiencing more frequent and more intense flooding due to the heavier rain and stronger storms caused by climate change[4].

Extended periods of extreme winter rainfall are now seven times more likely[5]

Around 5.2 million properties in England – one in six – are at risk of flooding[6]. By the 2050s the annual average economic losses from coastal and river flooding in England and Wales could amount to between £1.6 and £6.8 billion[7].

But climate change isn't the only reason we're experiencing more flooding. Over the centuries, we have removed many of our greatest flood alleviating habitats – wetlands. Over 75% of the UK's wetlands have been degraded or destroyed in the last 300 years[8]. This has wrought havoc on people's lives and will continue to do so.

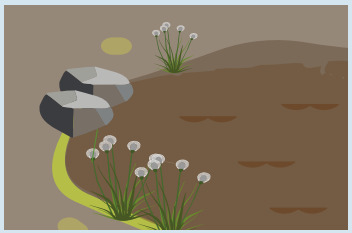
The UK Government recognises that traditional flood defences like concrete dams, embankments and walls will no longer be enough to protect us, and that in some circumstances they may actually exacerbate the problem. We need alternative, long-term solutions that put our communities and businesses on a sustainable footing.

It might sound counter-intuitive but adding water in the right place using NFM techniques can be a natural, sustainable and cost-effective way to manage flood risk.

How wetlands for flood resilience work

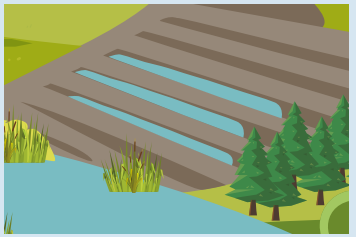
NFM is an approach that uses natural features in the landscape, such as wetlands, to slow down or store flood waters. The result is greater resilience to flooding.

It is this mosaic of features, rather than individual interventions, that together reduce flooding further downstream.

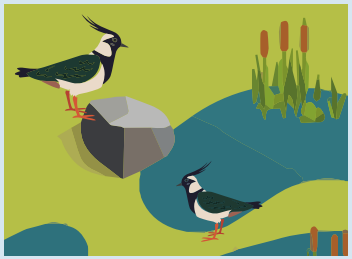


Healthy peatlands soak up water

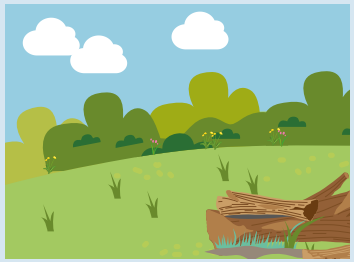
Swales clean water and retain it for longer



Horizontal ploughing helps retain water

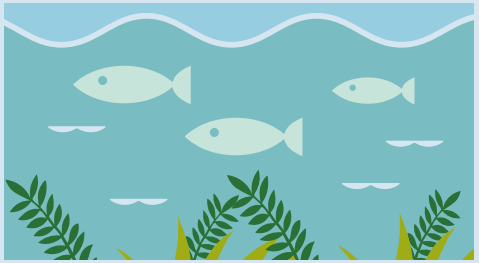


Floodplains store and slowly release stormwater

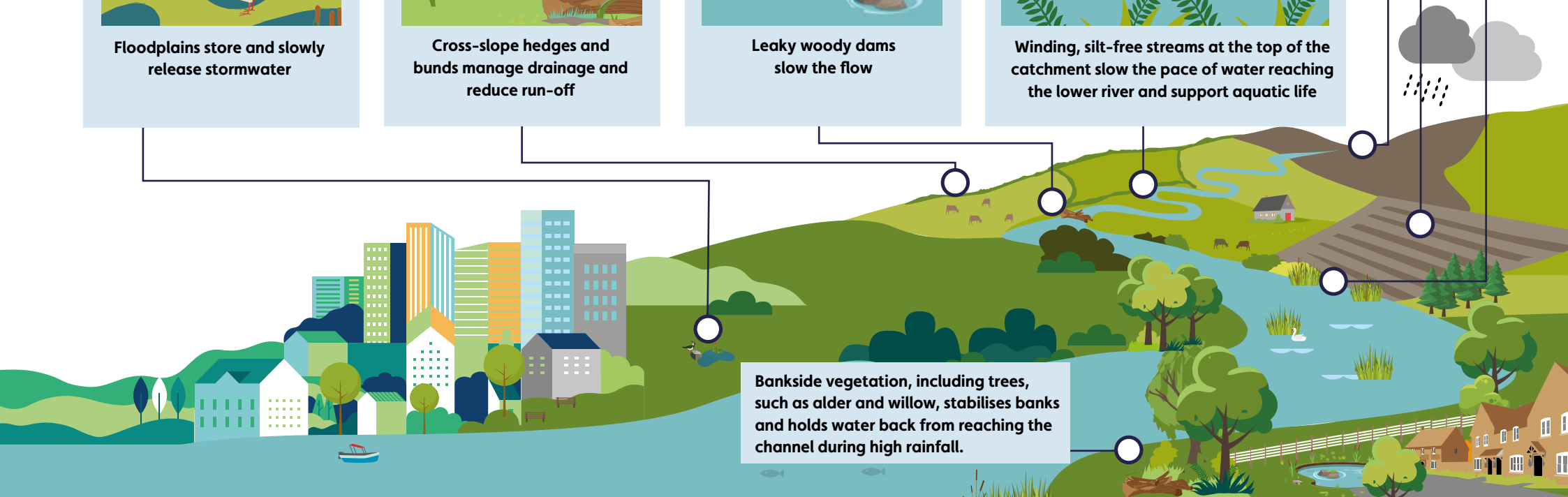


Cross-slope hedges and bunds manage drainage and reduce run-off

Leaky woody dams slow the flow



Winding, silt-free streams at the top of the catchment slow the pace of water reaching the lower river and support aquatic life



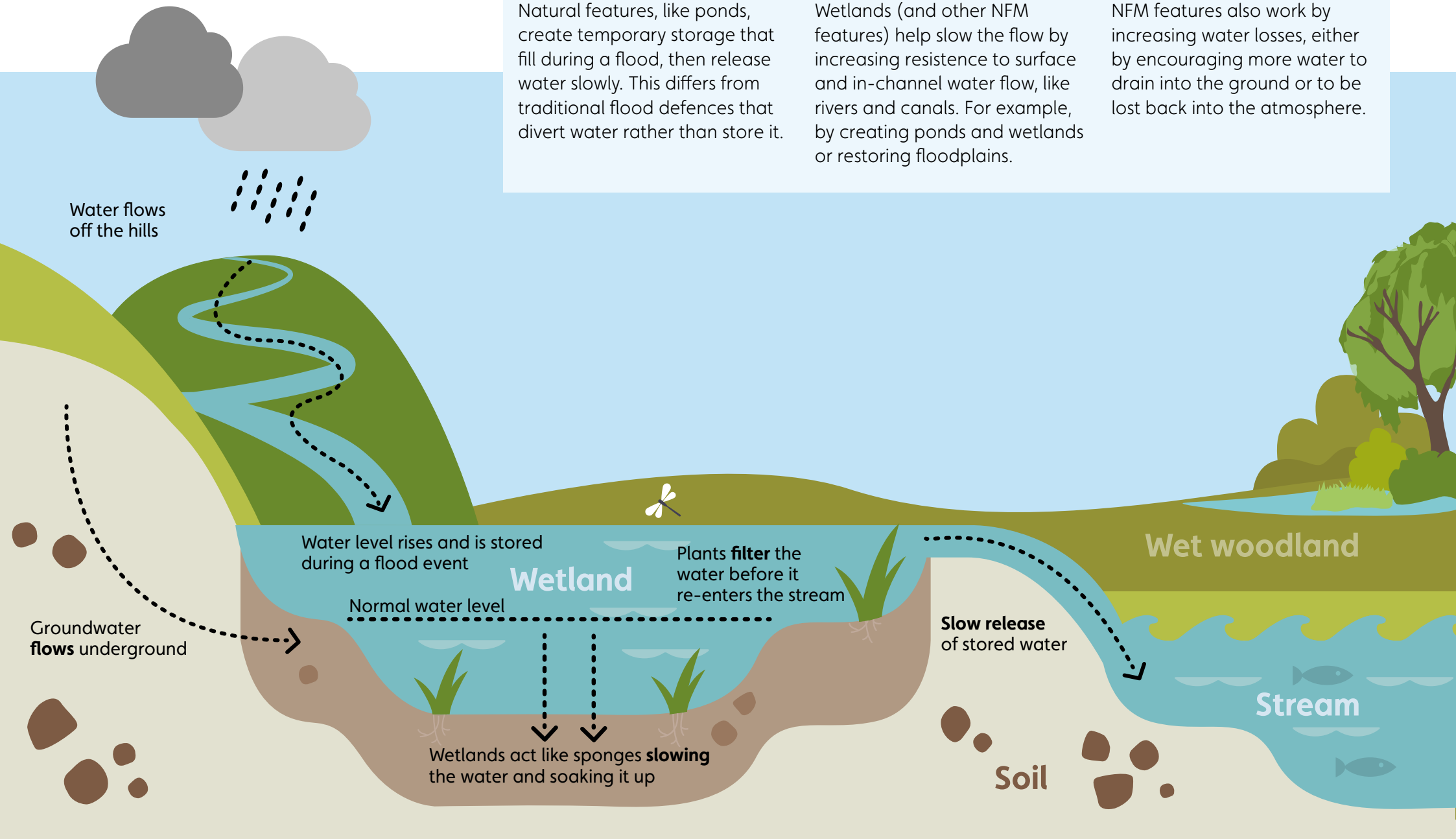
Bankside vegetation, including trees, such as alder and willow, stabilises banks and holds water back from reaching the channel during high rainfall.

How NFM works:

Natural features, like ponds, create temporary storage that fill during a flood, then release water slowly. This differs from traditional flood defences that divert water rather than store it.

Wetlands (and other NFM features) help slow the flow by increasing resistence to surface and in-channel water flow, like rivers and canals. For example, by creating ponds and wetlands or restoring floodplains.

NFM features also work by increasing water losses, either by encouraging more water to drain into the ground or to be lost back into the atmosphere.



Wetland habitats created by NFM measures also offer an array of co-benefits.

They:

- boost biodiversity
- improve water quality
- enhance local wellbeing and mental health
- capture and store carbon

Creating more wetlands to improve flood resilience will bring these benefits to the local area.

Proposal

WWT's vision is that NFM, especially where wetlands are used, is embraced as part of the UK's standard approach to flood risk management in the UK. This will require widespread acceptance of the value of wetlands for flood resilience and sufficient capacity and resources to implement and maintain them.

Wetlands should be used across wide areas of UK countryside and in urban areas (where sustainable urban drainage systems can be created).

The widespread use of wetlands for flood resilience in both urban and rural areas is critical in adapting to the increasing risk of flooding. Working with wetlands in this way will also help tackle the biodiversity crises.

Sustainable drainage systems (SuDS) help manage urban rainfall. They use natural processes to control and treat storm water in towns and cities, reducing the risk of flooding and improving water quality.

Purpose

So far the UK Government has only invested in small scale NFM schemes (that include creating wetlands). To ensure the flood resilience of communities and businesses action must be taken now across the UK. This requires sufficient funding and meaningful engagement with local communities to unlock the full range of benefits that wetlands have to offer people and wildlife.

Potential

Traditional flood defences that use physical flood barriers play an important role in protecting homes and businesses. But they're expensive, carbon intensive and do not offer the amazing co-benefits that wetlands do.

Wetlands complement existing flood defences and increase flood protection for communities. But it is important to understand the potential of different areas. Wetlands are most cost-effective in areas where floods are more likely and where at-risk properties are dispersed. While SuDS can be used in built-up areas, other measures are more effective if located upstream of traditional flood defences because they can reduce pressure on this infrastructure.

WWT is mapping the potential of wetlands for flood resilience across the UK and assessing the extent of the natural capital to be gained with such large-scale wetland creation. This is part of our 'Roadmap to 100,000 hectares' work.

Natural capital refers to the world's stocks of natural assets that underpin our economy, including its geology, soil, air, water and all living things.

Process

Creating wetlands for flood resilience requires:

Delivery: Different types and sizes of wetlands must be created and restored, and the benefits they provide measured and evaluated.

Capacity building: Practitioners need the right information, skills and advice. It will be critical to provide advice and training to Lead Local Flood Authorities (LLFAs), other local authorities, Internal Drainage Boards, land managers and businesses. This requires clear guidance, as well as funding for both training and for dedicated locally based NFM jobs.

Community engagement: Projects should empower communities and engender a sense of community ownership. Communities should be involved in designing and managing the projects, allowing them to develop specialist knowledge and skills.

Partnership

WWT cannot create wetlands for flood resilience alone. We want to work in partnership with government, businesses and wider civil society to create wetlands across the UK. Creating these wetlands at the scale required will need government and stakeholders to work closely together in embracing this new approach alongside traditional methods.

Lead Local Flood Authorities (LLFAs) are county councils and unitary authorities that manage flood risk in their area and deliver local flood-risk management plans.

Policy

Creating wetlands for flood resilience at scale requires a supportive policy framework.

Information, plans and funding must be in place to allow stakeholders to create and restore these wetlands. The UK Government has recognised the importance of wetlands in improving flood resilience, but there is more to be done to deliver this at a larger scale.

PRIORITY POLICIES FOR THE UK GOVERNMENT:

- Produce centralised guidance and provide training for land managers, planning authorities and practitioners on how to create and manage wetlands for flood resilience.
- Produce a nationally recognised NFM accreditation scheme that sets clear standards for best practice in wetland creation, restoration and maintenance.
- Provide funding for increased NFM creation, management and facilitation via a ring-fenced pot within the Flood Defence Grant-in-Aid scheme.

1.

Proposal

WWT wants to see wetland creation at the core of the UK's flood-risk management strategy.

We want to see widespread acceptance of the value of wetlands, and the provision of sufficient funds, skills and expertise to implement and maintain them.

What are wetlands?

Wetlands are unique areas that are permanently or seasonally inundated with water.

They include lakes, rivers, swamps and marshes, wet woodlands, wet grasslands, estuaries, saltmarshes, ponds and reservoirs. They range in size from garden ponds to the Pantanal in South America, which is three times the size of Ireland.

What do wetlands do?

Wetlands hold much of our natural capital – the stocks of natural assets that underpin our economy.

They provide essential ecosystem services that make life on earth possible, as well as nature-based solutions to many of our most pressing environmental and social problems. Wetlands provide relief from the stresses of modern life and improve the resilience of communities to the pressures of the climate crisis, flooding, pollution and the effects of urbanisation.

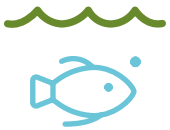
This document sets out how we can realise these benefits.

Nature-based solutions use the power of natural ecosystems to help tackle major challenges, such as climate change. Wetlands are one of the most powerful nature-based solutions because they provide so many benefits.

How do wetlands help us?

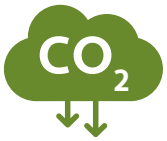
Protect us from flooding.

Support livelihoods by providing jobs, tourism and food.



Provide food and act as nurseries for many commercial fish species.

Provide freshwater for drinking, cooking and cleaning.

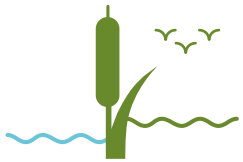


Help combat climate change by storing carbon.

They are biodiverse habitats, providing a home for over 100,000 species of animal.

Prevent coastal erosion by providing a buffer to the sea.

Treat our polluted water without the use of chemicals.



How can wetlands help us be more flood resilient?

By slowing down the floodwater, wetlands reduce the risk of flooding and help give communities more time to prepare for the impacts.

Wetlands have already shown how effective they can be at reducing flooding inland and at the coast. For example, some NFM measures were installed near the river Tweed, Northumberland. Where water had to pass through these measures it took longer to travel downstream.[9].

In one location in Stroud, Gloucestershire, stream levels were 1.4 metres lower after NFM measures were installed[10]. NFM measures saved almost £1.6 million in damage costs after a single rain event[11].

WWT focuses on two types of wetlands for flood resilience:

- **Small-scale** NFM projects that together reduce flood risk downstream. These are the main focus of this route map.
- **Large-scale** projects that deliver broader flood management in a single scheme. Examples include the Jubilee River Flood Alleviation Channel in Berkshire[12] and the Oxford Flood Alleviation Scheme[13].

What are the causes of the UK's increased flood risk?

Climate change

Flooding is a natural part of the water cycle, but climate change is increasing the flood risk we face. Climate change is causing more intense rainfall and rising sea levels, both of which can cause inland and coastal flooding. It has made events like 2015's storm Desmond 59% more likely[14]. The UK Government's plans to adapt to the impacts of climate change will not sufficiently mitigate the risk we face[15].

Wetland loss

Communities once protected by wetlands that stored and slowly released water are now exposed to the devastating impacts that flooding can have.

Land and water use

For 200 years we have managed water by attempting to move it downstream as quickly as possible. This has involved cleaning, dredging, straightening and sanitising watercourses to make water flow away more swiftly, and inserting drains under fields to drain water artificially.

However, the way we have managed land and water has actually contributed to flood risk across catchments. Intensive grazing of farm animals and the use of heavy machinery compacts soil, accelerating the runoff of soil and water into rivers, which in turn increases flooding downstream. Straightening rivers causes the water to flow more quickly, increasing flooding and reducing biological diversity of the habitats naturally provided by rivers.

What is the impact of flooding in the UK?

Homes

Around 5.2 million homes in England, or one in six, are at risk of flooding[16].
By the 2050s, annual average losses from coastal and river flooding in England and Wales could be worth between £1.6 and £6.8 billion[17].

Businesses

Flooding can damage business infrastructure and disrupt operations. The annual damage incurred by UK businesses is valued at £670 million. If temperatures increase by an average of 2°C this damage will increase by around 27% by 2050, or 44% in a 4°C scenario[20].

Health and wellbeing

Flooding can affect our mental health and wellbeing. Post-traumatic stress disorder, depression, anxiety and poor wellbeing are all more likely in those directly impacted by flooding and those who live nearby[18].

Farming

Flooded farmland can inflict heavy financial damage on farm businesses. In England, 60% of the best agricultural land (grade 1 land) is at the highest risk of flooding (Flood Zone 3). Flooding on farm land can reduce or delay the crop yield, or even destroy entire crops, resulting in less income for the farmers and less food for people across the UK[21].

Biodiversity

More severe and frequent flooding can also affect biodiversity, with scarcity of food and habitat loss and damage among potential impacts[19].

What would creating wetlands for flood resilience look like?

Wetlands created for flood resilience would include:

Wetlands in rural neighbourhoods, such as restored streams and rivers. An increasing proportion of the people and properties at significant risk from flooding are in more dispersed communities. These would benefit from a series of smaller wetlands that collectively reduce flooding across a large area.

Wetlands in cities and towns, including sustainable drainage systems, such as rain gardens, swales and small ponds. These can improve wellbeing and reduce flooding where people live and work, as well as preventing pollution from reaching waterways. Read our 'Wetlands for Urban Wellbeing' route map to find out more[22].

Wetlands on farms, such as water collection areas at the bottom of sloping fields and floodplain restoration to store water after heavy rain.

Coastal wetlands, such as saltmarsh to protect coastal communities from flooding and store carbon. Find out more about the benefits of saltmarsh in WWT's 'Wetlands for Carbon Storage' route map[23].

Improving access and community engagement

We must create opportunities for people to interact with wetlands where they may not have done so previously. To achieve this, more opportunities need to be created for people to be involved with projects that offer benefits to them beyond reduced flood risk.

These include:

Co-designing, co-creating and co-managing wetland creation with communities and community groups. This will ensure that wetlands meet a community's needs and improve access to these blue spaces.

Upskilling and empowering local groups to adopt new practices and activities that encourage their continued involvement with wetlands.

Citizen science and conservation volunteering programmes to allow people to reconnect with nature.

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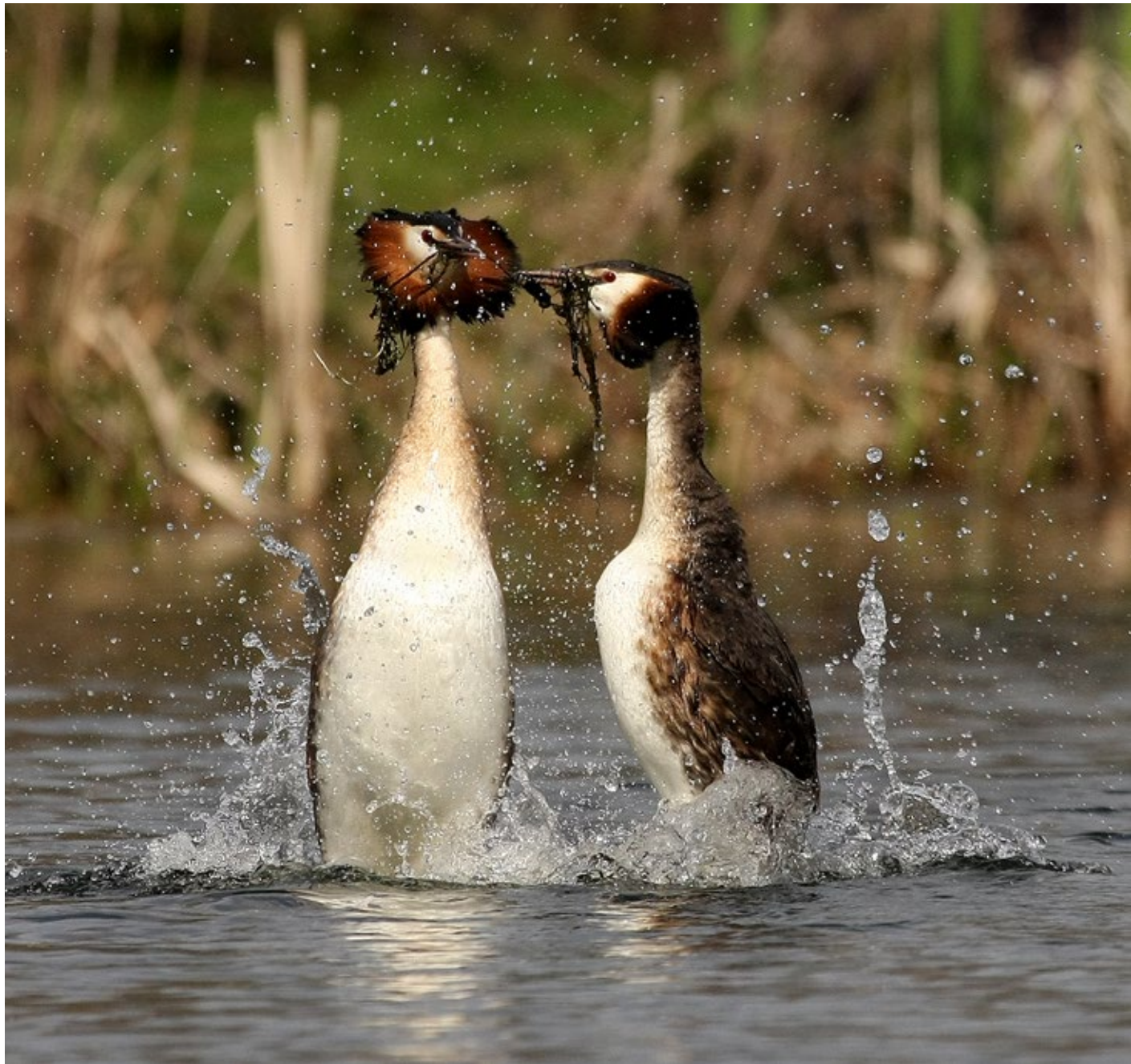
Purpose

Wetlands created for flood resilience provide many benefits, including improving wellbeing, boosting biodiversity, cleaning our waters and storing carbon.



What are the co-benefits of wetlands for flood resilience?

Wetlands offer essential benefits to nature and society that traditional flood defences do not.

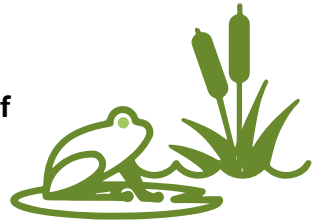
Recreation and wellbeing

Reducing flood risk helps eliminate associated adverse impacts on mental health, wellbeing and financial stability[24].

Wetlands do this by providing a space for people to exercise, relax and escape everyday stresses. They give peace of mind to farmers, businesses and homeowners, whose properties and infrastructure are at risk of flooding.

Wetlands provide an opportunity for local people to help carry out and take care of wetland projects. Volunteering often improves wellbeing and creates stronger community cohesion (see case studies for more details).

Biodiversity



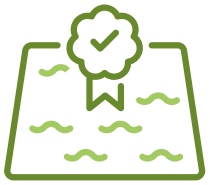
Increasing the quality and number of wetlands is one of the best ways of restoring biodiversity.

Wetlands support aquatic species and insects, creating a rich source of food for other wildlife on the surrounding land[25]. For instance, restoring floodplains creates habitat for fish and breeding wading birds, such as lapwings (who are in critical decline). Wetlands also provide food for mammals and help support invertebrates[26] and aquatic plants[27].

The connections of wetlands to floodplains are critical for many species. In the UK, nature, and in particular wetland nature, suffers when habitats become too disconnected[28]. Creating wetlands allows the expansion of many life-supporting habitats; this creates habitat corridors and stepping-stones that enable wetland species to survive and then thrive.

Water quality

Wetlands improve water quality.



Traditional flood defences speed up the flow of the water by diverting it, which can spread pollutants more quickly. Wetlands, in contrast, help prevent this by slowing down and storing the water.

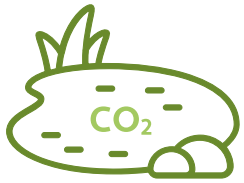
Reconnecting floodplains to rivers and constructing leaky, woody dams along rivers traps silt and agricultural chemicals. This stops them flowing downstream and results in cleaner water, provided the dams are properly maintained[29].

Land management techniques that aim to improve water quality, such as improving soil health, further reduce the volume of pollutants carried by rainfall to watercourses. They do this by allowing water to soak into the land, which retains more water[30]. These techniques should be used in conjunction with wetlands for flood resilience.

Wetlands also clean water by absorbing pollutants (see WWT's Wetlands for Water Quality Route Map for more details)[31].

Capturing and storing carbon

Wetlands can be carbon sinks.



Evidence is increasingly showing that reconnecting floodplains, restoring rivers (re-meandering those that have been straightened) and creating wetlands and wet woodlands all help create carbon sinks[32].

The creation of an extra 50 hectares of floodplain in the Norfolk Broads, for example, has generated £1 million in carbon sequestration benefits[33].

Case study:

Two Valleys: Slow the Flow project

Overview

Since 2018, WWT has been working in the Monksilver and Doniford stream catchments to implement its *Two Valleys: Slow the Flow* project.

Using NFM to protect properties from flooding in Somerset

Somerset has been badly affected by flooding because it is low lying and has 'flashy streams' (those that rapidly collect water) on steep, high ground. The extensive use of the land for farming has also contributed to increased flood risk.

In Williton, West Somerset, the merging of the Monksilver and Doniford Streams puts around 80 properties at flood risk. WWT chose this area for a pilot scheme to show that, by working across the catchment, NFM helps protect communities.

The project focused on the planning, delivery and monitoring of NFM measures to help reduce flood risk and provide wider environmental and social benefits. It assessed how best to build community support for these measures.

The knowledge and data gathered have improved our understanding of the challenges and opportunities such a project generates. The project has also enhanced the national evidence base for NFM practitioners and provided communities considering implementing NFM with a useful toolkit, if considering such measures in the future.

The project installed several NFM measures, including leaky, woody dams, water storage areas and riparian planting across a range of sub-catchments.

We worked with government bodies, Local Planning Authorities, businesses, and national and local charities. All were involved from an early stage, sharing knowledge and discussing what they needed from the project.

Community groups were consulted on what they wanted, and local volunteers were recruited to help implement the project.

The Slow the Flow NFM project was funded by the Environment Agency and the Green Recovery Challenge Fund. It involved the creation of wetlands for flood resilience. The project also established a network of local people trained and skilled in identifying and creating these wetlands.

Environment Agency

Green Recovery Challenge Fund

Department for Environment Food & Rural Affairs | The National Lottery Heritage Fund | Environment Agency | Natural England

What we achieved

35 farms

Implemented NFM solutions on 35 different farms and other land holdings.

90 fields

Carried out soil condition and flood hotspot surveys of 90 fields across 20 farms, with soil husbandry advice and mitigation recommendations.

91 dams

Built 91 leaky woody damns.

3,778 trees

Planted 3,778 native hardwood trees at 17 sites.

1,624 meters

Erected 1,624m of livestock fencing at five sites.

20 cross drains

Constructed 20 cross drains at five sites to reduce the runoff and pollution issues detected.

Assessments of additional benefits, such as supporting biodiversity, continued throughout and beyond the project. This will be completed in 2024.

Why should governments, businesses and communities create wetlands?

Traditional flood defences play a key role in protecting homes and businesses. But wetland creation is more cost-effective and it offers many other benefits[34].

While traditional flood defences are more space efficient in urban areas, they simply divert floodwater and the flooding impacts elsewhere. Conversely, wetlands store water and slowly release it.

Creating wetlands upstream can complement traditional flood defences by reducing the impact of high rainfall events before they reach urban areas. Slower water flow also reduces the strain put on traditional flood defences, increasing their longevity.

These wetlands help save businesses money, help the UK Government meet key nature targets, create jobs in local communities and improve community cohesion.

Managing flood risk is expensive. The UK Government, and the Environment Agency in particular, has committed substantial resources to flood and coastal defence, doubling investment to £5.2 billion between 2021 and 2027[35].

This should improve protection for a further 336,000 properties and builds on the previous strategy period that reduced risk for more than 300,000 buildings[36]. However, much of this target was reached using traditional, hard-engineered solutions, such as flood defence barriers.

Saving money

Wetland creation reduces water treatment and flood damage costs.

Water and utility companies can use wetlands to protect their infrastructure and water treatment works from flooding. Wetlands also improve water quality by removing sediment, nitrate and phosphate, and agrichemicals, such as pesticides, fertilisers and herbicides. By using wetlands, these companies protect their assets from flooding and prevent the spread of polluted water.

Other industries, such as shell fisheries, that depend on clean water, may also benefit[37].

The value associated with floodplain reconnection/wetland creation (per hectare per year) is estimated at:

£407

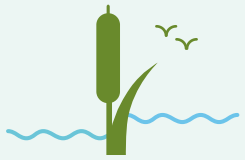
for flood-risk management

£304

for increased biodiversity

£292

for improved water quality



£227

for aesthetics and amenities

£82

for recreation[38]

Meeting UK nature and climate targets

Wetland creation would help the UK meet its habitat restoration targets.

The UK Government has a target of creating and restoring 500,000 hectares of wildlife-rich habitat by 2042[39]. Creating wetlands would boost efforts to meet this target by providing amazing habitats in which wildlife can thrive[40].

Reducing the cost of reaching net zero.

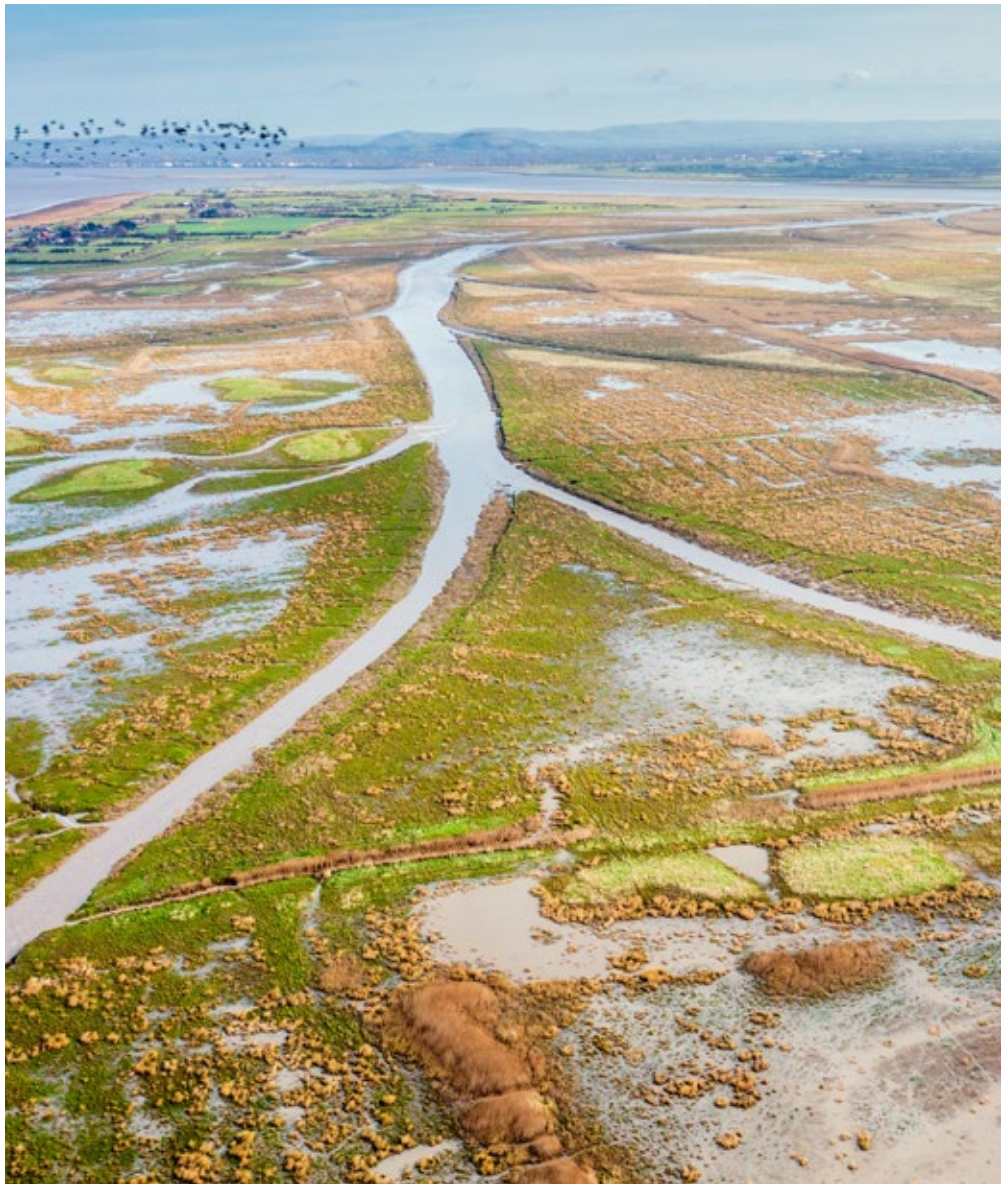
The Environment Agency tends to offset the carbon footprint of creating traditional flood defences by planting trees[41]. Creating more wetlands would reduce the money spent on offsetting, by minimising the carbon emissions generated by construction (labour and materials). Wetlands are also natural carbon sinks (read WWT's 'Wetlands for Carbon Storage' route map to find out more[42]).

Creating jobs

Green jobs and upskilling local people.

Local expertise for creating wetlands for flood resilience is in short supply. To create more wetlands we must establish dedicated roles in Lead Local Flood Authorities (LLFAs) and other local authorities and provide the right training and guidance. This would create employment opportunities across the UK.

Creating wetlands is often labour intensive, but the capital costs are low. These wetlands are usually best suited to large geographical areas. This means their creation provides rural employment[43].



Community cohesion

Engaging local people and bringing communities together.

Creating wetlands brings diverse partners together, fostering a shared commitment to reducing flood risk through co-learning and relationship building. This builds social capital[44]. Volunteer groups can take on the maintenance of projects, and monitoring can be carried out by citizen scientists.

This model has been highly successful in WWT's 'Two Valleys' NFM project in West Somerset.

Creating wetlands for flood resilience can engage local people and bring communities together.

3.

Potential

There is an exciting opportunity to create wetlands for flood resilience and provide many other benefits.

WWT is working to map potential areas for wetland creation. There are a range of factors to consider when determining where to create them.

What are the factors to consider when creating wetlands for flood resilience?

The risk of flooding

Wetlands are a priority in areas with a high risk of fluvial flooding (flooding caused by rivers bursting their banks) and surface water flooding. For England, these areas are outlined in the Environment Agency's flood-risk maps[45]. Similar maps are available for Wales, Scotland and Northern Ireland[46].

The level of flood risk

Wetlands are likely to be especially beneficial in catchments where there are relatively frequent moderate floods, rather than more infrequent extreme floods[47]. In large flood events, wetlands could become overwhelmed, although their ability to cope in these scenarios has not been fully tested. There are also evidence gaps when it comes to how wetlands for flood resilience work on a larger scale.

Proximity to traditional flood defences

Wetlands should be located upstream of traditional flood defences. In these cases, wetlands can reduce the pressure on traditional flood defences and/or future-proof those defences against climate change.

Where are the opportunities to use wetlands for flood resilience over the next five years?

Wetlands could make an invaluable contribution across large parts of the UK. Every farm and community should boast flood-busting wetlands. The key areas to focus on are:

Farmland

Intensively farmed land is often at risk of flooding. When soil is intensively managed it is often compacted and less able to absorb water. Farmers would benefit from using wetlands to create a buffer that stops fields from flooding by absorbing water. Wetlands also increase soil fertility, reduce soil erosion, help absorb pollutant run-off and support aquaculture[48].

Local authority-owned land

Wetlands should be created on local authority land.

LLFAs and other local authorities should take the lead on this because they are responsible for developing, applying, maintaining and monitoring a local strategy for flood-risk management.

Local authorities and LLFAs have access to land around towns and cities where wetland creation could be used to reduce flood risk. They can coordinate projects in parks and other urban spaces that would be improved by the creation of small wetlands or sustainable drainage systems. They could also create larger-scale wetlands (as part of NFM schemes) in rural areas to protect communities downstream.

Land owned by national infrastructure agencies

Agencies, such as National Highways and Network Rail should take action to address future flood risk by incorporating wetlands into their sites. By creating wetlands upstream of vulnerable sections of their network they can protect infrastructure from flood damage and avoid associated financial costs. The National Highways Environmental Strategy outlines National Highways' plan for creating more wetlands for flood resilience[49], but it is important that we see this implemented quickly and at scale.

Case study:
Thames catchment NFM advice

Providing expert advice on NFM

WWT is providing expert advice on NFM to local authorities and other stakeholders in the Thames region. This includes sharing best practice in creating wetlands and other NFM measures that improve flood resilience; facilitating peer-to-peer learning and helping NFM projects access funding.

Four million people in the catchment are currently at risk of flooding. When the River Thames floods, water levels are slow to fall, which can leave properties and businesses flooded for days or even weeks.

The economic impact of a major flood in the Thames catchment is currently estimated at £1 billion[50].

Of the 15 million people in the Thames catchment area, about four million people in the catchment are currently at risk of flooding. 1.7 illion from flooding from sea and rivers and a further 2.3 million from surface water flooding[51]. By incorporating the sustainable, long-term solutions of NFM into the overall flood-risk management strategy for the Thames catchment, we are helping individuals and communities, and boosting nature.

The Thames catchment project is funded by the Thames Regional Flooding and Coastal Committee, which was allocated £1.5 million to embed and mainstream NFM strategies.

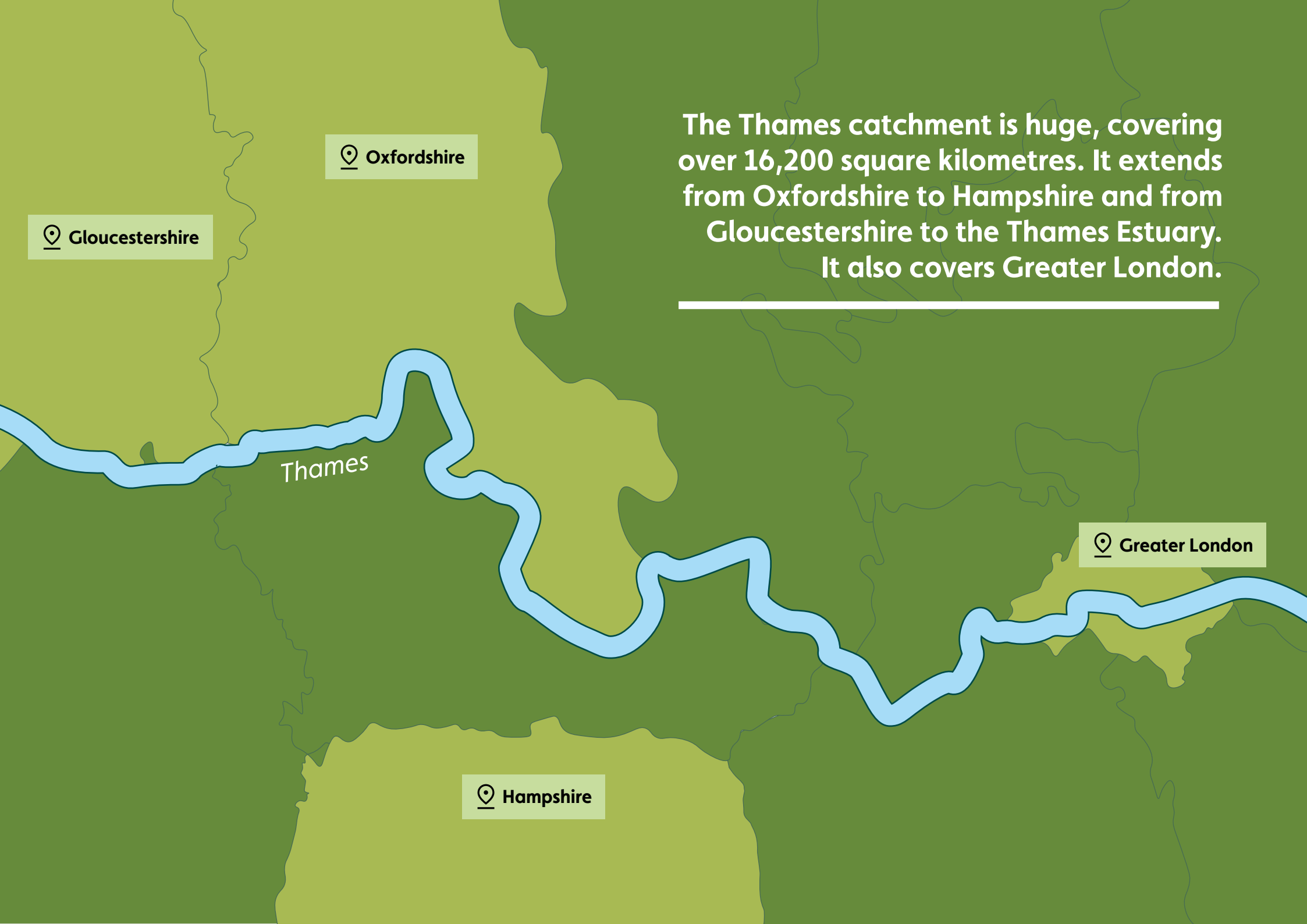
1 billion

The economic impact of a major flood in the Thames catchment is currently estimated at £1 billion.

4 million

A total of around 4 million people are at risk of flooding from rivers, surface water and the sea.

Environment Agency



The Thames catchment is huge, covering over 16,200 square kilometres. It extends from Oxfordshire to Hampshire and from Gloucestershire to the Thames Estuary. It also covers Greater London.

4.

Process

Creating wetlands requires building the capacity of local people to do this, gathering evidence, providing advice and training, and engaging local communities in project design and delivery. Protection and effective management of these wetlands is also vital.

Creating wetlands for flood resilience involves:

Delivery

WWT cannot create wetlands alone. Delivery at this scale requires support from government, communities, individuals, businesses, landowners and civil society groups.

Capacity building

Stakeholders must be equipped with the right advice, training and evidence to create high-quality wetlands. It is important to adapt our approach based on the project type and stakeholders' needs.

Community engagement

Local communities must be involved in the co-creation of wetlands. They should have the opportunity to work alongside organisations with expertise in NFM, like LLFAs and WWT, and to initiate their own projects. Supporting community involvement is essential at every step. This will enable residents to shape wetlands according to their needs, integrate them into community life and improve residents wellbeing. Alongside this, it is vital that existing wetlands are protected and managed so that they provide long-term benefits to local communities.

What are the priorities for wetland creation?

Set out below are the priority actions that will kick-start wetland creation for flood resilience.

Delivery

The following will demonstrate the benefits of wetland creation and create a model for further expansion.

Habitat creation

Creating wetlands on a bigger scale will show how larger wetlands improve flood resilience and establish much-needed wildlife habitat.

Creating a network of small-scale wetlands, integrated into a neighbourhood and/or farmland to illustrate how wetlands where people live and work, can provide multiple benefits. In urban areas, this should include creating SuDS. However, floodplain storage can be delivered on a larger scale.

Low-risk projects

Creating wetlands is most effective for communities and landowners when implemented as numerous small-scale, low-risk projects.

For example, leaky, woody dams can use engineered wood barriers and steel pins. Or they can be created by simply allowing trees and branches to fall into the watercourse. The latter is easy and extremely low cost to install, and maintenance only involves replacing the wood as it deteriorates.

Capacity building

The following sets out our priorities for building stakeholders' capacity to create wetlands for flood resilience.

The Catchment Based Approach (CaBA) is a community-led initiative that engages people and groups from across society to help improve our precious water environments.

Skills

An expansion in the skills and expertise needed to deliver NFM projects efficiently and effectively is needed. This includes on-the-ground implementation, community engagement and scientific monitoring. NFM projects employ a range of approaches, providing valuable experiences to draw upon. It is crucial to establish a method of capturing, condensing and sharing these experiences in a readily accessible, quality-controlled and regularly updated format.

The information collated by the Catchment Based Approach (CaBA)[52] is an excellent start. But a more coordinated and concerted effort is needed to pull together existing information and fill evidence gaps. This will be essential for enabling the more widespread and improved delivery of effective wetland.

Advice and support

The UK Government must establish an independent advice service that offers expertise to local officers. This would ensure consistency in approaches to wetland creation and provide clarity in best practice. Its guidance must be impartial, reliable and based on the experience of non-governmental bodies.

Evidence

Better monitoring and evaluation of nature-based solutions is needed to build scientific understanding and drive change in policy and funding. Such assessments would measure the effects of wetland creation on flooding, wellbeing, carbon storage, water quality, biodiversity and drought resilience.

Conventional modelling techniques are not suited to NFM. Flood-relief schemes use modelling to understand the potential for reducing flood risk and how best to do this. NFM, however, usually relies on several smaller projects that have a cumulative impact. This approach does not perform well in flood-risk models. Catchment or sub-catchment-scale modelling would better represent NFM opportunities and allow more wetland creation.

Knowledge gaps must be filled to help build confidence in the capacity of wetlands to reduce flood risk and to incentivise investment. There is a need for better understanding of the economic benefits of wetlands for flood resilience and of the long-term maintenance costs. It is also vital that expertise for identifying the best locations for NFM is improved.

Community engagement

It's important to work with and for the community in creating wetlands.

Project development

Finding a locally based site manager will maximise efficiency and the chances of success. Such people should be early additions to the project team. This will allow common objectives to be identified, problems and money to be shared, and key decisions to be made swiftly and correctly. This could also avoid costly and time-consuming changes down the line.

In developing a project, an empathetic approach towards landowners and farmers will be important, including efforts to learn from previous projects.

Just as key will be community involvement in project development, so that the project team understands where flooding causes the biggest problems and what changes local people want to see.

Project delivery

NFM programmes can't always be managed by a single organisation. They are made up of many small features within a landscape that rely on local landowners and communities for co-design, permission, implementation, maintenance and monitoring. This means meaningful engagement early on is essential. An Environment Agency's evaluation of the NFM pilots proposed 12 to 18 months preparation for effective landowner engagement[53]. Early engagement makes more projects possible and decentralises management. This will require more engagement officers to be employed by LLFAs.

Maintenance

If communities have been involved in the project design and delivery they will be well placed to carry out ongoing management and maintenance of the wetlands. Funding will be required to enable this. Sufficient management and maintenance will ensure longer-lasting multiple benefits for the local area.

Community and landowner engagement must be at the heart of wetland creation.

How will wetlands for flood resilience be financed?

Public finance

Public finance is essential for creating wetlands.

Flood Defence Grant-in-Aid

Government flood defence budgets should provide the main source of funding for wetlands for flood resilience. The level of Flood Defence Grant-in-Aid (FDGiA) budget allocated for the delivery of NFM should increase over time to reflect the growing number of likely NFM projects.

A moderate target of 5% of the FDGiA budget ring-fenced for this purpose, rising to 15% over six years, would provide between £43 and £130 million per year based on current budget allocations (£5.2bn for 2011–27[54]).

If local levy allocations followed a similar principle, it would substantially increase this sum. The 5% of FDGiA currently allocated to othe flood risk management projects should be diverted to NFM work in upstream catchments (in addition to the £43 to £130 million). This would add between £37 and £41million annually.

Local levy allocations refer to the distribution and allocation of funds, collected through local levies or taxes, to specific local purposes or projects, such as infrastructure development.

Environmental Land Management shemes (ELMs)

Through new agri-environment schemes (ELMs in England) farmers can be paid for targeted woodland creation for flood management. These payments should incentivise and reward all NFM measures, including wetlands.

Climate resilience

The funding provided for flood resilience, (such as from local and national governments, Environment Agency funding in England for flood and coastal risk management (FCRM), and partnership funding for flood prevention from local authorities), should be directed towards creating wetlands for flood resilience. The FCRM strategy to 2027 is committed to doubling the amount of NFM projects it funds. But it will need to go beyond this to tackle the scale of the problem.

Additionally, the Nature for Climate Fund[55] and the Flood and Coastal Resilience Innovation Programme[56] provide extra support for NFM. This funding should be increased to meet the scale of the threats posed by climate change.

Private finance

Private investment will also be important in creating wetlands for flood resilience.

Water companies

Private water companies in England are planning to invest £7.1bn in environmental improvements between 2020 and 2025[57]. These should include wetlands.

Water companies are also required to reduce their reliance on storm overflows and to reduce their negative impact on the wider environment. By investing in SuDS to store more water during high rainfall events, water companies could meet both these obligations

Insurance companies

Insurance companies could reduce the risk of property damage from floods by investing in wetlands. The risk will increase without such investment, leading to higher premiums that may become unaffordable for some. Insurance companies will benefit in the long run from investment in wetland solutions now.

Stacking or bundling benefits

Private financing of wetlands can involve combining the various advantages that businesses would gain from their investment. This is known as 'stacking' or 'bundling', and occurs when multiple ecosystem services like Biodiversity Net Gain and carbon offsetting are delivered on overlapping areas of land and sold separately or as bundles. While there is an opportunity to attract more funding sources through these mechanisms, it is important that the UK Government provides appropriate guidance and standards to ensure the benefits delivered are additional.

5.

Partnerships

No single organisation will be able to create wetlands at the scale needed. We need the involvement of national and local governments, the investment and know-how of businesses and co-creation with local communities.

We have identified key partners from across the UK to facilitate the UK-wide creation of wetlands for flood resilience.

Delivery

Government

The UK Government must develop and implement policies that facilitate the creation of wetlands for flood resilience at the scale required, in addition to protecting existing natural wetlands.

WWT will encourage this by:

- **Advocating for appropriate policies,** often in coalition with other organisations
- **Meeting policymakers** to discuss barriers to change
- **Working with the All-Party Parliamentary Group for Wetlands** to influence parliamentary processes and decision makers

Creating these wetlands will require working with the UK Government and its agencies and making use of their skills and expertise.

Key departments and agencies:

- **The Department for Environment, Food and Rural Affairs (Defra)**, the department responsible for developing the Flood and Coastal Rick Management Strategy and related policy
- **The Department for Levelling Up, Housing and Communities** (DLUHC), the department responsible for planning law
- **The Environment Agency**, the organisation responsible for managing the risk of flooding from rivers, reservoirs, estuaries and the sea
- **Lead Local Flood Authorities**, the county councils and unitary authorities responsible for managing the risk of flooding from surface water, groundwater and watercourses, and leading on community recovery
- **National Highways**, a government-owned company that maintains roads in England

All of these are fundamental to securing the policy and funding required to increase the use of wetlands, and to ensuring that such policies are implemented on the ground.

The Government's statutory nature conservation agencies (Natural England and the Environment Agency) must also make an important contribution where NFM can be used to support the development and delivery of Local Nature Recovery Strategies[58].

Business

Businesses should create wetlands as part of their plans to protect themselves against flooding. These include:

Infrastructure organisations responsible for key national infrastructure. These include Network Rail, National Grid, and power utilities.

Water companies that own large tracts of land that will themselves benefit substantially by planning, developing, implementing and funding wetland projects.

Private companies that benefit from good river flows (neither too high nor too low) and clean water, including those engaged in water-based recreation, such as outdoor swimming and fishing.

Civil society

We must work with landowners, farmers, land managers and their representatives to win their support in creating wetlands.

Environmental NGOs are allies in advocating for and delivering NFM. These include the Rivers Trust; fish conservation organisations, such as WildFish and the Angling Trust; the Wildlife Trusts, and others.

Capacity building

Government

Training and advice will be needed to build the capacity of the various agencies to create wetlands. The UK Government should work in partnership with local authorities, businesses, water companies, farmers and others to ensure that any guidance meets their needs. It's important that advice is tailored to different catchments.

Business

Evidence of the wider benefits of wetlands should be shared with local authorities, developers and water companies.

Civil society

Engaging with academic researchers, such as UK Research and Innovation, and their funders, will be crucial. Their expertise and collaboration will play a significant role in advancing knowledge, finding solutions and filling evidence gaps.

Additional training to enhance the skills of community groups and local charities will be essential. This will enable them to become equal partners in projects, actively participate in the development of initiatives, and eventually undertake their own wetland projects.

Community engagement

Government

Local authorities should ensure that projects are effectively delivered and that we make the very best use of the many benefits that wetlands can provide.

Business

Landowners and water companies should include community members as equal partners when creating wetlands.

Civil society

Civil society groups and local flood groups will be an important source of volunteers and citizen scientists, and a means of disseminating information about NFM.

6.

Policy

Creating and restoring wetlands for flood resilience requires a supportive policy framework. Stakeholders require the right information, plans and funding to make this happen.

We recognise that wetlands will be delivered as part of NFM programmes, so our policy asks relate to all forms of NFM rather than just wetlands.

These policies relate to the UK Government only. In time, WWT will present policy proposals to the devolved administrations in Scotland, Wales and Northern Ireland, to ensure that they are also doing all they can to accelerate the creation and use of wetlands.

The UK Government needs to adopt the following policies to ensure we can make the very best use of wetlands for flood resilience:

Information

TOP PRIORITY

Guidance: Produce centralised guidance and provide training for land managers, planning authorities and practitioners on how to create and manage wetlands for flood resilience.

Whilst there is a considerable amount of information and guidance on delivering NFM at a local and project level, there is currently no centralised guidance. Such guidance is essential to ensure consistency in approaches to creating wetlands for flood resilience (and NFM more broadly). There is also insufficient expertise at a local level to deliver NFM at the scale required.

Centralised guidance will ensure consistent methods and techniques are used to implement high-quality NFM. This will empower Regional Flood and Coastal Committees that have funding for flood-risk management, and will facilitate their investment in NFM techniques and raising awareness of the benefits and opportunities. Additionally, it would give a valuable insight into how to engage effectively with communities, so fostering collaboration and participation.

This guidance must be paired with training programmes that provide local officers with the necessary skills. Such skills should equip them to deliver high quality NFM and enable them to select the most suitable methods for their areas.

The UK Government's Plan for Water commits to delivering catchment plans that will improve the capacity of local groups to 'deliver improvements through the right tools, data, and approaches'[59]. This guidance and training should feature in these plans.

Sites: Map current and potential projects and programmes delivering NFM and ensure they are recorded in a consistent way.

Currently, the mapping of NFM is regionalised, inconsistent and ad hoc. Bringing existing mapping together in a more consistent approach and linking it to project monitoring, will ensure more strategic and joined-up planning and design for local projects.

This new mapping tool will provide essential information on the opportunities for wetland creation across the UK. It will facilitate the effective and efficient creation of wetlands, and guide investments, such as those delivered through the Nature Recovery Network and Levelling Up funding.

A new mapping tool must be accessible and up to date. It should be interactive, simple to find and easy to use. It should be coordinated by the Environment Agency, building on the work done by CaBA[60], and should be regularly updated to include ongoing projects nationwide.

Evidence: Build on the evidence base for wetlands for flood resilience to ensure more accurate modelling and greater understanding of their multiple benefits.

There is ample evidence of the many benefits of wetlands for flood resilience but gaps remain. More empirical evidence is needed to support NFM modelling, and therefore it is important that models are accurately updated. More precise modelling data will demonstrate that NFM works in different flood conditions and ensure that the NFM measures chosen are the best match for the catchment.

Monitoring of existing projects should also be improved to enable those delivering projects to learn from experience and create more effective projects in the future. There should be consistency in the approach to gathering this information so that projects can be compared. This would improve our understanding of the opportunities for NFM. Citizen science is one way to gather data and is well suited to NFM due to the localised nature and need for rapid responses (following heavy rain, for example).

There is an opportunity to embed this improved data gathering and modelling into the upcoming catchment plans announced as part of the Plan for Water. The forthcoming National Infrastructure Assessment also presents an opportunity - research on the multiple benefits of NFM should form part of this assessment and include recommendations for further action.

Plans

TOP PRIORITY

Standards: Produce a nationally recognised NFM accreditation scheme that sets clear standards for best practice in wetland creation, restoration and maintenance.

Guidance on NFM is currently limited to ELMs applications and specific projects, such as those under FCRM. Establishing consistent standards that promote the creation of high-quality wetlands for flood resilience will be essential to ensuring effective implementation of NFM by land managers.

The Government has already published a literature review that identifies research findings and best practice from stakeholders involved in NFM projects[61], and has built on this by using FCRM forums as a platform for developing and sharing best practice. These valuable insights could be consolidated into specific standards through an accreditation scheme. It is crucial that such standards consider landscape variations, land ownership, existing flood-management infrastructure and other relevant factors.

Strategies: Incorporate NFM techniques into all possible flood-protection projects by embedding them into climate adaptation, flood management and nature recovery plans.

Currently NFM is delivered on a case-by-case basis, funded by specific NFM projects. There is no cohesive and strategic approach to the widespread implementation of NFM. There is also a lack of specific policy on NFM. This makes NFM less likely to be included into flood management projects.

NFM must be integrated into all new and existing policy, funding commitments, flood management plans, national nature recovery plans and climate adaptation plans. The National Adaptation Plan (NAP)[62], for instance, includes NFM but it still requires policy support and faces funding barriers to deliver at the scale required. The UK Government must work towards establishing these ahead of the next NAP.

In addition, the Government aims to create or restore 500,000 hectares of wildlife-rich habitat outside protected sites to form part of a Nature Recovery Network[64]. Plans to deliver this must include increased funding and relevant policy changes to enable NFM at scale.

To ensure the effective inclusion of NFM in national strategies, the Government should also expand the scope of the National Infrastructure Assessment to include NFM. It currently looks at flooding infrastructure but not NFM.

National Adaptation Plan (NAP) is a strategic framework developed by countries to assess and address climate change impacts, vulnerabilities and adaptation measures at the national level.

Target: Make NFM the default option for all flood-management schemes.

The Government has taken positive steps towards recognising the value of NFM. However, flood alleviation schemes do not currently prioritise NFM techniques. This is preventing the rapid expansion of NFM. For example, only £15 million of the £2.6 billion 2015-2021 FCRM budget was allocated to NFM initiatives (on top of other small scale projects)[64]. While this has increased to £25 million in the 2021-2027 fund[65], it is not enough to allow for a more integrated approach to NFM. We want to see all projects incorporate NFM elements, particularly wetland creation.

By making NFM the default option, widespread adoption of these measures can be ensured. Flood-alleviation schemes should have to justify why they are not using NFM, rather than why they are. This should be coupled with better payments for landowners to incentivise this shift, including land-purchase or land-swapping schemes. This could be done through either government capital funding or green finance schemes. New mapping of current and potential NFM projects would make this easier.

The FCRM strategy highlights the Government's aim to 'mainstream' the use of NFM techniques[66], and this is the way to do it.

Funding

TOP PRIORITY

Public funding: Provide funding for increased NFM creation, management and facilitation via a ring-fenced pot of Flood Defence Grant-in-Aid (FDGiA).

NFM interventions, particularly when implemented individually, are not suitable for current funding arrangements, due to the modelling and evidence requirements of the funding. The need to undertake this for small, individual schemes makes them disproportionality expensive. Simply exempting NFM is not feasible. Instead, a coarser and more macro-scale approach to guide investment decisions, such as catchment or sub-catchment modelling, is needed. In particular, at least during a pilot phrase, there should be looser constraints on the forecasting accuracy of predicted benefits.

We propose a significant change in the government funding mechanism for NFM delivery. This would involve allocating a ring-fenced pot of FDGiA and local levy resources to areas, based on their 'potential'.

Instead of approving spending for individual schemes based on detailed designs and modelling, FDGiA should focus on setting and monitoring area-based performance targets for delivery. Incentives for exceeding targets and penalties for underperformance could be incorporated into the delivery process. This approach would enable FDGiA to leverage additional resources more effectively for NFM work. It would also complement measures, such as partnership funding calculator adjustments.

The cost of establishing a centralised or regionalised advice/support team and of commissioning priority work will depend on the delivery model and the scale and range of support provided. A rough estimate would be £1–2 million per year. The estimated cost for the delivery of wetlands projects is £100–200 million per year (or 11–23% of the total annual FDGiA budget). This is a significant sum and the benefits of this investment would need to be justified, particularly in terms of flood-risk reduction. However, the cost-benefit ratio would be extremely favourable.

Funding for NFM should also be integrated into all government policies that aim to help the UK adapt to climate change.

Public funding: Fund local NFM engagement officers in all LLFAs.

Expertise in NFM and the capacity to engage with communities are often limited. However, both are crucial for implementing the most effective measures across a catchment and ensuring community ownership of projects: they ensure long-term success. Building capacity in this way will result in a significantly higher return on investment and will generate more NFM compared to that generated solely by funding capital works.

LLFAs are responsible for managing flood risk in their area and delivering local flood-risk management plans. These plans assess the risk of flooding from various sources, such as rivers, the sea, surface water, groundwater and reservoirs. They also outline how risk management authorities (responsible for flood and coastal erosion risk management) should collaborate with communities to manage flood risk over the next six years.

These plans should incorporate a range of NFM measures, strategically implemented through a coordinated, catchment-based approach that involves extensive community engagement. Funding for such initiatives could be provided through the UK Infrastructure Bank, which has dedicated funding for local authorities and nature-based solutions. Linking this funding to job-creation opportunities would further strengthen the case for support.

Assuming an average of three or four officers per LLFA, the estimated cost for building the necessary capacity would be £18–24 million per year.

The UK Infrastructure Bank is a government-owned financial institution established to support infrastructure projects by providing loans, guarantees and other financial assistance.

Private funding: Require water companies to produce business plans that include investment in wetland restoration and the creation of wetlands for flood resilience.

The low level of investment by water companies in NFM is partly driven by a lack of confidence and understanding of the benefits and costs. It is crucial to demonstrate that NFM can offer a cost-effective solution for water management.

Water companies allocate significant funds to flood management but there is potential to increase investment in NFM rather than solely focusing on traditional measures. This shift in investment could help water companies meet the commitments and obligations laid out in the Water Industry National Environment Programme, Drainage and Wastewater Management Plans and the Defra Policy Statement on water company plans. By integrating NFM into these plans, water companies can proactively promote and prioritise the implementation of cost-effective NFM solutions in their operations.

Conclusion

WWT is calling for urgent action to adapt to the climate crisis, to protect communities and businesses and to restore nature through rapid progress in creating wetlands for flood resilience.

Traditional flood defences like concrete dams, embankments and walls are no longer enough to protect communities and businesses. We need other solutions that complement existing traditional infrastructure. Wetlands provide flood resilience but also bring a host of benefits for people and wildlife. They can improve the UK's water quality, increase biodiversity, provide spaces for recreation and improved wellbeing, and help capture and store carbon.

This is an exciting opportunity to integrate this approach into rural and urban spaces and to build local partnerships that bring this about. It is crucial to involve local communities, along with LLFAs and other local authorities, flood-risk experts and private investors in shaping, creating and protecting these wetlands.

If we want flood-resilient communities and businesses we need a stronger policy framework that will allow wetland creation in more places across the UK. This requires the provision of adequate funding to train local NFM delivery officers and increase the number of projects. Government also needs to produce centralised advice and support for these officers and to establish clear guidance and best practice to ensure quality wetlands are created.

WWT is already leading the way, creating wetlands for flood resilience, supporting local authorities and providing vital evidence to inform government schemes. However, there is much more to do. Rising to the challenge requires determined efforts from governments, businesses and communities across the UK. With the right partnerships, funding and policy changes we can make this happen.

The UK is not equipped to deal with the impacts of climate change. The increasing risk of flooding poses threats to the UK economy, its biodiversity and to our mental health and wellbeing.

We must act now to address the scale of the challenge while protecting our communities and wildlife.

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There are many exciting opportunities to accelerate the creation of wildlife-rich wetlands. Whether you're interested in working with WWT on a project, assisting others in building the capacity of stakeholders to create wetlands for flood resilience, or helping us put in place the policies needed to do so, we'd love to hear from you.

Together we can help secure a future where healthy wetland nature thrives and enriches lives.

WWT
For wetlands. For life.

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