Solving the Climate Change Challenge: Too much water… too little water… at the wrong time…

Nature Based Solutions

H2O Source2Sea aims to reduce the impact and financial cost of flooding through improved implementation of NFM (Natural Flood Management) and NDM (Natural Drought Management) systems.

More effective NFM and NDM strategies will lead to significant reduction in the public costs of flooding, as well as increases in water quality and reductions in nutrients, water course pollution and sedimentation. Citizen science will be used to monitor results and aid in further development of new GIS tools in pilot areas.

Key Outcomes:

- Establish nature based solutions for both flood and drought risk management
- Produce tools (GIS and financial mechanisms) to support the implementation of NFM and NDM
- Improve business-case for NFM and NDM through better natural capital assessments

Our Role:
KCC is leading the NDM pilot to make best use of water when it is available. We will work with partners including landowners and land-using businesses to implement and test water storage and trading schemes.

Green/Blue Infrastructure

Cool Towns aims to combat the increasing effects of heat stress and improve understanding of effective heat management in small and medium sized cities in the 2 Seas region.

Climate change is already causing hotter summers and more frequent droughts, as well as increasing the number and intensity of hot days and heatwaves. Cool Towns will improve stakeholder ability to understand and manage overheating risks through effective urban design.

Key Outcomes:

- Increasing awareness of green/blue infrastructure solutions to reduce heat stress
- Identification of heat-vulnerable populations
- Delivering multi-functional infrastructure solutions

Our role:
KCC will identify key heat stressed areas in Kent and deliver heat resilience measures. Our pilot will make use of partner knowledge to effectively manage and reduce heat stress and surface water flooding as well as improve public health outcomes.

Holistic Approach

C5a brings together the outcomes of 7 North Sea Region projects to develop a holistic management approach to managing water resources effectively across the region.

Recognising that adaptation measures taken upstream or in the upper catchment may have unintended negative consequences downstream, C5a is developing a new, whole of system approach to ensure coherent adaptation across the constituent systems (catchment, coasts, cities and infrastructure networks) to effectively manage flood risk.

Key Outcomes

- Building public sector capacity to plan for climate change
- Improving understanding of building adaptation capacity across the water system
- Developing more sustainable, integrated, multifunctional solutions that can be applied in practice

Our Role

For C5a we are Constituent Systems lead for Infrastructure Networks and are leading the Medway Catchment pilot, where we will be using nature based solutions, green/blue infrastructure, multi-layered safety and adaptive planning to reduce the impact of flooding across the catchment.

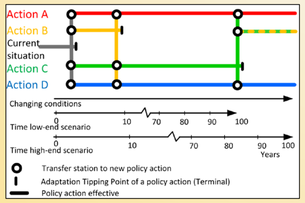
Adaptive Planning

STAR2Cs aims to overcome the 'implementation gap' between national plans and local adaptation action and reduce the impacts of flooding and climate change by:

- developing a versatile method to identify cost-effective mechanisms to deliver local adaptation measures
- building stakeholder knowledge and the ability to participate in effective 'future proofed' decision making
- demonstrating the success of this approach to encourage wider rollout across the 2 Seas area and beyond to stimulate adaptation action.

Key Outcomes:

- Reduction of long-term impacts of flooding
- Public property and infrastructure is better adapted to climate change
- Adaptation actions integrated into local policy, strategy, decision-making and business-as-usual.



Our role:
KCC is leading on development of the Adaptation Catalyst. We will also be developing an Adaptation programme for Kent based on outcomes of the Kent Climate Change Risk and impact Assessment.

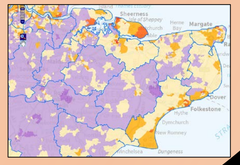
Multi-Layered Safety

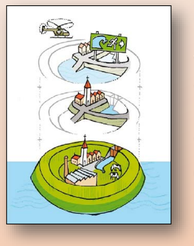
FRAMES is developing the concept of Multi-Layered Safety to include recovery from flooding events as well as planning, preparing for and responding to them.

Stakeholders will be better prepared for flooding, and able to recover to a state that is better than their pre-flood state, building long term resilience and reducing the potential future cost of flooding to residents and taxpayers.

Key Outcomes:

- More resilient health and social care facilities
- Tools to support increased flood resilience adopted by key sectors
- Increased emergency preparedness and response capacity
- Improved flood prevention measures





Our role:
KCC is working to improve flood resilience in the health and social care sector. We have assessed flood vulnerability and disadvantage to communities, as well as flood risk to health & social care properties.

We are reviewing the CCRA to develop a Kent Climate Change Risk and Impact Assessment (CCRiA) to better understand the impacts of climate change on key sectors and motivate action.

For more information, contact climate.change@kent.gov.uk

FWAG South East, Affinity Water and Kings
Kent Autumn 2018 Cover Crop demonstration

	Species	% in mix	Sowing rate kilos ha	kg ha	seeds sq m		Approx cost £ ha
EFA Simple	Oats Winter	80%	20	16	40	Low cost	16
	Mustard	20%		4	100	Avoid rape	
					140		
EFA Super	Baracuda Radish	20%	30	6	55	Adds value	
	W.Oats	40%		12	30	N .Fix	35
	Phacelia	4%		1.2	60	Radish advantage	
	Vetch	36%		10.8	22	Soil Health	
					167		
Early Mix	Black oats	30%	25	7.5	39	Frost kill?	
	Linseed	20%		5	70	N .Fix	30
	Buckwheat	25%		6.25	28	Small seeds	
	Radish --S . Nova	15%		3.75	34	Multi depth roots	
	Berseem clover	10%		2.5	125	Sow Early	
					296		
Grazing Mix	Rye	60%	40	24	68	No Brassica	
	Vetch	40%		16	32	Can leave late	34
					100		
			20				
N. Catch	Baracuda radish	100%	20	20	166	Soil structuring.	38
	alone					N . Catch	
N.Fix	Lupins	25%	30	7.5	13	soil Health +	
	Vetch	25%		7.5	15	Max N Fix	35
	Crimson Clover	3%		0.9	50	Non EFA	
	Berseem Clover	4%		1.2	60	Boosts Soil Fungi	
	Peas	25%		7.5	3	No Brassica	
	Oats . Winter	18%		5.4	14	Deep rooting Lupins	
					155		
Bare Stubble							?

Benefits of Cover Crops

In the last 10 years cover cropping has moved from a niche activity on organic farms to becoming widely popular on broad arable areas as the benefits become clear and soil health and vitality become of concern to many growers. There are 5 potential key benefits of cover crops and some farms will experience all 5 while others will see useful value from just 1 or 2 benefits.

- **Suit EFA and /or Environmental stewardship schemes.**
- **Reduce considerably the leaching loss of valuable nutrients from bare soils (especially Nitrogen) improving water quality and saving money.**
- **Improve soil structure, drainage, and soil organic matter levels, which can lead to less cultivation and higher yields.**
- **Reduce soil pests, diseases and weeds.**
- **Improve yields in the following crop and successive crops and offer a grazing opportunity.**

However there is a very wide choice of cover crop species that can be used and a range of cover crop agronomy to these benefits. Consequently it is vital to be clear about the target benefits on any farm /field and careful choices need to be made of cover crop species, variety and agronomy to suit soil type, rotation and the following crop establishment.

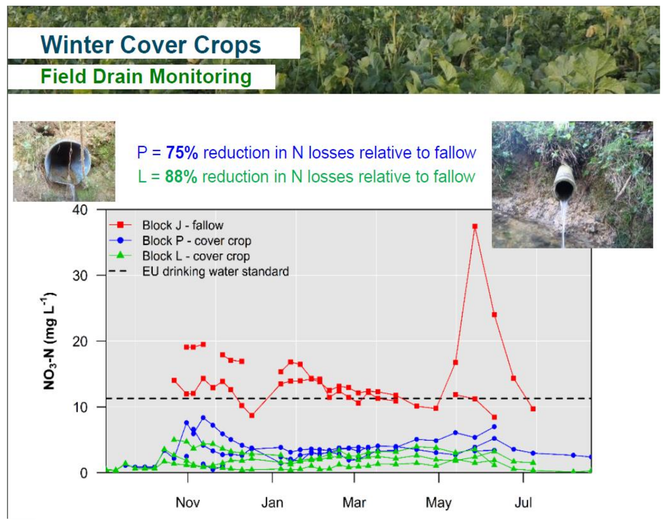
Reduction in Nutrient loss Cover crops can be very successful at reducing nutrients losses from bare soil especially after a cereal crop and Kings Trials show typically a 60% reduction. This can mean substantial improvements in water quality leaving the fields. Any nitrogen left behind after a crop has been paid for so why let it leach form the soil?

Soil structure improvement This is a key long term benefit. It is the cover crop roots that are important and selecting species that have the right combination of deep tap roots and branching side and shallow roots will be beneficial. The biomass produced will add valuable organic matter to the soil which is also important to help soil structure, water holding capacity and feed the soil fauna. Improved soil structure with friable tilth will allow cheaper cultivations, needing less draught and leading possibly to min-till or direct drilling. This cultivation cost savings in a key driver for many growers.

Yield improvements Kings trials and experiences show us that many growers quickly do see yield improvements in the next crop and also in subsequent crops. Growers can often see at least a 0.5 ton /ha extra yield on cereals and 10% extra yield with root crops , depending on the performance of the cover crop. Success with the following crop however will depend on attention to detail in the Cover crop termination (type of destruction and timings) , drill choice, slug and pest monitoring , suitability of the cover crops in that rotation .

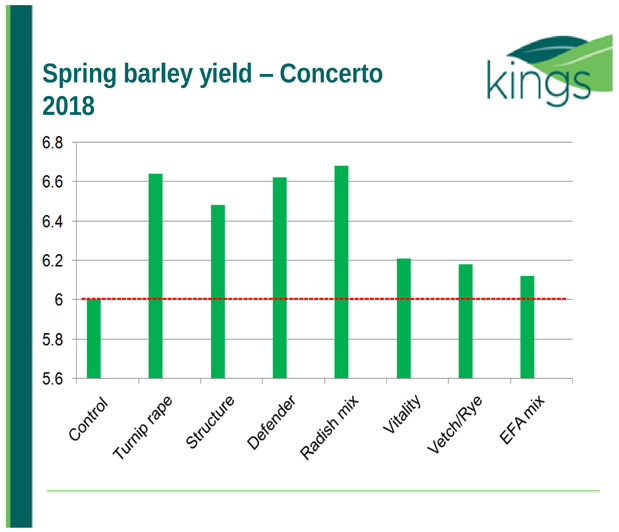
DEFRA DTC data , University of East Anglia

8 year project at Salle, Norfolk



James Hutton Institute , Dundee

3 year project looking at Cover crops with Spring Barley



Block P – Min till Block L – Direct drill Block J –Bare Fallow-Plough

Kings – Paul Brown 07970 220761 paul.brown@frontierag.co.uk
Office -- Tel 01379 658135 Website -- www.kingscrops.co.uk
Email office queries to --- kingscrops@frontierag.co.uk

The effects of the Eurasian beaver (*Castor fiber*) on hydrology and nutrient dynamics at variable spatial scales

Olly van Biervliet[1] (o.biervliet12@ucl.ac.uk)

[1]UCL Department of Geography, University College London, UK

Aims

The Eurasian beaver (*Castor fiber*) is the largest species of rodent in Europe and is noted for its ability to engineer its habitat[2,3]. After an absence of several hundred years, the Eurasian beaver has been reintroduced to multiple sites within the UK[1]. The purpose of this study is to better understand the hydrological effects of beaver dams at spatial scales from the individual beaver dam to the sub-catchment scale using field and numerical modelling approaches. The effects of beaver dams on water quality and sediment storage will also be investigated.

Author: Olly van Biervliet

Methods

A 1.6 km headwater stream in Scotland with about twenty five beaver dams along the channel was instrumented to asses changes in flow over the sequences of dams. Locations of flow measurement enabled appraisal of both a sequence of three beaver dams, and alterations in discharge over about twenty dams (Fig 1). Flow is gauged by three v-notch weirs with corresponding stilling wells and pressure transducers (Fig. 1), and additionally an ultrasonic Doppler flow meter (Starflow, Unidata). Regular volumetric gauging and dilution gauging is used to appraise the accuracy of the discharges recorded. Additionally, twenty one dipwells were installed to assess the effect of beaver on localised groundwater levels in the floodplain (Fig. 2). Four dipwells were instrumented with pressure transducers and all are also manually measured at regular intervals. Data from the stream has been used to construct a hydraulic model using the MIKE 11 platform.

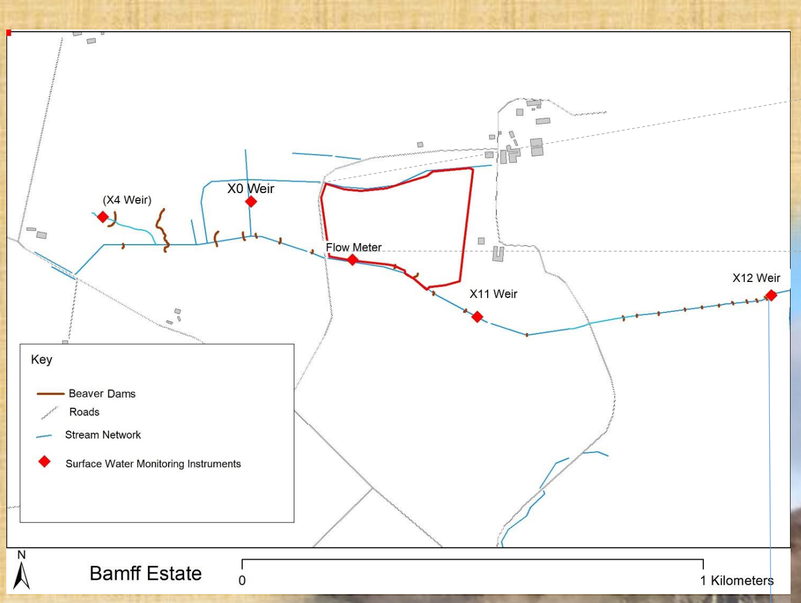


Fig. 1: Locations of monitoring instruments in case study site.

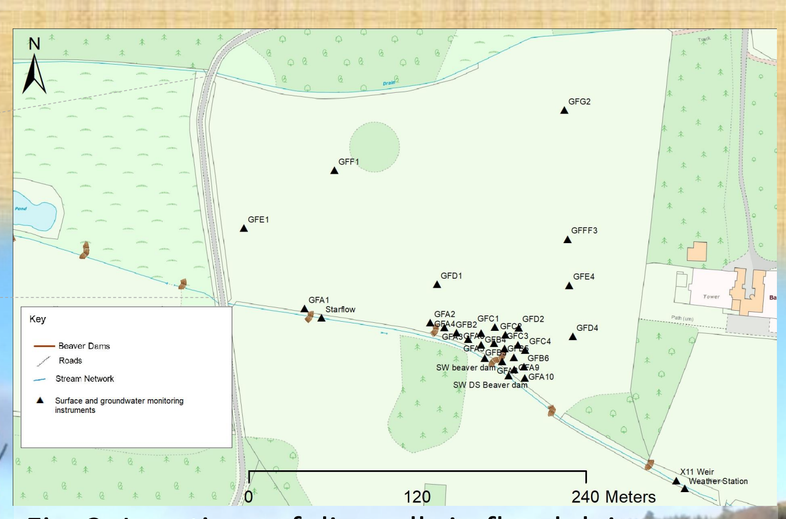


Fig. 2: Locations of dip wells in floodplain adjacent to two beaver dams.

Fig. 3: Monitoring weir with stilling well instrumented with pressure transducer.

Results and discussion

River flow

A sequence of three beaver dams did not appear to appreciably affect peak discharge during storm events during the Autumn and Winter 2017/18 (Fig. 4). However, it appears that the hydrograph recession is slower downstream of the dam sequence. It is still to be determined whether these results will be replicated at larger spatial scales and in different seasons.

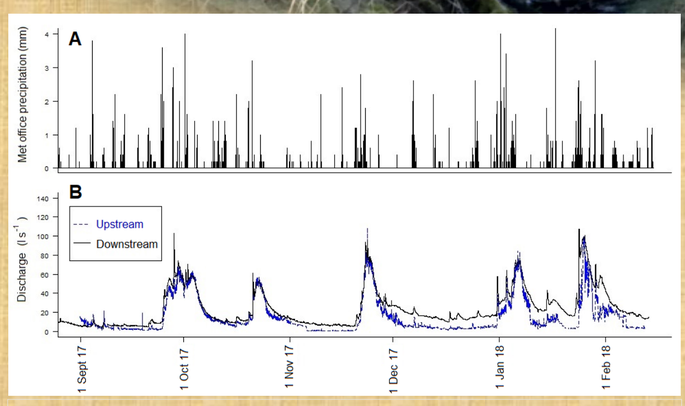


Fig. 4: A. Precipitation B. Stream discharge upstream and downstream of three beaver dams.

Groundwater

In the area of floodplain monitored, shallow groundwater levels suggested that under conditions monitored so far, water seeped from the beaver ponds into the adjacent floodplain. Downstream, where beaver dams were not present, and stream levels were consequently lower, the hydraulic gradient suggested that this water would return to the stream (Fig. 5).

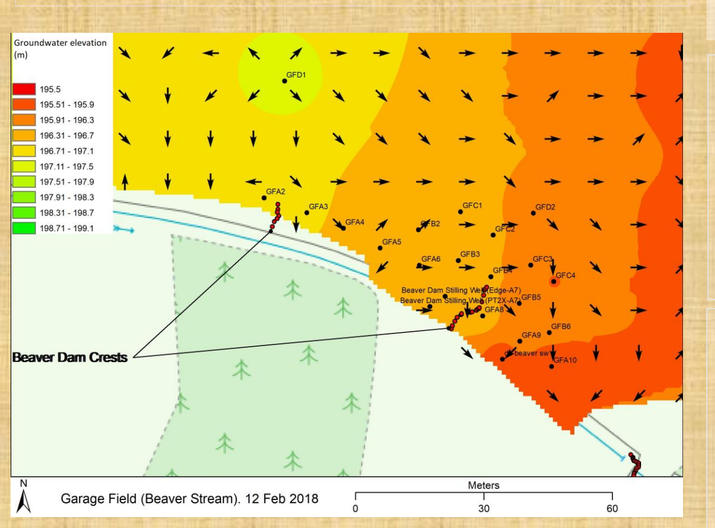


Fig. 5: Interpolated flow directions based on groundwater levels in February 2018.

Preliminary model results

Initially, the challenge is to determine how to best represent beaver dams in the model. Formulae for broad crested weirs with have been tested to represent dams. Simulations represent water levels within beaver ponds and downstream discharge relatively accurately. Simulations suggest peak discharges are more persistent when beaver dams are absent (Fig. 6). Next steps will involve representing the wider catchment including groundwater within a coupled model, MIKE SHE.

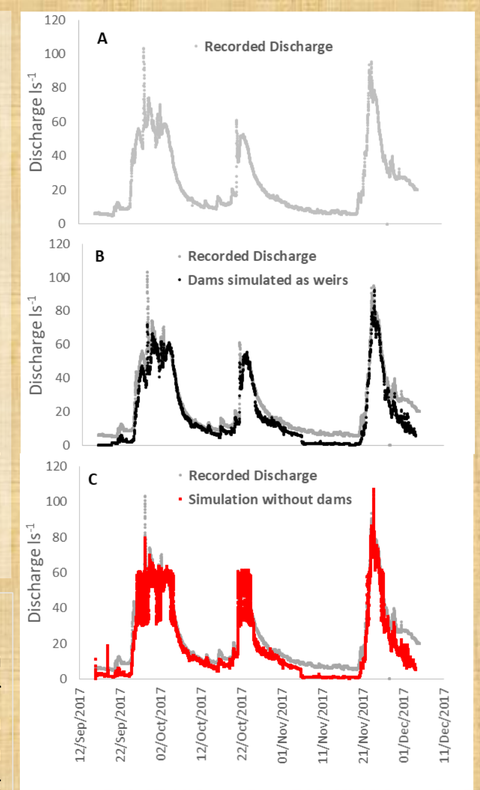


Fig. 6: Observed stream discharge (A), compared to MIKE 11 model simulations of discharge with dams simulated (B), and no dams simulated (C).

Acknowledgements

I would like to thank my supervisors Dr Julian Thompson, Prof. Helen Bennion, Dr Hannah Robson, Prof. Nigel Willby and Dr Mike Bowes for their invaluable input. This work has been supported by funding from NERC and the WWT, and equipment from Van Walt Ltd. I am extremely grateful for the help of Ian Patmore in preparing equipment and several field helpers.

Selected references

1. Gaywood, M.J., 2018. Reintroducing the Eurasian beaver Castor fiber to Scotland. *Mammal Review*, 48(1), pp.48–61
2. Law, A., Mclean, F. & Willby, N.J., 2016. Habitat engineering by beaver benefits aquatic biodiversity and ecosystem processes in agricultural streams. *Freshwater Biology*, 61(4), pp.486–499
3. Puttock, A. et al., 2017. Eurasian beaver activity increases water storage , attenuates flow and mitigates diffuse pollution from intensively-managed grasslands. *Science of the Total Environment*, 576, pp.430–443

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Interreg
North Sea Region
FRAMES
European Regional Development Fund

EUROPEAN UNION

The South East Rivers Trust is leading a project to deliver a Natural Flood Management (NFM) project on the Medway Catchment, as part of the Medway Flood Action Plan. We are working in partnership with Kent County Council, Environment Agency and others to provide advice, and deliver on the ground changes to help reduce flood risk and improve the environment.


Flooding at Yalding


Leaky Woody Barrier and diversion channel Bedgebury

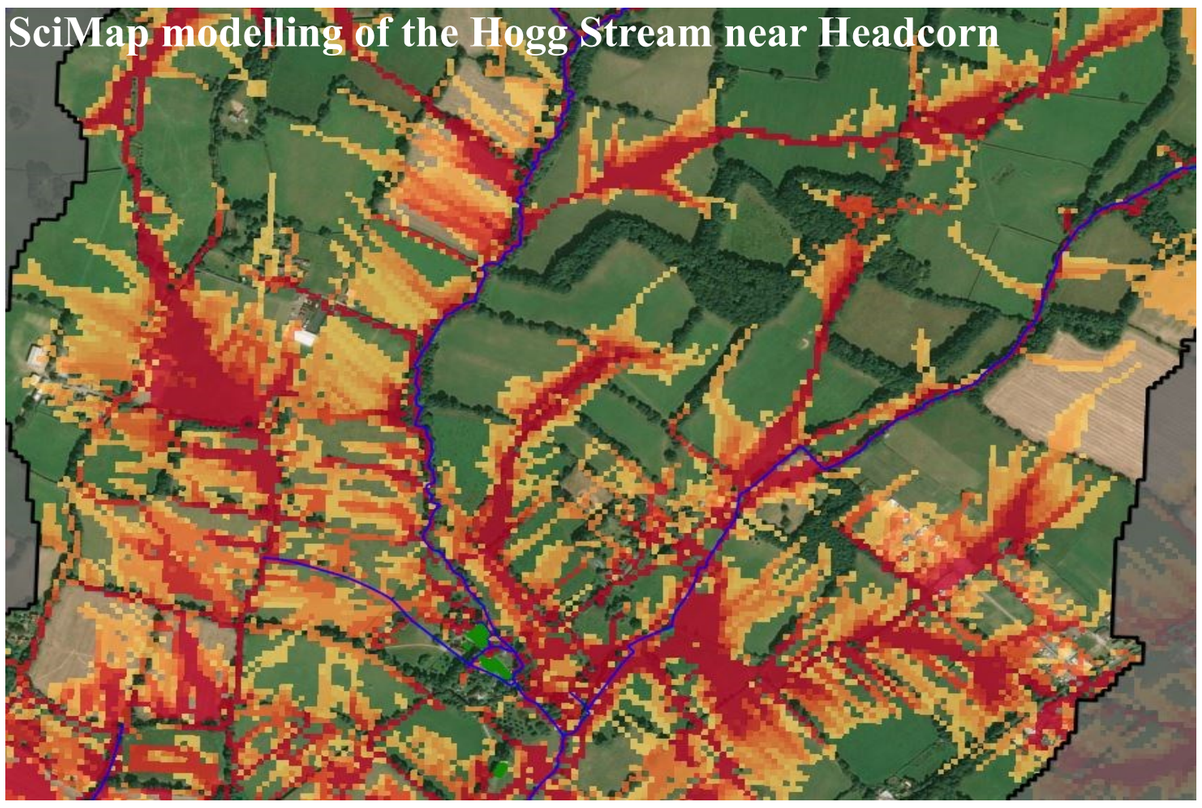
The project area focuses on the High and Low Weald areas which have notoriously heavy clay soils, and the main river channels have been deepened and straightened. The catchment is very 'flashy' and flooding events arise quickly. Our aim is to slow the flow through such measures as installing leaky wooden barriers in the headwater woodlands, diverting the flow into floodplains and other measures.

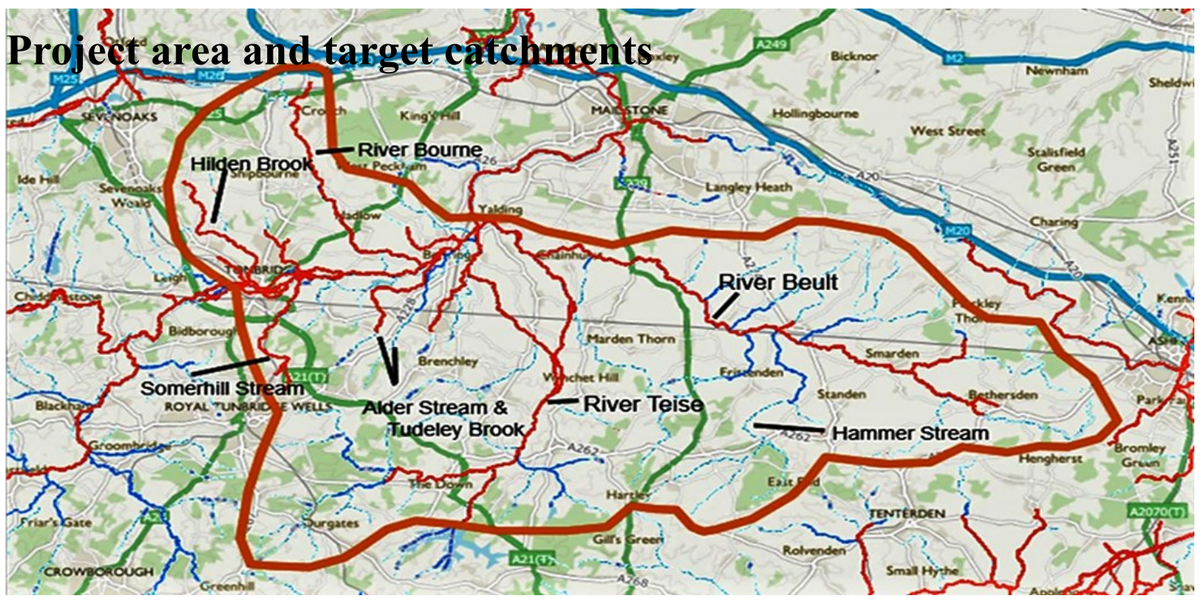
We have used local knowledge and SciMap modelling to identify the target sub-catchments of the Alder Stream and Hogg Stream as most promising for this approach. Work here will benefit the communities of Five Oak Green and Headcorn. We are also developing experimental sites with the Forestry Commission at Bedgebury Pinetum and with the National Trust at Sissinghurst Castle

Multiple Benefits

Natural Flood Management can not only help to reduce downstream flooding, but also has potential to provide:

- Landscape character improvement
- Additional or enhanced habitat for wildlife
- Better water quality by reducing soil or chemical run off
- Long term – more water availability in dry periods


SciMap modelling of the Hogg Stream near Headcorn



Project area and target catchments

Medway Natural Flood Management Partners include:
Environment Agency, Kent County Council, Joint Parish Flood Group, Tunbridge Wells Borough Council, Maidstone Borough Council, Tonbridge and Malling Borough Council, Sevenoaks District Council, Natural England, Forestry Commission, Medway Internal Drainage Board, Southern Water, National Farmers Union, Country Land & Business Association, National Flood Forum.

Part of the
Medway Flood Partnership

south
east
rivers
trust

MELANIE SANDERS
melanie.sanders.18@ucl.ac.uk

Mapping palaeochannels of the Swindale Beck using an unmanned aerial vehicle derived digital elevation model for application in river restoration

Aim:

The Swindale Beck is situated in the eastern side of the Lake District in the upper Eden Valley in Cumbria. It underwent artificial straightening 200 years ago which contributed to downstream flooding and a loss of biodiversity.

In 2015 a river restoration scheme was established as part of a flood alleviation initiative. The aim was to reintroduce a more natural flooding regime, and in doing so enhance groundwater recharge and support the hay meadows and rush pasture which are Sites of Special Scientific Importance (SSSI) and Special Areas of Conservation (SAC).

This study analyses the historical dynamics of the Swindale Beck by using Structure from Motion (SfM), a low cost method to survey the river before restoration began and to suggest a proposed restoration route.

Method:

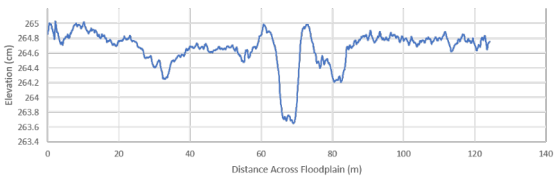
45 georeferencing control points were distributed across the reach and their GPS was recorded. A DJI Phantom 3 Pro UAV was flown across the study area at a height of 100 m and photos were taken every 4 seconds to ensure quality image overlapping. In total 600 photographs were used and loaded into AgiSoft Photoscan Pro 1.1. SfM was used to create a sparse point cloud which was then georeferenced using 14 GCPs and finally a dense point cloud was created. This was then exported as an orthophoto and a DEM which were both analysed in ArcMap using different spatial analyst tools.

Results:

The accuracy of the DEM was comparable to that of LiDAR. Combining the DEM and hillshade was found to represent the palaeochannels most clearly. Their position was substantiated by topographic profiles which revealed that the Swindale Beck had a dynamic past.

Using this information, the river was restored using a route similar to the one proposed here. The new channel is 140 m longer and 2 m wider than the old route and is better connected to the floodplain through the removal of levees, thereby enhancing groundwater recharge. The new sinuous channel has provided habitat for plant and invertebrate species and salmon have returned to spawn.

DEM STATISTICS	X	Y	Z
STANDARD DEVIATION (m)	0.121	0.132	0.248
RMSE (m)	0.183	0.161	0.116
MEAN ERRORS (m)	0.116	-0.018	-0.053

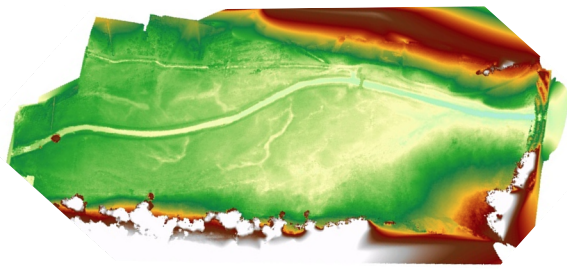


F) Topographic profile across the floodplain

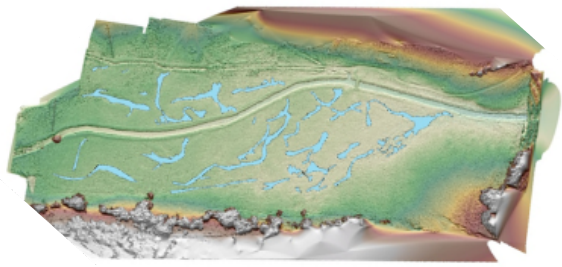
Ackowledgements

I would like to thank Richard Williams for his supervision and providing me with the equipment used in this study, and Andy Hardy for his continued support as my dissertation supervisor.

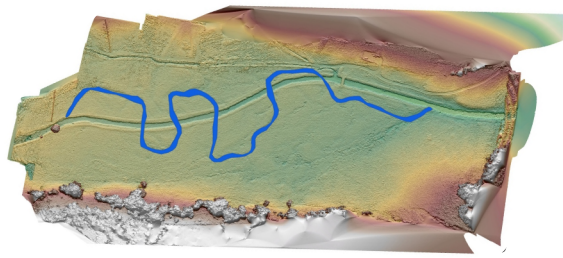
A) Aerial photograph



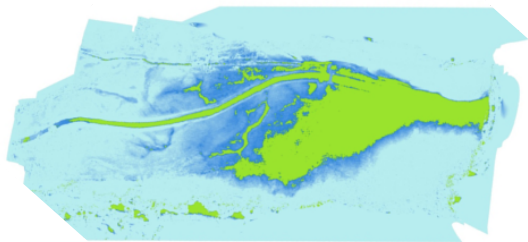
B) Digital elevation model



C) DEM + hillshade showing palaeochannels



D) Proposed restoration route

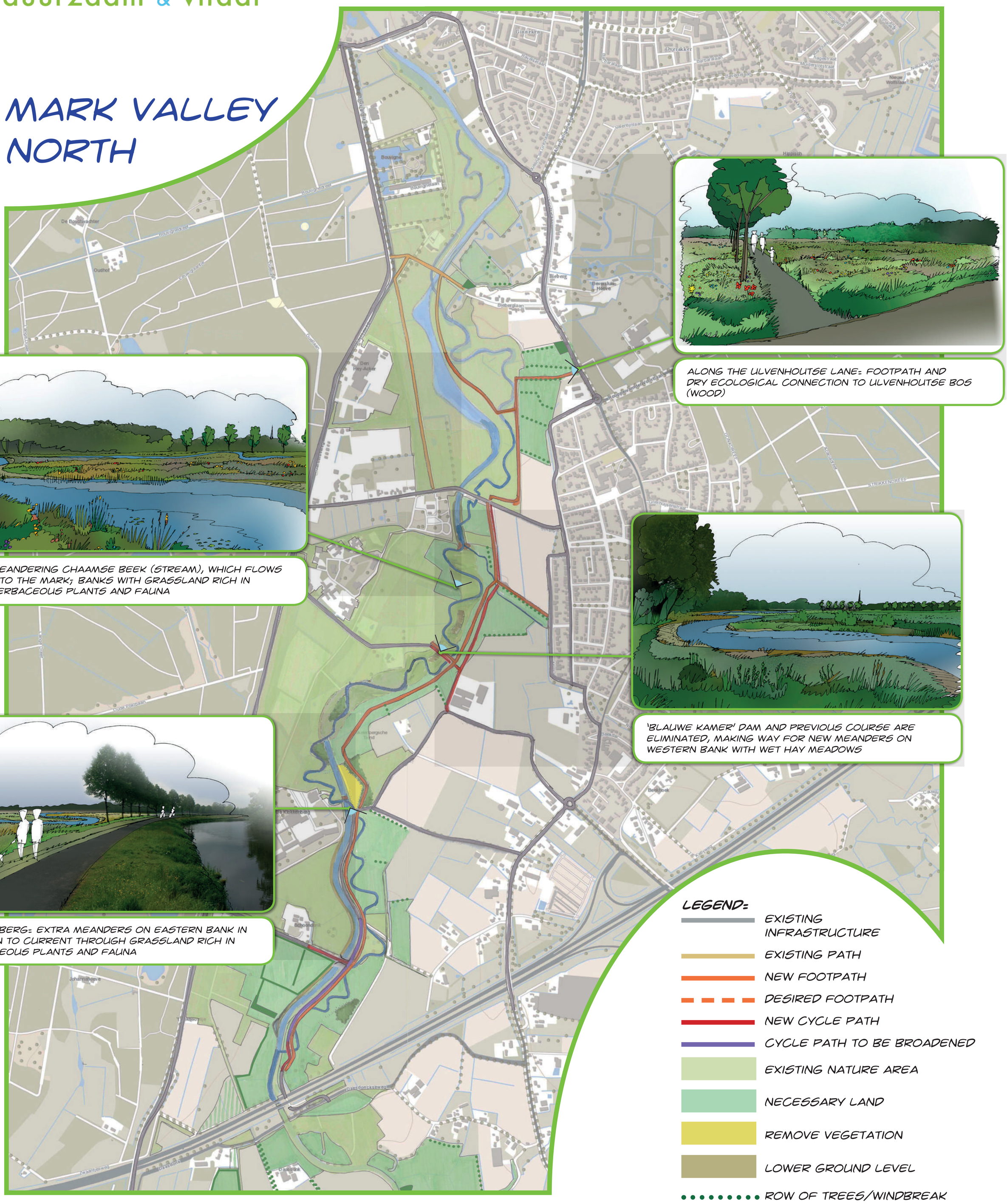


E) Negative relief (70cm)

Markdal
duurzaam & vitaal

PREFERRED RESTORATION ALTERNATIVE FOR THE MARK RIVER VALLEY (NETHERLANDS)

MARK VALLEY NORTH



ALONG THE ULVENHOUTSE LANE: FOOTPATH AND DRY ECOLOGICAL CONNECTION TO ULVENHOUTSE BOS (WOOD)

MEANDERING CHAAMSE BEEK (STREAM), WHICH FLOWS INTO THE MARK; BANKS WITH GRASSLAND RICH IN HERBACEOUS PLANTS AND FAUNA

'BLAUWE KAMER' DAM AND PREVIOUS COURSE ARE ELIMINATED, MAKING WAY FOR NEW MEANDERS ON WESTERN BANK WITH WET HAY MEADOWS

KOEKELBERG: EXTRA MEANDERS ON EASTERN BANK IN ADDITION TO CURRENT THROUGH GRASSLAND RICH IN HERBACEOUS PLANTS AND FAUNA

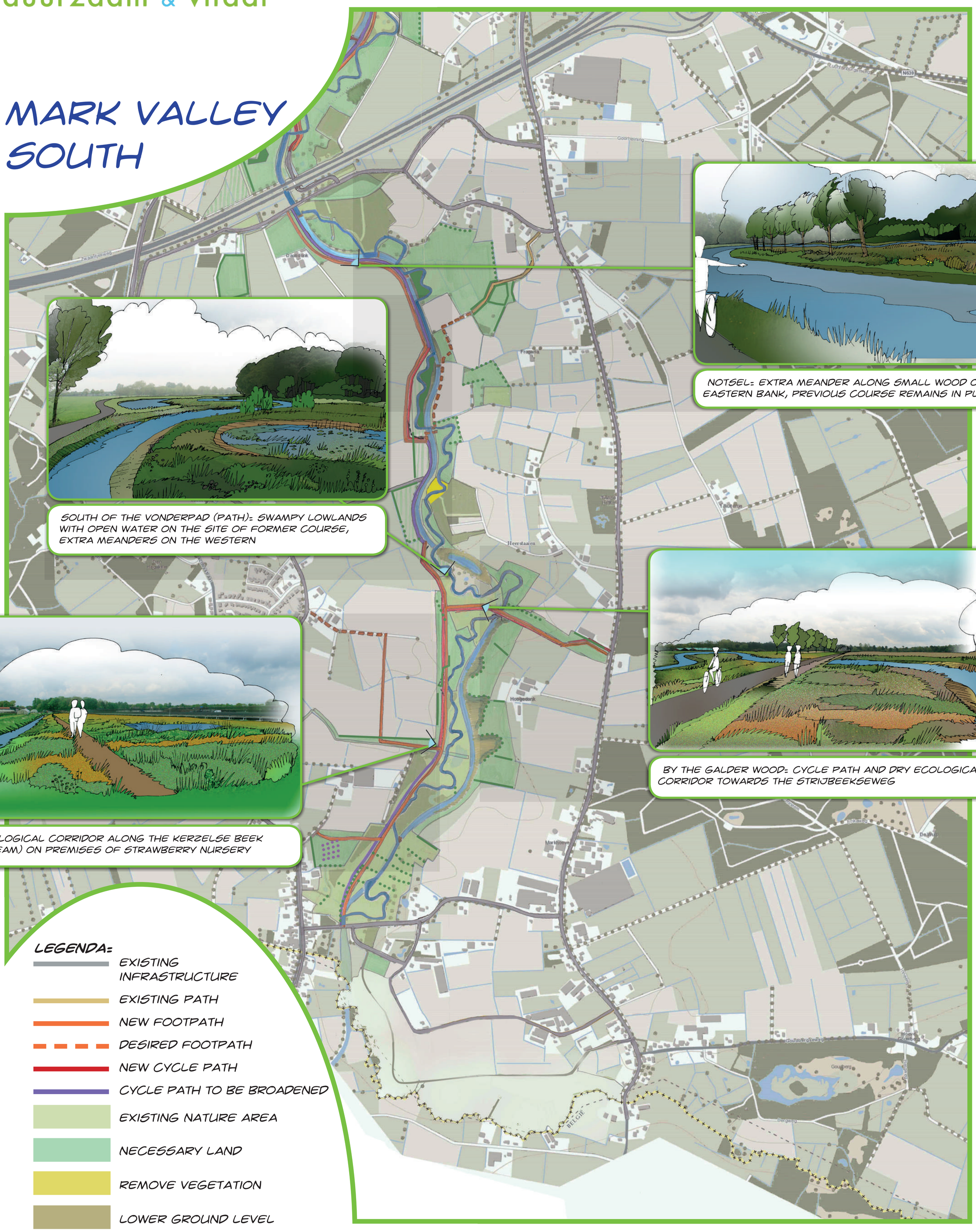
Waterschap Brabantse Delta

Interreg 2 Seas Mers Zeeën PROWATER
Europees Fonds voor Regionale Ontwikkeling

Markdal
duurzaam & vitaal

PREFERRED RESTORATION ALTERNATIVE FOR THE MARK RIVER VALLEY (NETHERLANDS)

MARK VALLEY SOUTH



NOTSEL= EXTRA MEANDER ALONG SMALL WOOD ON EASTERN BANK, PREVIOUS COURSE REMAINS IN PLACE

SOUTH OF THE VONDERPAD (PATH)= SWAMPY LOWLANDS WITH OPEN WATER ON THE SITE OF FORMER COURSE, EXTRA MEANDERS ON THE WESTERN

BY THE GALDER WOOD= CYCLE PATH AND DRY ECOLOGICAL CORRIDOR TOWARDS THE STRIJBEEKSEWEG

ECOLOGICAL CORRIDOR ALONG THE KERZELSE BEEK (STREAM) ON PREMISES OF STRAWBERRY NURSERY

LEGENDA=

- EXISTING INFRASTRUCTURE
- EXISTING PATH
- NEW FOOTPATH
- DESIRED FOOTPATH
- NEW CYCLE PATH
- CYCLE PATH TO BE BROADENED
- EXISTING NATURE AREA
- NECESSARY LAND
- REMOVE VEGETATION
- LOWER GROUND LEVEL
- ROW OF TREES/WINDBREAK
- FRUIT TREES
- CURRENT COURSE OF MARK
- INTENDED COURSE OF MARK

Waterschap Brabantse Delta

Interreg 2 Seas Mers Zeeën PROWATER
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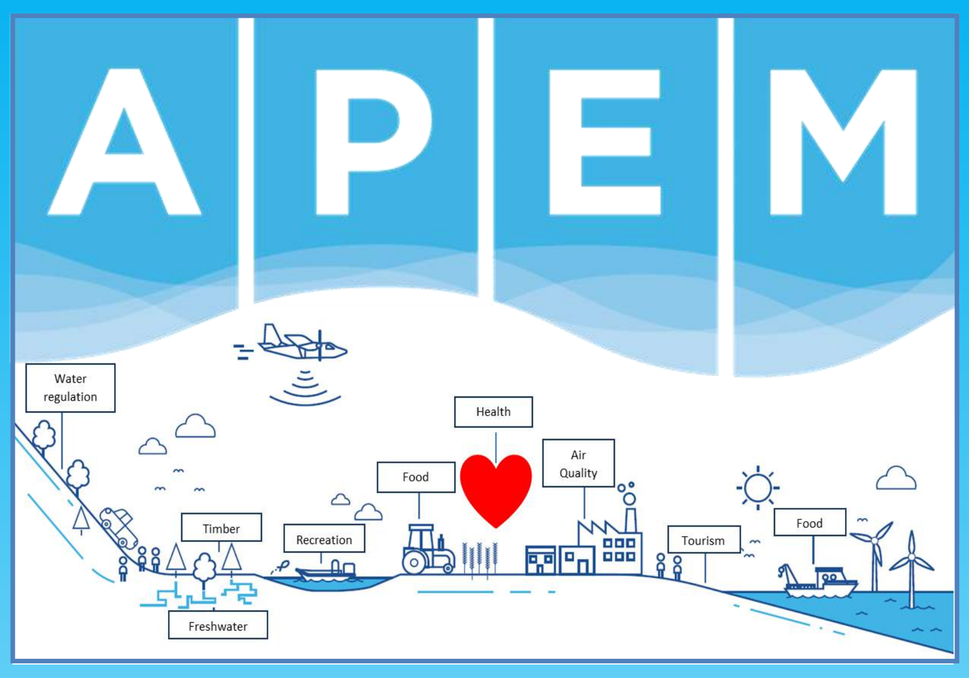
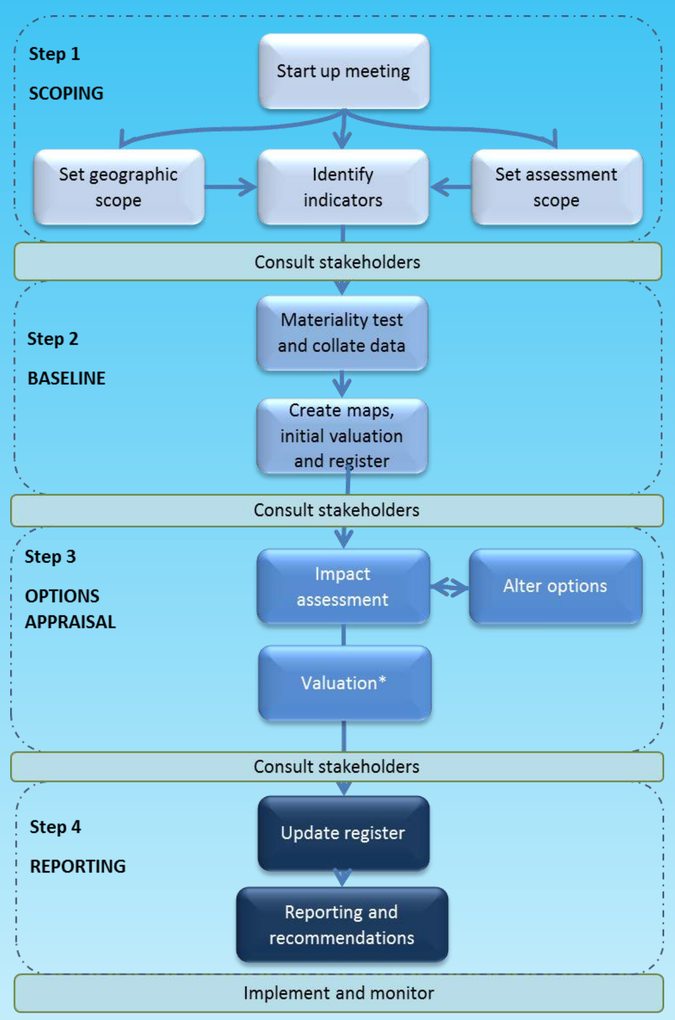
Natural Capital and river restoration: A possible approach



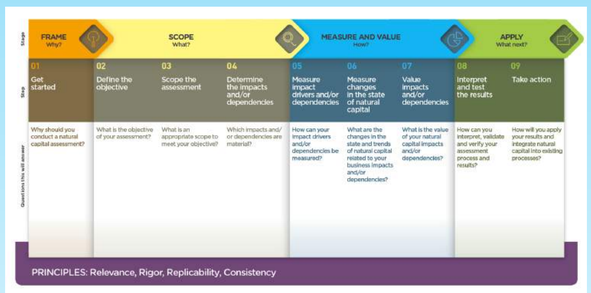


* = Valuation is an optional step

OVERVIEW

The natural capital approach is at the heart of the government's 25 Year Environment Plan and will drive better decision making and improved outcomes across a range of projects from flood risk management to water security and for a range of industries from water to development and infrastructure. APEM's easy and replicable 4 step approach can be used to:

- **Identify the most significant benefits and positive natural capital impacts for land owners, businesses, partners and customers.**
- **Identify risks as well as opportunities to optimise activities, for example in water resource schemes and habitat restoration projects.**
- **Monitor, measure and collate evidence for natural capital and ecosystem services.**
- **Support impact assessments such as EIA, HRA or impacts on the natural environment from pollution incidents etc.**
- **Carry out options appraisal to mitigate impacts and ensure no deterioration of the environment.**



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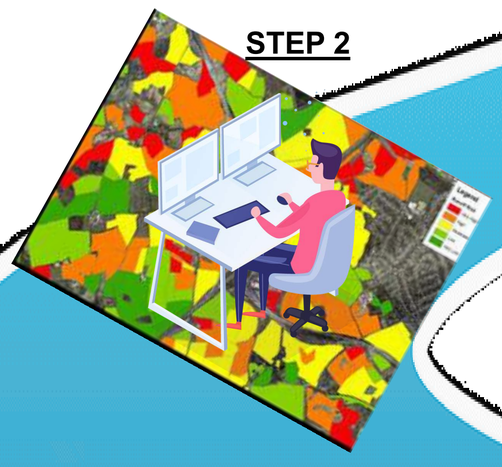

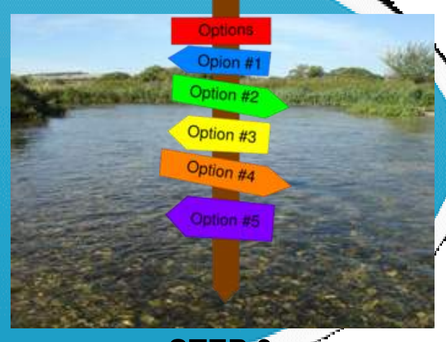

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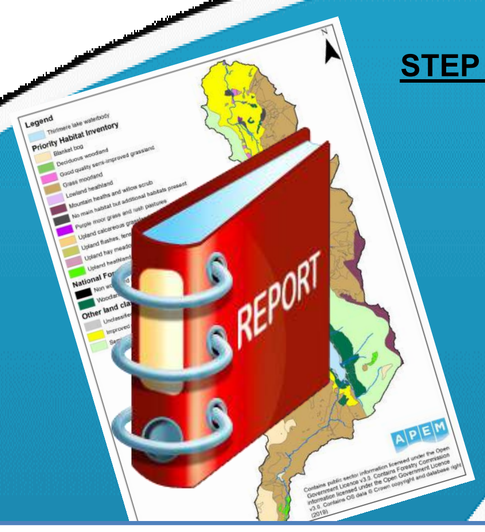

STEP 4

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- **Set the geographic scope;**
- **Set the assessment scope; and**
- **Identify the scope of indicators to be used for natural capital and ecosystem services.**

These three factors would be agreed with the project lead and the project steering group at a start-up meeting for any given project.

STEP 2: BASELINE

Materiality test and collate data

- **Based on the habitats being restored the relevant indicators and ecosystem services are identified;**
- **This would be expected to include a range of quantity (i.e. the extent of natural capital), quality (i.e. the condition of habitats) and ecosystem service flows (i.e. how the environment is used) indicators;**
- **Freely available data are collated in line with the indicators and habitats being restored. This could include WFD data, water quality, satellite images etc.**

Create maps, initial valuation and register

- **Maps are produced for each indicator (or set of) to show the natural capital related to the study area;**
- **Maps are designed to facilitate stakeholder involvement and show ecosystem services as well as natural capital;**
- **Where data isn't available for mapping the groupings would be used to provide a narrative to describe the natural environment and the benefits they provide to South west water and society in the study area;**
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STEP 3: OPTIONS APPRAISAL

- **Opportunity mapping used to identify best likely areas or options for natural capital and ecosystem services;**
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  - Effects on the quality of habitat in the area; and

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Example of potential scoring scheme

Impact Score	Scale of change in NC indicator
4	Significant increase predicted
2	Minor increase predicted
0	No change predicted
-2	Minor decrease predicted
-4	Major decrease predicted

Valuation (optional)

- **Any valuation would be part of the options appraisal and impact assessment steps as they would provide indications on the values and therefore costs to implement any of the most beneficial options.**

STEP 4: REPORTING AND RECOMMENDATIONS

Updating registers

- **Updated to show future baseline(s)**
- **Set out so can be valued**

Reporting and recommendations

- **Succinct map based reports**
- **Natural Capital action plans**

MONITORING AND IMPLEMENTATION

Important to provide evidence on effectiveness and value of actions

- **Monitor natural capital indicators**
- **Track progress against objectives**
- **Integrated programmes based on standard monitoring for efficiencies**

CONTACT FOR MORE INFORMATION

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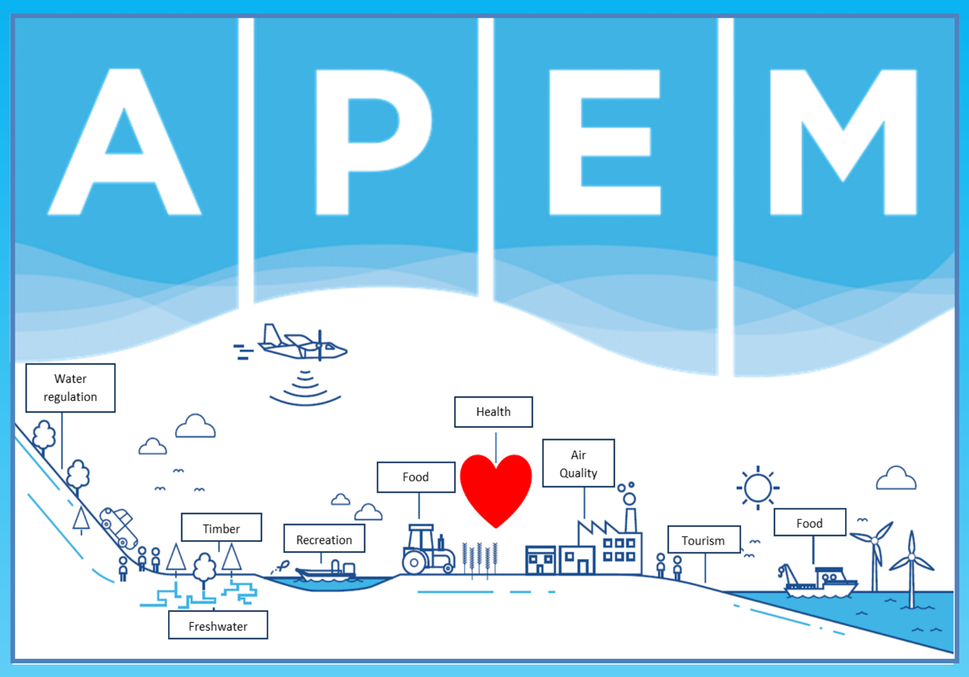
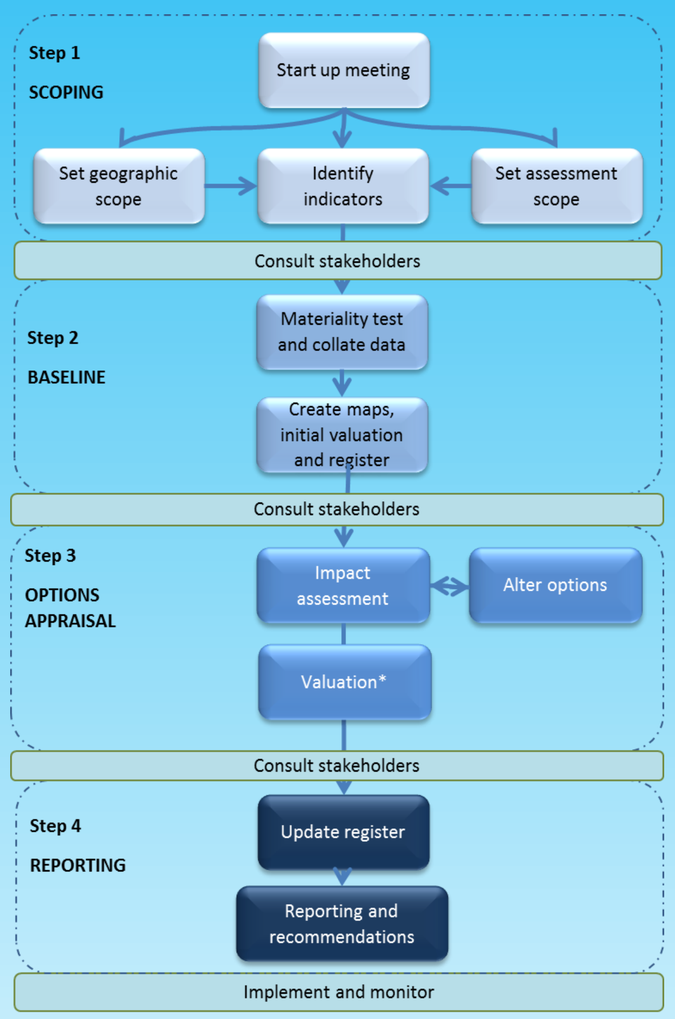
Natural Capital and river restoration: A possible approach





* = Valuation is an optional step

OVERVIEW

The natural capital approach is at the heart of the government's 25 Year Environment Plan and will drive better decision making and improved outcomes across a range of projects from flood risk management to water security and for a range of industries from water to development and infrastructure. APEM's easy and replicable 4 step approach can be used to:

- **Identify the most significant benefits and positive natural capital impacts for land owners, businesses, partners and customers.**
- **Identify risks as well as opportunities to optimise activities, for example in water resource schemes and habitat restoration projects.**
- **Monitor, measure and collate evidence for natural capital and ecosystem services.**
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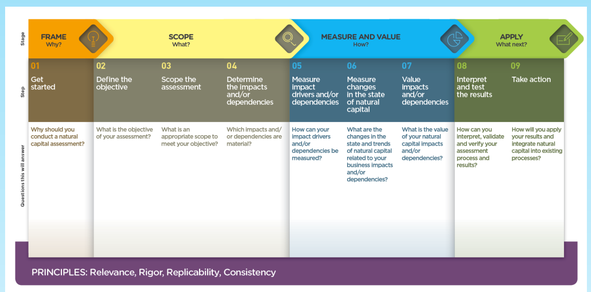

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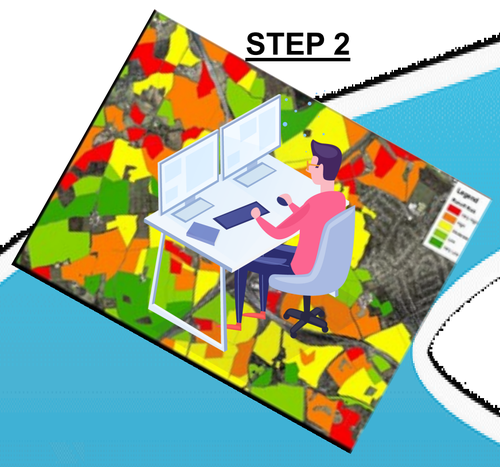

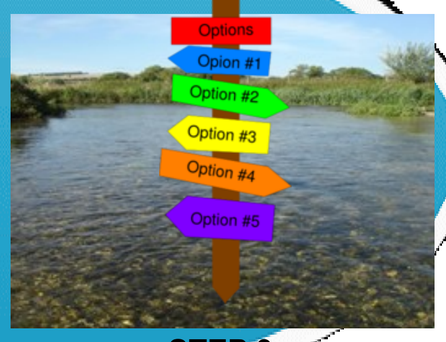

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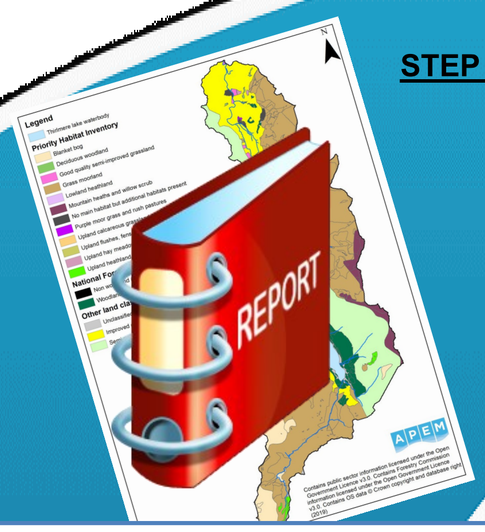

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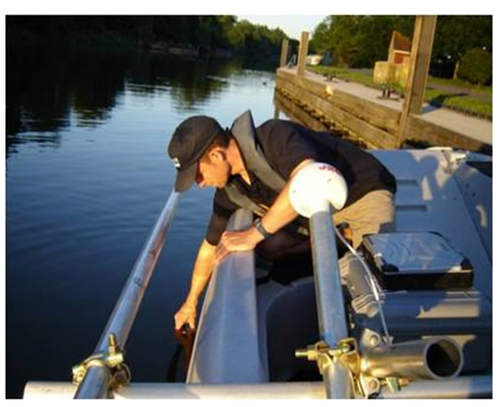

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OUTSIDE THE POLYTUNNEL

Samantha Jane Hughes (SERT), Bella Davies (SERT), Alex Adam (RT), Michelle Fountain (NIAB EMR) & Alan Turner (KCC)

- Promoting sustainable water management on commercial horticulture polytunnel sites.
- Building resilient supply chains based on best practice measures for water and environmentally friendly farming.
- Contributing to CaBA

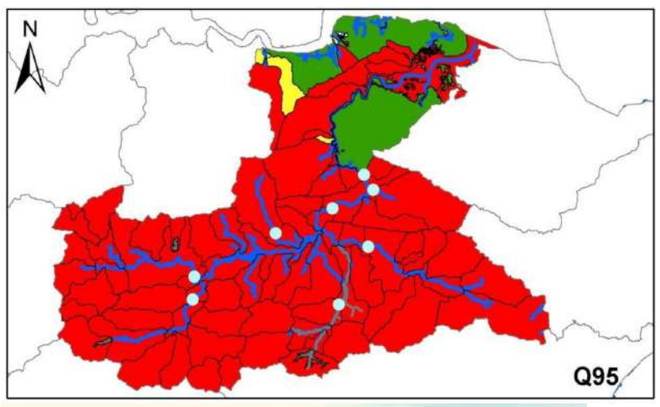
The Good

In a time of economic uncertainty and doubts over global food production, polytunnel horticulture is a positive. Medway polytunnel trickle irrigated horticulture is a rapidly growing economic activity that has doubled in the last 5 years and now forms a significant part of the 36% of UK soft fruit produced in London & the South East.

The Bad

Water availability and management are major issues in the Medway; one of the driest and most densely populated catchments in the UK. Fully abstracted and licenced Medway surface waters and groundwaters limit capacity to accommodate new licenses for polytunnel farmers. Many polytunnel farmers lack specialist advice, training and technical support on water management and are unaware of polytunnel impacts on the wider environment.

Excess runoff from trickle-fed fertigation can affect the water quality of local watercourses. Flashy runoff of rainfall from polytunnel polythene can cause localised flooding and soil erosion that impacts local watercourses and can damage local infrastructure.



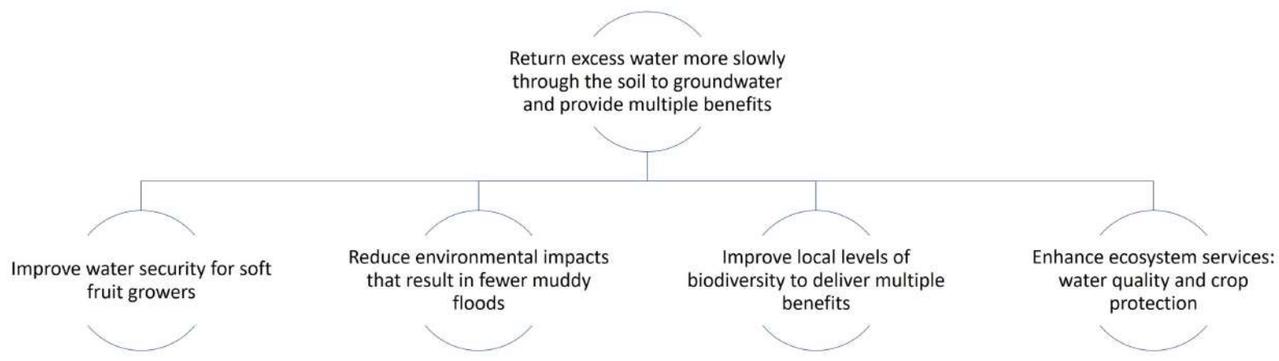
Most of the Medway is "maxed out" for water abstraction licensing but polytunnel horticulture is a water-dependent and rapidly growing, economically important sector. There is a need to balance water demand and environmental needs.

Holistic Water for Polytunnel based Horticulture

With water scarcity and environmental impacts in mind, SERT, Kent County Council and NIAB EMR teamed up to develop the "Outside the Polytunnel" (**OTPT**) project.

OTPT will develop measures for sustainable water management around polytunnel systems to produce multiple benefits for farmers and other stakeholders in the Medway catchment.

OTPT will research, test and demonstrate nature based water capture and retention features (floral interventions, wetland water treatment, silt traps and biodiverse ponds) that deliver multiple benefits to improve water security for Medway polytunnel farmers and benefit the environment . The project will work closely with Medway polytunnel supply chains to test and demonstrate OTPT systems and benefits. Guidance and advice will be made available to new and existing polytunnel farmers to encourage "buy in" to the OTPT concept.



OTPT will research, test and advise on options on interventions for water capture. The WET Centre at NIAB EMR (East Malling, Kent) is the OTPT "go to" demonstration site for suppliers.

OTPT is testing combinations of floral interventions that improve soil condition and infiltration to reduce runoff. Work has started at the WET Centre at NIAB EMR, and will roll out to commercial polytunnel ventures in the Medway that will serve as demo sites.

Floral interventions can help provide many other ecosystem services. Combinations of retention features such as biodiverse ponds and floral interventions at polytunnel sites will improve biodiversity and water quality and reduce runoff. The presence of more pollinators and insect predators will reduce the need for pesticide use, saving money for polytunnel farmers and benefitting the environment

The OTPT team will work closely with new and established polytunnel farmers and stakeholders in the Medway catchment to test OTPT elements in situ. The OTPT team will produce readily available and understandable Project Planning Guidance documents and advice for both new and established polytunnel farmers on the benefits of adopting the OTPT approach.

Part of a bigger picture

OTPT is one of six projects the Rivers Trust is promoting across the UK to develop water stewardship by bringing together businesses from across sectors, with stakeholders from UK governments and NGOs, to tackle the collective challenge of water stresses through catchment management. Building on mature partnerships, the 6 projects focus on stressed and vulnerable catchments in key sourcing areas to develop actions that address issues in CaBA partnership plans. The projects build on best practice to demonstrate benefits of collective action. **OTPT** is currently working with M&S, Tesco, Sainsburys, Natural England and selected water companies but is actively inviting other retailers and stakeholders to participate.

Come to the OTPT launch event on the 1st May at NIAB EMR in East Malling, Kent to find out more!

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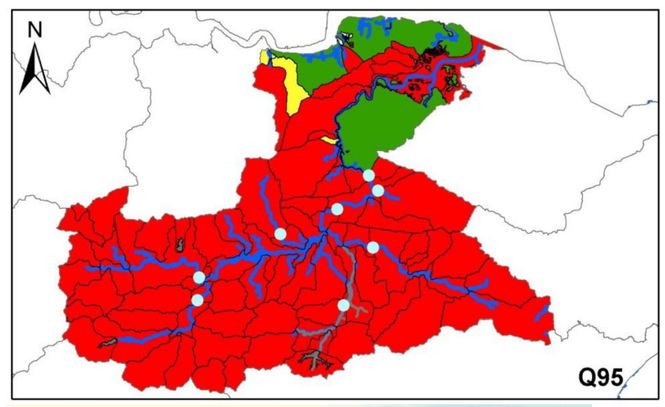

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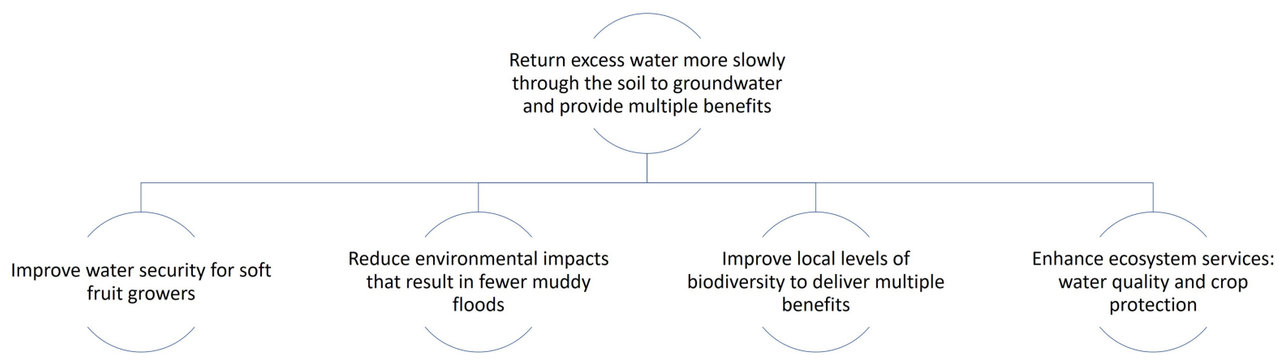

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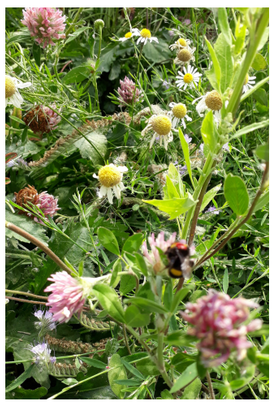

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PROWATER: South East England

Protecting and Restoring Raw Water Resources through Actions at the Landscape Scale

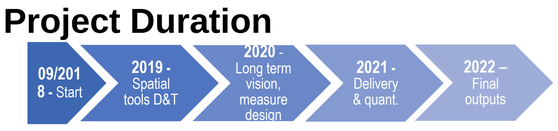
Interreg 2 Seas Mers Zeeën PROWATER
European Regional Development Fund

Project Background

Climate change will lead to **hotter, drier summers and wetter, warmer winters** in England. Increased flood risk **and higher likelihoods of drought periods** are expected. The availability and quality of raw water depends on regional climate, geology and land use. In South East England, the majority of drinking water comes from **groundwater resources**. These also feed globally rare **chalk streams** and so support not only a rapidly growing population but also important biodiversity. The landscapes connected to them are often characterised by the chalk which plays a crucial role in how groundwater bodies are recharged. Groundwater, as well as rivers in the area, are often already heavily abstracted and facing future pressures:

- **Urbanisation** resulting in sealed surfaces and rapid runoff
- **Climate Change** impacting rainfall patterns and recharge seasons
- **Housing development** increasing demand and pollution

Project Duration



Key Outputs

- GIS-based targeting and impact quantification tool
- 3 pilot sites (increase raw water availability & multiple benefits)
- Payments for Ecosystem services scheme
- Long term vision & policy recommendation on implementation of ecosystem-based adaptation measures to climate change & PES schemes

Regional Partners:
South East Rivers Trust
Kent County Council
(incl. Kentish Stour CP)
South East Water

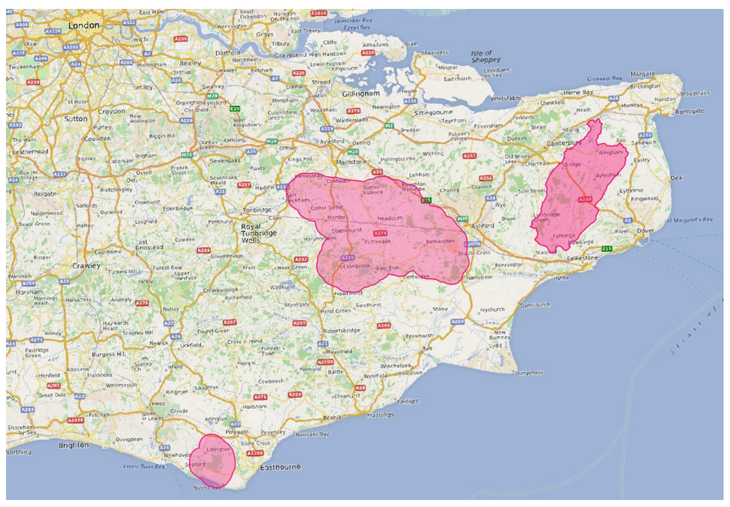
Regional Observers:
Southern Water
SES Water
Affinity Water
Natural England

Funding:
European Regional Development Fund (60%) - € 889,547 in the SE Region

South East England Pilot Areas

To protect and restore water resources, actions at the landscape scale to **increase recharge potential and protect habitats** are necessary. Land use impacts the delivery of clean water and other ecosystem services. Land management decisions need to take these into account, making trade-offs explicit. A **Payments for Ecosystem Services** scheme will increase uptake of adaptation measures by allowing providers of Ecosystem Services to be compensated or incentivised by those benefitting.

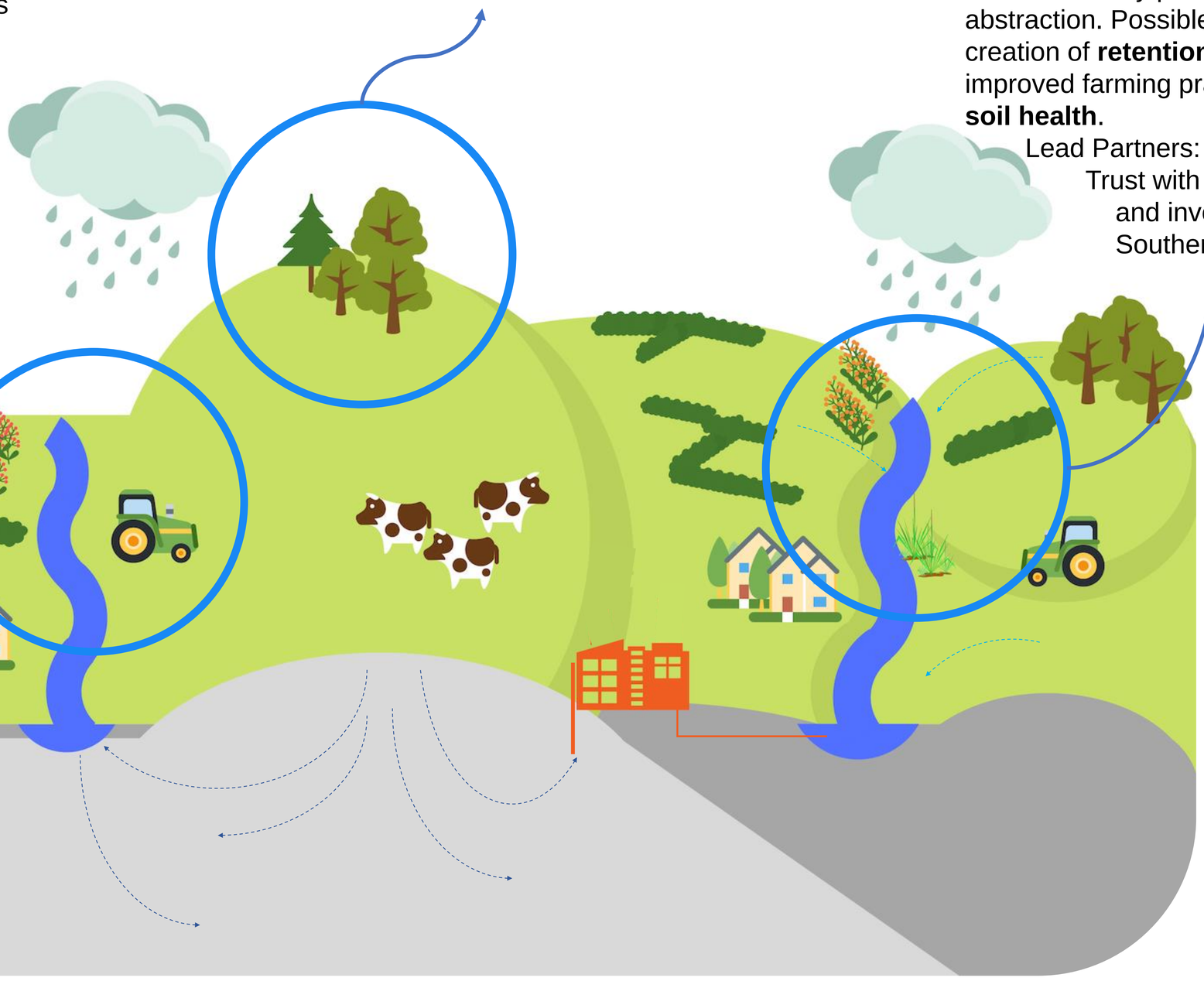
Measures will be delivered in 3 pilot areas in South East England to proof the concept of increasing infiltration and providing multiple benefits through ecosystem-based adaptation measures. They will be based on the spatial targeting tool developed in the project and the long term vision built with beneficiaries and providers of the ecosystem services.



The **East Kent Chalk** aquifer, part of the North Downs chalk block, provides drinking water as well as baseflows to the Little Stour (focus of the pilot). Arable farming and horticulture are key land use types in the catchment which suffers from low flows. Possible measures to improve recharge and increase resilience include improving farming practices to **improve soil health** and crop choice as well as **habitat conversion.** Lead Partners: Kent County Council (w Kentish Stour CP) with South East Rivers Trust.

Friston Forest is owned by South East Water and managed by the Forestry Commission. The area, sitting on top of the chalk aquifer, was planted in the 40s to increase rainfall. It was later found that the pine forest reduces recharge as it intercepts precipitation. Options **are conversion of remaining coniferous areas** into **broadleaf forest** or **chalk grassland**, reduction of forest cover and creation of **attenuation features** to increase recharge again. Lead Partners: South East Water with South East Rivers Trust

The **River Beult** is a tributary of the Medway and runs through a clay catchment. As such, it provides little recharge to the aquifer and contributes mainly to surface water abstraction downstream. Rapid runoff affects water quality, and the timing of discharge means it is only partly available for abstraction. Possible measures include creation of **retention features** and improved farming practices to **improve soil health**.
Lead Partners: South East Rivers Trust with Kent County Council and involvement from Southern Water.



south east rivers trust

south east water

Kent County Council kent.gov.uk

Kentish Stour Countryside Partnership

ses WATER

Affinity Water

Southern Water

Natural England

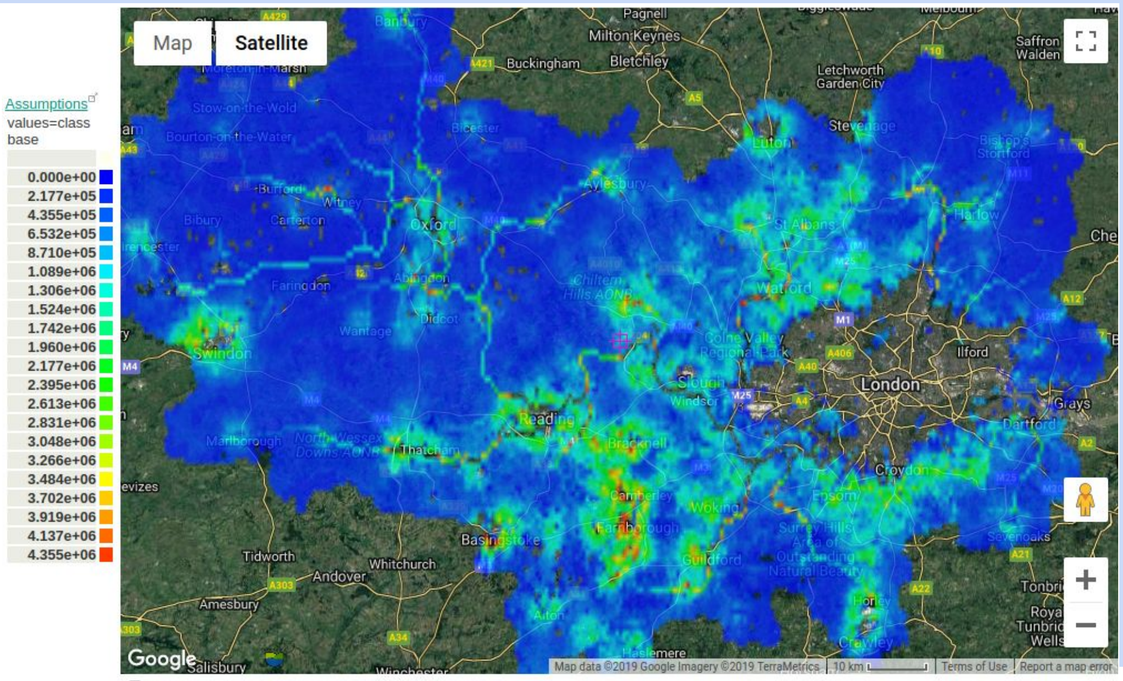
//SmartRiver: Leveraging the Internet of Things to assess the effectiveness of Natural Flood Management and its co-benefits.

KING'S College LONDON
Department of Geography

AmbioTEK
Technology Environment Knowledge
www.policysupport.org

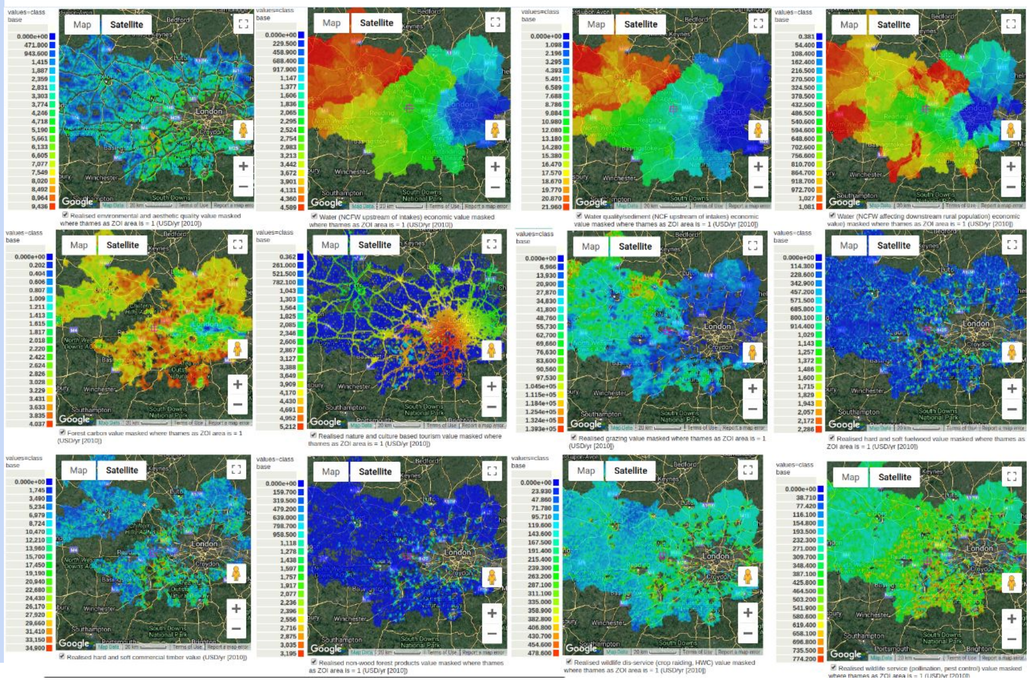
Here we use a series of tools to operationalise strategic planning and investment for Natural Flood Management

Flood mitigation is an important ecosystem service provided by natural capital. The same natural capital has a variety of co-benefits. Both can be mapped using Co$tingNature

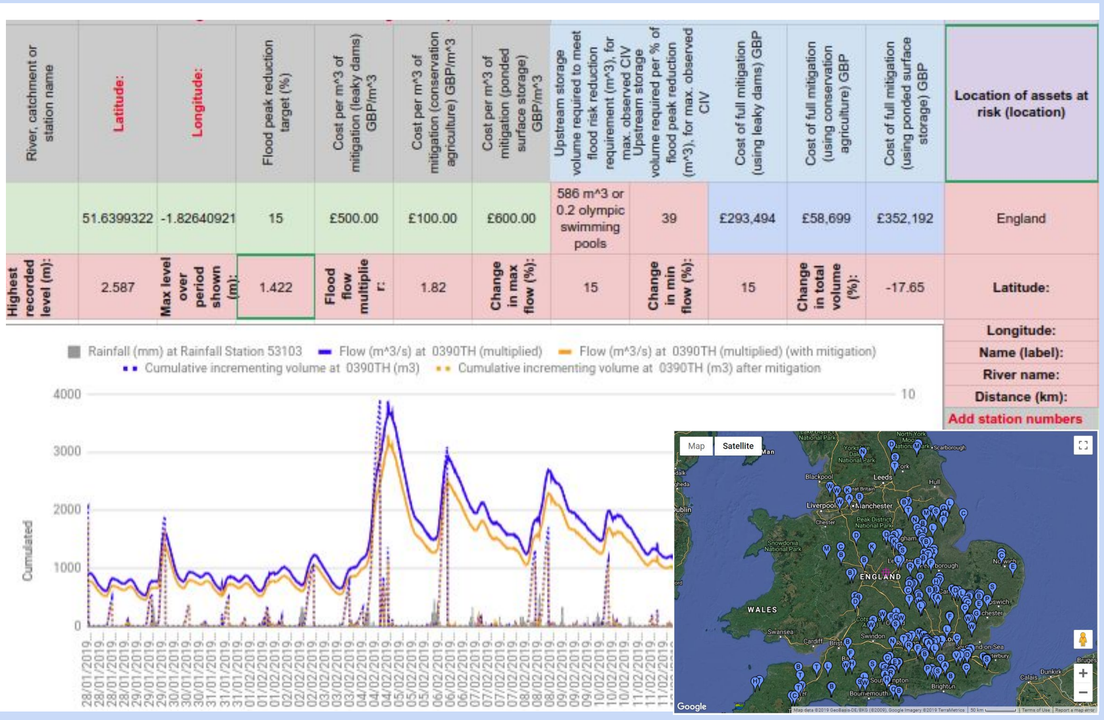


<GDP at risk mitigated by natural capital in the Thames

Co-benefits for 12 other ecosystem services>

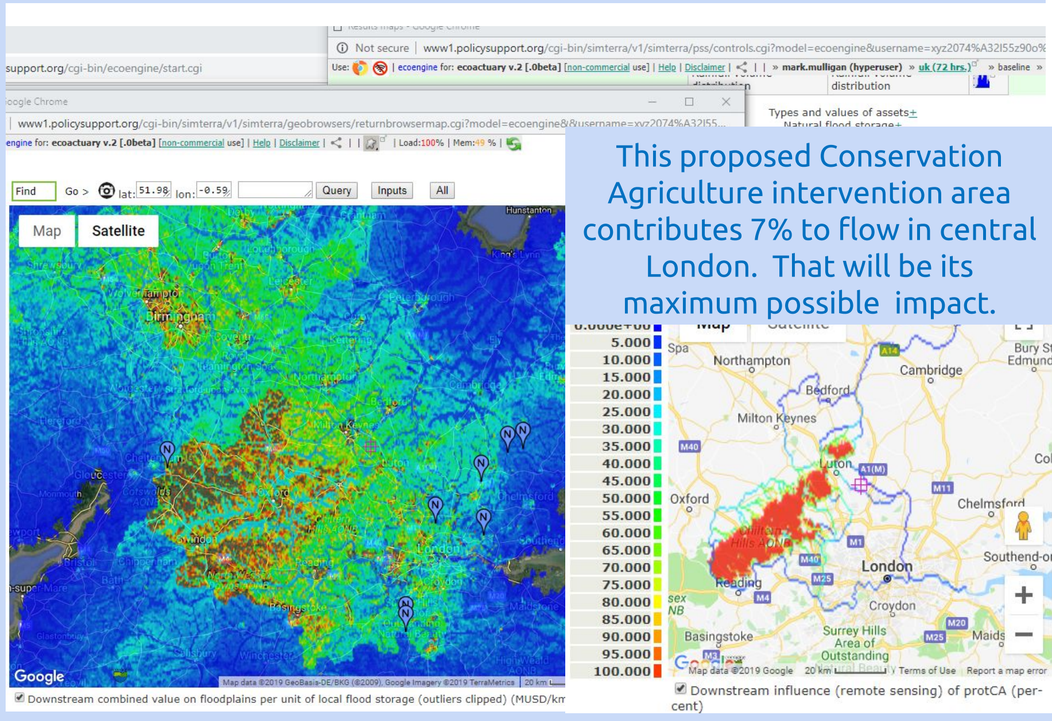


Managing these benefits involves protection of existing natural capital but also development of new, through investments in Natural Flood Management. These investments must be strategically placed to make a difference: Eco:Actuary help plan and locate the best sites for investment



<Eco:Actuary investment planner to examine scale of intervention needed

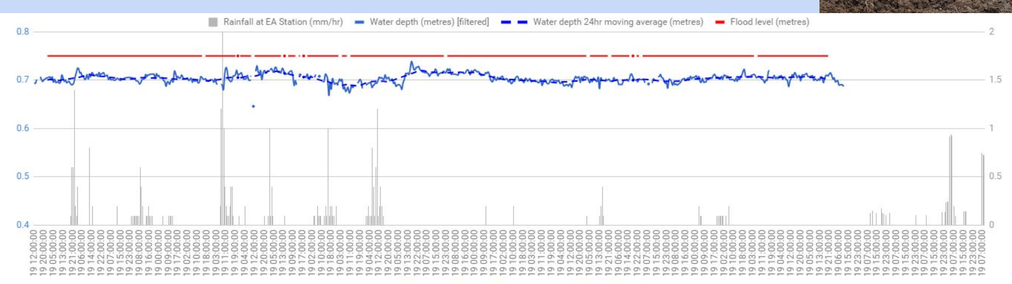
Eco:Actuary spatial model to understand where to invest for maximum return>



This proposed Conservation Agriculture intervention area contributes 7% to flow in central London. That will be its maximum possible impact.

They must also be monitored for their effectiveness: //Smart:River measures the impact of interventions on flood peak reduction downstream directly and in real time, connecting through the Internet of Things

Our //Smart:River web connected, low cost, DIY sensors are monitoring the contribution of leaky dams, retention ponds and conservation agriculture to flood mitigation at sites throughout England



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More information at
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