ADUR & OUSE
CATCHMENT MANAGEMENT PLAN

Update July 2019

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

Adur & Ouse
PARTNERSHIP

FOREWORD

In 2018 the Partnership decided that it was opportune to review its website and its Catchment Management Plan (CMP), and that the most effective way of doing this was to summarise what had been achieved both by the Partnership as a whole and also by the efforts of all its constituent parties. At the same time the key points for future objectives and actions would be highlighted. Since 2012, flood management, particularly so-called Natural Flood Management, has been rising up the environmental agenda (and becoming of great interest to councils and local communities, rural and urban) so this extra objective, despite not being a WFD matter, has been added to the forward-look CMP. The Partnership further dropped Engagement as a discrete objective as it was deemed a cross-cutting matter (i.e. that public understanding *sensu lato* was important enough to lie within all other objectives) and agreed that Fisheries is henceforth best treated as intrinsic to Natural Rivers.

The Adur & Ouse Partnership was one of ten such bodies originally set up by Defra to test the idea of a catchment-based approach to help deliver the objectives of the WFD. That it is still meeting – bringing together a formidable mix of academic, charitable, commercial and public bodies – and planning for a future of uncertain environmental and political climate, is testament to the dedication and professionalism of all involved. Long may it, and they, continue!

Hew Prendergast
Chair of the Adur & Ouse Catchment Partnership

CONTENTS

1. COASTAL & TRANSITIONAL WATERS

Shoreham Port © Sussex IFCA

Overview:

From Worthing's Teville Stream to Newhaven, the catchment's coastal waters sit on a flat, gently shelving platform, making them relatively shallow and moderately exposed. In the east of the catchment, these waters pound against the iconic chalk cliffs. In the west of the catchment the lower lying coast is characterised by its shingle beaches. Chalk is one of the key habitats of the intertidal and subtidal seascape, forming wave cut platforms under the cliffs, reefs and ledges. Key chalk habitat sites include Ship Rock, Looe Gate and South West Rocks marine Sites of Nature Conservation Importance together with Beachy Head West Zone. To the west of the catchment, particularly offshore of Brighton, significant sand wave fields exist. Brighton Marina and the coast's piers add another dimension of habitats which support shallow sub-tidal algal species usually found in deeper waters.

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, 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 Adur estuary provides 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. Marine fish populations provide a significant economic benefit to the area through commercial and recreational fisheries. Species such as lobster, crab, whelk, sole and plaice are particularly important to the fishing community and economy. As a tourist destination, the coastline has always provided healthy bathing waters as well as recreational fishing facilities.

Summary of current issues:

The fishing industry is a pressure on the marine environment due to the removal of biomass and the impacts of heavy mobile gears on the benthic habitats. Benthic habitats and water quality are impacted by the dredging activities of Shoreham Port and Brighton Marina. Development pressure along the coast and its tidal river reaches impacts intertidal habitats and opportunities for habitat creation are limited. Land management imposes a nutrient pressure from sewage discharges and agricultural run-off with nutrients entering the coastal waterbodies from river and groundwater systems.

The quality of coastal and estuarine waters is fundamental to the economic and social value of fisheries, tourism and local communities, 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 its 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 specific economic and social requirements of the area. This is achieved by actively mitigating against the impacts of local activities. Management of this important coastline and marine environment 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.

Outcomes & Achievements: 2012-2019

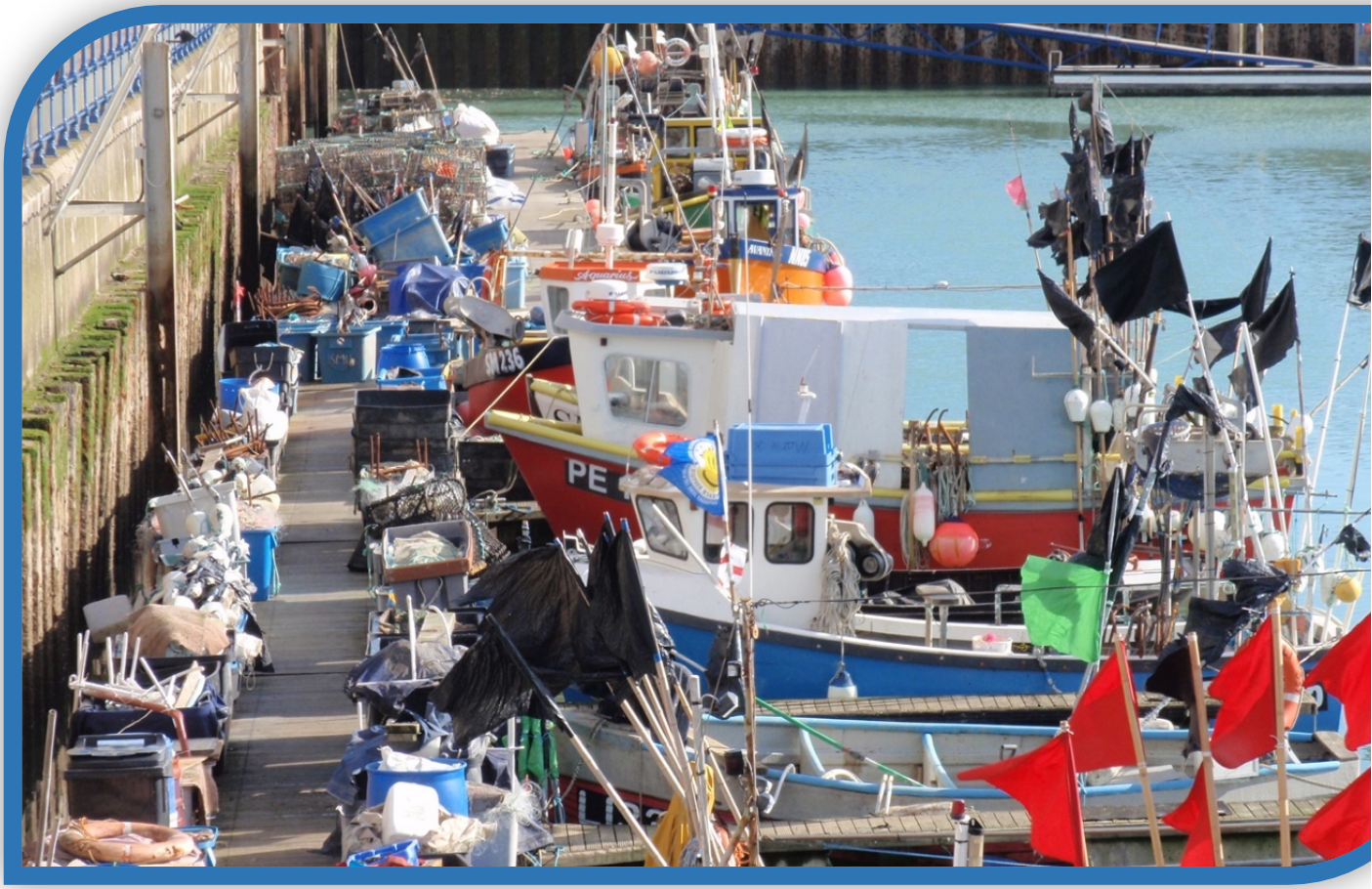
- Introduction of Beachy Head West Marine Conservation Zone fisheries management measures, under the Sussex Inshore Fisheries and Conservation Authority (IFCA) Byelaw.
- Clear Seas' publicity campaign, a project partnership between Sussex IFCA and the Environment Agency, to educate marine users from Brighton Marina, Shoreham Port and Newhaven Harbour on how to take simple steps to look after the marine environment.
- Completion of two comprehensive mapping projects for the marine environment (Sussex Coastal Habitats Inshore Pilot (SCHIP) Projects I and II) in partnership between Sussex IFCA, the Environment Agency and the University of Brighton.
- Development by The Living Coast (a United Nations Biosphere Reserve) of a virtual reality experience of Beachy Head West Marine Conservation Zone (BHW MCZ) which gives the user an underwater view of the chalk gullies and their wildlife.
- Initial work carried out with the Sussex Marine and Coastal Forum to establish a baseline of ecological legislation targets and current actions through a project called SeaView.

- Continuation of the collection and use of data by Sussex Seasearch and Shoresearch and small fish surveys that contribute to designation principles and management advice.

Seaford wave-cut platform from Bastion steps © Sussex IFCA

Case Study: Sussex Coastal Habitats Inshore Pilot

Sussex Coastal Habitats Inshore Pilot (SCHIP) II project developed a marine habitat map for the whole Sussex IFCA district. The project was funded by the Environment Agency and delivered by IFCA in collaboration with the University of Brighton and the Sussex Biodiversity Records Centre. The work brought together and analysed all available historic habitat data. The data was used to construct a broad scale habitat where known habitat information is extrapolated to fill in the gaps between data points. This created a continuous map that is being used to inform marine management decisions.



Brighton Marina fleet © Sussex IFCA

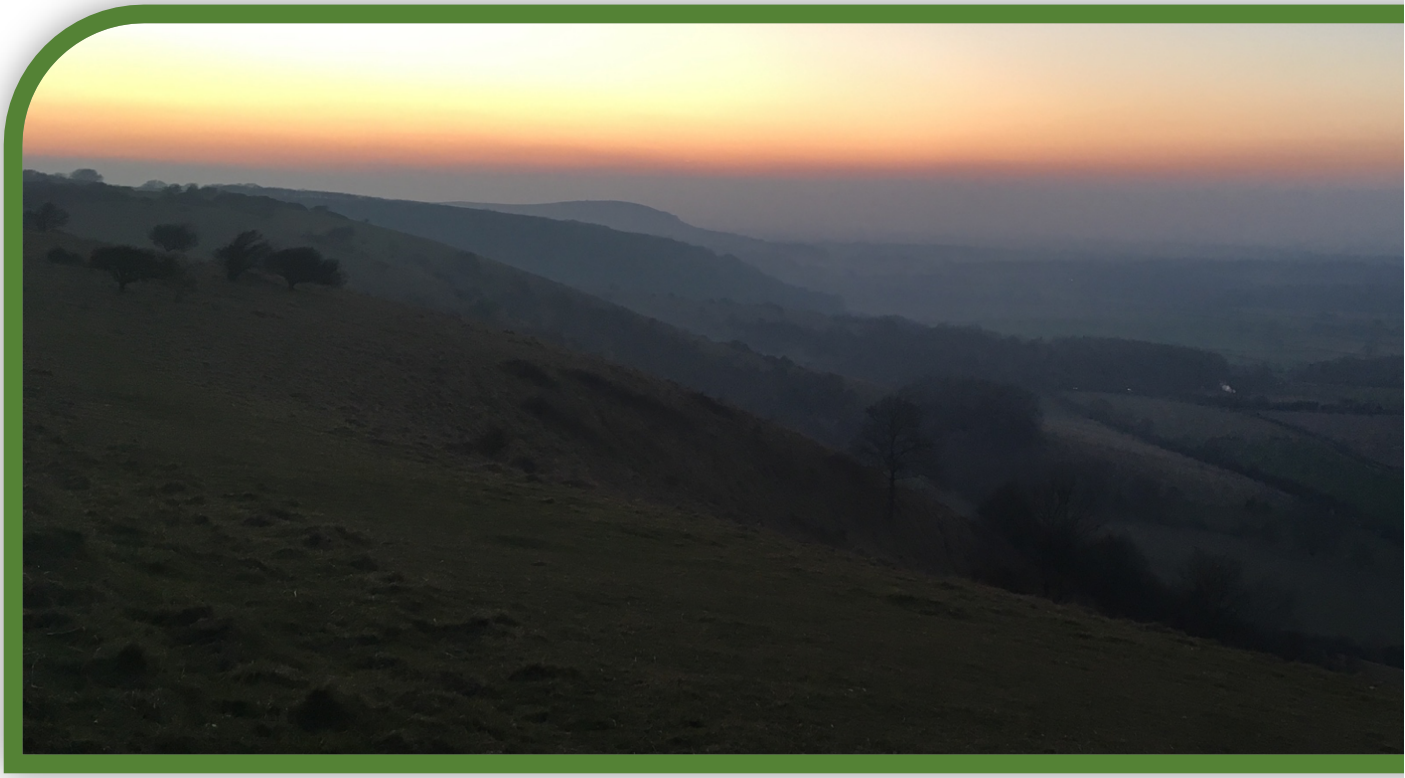
Future Actions & Priorities: 2019-2023

- Enhance our understanding of environmental quality and needs, for example completion of the SeaView analysis of the catchment's transitional waterbodies to give a better understanding of what ecological potential looks like.
- Restore degraded marine habitats, for example of historic kelp beds along the open coast between Brighton and Worthing.
- Managed Realignment and creation of intertidal habitat, for example in the lower Adur tidal reaches.
- Raise awareness of how people can reduce their impact on the marine environment, for example the Clear Seas campaign run in Newhaven, Brighton and Shoreham by Sea.
- Deliver the Living Coast Undersea Experience, an interactive, virtual reality tour of the BHW MCZ, a partnership between Living Coast, IFCA, Sussex Wildlife Trust (SWT) and ONCA (Brighton).

- Encourage sustainable environmentally-friendly seafood choices, for example through developing the partnership between The Living Coast, IFCA and Brighton & Hove Food partnership (BHFP) etc.
- Promote clean bathing waters and support actions for bathing water improvement.
- Support initiatives that address plastics and litter in the marine environment.
- Support water company delivery of their statutory obligations and performance commitments, including adding more event duration monitors to overflows in estuarine and coastal waters to monitor spills from network combined sewer overflows (CSOs) and sewage treatment works storm tanks.

This Coastal and Transitional Waters chapter aligns with the objective to secure clean, productive and biologically diverse seas and oceans as described in chapter 5 of *A Green Future* - the UK governments 25 year Environment Plan.

2. GROUND WATER



The South Downs from Ditchling Beacon © OART

Overview:

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. The Brighton Chalk Block, by far the larger, 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 a fundamental ecosystem service provided by the catchment, whether it be from the scarp slope springs at Poynings and Fulking or groundwater fed brooks at Lewes and Offham.

Summary of current issues:

High concentrations of nitrate (an ingredient in artificial fertilisers), pesticides and chemicals in groundwater compromise its value as a source of drinking water supply. These contaminants demonstrate a direct link between rural and urban land management activities and groundwater quality. Sources of pollutants may include discharges via private sewage treatment plants, main sewer leaks, highways run off, intensive farming practices and changes in land use such as converting farm land to vineyards and commercial camp sites.

Modelling has shown that, without action, drinking water standards for nitrates will be breached at some sources. In recent years there has also been a greater understanding of the role of Karst features in the chalk, these sink holes and fissures can lead to far quicker transport times for nitrates and other pollutants from the surface to the groundwater (sometimes a matter of days or hours).

The Brighton Chalk Block provides public water supplies for Brighton and Hove and beyond, to some 365,000 people, as well as base flow to streams, rivers and the marine environment. Its status is at risk from rising nitrate levels, as well as risks associated with turbidity and contaminants such as pesticides, chlorides, oils and solvents and diffuse pollution in both urban and rural areas.

Outcomes & Achievements: 2012-2019

- ChaMP collaborative project to improve groundwater quality introduced in 2015, see case study below.
- Nitrate apportionment modelling for the chalk aquifers undertaken in 2014.
- Soil Mineral Nitrogen (SMN) testing carried out on selected farms in Safe Guard Zones.
- Cover Crop study in 2017-18 followed by the roll out of Cover Crop incentive schemes to 105 hectares in the catchment.
- 1:1 Farm visits, advice, infrastructure audits, soil nutrient testing with 30 farm holdings.
- The Living Coast created the first rain garden in Portslade in 2016.
- Southern Water and South East Water metering programme aims to have 90% of customers on a water meter by 2020
- Water Company capital grant schemes pay for farm infrastructure improvements and contribute towards the cost of new septic tanks and oil tanks in the catchment.

Case study: ChaMP (Brighton Chalk Management Partnership)

ChaMP is a collaborative project between Brighton and Hove City Council, the Environment Agency, South Downs National Park Authority, Southern Water and the University of Brighton, working with the Brighton and Lewes Downs Biosphere (The Living Coast) and Natural England. Its aims are to protect and improve the quality of groundwater in the Brighton Chalk, to ensure it remains a sustainable resource for public water supply, and to tackle the rising trend of nitrates. This problem is a global issue and many of the lessons learnt from this project can be rolled out elsewhere. The current ChaMP project runs to 2025 but many of the interventions will continue beyond this point and lessons learned can be applied to adjacent chalk aquifers.

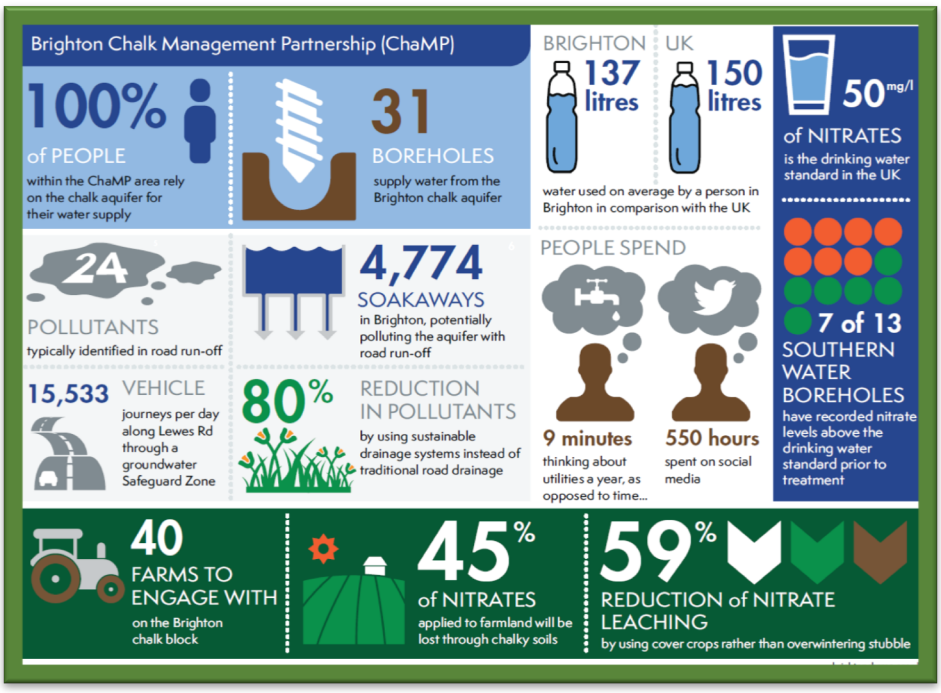
Urban interventions: Urban sources of nitrates include historic landfill, leaking sewers and mains, cemeteries, and chemicals used on allotments, sports pitches, golf courses and gardens, as well as polluted surface water run-off from roads. In rainfall events water is washed down the drains, and in some areas, directly into groundwater via soakaways in the chalk. As well as a wider urban programme, ChaMP is developing five Sustainable Drainage (SuDS) schemes - or rainscapes - which slow down and divert polluted run-off through a series of vegetated swales and basins, using natural

processes including sunlight, time and the action of microbes to clean the water before it discharges to the chalk.

Housedean Farm cover crop trials

Rural interventions: In the rural environment the ChaMP Catchment Sensitive Farming Officer gives advice to farmers and landowners; supported by specialist assistance, grants and incentives to promote changes in land management. ChaMP has run preliminary trials, and rolled out targeted interventions to farms, which include incentives for cover crops and nutrient testing. Lessons learned are being fed into the next phase; and further trials are planned into foliar feed and nitrogen reduction.

ChaMP research: ChaMP's focus on research includes contributing to, and bringing learning from, the international chalk management and groundwater pollution prevention knowledge base, as well as building practical, solutions-based local programmes; and influencing policy at local and national level.



Infographic highlighting the key issues and interventions ChaMP has identified and developed

Future Actions & Priorities: 2019-2023

- Support the development of Phase 2 of Brighton ChaMP 2020-25 to continuing land management interventions to reduce nitrates in the groundwater.
- Use the lessons from ChaMP to address issues in the neighbouring chalk blocks (such as Worthing Chalk).
- Work with organisations and communities to increase understanding of where our water comes from and the risks to it, increasing water awareness and water efficiency in the catchment.
- Support Rainscapes (SuDS) projects in the catchment to protect groundwater.
- Learn from the Wealden District Groundwater mapping project to assess relevance to the Adur and Ouse catchment.
- Support water company delivery of their statutory obligations and performance commitments, including:
    - Engaging and working with landowners and land managers to improve catchment resilience related to raw water quality deterioration
    - Ensuring capital grant schemes continue to fund farm infrastructure improvements and contribute towards the cost of new septic tanks and oil tanks in the catchment.
    - Carrying out groundwater investigations by 2022 to identify the sources and pathways of pollutants impacting drinking water sources

This Ground Water chapter aligns with the objective to achieve clean and plentiful water as described on page 10 of *A Green Future* - the UK governments 25 year Environment Plan.

3. SURFACE WATER QUALITY

Collecting and analysing water samples © OART

Overview:

The Water Framework Directive (WFD) uses biological and chemical indicators to assess water quality. Water quality within the catchment is influenced by a range of pressures, from isolated pollution incidents (point source pollution) to the combined effects of smaller sources of pollution (diffuse pollution), both rural and urban. 14 of the 17 water bodies monitored for water quality on the Adur are failing because of elevated phosphate, in comparison the Ouse fairs better with only 13 out of 24 water bodies exceeding phosphate thresholds. Low flows, limited riparian habitat and a lack of attention from partners contributes to poor water quality on the Adur. The River Ouse is a flashy catchment in part due to inherent landscape characteristics such as heavy clay soils, steep slopes and underlying geology. Despite extensive riparian and floodplain habitat in comparison to the Adur these characteristics increase run off from the surrounding landscape creating pathways for nutrients and other pollution. Human impacts such as intensified land management practices, land drainage and river channel modifications have exacerbated these effects in both river systems. Changing climatic conditions including longer periods of dry weather and increasing storm intensity are also significant factors affecting surface water quality and quantity in the catchment.

Summary of current issues:

Diffuse rural and urban pollution are among the largest contributors to poor water quality. Poor water quality changes plant communities and adversely affects aquatic invertebrates, fish and associated river wildlife. Nitrate, phosphate and faecal contamination from septic tanks, waste water discharges and agriculture can lead to algal blooms decreasing oxygen levels in water. Other factors include increasing areas of maize production for dairy farming, intensive crop production, highways drainage and changes in land use. Surface Water quality in the catchment is also compromised by high levels of metaldehyde and sediment. In the River Ouse this has resulted in the designation of a Drinking Water Protected Area Safeguard Zone.

There is growing concern over chemicals and drugs; for example, caffeine, anti-depressants, synthetic oestrogen and ibuprofen finding their way into surface waters alongside mirco-plastics and other litter. Little is known about the true impact of these contaminants other than their presence in our water is increasing.

Outcomes & Achievements: 2012-2019

- The partnership developed and delivered a septic tank and phosphate awareness project engaging over 6,000 residents across the Ouse and Adur catchment.
- OART undertook 850 water quality surveys and 170 biological quality samples.
- More than £300,000 has been invested by South East Water for capital infrastructure improvements and improving land management practices.
- Farm advice on diffuse pollution and prevention measures provided by South East Water to more than 300 farm businesses.
- Drinking Water Protected Area Investigations by South East Water in 2017 have determined sources and pathways of pollution.
- Catchment Sensitive Farming visits in the Ouse catchment have provided specialist advice on farm infrastructure, agri-environment schemes and soil husbandry, protecting water quality in the catchment.
- Southern Water study into the emerging risk of chemicals in water.
- Five rainscapes have been created in Hassocks by OART capturing and cleaning surface water in the village.

Case Study: Adur & Ouse Septic Tank & Phosphate Awareness Campaign

Naturally-occurring nutrients feed the diverse range of flora found in our water environment. But in excess, man-made phosphorous acts as a pollutant. It can't be seen in the water, but it makes its presence clear by disrupting ecosystems, allowing nutrient-hungry algae to out-compete aquatic plants, and in extreme cases, triggering algal blooms. When algae dies it is deposited as sediment which can smother plants, as the algae decomposes, oxygen is used up, suffocating aquatic insects and fish. 27 of the 41 WFD water bodies in the Adur and Ouse catchment are failing because of excess phosphate.

Attempting to tackle these water quality issues across such a wide catchment area requires unique and pioneering solutions. The Adur and Ouse Catchment partnership working collaboratively to protect and improve water quality led a phosphate and septic tank awareness campaign in 2018.
Despite around a quarter of phosphate coming from agricultural sources such as soil and nutrient runoff, yard drainage and organic manure a significant percentage comes from private package treatment plants. Agricultural contributions have been decreasing due to better nutrient management and water company wastewater treatment works discharges have reduced by more than half since the 1990's. Not a great deal has been done with communities not on mains drainage.

The Adur and Ouse Catchment Partnership identified properties unlikely to be served by the main sewage network and therefore likely to be using a septic tank or small package treatment plant. Those properties within 100m of a watercourse were mapped and addresses generated so that awareness raising literature could be sent out to raise the issue and encourage best practice and

alternative management as well as challenging some behaviours. Feedback from those receiving the literature was positive with a number of properties changing their detergents to phosphate free products with one resident requesting water quality kits so they could sample their local watercourse. Following the success, the exercise has now been repeated in the Arun and Western streams catchment.

Future Actions & Priorities: 2019-2023

- The partnership will continue to support initiatives that promote positive land management practices protecting and improving surface water quality in the catchment, such as Catchment Sensitive Farming.
- The partnership will develop and fund catchment walkovers on the Adur to include the identification of sources of pollution and potential solutions.
- Support research into the transportation of phosphate and sediment through our river systems.
- Support water company delivery of their statutory obligations and performance commitments, including:
    - The delivery of Drinking Water Protected Area Investigations by 2022 to identify the sources and pathways of pollutants impacting on Ardingly Reservoir.
    - The delivery of a Drinking Water Protected Area scheme by 2024 to address deteriorating water quality levels.
    - Engaging and working with landowners and land managers to improve catchment resilience related to raw water quality deterioration.
    - Delivery of Southern Waters Environment+ programme to reduce the number of Cat 1-3 pollution incidents by 35% from 2017-2024.
    - Production of a 25 year Drainage & Wastewater Management Plan for the catchment by 2022.
    - Phosphate removal at a number of wastewater treatment works by 2024 to reduce the impact on the environment and water quality.
    - Investigating the impact of intermittent discharges on 2 waterbodies in the Upper Adur by 2021 to identify improvements required.
    - Adding more event duration monitors to overflows to the freshwater environment (rivers) to monitor spills from network combined sewer overflows (CSOs) and sewage treatment works storm tanks.
    - A number of chemicals investigations to study the effectiveness of removal by new and existing technologies and to monitor the long-term trends of chemicals coming through wastewater treatment works.

This Surface Water Quality chapter aligns with the objective to achieve clean and plentiful water as described on page 10 of *A Green Future* - the UK governments 25 year Environment Plan.

4. NATURAL RIVERS

Berms on River Adur helping to restore natural processes © OART

Overview:

The Ouse and Adur rivers and their tributaries flow through a variety of landscapes and are subject to influences from both the local geology and land use. Both rivers have their northern headwaters in the sandstones and clays of the High Weald, where streams flow through steep-sided ghylls. Further downstream both rivers are fed and influenced by chalk springs and streams which are internationally renowned but under threat. Many streams have 'winterbourne' stretches in their headwaters which run dry or partially dry during the summer months.

Although stretches of the Ouse and Adur are still relatively natural, many are dammed, canalised and polluted. Wetlands and riparian vegetation have been lost and rivers isolated from their floodplains. The Adur and Ouse catchments support diverse ecology, migratory and non-migratory fish, otter, invertebrate and bird species.

Summary of current issues:

The main rivers in both catchments remain fundamentally modified by navigation and flood management works with river channels incised and disconnected from their floodplain, often a product of past dredging and straightening. The limited number of designations in the Adur catchment reflects the degraded nature of its riparian landscape. Non-native species such as Himalayan Balsam and Signal Crayfish contribute to sedimentation outcompeting native species altering the natural ecological status of these ecosystems.

The number of barriers in the Ouse and Adur catchment remains extensive despite considerable investment and success in their removal and or improvements to fish passage. Impoundments to natural ecological flows prevent or delay movement along the river corridor of migratory fish species such as sea trout and eel and isolate populations of many species. The cumulative impact of weirs (even if they are passed) has a substantial effect on the energy reserves of migratory species which inevitably impacts their spawning success and reproductive rates, threatening the long-term sustainability of populations. Fish and other aquatic species are also impacted by changes to flow regimes affected by abstractions and discharges.

Despite the upward trend (6%) between 2012 and 2016 across individual elements the number of waterbodies reaching the target Water Framework Directive (WFD) good ecological status or higher remains very low at just 20%. The partnership has contributed to the improvement in WFD status of the elements listed in the table below.

Element	% at Good Ecological Status or higher 2012	% at Good Ecological Status or higher 2016
Fish Populations	12	33
Invertebrates	78	82
Dissolved Oxygen	68	71

Outcomes & Achievements: 2012-2019:

- Ten priority weirs have been removed across both catchments, many through the ARPHA and MORPH projects funded by the Adur & Ouse catchment pilot 2012.
- Three fish passes and eight eel passes installed on priority structures.
- 18 km of in-channel modifications installed, including nine backwaters to improve habitat for fish communities.
- 75 tonnes of gravel installed to enhance and create spawning grounds for fish.
- 160 km of river walkover surveys undertaken.
- 69,000 floodplain and riparian trees planted.
- National Trust project at Sheffield Park has reconnected the river with its floodplain and created floodplain wetland benefitting bird species and other wildlife.
- South East Water completed the installation of eel Screens at Shellbrook and Barcombe Water Treatment Works and carried out biodiversity enhancements at Offham Marshes SSSI.

Backwater at Twineham on the River Adur © OART

Case study: Restoring the River Adur at Twineham

In 2014 OART led a collaborative project with the Environment Agency to remove four weirs, two on the Herring Stream and two on the River Adur as it flows through Twineham. This resulted in 4.8km of previously inaccessible river being opened up to multi-species fish passage.

Following this in 2015, using funding from Rampion Offshore Wind Ltd, OART undertook in-channel works to increase habitat for invertebrates and fish at all life stages which resulted in multiple benefits to the river and to those who use it for recreation. Four berms were constructed on alternate sides of the channel to create diversity and sinuosity of flow and provide additional stability to the banks. Within 12 months all the berms were densely vegetated with the pre-planted berm showing the greatest diversity with additional plant species established. Five backwaters were created to provide fish refuge in times of high flow. Large timbers were staked in place to provide shelter and coir erosion control matting used to prevent sediment entering the water and to assist with the establishment of bank-side vegetation. Within a few days fish fry were observed in the warm shallow water of the new backwaters.

Floodplain woodland is almost absent along the Adur and in March 2016, using funding from the Forestry Commission, 5,000 trees were planted to create four new blocks of wet woodland - increasing the tree cover along the Adur by 2% and providing feeding and breeding habitat for a range of birds, mammals and invertebrates. Additionally, the woodland will provide natural re-charge of woody debris to the river, creating habitat and shelter for fish and river invertebrates and will help to mitigate against rising river temperatures.

Before and after removal of Twineham tilting gate © OART

Future Actions & Priorities: 2019-2023

- Supporting the Enhancing Places, Inspiring Communities (EPIC) project - Restoration of the Broadwater Brook Stream in Sompting.
- Explore options to reconnect floodplain and create inter-tidal habitat in the Adur and Ouse estuaries.
- Review and build on previous partnership led studies such as EU life bid to identify improvement projects that work with natural processes.
- Support the removal of barriers to fish passage and restore natural processes.
- South East Water and OART to deliver the Slaugham to Ardingly restoration project, improving fish passage, enhancing habitat and reducing diffuse pollution.
- Support the installation of a multi-species fish pass at Barcombe Mills.
- Develop and fund projects following the recommendations in the walkover reports commissioned by the Catchment Partnership.
- Work with SDNPA Non-Native Invasive Species task force to map and control key NNIS within the catchment. Develop and deliver a NNIS awareness campaign for both catchments.
- Support water company delivery of their statutory obligations and performance commitments which promote natural river processes including investigating and tackling the spread of non-native invasive species and protecting and increasing biodiversity at their company owned sites.

This Natural Rivers chapter aligns with the objective to use resources from nature more sustainably and efficiently and to have thriving plants and wildlife as described on page 10 of *A Green Future* - the UK governments 25-year Environment Plan.

4. NATURAL FLOOD MANAGEMENT

(working with natural processes)

Leaky dam constructed to slow and divert water during flood events © SFI

Overview

The Pitt review followed the summer floods of 2007 and concluded that flood risk cannot be managed by simply building ever bigger hard defences. Softer approaches are often more sustainable; Natural Flood Management (NFM) offers an alternative solution, either by itself or one that can complement and extend the lifetime of more traditional engineered defences.

NFM or working with Natural Processes (WWNP) aims to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast. A wide range of techniques can be used to reduce flood risk by slowing and attenuating flow upstream while achieving other benefits. For example, re-meandering rivers, targeted woodland planting and improving floodplain connectivity all help to reduce the flood risk to communities downstream. These techniques also support an array of other ecosystem services including carbon sequestration, water purification, food and habitat provision.

The Catchment Flood Management Plan (CFMP) policy on the Ouse is to increase the frequency of local flooding in the upstream part of the catchment to deliver overall flood risk reduction and habitat enhancement. Restoring intertidal habitat along the Sussex coastline and within river estuaries is another aspiration. The CFMP policy on the Adur seeks to take action with others to store water or manage run-off in locations that provide overall flood risk reduction and environmental benefits. The main residential flood risk is to Bramber and Upper Beeding with the potential to restore tidal floodplain function and habitats.

The Adur and Ouse Catchment Partnership supports the NFM approach and is actively working with partners to identify and deliver NFM interventions across the catchment. The Sussex Flow Initiative (SFI) is one such project between the Sussex Wildlife Trust, the Environment Agency and the Woodland Trust, and is focused on the River Ouse catchment. Since 2016, the project has also been supported by Lewes District Council.

Summary of current issues:

For centuries we have altered the landscape, storing water where we want it, and draining it from where we don't. We've engineered the land, often to transport water into our rivers and out to sea as quickly as possible, with the aim of increasing the productivity and the output of our agriculture and forestry. As a result, there are vast networks of drainage ditches and subsurface land drains rapidly delivering water to our rivers, which themselves have been dredged and deepened to increase their capacity to quickly transport water downstream. Floodplain woodlands have been cleared to access the nutrient rich soils for farming, and wider catchment woodland grubbed out to make more space for food production. The areas of floodplain utilised for agriculture are often protected by flood embankments (or levees formed of dredging spoil), disconnecting the rivers from their floodplains and reducing the ability of these areas to store water during floods.

The legacy of these combined activities result in rapid rises and falls in fluvial flood waters after extreme weather events, periodically breaching flood defences and having devastating impacts on infrastructure, residential and business properties.

One of the key targets of NFM is to promote and integrate a holistic approach to water and land management, restoring and working with natural processes to make the catchment more resilient to flooding and drought. With climate change expected to make extreme weather events more frequent and unpredictable, catchment-wide NFM is an approach that can be used alongside hard engineering to buffer the impacts of future flooding.

Outcomes & Achievements: 2012-2019

- 57,000 trees planted in the Ouse catchment including 8.9 km of new hedgerow and 8.3 ha of woodland, including 4.2 ha of floodplain woodland & 300 rare Black poplars.
- 6,600,000 litres of new, seasonal water storage created in the Ouse catchment which can be activated during flood events, including a flood storage pond, a washland, multiple floodplain reconnections and run-off attenuation features.

- 150 leaky dams installed in the Ouse catchment to slow and temporarily store water during flood events.
- Engaged with 180 landowners, covering approximately 12 % of the Ouse catchment.
- Delivery of events for communities and stakeholders including Water Fairs, and Soil and Water Workshops, benefiting at least 40 landowners, 2,000 local residents and many other stakeholders.
- 150 volunteers supported works over 300 volunteer work days.
- Installation of seven SuDS interventions and 2 rain gardens to improve urban water quality and mitigate against flooding in Hassocks.

Case study – Natural flood management on the River Uck

SFI facilitated the planting of 16,575 trees across a 39-hectare site at the Horse Rescue Trust adjacent to the River Uck. The layout of the hedgerows and woodland were designed to intercept overland water flow, form wildlife corridors linking adjacent ancient woodlands, and to provide the landowner with shelter for his animals. Over time the trees will help to break up the heavily compacted clay soil and increase water infiltration and percolation. Additional environmental and societal benefits of the project, include carbon storage, water and air purification, providing a food source for pollinators and birds, and improving the aesthetics for visitors. The work was delivered in 2017-2019 with support from over 100 volunteers from local flood groups, schools, businesses, and other stakeholder organisations. Funding of the trees was supported by the landowner, the Bannister Trust and the Woodland Trust.

Tree planting on slopes adjacent to the River Uck at the Sussex Horse Rescue Trust in Uckfield © SFI

Wader scrape acting as temporary water storage following the excavation and breaking of a nearby subsurface land drain © SFI

Future Actions & Priorities: 2019-2023

- Support the planting of 50,000 trees in the Ouse Catchment (SFI).
- Focus on soil health and land management practices and its potential to attenuate flood water in the catchment.
- Reduce the 'very significant risk' of flooding for 16 properties (SFI).
- Deliver SuDS intervention in Hassocks, Ringmer and Wivelsfield in partnership with Lewes District Council.
- Deliver SuDs in Portslade and future SuDS in schools and local community projects and share best practice (OART).
- Deliver Community Infrastructure Levy on the Bevern to mitigate against flooding.
- Extend experience of NFM on the River Ouse and develop NFM in the intertidal and upper Adur in upper catchment as part of Future Adur Realignment project.

This Natural Flood Management chapter aligns with the objective to reduce risk of harm from environmental hazards such as flooding, and drought as described on page 10 of *A Green Future* - the UK governments 25 year Environment Plan.

AOCP PARTNERS

For more information about the Adur and Ouse Catchment Partnership please contact:

Peter King
Peter.king@oart.org.uk

Ouse & Adur Rivers Trust
Oakwood House
Bridgelands
Barcombe
East Sussex
BN8 5BW