ADUR AND OUSE CATCHMENT MANAGEMENT PLAN

December 2012

Understanding and improving all aspects of water within the Adur and Ouse catchment

Adur & Ouse
PARTNERSHIP

Version	Date	Control reason
Draft v1	22 June 2012	
Draft v2	6 July 2012	
Draft v3	12 July 2012	
Draft v4	3 August 2012	Updated Coastal Waters objectives
Draft v5	21 September 2012	Final objectives, draft targets and actions, all themes
Draft v6	18 October 2012	Final targets and actions, all themes
Draft v7	29 October 2012	Revised format, additional sections, introductions, case studies, plain English and consistency changes to targets and actions.
Draft v8	11 November 2012	SWQ T&F group introduction and revisions to actions; NF T&F group revisions to Natural Rivers section.
Draft v9	11 November 2012	Revisions to structure and additional sections; changes to all theme sections for consistency and plain English.
Draft v10	20 November 2012	'Draft for consultation' removed. 'Lead' column in objectives/ targets/ actions tables populated in part. Minor amendments.
Draft v11	11 December 2012	Completion of 'Lead' column, minor amendments.
Final	17 December 2012	Minor amendments and sign-off by Steering Group.

FOREWORD

Our local waters connect people, places and wildlife throughout the counties of East and West Sussex, and have played a central role in the history of how communities have settled here. The rivers Adur and Ouse have been important trade routes since Roman times, particularly for the iron industry. As the Saxons followed and worked the land, upstream settlements determined the place of now familiar towns including Lewes, Uckfield and Henfield. New Shoreham and Seaford established themselves as essential trade hubs until, in the 16th Century, a man-made cut was made to take the river directly to the sea at 'New Haven' and our two ports at Shoreham and Newhaven were born. We now rely on local groundwater for most of our public water supply.

Natural waters are clearly essential to our lives and livelihoods, our wellbeing and our heritage. Over time pollution, intensive land management and development have taken their toll on the quality of our local waters. This is being addressed through careful land management, planning and regulation and the last 30 years has witnessed dramatic improvements in quality. Despite this, our water environment is still at risk from pollution and the competing demands of society.

We want to encourage everyone to work better together to protect and enhance the health of the rivers Adur and Ouse, their underlying groundwater and the coastline. We have established the Adur and Ouse Partnership to do help do this and, over the past twelve months, have embarked on a process of dialogue and participation around a shared vision to *understand and improve all aspects of the water environment in the Adur and Ouse catchment.*

This Catchment Plan presents the results of dialogue so far and in writing it, we are seeking to raise awareness of our catchment's water environment and what needs to be done to protect and enhance it for the benefit of everyone. Organisations, businesses and local communities all have a part to play, through partnership working, in attracting funding, and delivering environmental improvements though events, education and direct work.

This document is not a done deal, it is just the start of a journey on which communities, organisations and companies work together to improve our local waters. We want you to become part of this ambition and to play whatever role you can to make our local waters a valued amenity and a healthy resource for people and wildlife. This Plan is not intended to be a contract document and is instead an agreement in principal between all the organisations signed up on a best course of action necessary to improve the water quality

We plan to review this document over time so that it reflects the views of all who choose to work collaboratively to realise its objectives. In this way the document is owned by everyone interested in improving the environment of the Adur and Ouse catchment. Much is being done at local level and more is planned, but there is still a need for others to get involved.

We hope that you will work with us to take the action required to realise our vision.

Henri Brocklebank
Chair of the Adur and Ouse Partnership

CONTENTS

1 INTRODUCTION

This draft Catchment Management Plan sets out a suite of objectives, targets and actions to galvanise true, integrated management of the Adur and Ouse water catchment. It has been produced by the Adur and Ouse Partnership, established in November 2011 to initiate an integrated catchment approach, by drawing together relevant organisations and groups.

The Partnership will now seek further advice, input and collaboration from many more organisations and individuals, all having a part to play, to develop and deliver actions that will protect the catchment's assets now and into the future.

The need for a catchment based approach was validated by Government in spring 2011, to help deliver the objectives of the European Water Framework Directive as well as Government's Natural Environment White Paper 2011. These National and European goals aim to protect and improve environmental assets, without compromising local social and economic aspirations. Transparent engagement and collaborative working between many people, at a realistic scale, is fundamental to success.

Defra commissioned ten pilots in the spring of 2011 to explore and evaluate existing and new engagement and collaboration techniques. The Adur and Ouse catchment is one of those ten pilot sites. Read more on this initiative at http://www.environment-agency.gov.uk/research/planning/131506.aspx

The brief of the pilot initiative was to *"provide a clear understanding of the issues in the catchment, involve local communities in decision-making by sharing evidence, listening to their ideas, working out priorities for action and seeking to deliver integrated actions that address local issues in a cost effective way and protect local resources."*

The Adur and Ouse Catchment Management Plan is a milestone on this journey.

Adur and Ouse – the place

The catchment area is a beautiful part of the South coast of England, showcasing typical rolling downland, stark white cliff faces and the rivers Adur and Ouse flowing over chalk and sand bedrock, to their highly urbanised estuaries.

The area is socially and economically diverse, supporting rural and agricultural communities throughout, and bounded by coastline that boasts the city of Brighton and Hove and the ports of Newhaven and Shoreham. Main inland towns include Lewes, Haywards Heath and Burgess Hill.

Poynings Stream

The Adur and Ouse river systems are shown schematically in relation to the coastline on pages 6 and 7. Underlying these surface water systems are large swathes of chalk and alluvium-holding groundwater.

The rivers, groundwater and coast are highly valued by those who live and work here. These natural assets provide drinking water, water for irrigation and livestock, port and navigation facilities, commercial fisheries, recreational pursuits and tourism, and a wide range of native plants and animals that maintain biodiversity and general wellbeing. The quality and quantity of water, and its ability to move and flow in a natural way, are fundamental to sustaining these assets.

Sections 3.1 to 3.6 of this plan describe the ecological, social and economic values associated with this water, categorised under six themes: coastal waters, fisheries, groundwater, natural rivers, surface water quality and – as an umbrella theme – engagement.

Adur and Ouse Partnership

The Adur and Ouse Partnership, established primarily for the purposes of integrated catchment management and delivery of the Water Framework Directive, is supported by a broad range of organisations and individuals, representing a whole host of interests.

The complex nature of the environment cannot be successfully managed in 'pockets' by isolated groups. Information needs to be shared and acted upon in a considered, collaborative and holistic way, to allow the most valued aspects of the water environment to be agreed upon, paid for and benefited from by all.

At the heart of the Partnership is the Steering Group, which directs and coordinates relevant activities and projects within the catchment. The Steering Group comprises representatives from the following organisations:

- Brighton & Hove City Council/ Biosphere project
- Environment Agency
- Forestry Commission
- National Trust
- Natural England
- Ouse and Adur Rivers Trust
- South Downs National Park Authority
- South East Water
- Southern Water
- Sussex Inshore Fisheries and Conservation Authority
- Sussex Wildlife Trust
- University of Brighton

The Steering Group has been instrumental in the production of this Plan, initially by identifying common ground that all represented organisations can focus on, and which is captured by the Partnership's vision.

"Understanding and improving all aspects of water within the Adur and Ouse catchment"

In working towards this vision, the Steering Group created bespoke task and finish groups, to explore six key themes that represent 'all aspects of water within the catchment'. These themes, and the way in which they form (and inform) the Partnership and the Steering Group, are shown below.

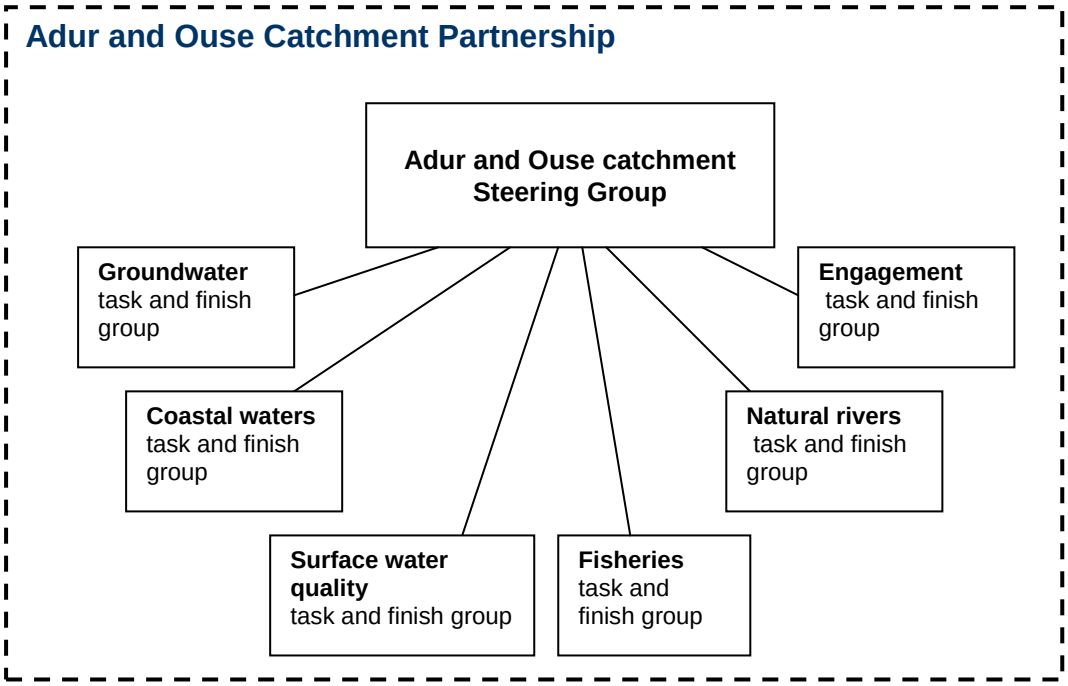


Figure 1: Schematic of the Adur and Ouse Partnership

There are four core elements that run through each theme, which are integral to achieving the vision:

- Evidence – the need to establish and make accessible a shared knowledge hub, which identifies, drives and helps to prioritise improvement activities
- Funding – the need for ongoing work, by everyone committed to achieving the vision, to identify and secure funding opportunities for improvement activities
- Engagement – the need to understand perceptions and aspirations, raise awareness and empower people to own issues and take action
- Activities – the need to deliver on-the-ground projects and initiatives that result in real-life changes to the water environment

The structure of this plan considers each theme individually, and presents objectives, targets and actions for each in section 3.

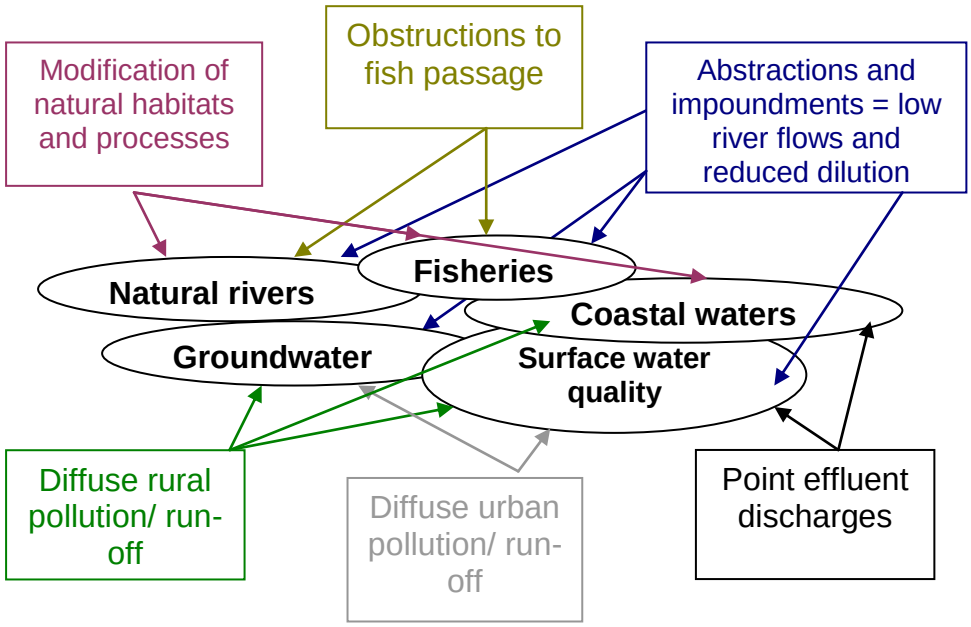
Objectives have been written for each theme, and, for each objective, there is a set of targets, against which there are a number of actions to be delivered. The package of objectives, targets and actions are tabulated for each theme in the following sections and should be read with reference to the maps showing surface and groundwater status on pages 11 & 12.

Pressures

Existing evidence shows that water in the catchment, and the benefits it provides, is under pressure from a known range of issues. Indeed the very drive for integrated management implies that combined pressures exist. In the Adur and Ouse catchment, these can be summarised as:

- Abstraction of raw water for public supply and, to a lesser extent, agricultural use (potentially exacerbated by drought conditions);
- Point source discharges, such as treated sewage effluent or domestic appliances misconnected to clean-water drains, inputting nutrients to surface and groundwaters;
- Diffuse source inputs via surface water run-off from both urban and rural land, such as washed-off fertiliser applications and heavy metals from roads;
- Modifications to the shape and functioning of rivers and coastlines, reducing natural habitat diversity and flood water storage areas.

This plan is structured against six themes, to enable logical train of thought and categorisation of the many actions proposed. However a single pressure, from traditional land management methods and redundant channel structures, to existing sewerage infrastructure and new development, can adversely affect several aspects of the water environment. This means that many of the actions contained in this plan cut across the six themes in the following ways:

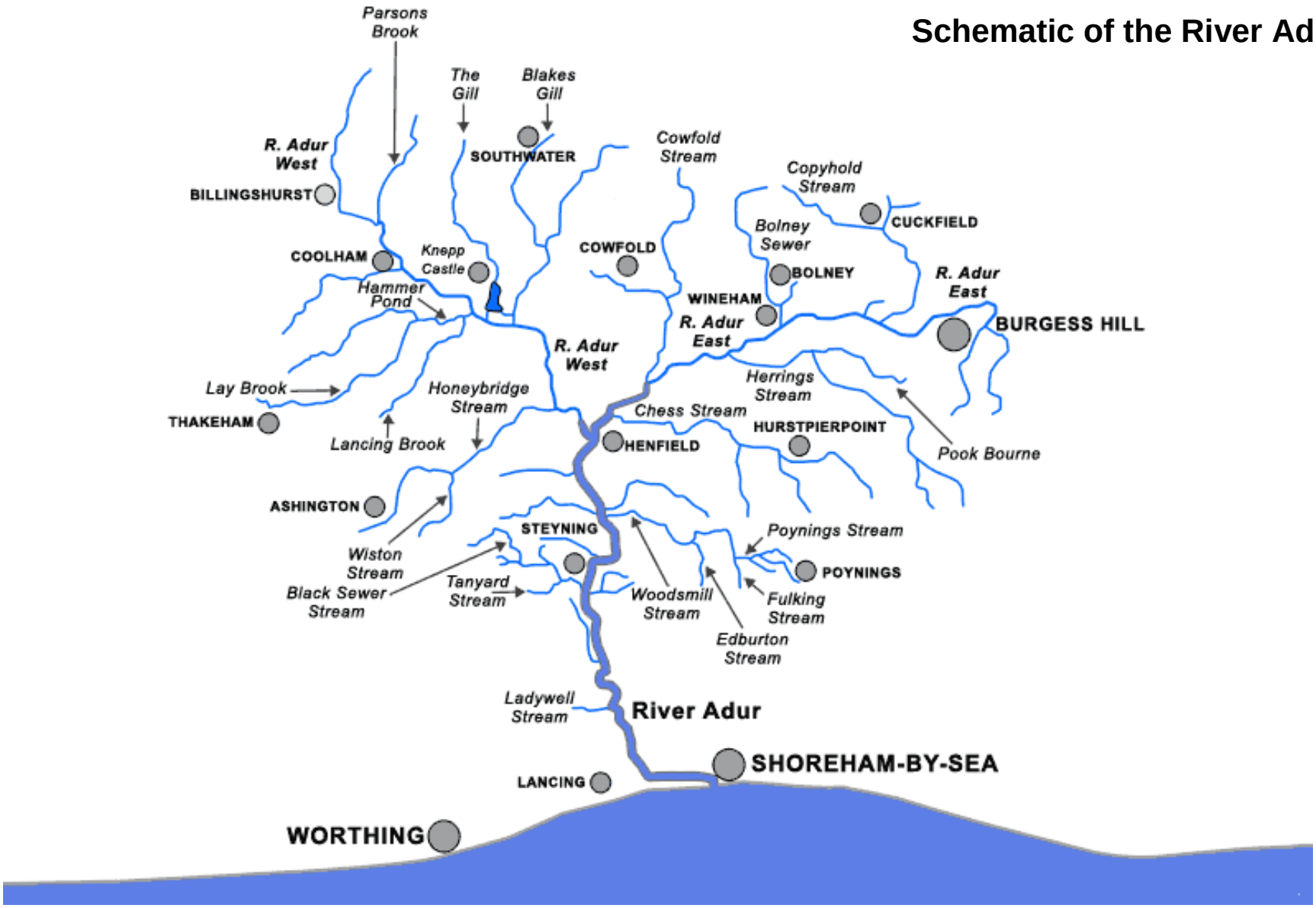


So it follows that solutions initially designed to address a discrete environmental problem will also, often directly, address other problems in the same location. This gives rise to multiple benefits from a single improvement activity, which is the best outcome environmentally and financially. Integrated catchment management is truly realised when the majority of activities result in multiple benefits. Implementation of this plan will strive to identify, appraise and realise multiple benefits.

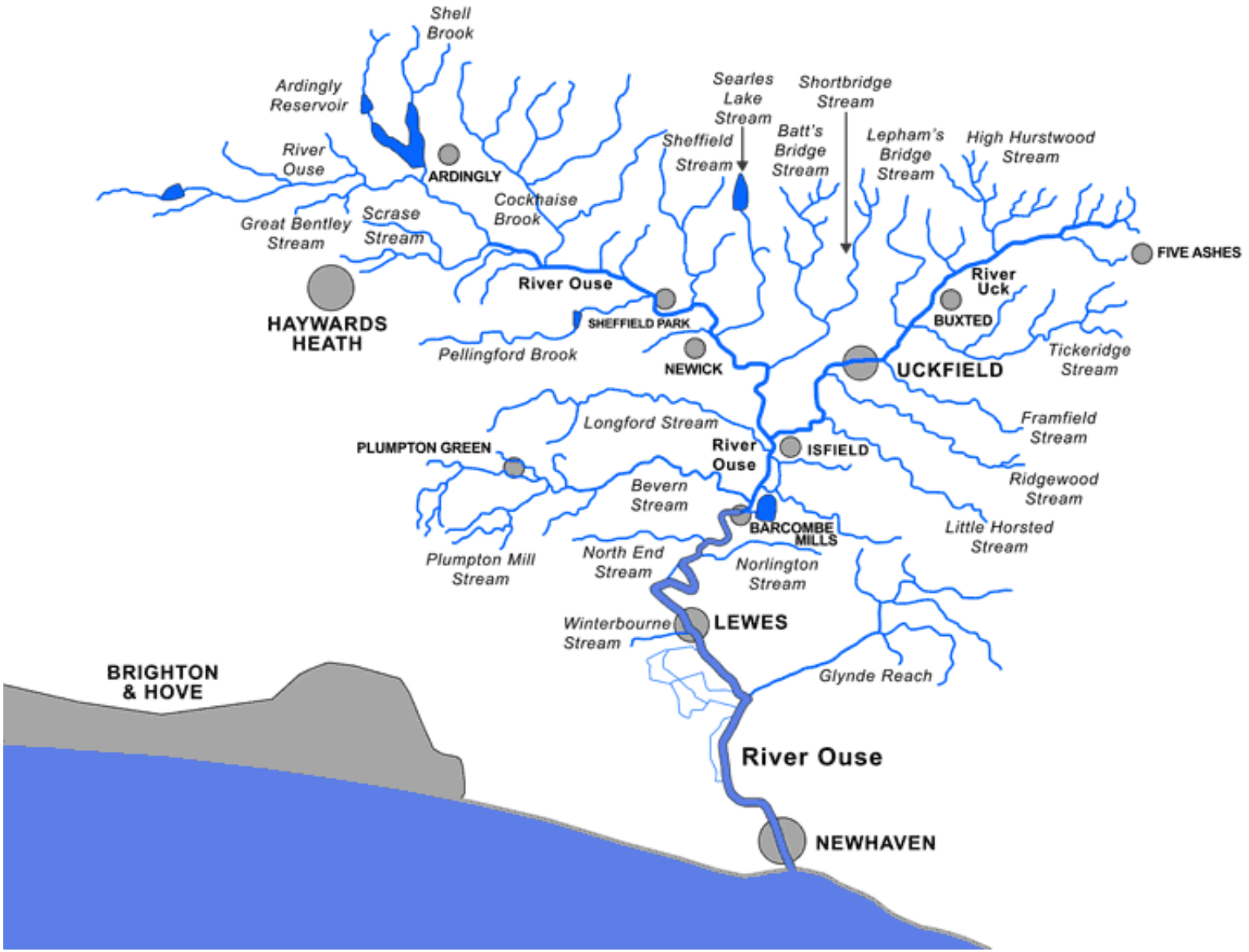
Multiple benefits from working across 'themes'

- An *engagement* initiative to promote best farming practice will result in widespread use of land management techniques (such as buffer strips, fencing and appropriate fertiliser application) that will improve *surface water quality* to the benefit of *fisheries*, and help to protect *groundwater* quality too.
- A project to remove an in-channel structure will improve *fisheries* by enabling migratory fish to move further upstream, whilst contributing to *natural rivers* in terms of flow regime and habitat enhancement.
- Flood risk management schemes incorporate techniques that enhance *coastal* habitats and incorporate *natural river* floodplains for storage of flood waters.

Schematic of the River Adur



Schematic of the River Ouse



2 THE WATER FRAMEWORK DIRECTIVE

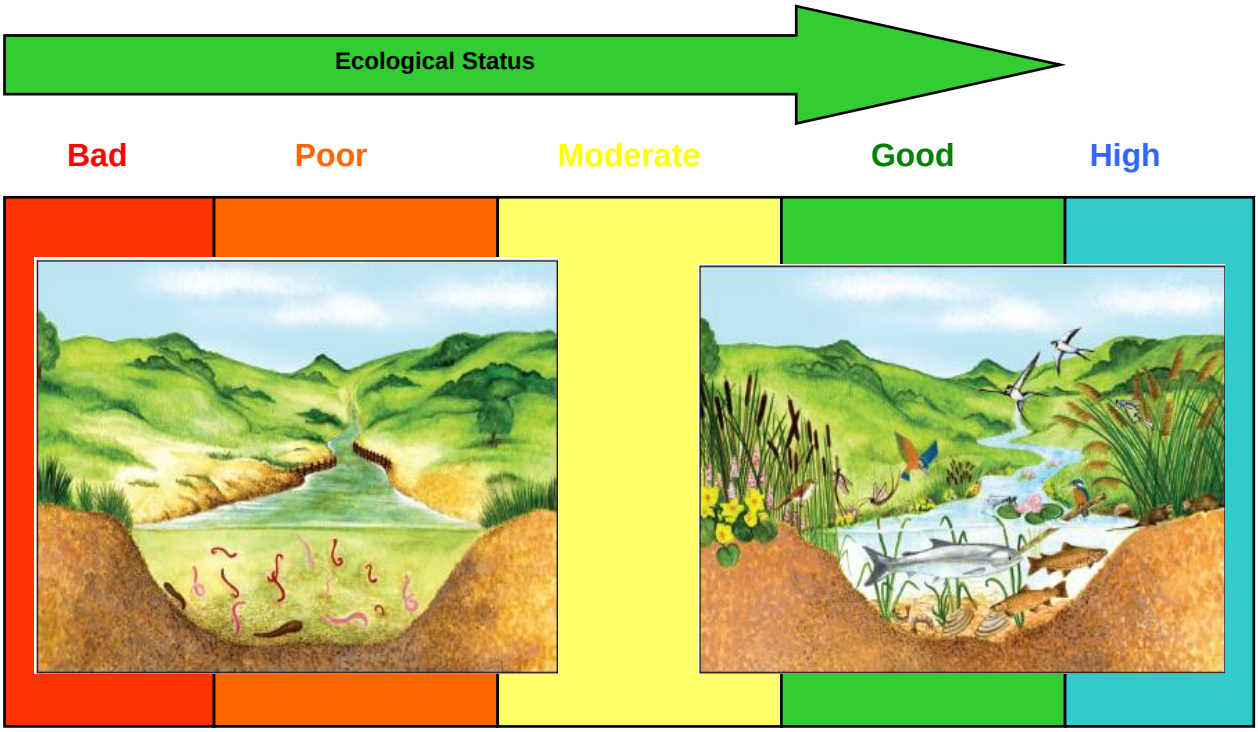


Figure 2: Waterbody classification 'status'

The over-arching objective of the Water Framework Directive 2000 (WFD) is to achieve **'good ecological status/ potential' in all waters.** The aim is to protect, improve and sustain all surface freshwater bodies (rivers and lakes), groundwater, estuaries and coastal waters the water environment across the European Union.

It embodies the principle of working together to achieve more, by providing a consistent framework throughout the European Union against which to plan and manage, and by using ecology to help measure the health of water.

The WFD is implemented through river basin planning, which introduces a six-yearly cycle of planning, action and review. This iterative planning cycle 'classifies' the state of all waters by measuring chemical, biological and ecological elements to provide a baseline condition every six years, against which to assess improvements or deterioration. That baseline condition of each waterbody is then matched to one of five colour-coded status categories: bad, poor, moderate, good or high, as shown above. For groundwater, quantity and chemical quality elements only are measured, and the classification categories are good or poor.

The WFD requires that the planning process takes place at the "river basin" scale to ensure the integration of landuse and water resource management, resulting in an improvement in water quality. This may be considered synonymous, in many ways, with integrated catchment management. The WFD provides a methodology for measuring the state of the water environment, together with a cyclical planning framework with which to align any catchment management or delivery plan. In turn, catchment-scale plans list and justify the actions needed to tackle the pressures faced in a particular geography.

Objectives of the Water Framework Directive

Environmental objectives for surface waters:

- prevent deterioration in status of waterbodies
- aim to achieve good ecological and chemical status in water bodies by 2015
- aim to achieve good ecological potential for artificial/ heavily modified waterbodies by 2015
- achieve the objectives and comply with the standards for protected areas, where relevant
- reduce pollution from priority substances, discharges and emissions
- cease losses of priority hazardous substances into the aquatic environment

Environmental objectives for groundwater:

- prevent deterioration in status
- aim to achieve good quantitative and chemical status by 2015
- reverse any significant and sustained upward trend in pollutant concentrations
- comply with objectives and standards for protected areas, where relevant
- prevent or limit input of pollutants into groundwater

Evolution of the WFD and its principles is described at
http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm

It is acknowledged that many waterbodies, particularly main rivers and coastlines, have been modified over the years for the purposes of navigation, flood defence, water supply and urbanisation. The WFD allows these waterbodies to be designated as 'heavily modified' with an alternative target of good ecological *potential*. There is no measurable target that defines when good potential is achieved, however general principles indicate that it is when the ecology observed in a waterbody is as good as it can be without compromising the social and economic uses of that water.

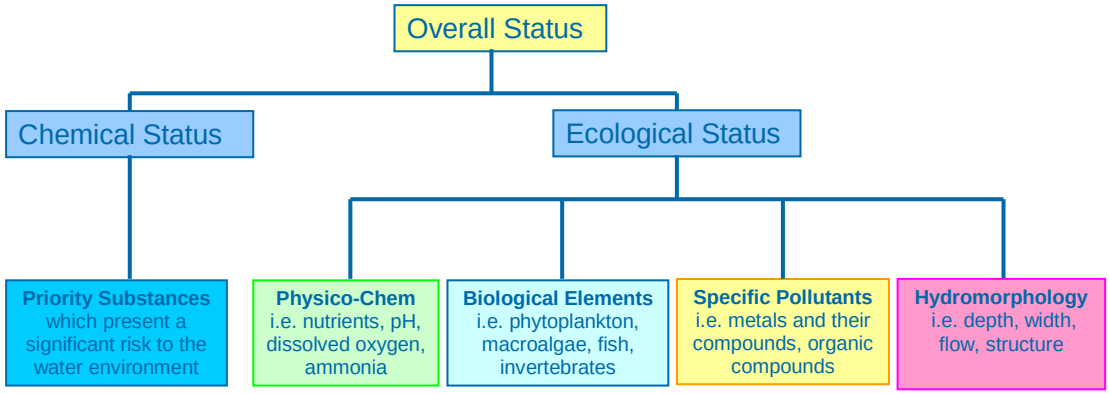
Parameters used for classification

To classify the status of any waterbody within a river basin district, a whole host of biological, chemical and physical parameters are measured. They fall into four categories, as follows:

- Biological quality (fish, benthic invertebrates, aquatic flora)
- Hydromorphological quality such as river bank structure, river continuity or substrate of the river bed
- Physical-chemical quality such as temperature, oxygenation and nutrient conditions
- Chemical quality that refers to environmental quality standards for specific pollutants

Specific target ranges are specified for each of these parameters, influenced by the geology and environmental designations particular to the region. If even one such target is not met, the water body will not be classed as achieving good status. This is called the 'one out all out' rule.

The way in which these parameters are considered in combination, to assess ecological status (for surface waters) and chemical status (for groundwater) are shown in the flow chart below:



The status of water in the Adur and Ouse catchment

The baseline status of waterbodies in the Adur and Ouse catchment was first published in the South East River Basin Management Plan in 2009. The Adur and Ouse is one of nine catchments that comprise the South East River Basin District, and warrants a variety of actions to achieve good status or potential across the area. The 2009 classification status of all 61 waterbodies in the catchment are shown in figures 3 and 4. Figure 5 shows the main pressures causing surface water bodies to fail to achieve good status/ potential.

This Catchment Management Plan has been developed with the objectives of the WFD in mind. That is to say, many of the targets and actions have been developed specifically to help achieve good status, because the WFD is a significant driver, with associated funding opportunities, for several organisations in the Partnership.

In synchronising integrated catchment management with river basin planning (and the objectives of the WFD) there is a need to strike a balance between environmental, social and economic needs to make catchment management truly sustainable. This introduces the concept of ecosystem services, and the need to assess the benefits of any action against how much it costs to implement. The ecosystem approach is discussed further in section 5.

The South East River Basin Management Plan can be viewed at http://www.environment-agency.gov.uk/research/planning/33106.aspx

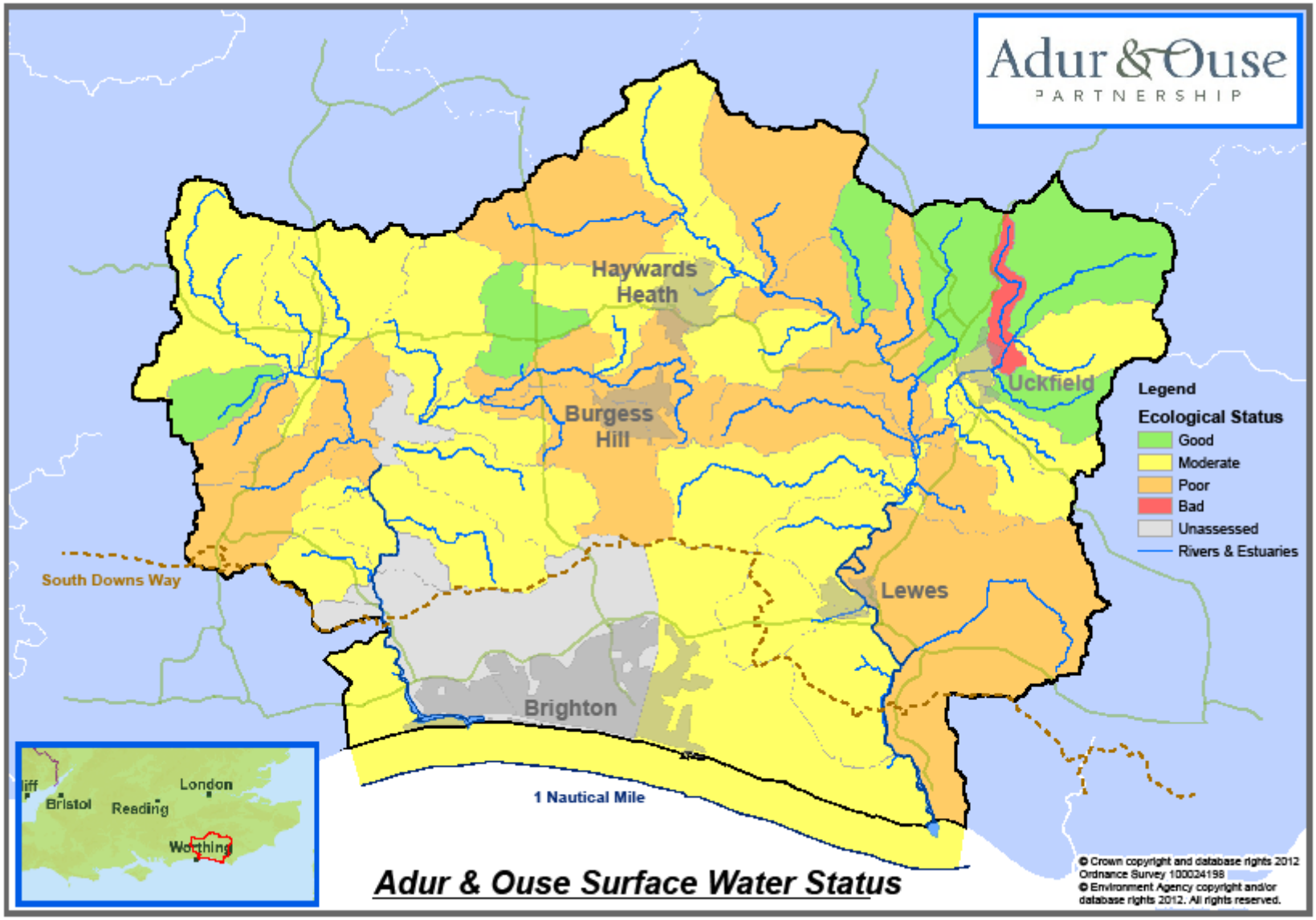


Figure 3 – 2009 baseline classification status of surface and coastal waters in the catchment

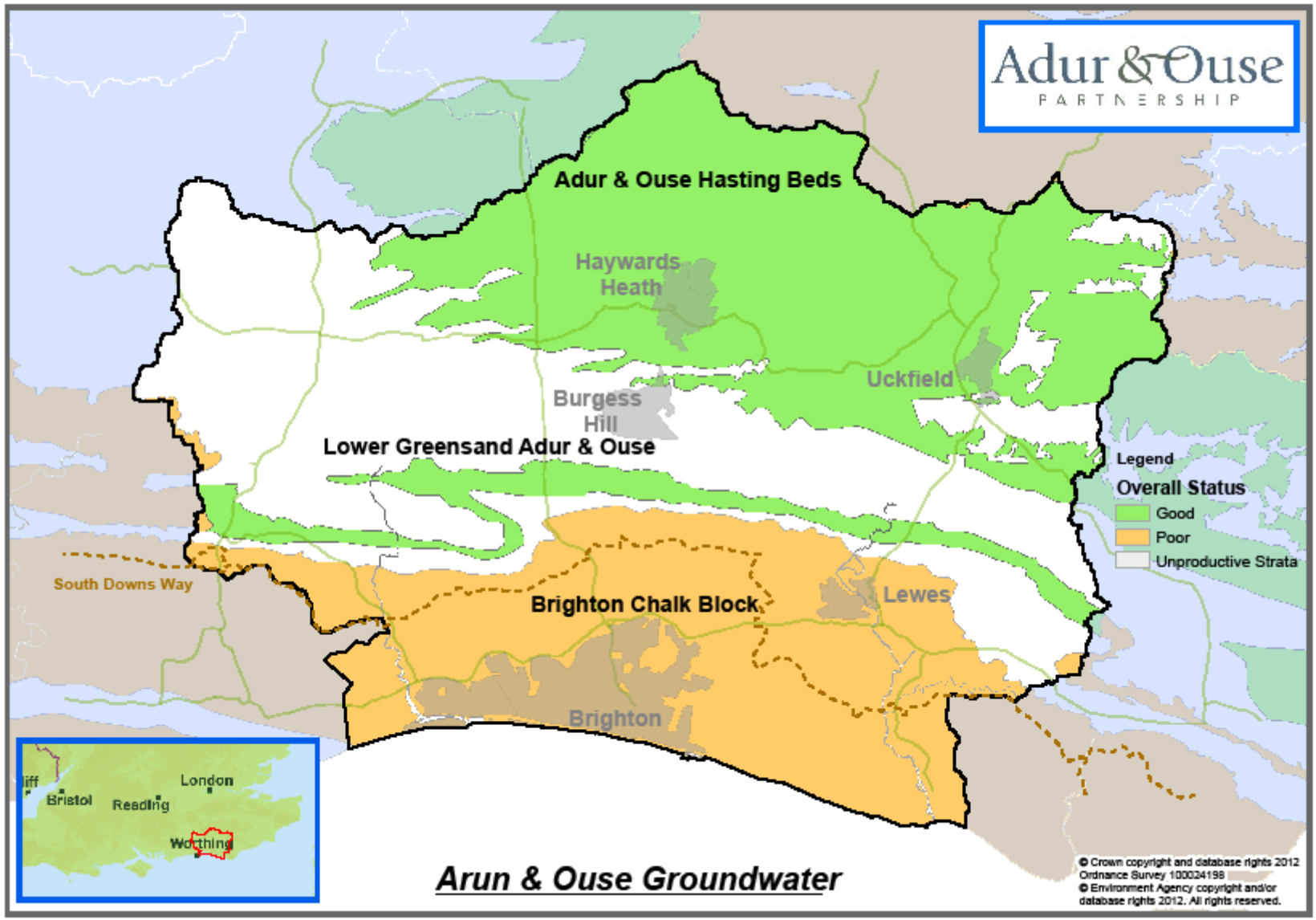


Figure 4 – 2009 baseline classification status of groundwater in the catchment

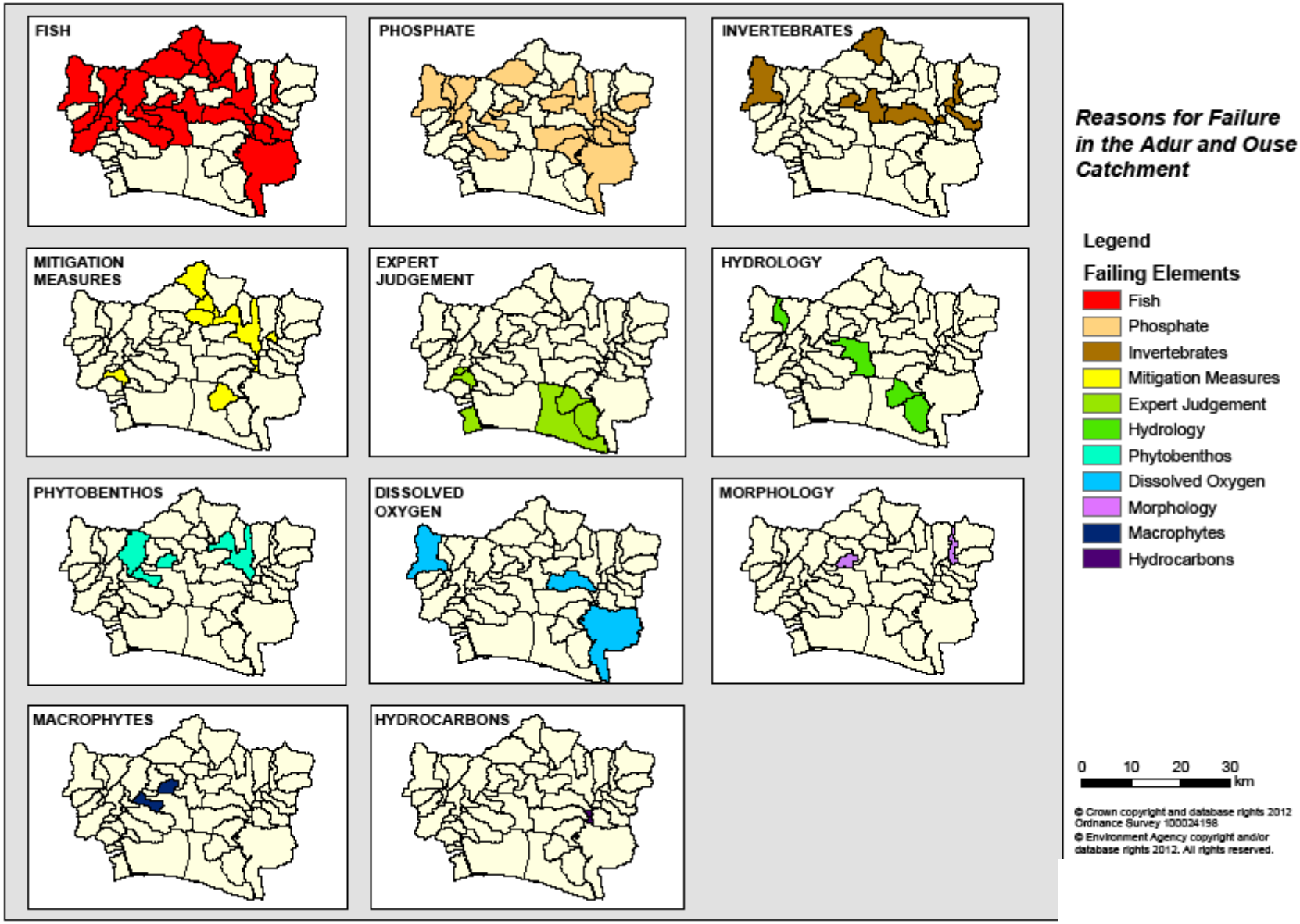


Figure 5 – top reasons for surface water bodies failing to achieve good status in the catchment

3 OBJECTIVES, TARGETS AND ACTIONS

This plan presents a suite of 21 objectives, with associated targets and actions, designed to understand and improve all aspects of water within the Adur and Ouse catchment.

The 21 objectives are listed in the table below, followed by sections 3.1 to 3.6, which present the work of each theme discretely.

Although each theme is presented in separate sections, evidence, funding, engagement and activities are clear, common threads across all targets and actions, because each is necessary to scope, justify and deliver environment improvements. Monitoring, academia, funding streams and the need for projects and engagement are essential components of these common threads, as shown in figure 6.

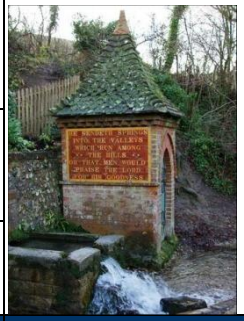
Actions currently underway

About 40% of the actions in this plan are already underway, either wholly or in part. These are highlighted green in sections 3.1 to 3.6, together with the organisation leading the work). These actions have either secured discrete funding or have an established mechanism for delivery. The case studies presented demonstrate just a handful of work that is funded and being delivered on the ground. Figure 6 shows the funding streams currently available and being utilised by many organisations in the Partnership. Identifying actions that are already underway allows synergies to be seen and exploited within and across themes, so that multiple benefits (including for evidence gathering, funding and on-the-ground projects) can be delivered through existing or new work.

Although a good proportion or actions can readily be delivered, this plan is necessarily aspirational. It is acknowledged that the funding needed to deliver all the actions in the Plan is not yet secured or available. Indeed one of the purposes of the Partnership is to facilitate cooperative efforts to seek and secure resources from a wide range of avenues, in an ongoing and persistent way. This approach needs to evolve and, as such, engagement objectives and actions are not as well advanced as for other themes.

Appraisal of the benefits to society, the economy and the environment is an essential step in justifying investment in many of the actions identified. This is discussed further in section 5.

Objectives for the Adur and Ouse catchment

1		**Coastal waters**
1.1		Facilitate actions to achieve good ecological status and good ecological potential in transitional and coastal waters
1.2		Use evidence to establish a better understanding of the marine environment and its pressures
1.3		Promote stakeholder understanding and support for sustainable marine environments
2		**Groundwater**
2.1		All risks to groundwater quality and quantity will have been identified and communicated using the 'ecosystem approach' through sharing of evidence, leading to a good understanding of the functioning of the aquifers and ecosystem services
2.2		More sustainable urban and rural land management will significantly reduce pollutants reaching groundwater such that diffuse pollution does not contribute to further deterioration of groundwater quality
2.3		Groundwater quantity within the catchment will be at sustainable levels, balancing both availability and demand within the context of an integrated supply network
3		**Surface Water Quality**
3.1		Research and investigate the current status of surface water quality in the Adur and Ouse, and establish and maintain a reliable evidence base to underpin this work
3.2		Adopt or set up a comprehensive monitoring programme to measure the progress and success of surface water quality improvement work
3.3		Tackle pollution in the Adur and Ouse catchment from both urban and rural sources
3.4		Encourage urban and rural populations, land and watercourse managers to play a positive role in sustainable river and water management*

4		**Fisheries**
4.1		All constraints and risks to the establishment of thriving fish populations (comprising an appropriate range of species) within the Adur and Ouse systems will be identified
4.2		Fisheries within the catchment will provide enhanced recreational opportunities and economic benefits
4.3		The effects, on fish and fisheries, of restoring rivers to a more natural state will be clearly identified and taken into account in river restoration plans
4.4		The potential impacts of climate change on fish and fisheries within the entire catchment, and appropriate adaptation measures, will be clearly identified
4.5		Issues, and appropriate actions, relating to fish and fisheries in tidal waters will be clearly identified
5		**Natural rivers**
5.1		Collate and maintain a high quality evidence base on all aspects of re-naturalising waterbodies in the catchment
5.2		Monitor the condition, extent and connectivity of riparian and wetland habitats in the catchment
5.3		Identify, research and find funding sources for re-naturalisation projects throughout the catchment
5.4		Encourage urban and rural populations, land and watercourse managers to play a positive role in sustainable river and water management*
6		**Engagement**
6.1	**Have your say!**	Seek to understand more about current perceptions and aspirations for the water in the Adur and Ouse catchment
6.2		Raise awareness of the water environment through active engagement of landowners, local communities, volunteers and other interested parties
6.3		Empower people to own local issues, and promote and take action on local solutions, within the framework of the wider catchment through sharing knowledge, partnership working and engagement

* shared objective

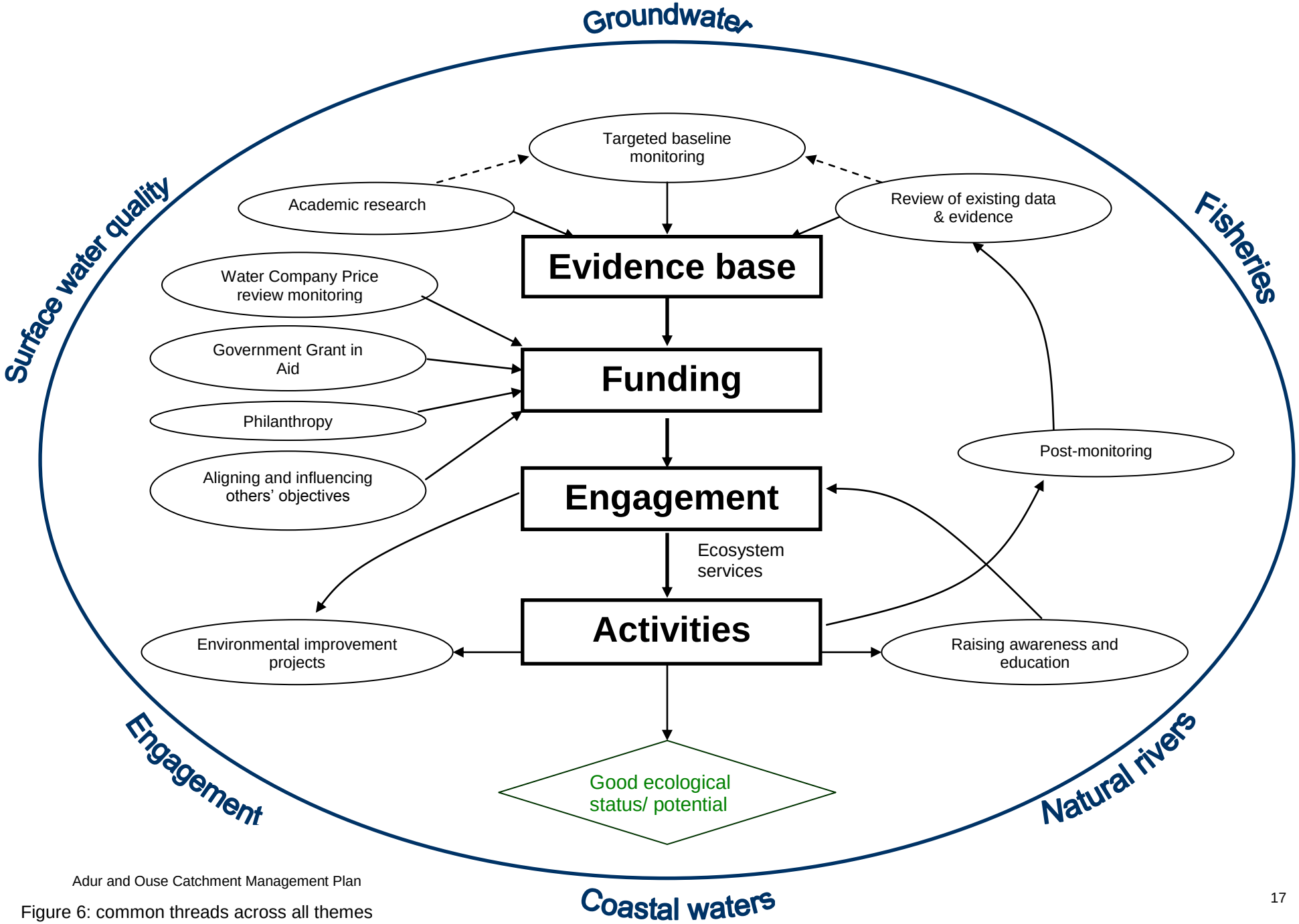


Figure 6: common threads across all themes

3.1 COASTAL WATERS

Understanding and improving all aspects of water within the Adur and Ouse catchment

Arial view of Shoreham Harbour (on the Adur estuary)

The area

From Selsey Bill to Beachy Head, the catchment's coastline consists of diverse and iconic coastal land and seascape, providing a wealth of different habitats for marine wildlife.

The coastal waters sit on a flat, gently shelving platform, making them generally shallow and moderately exposed. In the east of the catchment, these waters lap against the iconic chalk cliffs where, below the water, the chalk is eroded to form chalk galleys rich in aquatic species. A discontinuous chalk ledge runs parallel to the coast as far as Brighton following a 10m depth contour. This ledge gives rise to a unique series of low, underwater chalk cliffs that face north towards the beach, notably Kingswest Ledge, Looe Gate and South-west Rocks.

To the west of the catchment, particularly offshore of Brighton, significant sand wave fields exist, where the bedrock forms outcrops of mixed sediment habitats. Brighton Marina adds another dimension of habitats in the pontoons, which support shallow sub-tidal algal species usually found in deeper waters.

The coastal waters are frequented by a variety of marine cetaceans, such as harbour porpoise, as well as supporting a host of bird life. The area is particularly important to gulls, auks, gannets and kittiwakes, but rarer species such as peregrines, terns, sea ducks, grebes and fulmar are also seen.

The issues

The coastline and the sea have always been at the heart of the attraction of Sussex. Not only do they provide a haven for the many and varied wildlife, coastal waters are highly valued for transport, fisheries and tourism.

The estuaries of the rivers Adur and Ouse, which open to the sea at Shoreham and Newhaven, in particular have developed into busy transport hubs, which are fundamental to local and national movement of goods and consequently of high economic importance to local communities.

The estuaries also provide a large area of intertidal mudflat, which not only acts as valuable feeding ground for many wading birds, but also forms important juvenile nursery grounds for fish. As a result, marine fish populations provide a significant economic benefit to the area through commercial and recreational fisheries. Species such as sole, plaice and bass are particularly important to the region's fishery and economy. As a tourist destination, the coastline has always provided healthy bathing waters as well as recreational fishing facilities.

The opportunities

The quality of coastal and estuarine waters is fundamental to the economic and social value of fisheries and tourism, as well as marine habitats and wildlife. However the same geographic area needs to accommodate the development needs of harbour transport, commercial fishing activities and local communities.

The Sussex coastline and it's estuaries are designated as 'heavily modified' waterbodies under the Water Framework Directive. Over time, they have to reach 'good ecological potential'. This means managing these waterbodies in a way that maximises the health and diversity of the ecology without compromising the economic and social requirements of the area. This is achieved by actively mitigating against the impacts of local activities.

The natural coastal environments have no doubt shaped, and been shaped by, ecological systems, economic activities and coastal communities as communities have moved in and evolved. This will continue to happen, but needs to happen in a joined up way that ensures development and commercial activities benefit from the natural environment, without natural processes deteriorating. In this way this iconic coastline will remain vibrant and alive.

Sussex Coastal Habitats Inshore Pilot (SCHIP) Project

Velvet swimming crabs in rocky habitat off Brighton

Sussex Wildlife Trust is working in partnership with the Sussex Inshore Fisheries and Conservation Authority (IFCA) to help improve the health of the marine environment off Sussex.

As part of the Sussex Coastal Habitats Inshore Pilot (SCHIP) project, partners will work with decision-makers, local experts and key stakeholders to develop a better and shared understanding of the habitats, species and pressures on the Sussex coastal water body. This stretches from Selsey in the west to Beachy Head in the east and out to 1 nautical mile.

A key output will be the creation of a habitat map for the Sussex coastal water body, far more accurate and detailed than anything else that currently exists. Knowing what habitats are where is vital in directing management to where it's most needed.

Another element of the project will look at how the wider marine community can help gather data to assist in the assessment of the health of the marine environment. The need for more data on our marine environment has been highlighted through the current identification of Marine Protected Areas under the Marine and Coastal Access Act (2009). Sussex Wildlife Trust has been involved since the beginning of this process and has seen that the paucity of supporting data could result in many sites not getting the protection they desperately need. The SCHIP project will help to start to address this in the region.

Central to this projects philosophy is that all of the outputs will be openly available to anyone who would like to see or use them. Once completed, the habitat map, GIS layers and reports will all be made available through the Sussex Wildlife Trust website (www.sussexwildlifetrust.org.uk)


Adur & Ouse
PARTNERSHIP
Haywards Heath
Burgess Hill
Uckfield
Saltmarsh Habitat
South Downs Way
Lewes
Brighton
Bathing Waters
1 Nautical Mile
Draft Marine Conservation Zone
London
Bristol
Reading
Worthing
Adur & Ouse Coastal Waters
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1.1	Facilitate actions to achieve Good Ecological Status (GES) and Good Ecological Potential (GEP) in transitional and coastal waters			
	These actions are to improve water quality and the 'naturalness' of the coasts, estuaries and marine ecosystems in the area, according to the overarching criteria of the Water Framework Directive.			
	Targets	**Actions**	**Lead (green if underway)**	**By**
1.1.1	Improve the naturalness of coasts and estuaries	Influence existing coastal defence strategies and dredging regimes by establishing and promoting protocols that mitigate against the impacts from these activities on natural processes and ecology. Impacts may include, for example, geomorphological or landscape changes, scouring of sea bed.	Partnership Task & Finish Group	2020
		Review the available recommendations on how to mitigate against impacts from coastal defence and dredging activities, make suggestions for amendments where appropriate, and use these to influence existing and future coastal strategies and regimes	Natural England, Partnership Task & Finish Group	
		Review existing coastal defence measures and navigational dredging, and influence the future review of these strategies and plans, for the purpose of ecological enhancement and the reduction of impacts		
1.1.2	Where opportunities exist seek to reduce pressures on the marine ecosystem	Identify pressures on coastal waters and monitor those pressures; for example, the development of on and off-shore infrastructure, such as off-shore wind farms	Environment Agency, Partnership Task & Finish Group	2013
		Define barriers to achieving GEP in coastal and estuarine waterbodies		
		Support the integration of actions into local plans, that will contribute to achieving GES/GEP	Partnership Task & Finish Group	
		Promote sustainable fishing and encourage environmentally-friendly seafood choices	Inshore Fisheries & Conservation	

			Authority (IFCA)	
1.1.3	Support the creation and management of protected areas	Identify all protected areas in the waterbody and their objectives	Natural England, Environment Agency	2012
		Identify the status of the protected areas and the reasons for any failures	Natural England, Environment Agency	
		Identify actions to reduce failures		
		Support the marine protected area network and promote conservation of threatened and 'typical' habitats and wildlife	Partnership Task & Finish Group	
1.1.4	Improve water quality in the Adur and Ouse coastal and transitional waterbodies	Highlight the impact of 'upstream' activities on coastal waters as it relates to sources of nitrogen (in particular) and promote actions to reduce sources of nitrogen i.e. catchment sensitive farming	Environment Agency, Partnership Task & Finish Group	2018
		Take proactive steps to prevent infrastructure failures as a cause of pollution		
		Gather further data on the chemical status of inshore waters and in particular take action to further understand the influence of chemicals through the study of ecotoxicology		

1.2	Use evidence to establish a better understanding of the marine environment and its pressures			
	The actions needed to improve coastal waters need to be backed-up by a comprehensive suite of evidence showing the current state of natural habitats, the impact of human activity and the value of existing environmentally beneficial measures, such as Marine Protected Areas.			
	Targets	**Actions**	**Lead**	**By**
1.2.1	Undertake research that sheds light on the interactions between fishing, habitats and wildlife	Identify the effects of Sussex fisheries on marine life		2015
		Identify mitigation measures that could be introduced to minimise fisheries impacts. For example, equivalent schemes to the lobster pot escape hatches; enforcing the return of cuttlefish pots with eggs attached to the seafloor until hatched	IFCA	
1.2.2	Identify and support monitoring work that communities may undertake to support and extend the current monitoring programme	Identify existing monitoring of additional Indicator Species (such as birds / fish / invertebrates) and consider the relationship between these indicators and the classification status and methodology of coastal and estuarine waterbodies		2014
		Identify where opportunities exist to extend small fish and young fish monitoring programmes and support partners to undertake additional surveys	Environment Agency	
		Engage with and support existing monitoring programmes to improve current understanding of Sussex's seas. For example Seasearch, Shoresearch, Beach Cleans, indicator species searches.	Wildlife Trust, Partnership Task & Finish Group	
1.2.3	Understand the role of the estuaries in supporting commercial fish populations	Monitor coastal fish populations through 'young fish' surveys in coastal waters and develop a protocol to integrate young fish and small fish monitoring programmes	Partnership Task & Finish Group, IFCA	2015
		Consider the relationship between, and appropriateness of, monitoring tools and pressures	Environment Agency	
		Report on commercial fisheries landings into the coastal ports and identify where the landings have originated, using best available techniques.	IFCA, Marine Management Organisation	
1.2.4	Describe the Marine Protected	Describe and promote the role of, and protection afforded by, Marine	Partnership	2013

	Area network's contribution to the protection of the marine environment	Protected Areas (Marine Conservation Zones, Sites of Special Scientific Interest, Natura 2000 sites) status and condition to stakeholders, and facilitate partnerships and engagement between organisations in these areas	Task & Finish Group	
		Promote and develop codes of conduct for marine sites of nature conservation importance		
		Support the establishment of management groups for Marine Protected Areas	Task & Finish Group	
1.2.5	Collate enough evidence to agree actions to improve the marine and estuarine ecosystem in the Adur and Ouse waterbodies	Identify gaps in the understanding of the marine environment and seek to commission, where necessary, research to fill these gaps		2020
		Identify pressures and impacts on the marine environment and gather information on actions and activities	Task & Finish Group, Environment Agency	
		Collect data on the distribution of marine habitats and wildlife that will help inform management and planning		
		Contribute to marine planning, the implementation of the Marine Strategy Framework Directive and Integrated Coastal Zone Management Policy by providing access to data and through the distribution of status reports on coastal and estuarine waters, in an appropriate format	Task & Finish Group	

1.3	**Promote stakeholder understanding and support for sustainable marine environments**			
	It is essential that proposed actions are developed and implemented in collaboration with all interested parties so that the impact is durable and long-lasting.			
	Targets	**Actions**	**Lead**	**By**
1.3.1	Promote public support for Marine Protected Areas	Inspire people about our local marine wildlife – raising awareness of Sussex seas and marine life and promoting widespread understanding of the importance of a healthy marine environment	Partnership Task & Finish Group	2013
		Raise awareness of existing and proposed Marine Protected Areas	Partnership	

		off Sussex, particularly their wildlife and their importance	Task & Finish Group	
		Feed information from statutory authorities out to the local community on Marine Protected Areas, their status and management	Partnership Task & Finish Group	
1.3.2	Establish and implement a stakeholder engagement plan which identifies who wishes to be involved and how to engage effectively with others	Identify key stakeholders to engage with for a sustainable marine environment	Partnership Task & Finish Group	2013
		Create and facilitate a coastal waters partnership working group	Partnership Task & Finish Group	
		Raise awareness of the coastal and estuarine water bodies and their status and function	Partnership Task & Finish Group	
		Work with marine sectors and stakeholders to understand perspectives and find shared solutions	Partnership Task & Finish Group	
1.3.3	Identify opportunities for communities, government agencies and non-governmental organisations to participate and to promote a partnership approach to objectives 1 & 2	Raise awareness of the Adur & Ouse Partnership as it relates to coastal and estuarine waters and how people may be involved in improving the quality of these environments	Partnership Task & Finish Group	2014
		Consider the relationship between stakeholders awareness of pressures and issues and results of monitoring	Partnership Task & Finish Group	
		Recognise and support communities to improve their coastal and estuarine waterbodies		
1.3.4	Develop shared access to marine monitoring data	Establish and develop meta-databases and common formats to share data and evidence		2015
		Report to Environment Agency on availability of existing marine monitoring data		
		Signpost new data and promote the sharing of data	Partnership Task & Finish Group	

3.2 GROUNDWATER

Understanding and improving all aspects of water within the Adur and Ouse catchment

The area

The catchment is comprised of two major aquifers: the Brighton Chalk Block of the South Downs, and the thin ridge of Lower Greensand which outcrops to the north of the Downs and runs parallel to the chalk escarpment.

Figure 4 shows the shape and positioning of these distinct swathes of geology, and how these groundwater bodies are not constrained by the boundaries of surface water systems (the catchment area) but extend east and westwards beyond.

The Brighton Chalk Block is by far the largest aquifer underlying the catchment. It is a crucial water source for public water supply for Lewes, Brighton and Hove, and neighbouring towns on the south coast as well as many rural communities. Groundwater is therefore a fundamental ecosystem service provided by the catchment to the catchment, whether it be from the scarp slope springs at Poynings and Fulking (pictured) or groundwater fed brooks at Lewes and Offham.

The issues

Aquifers are classified according to their quality and quantity, under the Water Framework Directive. The quality of groundwater is assessed by chemical parameters, whereas the quantity of groundwater considers the impact of abstraction on water resources. Whichever is the poorest assessment (i.e. quality or quantity) dictates the overall groundwater body status, which can either be good or poor.

The Lower Greensand aquifer is currently at good status. However, monitoring data shows increasing trends in nitrate and pesticide concentrations in recent years, which means that a careful eye needs to be kept on nitrate and pesticide use in the catchment.

High concentrations of nitrate (an ingredient in artificial fertilisers) and pesticides in groundwater compromise it's value as a source of drinking water supply, because these contaminants needs to be removed by artificial treatment before the water can be used for supply. These contaminants suggest a direct link between rural land management activities and groundwater quality.

The Brighton Chalk Block aquifer is at poor status, due to quantity issues. This is because a significant amount of groundwater is abstracted from the aquifer, principally for public water supply. It is therefore important to manage public demand for freshwater against a backdrop of a finite groundwater supply. The Brighton chalk is also vulnerable to diffuse rural and urban pollution. Consequently there is a risk, as there is to the Lower Greensand aquifer to the North, from rising trends in nitrate levels observed over the years.

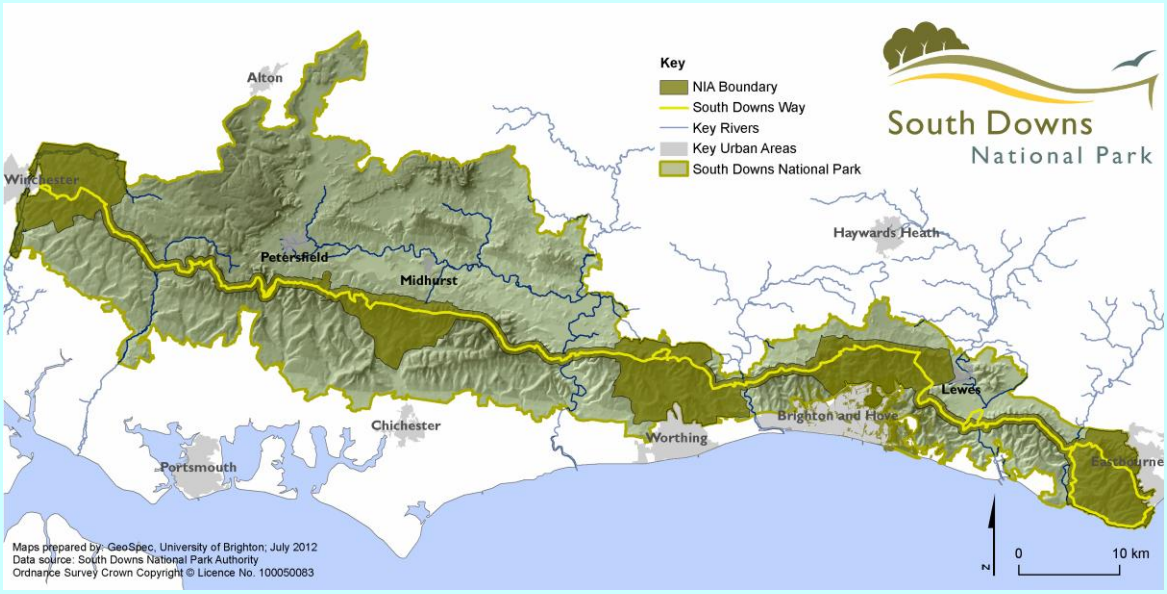
The opportunities

The objectives, targets and actions in the following tables are designed to achieve good status in the Brighton Chalk Block, and reverse increasing trends of nitrate and pesticides concentrations in groundwater across the whole catchment area. This can be achieved through working together towards:

- a sustainable abstraction regime addressing the 'imbalance' between the volume of water abstracted from the chalk aquifer and the amount of rainfall that refills the aquifer each year; and
- sustainable land management practices that continue to produce economic benefits but also deliver improvements in groundwater quality.

A progressive collaborative approach to protected local groundwaters will allow catchment communities to benefit from a truly sustainable 'ecosystem service' of naturally occurring high quality drinking water provided by the Brighton Chalk of the South Downs.

The ‘South Downs Way Ahead’ Nature Improvement Area



The South Downs Way Ahead Nature Improvement Area is one of 12 national ‘Nature Improvement Area’ (NIA) pilot schemes.

The vision for the South Downs Ways Ahead NIA is:

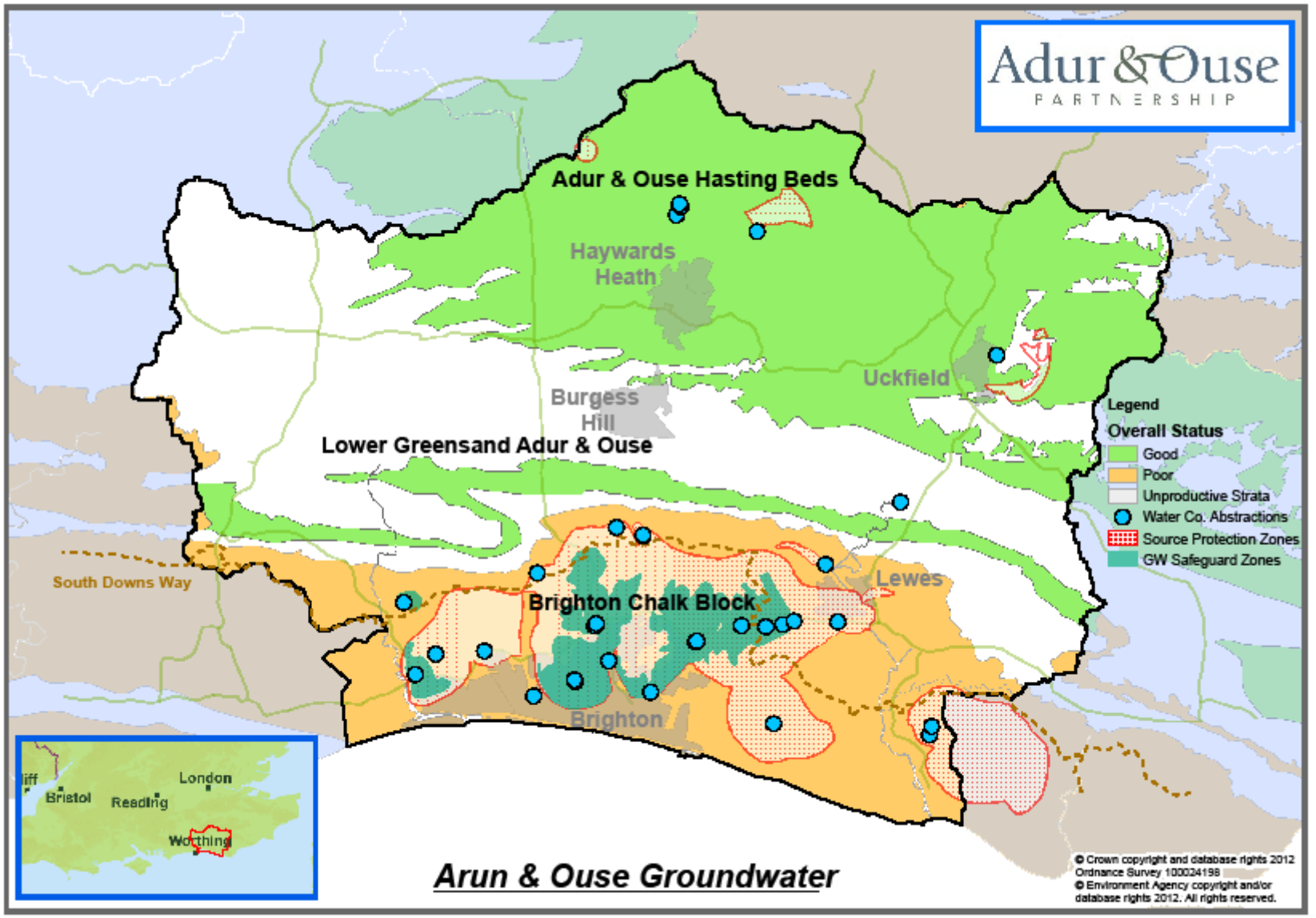
A better connected chalk ecosystem, sustainably managed to enhance biodiversity and people’s well-being for now and the future.

Associated with this vision is an objective seeking to secure the protection of chalk groundwater quality through good land management. Computer modelling work will be undertaken to identify the actual sources of groundwater pollutants and their associated impacts across the NIA area. This ‘compelling evidence’ will then be used to drive changes in land management through engagement with land owners and catchment managers.

This NIA objective is also a mechanism that can contribute to the achievement of ‘good status’ in the Brighton Chalk Block of the Adur & Ouse catchment.

As a result of this, the Adur & Ouse Partnership is working in collaboration with the South Downs Way Ahead NIA Partnership to develop synergies between the respective programmes of work. Issues identified by the Adur & Ouse Groundwater Task & Finish Group, specific to the Brighton Chalk Block, are being directly incorporated into the NIA project to bring about action.

This is an excellent example of maximising efficiency between projects and ultimately the effectiveness of measures delivering improvements on the ground.


Adur & Ouse
PARTNERSHIP
Adur & Ouse Hasting Beds
Haywards Heath
Uckfield
Burgess Hill
Lower Greensand Adur & Ouse
South Downs Way
Brighton Chalk Block
Lewes
Brighton
Legend
Overall Status
Good
Poor
Unproductive Strata
Water Co. Abstractions
Source Protection Zones
GW Safeguard Zones
London
Bristol
Reading
Arun & Ouse Groundwater
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2.1	All risks to groundwater quality and quantity will have been identified and communicated using the 'ecosystem approach' through sharing of evidence, leading to a good understanding of the functioning of the aquifers and ecosystem services			
	It is important to identify why the aquifers of the catchment may not achieve good quantitative and chemical status, and to communicate this to all partners. This will establish an open, universally acknowledged evidence base that will be used to drive forward mitigation and remediation actions to ensure a balance between water supply and the environment			
	Targets	**Actions**	**Lead (green if underway)**	**By**
2.1.1	Construct a robust evidence base by drawing together current research and data from a wide range of sources and relaying that evidence base back to relevant sources/stakeholders	Identify current projects that are ongoing in the catchment, develop relevant synergies and identify gaps and areas of work that are not being addressed		2013 – 2015
		Use an ecosystem service approach to communicate the need to address these gaps/areas of work not being addressed between all relevant stakeholders		
		Understand the principal sources of nitrates in groundwater that impact the 'chalk water quality ecosystem service'– delivered through the Nature Improvement Area surface-groundwater module, which will provide evidence of land use and groundwater interactions	NIA Partnership, led by South Downs National Park Authority	
		Investigate the impact that private sewage treatment works and septic tanks have on groundwater failing to achieve good status	NIA Partnership, led by South Downs National Park Authority	
		Investigate the causes of increased groundwater turbidity (given the problems it can cause to water supply systems) and identify remedial catchment management schemes that enhance relevant ecosystem services		
		Consider the findings of the Brighton Chalk Block groundwater modelling (groundwater flow and recharge), including abstraction impact assessment on the Lewes Winterbourne and identify areas for further study or partnership working		
		Investigate the impact of abstraction from the Chalk on the scarp slope springs of the South Downs, drawing together the work of the		

		Lewes Winterbourne/Brighton Chalk Block groundwater modelling, the Poynings Stream Restoring Sustainable Abstraction scheme and the independent work of Nigel Holmes		
		Investigate the impact of climate change on water resources in the Brighton Chalk Block. This will be undertaken by water companies through the production of their next Water Resources Management Plan	Southern Water, South East Water	
2.1.2	Construct a robust evidence base by drawing together monitoring data from a wide range of sources	Continue to deliver the Environment Agency monitoring action plan to improve the groundwater quality monitoring network used to classify the status of waterbodies	Environment Agency	2013 - 2015
		Confirm which groundwater dependent terrestrial ecosystems need assessing, to understand the effects of groundwater abstraction on protected sites, and plan how required monitoring will be resourced		
		Water companies to extend their monitoring suites to take account of land use in their catchments (with an emphasis on associated multiple ecosystem service benefits) including identifying emerging pollutants and urban influences on groundwater		
		Consider whether additional monitoring is required to meet the groundwater status targets in the Adur and Ouse catchment, seek funding for new monitoring sites as required, and share data through the Adur and Ouse Partnership		
		New data will be incorporated into future rounds of the South East River Basin Planning waterbody classification		
		Create an evolving evidence base that includes a focus on the status of relevant ecosystem services to inform water companies' Periodic Review process		

2.2	More sustainable urban and rural land management will significantly reduce pollutants reaching groundwater such that diffuse pollution does not contribute to further deterioration of groundwater quality			
	This objective is key in preventing further deterioration of groundwater quality and, in the long term, delivering improvements in groundwater quality. Sustainable land management has the potential to deliver wider environmental benefits, for example improved biodiversity through Chalk grassland habitat creation.			
	Targets	**Actions**	**Lead**	**By**
2.2.1	Land use with an emphasis on practices that enhance multiple ecosystem services (with regards to groundwater quality) will be the leading practice of downland and headwater areas	Farms in groundwater Safeguard Zones with rising nitrate levels are inspected to check compliance with best practice	Environment Agency	2021 - 2027
		Safeguard Zone Action Plan actions are identified to drive improvements in farming practice above best practice		
		Environment Agency's rural 'Oil Care Campaign' is delivered		
		Specific 'influencing actions' are developed through the developing work of the Nature Improvement Areas, the Biosphere Project and City & Downland Estate Policy		
		Production of case studies that identify how landuse type and land management influence ecosystem service provision, and identify criteria for their valuation		
		Higher level stewardship schemes are targeted using a weight of evidence approach, to ensure adoption of farming best practice in high-risk groundwater areas	South Downs National Park Authority, Natural England	
		Develop a campaign to raise public awareness within farming and local communities, of the links between water coming out of the tap and local activities in rural areas		
		Delivery of a Brighton & Hove City Council/Environment Agency groundwater and agriculture project improving farming best practice and groundwater quality	Brighton & Hove City Council, Environment Agency	
2.2.2	Urban pollution does not contribute to deterioration of groundwater quality	Investigate and assess the potential pollution sources from infrastructure in urban centres. This includes surface water drainage from roads, industrial estates and commercial areas,		2021 - 2027

		public open space and residential areas (including private gardens)		
		Identify pollutant sources posing greatest risk of polluting groundwater and focus mitigation and remediation measures accordingly on a prioritised basis. This will be captured through Safeguard Action Plans		
		Work with industrial estate owners to identify and influence their drainage network and make improvements where required		
		Develop a campaign to raise public awareness within local communities, of the links between water coming out of the tap and local activities in urban areas		
2.2.3	Inform the Periodic Review 2014 (PR14) with regards to groundwater *quality* (and successive Periodic Reviews or equivalent thereafter)	Help the development of water company asset management plans and water resources management plans to include catchment management options with an emphasis on enhancement of ecosystem services	Environment Agency, Natural England, South Downs National Park Authority	2013 - 2015
		Improve sewerage infrastructure through maintenance and/or sewer replacement to prevent leakage and associated groundwater contamination		
		Include groundwater quality environmental improvement schemes in the National Environment Programme to mitigate against impacts on groundwater from water company waste water treatment operations. For example include investigations, improvement actions, catchment management measures.	Environment Agency, Natural England, South Downs National Park Authority	

2.3	**Groundwater quantity within the catchment will be at sustainable levels, balancing both availability and demand within the context of an integrated supply network**			
	It is important to reduce groundwater abstraction to improve the quantity of groundwater stored in the aquifers. The improvement of the 'groundwater stores' is needed to support wetland environments dependent on groundwater flows, and to ensure a robust, sustainable water supply in the long term. Actions associated with reducing domestic demand are essential, as is the resilience of water company resource zones and the ability to 'move water around' in order to fully utilise water sources			
	Targets	**Actions**	**Lead**	**By**
2.3.1	Environment Agency delivers the Catchment Abstraction Management Strategy	Update the Adur & Ouse Catchment Abstraction Management Strategy using available data to ensure the sustainable management of water resources within the catchment		2013-2015
2.3.2	Inform the Periodic Review 2014 (PR14) with regards to groundwater *quantity* (and successive Period Reviews or equivalents thereafter)	Include water resources environmental improvement schemes in the National Environment Programme to mitigate against impacts on groundwater from water company abstractions. For example include investigations, field trials, catchment management measures, options appraisal.	Environment Agency, Natural England, South Downs National Park Authority	2013-2015
		Water companies meet leakage target levels set by Ofwat		

2.3.3	Abstractions from groundwater are licensed and managed in a way that balances the need between water supply/ demand and the environment	Environment Agency delivers the Restoring Sustainable Abstraction Programme, designed to address abstraction related risks and issues with abstraction licence holders. This involves investigations, options appraisal and potentially the implementation of measures to address problems	Environment Agency, Southern Water, South East Water	2013-2027
2.3.4	Water companies deliver Asset Management Plan schemes to help manage water resources in a sustainable way	Groundwater source enhancements	Southern Water, South East Water	2013-2015
		Lewes Winterbourne investigation for the Water Framework Directive - an investigation into the potential adverse impacts of abstraction on the Lewes Winterbourne	Southern Water	
		Worthing-Brighton Chalk Block modelling - the development of a numerical model to help manage water resources across the respective Chalk blocks sustainably	Southern Water	
		Household metering - an initiative to help reduce domestic consumption	Southern Water	
		Poynings options appraisal - a scheme identifying the most sustainable options to reducing the impact of groundwater abstraction on the Poynings Chalk Stream	South East Water	
		Water efficiency programme - an initiative to help reduce per capita consumption	South East Water	
2.3.5	A reduction in household and business demand in the water resource zones supplied by the Adur & Ouse sources driven by 'local sustainability initiatives' to Defra's aspirational target of 130	Complete Southern Water's household metering programme in the water resource zones supplied by the Adur and Ouse sources by 2015	Southern Water	2015-2021
		Complete South East Water's household metering programme in the water resource zones supplied by the Adur and Ouse sources by 2020.	South East Water	

	litres per head per day	Develop a campaign to raise public awareness of efficient water use in domestic and business communities, such as where water comes from, demand management tips, and signposting for water efficiency incentives		
		Application of the ‘One Planet’ framework in relation to water sustainability, which includes local targets to reduce water consumption and increase efficiency and re-use		

3.3 SURFACE WATER QUALITY

Understanding and improving all aspects of water within the Adur and Ouse catchment

Looking inland across the River Adur, from Mill Hill, Shoreham

The area

The following objectives, targets and actions specifically deal with the surface water quality of the rivers Adur and Ouse, including that of feeder streams and brooks, which are an integral part of the whole catchment.

In the east, the feeder streams of the river Ouse are small and shallow forest streams, which become flashy in times of heavy rainfall. Some of the middle Ouse tributaries are similar, whilst others are characteristic of slow-flowing lowland streams, attributable in places to historic navigational weirs. The lower reaches of the Ouse are typical lowland channels of uniform depth and flow. The river flows predominantly through soft sandstones, alluvium and clays, although the Bevern and Northend streams are notable in that they are derived from chalk springs. See page 6.

To the west, the river Adur is fed by two main arms – the Adur East and the Adur West, both fed by many tributaries and ditches. The arms meet just west of Henfield, where the river becomes tidal and embanked for some nine miles before it reaches the estuary at Shoreham-by-Sea. The upper arms of the catchment are dominated by sands and chalk geology, which changes to impermeable clay in the lower stretches, making the main river very reactive to rainfall. See page 7.

The issues

The water quality of both river systems is compromised by a range of pressures, from isolated sources of pollution through to the combined effects of multiple diffuse sources, both rural and urban. Evidence driving the ecological status of the river systems shows that nutrification, particularly phosphates in freshwaters, are a primary reasons for poor water quality. See figure 5.

Other factors affecting surface water quality include increased demand for drinking water, a growing population, the need to increase food production and the uncertainty of climate change factors.

Work has been ongoing for many years to help manage these pressures. In particular, significant investment by water companies has resulted in much reduced nutrient levels being discharging from large sewage treatment works. Additionally, best practice land management techniques have developed and are being used, often funded by agri-environment schemes.

Implementation of best practice land management (both rural and urban) needs to continue, ideally justified by the multiple benefits to environmental goods that will result in best practice investment.

Engaging with and informing the wider public will also be essential, for example on issues such as water demand, domestic pollutants (particularly phosphate) and the general value of surface water quality.

Further study and research also has a part to play in surface water quality management, help tackle certain problems. For example, the relationship between highways drainage and sedimentation.

The length of time required to fulfil the objectives of this plan may be considerable, but true success requires a long term vision.

The opportunities

Attempting to tackle these water quality issues across such a wide catchment area will require unique and pioneering solutions. This is a challenge which cannot be completed by one organisation alone and the spirit of the Adur & Ouse Partnership offers a chance to improve and protect surface water quality through a collaborative approach.

"Often the approach to catchment management requires a blend of regulation, business management, advice and incentivisation all combined into an integrated resource management plan" (Restoring river catchment function using payments for ecosystems services, The Water Project, 2011).

Delivering such an ambitious plan is certainly no easy task but there are many opportunities available. The contribution that can be made by private business must be considered, for example, through water companies' periodic price review, which is required every five years by Ofwat. To inform the periodic price review, inspiration can be drawn from examples elsewhere in the UK, such as the project undertaken by South West Water and the West Country Rivers Trust delivering benefits to water quality and biodiversity in Cornish river catchments (see case study below). There is also an opportunity to work more closely with the farming community, and tap into agri-environment schemes to fund changes in land management practices. Through working better together with all communities that work and live in the catchment, this plan presents a unique chance to improve the quality of the rivers Adur and Ouse for years to come.

Upstream Thinking, South West Water

Upstream Thinking is a new approach to improving raw water resources. The aim of the approach is to initiate coordinated multiple-benefit projects right across a catchment, which tackle impacts on water quality at source. The result is to improve raw water quality by improving upstream land management, long before it reaches water treatment works.

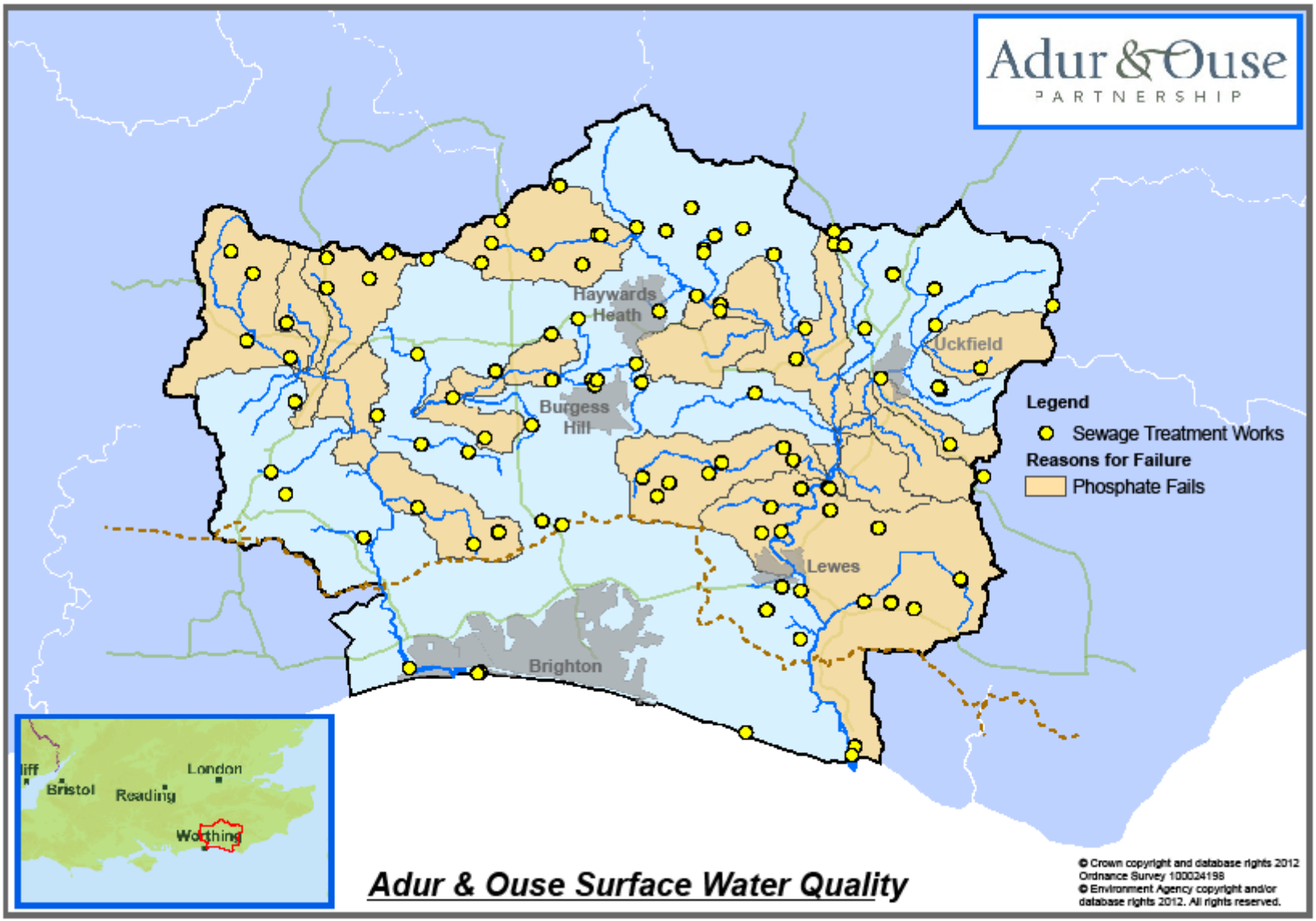
The initiative started in 2008 with the pilot restoration project on Exmoor Mires, led by South West Water, which restored 326 hectares of Sites of Special Scientific Interest. Additionally, partners Westcountry Rivers Trust demonstrated the success of catchment sensitive farming in their pilot project in the Upper Tamar, where raw water quality was being impacted by blue green algae blooms resulting from high nutrient inputs.

These two projects were the formation of a programme of six projects, funded by South West Water but led by partner organisations, all aimed at improving and protecting raw water sources.

It was the success of the pilot partnership projects that led to Ofwat approving £9.1million of investment between 2010 and 2015, to fund the six-project programme. Multiple benefits are generated by this investment, initially by delaying or even preventing expensive upgrades to water treatment works in the future. Further benefits include increased biodiversity, reduced energy use, carbon sequestration and reduced flood risk.

Currently the water industry in general relies on expensive energy and chemicals to treat poor quality raw water. Improving land management reduces run-off, which reduces the amount of resources needed to intensively treat water. Fewer resources in terms of chemicals, energy and emissions reduce detrimental environmental impact, and the associated reduction in revenue costs could potentially avoid bill increases in the long term.

Visit http://www.upstreamthinking.org/


Adur & Ouse
PARTNERSHIP
Haywards Heath
Uckfield
Burgess Hill
Lewes
Brighton
Legend
Sewage Treatment Works
Reasons for Failure
Phosphate Fails
Bristol
Reading
London
Worthing
Adur & Ouse Surface Water Quality
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3.1	Research and investigate the current status of surface water quality in the Adur and Ouse, and establish and maintain a reliable evidence base to underpin this work			
	To improve the water environment, a better understanding is needed of the waterbodies within the Adur and Ouse catchments, including the reasons why they fail to achieve good status. More research is needed on individual streams to learn about their behaviour, characteristics, flow, biodiversity and every detail that will enable improvements to be made.			
	Targets	**Actions**	**Lead (green if underway)**	**By**
3.1.1	Demonstrate a thorough understanding of surface water quality issues in the Adur and Ouse catchments	Agree on a methodology to be used when investigating reasons why surface waterbodies fail to achieve good status	Environment Agency	2013-2015
		Study and help develop waterbody information for the Adur and Ouse catchment, using Environment Agency Waterbody Summary Sheets (see Appendix A) where appropriate	Environment Agency	
		Increase confidence in the current classification of waterbodies at moderate, poor or bad status – see figure 3 – and investigate the key reasons for these classifications		
		Identify waterbodies that need to be investigated further and where the issues of poor water quality are not fully understood	Environment Agency, South East Water & Ouse Upstream Thinking Project	
3.1.2	Establish and maintain a reliable evidence base to identify key areas of concern and effectively target resources on the ground.	Identify current and recent research that investigates issues of water quality within the Adur and Ouse catchments	University of Brighton	2013-2027
		Research and understand the issues of sediment loading in the rivers Adur and Ouse and identify the most likely sources	South East Water & Ouse Upstream Thinking Project	
		Analyse the current projects addressing surface water quality in the catchment and identify any gaps or areas of work that are not being addressed	Adur and Ouse Partnership	
		Focus more research into faecal pollution from both livestock and human sources	University of Brighton	

		Understand research into the effects of climate change on surface water quality and respond to this research		
		Investigate and understand the application of computer modelling in relation to predicting and quantifying pollution risks		
		Conduct a review of existing techniques and methodologies used for catchment walkovers to develop an agreed strategy. This will ensure consistent techniques and a robust evidence base based on a single methodology		
		Carry out catchment walkovers in urban areas to identify issues surrounding surface water drainage		
		The outcomes from any catchment walkovers will be shared with others via a central knowledge hub or catchment website		
		Identify and map all private sewage works and septic tanks that have a current discharge consent	Environment Agency	
		Carry out catchment walkovers to identify private sewage works and septic tanks that do not have consent to discharge or that are currently breaching their consent		
		Assess the impact of private sewage works and septic tanks on water quality in the catchment by focusing on a single stream as a case study		

3.2 Adopt or set up a comprehensive monitoring programme to measure the progress and success of surface water quality improvement work

Monitoring has a key role to play in successfully improving the current status of the Adur and Ouse catchments. It helps to demonstrate where work undertaken on the ground is effective and continues to provide improvements in water quality. It also helps to manage new and emerging pollutants that may not have been considered when constructing this plan.

	Targets	Actions	Lead	By
3.2.1	Develop a framework for water quality monitoring on the Adur and Ouse and establish water quality monitoring at the earliest opportunity	Establish costs involved in setting up a monitoring programme	South East Water and University of Brighton	2013-2015

		Seek funding and opportunities to collaborate with any current research and monitoring already in place	SE Water & University of Brighton	
		Investigate ways of monitoring water quality through indicator species such as populations of wild trout	Ouse & Adur Rivers Trust	
		Conduct a review of existing techniques and methodologies used in water quality monitoring within the catchment and establish the lifespan of any monitoring programmes		
		Adopt a single methodology that will be used for water quality monitoring across the Adur and Ouse Catchment, to ensure consistency of techniques and a robust evidence base		
		Ensure that the organisation(s) responsible for analysis and testing abides by the current standards set by the industry and has the appropriate accreditation		
		Investigate the outcomes from the government Demonstration Test catchments and explore the pros and cons of real time monitoring	South East Water, Ouse Upstream Thinking Project	

3.3	**Tackle pollution in the Adur and Ouse catchment from both urban and rural sources**			
	When dealing with surface water quality issues, inputs from both rural sources and urban sources needs to be considered as part of a joined up approach, that considers both the built up environment and the countryside			
	Targets	**Actions**	**Lead**	**By**
3.3.1	Develop a strategy to tackle pollutants and improve the current status of water quality in the catchment as defined by the River Basin Management Plan	Classify the urban areas of the catchment and the rural areas of the catchment	South East Water, Ouse Upstream Thinking Project	2016 – 2020
		Identify the main group of pollutants found in urban areas and identify their likely sources		
		Identify the main group of pollutants found in rural areas and identify their likely sources	South East Water, Ouse	

			Upstream Thinking Project	
		Identify any new and emerging contaminants which pose a serious threat to public water supply and biodiversity, for example, metaldehyde	South East Water, Ouse Upstream Thinking Project	
		Engage with key stakeholders and the wider community in both urban and rural areas to seek their help in tackling surface water pollution	South East Water, Ouse Upstream Thinking Project, Ouse & Adur Rivers Trust	
		Investigate and research the outcomes from Environment Agency's water quality modelling, including SAGIS modelling, and act upon findings	South East Water, Ouse Upstream Thinking Project	
3.3.2	Phosphate pollution will no longer be a reason why waterbodies fail to achieve Good Status in the Adur and Ouse catchment	Research and understand phosphate accumulations contained in sediments and how phosphate can move through the river system via sediments		2021 – 2027
		Build up a risk map which shows where the likely sources of phosphate pollution are coming from including both point source and diffuse.	South East Water, Ouse Upstream Thinking Project	
		Identify the main sources of phosphate pollution at a waterbody level	Environment Agency	
		Investigate the current strategies used by Southern Water and South East Water to improve surface water quality and influence their investment spending through the Periodic Review.	South East Water, Ouse Upstream Thinking Project	
		Investigate how methods of source tracking could be used in tackling phosphate pollution and act upon findings		

3.3.3	Understand and address the issues of surface water pollution from roads and highways drainage	Research the contribution that highways drainage makes to surface water pollution and feed this back to the evidence base		2016 – 2020
		Work with the Local Authority Highways Department and their contractors, to develop a long term strategy for dealing with the issue of surface water pollution		
		Identify areas of the highways drainage network where maintenance is badly needed	East & West Sussex County Councils	
		Work with the Local Authority Highways Department, the Highways Agency and their contractors to gain a thorough understanding of the highways drainage network		
		Investigate new and emerging 'end of pipe' techniques used to tackle surface water contaminants		
		Raise awareness of the pressures exerted on surface water quality by highways and urban drainage.		
		Identify sewerage misconnections on any property developments in the catchment		
		Investigate case studies from around the UK where sustainable urban drainage systems have been used and assess their potential use in the Adur and Ouse catchment.		
		Identify suitable sites in the catchment for the creation of lagoons and reedbeds that will act as surface water capture from highways drainage		

3.4	**Encourage urban and rural populations, land and watercourse managers to play a positive role in sustainable river and water management ***			
	The challenge to improve surface water quality is complex and will require local solutions to local problems. The actions to address poor water quality cannot be applied generally, they need logical thinking at a local level. This needs to engage everyone who is connected to the river catchment, and in this way new working relationships will be built. This will help to generate the support needed and inform and educate those that live and work within the catchment.			
	Targets	**Actions**	**Lead**	**By**

3.4.1	Demonstrate methods of improving surface water quality through land-use best practice and innovation	Identify key issues surrounding land use and sustainable catchment management and engage with farmers / landowners / stakeholders to gain their trust and support for our work.		2013 – 2015
		Partner organisations will lead by example, demonstrating results to inspire others		
		Set up and maintain a number of demonstration projects in urban & rural locations which showcase best practice	South East Water, Ouse Upstream Thinking Project	
		Produce a toolkit for farmers, landowners, stakeholders and individuals which contains information on funding availability, sources of advice / training and the relevant regulations surrounding land use and water quality	South East Water, Ouse Upstream Thinking Project	
		Evaluate progressive research, surface water quality enhancement and river re-naturalisation techniques, and where appropriate, promote these to stakeholders and individuals	South East Water, Ouse Upstream Thinking Project	
3.4.2	Build working relationships with both public and private business to deliver sustainable catchment management on the ground	Ensure that all interested stakeholders and groups, concerned with surface water quality, are brought together to build momentum and support for integrated catchment work.	South East Water, Ouse Upstream Thinking Project	2013 – 2027
		Promote the work of the Partnership wherever possible to build a wide network of contacts throughout the public and private sectors	South East Water, Ouse Upstream Thinking Project	
		Help and support South East Water to fulfil the objectives of its Upstream Thinking Project on the River Ouse		
		Work with South East Water and Southern Water to develop cost effective catchment management schemes as an alternative to traditional water treatment processes		
		Secure long term commitment to catchment management initiatives from both water companies through the Periodic Price Review		

		implemented by OFWAT		
3.4.3	Encourage community ownership of local measures to improve the water environment within the catchment, and we will support communities with information about the causes, effects and natural solutions to water quality issues	Support local community groups (for example Parish Council sub groups) to help them identify local issues and take ownership of local actions		2013-2027
		Endeavour to ensure that planning policies support improved natural rivers and surface water quality through green infrastructure and sustainable drainage solutions		
		Raise awareness of the issues surrounding domestic cleaning solutions and garden herbicides, which contribute to the pollution of watercourses		
		Design and deliver educational programmes throughout schools to raise awareness of the harmful effects to the environment that cleaning solutions can have		
		Provide communities with information on the latest innovations in surface water drainage and how they can help to maintain functional sewerage systems, such as septic tanks and package treatment plants		

* Shared objective with natural rivers (see page 62

3.4 FISHERIES

Understanding and improving all aspects of water within the Adur and Ouse catchment

Brown trout

The area

The catchment supports large populations of migratory and freshwater fish, comprising species indigenous to the rivers as well as those not native to the catchment, some not native to the UK. The lower tidal reaches support an estuarine fish community, with essentially marine species also present around the mouths of the rivers. Fish sampling across the catchment shows that in many places, fish are not achieving good ecological status.

Fish stocks in freshwater reaches support important mixed (coarse and game) recreational fisheries, including very large pike, carp and, (on the Ouse) barbel. A significant number of anglers, particularly on the Ouse, specifically target sea trout as the rivers are renowned for exceptionally large specimens. There is limited angling for non-migratory brown trout. Angling on much of the main river and their larger tributaries, is controlled by a small number of long established local clubs, several of which were founded over 100 years ago. Membership of the angling clubs with access to water on the Adur and Ouse totals several thousand individuals, in addition some stretches can be fished on a day-ticket basis rather than via full club membership. The lower tidal sections, which are not controlled by angling clubs and offer free fishing where publicly

accessible, are also popular recreational fisheries for estuarine species, particularly bass.

Fish populations of the Adur and Ouse support recreational fisheries of social, economic and conservation importance. However they are under pressure from a wide range of factors.

The issues

Much of the main rivers remain fundamentally modified by navigation works, undertaken during the late 18th and early 19th Centuries, when the river channels were dredged and straightened, with many locks and weirs constructed. There also exist numerous other barriers, from mill structures and dams with medieval origins, to modern gauging weirs, automatic sluices and tidal flaps. Virtually none of these structures were constructed with any facility for fish passage and many present partial or complete obstacles to fish movement, particularly for true migratory species, which can affect population size.

Fish populations are also adversely affected by water quality, including sporadic major pollution incidents and diffuse rural pollution, and changes to flow regimes via abstractions and discharges.

The opportunities

Actions contained in this and other chapters throughout this plan will help attain the physical habitat, and water quality and quantity desirable for flourishing fish populations throughout the catchment. This will bring about ecological, and wider social and economic benefits, particularly for recreational fisheries interests.

To supplement proposed improvement actions, further research is required to better understand the behaviour and distribution of species right across the river systems, particularly in the smaller tributaries and tidal stretches. It is also important to better understand the potential impacts of climate change. The south eastern geography of the catchment may experience more extremes of temperature and flow than other regions of the UK, which may lead to the rivers becoming less hospitable to fish requiring cooler waters.

The removal of Buxted Weir on the river Uck

Buxted Weir (pictured here) presented one of the most significant obstructions to fish passage in the Ouse catchment. Ouse and Adur Rivers Trust and Environment Agency jointly undertook a project in 2011and 2012 to remove the structure and enhance habitat quality at the same time.

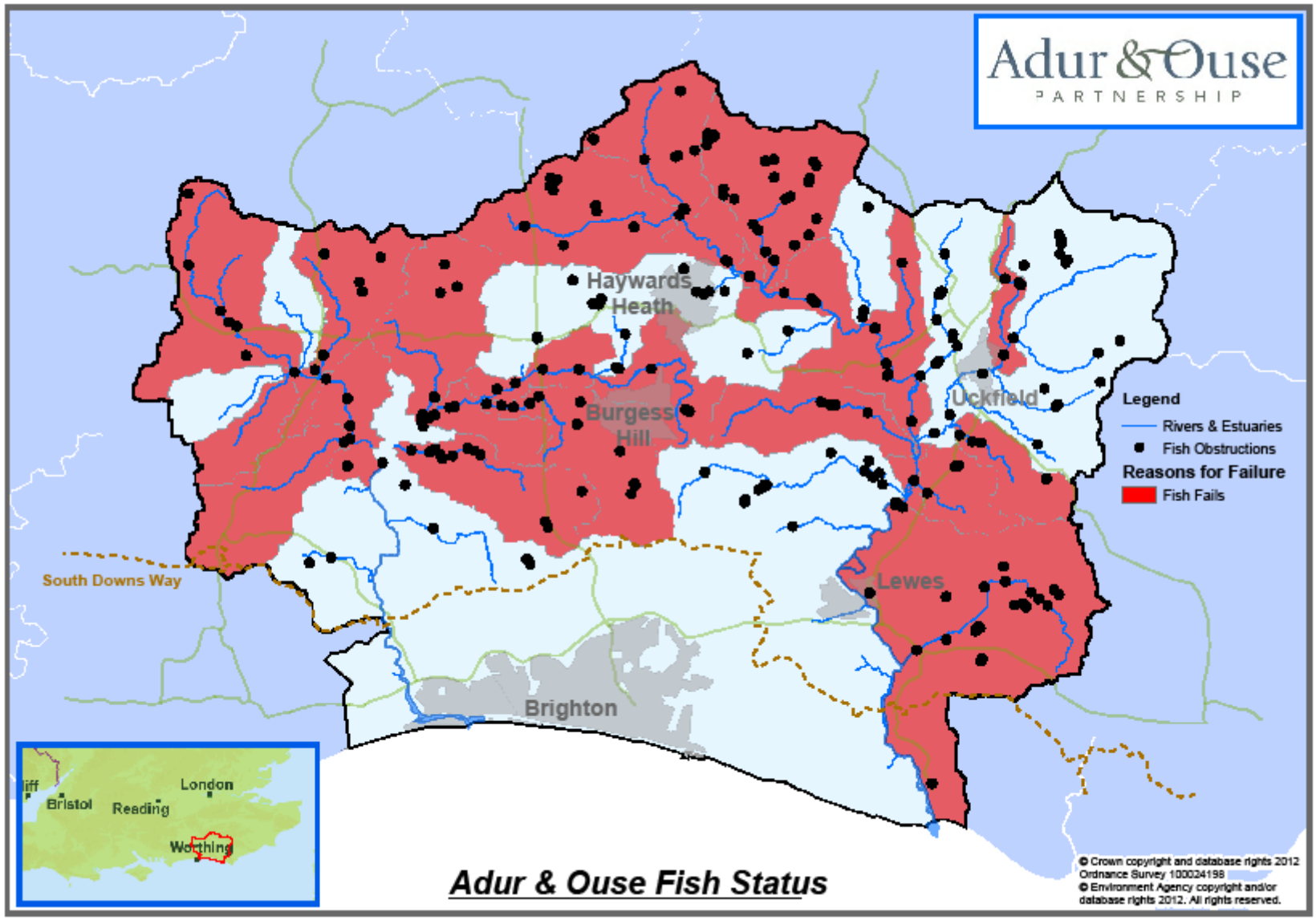
This was no small undertaking, as the weir provided a head of water to feed two lakes of significant amenity value within the grounds of Buxted Park Hotel.

The impact on the adjacent lakes, from removing the weir, was carefully monitored as the wooden weir boards were removed one by one, over a period of five months. As the project progressed, the monitoring programme demonstrated that one of the lakes could be maintained even when isolated from the river, paving the way for full weir removal of the weir. Through the formal planning process, commitment to fully remove the weir was obtained, which included consultation and discussion with landowners, Natural England and angling clubs.

The final stage of the project saw the removal of the concrete weir base, channel realignment and stabilisation, and habitat enhancement works to accommodate the lower water levels of the now unimpounded river.

The project will have multiple benefits. All-species fish passage has been provided and many kilometres of previously inaccessible high quality sea trout spawning/nursery habitat has been opened up. The restored stretch, which was seldom fished before the work, is now very popular with anglers. Once mature, the project should comprise a significant landscape enhancement, cointributing to the overall conservation status of the Buxted Site of Special Scientific Interest.

Part of the Environment Agency Middle Ouse Restoration of Physical Habitats (MORPH) project
http://www.environment-agency.gov.uk/research/planning/135096.aspx


Adur & Ouse
PARTNERSHIP
Haywards Heath
Burgess Hill
Uckfield
Lewes
Brighton
South Downs Way
Legend
Rivers & Estuaries
Fish Obstructions
Reasons for Failure
Fish Fails
London
Bristol
Reading
Worthing
Adur & Ouse Fish Status
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4.1	All constraints and risks to the establishment of thriving fish populations (comprising an appropriate range of species) within the Adur and Ouse systems will be identified			
	Fish populations in the catchment comprise a range of indigenous and non indigenous species, some non-native. Current species composition, distribution and abundance reflect natural distribution, anthropogenic introductions, and river characteristics. Waterbodies have been significantly modified over time for navigation, milling, defence, and flood management, and many structures affect fish movement and migration. In addition, flow regimes are modified by abstraction and discharges, and water quality is impacted by point and diffuse inputs. All these factors contribute to the characteristics of available fish habitat, which affects the present distribution and abundance of individual species. As measures to re-naturalise waterbodies are implemented, habitat characteristics will change, and fish populations will respond positively			
	Targets	**Actions**	**Lead (green if underway)**	**By**
4.1.1	Use all available evidence to understand the issues affecting the distribution and species composition of fish populations and how this would be affected by actions to create more naturalised river systems	Collate all available relevant data, including historic data, on fish and fisheries within the catchment	Environment Agency and Partnership Task & Finish Group	2014
		Identify an appropriate range and distribution of fish species within the catchment		
		Review the fisheries classification for all catchment waterbodies from the South East River Basin Management Plan 2009	Environment Agency	
		Understand the reasons for the fish classification status in each waterbody, including habitat and water quality constraints and the presence of invasive species		
		Develop a protocol for, and programme of, walkover surveys to further inform understanding of constraints to the establishment of thriving fish populations	Ouse and Adur Rivers Trust	
		Understand how fish populations will respond to river restoration projects, at an individual project and cumulative level	Environment Agency	

4.1.2	Ensure that the outcomes of investigations and actions are taken into account in future waterbody classifications for River Basin Planning	Waterbody classifications in future River Basin Management Plans, reflect which species should be present, and in which sections of any re-naturalised stretch following river restoration		2015
4.1.3	Review the contribution to fish populations, made by 3rd and 4th order tributaries to main rivers	Review existing data to assess the contribution to overall fish populations made by 3rd and 4th order tributaries to main rivers , including minor tributaries, ephemeral streams and ditches		2013
		Develop a methodology, including appropriate field survey protocols, to quantify the contribution of minor watercourses	Ouse and Adur Rivers Trust	
		Undertake a detailed pilot survey, at a high level of resolution, of 3rd and 4th order tributaries and associated streams and ditches, to assess issues affecting their performance		
		Undertake a catchment wide programme of assessment of 3rd and 4th order tributaries, informed by the findings of the associated pilot survey		2015
4.1.4	Ensure that barriers to fish migration and movement do not compromise the achievement of good ecological status or potential	Initiate and undertake appropriate research to assess the significance of barriers to fish migration and movement, including temperature barriers and flow, in addition to physical barriers	Ouse and Adur Rivers Trust	2015
		Develop and implement a programme of work which will ensure that physical and other barriers to fish migration and movement will no longer compromise the achievement of good ecological status or potential	Ouse and Adur Rivers Trust	2021

4.2	Fisheries within the catchment will provide enhanced recreational opportunities and economic benefits			
	The rivers Adur and Ouse provide important recreational fisheries, with angling on much of the main rivers and their larger tributaries. Angling clubs own significant stretches of the rivers and, as well as being essential partners in river restoration projects, are a source of volunteers for habitat restoration. However, there is the potential for river restoration measures, in some circumstances, to impair angling opportunities and it is important that compensation is provided to ensure there is no net loss of angling facilities. Further, some stretches of the main rivers are seldom fished and reasons for this need to be understood, in order to increase recreational and economic benefits			
	Targets	**Actions**	**Lead**	**By**
4.2.1	The economic and social benefits of angling within the catchment are recognised	Collate and evaluate existing relevant information on recreational angling within the catchment	Environment Agency	2013
		Ensure that angling clubs and riparian owners are fully informed about, and encouraged to participate in, river restoration opportunities	Environment Agency	
		Consider, where appropriate, the ecosystems approach, in assigning societal and economic values to angling and fisheries	Environment Agency	
4.2.2	River restoration measures improve recreational opportunities and enhance the economic benefits of fisheries; where projects could impair angling opportunities full consideration should be given to the provision or enhancement of alternative facilities	River restoration projects include an assessment of the likely impact on recreational fisheries and opportunities to mitigate these, for example by the creation of backwater habitat designed for angling. Any net loss of angling facilities should, where feasible, be compensated by alternative facilities, including by the restoration of derelict fisheries	Environment Agency, Partnership Task & Finish Group	2027

4.3	The effects, on fish and fisheries, of restoring rivers to a more natural state will be clearly identified and taken into account in river restoration plans
	River restoration projects, especially those that remove structures and alter impounded reaches, will create a more natural fisheries habitat to benefit species adapted to faster flows. Species that prefer slower flows may decline, particularly in the upper reaches. Project planning and implementation should thus incorporate sufficient depth and cover in habitat creation and maintenance While overall fish populations may improve through restoration projects, species abundance and composition will alter, which has implications for recreational fisheries. These implications should be evaluated at an early stage with angling clubs and riparian owners. Historically many river restoration projects have not been sufficiently monitored to gauge their success and this needs to change, including quantifying the cumulative impacts of multiple projects on fish and fisheries. Local communities and organisations, including angling clubs, could be engaged in cost effective monitoring and ongoing maintenance, to ensure that optimal fisheries habitat is maintained

	Targets	Actions	Lead	By
4.3.1	Ensure that the implications for fish and fisheries of specific projects and actions are clearly identified at an early stage and taken into account in the development of projects	Develop appropriate methodologies and protocols to mitigate against any impacts to fish and fisheries from river restoration work		2027
		Effectively communicate issues associated with river restoration projects, to angling clubs and riparian owners		
		Projects involving the removal of barriers and reductions in depth will, where feasible, include measures to maintain suitable habitat for large cyprinids		
4.3.2	Provide for cost effective monitoring, involving local communities	In the planning stages of river restoration projects, baseline conditions will be established using existing data, supplemented by additional data where necessary	Ouse and Adur Rivers Trust for certain projects	2027
		River restoration proposals and plans shall include adequate provision for targeted post project monitoring, over an appropriate timescale, of outcomes for fish and fisheries	Ouse and Adur Rivers Trust for certain projects	
		Where feasible, pre and post project monitoring should be undertaken by, or involve, local communities and organisations.	Ouse and Adur Rivers Trust for certain projects	
4.3.3	Develop and undertake research to establish the impacts, including long term and cumulative impacts, of projects	Define an appropriate programme of research and identify funding requirements and opportunities		2013
		Funding for specific restoration projects shall includes provision for long term monitoring, or make alternative provision for such monitoring		2027
4.3.4	Clearly identify, at the outset of projects, any requirement for ongoing maintenance to ensure optimal fisheries habitat	River restoration projects that require ongoing maintenance to ensure optimal habitat is preserved, will ensure that this requirement is clearly identified at the project planning stage and appropriate provision made	Environment Agency	2027
		Angling clubs and community groups shall be engaged in ongoing maintenance work where feasible	Ouse and Adur Rivers Trust, Ouse and Adur Preservation Society	

4.4	**The potential impacts of climate change on fish and fisheries within the entire catchment, and appropriate adaptation measures, will be clearly identified.**			
	There is significant uncertainty around how the effects of climate change will manifest themselves. However it is a reasonable to expect increases in the frequency and severity of flooding and drought, and a progressive increase in temperature. Some species will favour changes in flow and temperature, whereas others may be negatively affected. Both the Adur and Ouse both have particularly long tidal stretches that predominantly support freshwater fish in their upper sections. These populations may be significantly impacted by sea level rise and associated increasing salinity. Best Climate change modelling needs to be factored into the planning and implementation of river restoration projects, to incorporate adaptation measures and afford resilience to climate change			
	Targets	**Actions**	**Lead**	**By**
4.4.1	Develop methodologies and protocols to take account of the impacts of climate change, on an individual and cumulative project basis, for all river restoration projects and actions	Take into account potential changes to the thermal regime of waterbodies, resulting from climate change, in the planning and delivery of river restoration projects, supported by an appropriate water temperature monitoring regime	Environment Agency, Ouse and Adur Rivers Trust	2013 - 2027
		Take into account the potential for greater extremes of flow, resulting from climate change, in the planning and delivery of river restoration projects	Partnership member managing project	
		Identify and adopt appropriate measures, including riparian shading and provision of backwater habitats, to help adaptation to climate change	Partnership member managing project	
		Communicate to the angling community and riparian owners climate change issues and appropriate adaptation techniques or measures	Environment Agency, Ouse and Adur Rivers Trust	
4.4.2	Identify the implications of sea level rise, including saline intrusion, on fish and fisheries in all tidal waters within the catchment	Identify the implications of any extension inland of the transitional zone and increased salinity for fish populations, as sea level rises	Environment Agency	2014
		Identify the implications for fish and fisheries of structures within, or defining the upstream limit of tidal waters		

4.5	Issues and appropriate actions, relating to fish and fisheries in all tidal waters within the catchment will be clearly identified			
	Both the Adur and Ouse have long tidal reaches and associated tributaries. Fish populations range from nearly fully marine at the tidal mouths and estuarine species in the lower reaches, to freshwater fish communities in the upper kilometres. The resident freshwater fish of the upper tidal stretches are well documented. However, the distribution and behaviour of species in the downstream sections is less well understood. Seven migratory species (sea lamprey, river lamprey, salmon, sea trout, allis shad, twaite shad, eel) are known to occur within the tidal reaches of the catchment, and there is a need for research to characterise migratory fish populations and identify appropriate protection measures			
	Targets	**Actions**	**Lead**	**By**
4.5.1	Collate and evaluate existing data on the significance of transitional waters for estuarine, migratory and freshwater species and issues affecting these populations	Collate and evaluate all relevant existing data and anecdotal information on the composition and spatial and temporal distribution of fish populations within all transitional waters within the catchment		2014
		Identify the issues which are, or may be, affecting these populations		
4.5.2	Develop and undertake research needed to understand pressures on, and the protection of, migratory fish within transitional waters.	Develop (by 2014) and undertake research, supported by appropriate funding, to further understand issues determining the occurrence, distribution and behaviour of migratory species, including lamprey, sea trout, salmon and shad, within all transitional waters within the catchment		2018
		Determine whether existing measures to protect migratory fish populations are adequate and identify and implement any additional measures required		
4.5.3	Develop and undertake research needed to identify the role of transitional waters in the production of juvenile migratory and freshwater fish	Develop (by 2014) and undertake research, supported by appropriate funding, to identify the significance of transitional waters as a habitat for juvenile fish, including sea trout, shad, lamprey and cyprinids .		2018
4.5.4	Identify the implications of sea level rise on fish and fisheries within the tidal waters of the catchment	Identify clearly the implications of, as sea level rises, the extension inland of the transitional zone and increased salinity for fish populations		2014
		Identify the implications for fish and fisheries of structures within, or defining the upstream limit of tidal waters		

3.5 NATURAL RIVERS

Understanding and improving all aspects of water within the Adur and Ouse catchment

Typical character of the middle river Ouse

The area

A natural river can be defined as a river and floodplain that is free to change through natural processes. These processes impact flow, sediment movement, inputs such as woody debris into the river, and processes caused by organisms in and around the river (plants and animals).

The rivers Adur and Ouse run through a variety of landscape types and as such the types of river and stream reaches within the catchment vary considerably. Both rivers have their headwaters in the sandstones and clays of the High Weald. Ghylls (or gills) are ancient steep-sided, wooded valleys created by these streams cutting gullies into existing slopes. The hilly topography means that the land surrounding ghylls tends not to be intensively cultivated and so the water flowing in the streams is often relatively unpolluted and the delicate balance and biodiversity of this unique environment is maintained.

Further downstream both rivers are impacted by the chalk geology of the South Downs. Chalk rivers or streams are watercourses which flow across chalk bedrock, and/or are influenced by local chalk geology. Chalk rivers are usually fed by underground or seasonal springs. They often have 'winterbourne' stretches in their headwaters that run

dry, or partially dry, in late summer because of lack of rainfall recharging the spring. All chalk rivers are fed from groundwater aquifers which means they have clean, clear water and relatively stable water temperatures. These unique conditions along with their chalk geology, support a rich diversity of wildlife including important fish populations such as brown trout, and many other specialist species.

The issues

Many stretches of Sussex rivers still express their natural processes, however the Sussex landscape has been subject to considerable change over the centuries. For the rivers Adur and Ouse, this has meant canalisation, culverts, banking and other hard engineering that have served the purpose of draining land for agriculture and speeding up the flow of water from the land to the sea. On the Adur and Ouse these interventions have had an impact on the course and flow of the rivers and are contributing to a reduction in ecological status.

In addition to the loss of naturalness to our rivers, there has been a dramatic loss of wetland habitat in Sussex over the last 200 years (with over 25% of this loss happening since the 1960s). Reedbed, Fen, ancient floodplain woodland and species-rich floodplain grazing marshes are all habitats under threat. There is currently no semblance of an ecological network on the catchment, although research tells us that the potential for such a network is high.

The opportunities

An aspiration for natural rivers is not an aspiration to go back in time, but a direction of travel towards river systems whose geomorphology and habitats improve ecological status. They can help rebuild ecological networks and in doing so improve biodiversity, landscape, fish stocks, flood risk and water turbidity. It must be acknowledged that there are restrictions to re-naturalisation in the catchment, for example development and some other land uses adjacent to water courses.

"I have found that landowners that I have talked to on the Uck catchment have been very receptive to the role that their land could play in reducing flood peaks whilst improving the ecological status of the river"

Sandra Manning-Jones, TrUck Officer October 2012

Trees on the river Uck (TrUck)

Water storage on the catchment (©Fran Southgate)

In May 2012 the Woodland Trust, Environment Agency and Sussex Wildlife Trust began a partnership project to look at managing flooding with added benefits for wildlife and river health. Trees on the river Uck (TrUck) was born.
TrUck is a two year project based in the river Uck, a sub-catchment of the river Ouse. The project seeks to slow the passage of flood water and surface water run-off, by planting woodlands and encouraging temporary use of the floodplain in suitable locations.

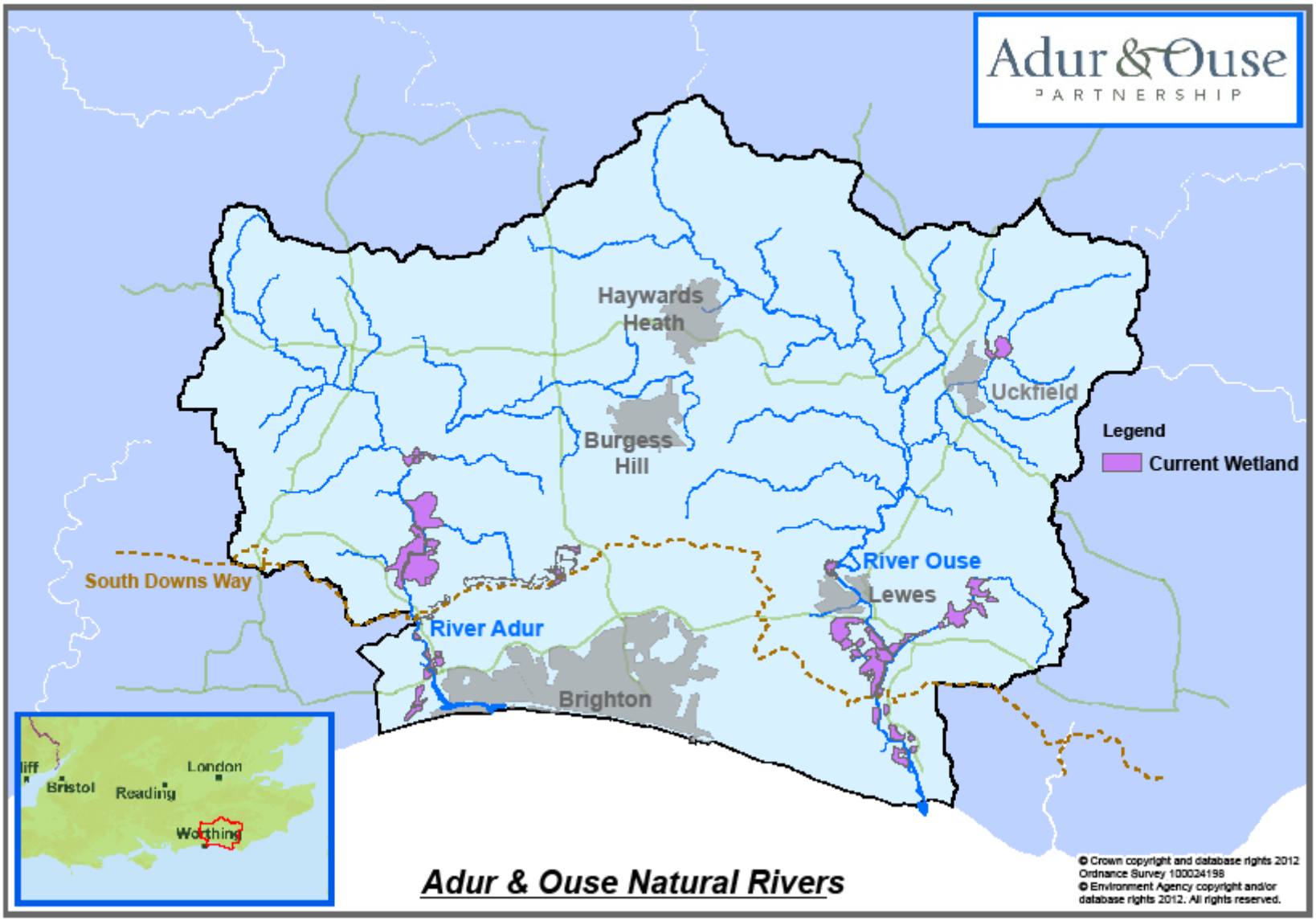
Research into this type of intervention, in other areas around the UK and abroad, has shown that increased woodland cover can have an important role in the reduction of flood peaks. Working with natural river features can also have added benefits for wildlife and the river as a whole, including species such as Brook lamprey and Brown trout, and also species associated with wet meadows – a nationally declining habitat. Natural rivers also support a wide range of invertebrates that are vital food source for birds and bats.

Sandra-Manning Jones, the TrUck Project Officer is working with landowners and river users to build an accurate a picture of the sub-catchment, to identify locations where woodland or hedgerow planting could help to reduce flooding. This could involve sites within the river corridor, and also on higher ground where water runs off the land quickly, adding to flooding problems.

Aside from planting trees, the project also hopes to increase the use of riverside grassland habitats, to temporarily store water during high water times. This natural type of flood storage already happens in some places, particularly in more extreme flood events.

Working with the Ouse and Adur Rivers Trust and South East Water, TrUck is initially surveying the river to gain a better understanding of the watercourse and its processes. TrUck is offering free advice, tree and hedgerow planting, and biodiversity surveys in certain locations. These offers are at the heart of working together with others.

Visit http://www.environment-agency.gov.uk/research/planning/140250.aspx


Adur & Ouse
PARTNERSHIP
Haywards Heath
Burgess Hill
Uckfield
Legend
Current Wetland
South Downs Way
River Ouse
Lewes
River Adur
Brighton
London
Bristol
Reading
Worthing
Adur & Ouse Natural Rivers
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5.1	Collate and maintain a high quality evidence base on all aspects of re-naturalising water bodies in the catchment			
	Although data and information on the catchment exists, it is stored in many locations, some with limited access. Additionally the technical nature of some key evidence for natural rivers is inaccessible to a non-specialist audience and is therefore not informing or influencing the development of this theme. Invasive aquatic species are a key issue on the catchment and survey information on their extent (required to target their removal) will be undertaken as part of this objective.			
	Targets	**Actions**	**Lead (green if underway)**	**By**
5.1.1	Identify where waterbodies failing to achieve good ecological status/ potential can be attributed to and/or alleviated by water body re-naturalisation	Review existing information to identify where water bodies failing to achieve good status is attributable to modified morphology, which could be alleviated by river restoration measures or projects		2013
		Hold a series of workshops with relevant individuals to map problem areas and to offer broad level solutions to the re-naturalisation of the Adur and Ouse river systems.		
		Assess potential re-naturalisation projects to develop a suite of projects to be taken forward		
5.1.2	Develop a mechanism and structure for evidence storage and sharing	Make best use of river basin planning databases, internet information hubs and the Sussex Biodiversity Records Centre facilities, for holding and collating information		2013
		Evidence sharing beyond the Steering Group will be through the Sussex Local Nature Partnership Forum	Sussex Local Nature Partnership Forum	
		An evidence base will be populated as an ongoing task, as and when data becomes available		
5.1.3	Collate project development material for a suite of desirable and potential re-naturalisation projects	Collate project development material for a suite of desirable and potential projects		2013

5.1.4	Develop evidence that justifies natural rivers beyond biodiversity and hydromorpohology, by demonstrating social and economic benefits	A useable system for analysing the costs and benefits of projects will be established		2014
		Draw in expertise from universities and others and encourage original research in the application of environmental economic techniques		
5.1.5	Develop and promote targeting tools for re-naturalisation projects	Build on existing connectivity modelling to create locally relevant targeting tools for re-naturalising rivers projects		2015
		Update and develop existing habitat potential models for the catchment		
		Garner relevant research from universities develop and promote targeting tools for re-naturalising rivers projects		
		Encourage original research linked to site targeting for re-naturalising rivers projects.		
5.1.6	Analyse the efficiency and delivery mechanisms of waterbody re-naturalisation	Experience of all works carried out both in the catchment and beyond will be compared, looking at funding, effort and results		2016

5.2	**Monitor the condition, extent and connectivity of riparian, riverine and wetland habitats in the catchment**			
	Current knowledge of condition and extent of riparian, riverine and wetland habitats within the catchment is patchy, and monitoring for improvements resulting from re-naturalisation work is often overlooked. A number of partnership organisations undertake various monitoring throughout the catchment and this needs to be co-ordinated in a standardised manner, to enable long term benefits of changes to be understood. Improvements aspire to achieve habitat connectivity within the catchment, which in turn will be used to target future interventions. Monitoring takes place as part of Environment Agency work programmes and voluntarily by a range of groups. The targets of this objective seek to influence both.			
	Targets	**Actions**	**Lead**	**By**
5.2.1	Clarify the purpose and scope of existing monitoring on the Adur and Ouse	Establish what systematic monitoring, both volunteer and professional, is taking place in the catchment	Environment Agency, Ouse and Adur Rivers Trust	2013

		Establish a framework for monitoring progress towards an increasingly naturalised catchment		
5.2.2	Review existing monitoring protocols and methodologies relevant to the catchment and identify best practice	Review existing monitoring protocols and methodologies relevant to the catchment and identify best practice		2013
5.2.3	Promote consistent monitoring standards and techniques throughout the catchment	Apply appropriate dissemination of monitoring best practice to all relevant bodies in the catchment		2014
		Review all monitoring activity to ensure optimum efficiency both in terms of time and finance to avoid duplication and maximise resources		
		Ensure that all future habitat intervention projects include monitoring appropriate for flow, turbidity and chemical status as relevant to provide the future evidence base	Adur and Ouse Partnership	
5.2.4	Quantify the extent, condition and connectivity of wetland, riparian and riverine habitats within the catchment	Quantify the extent, condition and connectivity of riparian, riverine and wetland habitats within the catchment	Sussex Biodiversity Records Centre	2015
5.2.5	Quantify the extent, condition and connectivity of wetland, riparian and riverine habitats within the catchment	Establish the baseline extent and condition of relevant habitats	Sussex Biodiversity Records Centre	2015
		Analyse gaps in the data to determine the requirement for additional data collection through surveying		
		Fill the gaps in existing information on relevant habitats		
		Apply connectivity models when condition and extent data is sufficient to do so		
5.2.6	Implement an effective programme to monitor changes in the extent and condition and connectivity of riparian,	Ensure standardised data collection by all parties involved and ensure professional data collation and management services for monitoring data		2016

	riverine and wetland habitats			
5.2.7	Quantify, through efficient and effective monitoring we, the effect of natural river interventions on the Adur and Ouse catchment	Integrate monitoring that supports natural rivers in relevant aspects of Environment Agency business		2017

5.3 Identify, research and find funding sources for re-naturalisation projects throughout the catchment

The extent of altered channels in the rivers Adur and Ouse is high, which makes the task of prioritising work and setting short term aims difficult. This is further complicated by the complex nature of river projects and the need to address multiple, overlapping disciplines (such as water quality, fish passage, poor hydromorphology) The information and data required to identify or justify projects can be hard to access and interpret, which can make project limitations and associated costs hard to predict.

There is currently no central support mechanism in place for local projects, which can result in project management being unclear, inconsistent between organisations and/or difficult for small groups to manage. In addition, there is no consistent documentation for project development, implementation or monitoring, making it difficult to quantify societal/ ecosystem service benefits in a consistent way. Projects can also fail when risk adverse organisations require difficult-to-obtain evidence on the potential results of projects.

	Targets	**Actions**	**Lead**	**By**
5.3.1	Have and share a clearly defined vision of natural rivers within the catchment, which references an informed evidence base	Develop a plan, utilising data specified in objective 5.2, detailing how much habitat should be restored and created, setting targets for condition and extent		2013
		Develop a communications plan, detailing the wider ecosystem service benefits and value of naturally functioning rivers and river catchments. Liaise with stakeholders involved with catchment management, encouraging them to share, contribute to and adopt the vision		

5.3.2	Use available tools to target and prioritise projects and/or sites and collate project development material for a suite of desirable and potential projects	Develop a method of quality assessing projects for feasibility, practicality and realism in delivery, integrating opportunism as a targeting tool.		2014
		Produce a priority project catchment list methodiology, informed by action 1 to this target		
		Investigate and support both large scale, long term projects as well as short term interventions		
		Assist project leaders to clearly interpret and express social, economic and other value/benefits of each project, supporting best practice and encouraging project delivery		
5.3.3	Identify the ecosystem costs and benefits of natural rivers projects to influence allocation of funding	Provide a service which will identify the wider ecosystem service benefits & value of projects		2014
		Develop incentive tools in respect of payments for ecosystem services		
5.3.4	Have a clearly defined evidence framework to be utilised within the catchment by partnership organisations	Develop a clear recording methodology to be utilised by all partners, ensuring a standardised recording mechanism of habitat creation/restoration.	Sussex Biodiversity Records Centre	2014
		Deliver a report, using the recording framework, detailing how much habitat has been restored along with the wider ecosystem benefits		
5.3.5	Investigate and collate information on funding sources available outside of the Adur and Ouse Partnership	Create an accessible ‘hub’ which facilitates the exchange of information between project facilitators, funders and deliverers		2013
		Provide a service to assist partners in identifying suitable funding streams and match funding opportunities		
		Help others target applications for project funding as appropriate		
		Help develop clear and achievable pathways from project vision to delivery		
		Assist project leaders to clearly interpret and express the social,		

		environmental and other value/benefits of each project for bid development.		
5.3.6	Collate information on additional funding streams from partners and other stakeholders at a local and strategic level	Actively encourage stakeholders to identify internal funding streams that can deliver river naturalisation project objectives with stakeholder non-biodiversity led business objectives		2014
		Identify match funding opportunities available internally from the Adur and Ouse Partnership and via other sources		
		Seek to influence and find funding mechanisms focused outside of target areas such as the South Downs National Park, Areas of Outstanding Natural Beauty and those assisted by stewardship agreements	Adur and Ouse Partnership	
		Adur and Ouse Partnership members and associates will inform the targeting of funding by geography, project type and project stage within their respective organisations.		

5.4	**Encourage urban and rural populations, land and watercourse managers to play a positive role in sustainable river and water management ***			
	The role of natural rivers in supporting sustainable water management is considerable, backed up by evidence from the UK and abroad. Sharing this knowledge and applying it to the Sussex urban and rural populations could inspire many to play a positive role in the use and management of land and rivers.			
	Targets	**Actions**	**Lead**	**By**
5.4.1	Demonstrate methods of improving surface water quality through land-use best practice and innovation	Identify key issues surrounding land use and sustainable catchment management and engage with farmers / landowners / stakeholders to gain their trust and support for our work.		2013 – 2015
		Partner organisations will lead by example, demonstrating results to inspire others		

		Set up and maintain a number of demonstration projects in urban & rural locations which showcase best practice	Environment Agency, Knepp Estate	
		Produce a toolkit for farmers, landowners, stakeholders and individuals which contains information on funding availability, sources of advice / training and the relevant regulations surrounding land use and water quality		
		Evaluate progressive research, surface water quality enhancement and river re-naturalisation techniques, and where appropriate, promote these to stakeholders and individuals		
5.4.2	Build working relationships with both public and private business to deliver sustainable catchment management on the ground	Ensure that all interested stakeholders and groups, concerned with surface water quality, are brought together to build momentum and support for integrated catchment work.		2013 – 2027
		Promote the work of the Partnership wherever possible to build a wide network of contacts throughout the public and private sectors		
		Help and support South East Water to fulfil the objectives of its Upstream Thinking Project on the River Ouse		
		Work with South East Water and Southern Water to develop cost effective catchment management schemes as an alternative to traditional water treatment processes		
		Secure long term commitment to catchment management initiatives from both water companies through the Periodic Price Review implemented by OFWAT		
5.4.3	Encourage community ownership of local measures to improve the water environment within the catchment, and we will support communities with	Support local community groups (for example Parish Council sub groups) to help them identify local issues and take ownership of local actions		2013-2027
		Endeavour to ensure that planning policies support improved		

	information about the causes, effects and natural solutions to water quality issues	natural rivers and surface water quality through green infrastructure and sustainable drainage solutions		
		Raise awareness of the issues surrounding domestic cleaning solutions and garden herbicides, which contribute to the pollution of watercourses		
		Design and deliver educational programmes throughout schools to raise awareness of the harmful effects to the environment that cleaning solutions can have		
		Provide communities with information on the latest innovations in surface water drainage and how they can help to maintain functional sewerage systems, such as septic tanks and package treatment plants		

* Shared objective with surface water quality (see page 41)

3.6 ENGAGEMENT

“ Public support and involvement is a precondition for the protection of water... Without popular backing, regulatory measures will not succeed.... Your Water, Your Life – Plunge into the Debate!”

European Commission, 2010

The water environment belongs to everyone and is a vital resource now and for future generations. Demands on our rivers, estuaries and coasts have led to changes in their characteristics and value, both for people and for wildlife. A legislative framework, the Water Framework Directive, now exists to help make improvements in the water environment, and public participation is a key principle to achieving the objectives of the Directive. The need for everyone to be able to be involved recognises the importance of water as such a vital resource and how everybody plays a part in looking after it.

Working together to develop ways to exchange thoughts and information about rivers, floodplains, coasts and estuaries can help to ensure that the right solutions are put in place and that everyone can contribute to making change for the better.

http://www.eea.europa.eu/themes/water/water-management/public-participation

Engagement on the middle Ouse

The Middle Ouse Restoration of Physical Habitat (MORPH) project aims to restore the river and its floodplain to a natural state. This will reduce downstream flooding and improve wildlife habitats both in and beside the river. 15 sites have been selected for improvement work. The project is a partnership project between the Environment Agency and the Ouse and Adur Rivers Trust (OART) and is the biggest project within the Adur and Ouse catchment.

The engagement for MORPH has been led by a project officer – Peter King - employed by OART. Having a lead project officer has led to a huge amount of engagement around the project and has brought forward many additional opportunities for habitat improvement works in the Ouse catchment.

Pete King reports:

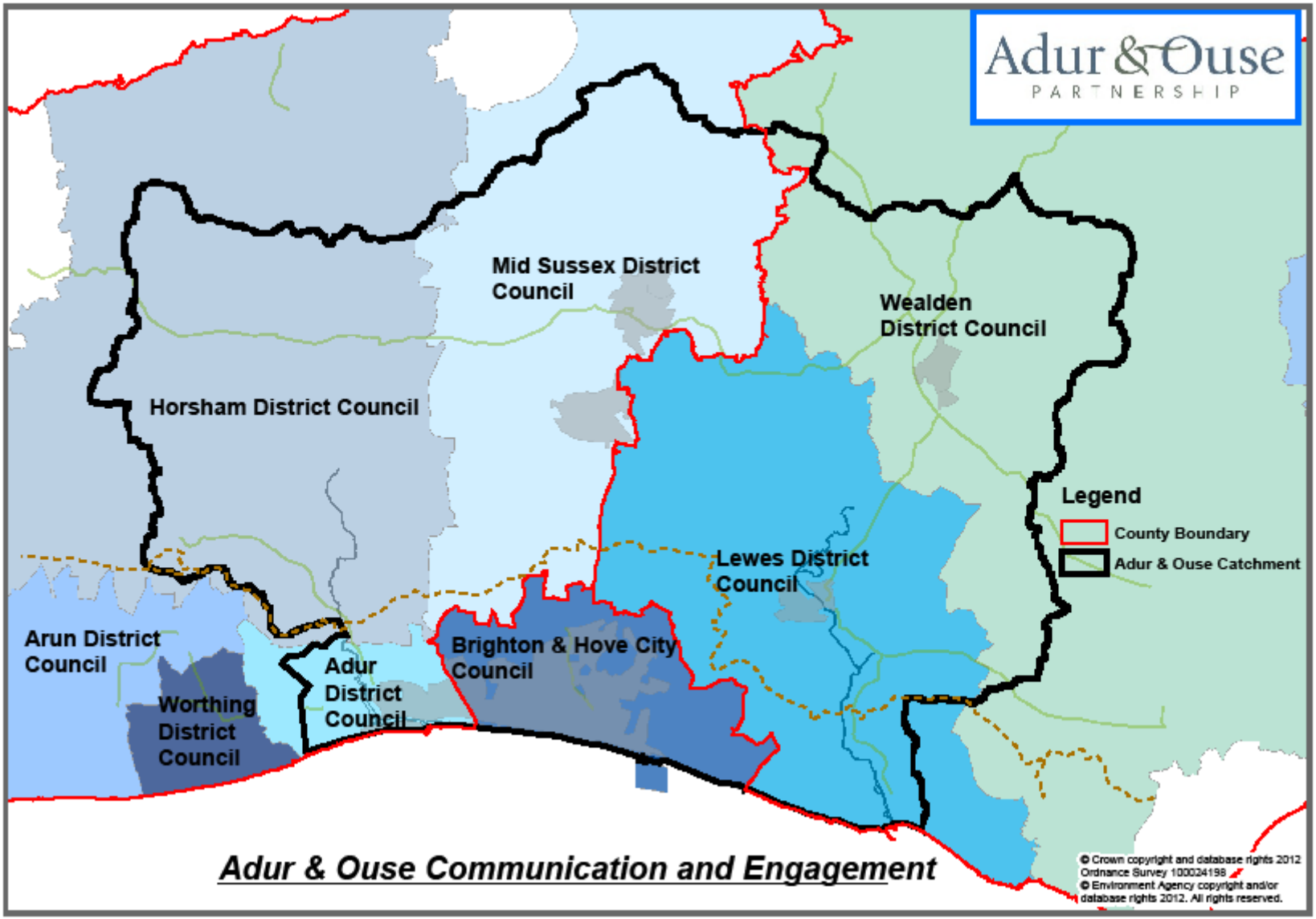
'Since December 2011, across the MORPH sites, we have spoken to 146 individuals. These range from landowner & stakeholder groups to interested parties who wish to be informed as the projects develop. In addition we have consulted with nine parish councils, South East Water, High Weald Area of Outstanding Natural Beauty, Natural England, East & West Sussex County Councils, Canoe England, Sussex Ouse Restoration Trust, Grassland Trust, Uckfield Flood Forum, Sussex Wildlife Trust and Sussex University.

I arrange these meetings in the best way for the site and for the stakeholder - including individual and group landowner meetings, attendance at angling club committee meetings, parish council meetings, resident's association meetings and individual site visits. I attend most meetings, but other members of the MORPH team come along when needed.

The MORPH project also has a twitter page, which I keep up to date with progress.'

The project team also work to raise the profile of the project outside direct consultation. Example include:

- A number of press articles during November 2012
- Engagement through National Trust visitor surveys at Sheffield Park (a National trust – owned river restoration site)
- Displays at the sustainable community group in Barcombe village
- Articles in Rivers Trust newsletter
- Leaflets at key sites (Bluebell Railway and Buxted Park Hotel)
- Environment Agency Fisheries and Biodiversity external newsletter
- Environment Agency and Ouse and Adur Rivers Trust webpage


Adur & Ouse
PARTNERSHIP
Mid Sussex District Council
Wealden District Council
Horsham District Council
Legend
County Boundary
Adur & Ouse Catchment
Lewes District Council
Arun District Council
Brighton & Hove City Council
Adur District Council
Worthing District Council
Adur & Ouse Communication and Engagement
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6.1	Seek to understand more about current perceptions and aspirations for the water in the Adur and Ouse catchment			
	Organisations, industries, communities and individuals all use water and interact with the water environment. Whilst we have pockets of information there is no comprehensive picture about how people value or perceive their water, river and coastal resource. All of the theme groups will be gathering some information about what people value and perceive in relation to their own needs and environment, for example, landowners managing rainfall runoff through their own environmental practises [Surface Water theme group]. The opportunity of working at a catchment scale is to bring together knowledge across all themes to build a picture of what people aspire to for the water environment in the Adur and Ouse. This will provide the basis for raising awareness of issues and their own impact on the water environment as well as promoting ownership of the water environment into the future. Early investigations have shown the organisations already engaged have tremendous potential to reach a large audience within the catchment. For example, South East water customers living within the catchment could be reached through a single or series of mail shots. The engagement theme group will be aim to provide some consistent tools and mechanisms across themes to co-ordinate how we learn more			
	Targets	**Actions**	**Lead (green if underway)**	**By**
6.1.1	Have a clear understanding of the aspirations and perceptions of people within the catchment	Understand and map those currently reached, through communication mapping within each theme		2013
		Identify and map those who should and could be additionally be reached		
		Set up a Facebook page about the catchment work to get comments and feedback from the public		
		Develop an overarching communication plan identifying mechanisms for reaching landowners, local communities, volunteers and other interested parties		
6.1.2	Evolve understanding of people's aspirations and perceptions to identify any changes after the implementation of the Catchment Management Plan	Seek views on aspirations and perceptions across the catchment via a universal survey targeting those people not currently being reached		2015
		Co-ordinate and report on the outcomes from the survey and		

		insight gained from mechanisms used by each theme		
		Promote, support and develop the use of tools (eg KETSO) for wide public consultation, which will produce semi-quantitative data on the wider community, and specific interest groups/ views		

6.2	**Raise awareness of the water environment through active engagement of landowners, local communities, volunteers and other interested parties**			
	By understanding more about what people value and aspire to, some of the real issues facing the water environment can be raised and the scale of the gap between their aspirations and reality gauged. Raising awareness of the water cycle and what it means for each group in the community will help to develop a sense of ownership, ambition and benefit (economic, social and quality of life)			
	Targets	**Actions**	**Lead**	**By**
6.2.1	Identify all groups that shall and can be worked with	Review planned awareness raising and engagement activities in each theme to develop common initiatives and campaigns		2013
		Provide resources, for example primary schools, schools and colleges, to meet the needs of all themed engagement actions		
		Investigate the use of multi-media, such as smartphone technology, podcasts, podscrolls and audio, as support tools for themed engagement actions		
		Work with other organisations and initiatives, such as Love your river/ coast, water companies, local authorities, other projects (Biosphere, Brighton & Hove One Planet) to connect with new audiences		
6.2.2	Establish mechanisms for sharing information across themes	Run workshops for key stakeholders, including land managers, farmers and fishing clubs	Environment Agency	2013
		Create pubic exhibitions at project delivery sites, for example the British Museum of Folklore		

		Identify hard to reach groups and develop mechanisms for increased levels of engagement.		
6.2.3	Raise awareness sufficiently to have a clear direction on engagement that will lead to actions to achieve good ecological status	Provide a common forum (website) and information sources for the catchment activities within the Adur and Ouse	Environment Agency	2013

6.3	**Empower people to own local issues, and promote and take action on local solutions ,within the framework of the wider catchment through sharing knowledge, partnership working and engagement**			
	By getting everyone involved and working together, the future of the water environment and its guardianship will not just be in the hands of one group: all can have a say. This is objective seeks to empower local delivery and begin to meet the aspirations of everyone in the catchment			
	Targets	**Actions**	**Lead**	**By**
6.3.1	There is a properly co-ordinated approach to 'getting involved' across the catchment, utilising a mechanism for sharing information that will be established by 2013.	Identify "getting involved" activities which are being promoted by each theme		2015
		Seek ways to co-ordinate and rationalise activities across groups	Steering Group	
		Produce a co-ordinated plan of volunteer activities that will maximise benefit		
		Identify ways of matching volunteers to activities		
		Hold a "getting involved" conference or fair in 2014		
6.3.2	More people are actively helping to look after their local waterbody, and this is happening in waterbodies failing to achieve good status	Set up "volunteer champions" to help co-ordinate and promote getting involved		2015
		Report on results of activities quarterly in a user friendly way		
6.3.3	More people will value the Adur and Ouse catchment and the contribution they can make to looking after them	Re-run survey of aspirations and perceptions		2016

4 NEXT STEPS

The Adur and Ouse Partnership is committed to developing and facilitating the delivery of actions across the catchment. A forward look through 2013 and beyond has been drawn up, which show key activities that the Partnership wants to pursue, and how these could align with other's key milestones. See figure 6.

It is anticipated that this Catchment Management Plan, and any supplementary documents, will form the basis of the 2nd South East River Basin Management plan for this geography.

The Partnership proposes to undertake the following steps for 2013:

- Produce a strategic engagement plan
- Consult widely on this Catchment Management Plan (see table 1 below)
- Ensure that this plan aligns with the objectives and work of key strategic groups in the catchment (see table 2 below)
- Revise and launch this Catchment Management Plan following wider consultation
- Undertake a cost-benefit analysis, in an ecosystem services context, of actions in the plan
- Prioritise actions, and seek and secure funding in an ongoing manner
- Develop a detailed plan for the delivery of actions

Angling Clubs	Members of parliament
Brighton & Hove City Council (Biosphere project)	National Farmers Union
Country Land and Business Association	National Trust
Environment Agency	Natural England
Farming communities	Organisations of the Steering Group members
Forestry Commission	Ouse and Adur Rivers Trust
Key councillors	South Downs Land Managers Group
Landowners, managers and their professional bodies	South Downs National Park Authority
Local Authorities	South East Water
Local communities	Southern Water
Local community groups	Sussex Inshore Fisheries and Conservation Authority
Local interest groups, such as ramblers	Sussex Wildlife Trust
Local Nature Partnership	Tenant Farmers Association
Local schools and teacher groups	University of Brighton

Table 1 – list of consultees for consultation on this draft Catchment Management Plan

Brighton and Hove Local Strategic Partnership	
City Sustainability Partnership	Sub group of the Brighton and Hove Local Strategic Partnership
Coast to Capital Local Enterprise Partnership	
East Sussex Environment Strategy Group	Sub group of the East Sussex Local Strategic Partnership
East Sussex Local Strategic Partnership	
Local Authority Local Development Framework	One of these groups for each local authority
South East Local Enterprise Partnership	
Sussex Local Nature Partnership	
West Sussex Environment and Climate Change Board	Sub group of the East Sussex Local Strategic Partnership
West Sussex Local Strategic Partnership	

Table 2 – key strategic groups in the catchment

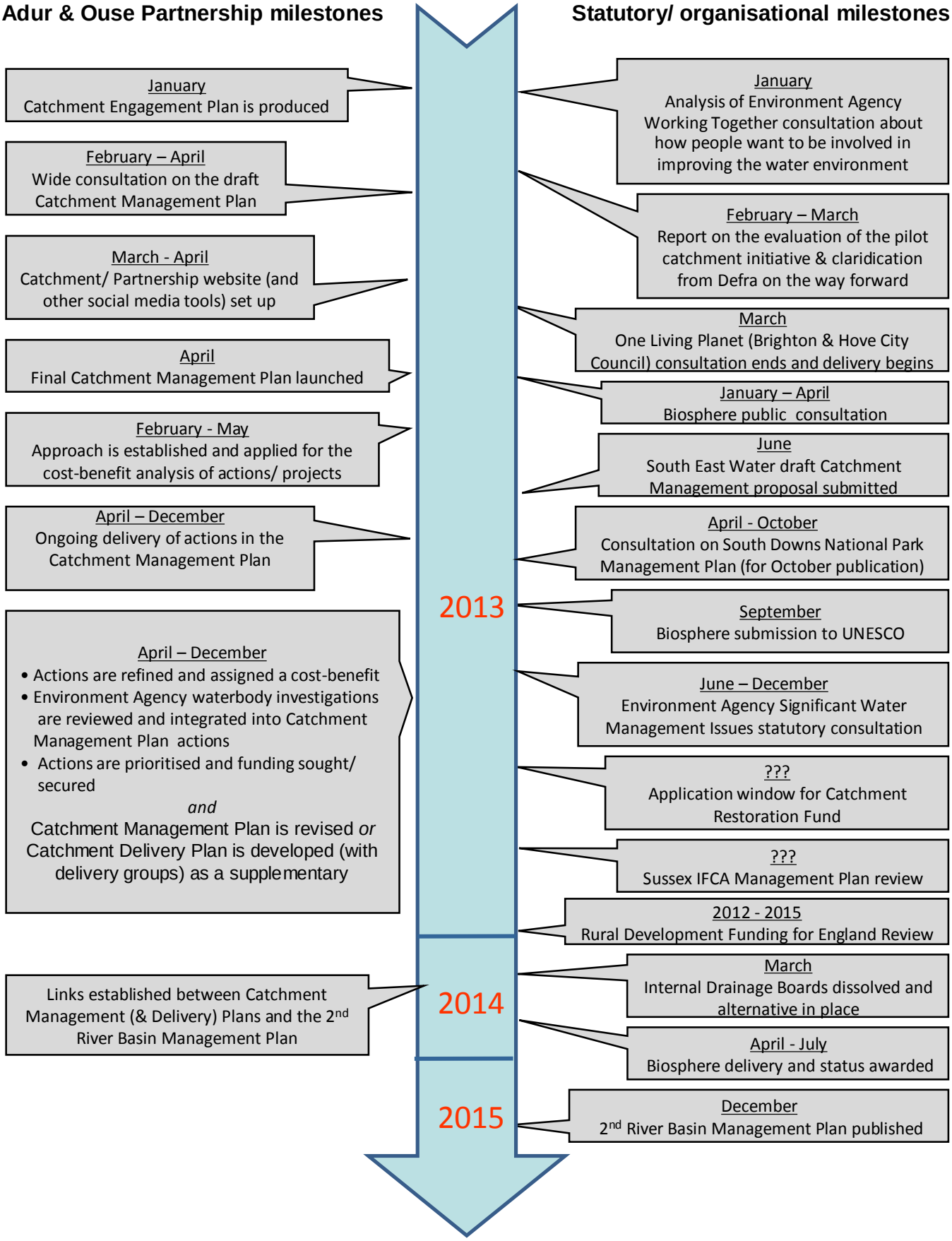

Figure 6 – Forward Look for the Adur and Ouse Partnership

5 ECOSYSTEM SERVICES

Natural ecosystems provide a multitude of resources and processes that benefit humankind economically and socially, and produce human wellbeing. These services are fundamental to sustainable catchment management, and it is essential that some degree of ecosystem services assessment is undertaken during the implementation of actions in this Plan.

Ecosystems provide food and raw materials, as well as water to drink. They provide protection from floods and drought, places to walk and enjoy recreational activities. They recycle nutrients and air, store carbon, and help to regulate the climate.

The UK National Ecosystem Assessment (UK NEA 2011) finds that the natural environment is critically important to health and wellbeing, and economic prosperity, but its services are consistently undervalued in conventional economic analyses and decision making.

The UK NEA 2011 recognises four categories of ecosystem service:

- Provisioning services - the tangible goods people obtain from ecosystems
- Regulating services - 'processes' that ecosystems provide to purify water, pollinate plants, moderate climate and control pests and diseases
- Supporting services - provision of the basic infrastructure needed for life
- Cultural services - environmental settings influencing values, behaviours, health

There is no single classification system of ecosystem services within these four categories. Classification tables are proposed in the UK NEA 2011, The Economics of Ecosystems and Biodiversity (2011), and Natural England's economic valuation of uplands ecosystem services (NECR029). The following summary of all ecosystem goods can be drawn from across this literature:

Category	Ecosystem Good
Provisioning	Fresh water
	Food
	Fibre
	Energy
	Natural medicine
Regulating	Pollution/noise control
	Disease/pest control
	Equable climate
	Flood/erosion control
Supporting	Biodiversity/wildlife
Cultural	Historic/cultural landscapes
	Recreation/Tourism
	Aesthetic/inspiration
	Spiritual/religious

The *concept* of ecosystem services is gaining momentum but as yet there is no established methodology to assess the monetary benefits that ecosystems provide. This will become essential if nature's services are to secure a place in economic thinking, and thus attract the investment needed to protect and maintain them.

However, the *practical application* of the ecosystem approach (which encompasses the costs and benefits of ecosystem services) and the value of doing it, is in its early stages.

General principles

There are some key documents and case studies that have been produced in recent months, which provide points of reference, principles and general methodology for any group or sector seeking to undertake a cost-benefit assessment of work to improve/ protect ecosystem goods.

For example, an introductory guide to valuing ecosystems (Defra, 2007) promotes the use of 'value transfer' (i.e. using existing economic valuation evidence) in a systematic approach, to quantify the value of ecosystem services in decision-making. The recommended steps of this approach are to:

Step 1: Establish the decision-context in which the case study analysed is based

Step 2: Define the ecosystem services and the population that will be affected by the case study

Step 3: Define and quantify the ecosystem changes that will be brought about by the case study relative to the baseline of 'no-case study'

Step 4: Identify and select the appropriate monetary valuation evidence

Step 5: Transfer evidence and estimate monetary value

Step 6: Aggregate monetary values

Step 7: Conduct sensitivity analysis

Step 8: Reporting (of the analysis and conclusions)

These steps have been adopted in Natural England's Valuing Ecosystem Services: Case Studies from Lowland England (Natural England Commissioned Reports, Number 101 2012), from which the case study below has been extracted.

The steps demonstrate that any cost-benefit assessment of environmental improvement activities needs to be made on a case-by-case-base and focused on a specified geographic area. Assessments (e.g. case studies) for one project cannot be extrapolated with confidence to another proposal. Furthermore, the application of the steps above, such as establishing a baseline, or an appropriate monetary value, is a subjective process based on individual interpretation.

This raises the question about the depth to which a cost-benefit assessment of ecosystem services should go to maintain its inherent value. Current thinking recognises that action/ site-specific assessments may be qualitative, quantitative or monetary. Indeed, Valuing Ecosystem Services: Case Studies from Lowland England, finds that ensuring transparency of the analytical process is as important, if not more important, than quantified monetary valuations of any benefits assessed.

Another significant learning principle from recent case studies is that it is reasonable, provided it is made clear, that any cost-benefit assessment is restricted to the boundaries of the site (such as the catchment, or a project area) even though this may result in displacement elsewhere. Displacement in this context means that the provision of an ecosystem service in one location may remove the provision of that same service elsewhere. For example, relocating a point of water abstraction to increase river flow may mean that abstraction is increased and flow reduced elsewhere.

This principle significantly reduces the complexity of any analysis, and helps to address the question of depth, and fit-for-purpose outputs, which might well prove to be qualitative rather than quantitative given that transparency of the process is just as important.

The case study below, about rewilding Knepp Estate, is an excellent example of assessing ecosystem services in relation to the Adur and Ouse catchment:

- The site lies within this catchment, near Horsham in West Sussex
- The study is one of 6 case studies commissioned by Natural England to fill a literature gap in valuing ecosystem services in lowland England
- The study applies Defra's recommended steps to take on the value transfer approach
- The work resulted in a qualitative rather than a quantitative assessment, despite the high profile of the site and relevant information being at hand

The Adur and Ouse Steering Group fully recognises the need to undertake further work, in the process of implementing this Plan, to assess in a qualitative or quantitative way, the costs and benefits of actions set out in the preceding sections.

Knepp Estate Rewildling: Valuing ecosystems services

The rewilding project on the Knepp Estate, in West Sussex, has been designed to turn around the economic viability of the Estate, which can no longer make a profit from intensive agriculture. The project seeks to restore 3,500 acres to 'the state it enjoyed before intensive agriculture took its toll, and to allow the grazing animals to drive habitat changes by letting them roam as freely as possible with minimal human intervention'. In practice, this means extensive livestock rearing – including Longhorn cattle, Fallow deer, Exmoor ponies and Tamworth pigs - on rewilded land alongside educational visits, field sports, and a historic park restoration.

Likely ecosystems services

A baseline was established against which to assess the ecosystems services that could result from the project, and their likely value. Grassland rental was considered the most appropriate choice for the baseline along with some existing non-agricultural land uses.

The key ecosystems services benefits were identified as:

- Food and fibre – food production under the project would be lower, but of higher quality/ value. The change in animal type would result in higher value meat from traditional breeds, and there are options for high value niche marketing/branding associated with this.
- Climate regulation – change in type/density of livestock will reduce emissions from livestock; increased woody biomass will enhance carbon storage in biomass.
- Recreation – recreational use of the area will be enhanced through improved aesthetic quality, wildlife, more 'interesting' breeds of livestock, and the upkeep of paths and bridle paths along with the creation of 'cool camping' facilities.
- Cultural and spiritual – the cultural and spiritual values of wilded land could be significant, especially in the context of the south-east of England where such areas are increasingly scarce.
- Landscape and aesthetics – returning the landscape to its 'original' parkland state will enhance the aesthetic appeal as well as the biodiversity.
- Biodiversity/habitat – Significant improvements are expected due to the rewilding project.

Valuing these services

Monetary values for the ecosystems service changes that could be expected from the project have been estimated over 10, 50 and 100 years. The most significant values arising are from the composite of biodiversity, cultural and landscape services and the greenhouse gas emission reductions. Although the study states that there is 'high uncertainty regarding the physical and monetary measures of these services'.

The findings of the assessment do allow for a cost: benefit analysis of the project. Even over the shortest period of analysis – 10 years – the cost:benefit ratio is approximately 1:2, so even if the total benefits were half those estimated, the project could still be considered value for money.

It is also interesting to note that, whilst the valuation process relies on a number of assumptions and many uncertainties remain, undertaking this assessment is likely to be beneficial. As The valuation report finds that 'in many cases it is the process of valuation which shines more light on the benefits of the project that then final values produced'.

Visit: http://www.knepp.co.uk and http://publications.naturalengland.org.uk/publication/2319433

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Catchment Steering Group:

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Task and finish groups:

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7 TERMS AND ACRONYMS

Term	Acronym	Description	Links to further information
3rd and 4th order tributaries		Refers to the hierarchical arrangement of tributaries, where the 1st order tributary is typically the least in size	http://en.wikipedia.org/wiki/Tributary
Agri-environment schemes		Schemes that provide payments to farmers for effective land management to protect the environment and wildlife	http://www.naturalengland.org.uk/ourwork/farming/default.aspx
Aquifer		Underground layers of water bearing rock	
Asset Management Programme	AMP	A water company plan that sets out it's proposed spending plans for the next five years	
Biosphere project		Projects focused on designated geographical areas that promote a balance between people and nature	
Catchment Abstraction Management Strategy	CAMS	Documents that outline how much surface and ground water is available for abstraction within a given geographical area	http://www.environment-agency.gov.uk/business/topics/water/119927.aspx
Classification		The way in which the status of waterbodies is assigned under the WFD	
Cross compliance		The requirement for farmers to comply with a set of statutory management requirements	http://rpa.defra.gov.uk/rpa/index.nsf/UIMenu/814240C66F10CAC8802570C7004248D4
Department for Environment, Food and Rural Affairs	Defra	UK Government department responsible for environmental protection, food production, agriculture, fisheries and rural communities	http://www.defra.gov.uk/
Ecosystem services		Good and processes provided by the natural environment	

Ecosystems approach		Managing the environment in a way that protects and values ecosystem services	
Good ecological potential	GEP	The WFD target objective for artificial and heavily modified waterbodies	
Good ecological status	GES	The WFD target objective for surface, transitional and coastal waterbodies	
Good Status	GS	The overall objective for waterbodies classified under the WFD	
Groundwater dependent terrestrial ecosystems	GDTE	Wetlands that are critically dependant on groundwater flows and/or chemistry	http://www.wfduk.org/resources%20/groundwater-dependent-terrestrial-ecosystem-threshold-values
Higher Level Stewardship	HLS	An agri-environment scheme that involves complex environmental management over a long period of time by the land managers involved	http://www.naturalengland.org.uk/ourwork/farming/funding/es/hls/default.aspx
Indicator species		A biological species that defines a particular environmental characteristic	http://en.wikipedia.org/wiki/Indicator_species
Marine conservation zones	MCZ	Designated marine areas to protect nationally important marine wildlife, habitats, geology and geomorphology	http://jncc.defra.gov.uk/page-4525
Marine Protected Areas	MPA	Zones of the UK's seas and coasts where wildlife is protected from damage and disturbance	http://www.naturalengland.org.uk/ourwork/marine/mpa/default.aspx
Mitigation measures	MMlo	Generic descriptions of work required to mitigate against activities that can adversely affect natural environmental processes	
National Environment programme	NEP	a component of the water company periodic review process –	

Natura 2000 sites	N2K	A European network of Special Conservation Areas and Special protection Areas designated under the EU Habitats and Birds Directives	
Nature Improvement Areas	NIA	12 designated areas in which to develop a shared visions to deliver landscape-scale ecological networks collaboratively	http://www.defra.gov.uk/environment/natural/whitepaper/nia/
Nitrate Vulnerable Zones	NVZ	A conservation designation for areas of land that drain into nitrate polluted waters, which applies rules on amount and timing of fertiliser application	
Water Services Regulation Authority	Ofwat	The economic regulator of the water and sewerage industry in England and Wales	http://www.ofwat.gov.uk/
Periodic Price Review	PR	A review of proposed water company spending plans (AMP) to set the price, investment and service package that customers receive. For example PR09 took place in 2009 prior to AMP 2010-2015	http://dwi.defra.gov.uk/stakeholders/price-review-process/index.htm
Restoring Sustainable Abstraction Programme	RSA	A programme of changes to surface and groundwater abstractions, that seek to find a balance between public and environment needs	http://www.environment-agency.gov.uk/business/topics/water/32026.aspx
River Basin Management Plan	RBMP	A plan describing the classification of water bodies that make up a river basin district, and the measure required to achieve good ecological status, as required by the WFD	http://www.environment-agency.gov.uk/research/planning/33106.aspx
River Basin Planning	RBP	The six-year cycle of planning, implementation and review stipulated by the WFD	http://www.environment-agency.gov.uk/research/planning/33106.aspx

Safeguard Zones	SGZ	Areas designated to protect the quality of raw surface and ground water that is abstracted for drinking water supply	
	SAGIS	A conceptual water quality model designed to calculate the proportional inputs of different pollutants to a river system	
Local Nature Partnership	LNP	Partnerships working to improve the range of benefits and services provided by good land management	http://www.sussexwildlifetrust.org.uk/conservation/page00047.htm
Transitional and coastal waters	TRaC	Estuaries and coastal waterbodies (out to 1nm)	
Transitional zone		River reach where fresh and sea water meets and combines, creating specific ecological conditions and habitat	
Water Framework Directive	WFD	EU Directive requiring member states to achieve good quantitative and qualitative status in all water bodies by 2015	http://ec.europa.eu/environment/water/water-framework/index_en.html
Waterbody		Defined areas of natural or artificial bodies of water encompassing rivers, lakes, groundwater, estuaries and coastal waters (out to 1nm)	

APPENDIX A

Waterbody Summary Sheets

Waterbody Summary Sheets are a live information document, produced by the Environment Agency (South East) for every surface waterbody in the Adur and Ouse catchment.

The purpose of the summary sheets is to share and evolve current information and technical judgement on each waterbody, in a short standardised fashion, focusing on compliance with Water Framework Directive objectives. The sheets are live so that new information, including information held by others, be incorporated as collaborative understanding grows. They currently describe:

- the reasons why a waterbody is likely to be failing to achieve good ecological status/ potential
- monitoring points and data used for status classification
- relevant actions from the 1st South East River Basin Management Plan
- proposed further, local actions that could contribute to improving the status of the waterbody

Waterbody summary sheets for this catchment are available from the Environment Agency on request. Note that summary sheets for coastal and groundwater bodies are not yet available. An example summary sheet for the River Uck between Ridgewood Stream Confluence and Ford is presented below.

Water Body Summary Sheet

Water Body Summary Information (Data based on SERBMP Dec 2009)

WATER BODY ID	WB NAME	CATCHMENT	WB TYPE	HMWB
GB107041012640	River Uck between Ridgewood Stream Confluence and Ford	Ouse	River	No

WB COORDINATOR/TEAM	AIG LEAD	DESK STUDY AUTHOR
TBC Elliot Tinton	Cathryn Nelson	Jessica Durkota

Designations							
Bathing Water	Drinking Water	Shellfish Water	Freshwater Fish	Nitrates Directive	Urban Waste Water	Wild Birds Directive	Habitats and Species
No	No	No	Yes	Yes	**Yes**	No	No

Overall Ecological Status/Potential	Confidence WB is less than good	Elements Driving Classification	Other Failing Elements (element status)	Elements Passing
Moderate	Very Certain	Phosphate	Hydrology	Fish Morphology Ammonia (Phys-Chem) Dissolved Oxygen pH Temperature Copper Zinc Ammonia (Annex B)

Relevant Monitoring Points					
Diatoms	Macrophytes	Fish	Invertebrates	Physico-Chemical	Chemistry
Not Used to Classify	Not Used to Classify	Owlsbury Farm (10555)	Not used to classify	Owlsbury Farm (F0002274)	Copper and Zinc are monitored at Owlsbury Farm (F0002274)

Photographs of catchment

Photograph of the River Uck looking downstream of the Uckfield Bypass Bridge (A22)

Situation

BACKGROUND

This water body contains approximately two kilometres of the River Uck; although it begins immediately downstream of the urban area of Uckfield, the surrounding land use is largely agrarian. The water body begins downstream of the confluence between the Uck and Ridgewood Stream, flowing until just upstream of the confluence between the Uck and the Little Horsted Stream near the village of Ford. The river flows over an incised clay substrate and has a very flashy hydrological regime, particularly during the winter months.

STATUS

This water body is currently of Moderate status as a result of failures in Phosphate; although it is predicted to remain at this status, we are working to an objective of Good Ecological Status for 2027.

PRESSURES

This water body receives the discharge from a large Sewage Treatment Works located in Uckfield which is likely to influence its nutrient status; in addition, several smaller incidents and discharges of concern are located upstream. There is also a high stand coverage of the invasive species Himalayan balsam (*Impatiens glandulifera*) along the banks of this water body which is likely to influence the macrophyte community.

FAILING ELEMENT OVERVIEW

The following is a summary of the current situation for each failing element as of March 2011

Phosphate

The physico-chemical status of this water body has been classified using the monitoring data from Owlsbury Farm (F0002274) where all determinants (including chemical) achieve High Status with the exception of Phosphate which is Moderate. Annual mean Orthophoshpate levels consistently exceed the threshold for Good Status, recording an average of 1.01 mg L^{-1} in 2010 (n=12). This water body is located immediately downstream of the discharge from Uckfield Sewage Treatment Works, although this failure in Phosphate is likely to be attributed to multiple upstream sources, it is likely that this discharge contributes a large proportion of nutrients to this water body.

Water Resources

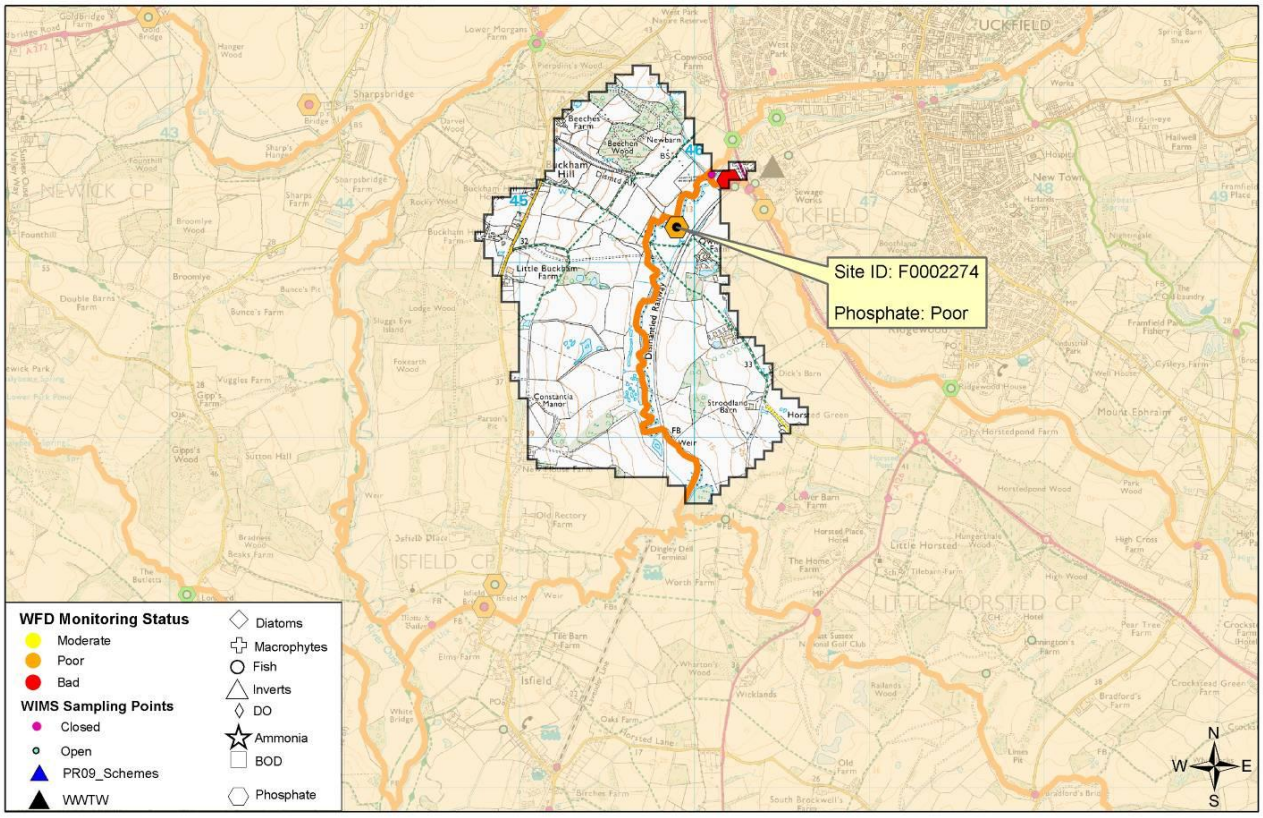
The Water Resources WFD Stage One assessment utilizes a desktop study to confirm that the flow compliance result is correct and ascertain whether the ecological monitoring sites are suitable for assessing abstraction impacts. The ecological status of suitable monitoring sites is noted, water bodies where flow non-compliance is confirmed and the ecological assessment indicates a potential hydroecological issue, progress to the second stage. The second stage assesses the reason(s) for failure and the (potential) abstraction pressure on the failing ecology. This water body is currently assessed as being compliant with its river flow objectives and, as such, should **not pass** to the Second Stage of the WR WFD investigation.

KEY PARTNERS

We will work closely with internal teams and Southern Water to investigate and improve the contribution of Phosphates to this water body.

Water Body Action Team (to include external stakeholders where appropriate)					
Action ID	**Action Description**	**Target Date**	**Progress**	**Name**	**Team / Organisation**
RBMP Actions					
SE105	Improvements to water company assets at 21 locations in the Adur and Ouse Catchment, to deliver benefits against the pressures identified or investigate the need for further investment. Schemes to ensure no deterioration in the current classification as a result of increased volumes of discharge from Dial Post STW, Fletching STW, Halland STW, Lower Beeding STW, Burgess Hill (Goddards Green) STW, Ripe WWTW, Wivelsfield STW and Monks Gate STW.. Event/duration monitors to be installed at: Carnegie Rd CSO, Cortis Ave CSO, Marine Cres CSO, Mertletts Way CSO, Sea Lane Goring CSO, Sea Lane Worthing CSO, Sompting Rd Penfold Rd CSO, Sompting Rd CSO, Wallace Ave CSO, and Wigmore Rd CSO.	31/12/2015			Southern Water
SE0200	Carry out investigative riverine and land based field work into the origins, causes of and solutions to pollution where we need to improve certainty. Outcome: Improve our understanding of problems, in order to take effective action to address them.	Implemented		Jess Durkota	Analysis and Reporting, EA
Sub Actions					
SE0200-1	Continue to monitor progress of the UWWTD proposal and undertake biological monitoring as required	31/12/2012		Jess Durkota	Analysis and Reporting, EA
WB Add on RBMP Action					
Sub Action					
New Actions					
NA1	Recommend carrying out/reviewing P source apportionment work across Ouse catchment to verify which P sources should be reduced to achieve Good status and assess whether this is practicable.	31/12/2012			SEP (Water Quality), EA
Sub Actions					
Redundant RBMP Actions (Of those listed above)					
Action ID	**Action Description**	**Reason no longer relevant**			
Mitigation Measures (MM)					
MM ID	**MM Description**	**Target Date**	**Progress**	**Name**	**Team / Organisation**

Map of Catchment –



Glossary

A&R	Analysis and reporting team
ASPT	Average Score Per Taxa
BIOSYS	Our main database for storing, manipulating and reporting data from freshwater and marine biological surveys at any taxonomic level
BMWP	Biological Monitoring Working Party
CEO	Combined emergency overflow
CSF	Catchment sensitive farming
CSM	Customer Self Monitoring (of STPs/WIMS sampling points)
CSO	Combined sewer overflow
D/S	Downstream
DO	Dissolved oxygen
EM	Environment management team
EP	Environmental planning team
FCS2	Fisheries Classification Scheme version 2
FRB	Fisheries recreation and biodiversity team
HEVI	HydroEcological Validation tool
LIFE	Lotic Invertebrate index for Flow Evaluation
NFPD	National Fish … Database
NTAXA	Number of taxa
P	Phosphate
RIVPACS	River InVertebrate Prediction and Classification System
RIVPACS	predicts the macro-invertebrate fauna at any site on a river from a small number of environmental parameters derived from maps or measured at the site.
SERBMP	South East River Basin Management Plan
SS	Suspended solids
STP	Sewage treatment plant
STW	Sewage Treatment works
U/S	Upstream
WB	Water body
WQIP	Water Quality Improvement Plan
WWTW	Waste water treatment works

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Adur & Ouse PARTNERSHIP

The content of this Catchment Management Plan represents the views of the Adur and Ouse Partnership and does not necessarily represent the views of the individual organisations represented on the Steering Group of the Partnership.

For more information or to get involved please contact:
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