Nature-based Solutions for resilient Water Resources

PROWATER WP3 - Workshop Review

Contents

Summary

This report summarises the discussion and information presented at an online workshop held as part of PROWATER in May 2021. It was organised by South East Rivers Trust (SERT) with support from Kent County Council, South East Water and Westcountry Rivers Trust, and attended by 26 representatives of the regional water companies and Environment Agency, Natural England, and Water Resources South East (see Annex 1 for agenda and attendants), focusing on three questions:

- What is the potential contribution nature-based solutions (NbS) can make to regional water resources?
- How can they be integrated in water resource planning?
- What are mechanisms to deliver this?

Where there is reference additional resources or activities that were not part of the workshop, this is highlighted.

Barriers to integrating Nature-based Solutions in water resource planning

Three types of potential barriers were identified in the workshop:

1. **Regulatory barriers and lack of integrated policy/planning mechanisms bringing together spatial priorities**
    - Current frameworks (WINEP, RBMP, …) are ill suited to catchment-scale delivery of long-term programmes
    - There is no clear pathway for investment and evidencing of NbS for water resource planning
    - Multiple inconsistent landscape scale plans exist in isolation and do not facilitate joined-up planning and investment from different beneficiaries or delivery on the ground
2. **Uptake from landowners/managers**
    - Delivery at scale is dependent on landowner uptake, which requires time and investment
    - Competing requests of landowners reduce their willingness to engage (linked to lack of a joined-up approach to setting spatial priorities)
    - The Government's agricultural policy is still undefined but could support joined-up funding and spatial prioritisation for water
3. **Evidence of impact of NbS (benefits and hydrological processes to allow modelling benefits)**
    - Planning for and predicting the impact of nature-based solutions on water resource yield at catchment scale is currently unreliable with existing modelling processes and quantification tools
    - There are different types of NbS with different impacts on natural processes (infiltration, retention, recharge), which can make evidence on outcomes inconclusive as different processes are measured

Steps to support uptake of Nature-based Solutions

High level actions identified in the workshop to support the uptake of NbS in water resource planning included:

- Provision of case studies on the potential of catchment-scale delivery of NbS to engage with Ofwat and inform potential regional trials, quantifying water resource yield and quality impact wherever possible.
- Engagement in conversations with water companies, regional water resource groups, regulators and catchment stakeholders about an overall framework for the delivery of NbS supporting blended funding and landowner engagement.
- Use of the new WINEP process to trial catchment-scale approaches on a 15-year timescale to feed into regional plans.

Readiness to include different types of NbS

Different types of nature-based solutions were discussed and evaluated for their readiness to include in water resource planning. Four dimensions were discussed against which NbS could be evaluated (See Figure 1 below).

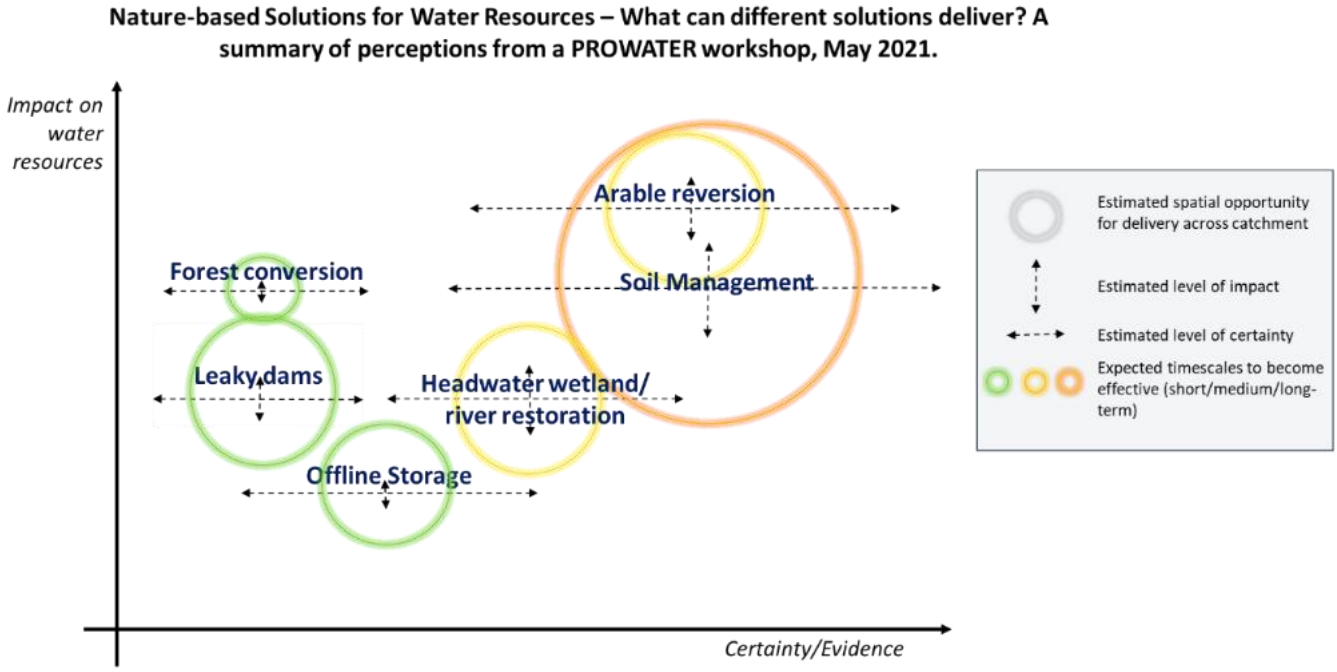

Figure 1 Graphic summary of different NbS are perceived , taking account of the four dimensions discussed – perceived ability to deliver at spatial scale, timescale, level of impact and certainty of impact.

SERT Review:

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Reviewed by:	Cat Moncrieff, Water Resource Lead, South East Rivers Trust cat@southeastriverstrust.org

1. Background

On 27th May 2021, South East Rivers Trust with support from South East Water and Kent County Council hosted an online workshop as part of PROWATER. PROWATER, a project funded by the Interreg 2 Seas European Regional Development Fund, aims to increase the implementation of 'Ecosystem based Adaptation' (EbA) measures to climate change. These measures restore ecosystems to improve water retention at the landscape scale, improving long term stability of groundwater levels and river base flows.

This workshop forms part of PROWATER WP3 'Building a long-term vision'. The aim was to share project learnings and approaches, and discuss how nature-based solutions can be integrated into future water resource planning, and work towards a 'long-term vision' of Ecosystem-based Adaptation.

In the workshop, participants were presented with the evidence gathered through the project and were then invited to discuss the evidence laid out. They were split into two groups, one focusing on the Little Stour catchment and the other on the Beult. Each group had a facilitator and a minute taker, and all sessions were recorded. The groups used MURAL (https://www.mural.co/) to interact with the evidence and capture input (See Annex 2,3 and 4).

2. What role can Nature-based Solutions play in regional Water Resource Planning?

Nature-based solutions were seen by all participants as important contributions to water resource protection by the water industry. They can address existing issues and pressures on water quality and flow, as well as ensuring the ability of sources to continue providing water into the future, i.e. ensuring the resilience of both surface and groundwater catchments to future conditions and pressures. There are different perceptions of how 'ready' NbS are to be included in water resource management (see Figure 2).

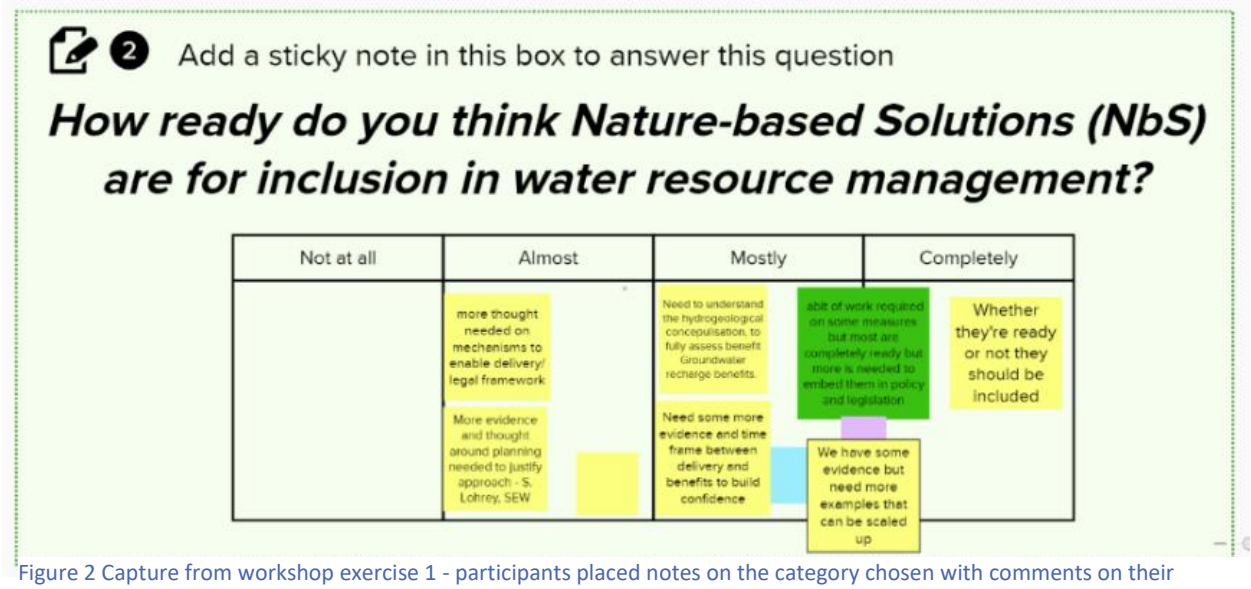


Figure 2 Capture from workshop exercise 1 - participants placed notes on the category chosen with comments on their reasoning.

Nature-based solutions in water resource policies and planning

Two policy and planning mechanisms were highlighted as essential prerequisites that should be implemented by government and regulators that are not currently in place:

1. *An integrated spatial plan of priorities and objectives beyond the water industry, supported by multiple stakeholders and sectors as well as regulators and government.*

   This would combine for example biodiversity, natural flood management and similar planning objectives, communicating priorities to water companies and delivery organisations on the ground. There are different possibilities for who the owner or convener of a plan like this could or should be. Workshop participants identified regional water resource groups as being well placed to take the lead thus promoting the integration of different funding streams from water companies as well as other potential investors, including but not limited to Biodiversity Net Gain, ELMS and Local Nature Recovery Networks. However, such a plan would require high-quality data to inform spatial priorities currently held by different organisations, at different scales and resolutions, not always spatially referenced (e.g. local plans), and often subject to restrictive licensing conditions.

2. *A water industry-specific framework setting out how water companies can invest in NbS for water resources, supported by regulators like the Environment Agency and Ofwat*

   It was clear that water industry representatives feel that NbS are not sufficiently supported by regulators as options in water resource plans and therefore present a risk. To support uptake and development of robust plans, Ofwat should foster confidence in scoping and planning catchment options by providing a clear framework and methodology for investment linked to a statutory driver, and an opportunity for catchment-scale trials and monitoring. Regulators such as the Environment Agency need to support the inclusion, monitoring and quantification of catchment measures to achieve environmental outcomes.

Adoption of these two planning mechanisms could be supported by a natural capital focus that water companies are already encouraged to implement. A catchment approach should be taken, highlighting the reliance of water resources on ecosystem resilience and supporting restoration and protection of natural assets and processes at the catchment/landscape scale. Focusing on the natural assets of a catchment, their condition and processes they support, offers a way of identifying, targeting and monitoring measures to increase catchment resilience. This should not only respond to existing pressures such as pesticides impacting on drinking water, but focus on protecting sources for the future by anticipating the impact of pressures such as land-use and climate change on natural assets.

A clear framework is needed that sets out a methodology for how NbS in both surface and groundwater catchments can be evidenced, targeted and included in long-term, regional planning. While current demonstration sites are providing evidence on a small scale, demonstrating some proof of concept for measures, landscape-scale pilots are a necessary next step to demonstrate the impact of the approach at scale and to gather reliable data and experience. This needs to be linked to a strong monitoring framework.

A framework for investing in NbS as part of water resource planning would need to:

- Take a long-term view that is aligned with WRMPs,
- Specify the type and level of evidence that is required to make a case for investment in NbS
- Respond to ground- and surface water specific pressures and catchments
- Set out a wider set of environmental and water resource objectives, rather than focusing on yield and individual pressures
- Provide clear metrics that correspond to characteristics and resilience of natural assets and processes
- Allow a range of options to be included that can respond to the specific needs of the catchment and adapt to climate change
- Align clearly with other policies and drivers such as natural flood management, nature recovery networks, nutrient neutrality by providing shared spatial plans, metrics and investment opportunities

Some discussion points on barriers to delivery of NbS and next steps are captured in Figure 3.

Existing pathways for delivering NbS in water resource planning

Statutory frameworks and plans that are currently in place, such as the River Basin Management Plan (RBMP), or the Water Industry National Environment Programme (WINEP), fall short of integrating funding streams and delivering ambitious catchment-scale measures.

Reasons cited for why these are ill-suited to delivery of NbS are:

- A narrow approach to environmental improvements in WINEP
- Short timeframes for delivery that present a barrier to more ambitious, catchment-scale projects in WINEP
- Insufficient regard for groundwater bodies in the RBMP
- Lack of ambition in measures included in RBMP
- A focus on narrow water yield changes that are difficult to evidence for NbS in WRMPs

As WINEP undergoes changes, moving to a longer-term, partnership-oriented approach, it may present an opportunity to include landscape-scale trials of NBS that allow more long-term planning as well as additional gathering of evidence and proof of concept that could support the move of these measures into a water resource management plan.

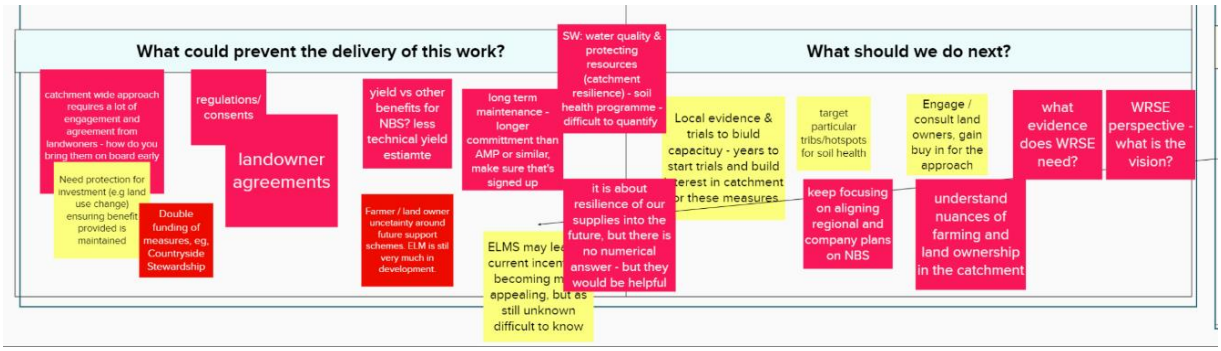


Figure 3 Example capture from workshop session 2 - notes by participants on barriers to delivery of catchment scale schemes.

The Regional Resilience Plan being developed by Water Resources South East is seen as an opportunity to bring together some of these requirements and provide a framework that can support water companies in taking a landscape-scale, ecosystem-based approach to protecting sources and enhancing resilience.

Catchment Partnerships are existing mechanisms to convene stakeholders on a catchment scale and develop shared priorities and action plans. They should be supported in their function and used to develop active partnerships between water companies and wider stakeholders in the catchment.

Water Protection Zones were mentioned as an existing regulatory mechanism that could be used to enforce particular actions in catchments. These seem to mainly relate to pollution, and only one (on the River Dee) has been put in place nationally.

Links to wider policies that support delivery of NbS

There are clear links to other government policies and legislation that should support use of NbS for water resources through land management changes, outside of water-industry specific policy, some of those discussed and relevant are set out below:

New Environmental Land Management Schemes:

ELMS is replacing the existing agri-environment schemes. Currently, design of this new scheme is still ongoing, but Defra have set out some key aspects: There will be three separate schemes ('Sustainable Farming Incentive', 'Local Nature Recovery' and 'Landscape Recovery'), which will focus on different aspects of farming at different scales. Land Management Plans, in some cases at a landscape scale, will be delivered through these schemes. Particularly the 'Local Nature Recovery' scheme which focuses on paying 'for actions that support local nature recovery and deliver local environmental priorities', including, for example, Natural Flood Management.

https://defrafarming.blog.gov.uk/2021/06/23/how-farming-is-changing/#other

South East Rivers Trust have secured funding to run an ELMS Test & Trial alongside PROWATER from September 2021 to October 2022.

Local Nature Recovery Networks:

Local Nature Recovery Networks are currently being developed which will restore protected sites, create additional habitats and connect them. This will be funded through public and private investment, for example through Biodiversity Net Gain. LNRNs have the stated objective to 'improve the landscape's resilience to climate change, providing natural solutions to reduce carbon and manage flood risk, and sustaining vital ecosystems such as improved soil, clean water and clean air' alongside others.

https://www.gov.uk/government/publications/nature-recovery-network/nature-recovery-network

Nutrient Neutrality:

Where designated sites (Special Areas of Conservation (SAC), Ramsar, Special Protection Areas (SPA) and potential SPA sites) are in unfavourable condition, further additional nutrient loading is effectively not permitted. This impacts on development by requiring that any new developments have to demonstrate 'nutrient neutrality', i.e. that they are not adding more nitrogen/phosphorus than the existing land use which development is replacing. Achieving this means that development has to mitigate inputs through waste water treatment or by offsetting an increase in nutrient loading from the development through a

reduction elsewhere, e.g. by converting land use to a lower-input land use. This can present an additional investment mechanism in supporting land use change (e.g. tree planting, arable reversion, wetland creation) in relevant catchments, such as the Kentish Stour.

https://www.ashford.gov.uk/media/l3dgnfyu/stodmarsh-nutrient-neutral-methodology-november-2020.pdf

Carbon Net Zero:

The UK government, and UK industries including the water industry, have set targets to achieve net zero carbon emissions by 2050 (UK govt.) and 2030 (water industry). These emissions reductions can come through reductions in carbon emissions or increases in uptake, including through restoration and creation of natural habitats. This is often focused on tree planting, but can include a range of measures including peatland restoration or wetland creation.

Net zero commitments, linking to a range of nature recovery and NbS measures with carbon sequestration potential, could provide additional support from regulators and local authorities as well as a funding stream.

https://www.ons.gov.uk/economy/environmentalaccounts/articles/netzeroandthedifferentofficialmeasuresoftheuksgreenhousegasemissions/2019-07-24

Carbon storage and sequestration by habitat:
http://publications.naturalengland.org.uk/publication/5419124441481216

3. Impact and Evidence of Nature-based Solutions for Water Resources

NbS can support protection and restoration of water quality as well as quantity, but traditionally they have been used more for water quality improvements. They are more complex to plan and model than traditional 'hard infrastructure' approaches, but also able to directly address catchment characteristics that may impact multiple aspects of resilient sources.

In order to be effective, there was agreement that generally, NbS should be:

- appropriate to the type of catchment in which they are applied
- planned and delivered on a significant scale across the catchment
- delivered as a combination of different types of NbS
- integrated with other landscape-scale priorities and plans (both statutory and non-statutory)

Workshop participants worked in two groups to discuss perceptions of what specific types of NbS can deliver for water resources. They were asked to locate them on an impact/certainty matrix and discuss each solution in turn.

The outcomes are summarised in Figure 4 below, highlighting four key factors that were emphasised in the discussions:

- Magnitude and/or scale of impact (on water supply and wider benefits)

- Certainty of impact (academic evidence, local evidence, ability to represent impact in plans or models)
- Timescale of impact (immediate after delivery, or slow build up)
- Spatial scale of delivery possible (e.g. based on soil type, existing land use, and location within the catchment)

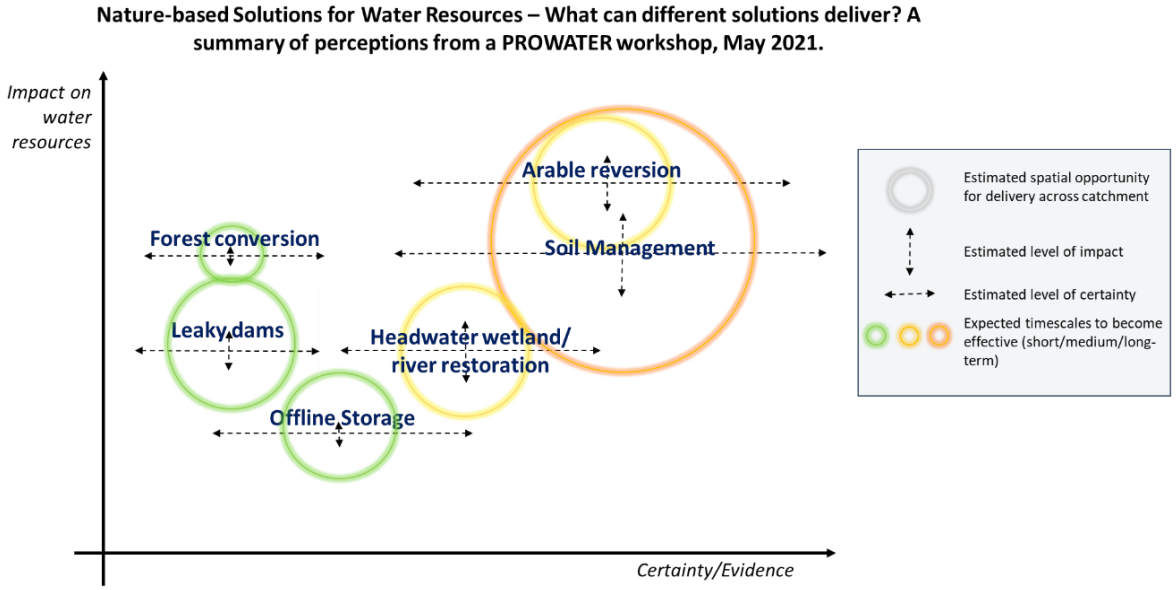


Figure 4 Graphic summary of how different NbS are perceived by water company and other stakeholders, taking account of the four dimensions discussed – perceived ability to deliver at spatial scale, timescale, level of impact and certainty of impact.

The quantification of benefits through the implementation of NbS as well as their cost, ideally communicated in the form of Ml/d, was felt to be a key element in gaining confidence and support from regulators such as Ofwat but difficult to achieve. Some measures are simpler to model than others, and confidence in estimates can be low. However, it was suggested that even having estimates is a good starting point for water companies to discuss investment in NbS. The ability to prioritise both measures and locations likely to have the biggest impact and possibly align with other interests was also considered, with participants discussing the balance between aiming for biggest gains vs easy wins.

In PROWATER, quantification tools are being trialled and developed to allow estimating impact of NbS on infiltration, recharge and flow on a field- to catchment-scale. These tools include existing, trialled and reviewed tools such as InVEST and field-scale tools based on Alliance for Water Stewardship methods of 'volumetric water benefit accounting' developed by the World Resource Institute. The University of Antwerp, a leading partner in the project, is working on a scenario evaluation tool to support further quantification of Ecosystem Services.

The estimated impacts of measures presented in the case study annex use these quantification approaches.

The types of NbS discussed in the workshop are set out in more detail below, alongside discussion points for each measure. While not all NbS have been trialled in PROWATER, they are all common water retention measures that could be implemented in catchments across the South East to increase the

resilience of water resources by increasing infiltration, retention or attenuation of water across the catchment.

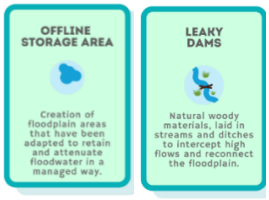
Measures in the wider landscape (not channel focused, particularly important in groundwater catchments):

	**Soil management** was overall seen as one of the key measures that was 'integral to catchment health' due to the multiple benefits it provided (e.g. carbon capture), including for farmers themselves, and the large area in most catchments that would be suitable. This makes the uptake of measures by farmers more likely. Compared to other measures, it may take longer to achieve the desired benefits, and natural differences in the capacity of different soil types to deliver the desired outcomes need to be recognised. However, there is a high degree of confidence in its potential impact. (PROWATER is trialling & monitoring soil management measures to increase infiltration in both the Beult and Little Stour catchments.)
	**Arable reversion to grassland**, particularly in the context of chalk catchments, was also seen as a high-impact option, due to the wide scope for potential opportunities (e.g. by putting focus on arable soils on steep slopes, which are likely less productive and promise higher benefits for water). Clearly, its impact is dependent on soil quality before reversion. (PROWATER is monitoring the impacts of a Countryside Stewardship funded arable reversion on recharge in the Little Stour catchment.)
	**Forest conversion to grassland** is a potentially contentious measure that may go against other objectives such as tree planting targets and is subject to a range of impact assessments. It is seen as more difficult to deliver than other measures. It is important to note that there are clear differences between, for example, coniferous plantations and broadleaved native woodlands and ancient forests. Conversion would not be an option in many cases. (In PROWATER, the impact of reverting a beech plantation on chalk to grassland, as well as the impact of restoring gorse and scrub to heathland are being monitored in the Friston Forest trial area in the Cuckmere catchment.)

In- or near-channel measures:

Headwater wetlands are seen as particularly location-dependent measures that can play a crucial role in the right location and context. While there is evidence available through past NFM-focused work, certainty on impact seems to be lower than for other measures, partly because of the difficulty of modelling impacts in existing water-resource models. There is an assumption that there are likely to be fewer opportunities for delivery on a catchment scale. They are highlighted as particularly suited to organic, possibly peaty soils rather than permeable soils. (This measure is being trialed and monitored in the Beult catchment for PROWATER.)

River Restoration, similar to headwater wetlands, is seen as location-dependent and difficult to model in terms of their impact, and as such there is a lower level of confidence. Benefits for water resources are seen particularly in the context of floodplain restoration which could support recharge and base flows. Additionally, this is highlighted as a measure to increase resilience to the impact of low flows. (While not part of PROWATER, there are a range of examples of River Restoration delivered by South East Rivers Trust and others that can be drawn on for regional case studies.)



Leaky dams and offline storage are also generally supported as catchment-scale contribution to natural processes, for which evidence can be difficult to quantify. However, there is a growing evidence base and case studies through Natural Flood Management approaches. (While not part of PROWATER, there are a range of examples of leaky dams and offline storage delivered by South East Rivers Trust and others that can be drawn on for regional case studies.)

4. Landowner uptake and delivery of Nature-based Solutions at catchment scale

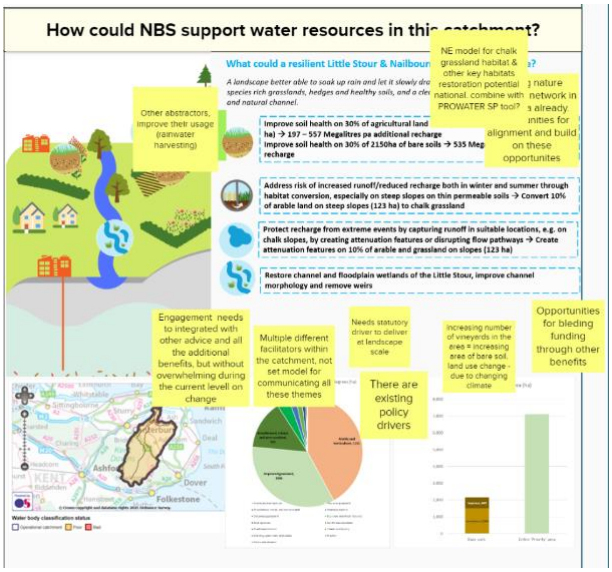
As NbS need to be delivered at catchment- or landscape scale, in suitable locations, and be in place long term to be effective, landowner uptake is a key factor. This is identified by many participants as a risk and potential barrier to the integration of NbS.

Recommendations made to support engagement with farmers to increase NbS uptake and buy-in are to:

- link clearly to the agricultural transition and new Environmental Land Management schemes (ELMS)
- use simple and consistent messages across different organisations and projects
- present the 'bigger picture' of the implementation of measures and their multiple benefits
- explain the impact of measures, including the importance of land management measures at scale for regional water supply

Figure 5 Example of workshop output from Session 2 – yellow post it notes are notes of discussion about evidence and barriers presented and discussed in the workshop in breakout group 2 (Little Stour).

The lack of a consistent approach integrating catchment priorities into one plan that could support engagement with farmers was highlighted again as a barrier. This risks overwhelming individual farmers with competing asks. Catchment partnerships provide one possible forum for a joined-up approach. However, every catchment is unique with different organisations taking the lead on farmer engagement.



Land ownership structures and agricultural supply chains impact on how NbS can fit into existing land management, e.g. by influencing the types of measures that are likely to be taken up, value of existing land use and other beneficiaries. These differ between catchments. Starting with an understanding of the current farming context can help plan and estimate delivery of NbS at catchment/landscape scale, as well as identify potential other beneficiaries or interested parties such as retailers.

Schemes are voluntary and as such uptake will not be immediate. Enough time needs to be built into schemes to allow for a phase of engagement and scoping. Additionally, incentives need to be sufficient to make uptake of measures worthwhile – either through ELMS or through other schemes, and where possible by combining funding pots. This was stressed particularly by participants directly involved in land owner engagement. Areas of land that are less valuable for farming, such as steep slopes with thin soils in chalk catchments which are also potentially particularly relevant for recharge to groundwater present 'low hanging fruit' that could achieve significant impact.

(As part of PROWATER, a second workshop was held with landowners in the Beult catchment, one of the PROWATER pilot catchments, that discussed willingness to implement NbS and expectations of a payment system in ELMS. A report summarising the discussion is available.)

Securing benefits through long-term agreements on land use (change) is in some cases needed to give confidence to water companies and regulators, and for some measures also to ensure enough time for the measure to become effective. Mechanisms could include conservation covenants, which are part of the forthcoming Environment Bill. Similar approaches have been used for example in the Upstream Thinking project in the Westcountry. Some highlighted that this is particularly relevant for biodiversity benefits, but may be less so for water as some results (e.g. nutrient uptake from cover crops) can be realised fast. Long term commitments could also prevent uptake as they lock farmers into agreements that may impact on the value of their land. There was a brief mention of the possibility of water companies purchasing and managing land themselves to ensure long-term protection of natural assets. SERT will explore questions around contracts and agreements through the Prowater ELMS T&T.

Land use change was highlighted as an additional risk to water resources. For example, there is an increase in viticulture in the South East which tends to be associated with an increase in bare soils and potentially need for irrigation, presenting two additional pressures on the system. These trends need to be understood and accounted for in ascertaining needs and pressures on a regional and catchment scale and be taken account of in long-term planning for water resources. Land managers driving these

changes should be engaged early on to support development of a sustainable sector. (While not part of PROWATER, the Holistic Water for Horticulture project aims to engage with the growing horticultural sector in some catchments in the South East to support a more holistic approach to water management - https://www.holisticwaterforhorticulture.org/)

Annex 1 – Agenda and Attendants

Workshop Agenda:

Time	*Outline*	*Lead*
10:00 – 10:05	Introduction & Welcome	Kathi Bauer, South East Rivers Trust
10:05-10:20	Setting the scene: Nature based solutions & PROWATER in the context of wider water resource challenges.	Debbie Wilkinson, South East Water
10:20-10:40	Introducing PROWATER: overview of pilot catchments and demonstration sites and methods used for targeting and quantification.	Kathi Bauer
10:40-11:05	Session 1 (using MURAL) – Rapid review of nature-based solutions in PROWATER and beyond (incl. an introduction to using the workshop platform)	Alan Turner/ Debbie Wilkinson/ Kathi Bauer
1:05 – 11:10	Feedback from groups	Zoom - all
11:10- 11:50	Session 2 (MURAL) – Scaling up delivery of NBS for water resources: what could a scheme look like? Examples Little Stour & Beult catchments.	Alan Turner/Debbie Wilkinson/ Kathi Bauer
11:50-12:00	Discussion & wrap up: what are the next steps, and who should be involved?	Alan Turner, Kent County Council Zoom - all

Attendants:

Kathi Bauer (SERT),
Chris Gardner (SERT),
Debbie Wilkinson (SE Water),
Jo Neville (WRT),
Alan Turner (KCC),
Freya Stacey (WRT),
Richard Sands (SE Water),
Simon Lohrey (SE Water),
Emma Goddard (SE Water),
Louise Bardsley (NE),
Charles Chantler (CSF, NE),
Alister Leggatt (Affinity Water),
Shaun Dowman (Affinity Water),
Charlotte Ivison (Thames Water),
Becky Pointer (Affinity Water),
Chris Woolhouse (SWS),
Chris Lambert (Thames Water),
Meyrick Gough (WRSE),
Max Tant (KCC),
Lee Dance (SE Water),
Claire Neale (SWS),
William Purnell (Environment Agency),
Jon Gibson (Affinity Water),
Nick Honeyball (Affinity Water)

Joined later:

Kate Rice (SWS)
Alison Murphy (SES)

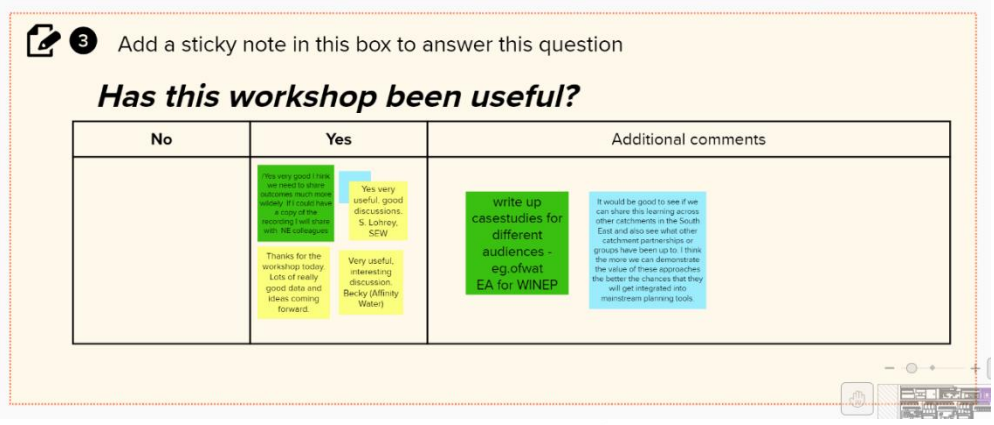
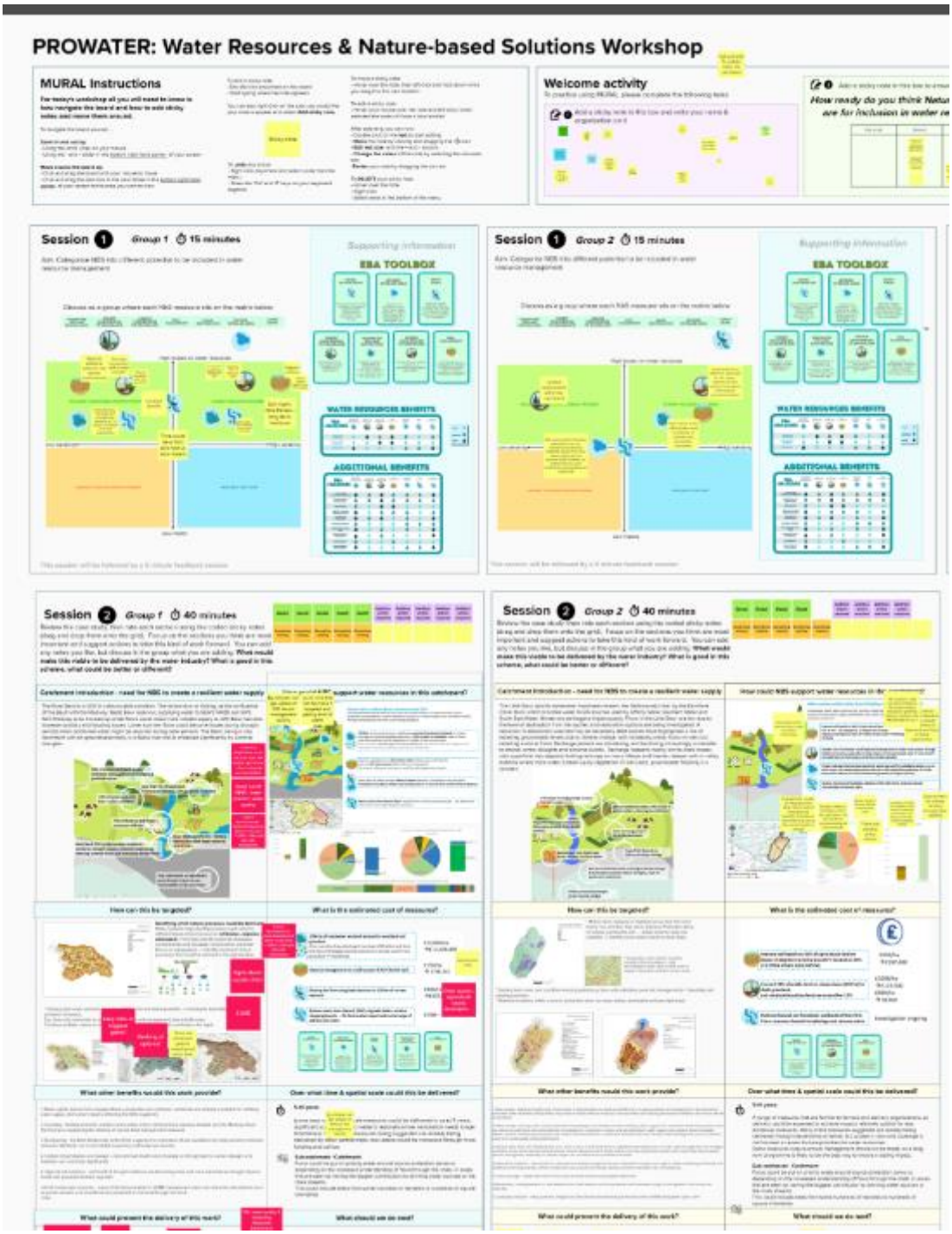


Figure 6 Workshop feedback.

Annex 2 – MURAL boards used

Mural boards were prepared ahead of the workshop by facilitators from SERT and WRT. The sections were set out to follow the process that would be taken as part of a WRMP options appraisal, showcasing evidence and information for a set of potential catchment options for two case study areas, the Little Stour and Beult. The detailed information is set out in Annex 4.



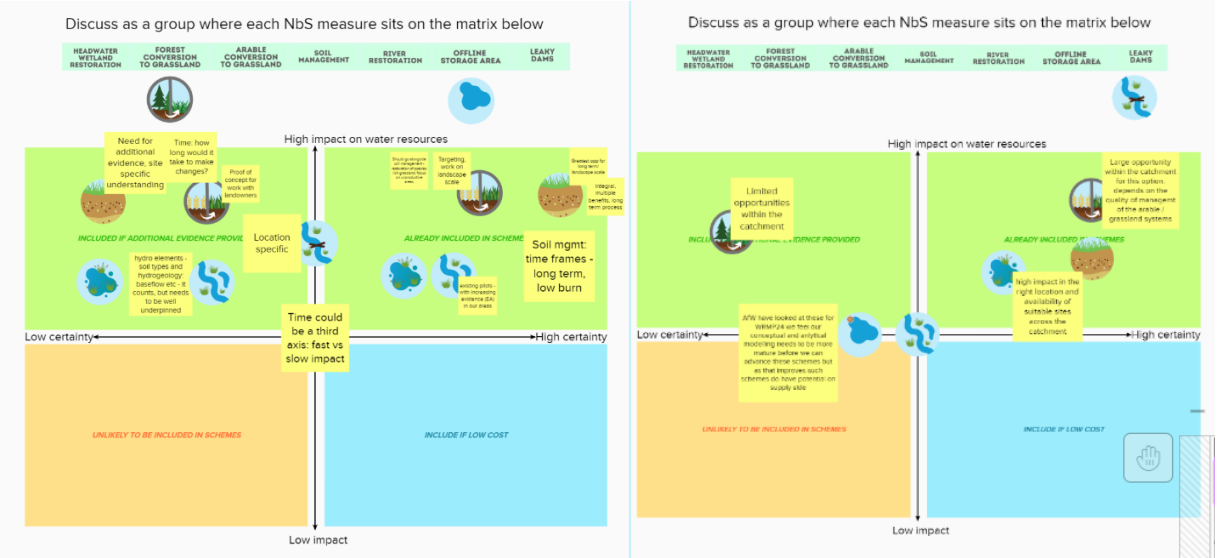


Figure 7 Outputs from session 1 discussions in each breakout group on the level of certainty/impact of different NbS on water resources. Participants were asked to place icons for each measure on the matrix and discuss their placement - see post it notes. s

Annex 3 – Impact Matrix for Nature-based Solutions

Ecosystem-based Adaptation – Impact Matrix: This was developed based on estimated impacts on function (recharge/infiltration/retention) overall in a catchment and likely scale of delivery, as well as multiple benefits/factors influencing catchment resilience. The additional impact indicators are aligned with those set out in WRSE's best value plan and resilience framework to indicate alignment with regional water resource planning.

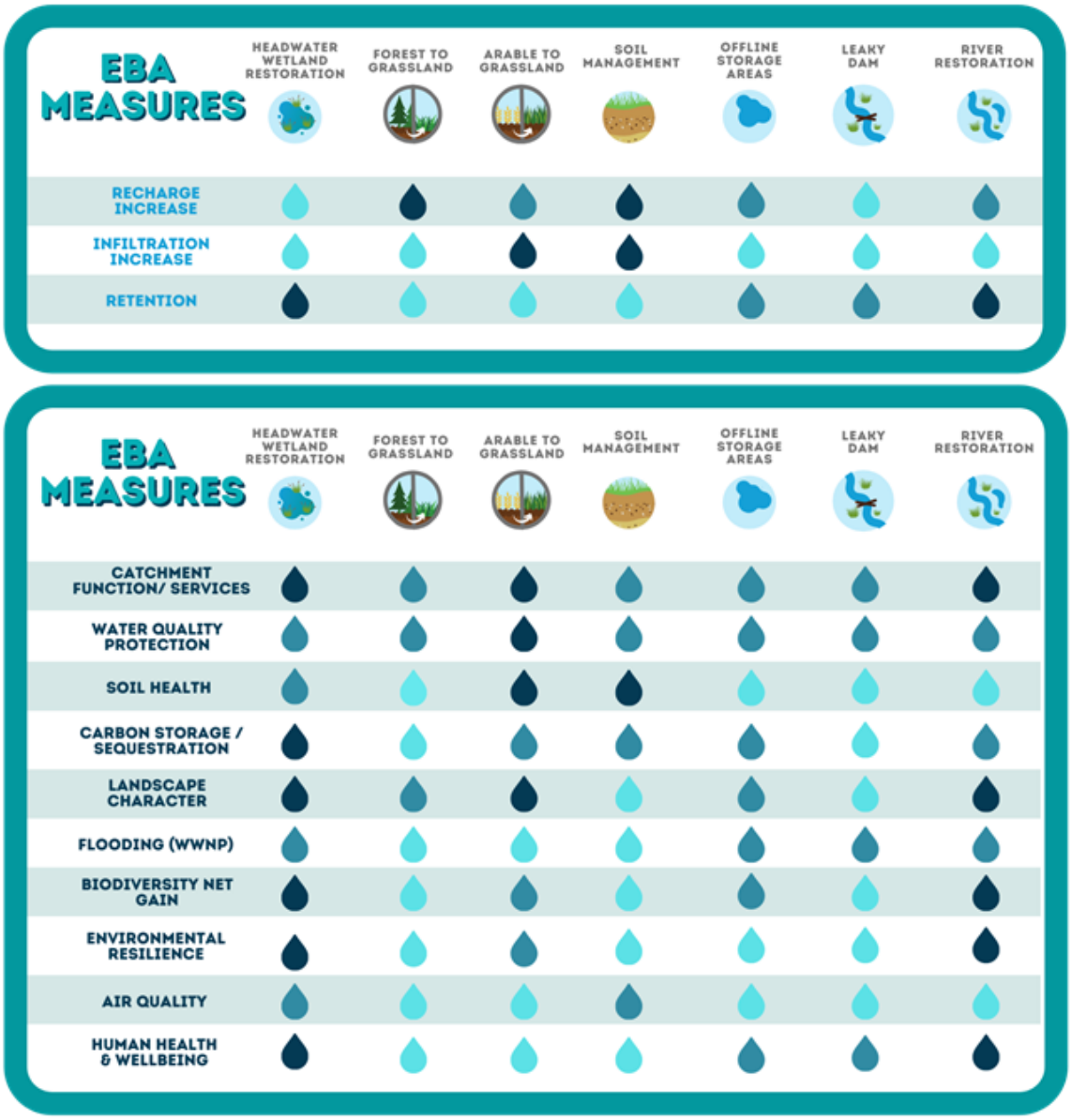
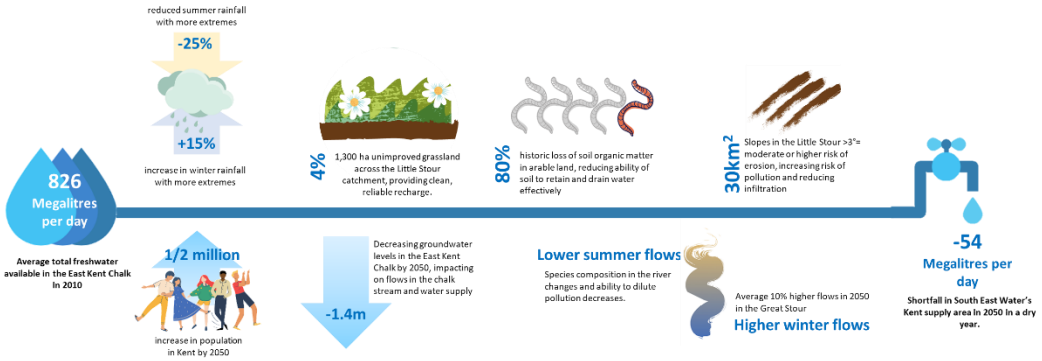


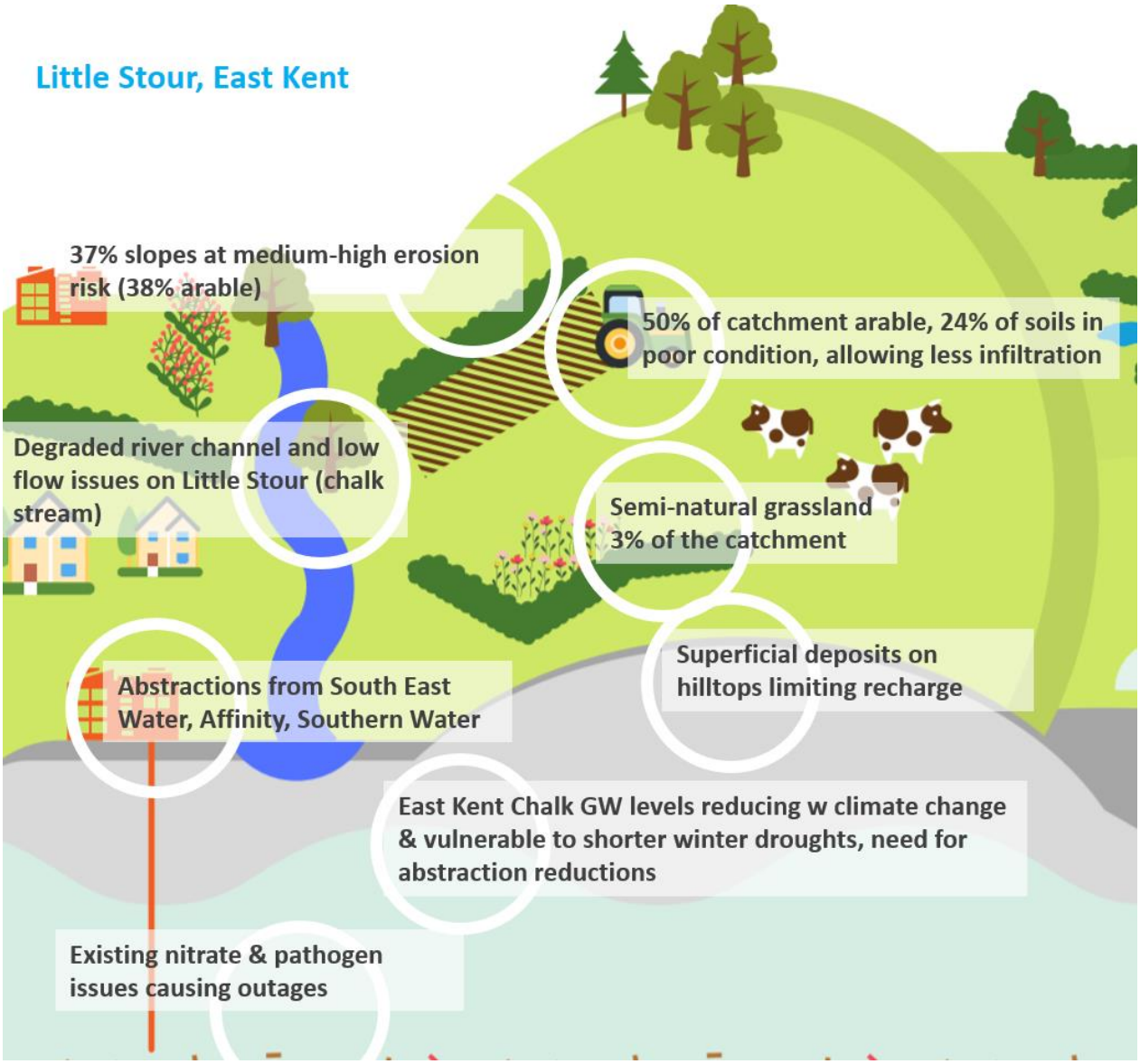
Figure 8 Ecosystem-based Adaptation/ NbS impact matrix developed as part of PROWATER.

Annex 4 – Case Studies

Little Stour – East Kent

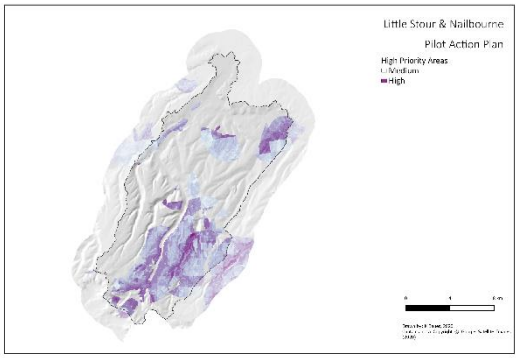
What are the pressures on water resources in this catchment?

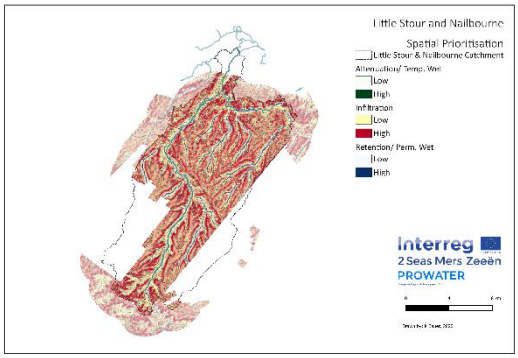


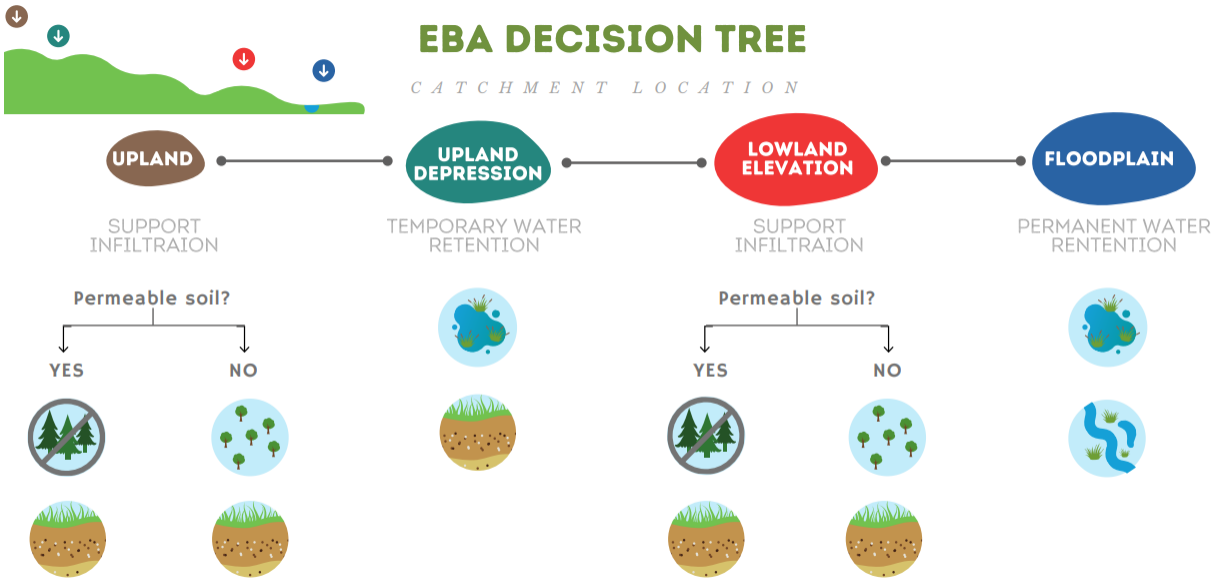


How can we target Nature-based Solutions in this catchment?

We have used a multi criteria analysis to target high priority areas for water, alongside the use of more detailed 'water systems maps' on a site scale that support selection of NbS measures. More info here: https://www.southeastriverstrust.org/wp-content/uploads/2021/03/Pilot-Action-Plan-Little-Stour-FINAL-PP-signed.pdf

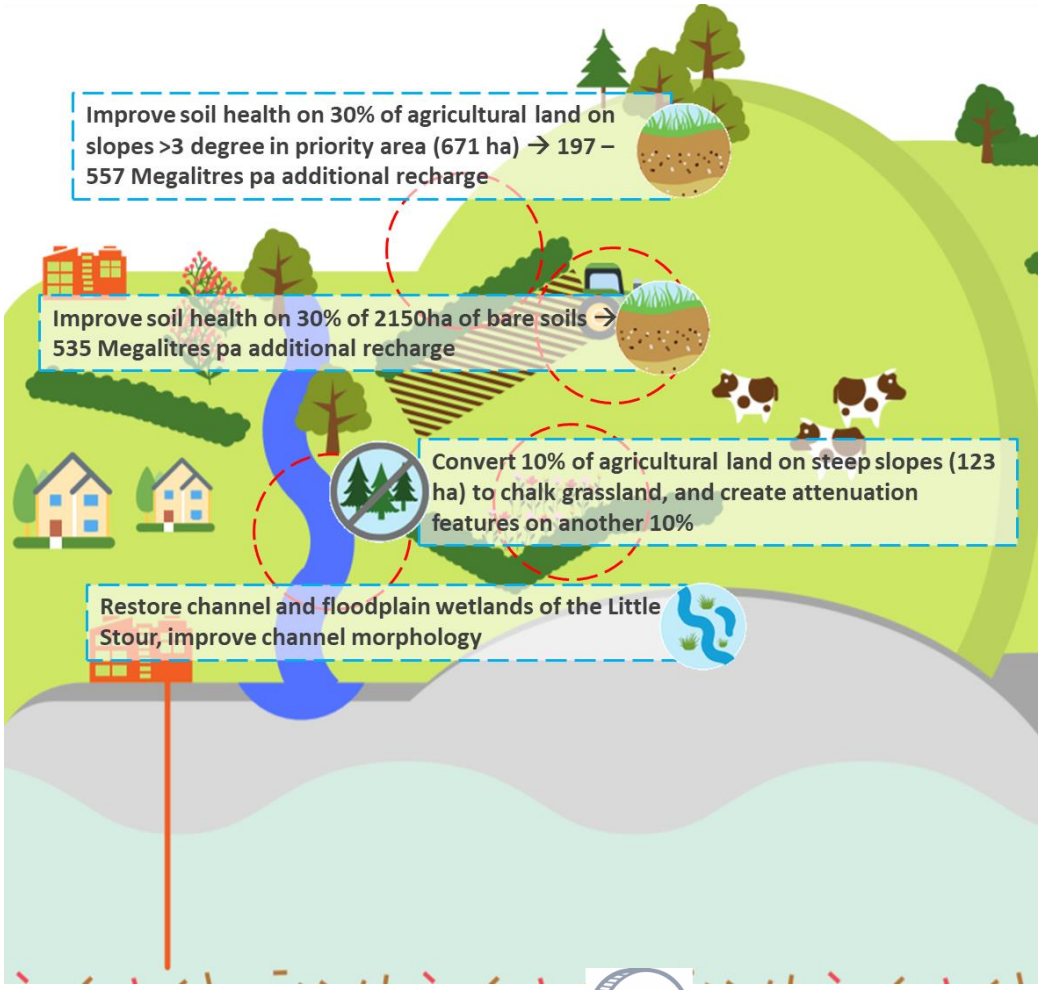






How does this translate into opportunities in the catchment?

Impact estimates are based on the 'Replenish' methodology using the WRI/AWS method for soil condition/land use change impact on infiltration/recharge to groundwater.



Improve soil health on 30% of agricultural land on slopes >3 degree in priority area (671 ha) and on 30% of 2150ha of bare soils (645 ha)	£150/ha →£197,400
Convert 10% of arable land on steep slopes (123 ha) to chalk grassland, and create attenuation features on another 10%	£1000/ha →£123,000 £500/ha → £61,500
Restore channel and floodplain wetlands of the Little Stour, improve channel morphology and remove weirs	Investigation ongoing

Impact estimates are based on the 'Replenish' methodology using the WRI/AWS method for soil condition/land use change impact on infiltration/recharge to groundwater.

What other impacts could this work support?

Water quality - Nutrient neutrality due to the impact of eutrophication on Stodmarsh NNR is an increasing pressure on development in the catchment, and waste water treatment directly linked. Agriculture is mainly linked to N inputs in the catchment, but reducing the impact of fertilizer and manure will still be beneficial.

Water quality - drinking water: nitrate, pesticides and pathogens are already issues for drinking water supply in the catchment. While many nitrate issues are historic and therefore will not be affected immediately by a reduction in inputs, this will make future water supply more resilient. More immediate effects could be achieved by focusing on the location of known fissures or dissolution features that could transport rapid recharge into source protection zones and create quality and turbidity issues.

Surface water flood risk - Muddy floods are a historic issue on the South Downs, despite the permeable soils on chalk. Land management has managed to address these, but increasing extreme events could increase the risk of similar events occurring, impacting transport and communities. Ensuring best practice management especially on steeper slopes can contribute to the prevention of issues.

Agricultural resilience - soils across the catchment are already drought prone and vulnerable to loosing more organic matter, impacting productivity and resilience of farming business. While it is likely that crop choices will change, healthy soil will be important in all circumstances.

Carbon storage - undisturbed soils are more secure carbon stores than ploughed arable land.

Biodiversity - chalk grassland is a rare habitat, as are chalk streams, and their protection and restoration is high on the agenda in the county and nationally.

Landscape character - rolling downland, hedges and chalk streams are key landscape features noted in AONB management plans

Disadvantage: groundwater flood risk

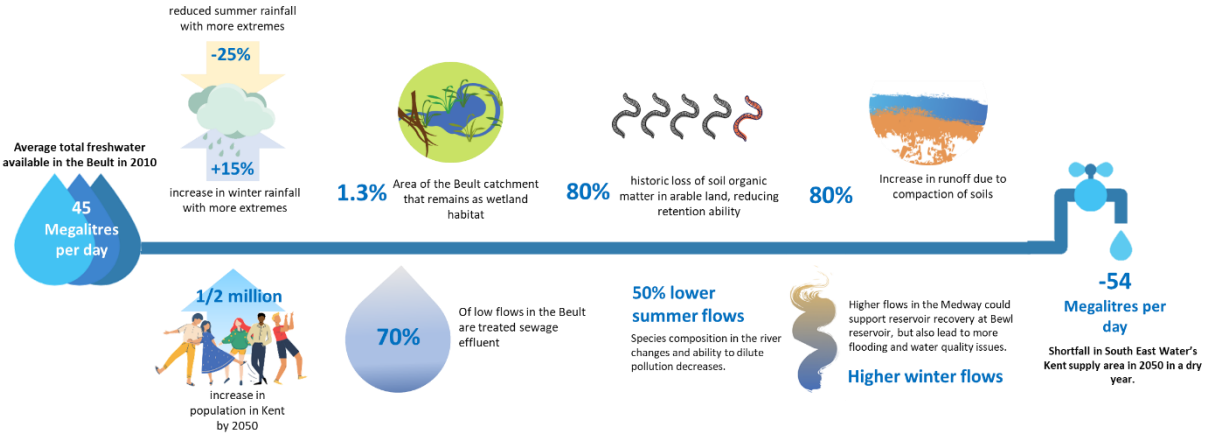
Over what time and spatial scale could this work be delivered?

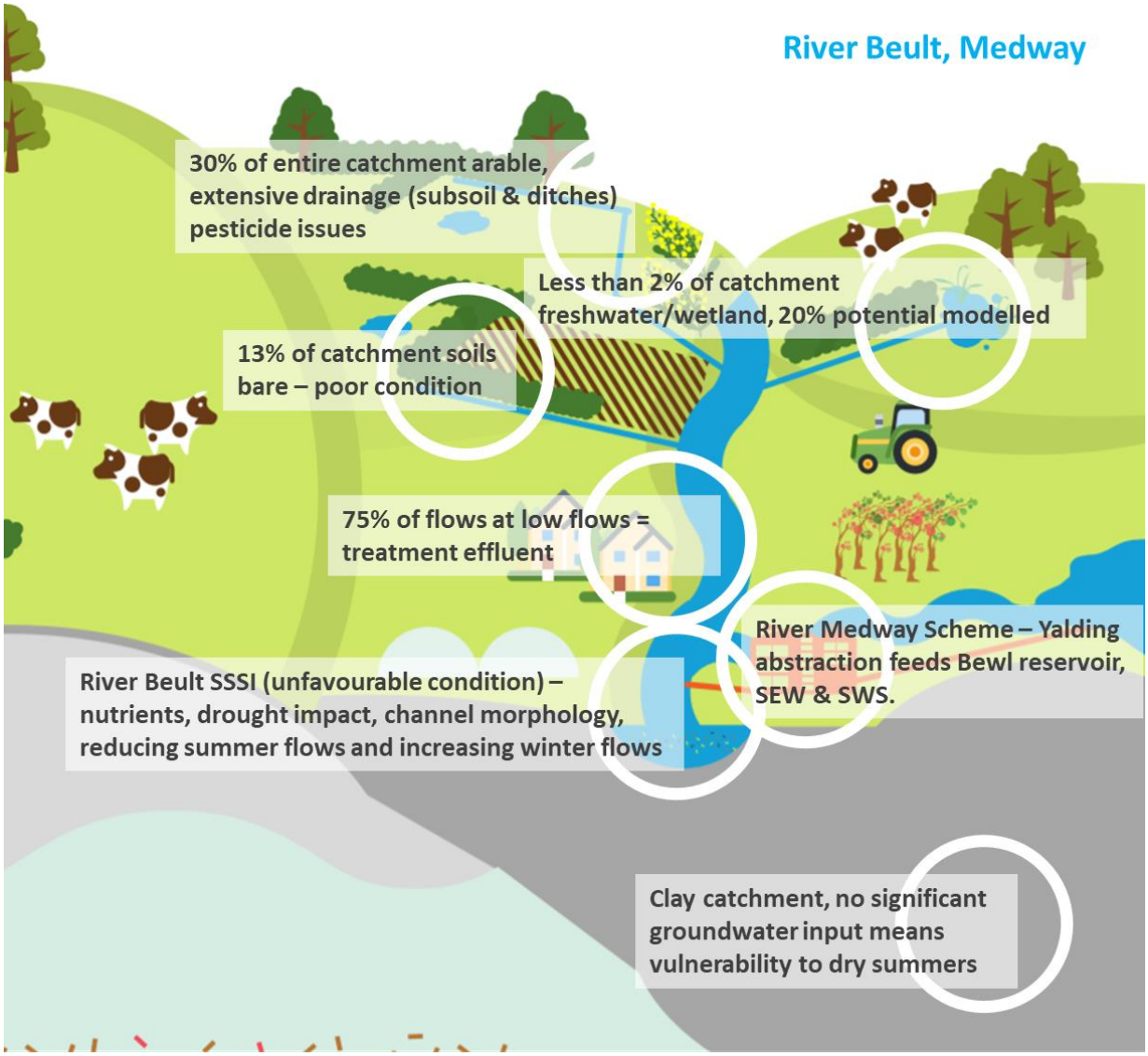
Sub-catchment - Catchment: Focus could be put on priority areas around source protection zones or, depending on the increased understanding of flows through the chalk, in areas that are seen as having the biggest contribution to drinking water sources or the chalk streams. Focusing on the southern parts of the catchment, in the 'upper' areas of the groundwater catchment, could be recommended. This could include areas from some hundreds of hectares to hundreds of square kilometres.

5-10 years: Many of the measures suggested are already being delivered through stewardship schemes, but uptake is slow and coverage is not focused on areas that are priorities for water resources. However, there is a range of measures that are familiar to farmers and delivery organisations, so delivery could be expected to achieve impacts relatively quickly for less ambitious measures. However, as some of these measures require annual management choices to be made, a long-term programme is likely to be the best way to ensure a lasting impact. Monitoring of impacts would also need long term commitment to allow for long term assessment to be carried out.

River Beult – Medway

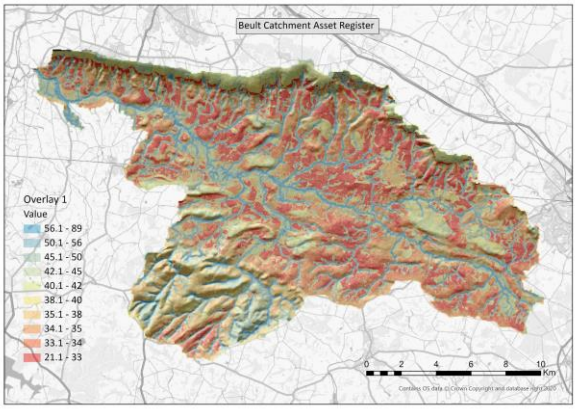
What are the pressures in this catchment?

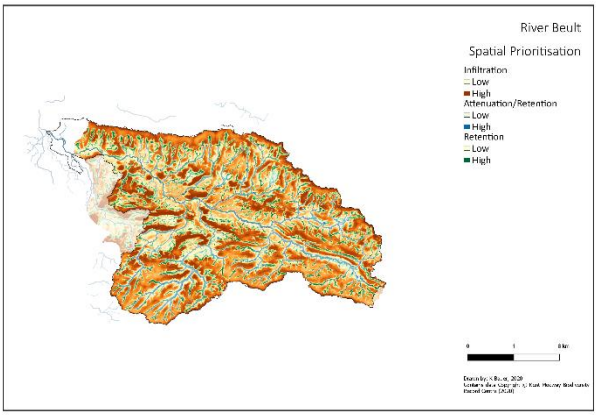


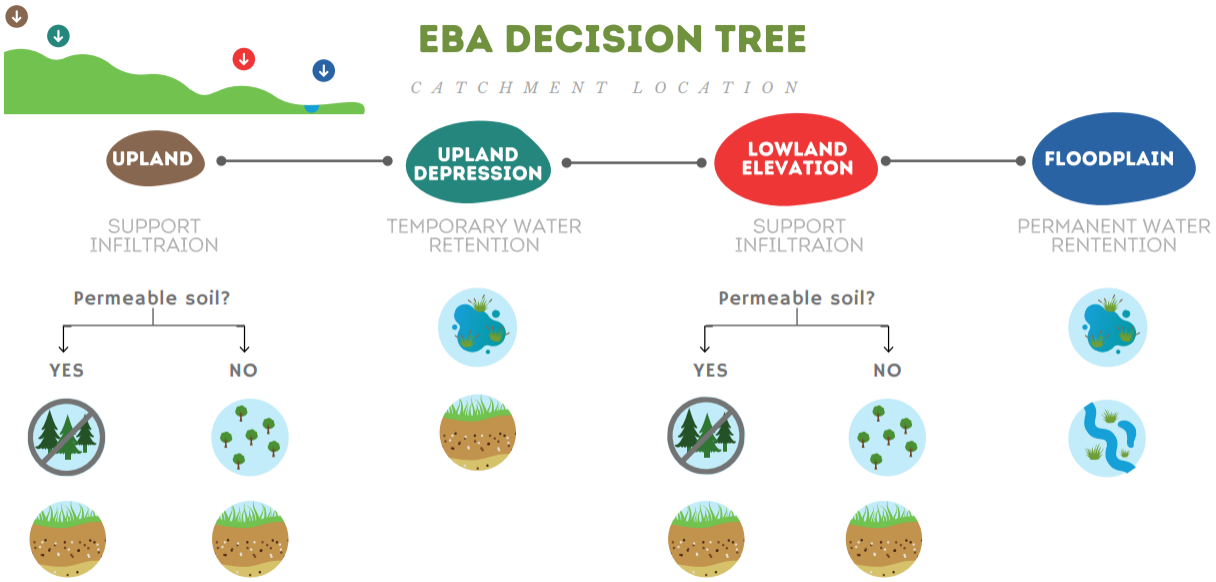


How can we target Nature-based Solutions in this catchment?

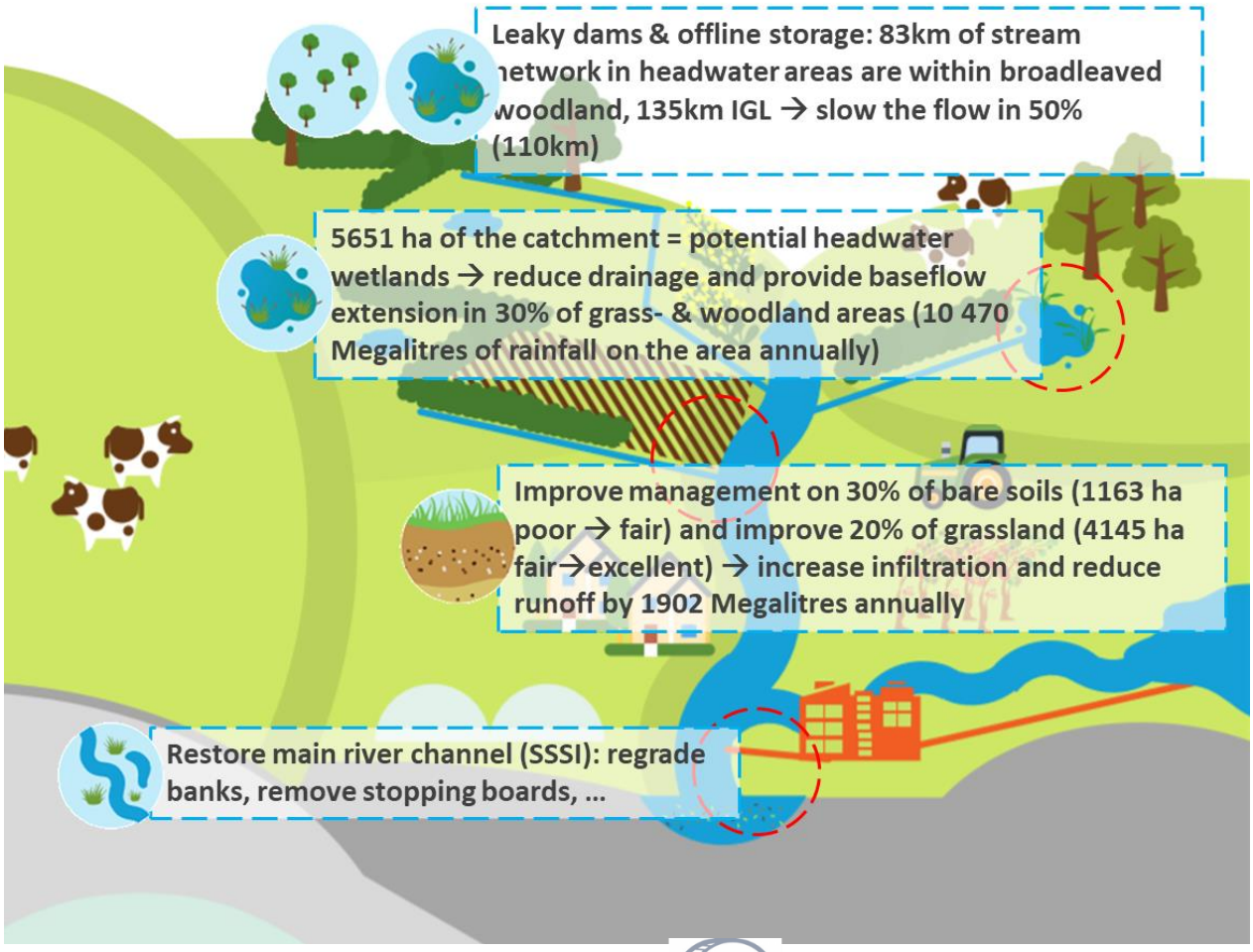
We have started developing a natural capital asset register approach based on the understanding of data and evidence we have gathered through the project so far (left). This highlights natural assets across the catchment that could be protected, restored and enhanced, using approaches like mapping bare soils from satellite imagery to get a better understanding of catchment condition. *This approach is still being refined.* On a site scale, water systems maps can again inform selection of appropriate NbS (right).







How does this translate into opportunities in the catchment?



1584 ha of headwater wetland restored in woodland and grassland Also: consider tree planting to increase infiltration and slow the flow (0.9 Megalitres/ha reduction in annual runoff from grassland → woodland)	£12,000/ha →£ 11,408,400
Improve management on 1163 ha poor & 4145 ha fair soils	£150/ha → £796,265
Slowing the flow using leaky barriers in 110 km of stream network	£500/km →£165,000
Restore main river channel (SSSI): regrade banks, remove stopping boards, … EA Restoration report sets out a range of options and costs.	£536k - 3 million

Impact estimates are based on the 'Replenish' methodology using the WRI/AWS method for soil condition/land use change impact on infiltration/recharge to groundwater.

What other impacts could this work support?

Water quality (issues from sewage effluent, pesticides and nutrients) - pesticides are already a problem for drinking water supply, and nutrient input is affecting the SSSI negatively

Flooding - Yalding and other, smaller communities in the catchment are regularly flooded, and the Medway Flood Partnership is supporting the delivery of natural flood management measures

Biodiversity - the Kent Biodiversity Action Plan suggests the restoration of wet woodland and improvement of stream networks. Wetlands are a rare habitat supporting nationally rare species.

Carbon sequestration and storage - improved soil health is increasingly on the agenda for carbon storage, and wetlands can contribute significantly

Agricultural resilience - soil health & drought resilience are becoming more and more important as drought impacts arable and grassland farmers regularly.

Landscape character - many of the features listed in AONB management plans and character descriptions such as ponds, streams and woodlands are protected or restored through this work.

Over what time and spatial scale could this work be delivered?

Sub-catchment (operational) to catchment (management catchment) scale

5-10 years (some easy win & small scale measures could be delivered in up to 5 years, significant scale of soil and wetland restoration/river restoration needs longer timeframes). Many of the measures being suggested are already being delivered by other partnerships, but uptake could be increased through more funding and advice.