Making Space for Water: Investing in nature-based solutions with beavers

Photo: Ben Lee

A new opportunity for individuals and organisations to deliver positive change for nature and society by supporting the expansion of beaver wetlands in South West England.

Devon Wildlife Trust

University of Exeter

Introducing the Making Space for Water Programme

This document presents a new approach for individuals and organisations to support positive changes in our water environment.

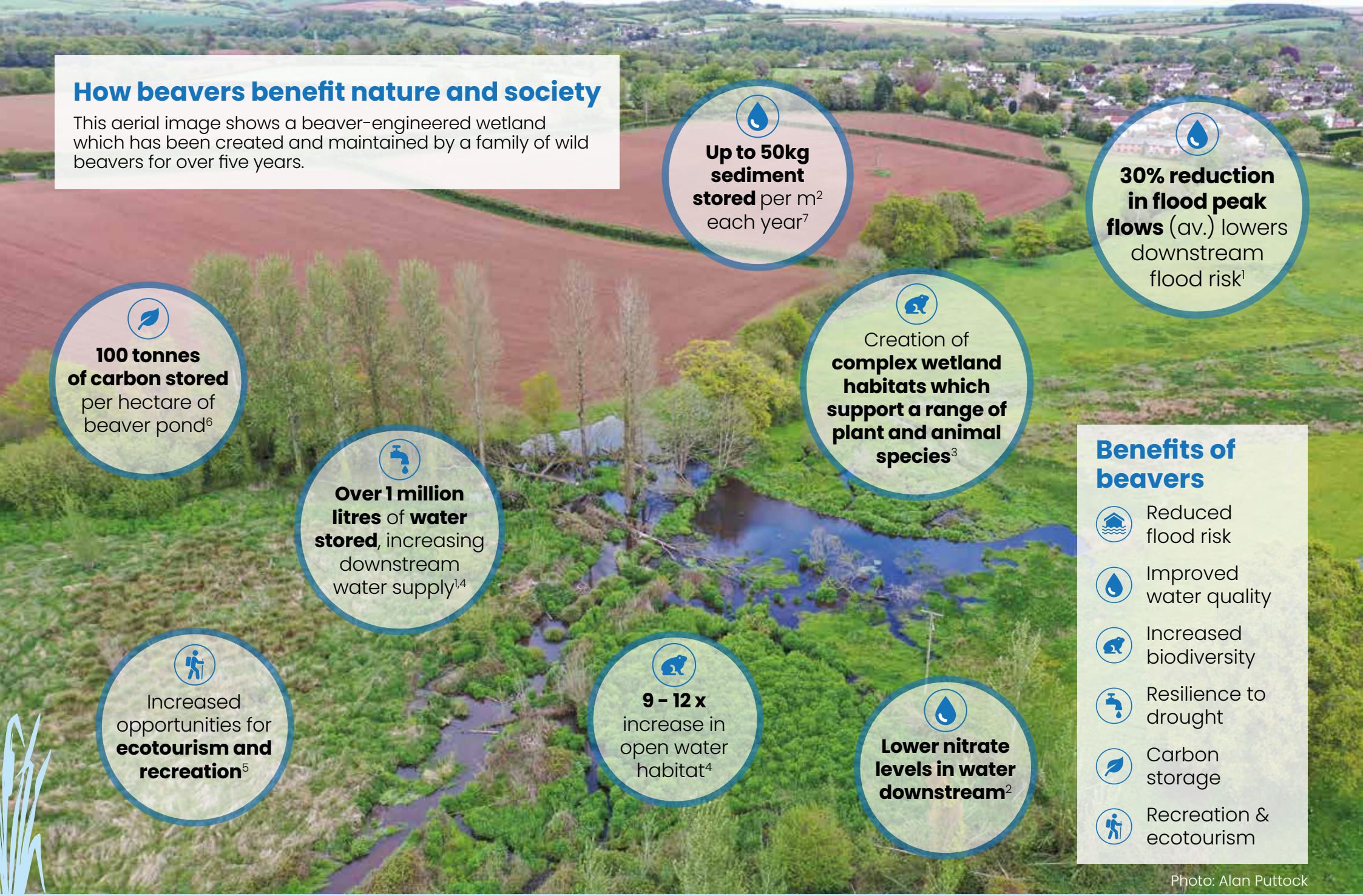
Beavers can reduce downstream flood risk, improve water quality, enhance biodiversity and increase climate resilience.

The Making Space for Water Programme is seeking funding to provide targeted support to land managers who make space for beaver wetlands in priority sites across South West England.

With your support, this pioneering programme will utilise the remarkable capacity of beavers to transform our environment to deliver multiple benefits for nature and society.

Photo: Sam Moore (@sam_alexander_photography)

Beavers are ecosystem engineers: they create extensive nature rich wetlands which have the capacity to generate significant benefits for society.



How beavers benefit nature and society

This aerial image shows a beaver-engineered wetland which has been created and maintained by a family of wild beavers for over five years.

Up to 50kg sediment stored per m^2 each year[7]

30% reduction in flood peak flows (av.) lowers downstream flood risk[1]

100 tonnes of carbon stored per hectare of beaver pond[6]

Creation of **complex wetland habitats which support a range of plant and animal species**[3]

Over 1 million litres of **water stored**, increasing downstream water supply[1,4]

Increased opportunities for **ecotourism and recreation**[5]

9 – 12 x increase in open water habitat[4]

Lower nitrate levels in water downstream[2]

Benefits of beavers

- Reduced flood risk
- Improved water quality
- Increased biodiversity
- Resilience to drought
- Carbon storage
- Recreation & ecotourism

Photo: Alan Puttock

A natural solution to current challenges in South West England

Our watercourses face intense pressures from land use change, increased demand for water resources, declining biodiversity and climate change. Scientific research has shown that beavers play a crucial role in addressing these issues and increasing future resilience.

Reduced flood risk

- Beavers create complex dam structures in small watercourses, holding back and slowing the flow of water.
- Hydrological monitoring across sites in England has shown that the creation of beaver dams reduced peak flows by an average of 30%[1,7], reducing downstream flood risk. This finding reflects similar research from mainland Europe[8] and North America[9].
- Supporting the targeted expansion of beavers can play a critical role in protecting the 30,000 residential and 5,000 non-residential properties currently at high risk of flooding in South West England[10].

Flooding has caused extensive property damage in Devon - beavers can reduce downstream flood risk.

Photo: David White

Resilience to drought

- Beaver dams raise the water level behind them, re-connect the floodplain and store large volumes of water[11].
- Research shows that beaver-created wetlands buffer adjacent habitats against drought, maintaining soil moisture and vegetation growth[12]. Studies have shown that the storage and slow release of water can help sustain streamflow during drought conditions[4].
- Enhancing beaver wetlands can increase climate resilience and help to address summer water supply pressures, a growing challenge in South West England, particularly during peak tourist season[13].

Vegetation in and around a Devon beaver wetland is buffered against drought.

Photo: Clinton Devon Estates

Improved water quality

- Beaver wetlands act as a large water filter, removing sediments and other pollutants from the water as it slowly flows over, through and around a sequence of dams.
- Studies show significant reductions in key water pollutants downstream of beaver-created wetlands, including measurable declines in nitrogen (up to 50%), phosphate (up to 70%) and suspended sediment (up to 78%)[1].
- Water quality benefits from beaver wetlands can help to reduce water treatment costs and improve the conditions of the 79% of watercourses currently failing to achieve Good Ecological Status in South West England[14].

Beaver dams filter water pollutants and enhance downstream water quality.

Photo: Alan Puttock

Increased biodiversity

- Beavers create a mosaic of different habitats, providing food, water and shelter for an abundance of other species[3].
- Ecological research demonstrates that beaver activity can enhance plant and invertebrate diversity, increase amphibian abundance, improve fish habitat and benefit protected mammal species including bats, otter and water vole[11].
- The UK has lost more than 75% of its wetlands since 1700[15]. Beavers can kick-start the recovery of Britain's wetlands, providing vital resources for a diverse range of plants and animals.

Frogspawn increased from 10 clumps to 681 clumps following the arrival of beavers at a site in Devon: an important sign of wetland recovery.

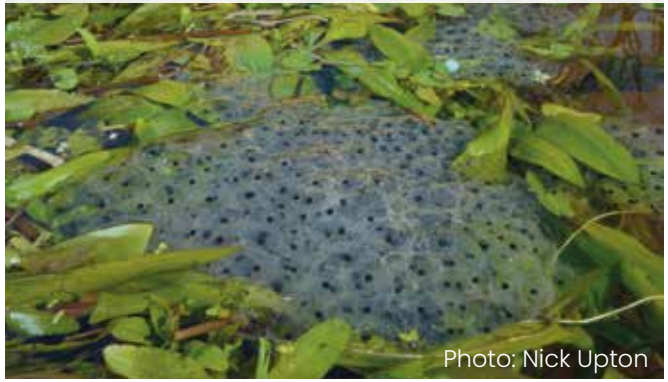


Photo: Nick Upton

Carbon storage

- Beavers can significantly increase carbon storage in river corridors by capturing carbon-rich sediments in their ponds and inundating surrounding soils[4].
- On a global scale, beaver ponds contain an estimated 380 million tonnes of carbon stored in their bottom sediments[16].
- The expansion of beaver wetlands, particularly along river corridors where existing carbon storage is low, can help Devon to reach net-zero emissions by 2050[17].

Beaver wetlands trap and store large amounts of carbon in pond sediments, wetlands and woody material.

Photo: Henley Spiers

Recreation & ecotourism

- Beavers are iconic, charismatic animals whose presence is associated with feelings of pride and excitement for local residents[5].
- Beaver watching in Devon has increased visitor numbers and delivered economic benefits for local businesses[7]. Visits to see beavers at one site in Scotland generated more than £350,000 in visitor expenditure over five years[18].
- The UK is one of the most nature-depleted countries in the world[19]. New opportunities for people to spend time with beavers and their nature-rich wetlands can deliver economic benefits for rural businesses and increase well-being for people living in Devon and the millions of tourists who visit the region.

Beaver watching is popular with locals and visitors to the River Otter, helping to support rural businesses.

Photo: DWT

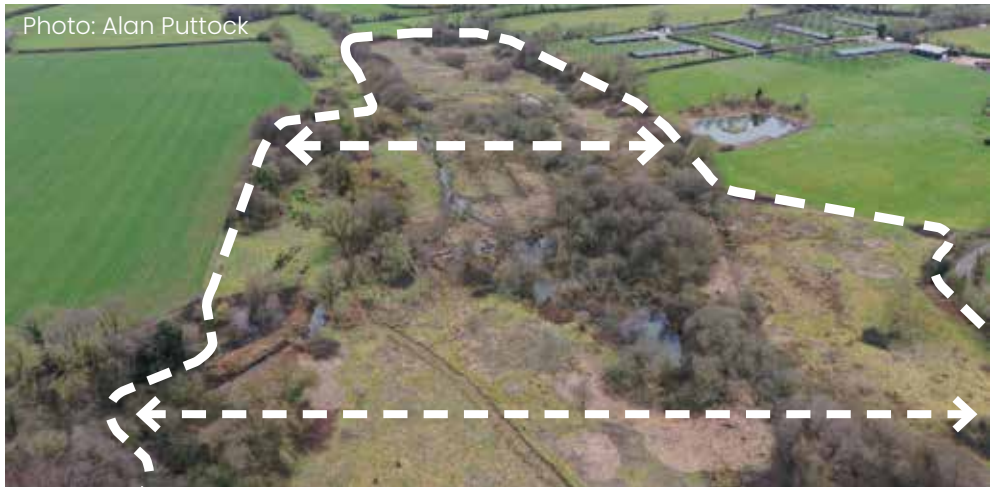
Investing in beaver wetlands to benefit nature and society

A growing body of scientific evidence shows that the expansion of beaver-created wetlands at a landscape scale will deliver a diverse range of quantifiable benefits to society.

In order to maximise the delivery of these benefits beavers need freshwater, food and space to build dams and create new wetlands.

Devon Wildlife Trust has over eight years of experience working with landowners in catchments with wild beavers. Many of these landowners are interested in making more space for beavers to engineer new wetlands on their land if long-term financial support can be provided. Financial support is required to ensure their rural businesses are sustainable and to reward landowners for the multiple benefits they are delivering through the expansion of beaver wetlands.

Two examples of how funding can be targeted to secure the long-term benefits derived from beaver activity are presented in the following section.



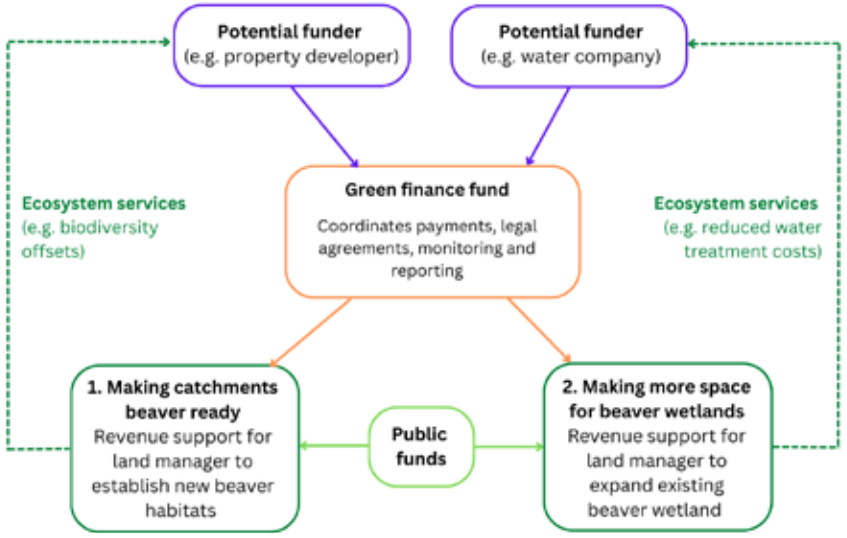
Making space for water: a beaver-engineered wetland in Devon where the landowner has voluntarily made space for the expansion of beaver activity. The site has developed into a thriving ecosystem and valuable buffer alongside productive agriculture.

We are looking to build collaborative partnerships with a range of funders who want to see nature-rich river corridors extend across South West England.

This programme will facilitate the transfer of funding from partners interested in maximising the benefits of beavers, to landowners who create suitable beaver habitat and/or support the expansion of existing beaver wetlands.

Our funding model will build on existing green finance programmes, such as the Wyre Catchment NFM Project and the Upstream Thinking Project, where public and private finance are blended to deliver multiple benefits for society.

This programme is the first of its kind in the UK, using wild beavers to deliver natural solutions to address the challenges faced by businesses and society. It brings together leading expertise in green finance markets, ecosystem service science and beaver management.



Payments for ecosystem services from private and/or public funding sources will be collated and directed to land managers who make space for water and support the long-term expansion of beaver wetlands.

“For over a decade Clinton Devon Estates has been learning to live with beavers”

John Varley, Chief Executive, Clinton Devon Estates

Photo: Matt Austin

“We have seen the major benefits beavers can bring for wildlife through the creation of multiple wetlands but have also experienced the negative impacts they can have and the challenges they present to farmers and land managers.

In our experience, if properly managed, the cost of having beavers is far outweighed by the environmental, social and economic benefits they bring. We support the development of financial support mechanisms for farmers and land managers that recognise the cost of beavers to their own businesses and which enable the delivery of the multiple benefits to wider society.”

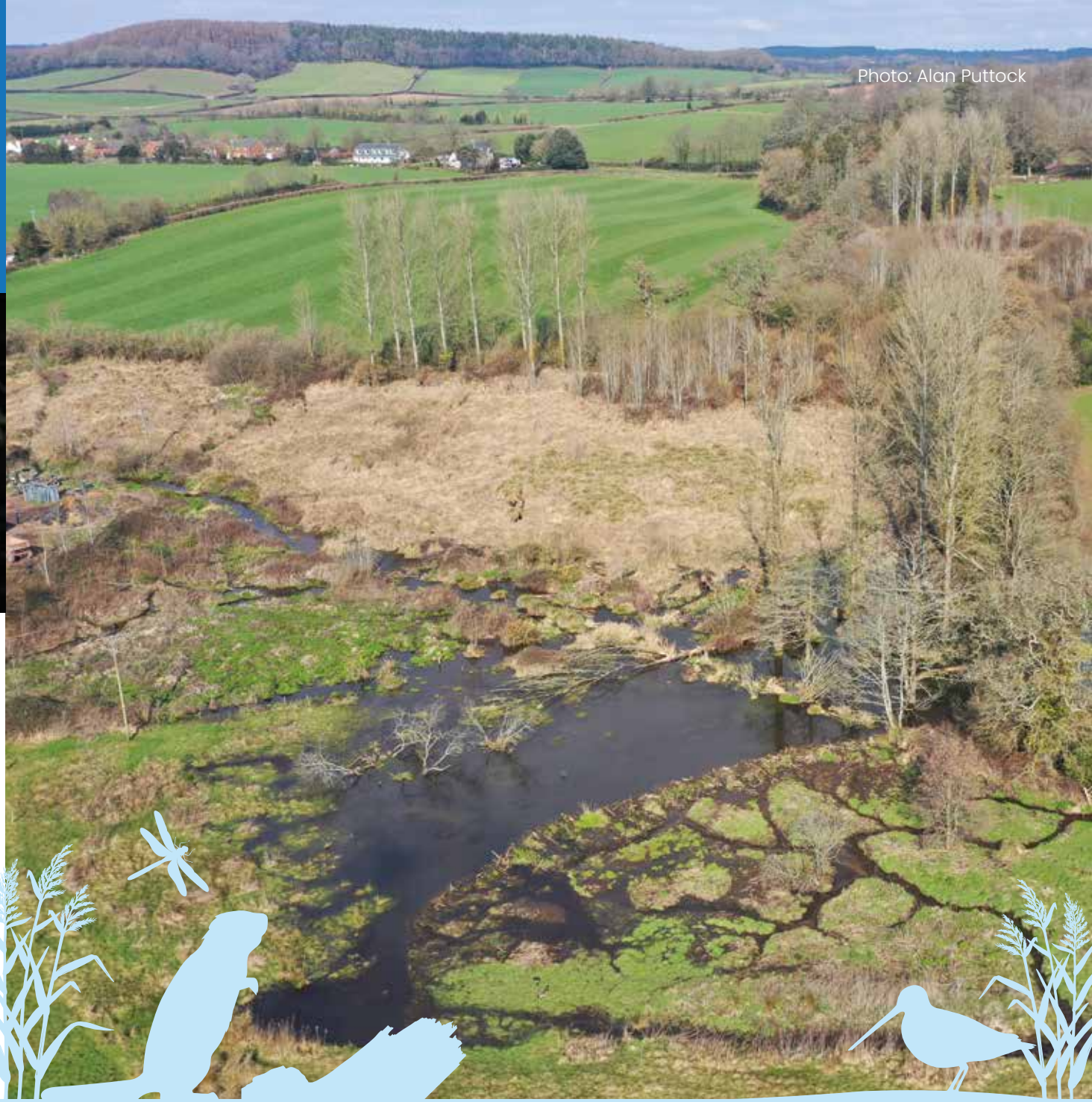
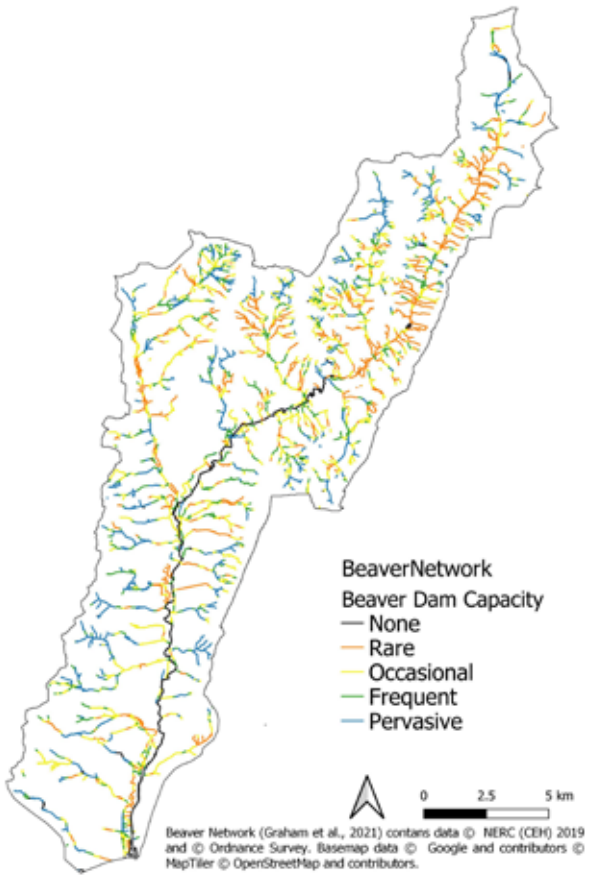


Photo: Alan Puttock

1. Making catchments beaver ready

Devon Wildlife Trust and the University of Exeter have pioneered the development of scientific models to identify where habitat creation for beavers will deliver maximum ecosystem service benefits while minimising the potential for problems.

These models will be used to target financial support to landowners in locations where making space for beavers will deliver measurable benefits for nature and society.



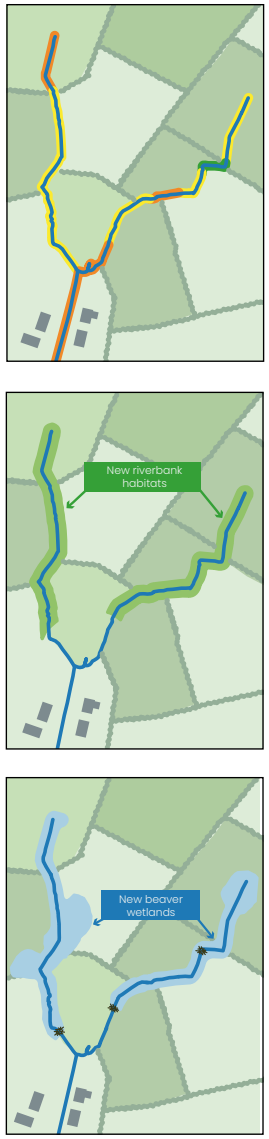
Modelling by the University of Exeter shows that over half the 600km network of streams and rivers in the River Otter catchment lack suitable habitat for beavers.

Many of these areas could support beaver dams and wetlands if riverbank trees and shrubs are available for beavers to feed on.

By establishing these habitats, this project will create nature-rich river corridors which provide multiple environmental benefits, including water quality enhancement, carbon storage and increased biodiversity.

Many areas of the River Otter in East Devon currently have low beaver dam capacity (shown as yellow and orange sections in model outputs) because they lack suitable habitat along the riverbank.

Case Study 1 is based on model outputs for a real sub-catchment in Devon, and shows the potential for payments to land managers to increase beaver wetlands and associated ecosystem services:



Baseline site(s) identified:
- Streams where trees and shrubs are absent from most of the bank are identified within target areas for ecosystem service enhancement.
- Beavers are currently unlikely to settle and build dams here: the beaver dam capacity of this tributary is low.
- Current environmental benefits are constrained.

- Engaged land manager enters formal agreement to create nature-rich corridors along the banks.
- Capital payments delivered for habitat creation.

Beaver ready site(s) established:
- Riverbank trees and shrubs are established, providing multiple environmental benefits.
- Revenue payments to land manager(s) reflect the environmental benefits delivered by new riverbank habitats.

- Arrival of beavers through natural dispersal or targeted release into priority sites.
- Land managers are supported with further advice, guidance and monitoring to maximise benefits.

Beaver ready site(s) maintained and enhanced:
- Beavers build dams and wetlands develop.
- Environmental benefits are enhanced by beaver activities.
- Land manager receives revenue payments for river corridors plus bonus payments for additional ecosystem services generated by beaver activities.

Increased delivery of ecosystem services

The Making Space for Water programme will support land managers to create habitats just like this, containing a mosaic of trees, wet grassland, ponds and flowing water which enable beavers and other wildlife to thrive alongside productive agriculture.

By planting trees and shrubs along river corridors we will create optimum conditions for beavers to settle and establish long-term territories in sites where the benefits they deliver are maximised.

Photo: Alan Puttock

2. Making more space for beaver wetlands

We are engaging with landowners who already live and work alongside wild beavers in Devon. These sites present significant opportunities to enhance the benefits delivered by beaver wetlands by supporting targeted long-term changes in land use.

Beavers are legally protected but under licence land managers can use a range of methods to minimise their impacts, for example by removing or reducing the size of beaver dams to limit local land inundation.

Where beaver impacts are minimised the wider benefits of beaver activities are also significantly reduced.

With the right financial incentives, land managers can be supported to provide space for beaver wetlands to expand. This will deliver significant and lasting environmental benefits.

The photo shows a recently established beaver territory in an agricultural landscape in Devon. This wetland has the potential to provide habitat for many species, attenuate flow and filter out pollutants. We are working with the landowners to secure financial support to enable the transition in land-use to maximise these benefits.

Photo: Jake Chant

Case study 2 shows the changes in a real beaver wetland within the River Otter catchment where beaver dams are reduced in size and where beaver dams are left to develop naturally:

Baseline beaver wetland site:

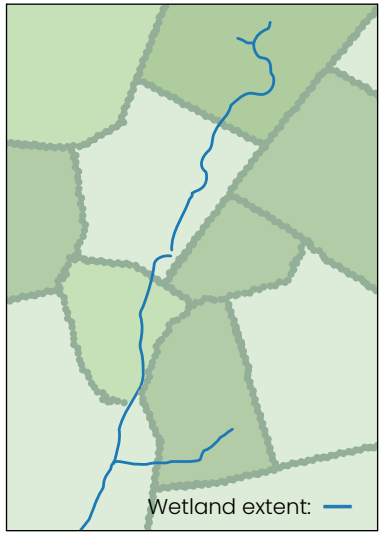
- Beaver dams have been managed to reduce dam height.
- This minimises water storage and wetland extent.
- The environmental benefits of beaver activities are minimised.

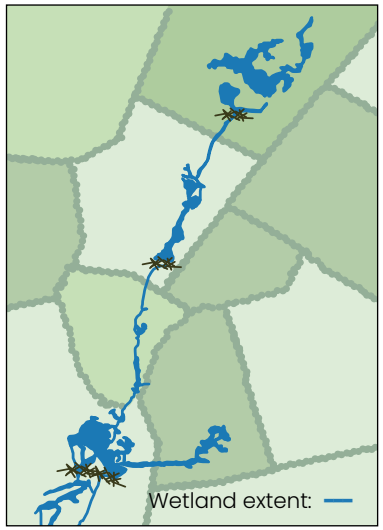
Revenue payments agreed with land manager to make space for water.

Management plan for the beaver wetland co-developed with land managers.

Making space for water site:

- Dams and wetlands expand naturally as a result of beaver activities.
- Environmental benefits are maximised and sustained.
- Revenue payments to land managers for the range of environmental benefits delivered.





Increased delivery of ecosystem services

Help support our vision! Contact us:

If you or your organisation is interested in finding out more about the Making Space for Water programme, please get in touch with our

Green Finance Officer, Holly Barclay:
beavers@devonwildlifetrust.org

Peter Burgess (Director of Nature Recovery at Devon Wildlife Trust) and Professor Richard Brazier (Director, Centre for Resilience in Environment, Water and Waste (CREWW)) transport a beaver which was released on the River Otter to boost genetic diversity of the existing wild population.

Who we are

Devon Wildlife Trust

DWT has worked with beavers for over a decade. DWT is the only English organisation who have led a reintroduction of beavers to the wild. Many of our projects involve building consensus and partnerships with landowners and local communities.

We currently have over 20 farming and wildlife advisors working across Devon, collectively influencing thousands of hectares of land every year. Current initiatives include restoration of 22,000 hectares of wet grassland as part of the Working Wetlands project supported by South West Water, and delivering natural flood management interventions to reduce flood risk to properties in East Devon.

University of Exeter

Researchers at the University of Exeter have studied the environmental and societal impacts of beavers in Devon since 2011, led by Professor Richard Brazier who co-directs the Centre for Resilience in Environment, Water and Waste (CREWW). Professor Brazier chaired the River Otter Beaver Trial Science and Evidence Forum between 2015-2020, ensuring the delivery of solid scientific evidence. Professor Brazier's team continue to study the impacts of beavers across the UK, including in the River Otter and River Tamar where advanced modelling tools are being used to determine where maximum ecosystem service benefits of beavers can accrue while minimising potential conflicts in human-dominated landscapes.

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This report was written by Holly Barclay, Matt Holden, Pete Burgess (Devon Wildlife Trust) and Alan Puttock (University of Exeter). With thanks to Russell Luscombe, Steve Hussey and Ashley Beevers for valuable feedback on earlier drafts.

Beavers in Devon: The story so far

Eurasian beavers *(Castor fiber)* are a native mammal which lived in watercourses throughout Great Britain until they were hunted to extinction 400 years ago.

In 2015 DWT was granted a five year licence to reintroduce wild beavers into the River Otter and study their impacts, in collaboration with the University of Exeter and other local partners.

In August 2020 the UK government announced that the River Otter beavers could stay and expand their population naturally, representing the first successful reintroduction of a native mammal in England.

South West England is now a stronghold for beavers in Britain. This region provides a unique opportunity to develop innovative funding approaches that will support England's growing population of wild beavers to deliver multiple environmental and societal benefits while living alongside people for the first time in 400 years.

Further information about beavers in Devon can be found at:
https://www.devonwildlifetrust.org/beavers
https://www.exeter.ac.uk/research/creww/research/beavertrial/

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Photo: Nick Upton