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Forest to Sea

A Vision and Strategic Action Plan for water in the catchments of the Forest of Dean, Gloucestershire

Introduction to the Forest to Sea Vision and Strategic Action Plan

Who wrote this Vision and Strategic Action Plan?

This document was co-written by a group of partners who form the Forest to Sea Working Group, including:

- Environment Agency
- Farming and Wildlife Advisory Group
- Forest of Dean District Council
- Forestry England
- Gloucestershire County Council
- Gloucestershire Wildlife Trust
- Severn Rivers Trust
- Severn Trent Water
- WWT
- Wye Valley National Landscape

How did we engage local communities and what did they say?

The Vision and Strategic Action Plan went out to public consultation from November 2025 to January 2026. We reached out to people through a stakeholder event, posters, local council bulletins, social media, and the Severn Vale Catchment Partnership quarterly newsletter. We received responses from members of the public, local councils, and NGOs. These were anonymised and discussed by the Forest to Sea Working Group who decided what changes needed to be made to the document as a result. You can find the comments and the group's response on our website.

What species are on the logo and why did we choose them?

The logo includes an otter, goshawk, European eel, willow, small pearl bordered fritillary, and golden ringed dragonfly. We chose species that are iconic to the programme area and part of the cultural heritage of the Forest of Dean, as well as those that will benefit from the environmental objectives laid out in this document. The logo was designed by Stu McLellan, an artist based in Stroud. You can find more of his work at *www.stumclellan.co.uk.*

What is the aim of this document?

Since 2020, the Severn Vale Catchment Partnership has been developing a series of Flagship Programmes - co-developed bodies of work that highlight areas where we will focus on improving our waters. These set out how we can restore water environment functionality at a catchment level. Forest to Sea is our second Flagship Programme. The purpose of the Vision and Strategic Action Plans are to lay out our environmental priorities for the catchments and bring together those who live near and work with water across the area, providing a joined-up approach to improving the water environment. It means that rather than having a few disjointed projects which might have beneficial but limited impact, we can come together to find common ground and properly identify what would make a real difference. We can then focus on developing integrated projects to do this at scale, providing more attractive propositions for funders. It shares responsibility for a healthy water environment across many organisations, communities, and individuals, and helps us to come together to provide stronger narratives to enable real change for the water environment in the Forest of Dean catchments.

Contents

Introduction to the Forest to Sea Vision and Strategic Action Plan 2
Geographical Scope of this document 3
Our Vision for Forest to Sea 4
Delivery of the Vision 5
What makes these Dean catchments unique? 5
Environmental Priorities and Objectives 7
Climate Change Resilience 7
The Forest, the Estuary, and the Marine Environment 8
1. Making it easier for fish to migrate, spawn, and thrive in the Forest of Dean 8
2. Making space for wildlife along our rivers and their floodplains 9
3. Working in the wider landscape 11
4. Cleaning up our rivers 13
5. Restoring healthy flows and reducing flood risk 15
6. Forests and forestry 17
7. Monitoring and data 18
8. Community engagement and partnership 20
Glossary and Further Reading 21

Geographical Scope of this document

For the purposes of this programme, in the Forest to Sea Vision and Strategic Action Plan the term "Forest of Dean" or “Forest” refers to the wider area covered by the strategy, rather than the Statutory Forest or the Forest of Dean District Council boundary. The strategy and vision are based on catchments (areas where water collects into one river or stream from the surrounding land) rather than administrative boundaries, and some catchments within the administrative boundaries will fall within other flagship programmes being developed by the Catchment Partnership (such as Wilder Leadon which focuses on the river to the north of this area). The scope of the strategy covers the broader landscape and communities, as well as the natural, cultural, and economic functions therein. As a partnership, we will support appropriate project proposals and bids across the area which actively contribute toward the delivery of the vision. The geographical boundary can be seen in the map below:

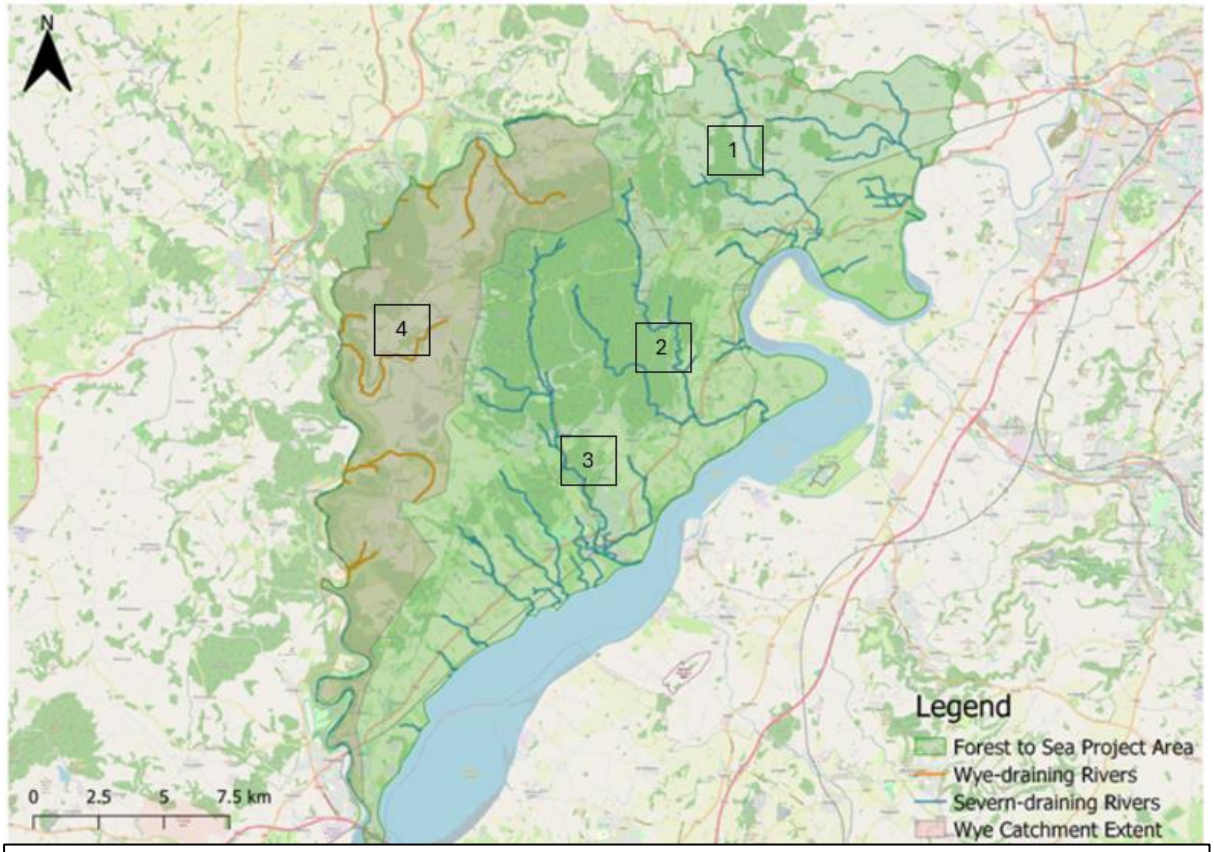

Figure 1. The main river catchments as labelled above are 1. Westbury Brook, 2. Cinderford Brook/Blackpool Brook, 3. Cannop Brook/River Lyd, 4. Valley Brook.

Our Vision for Forest to Sea

Clean, clear streams will choose their own courses across their floodplains, flowing from a mosaic of heathland and mires[1] at the heart of the Forest of Dean through dappled wet woodland and open areas to saltmarsh on the Severn Estuary and into the sea. Tributary floodplains will largely be riparian woodland with tree species appropriate to this wet environment. Floodplains will be seen once again as integral parts of the river which regularly hold water, rather than as something separate that should be dry.

Meandering headwater[2] streams, full of life, connected to functioning spongy wetlands will slow the flow to recharge aquifers and reduce flood and drought risk. Flowing naturally south and east to the River Severn, and west to the River Wye, underneath the canopy of a working forest and across farmed slopes, these vital waterways will unite the landscape and support migratory eels, lamprey, and Atlantic salmon to travel from source to sea and back again. Ponds will pepper the landscape providing homes for wildlife and enabling it to move and thrive. This will be a place where a rich heritage blends with the current uses of the forest and education is a cornerstone of conservation.

Springs, streams, ditches, ponds, flood plains, wetlands, and saltmarsh will be better understood and enjoyed by people, valuing the wildlife supported by a healthy system. Forest communities will benefit from thriving, healthy brooks and reduced flooding through

better water management. They will be involved in, and consulted on, projects that affect their waterways and be encouraged to add to the growing body of citizen science in the catchment. The Severn Estuary and the sea will be healthier because of our thriving freshwater catchments.

Delivery of the Vision

Delivery of this vision relies on a wide range of organisations, community groups, and individuals coming together and successfully developing, sourcing funding for, and implementing projects that will cumulatively achieve the 2035 objectives. The Severn Vale and Wye Catchment Partnerships have co-created, and will keep updated, a rolling list of pipeline projects that could help deliver the activities and improvements set out within this plan. We are always keen to hear of potential or active projects which can help to achieve this programme's objectives. Those delivering projects will need to ensure that all relevant permissions are obtained from authorities and landowners before work starts. Potential funders who are interested in being involved are encouraged to get in touch..

For further information and resources, to get involved, or to add a project to the current pipeline list please get in contact using the details set out on the Severn Vale Catchment Partnership website: *catchmentbasedapproach.org/get-involved/severn-vale.*

What makes these Dean catchments unique?

This programme area is a land between two rivers – the Wye and the Severn. The third river, the Leadon, is the subject of a separate flagship programme called Wilder Leadon. The Dean is a stronghold for nature with an independent spirit, and a community on the borders of England and Wales. It has a strong and unique heritage influenced by two distinctive rivers and the geology they sit upon.

The story of Forest to Sea starts on a forested plateau sitting proudly 150–200 metres above sea level between the River Severn and the River Wye. The area's geological tapestry is unlike any of its neighbouring landscapes, with rock layers shaped into a bowl by ancient tectonic forces. The resulting layers of rocks shape the land and its resources, with Green-Grey Sandstone perched across the central plateau. It contains coal and iron seams that have deeply influenced the growth of villages such as Bream, Cinderford, and Ruspidge - each rooted in local Foresters' mining heritage and proximity to the mines. The underground tunnels (adits) and shafts have become vital homes for internationally important populations of lesser and greater horseshoe bats – they could be adversely impacted by high water levels if they were to rise.

Beneath it lies Carboniferous Limestone appearing as outcrops near Lydney, Clearwell, and Chepstow and mined for iron through the ancient surface-level scowles[3]. Below that the oldest rock, Devonian Old Red Sandstone, appears as notable outcrops along the River Wye at Symonds Yat and Ross-on-Wye. Each layer influences water flow through the landscape, guided by its permeability[4] and centuries of human extraction. Across the Forest, water and the industrial heritage are often inseparable. Places such as Cannop Ponds, Blue Rock Trail,

and Darkhill Ironworks demonstrate how local Foresters have long adapted the surface water flow. Using weirs, leats, dams and mines they effectively reshaped the brooks to meet industrial and local needs.

Springs and seepages emerge from underground aquifers through geological faults across the plateau. The pristine water feeds a vast spongy area that was historically dominated by wet woodlands, braided streams, sphagnum bogs, and mires. It would once have been impassable and inhospitable to people. Today, the sponge-like effects have mostly dried out from a legacy of mining and industry that harnessed the water to generate power, and from drainage to reclaim land and enable forestry.

As the wetter plateau slopes down to the Severn and the Wye, the geology changes to the drier calcareous layer. The water gathers pace to form flowing brooks that would have once teemed with fish such as lamprey, eel, and brown trout - traditional staples of the local Foresters' diet. The brooks have been degraded by mining industries, polluted with heavy metal, straightened, and channelled to power refineries and mills. Recent forestry practices, still a core industry in the district, have provided some respite to many of the area's brooks, allowing them to revert to a more natural state and to cling onto some endangered populations of white-clawed crayfish and European eel. Forestry England owns large amounts of the land in this Programme area and the ability to manage the landscape under one coordinated ownership is perfect for consistent, long-term restoration across whole catchments. Beneath the uninterrupted woodland canopy some of the brooks can choose their own paths and directions. It offers a rare opportunity in today's lowland Britain to study how rivers could be if only they are given time and space with minimum interference. Restoration is ongoing; beavers have been reintroduced in enclosures on two brooks, and efforts are underway to reverse old drainage systems, remove barriers, restore wetlands, and reconnect brooks to their natural floodplains. This work helps bring the landscape closer to what it once was and shows what's possible when nature is given space to heal.

The forested plateau gives way to an undulating agricultural landscape where brooks become increasingly incised and tidal as they approach the Severn and the Wye rivers. To the south, the brooks flow onto the expansive Severn Estuary landscape, an area of international importance designated as a Ramsar Site[5], Special Protection Area (SPA)[6], Special Area of Conservation (SAC)[7], and Site of Special Scientific Interest (SSSI)[8]. Medium-sized farms lie within this narrow floodplain, nestled between forest and estuary, a striking juxtaposition of woodland and tidal landscape. The floodplain faces mounting challenges: it hosts major highways and railway lines while contending with increasing flooding and tidal forces because of climate change, which together drive coastal squeeze and threaten existing flood defences and saltmarshes. The narrowing of the tidal Severn as it surges upstream squeezes the water of the iconic Severn bore. The extreme tides and the seasonal run of migratory fish supported historic fishing traditions woven into the life of communities living beside the Severn. Ecological pressures today mean that many of these ancient methods struggle to be compatible with the needs of recovering fish populations.

To the west, brooks flow into the gorge-like Wye Valley, part of the Wye Valley National Landscape, where the River Wye (also a SAC and SSSI) is internationally renowned for its Atlantic salmon and water crowfoot populations. The water meanders through a patchwork

of farmland that straddles the England–Wales border, raising complex challenges around nutrient runoff and soil loss. The Wye (a popular navigation river of 100 miles) faces intense attention over its water quality. Here too there is tidal influence as well as the challenges of living and working in a steep-sided landscape with numerous landslips.

Forest to Sea encompasses a compact yet rich landscape where within just a few miles one can witness the transformation of water from source to estuary. It is a microcosm of all that is precious - and precarious - about the Forest of Dean area and has the potential to become even more resilient and remarkable.

Environmental Priorities and Objectives

This document sets out the environmental priorities and objectives that have been agreed through consultation with a wide range of stakeholders through the Severn Vale Catchment Partnership and beyond. Whilst the plan seeks to include ambitious and specific objectives to be delivered by 2035, other works will be considered when opportunities arise. All these objectives and opportunities can only be realised through collaborative working. We will support appropriate project bids which will help to deliver elements of this programme. This plan also considers broader environmental objectives such as the government's 25 Year Environment Plan[9] and Local Nature Recovery Strategies (LNRS)[10].

The many aspects of our environment do not exist in isolation and, while we have detailed the challenges and opportunities under the headings below, all of them are interlinked and there is a lot of overlap between them. Bear this in mind as you read this document as you may find information related to elements in another section.

Climate Change Resilience

As climate change impacts continue to materialise in the coming years, a range of ecological, hydrological, and habitat impacts can be anticipated within the Forest area, throughout the Severn Basin, and beyond. More extreme weather events will be experienced across the area including both flooding and drought. New invasive species may impact on our native wildlife. What we do in our catchments can help to mitigate some of these and build both our own and our wildlife's resilience and adaptability to change. Climate change resilience and reducing our climate impacts will therefore be woven into all planned interventions and work will take account of the latest data and evidence. Wherever possible Nature-based Solutions[11] (NbS) will be at the heart of our work to improve the catchments for wildlife and people – adapting to climate change and delivering improvements to flood risk and biodiversity, storing carbon, and providing socio-economic benefits.

The Forest, the Estuary, and the Marine Environment

It is important to remember that part of this programme is coastal, and that this catchment area incorporates the Severn Estuary. The estuarine habitat is an important one, and much inter-tidal habitat has been lost over the years due to human modifications.

We must also remember that what we do in our freshwater Forest catchments has long term effects on the health of our estuary and marine environment, and these influences can be both positive and negative. Excessive sediment and nutrients coming from the land can lead to reduced oxygen and the shading out of seagrass beds, and litter can trap marine wildlife and impact on seabird productivity. Conversely, large wood pieces entering the sea can form important floating and sunken habitats for marine wildlife.

The estuary itself can provide active interventions, such as the creation of intertidal habitat, as part of this programme. This can improve the wider catchment and the future of those coastal communities living along the estuary, who face an uncertain future as shorelines change - these communities face increasing threats from climate change and sea level rise. Beyond this, we will consider the wider impacts of this programme on the estuary and marine environments throughout its life and ensure that we are linked closely with our partners who work in those places to achieve benefit as widely as we can.

The floodplain faces mounting challenges: it hosts major highways and railway lines while contending with increasing flooding and tidal forces because of climate change, which together drive coastal squeeze and threaten existing flood defences and saltmarshes.

1. Making it easier for fish to migrate, spawn, and thrive in the Forest of Dean

Background

The Forest of Dean is an area rich in history, and many of the watercourses running through it have been shaped by the industrious iron and coal mining activity in the area throughout the 18th–mid 20th centuries. The form of many waterbodies such as the Cinderford, Blackpool, and Cannop Brooks has been modified through straightening and channelising to protect key infrastructure such as mines and railways from flooding or erosion. Watercourses in the Forest of Dean also historically provided an ideal setting for establishment of watermills - commonly used for corn milling, sawmilling, or to power iron forges. Finally, much of the area adjacent to the Severn Estuary is historically drained saltmarsh, therefore almost all waterbodies (excluding the Bideford Brook) are also protected from tidal inundation by flapped outfalls. Physical structures such as tidal gates, weirs, culverts, and sluices associated with these human activities have disconnected the Forest waterbodies by slowing and impeding fish movement.

Approximately 70 of these barriers are currently recorded on the UK River Obstacles Map[12]. Some examples of significant and known structures which are a partial or full barrier to fish migration are: the tidal gates on river outfalls, Parkend gauging weir (Lyd), tidal weir and Blakeney weir (Bideford Brook), Dean Heritage Centre weir (Soudley Brook),

Blue Rock Trail sloping weir (Soudley Brook), Wenchford weirs (Blackpool Brook), Cannop Pond and Mallards Pike spillways, and Westbury Court weir (Westbury Brook).

Despite this, multiple fish species are present in the Forest of Dean watercourses. Records show several species that migrate from the sea via the Severn Estuary Special Area of Conservation into the Forest's streams and rivers, such as: Atlantic salmon, European eel, sea lamprey, and sea trout; and others that spend their entire life cycle in the river, including brown trout, bullhead, perch, roach, pike, rudd, dace, stickleback, stone loach, minnow, and river and brook lamprey. Many of these iconic species are in sharp decline across not just the Forest, but across their entire geographic range and require clean, flowing waters and gravels with diverse, abundant habitats to begin recovery.

In the Forest, many of these fish populations find their movement to spawning or feeding grounds negatively impacted by the man-made barriers and lack good habitat availability due to the modifications humans have made to river channels. Re-connecting and re-naturalising river, wetland, and saltmarsh habitat in the Forest of Dean will create conditions for thriving freshwater and brackish fish populations in the area.

Statement of Ambition

We will make rivers throughout the Forest of Dean passable up and downstream for all fish and other aquatic species by removing in-river barriers or implementing the most natural fish pass solutions possible. In-stream habitat restoration throughout the catchments will complement these works, ensuring species have access to the variety of habitats necessary to complete the different stages of their life cycles.

2035 Objectives

- Assess and prioritise known barriers to fish migration across the Forest of Dean catchment, including but not limited to; Dean Heritage Centre weir, Blakeney weir, Westbury Court weir, tidal gates, and forestry track culverts. Utilise learning from barriers that have previously been addressed (for example the retrofitted, 'fish friendly' Cone Pill outfall) to consider feasibility. Include assessment of each structure's potential to enhance habitat connectivity but also assess against criteria such as heritage value and potential to impact on other priority species (such as white-clawed crayfish).
- Seek funding for and implement a minimum of 3 fish passage improvements at feasible and high priority sites identified in the prioritisation exercise, or those that arise opportunistically.
- Seek funding for and implement fish habitat enhancement projects to complement improved connectivity of watercourses in the Forest of Dean.

Key species supported: Lamprey, European eel, Atlantic salmon, and brown trout.

2. Making space for wildlife along our rivers and their floodplains

Background

By storing vast quantities of floodwater, healthy river floodplains can support a huge range of wildlife, including many declining freshwater species. The watercourses of the Forest of Dean area provide vital habitats for wildlife, but they need space to thrive. Existing freshwater ecosystems are linked mainly hydrologically but sometimes just ecologically, with ponds, pools, and specialist tufa[13] habitat along the Slade Brook providing important refuges for wildlife. Physical modifications including straightened, over-deepened channels, culverts, and embankments negatively affect the catchment resulting in the alteration of natural flow patterns, habitat degradation, and poor water quality.

Historic land management and flood embankments along the Severn Estuary, alongside climate-related sea level rise and other fluctuations, have caused significant loss of inter-tidal habitats such as saltmarsh over the last 200 years. As a result, we have lost many species unique to those habitats.

Restoring natural riverbanks, reconnecting floodplains, creating/restoring saltmarsh and allowing wood and vegetation to accumulate in streams creates diverse habitats for fish, invertebrates, and amphibians. Protecting wetland areas and reducing pollution also supports biodiversity, benefiting species including sphagnum moss, sundews, willow tit, white-clawed crayfish, great crested newt, and scarce blue-tailed damselfly. By creating and managing watercourses, ponds, springs, and flushes with nature in mind we can build a healthier environment for wildlife and people, while also improving water quality and flood management.

Our aspiration is to create a naturally functioning wetland complex that will provide a safe space for wildlife, store carbon in the face of climate change, and hold and filter water. The mosaic of habitats will include wet woodland, scrub, surface flow marsh, reedbeds, scrapes, ponds, springs, flushes, and saltmarsh. The reintroduction of beavers will help to create and maintain biodiverse wetland and river habitats. Appropriately sited trees along sediment and run-off pathways will interrupt flow routes and increase soil infiltration which reduces flooding and the amount of sediment, nutrients, and pollutants reaching a river channel.

Alongside native species there are populations of invasive non-natives within the catchment including Himalayan balsam, Japanese knotweed, American Skunk Cabbage, and signal crayfish. Non-native fallow and muntjac deer are also present and having negative impacts on habitat regeneration, as well as future consequences for beaver-created wetlands.

Statement of Ambition

We will work at the whole freshwater and inter-tidal landscape scale by making improvements to a range of habitats including saltmarsh. This will include working through the Local Nature Recovery Strategies (LNRS). We will continue to introduce large woody debris[14] into tributaries by introducing features that are associated with more natural river systems and diversity of flow types. Natural Flood Management (NFM)[15] interventions will be incorporated into our general approach to river restoration and contribute to the reduction of downstream flood risk. We will reintroduce beaver and carry out work to maximise benefits while minimising risk to adjacent land use and property. Through coordinated action, community engagement, and long-term monitoring we aim to prevent

the introduction, limit the spread, and effectively control existing invasive non-native species.

2035 Objectives

- Re-naturalise river channels by introducing woody debris at 30 sites, restore 20ha of wet woodland in the floodplain, and create/restore and manage 20 new clean water habitats (e.g. ponds, flushes, and pools).
- Map existing clean water (near natural nutrient levels) habitats across the programme area.
- Reconnect 5km of headwater river with the floodplain by removing embankments and re-meandering straightened sections of river.
- Following the completion of the Beaver Feasibility Study[16] which provides the evidence base, carry out licensed beaver reintroduction in suitable areas to restore natural processes and improve ecological health within the riparian zone. Undertake site fidelity enhancements (e.g. riparian planting and beaver dam analogues in the headwaters of the Blackpool, Cannop, and Cinderford Brooks to encourage beaver settlement). Ensure beaver management plan is in place.
- Create/restore a minimum of 100ha saltmarsh in the upper Severn Estuary.
- Promotion of Check, Clean, Dry[17] approach amongst volunteers, staff, residents, visitors, and contractors to reduce risk of spread of invasive species and disease.
- Retain and expand white-clawed crayfish habitats to support existing populations in the Park (Warth) Brook. Undertake a minimum of three surveys to investigate the population status in other watercourses, including the Ferneyley (Warth) Brook. Investigate potential for an Ark site on the upper Westbury Brook.

Key species supported: Eurasian beaver, great crested newt, scarce blue-tailed damselfly, white-clawed crayfish, otter, water vole, water whorl-grass, fan-leaved water-crowfoot, soft rush, lesser spearwort, common saltmarsh grass, sea aster, sea arrow-grass, sea spurrey, and spear-leaved Orache.

3. Working in the wider landscape

Background

Much of the Forest is woodland, with a rich network of traditional orchards and a pattern of small fields with ancient hedgerows linking the woodland to the open countryside. Historically there were ponds spread throughout this landscape. The unique challenges and opportunities provide by extensive forest and woodland management are detailed in section 6 - Forests and Forestry.

The area's farms are mostly focused on growing fodder crops as well as intensive and more extensive animal farming including dairy cows, pigs, and beef cow units. There is some arable cropping on the free-draining lighter soils. These soils are easier to work with machinery but can suffer from soil erosion and capping[18], contributing to diffuse water pollution from nutrient and pesticide run-off, and loss of sediment. Nitrates, fertilisers, and pesticides can also leach into groundwaters of the complex aquifer system which supports

water supply and baseflow to rivers and wetlands. The loss of topsoil can affect agricultural productivity and reduce resilience to drought, flooding, and more extreme weather events, as well as impacting marine life if it reaches the sea. Advice and financial support are needed to help farms update their yard infrastructure to bring them in line with current regulations and improve the management and separation of clean and dirty water in yards. Land management advice and support to identify funding opportunities is key to retaining and improving soil health and reducing diffuse pollution from farms. There is a willingness to work together for farming and wildlife, but the biggest challenge for many is the initial investment required.

The area has lost many of its historic ponds with 60% of those lost from the agricultural landscape due to intensification, infilling, sedimentation, and neglect. Many of these infilled ponds are still visible as 'ghost ponds'[19]. The restoration and creation of new ponds supports associated species which are especially affected by fragmentation such as Great Crested Newts and other amphibians. Agricultural drainage has led to the loss of wetland habitats with some surviving water meadows in the lower parts of the Ley Brook.

Statement of Ambition

We will promote opportunities via farm visits and local networks for farmers and landowners through the Environmental Land Management Scheme[20] (ELMs – including the Sustainable Farming Incentive[21], Countryside Stewardship, and Landscape Recovery) and other relevant initiatives as they arise. Funding streams will be explored covering land management options, capital works, and advice to support regenerative farming practices and target those holdings at higher risk of generating diffuse water pollution. This will include support through Catchment Sensitive Farming (CSF)[22] engagement including accessing specialist tailored on-farm advice. We will identify locations for the creation of high-quality clean water ponds and wetlands and identify waterbodies that would benefit from riparian buffers and livestock fencing to keep stock out of watercourses, reducing soil erosion and improving water quality.

2035 Objectives

- Promote river and wildlife friendly farming agricultural practices on grassland and rotational land (e.g. increasing soil organic matter, keeping soil covered, minimising soil disturbance, reducing compaction, introducing riparian buffers, and providing advice on livestock and nutrient management best practice).
- Promote best practice and interpretation of legislation such as Storing Silage, Slurry and Agricultural Fuel Oil regulations(SSAFO)[23], and Farming Rules for Water[24] (FRfW).
- Hold 2 outreach events for farmers and landowners during the first year in the Greathough Brook and Westbury/Longhope Brook to promote opportunities for reducing nutrient loading into waterbodies.
- Carry out 25 farm visits within the Greathough Brook and Westbury Brook catchments to scope for risks and opportunities to reduce diffuse pollution and improve water quality. Provide farm plans to illustrate water quality risks and solutions including funding to support positive action to improve water quality.

- Identify hotspots for nutrient loading and investigate potential causes and solutions through a scoping exercise to determine priority areas.
- Identify priority waterbodies on farm for riparian buffers which may include grass or wildflower margins and scrub or tree planting, aiming to establish 2ha.
- Protect 1.5km of ditches/watercourses to exclude stock, prevent pollution from livestock entering the water, and provide alternative water supply if required.
- Create or restore 130 clean water ponds including ghost ponds and opportunities for re-wetting and habitat creation.
- Increase engagement working with CSF to deliver on-farm specialist advice including separation of clean and dirty water in yards, pesticide management, soil health, nutrient, and livestock and water management.

Key species supported: Great crested newt, Lesser Spearwort, Marsh St John's Wort, Marsh Pennywort, and aquatic plants and invertebrate assemblages which are sensitive to pollution.

4. Cleaning up our rivers

Background

The following map shows the ecological water quality classifications of the waterbodies in the programme area (plus the bordering Estuary), under the Water Framework Directive[25] criteria:

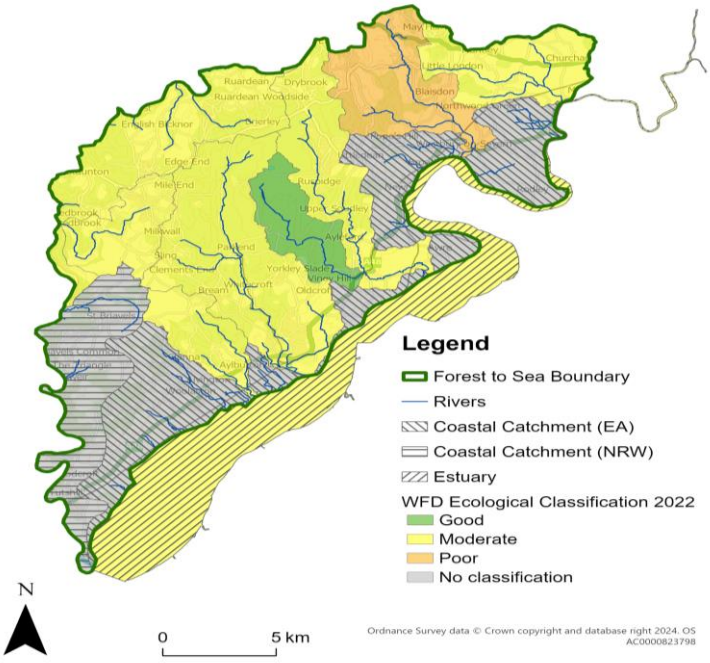

Figure 2. Ecological water quality classifications (2022) of the waterbodies in the programme area under the Water Framework Directive criteria.

Water quality in the Forest of Dean waterbodies is impacted by both rural and urban environments. Sediment from forestry activities can impact on water quality and there is legacy drainage from mines which results in the iron-rich discharge to the Cannop Brook at Norchard's Drift. The Westbury, Longhope, and Valley Brooks are particularly influenced by both agricultural sources, including nutrient and sediment inputs from fertilisers and livestock management, and point sources from sewage treatment works (both private and water company-owned) and septic tanks. Excess nutrients can result in algal blooms and oxygen crashes reducing ecological health, and sediment can cover gravels which salmonids need for spawning. They can also change the vegetative community of a waterbody, resulting in a decline in overall ecological health.

In urban areas many road and rainwater drains lead directly to a watercourse. This can result in contamination from residential, industrial, and commercial areas through misconnections to the 'wrong' system (e.g. from bathrooms and kitchens), and through materials like paint or oil being poured down surface water drains. Run-off from roads and other infrastructure can also be a source of pollutants. There are also sewage storm overflows at various locations which can discharge diluted untreated sewage into rivers during heavy rainfall, but which sometimes also discharge during dry spells for a variety of reasons, including increasing population pressure but also misuse of the sewerage system. New development across the catchment can also exacerbate these issues. Historic industries have left a legacy of contaminated soils which can be mobilised into the water environment during development or construction activities.

The problem of litter and microplastics is also increasing. The catchment has an extensive network of public footpaths close to waterbodies which provide opportunity for negative impacts such as dropped litter and disturbance, but which are also perfect for increasing positive engagement with communities to enhance the water environment.

All the issues which impact on our freshwaters also end up impacting the Severn Estuary and the seas beyond. Litter can cause entrapment and ingestion for wildlife. Sediment from land runoff and from sewerage systems can carry nutrients and chemicals which alter the natural balance of our ocean systems. Microplastics can be ingested by wildlife in our rivers and seas.

There is no single solution to improving water quality – it needs a deeper level of understanding and an integrated approach by multiple stakeholders to effect real change. It is also negatively influenced by poor habitat quality and the physical nature of our rivers which are addressed by other objectives in this document.

Statement of Ambition

We will strive for the Forest of Dean's waterbodies to achieve Good Ecological Status[26] under the Water Framework Directive resulting in good chemical and biological water quality, and healthy associated riverine habitats. To do this, we will engage local communities including businesses and residents to help them to better understand drainage systems and misconnections, work to reduce the frequency of sewer spills across the area, work with partners to deliver support to farmers and, where appropriate, changes to land

management practices, and encourage the development of blue and green infrastructure (BGI)[27] across the catchment.

2035 Objectives

- Work with farmers and landowners and other stakeholders to reduce sediment and nutrient input to impacted waterbodies including, but not limited to, the Westbury and Longhope Brooks, Walmore Common SSSI, and the headwaters of Greathough Brook (see also Objectives in section 3, Working in the Wider Landscape).
- Run misconnection and drainage awareness campaigns every other year, engaging 5 schools or communities - focused in the Cinderford and Cannop Brook catchments.
- Fell 90% of non-native trees along waterbody buffer strips on Forestry England land, encourage native species to reestablish.
- Work together (including Severn Trent Water, Gloucestershire Highways, Local Authorities, eNGOs, and local communities) to plan and deliver a programme of blue and green infrastructure intercepting highway, surface water, and roof runoff through the creation of a minimum of 20 Sustainable Drainage Systems[28] (SuDS) features in urban areas (primarily Cinderford and Lydney) including rain gardens[29], swales[30], green roofs, and depaving[31].
- Work together to understand and reduce sewer overflow frequency into the forest catchments.
- Work together to undertake and support ongoing Outfall Safaris[32] in at least one urban area to identify outfalls where misconnections may need addressing (Severn Trent to lead).
- Support water quality discharge upgrades at wastewater treatment works throughout the programme area, including at Cinderford and Longhope.

Key species supported: Stoneflies, Daubenton's bat, Horseshoe bat species, dipper, brook lamprey, Atlantic salmon, brown trout, and a range of pollinator species.

5. Restoring healthy flows and reducing flood risk

Background

Each sub-catchment within the Forest to Sea Programme faces its own individual challenges related to flow. The Blackpool Brook and Cinderford Brook catchments experience low flow issues, whilst all the catchments experience high peak flows resulting in flooding, which can impact residents and property. The Cinderford Brook and Cannop Brook catchments are defined as Rapid Response Catchments[33], with the potential for rapid onset flooding.

The Forest of Dean has a rich industrial heritage characterised by mining, milling, and forestry operations. Collectively, this history has significantly impacted flow and groundwater. To enable mining work, water was pumped out of mine shafts and

watercourses were artificially modified with concrete lining. This has resulted in flow being accelerated in some places and water lost to flaws in the geology in others. Several reaches have historically been straightened to make way for new infrastructure, and leats were created to increase flow to drive mills. The net effect of this is an increase in flood risk due to flows reaching downstream communities at an accelerated rate, with many areas disconnected from the floodplains that would slow flows and increase infiltration of water. Forestry operations have historically over-drained sites which further exacerbates flooding by allowing surface water to reach watercourses at a faster rate.

Extensive drainage has led to loss of poorly drained wet 'spongy' areas and mires that hold water following rainfall. Water held in this way recharges groundwater levels and positively impacts on low flows as it is slowly released.

The negative effects of low flows in watercourses include increased silt deposition, poorer dilution of pollutants, and reduced oxygenation of water. Low flows can also act as barriers to the movement of aquatic organisms and fish migration and reduce habitat diversity. Low base flows in the Cinderford Brook catchment are partly due to abstraction of water from the aquifer at Buckshaft (Ruspidge) for drinking water, and partly to other factors including losses to mine workings. Sections of the Blackpool Brook catchment dry up completely during most summers from Mallards Pike Lake. This is caused in part by leakage into old mine workings downstream of the lake.

All the catchments have experienced flooding, which is expected to increase in magnitude and frequency due to climate change. Flooding is exacerbated by the Forest of Dean's steep topographic nature coupled with heavily modified catchments. Natural Flood Management (NFM) reduces peak flows and downstream flood risk, as well as providing areas for water storage which can help reduce low flows in channels. Watercourse restoration work can bring similar and complementary benefits, as can the expansion of beaver-modified habitat. These measures can help to manage both low and high flows in a sustainable way, increasing the health of our river systems. Through continued collaborative partnership working, the delivery of such activities can be supported at an unprecedented scale.

Statement of Ambition

We will look to manage flows using Nature-based Solutions and work with natural processes to create a more consistent base flow in low flow catchments and reduce peak flood flows across all catchments. This will increase habitat diversity, create a more resilient water environment, and reduce the economic damage associated with flooding events. We will be mindful of the wider impacts of fluctuating water levels in the mining system on bat communities which roost in these areas.

2035 Objectives

- Deliver, build upon, and learn from Forestry England and Gloucestershire County Council's Cannop NFM project which aims to install 5000 Large Woody Debris dams, create 8ha of wetland habitat, comprehensively restore 4km of watercourse, reconnect floodplains, and remove barriers to fish. Submit a collaborative bid for funding across the remaining catchments within Forestry England's ownership

(Blackpool, Cinderford, and Greathough Brooks) allowing for large-scale NFM delivery across the entire proportion of Forestry England's land.
- Build upon Severn Rivers Trust and Forestry England's partnership project to improve low flow resilience on the Cinderford Brook, applying learnings for future delivery across the flagship area.
- Offer the partnership collaboration as an exemplar in how to deliver large scale catchment-based NFM.
- Wet up headwater reaches and help to restore mires in areas such as Foxes Bridge Bog and Woorgreens, providing a more sustainable water environment which is more resilient to the effects of climate change.
- Seek to better understand the inter-relationships between mines, groundwater, and surface waters in relation to flows and water quality.

Key species supported: Atlantic salmon, European eel, lamprey species, brown trout, and aquatic invertebrates.

6. Forests and forestry

Background

The catchments that fall within the Forest to Sea programme area are largely forested and a majority is under Forestry England management, with the remainder privately owned. Forests and forestry practice affect the water resource of catchments in many ways and are a highly significant factor within the Forest to Sea catchments.

Centuries of woodland management have led to the creation of effective drainage patterns across much of the land surface. The result of this and other human interventions to divert water has resulted in an overly drained landscape in which water moves more rapidly through the forest than it would naturally. There are two contrasting impacts of water moving through the Forest rapidly: firstly, during periods of drought, low flow or no-flow conditions in the waterways have significant negative impacts on ecology of streams and associated ponds. Secondly, in periods of high rainfall the speed of water in the main channels can cause increased erosion leading to excessive sedimentation and damage to infrastructure, such as bridge supports and culvert pipes, as well as downstream flood risk to properties.

Trees close to the channel can help to reduce the amount of water entering the channel, which can be positive or negative according to whether the Forest is experiencing drought or periods of heavy rain. Trees close to the channel also provide shade which again can be both positive and negative as it affects the development of aquatic plants. Another factor to consider is the type of tree species growing near a channel as certain species can negatively impact the pH of the channel ecosystem. It is, however, important to note that the intrinsic 'roughness' of woodlands and associated habitats results in water moving more slowly across the surface before finding its way to drainage channels than either urban or agricultural land uses.

Despite the impact that people have on the way water moves through the Forest landscape, connectivity does remain between the sea, the large tidal rivers, and the Forest's streams and headwaters. This connectivity, and the relatively sheltered conditions of a managed woodland, provides huge potential for a wetland network of national importance.

Through collaboration with the Environment Agency, Gloucestershire Wildlife Trust, Forestry England, and Gloucestershire County Council the four main catchments that have their headwaters in the Forest of Dean have Catchment Management Plans, which are focused on how interventions on Forestry England land can improve the water environment. Opportunities for similar intervention on privately owned forested land will be explored with owners and managers.

Statement of Ambition

The wooded slopes of the valleys and plateaus will include areas of wetland, ponds, and wet heathland that will act as sponges holding sufficient water for our streams to flow healthily throughout the summer months, maintaining good water quality and providing a habitat for fish and other aquatic species.

Through forestry management practices and the reintroduction of beaver the diversity of the riparian woodland structure will be improved, and the diversity of species will be increased. Non-suitable tree species will be removed from riparian zones and replaced with native species such as willow, aspen, and alder which support riparian ecology in general, some of which will also improve suitability for further wild beaver colonisation. These riparian zones will no longer be actively managed for timber production.

Diffuse pollution will be minimised during forestry management operations as woodland managers will always consider pollution risk and prevention methods, helping to maintain healthy riparian zones.

2035 Objectives

- Through Forestry England's Forest Plan process, identify and map locations for development of functional riparian zones through the removal of non-riparian suitable species and increasing of canopy gaps. (Our Shared Forest[34] pg.33).
- Reduce the number of artificial barriers that restrict the movement of fish, gravel, and flows including reducing the number of artificial barriers on the Forestry England estate by 10% and in privately owned forests by 5% (following barrier appraisal exercise in Section 1). (Our Shared Forest pg.32).
- Manage water flow on operational Forestry England sites (Our Shared Forest pg.33), and in privately owned forests to reduce soil erosion and excessive sedimentation.
- Increase the area of UKWAS certified British woodlands within the Forest to Sea plan area.
- Promote the completion of diffuse pollution risk assessments and/or pre-operation diffuse pollution control plans before commencement of woodland management operations.

Key species supported: Eurasian beaver, Atlantic salmon, brown trout, and water vole.

7. Monitoring and data

Background

The Forest to Sea area is one of both cultural and natural heritage, linking the Severn estuary to the upper areas of woodland and heathland. The water and its associated habitats act as a vital network across the programme area. Individuals and organisations are working to make positive change across the programme area and to understand the effectiveness of these actions and prioritise them - monitoring and data collection will be vital to understand and safeguard this landscape.

Often, changes to water quality might be small, temporary, or only observed during events such as heavy rainfall and other extreme weather events. It is only through a thorough understanding of the landscape and catchment that these cumulative effects can be fully understood.

Without monitoring it can be unclear where interventions are needed and how effective past efforts and expenditure have been. Collecting and analysing data needs people on the ground to take measurements, and citizen scientists can help to facilitate a broad range of standardised data collection across the catchment from source to sea. To date, citizen science monitoring has been *ad hoc* in this area. However, there are many legacy groups borne of successful projects, such as Foresters Forest[35], with a cohort of invested and passionate individuals to collaborate with.

The main monitoring activities to date belong to single organisations and include catchment-scale water flow and quality monitoring, citizen science monitoring groups, and national schemes such as Riverfly[36], The Big River Watch[37], and Freshwater Watch[38]. Whilst this is positive, the data points are often from different groups and organisations, with inconsistent, and sometimes uncoordinated, monitoring across the catchments. The collective strategy of the Severn Vale Catchment Partnership and emerging citizen science programmes, such as the WaterWatch Collective Gloucestershire[39], means that data sharing can be better facilitated and contributing organisations can harmonise data collection and use it more effectively.

Statement of Ambition

We will work together to encourage the establishment of co-ordinated citizen science groups to deliver meaningful monitoring for a better understanding of the water environment in the Forest to Sea programme area. We will improve understanding and knowledge of the catchment for the benefit of all by supporting the establishment of an online platform and citizen science hub, augmenting existing work and collaborating with the WaterWatch Collective and University of Gloucestershire to maximise the value of data gathered by citizen scientists and enabling dialogue between a diverse range of stakeholders at a regional and catchment scale.

2035 Objectives

- Establish a programme of monitoring within the catchment. Collect good quality and comprehensive data to inform on the health and status of the water-related environment in the catchment, identify the threats to these environments, and work together to minimise and remove these threats. Take into consideration the source to sea aspect of this.
- Conduct an annual assessment of data across the area to assess trends or gaps in data. Identify how citizen science through the WaterWatch Collective or other citizen science initiatives can help. Continue and expand coverage of Wye citizen science monitoring in relevant sub catchments.

Key species supported: White-clawed crayfish and riverfly communities.

8. Community engagement and partnership

Background

The main watercourses in this catchment run through the Forest of Dean and associated areas to the Severn Estuary or the River Wye and into the sea, flowing through or past many towns and villages.

Effective community support will increase the sustainability of the projects and is achieved through early and continuing engagement with, and involvement of, local people and the education of the young. Offering opportunities to co-design plans and contribute through citizen science schemes will provide a sense of ownership while contributing to project monitoring and building a local evidence base.

Increasing access to the water environment, awareness of the challenges that it faces and how we can all work together to make it healthy and functioning is crucial to achieving the vision of the Forest to Sea Programme.

Statement of Ambition

To achieve the desired outcomes, we will work with all those that have an interest in improving the water environment of the streams and brooks that flow from the Forest to join the Severn or Wye on their journey out to sea. Flood Action Groups[40] such as the Lydney Flood Forum will be a key element to ensure residents that suffer from flooding are involved in any restorative work. We will also work to raise the profile of our water environment and enhance understanding of its importance across the area.

2035 Objectives

- Work with Gloucestershire Highways to install the names of rivers and streams on road bridges across the Forest catchments to promote a better awareness of the catchment among local communities.
- Work with local communities and landowners to run at least 5 litter picking/survey and river cleaning events and hold citizen science events to identify pollution sources (see also the section 4 objective around Outfall Safari) to help reduce them and enhance natural restoration.

- Promote and expand citizen science approaches across the area (see also section 7 objectives), establishing at least one citizen science group to undertake regular monitoring.
- Run an annual event for all stakeholders to discuss progress towards achieving the vision, encourage community involvement, and identify further opportunities.
- By 2036 work with a minimum of five schools/young people's forums explaining the issues facing our water environment, how drainage systems work, and how to help our rivers and ponds become and stay healthy.
- Complete interpretive trail linking Cinderford rain gardens and river restoration in Cinderford Linear Park.
- Involve communities in SuDS projects throughout the area (see also objectives in Section 4, Cleaning Up Our Rivers).
- Support stakeholders to manage beaver activity on their land where needed, building understanding of UK government's five-step management approach. Work with local communities and land managers to identify and deliver risk-management measures (e.g. tree wrapping) where possible.

Key species supported: all water-related species.

Glossary and further reading

A glossary, numbered[123], explaining terms and acronyms, as well as suggested further reading, is available on the Severn Vale Catchment Partnership website: *catchmentbasedapproach.org/get-involved/severn-vale*.

Thank you to Stu McLellan for designing the logo for Forest to Sea. Find more of his work at

www.stumclellan.co.uk