Interreg
2 Seas Mers Zeeën
PROWATER
European Regional Development Fund

Restoring seasonal wetlands for climate adaptation

Results of changes implemented to the 'River Beult' site by South East Rivers Trust

October 2022

www.pro-water.eu

DISCLAIMER

COLOFON

The PROWATER project has received funding from the Interreg 2 Seas programme 2014-2020 co-funded by the European Regional Development Fund under subsidy contract No 2S04-027. Interreg 2 seas is a European territorial cooperation program for the United Kingdom, France, the Netherlands and Belgium (Flanders).

This report represents Deliverable 6.1.7 of the project PROWATER : 'Synthesis booklet: Report of the assessment results for the cases'.

Citation: Bauer Katharina, Vande Velde Katherine (2022). Restoring seasonal wetlands for climate adaptation - Results of changes implemented to the 'River Beult' site by South East Rivers Trust. Deliverable 6.1.7 of the PROWATER project, Interreg 2 Seas programme 2014-2020, EFRD No 2S04-027.

AUTHORS

Bauer Katharina
South East Rivers Trust
Connect House, Kingston Rd,
Leatherhead KT22 7LT, United Kingdom

Vande Velde Katherine (editor)
Departement Omgeving
Afdeling Strategie, Internationaal Beleid en Dierenwelzijn
Koning Albert II-laan 20 / 8
1000 Brussels, Belgium

PROJECT PARTNERS

COLLABORATERS FOR THE DEMONSTRATION SITE

Restoring seasonal wetlands for climate adaptation

On Moat Farm in the river Beult catchment, South East Rivers Trust developed the Interreg 2 Seas PROWATER demonstration site 'River Beult' (including sub-sites 'Streetend Wood' and 'Harp Meadow') in collaboration with the land owners. The site demonstrates how the region can adapt to the consequences of climate change through Ecosystem-based Adaptation.

The South East Rivers Trust is an environmental charity bringing rivers and their catchments back to life. Ecosystem-based Adaptation measures are a key tool in restoring our freshwater ecosystems, the life they support, and increasing their resilience under the pressure of climate change. Ecosystem-based Adaptation (EbA), a Nature-based approach to climate change adaptation, harnesses ecosystem services to increase resilience and reduce the vulnerability of human communities and natural systems to the effects of climate change. These EbA measures can be integrated into adapted agriculture, forestry and environmental management.

This publication summarises the EbA measures and results of sites within the River Beult catchment. The measures implemented in the headwaters of the catchment aimed to restore the retention capacity of seasonal wetland areas that would naturally be present. By increasing roughness of the area to slow the flow, and removing or filling in channels draining the area, water can spill over the floodplain and wet woodland habitat and wet grassland (both seasonal wetlands) were restored in two separate sub-sites.

Climate change adaptation measures such as the ones at Moat Farm, increase the sponge effect of the area. In dry periods, they make more fresh water available for human activities and nature, when the retained and infiltrated water in the landscape can be released back to the drier environment. In wet periods, more retention and (at a later time) infiltration can take place, which can buffer high peak surface water discharges. This can lower the risk for flooding downstream.

The results are summarised using various steps (chapter 1 to 4) that represent the process for successful planning and implementation of climate change adaptation measures (see Output 1). Presented insights and lessons learnt can help governments (national, provincial and municipal), knowledge institutions, consultancies, managers of nature areas, drinking water companies and landowners in the design of climate change adaptation projects.

Figure 1 - The dot situates the demonstration site for Ecosystem-based Adaptation in the Interreg 2 Seas region.

1 Understanding the catchment

1.1 Geographical & hydrological context

The River Beult is the only riverine Site of Special Scientific Interest (SSSI) in Kent, designated for its characteristics as a clay river. It consists of 10 sub-catchments, only one of which is in good condition (Water Framework Directive classification). The slowly permeable clay soils provide little storage capacity in the catchment. As a result, the surface water network is dense, with many areas artificially drained (through and underdrains) and ditches to increase productivity of the landscape. This increases the risk of diffuse pollution from overland or drainage flow and the vulnerability to dry periods. Organic matter content in the dominant type of soil here has been reducing both under arable and grassland management, reducing the ability of the soil to infiltrate and retain water. The heavy soils of the catchment, combined with gentle slopes, provide low soil erosion risk but soil capping and compaction are of greater concern.

The landscape is part of the Low Weald, characterised as a broad, low-lying clay vale with small scale pastoral agriculture, a high proportion of ancient woodland, small towns and isolated settlements.

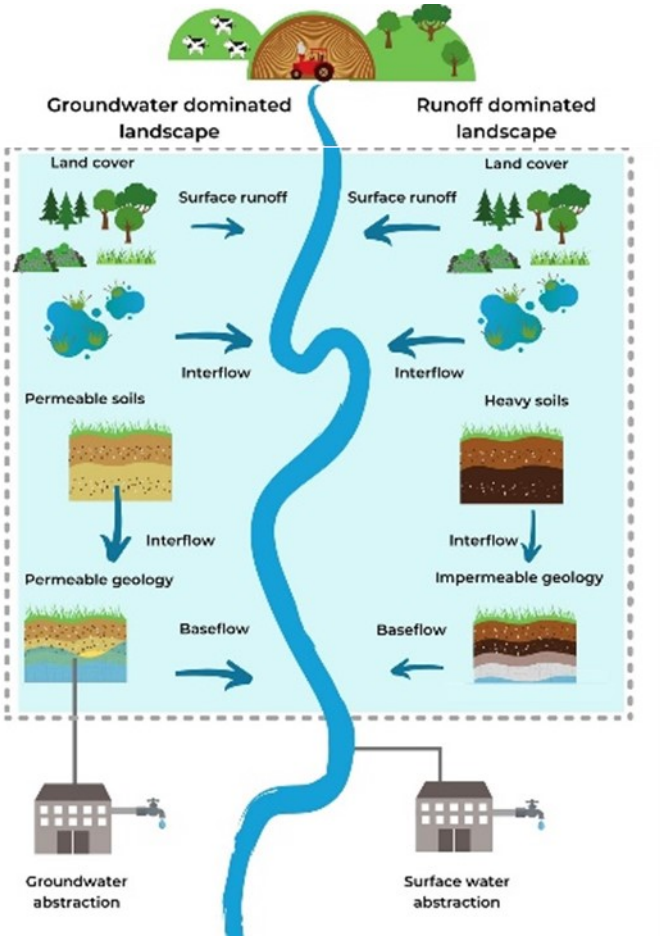


Figure 2 - The demonstration site Moat farm is located in a runoff dominated catchment.

*In unmodified or sustainably managed **runoff dominated catchments**, water predominantly moves above the surface but interflow and baseflow are still present. When the landscape is modified, surface runoff dramatically increases and interflow and baseflow are further reduced. This leads to an increase in frequency and severity of low river flows during dry periods and an increased risk of flooding following periods of extreme rainfall.*

*In unmodified or sustainably managed **groundwater dominated catchments** there is little runoff following precipitation as water predominately infiltrates through permeable substrates and moves either laterally or vertically below the surface. However, modification such as surface sealing, soil compaction and land drainage reduce the ability of water to infiltrate and therefore result in greater levels of runoff. Groundwater replenishment depends on the hydrological connectivity to the surface. When connectivity is interrupted by these modifications the resilience of this water supply is reduced.*

Wetland ecosystems (such as fens, marshes, wet woodland and open water) are key in regulating flows and water quality, but only account for 1.3% of the catchment area. Ponds, however, are a key feature of the landscape historically and many ponds have been restored through grant schemes.

Mean annual rainfall across the catchment is 750mm, and potential Evapotranspiration is 522mm (70% of rainfall return to the atmosphere instead of becoming stream flow). Climate change is increasing the risk of significant surface runoff and diffuse pollution as periods of wet weather are increasing in intensity and duration. Increasingly drier summers will dry out soils, reducing yields from grassland and arable crops, and increase the risk of flash flooding in intense summer storms as dry soils are unable to infiltrate water.

1.2 Human context

Moat Farm itself sits within a mosaic of pastures grazed with sheep and cattle, some horse paddocks, woodlands, arable land and settlements. While there is no major urban area within the catchment, the expanding town of Ashford is only a few miles away. Local plans for Ashford include further development as well as provision for green infrastructure and access, which are likely to impact the area due to its proximity. Many towns in the area are also impacted by flooding from surface water and from rivers, including Shadoxhurst itself, which is the closest settlement to Moat Farm.

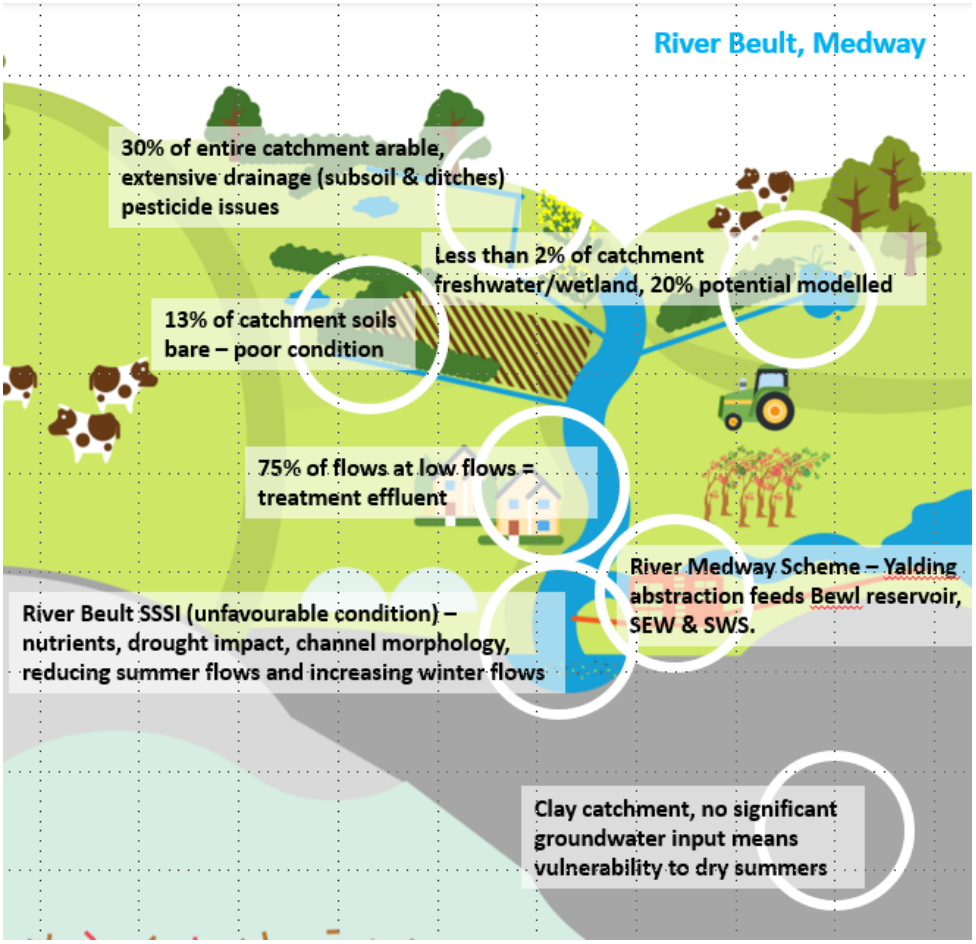


Figure 3 - Land use and land cover in the vicinity of the demonstration site.

Water-loving species such as water voles are present on site, and it is home to a range of other species benefitting from a wetting up of the site such as nightingales and turtle doves, great crested newts, and bat species. While Moat Farm itself is not a designated site for nature conservation, it is adjacent to a local wildlife site (Stone Wood) and SSSI (Alex Farm Pastures) and feeds the stream that in turn feeds the River Beult SSSI some miles downstream. Moat Farm as well as many holdings nearby are part of existing agri-environment schemes.

1.3 Water Resource risks & challenges

The Beult is dominated by heavy soils, with no significant groundwater storage, making surface water abstractions the main source for drinking water. Moat Farm is located in the Upper Beult and Bethersden stream catchment, one of the sub-catchments of the Beult. There are no (surface water) abstractions directly within the Beult catchment for public water supply. The main abstractions from the river are for irrigating agricultural and horticultural crops, such as apple orchards. However, the River Beult contributes to a public water supply abstraction point just downstream of its confluence with the main river Medway at Teston, which in turn feeds Bewl Reservoir. This supplies water to two water companies in the area (Southern Water and South East Water). The catchment is a drinking water safeguard zone, with pollution from pesticides and sediment impacting the use of water for public water supply. In planning abstraction, water supply companies and private abstractors such as farmers also have to take account of the impacts on the Beult SSSI and Medway, which can suffer from low flows and low dissolved oxygen levels especially in summer months.

The lack of groundwater bodies (in this runoff dominated catchment), increases the catchment's vulnerability to dry summers. Agricultural drainage and drainage of the main channel for navigation has influenced hydrological processes over time, decreasing the resilience to drought and flash floods. Less than 2% of the catchment remain as wetlands, as waterlogged areas were drained to enable productive agriculture to develop. The over deepened channel is not connected to the floodplain.

Increasing urbanisation in the area is putting pressure on public water supply, waste water services, as well as the landscape. Growth of the horticultural sector also has the potential to increase water resource challenges. These challenges together with climate change are leading to a risk of a shortage of water available for public water supply especially in dry periods within the next five years.

2 Identifying and engaging buyers, sellers and brokers

The basic idea behind the PES (Payment for Ecosystem Services) financing model is that investments made by 'buyers' in climate change adaptation measures result in the targeted provision of ecosystem services provided by the 'sellers' (see Output 2). While the wetland restoration at Moat Farm is on a relatively small scale, it demonstrates the benefits that nature-based solutions can provide in the area. The main beneficiaries that are potential buyers in schemes are water companies who directly benefit from a more resilient water supply and reduction of pollution in the watercourse, but also businesses or communities impacted by flood risk, and housing developers that could invest in biodiversity measures as part of their biodiversity net gain proposals.

It is a good example of the type of (potential) sellers dominant in the catchment, which is mainly agricultural. Moat Farm is owned and managed by the same family, while many other farms, especially larger arable farms, are managed by contract farmers who do not own the land. In some cases, land is owned by the wildlife trust or government bodies such as the forestry commission.

A number of organisations are acting as a form of broker in the catchment, mainly those offering environmental/agricultural advice. In PROWATER, the South East Rivers Trust brokered an agreement between landowners and funders, which included water company and public funding. Support from another organisation, Kent Wildlife Trust, facilitated connection to the farmer cluster in the area which enabled a wider reach to potential sellers of the desired ecosystem services. Figure 4 gives a summary of the different stakeholders acting in the catchment.

Figure 4 - Stakeholders, including potential buyers and sellers, for Ecosystem-based Adaptation.

The main cost of the EbA measures delivered on Moat Farm was for the restoration of the wetland habitat (for temporary water retention), the design and assessment process, and surveys related to permitting. The landowner was willing to create this measure without any additional payment for the benefits it delivers or its maintenance.

Cost element	£	€
Staff time for investigation, design, permitting	15.000	17.400
Staff time for delivery and travel to the site	32.000	37.120
Contractor & machinery	23.900	27.724
Consultants and surveys	5800	6728
Direct permit cost (Planning Permission)	262	304
Monitoring equipment	1500	1740
TOTAL	**78.462**	**91.016**

Over the course of the project, two things have happened: firstly, the delivery of the demonstration site and close work with partnership organisations has developed interest and confidence in the approach being delivered. Secondly, the policy and financial landscape is much more open and encouraging of the delivery of nature-based solutions and investment in the natural environment for the delivery of ecosystem services.

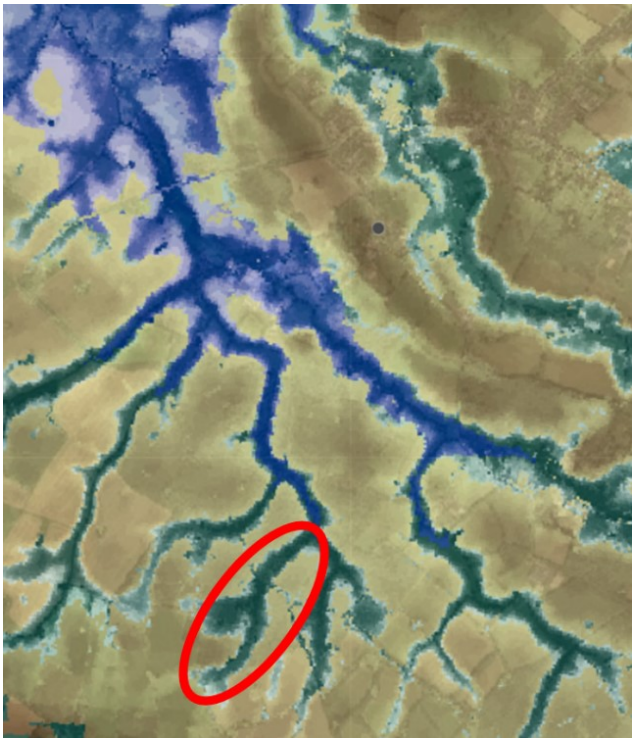
An overview of opportunities for the site is given below:

- **Environmental Land Management Schemes (ELMS) and agri-environment schemes**
  A Landscape Recovery Pilot application has been made, including the investment site and 10 neighbouring holdings, covering 800 ha and 9 km of connected stream network. This would develop a long-term (20+ years) funding scheme combining public and private funds to protect and restore natural processes in the catchment.
- **Existing water company schemes**
  Parts of the catchment are eligible for funding from the local water company to reduce pesticide input into the stream network. This includes options such as riparian buffer strips, cover crops and herbal leys.
- **Flood risk reduction**
  Settlements in the catchment already suffer from flooding and this is likely to become more problematic with climate change. The Environment Agency as well as Kent County Council are interested in reducing this risk and already funding NFM schemes.
- **Biodiversity Net Gain**
  Across England, a mandatory 10% 'biodiversity net gain' will apply to developments and infrastructure projects. Some areas are proposing higher targets, including Kent County Council who are pushing for a 20% net gain mandate. A proportion of this gain will need to be made by creating or restoring habitats on private land, creating biodiversity credits and paying for their maintenance over 30 years.
- **Nutrient trading / neutrality**
  While this is not currently relevant in the Beult catchment, the need for nutrient neutrality in neighbouring catchments is increasing the interest in nature-based solutions such as constructed wetlands to reduce the impact of P and N on protected wetland habitats. The Beult itself is a SSSI that is impacted by eutrophication, and there is currently an investigation ongoing to understand the impacts of sewage treatment works on the river, which may also result in investment in nature-based solutions.
- **Carbon trading**
  While there are currently few established and accredited systems to trade carbon credits, there is an increasing appetite both on the buyer and seller side. This is particularly the case for woodland planting / regeneration and soil carbon, but also being developed for other habitats.

3 Prioritising locations for climate adaptation measures

3.1 Prioritisation by means of the water system map

For the project PROWATER, the University of Antwerp applied the water system map to the Interreg 2 Seas area (including catchments in Flanders, the Netherlands and South England) (Output 3). This map helps prioritise where to best apply EbA measures to infiltrate and retain water, based on hydrological characteristics, soil typology and topographical information. The map identifies 'natural places' in the landscape for seepage (groundwater coming back to the surface) and infiltration.



Runoff dominated catchment

Hill top / Plateau – infiltration area, where water can infiltrate into and be held on to by the soil (indicated in brown)

Valley height – infiltration area, where water can infiltrate into and be held on to by the soil (indicated in yellow). Water that infiltrates here will have less residence time before it emerges in streams. However, flood attenuation can be achieved by infiltration.

Hill depression / Valley depression – Temporarily wet area, where runoff can be retained and slowly infiltrate into and be held on to by the soil. (indicated in green)

Floodplain – Permanently wet area, where runoff and seepage can be retained and slowly released. (indicated in blue)

Figure 5 - The red circle indicates the location of the seasonal wetland on the water system map. The map confirms the suitability to restore previously degraded temporary wetland (with the potential for temporarily wet zones indicated in green).

Moat Farm lies at the top (in the headwaters) of the catchment, in the green zone of the water system map, which is most suitable for temporary retention of runoff and delayed infiltration. Local runoff naturally gives rise to a number of streams that form part of the headwaters of the river Beult.

3.2 Refining spatial prioritisation & EbA opportunities

Spatial planning and the choice of EbA measures to implement by South East Rivers Trust, also took into consideration the following elements:

- Landowner willingness were a big influence on the final site chosen
- Regulation influenced the detailed design of the measure, but not the general type
- Morphology of stream channel and surrounding landcover influenced the design

A first sub-site located on Moat Farm (Streetend Wood) included a seasonally dry, over-deep channel running through a woodland. During flow periods, this channel drained water quickly out of a potential wetland, carrying with it sediment from a byway upstream and contributing to high flows downstream.

The measures implemented aimed to restore the retention capacity of this seasonal wetland area (green zones on the water system map) by increasing roughness of the area to slow the flow (allowing the water to spill over the floodplain) and removing the channel draining the area. To restore the retention function of the feature, trees were cleared around the channel to bring light in and make woody material available; 200 m of the channel were filled in using clay from the site; a pond was dug and large woody debris was placed across the flow path of water.

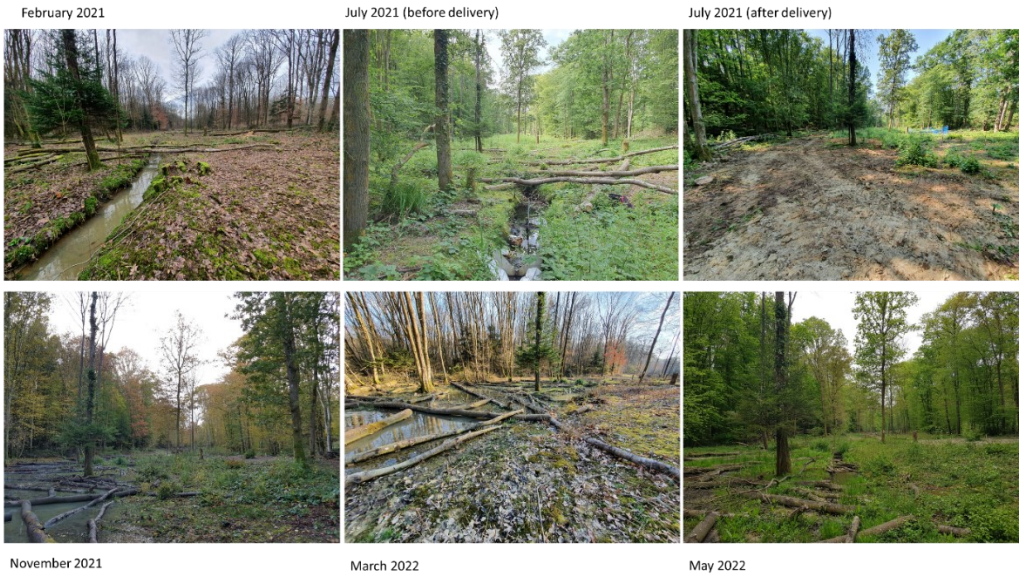


Figure 6 – Sub-site Streetend Wood. To restore the retention function of the feature, trees were cleared around the channel to bring light in and make woody material available; 200m of the channel were filled in using clay from the site; a pond was dug and large woody debris was placed across the flow path of water.

A second sub-site on Moat Farm (Harp Meadow), with an agricultural ditch in a grassland, was changed in a similar way, filling in 100m of channel to restore wet grassland.

Figure 7 – Sub-site Harp Meadow. This sub-site included an agricultural ditch in a grassland. This was restored to a seasonal wetland in a similar way, filling in 100m of channel to restore a wet grassland.

3.4 The expected impact

The implemented EbA measures have resulted in a wetting up of 0.6 ha of woodland area and 0.5 ha of grassland, spilling water into the floodplain regularly and transforming the sub-sites into wet woodland habitat with dense vegetation and wet grassland.

The increase in roughness and the wider floodplain are expected to slow flows by about half. This increases the residence time and volume of water stored in the area, which means that high flows are released more slowly, and more water is stored in the wetland for longer. While this is a small scale restoration, benefits like this can contribute to reduced flood risk downstream by reducing peak flows, increase the availability of water during dry periods by releasing flows from heavy rainfall more evenly,

settle out sediments, and create drought resilience in the area by holding on to water. This benefits wildlife such as nesting birds and insects that need access to water during dry periods, and communities downstream that use drinking water and are at risk of flooding.

4 Monitoring and Evaluation

4.1 Monitoring and evaluating the impact of EbA on ecosystem services

Water level loggers were put in place to understand the patterns of water retention on site, and how the measure affects them, ideally over the course of several years. Phase 1 habitat assessments were carried out as part of the consenting process, but also serve as a baseline to compare impacts on vegetation. Finally, timelapse camera and fixed point camera were used.

Monitoring has proved challenging due to the weather across the years being very different. Additionally, the siting of loggers had to be adjusted due to the design of the measure.

Additional evaluation options are modelling impacts (challenging given the nature of the change), or evaluating based on a scoring system (e.g. using the Biodiversity Metric 3.1 to assess change in habitat value, and the associated ecosystem services).

4.2 Evaluating the participatory planning and implementation process

Permits needed:

- Ordinary watercourse consent (to assess flood risk and impacts on drainage)
- Planning permission (for pond only, to assess impact on landscape)
- Ecological assessment and watching brief (to mitigate impact on protected species such as bats, amphibians)

Evaluation of the implementation process:

- Regulations in place at the moment to prevent increases in flood risk, ecological impact etc. are not designed to assess nature based solutions, and regulators can still be unfamiliar with the details of how they are delivered. Navigating the need for evidence on Nature-based Solutions (including EbA) can be challenging and costly.
- Communicating the impacts of a process-driven nature-based solution, where outcomes are not completely certain, can be difficult. Being able to give sufficient information, including the elements of uncertainty to a landowner to make a good decision is crucial.
- Monitoring and being able to demonstrate outcomes are key challenges for stakeholders especially on the buyer side. Robust, evidence based spatial targeting and a level of quantification is able to support buy-in.
- Being able to have a demonstration site that farmers, landowners, and other stakeholders can visit has been a key part in communicating and developing a vision for the catchment. This has been partly due to the support from landowners. While there is often a drive to focus on hard-to-engage audiences, having a supportive partner that can provide a different perspective and engage with different stakeholders has been invaluable.
- Landowners and farmers often highlight the importance of robust, local advice in developing a shared vision for an area, and in bringing landowners together at scale. Having a knowledgeable facilitator is key. Building strong partnerships with other organisations further creates trust and a shared message that is more likely to get buy-in from sellers.