



Wiltshire Wildlife Trust



By Brook Sub-Catchment Action Plan

Alice Baker (Water Team Project Officer)

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Executive Summary

PEBBLE (Protecting and Enhancing the By Brook and its Local Environment) is a partnership project led by Wiltshire Wildlife Trust (WWT) with Bristol Avon Catchment Partnership (BACP) and support from the Wild Trout Trust (WTT). The first phase of PEBBLE ran for the financial year of 2019/20.

There is a legacy of a number of stakeholders taking action on the By Brook, multiple reports have been written and works delivered. It was recognised by BACP delivery partners that there was a need to pull everything together and develop a strategic outline action plan for the river going forward.

The aim of PEBBLE was create a sub-catchment action plan for the river. The first stage of this was to compile and collate all current available information for the By Brook into one place that signposts past and on-going work in the catchment. Following this, wider engagement was carried out with stakeholders and landowners down the By Brook to determine challenges and priorities for the river going forward.

The second stage of PEBBLE used the information gathered in stage one to create a strategic action plan for the river that identifies key issues facing the By Brook and recommends solutions that work for not just the river, but also wildlife, landowners and the local community.

It is hoped that this report lays the groundwork for stakeholders and delivery partners across the catchment to undertake sustainable and multi-benefit improvements across the catchment in-line with wider aspiration for the river.

Part 1 – By Brook Overview

Catchment Summary

The By Brook is a tributary to the Bristol Avon of approximately 34km in length. The By Brook rises near the village of Tormarton where it flows in an easterly direction towards Burton. Here it changes direction to flow south through the villages of Castle Combe, Ford and Slaughterford down to Box. Along this reach the By Brook is joined by the Broadmead Brook and Doncombe Brook. From Box the river travels west until it joins the main Bristol Avon at Bathford (Figure 1).

The catchment is composed of six surface waterbodies (Figure 1), three making the main By Brook river (Upstream to downstream waterbody ID: GB109053027500, GB109053027480 and GB109053027380) and three tributaries, the Broadmead Brook (GB109053027490), the Doncombe Brook (GB109053027400) and an un-named tributary (GB109053027460). All three waterbodies making the main By Brook are classified as 'Moderate' in the 2016 cycle of the Water Framework Directive (WFD), failing to make 'Good' status for reasons including diffuse and point source phosphate pollution from agricultural and rural sources and barriers to fish migration (Figure 1). Of the tributaries, the Broadmead Brook and un-named tributary are classed as in 'Good' status and the Doncombe Brook is classified as in 'Poor' condition due to barriers to fish migration and diffuse sources of pollution from livestock (Figure 1).

The geology of the catchment is primarily greater and inferior oolite limestone and sandstone with pockets of mudstone (Figure 2). There are superficial deposits of alluvial clay, silt, sand and gravels along the length of the river.

The By Brook catchment lies within the Cotswolds Area of Outstanding Natural Beauty (AONB) and the river runs through three Sites of Special Scientific Interest (SSSI); Rack Hill SSSI just downstream of Castle Combe, Colerne Park and Monk's Wood SSSI, and Honeybrook Farm SSSI south of Slaughterford, with other SSSIs lying within the catchment. In addition to the SSSI and AONB the river runs through multiple County Wildlife Sites, a Woodland Trust reserve and Box Conservation Area (Figure 2).

The upper reaches of the catchment are defined mainly by arable farming, with the middle reaches mainly livestock farming, primarily cattle, and the lower reaches a mixture of both arable and livestock. There is a rich culture of angling along the river, with six angling clubs holding the majority of the fishing rights down the By Brook. The river supports populations of wild brown trout (*Salmo trutta*), grayling (*Thymallus thymallus*) and many coarse fish species.

The By Brook is a steep river, with a drop of over 200m in 25km, as a result of this it has a strong history of milling and the channel has been heavily modified from its original planform. There is evidence of at least 20 mills along the length of the river, none remain in use with Chapps Mill paper mill the last to cease production in the 1990s. Many of the weirs and sluices from the mills are still present today and negatively affect natural sediment movement down the river and fish migration upstream, this is one of the primary factors for the ecological failings under the WFD.

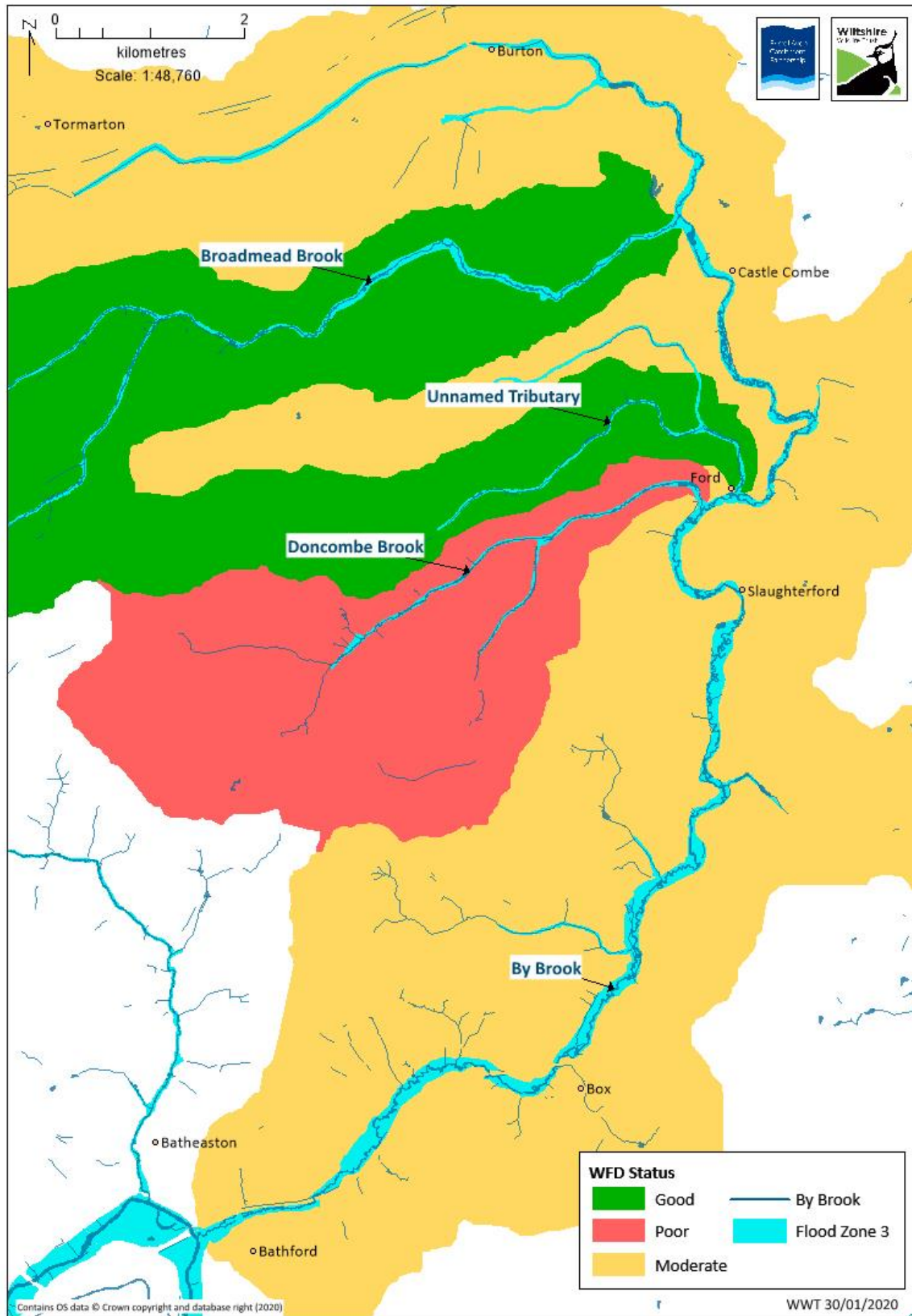


Figure 1. Overview of the By Brook catchment including Water Framework Directive (WFD) status of waterbodies and Flood Zone 3 (Data from the Environment Agency).

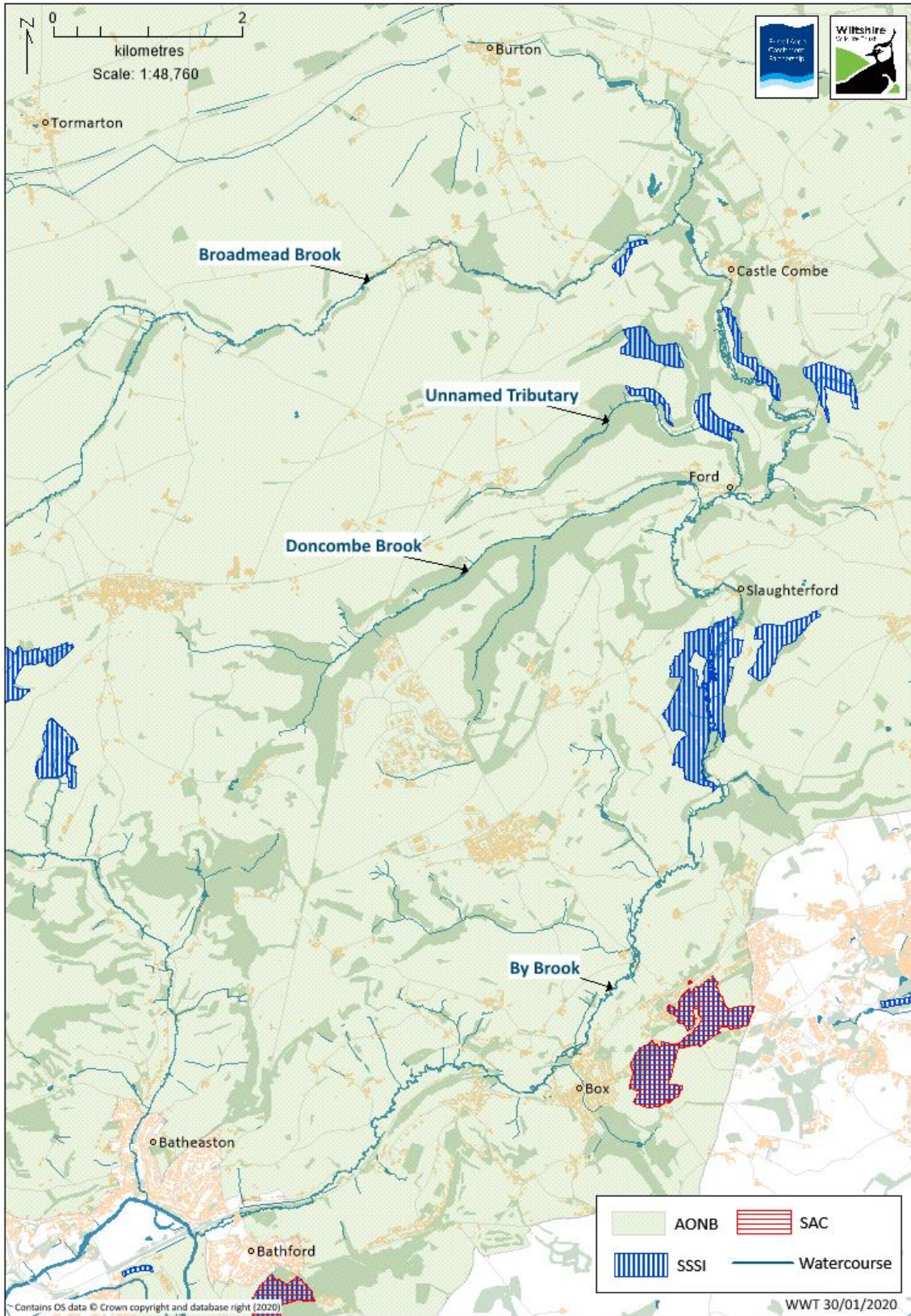


Figure 2. Protected areas across By Brook catchment.

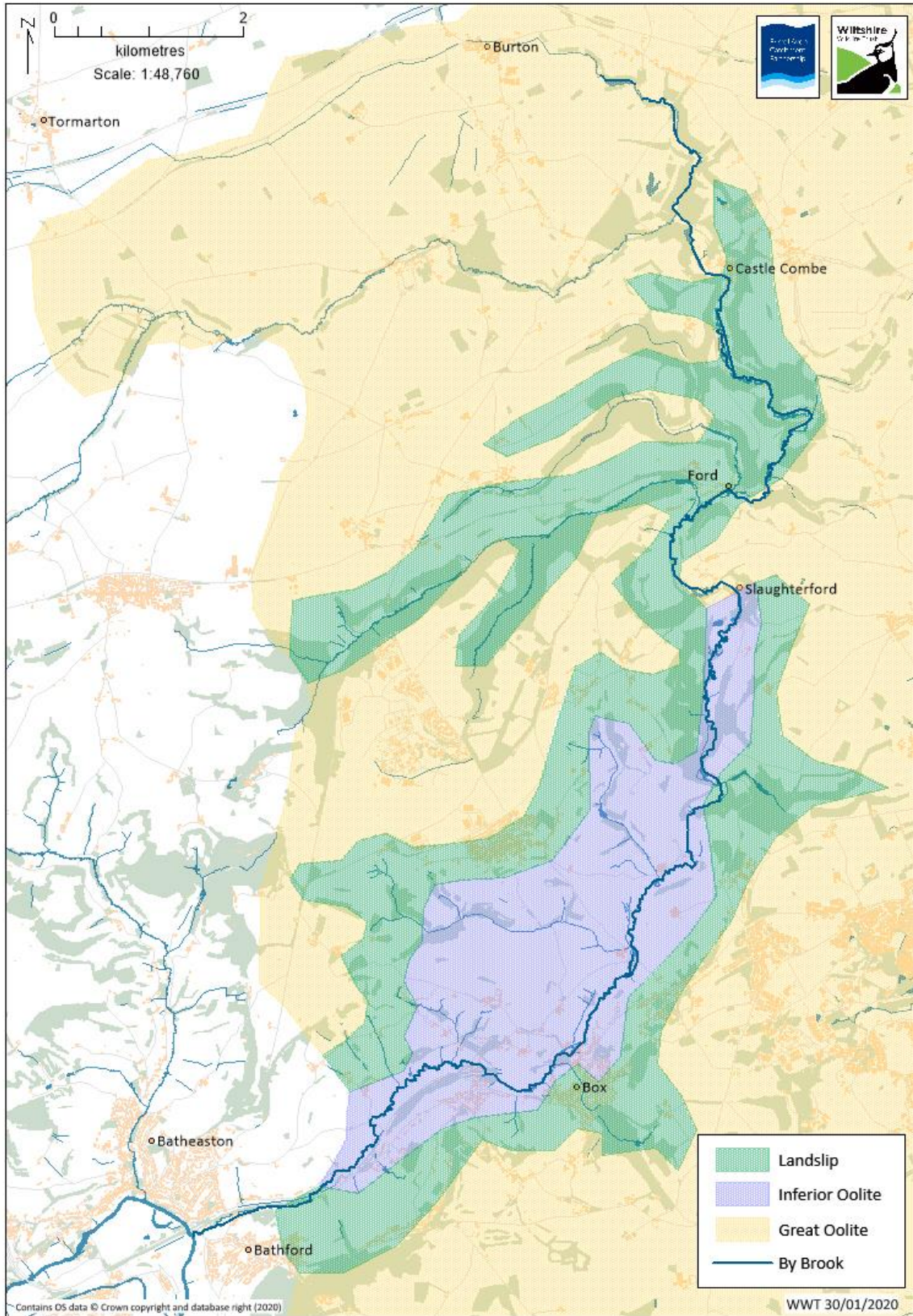


Figure 3. *Geology of the By Brook catchment.*

Work to Date

Invasive species

Wiltshire Wildlife Trust (WWT) have a long history of invasive species work on the By Brook. An invasive non-native plant project was set up in 2010 and removed Himalayan balsam, giant hogweed and Japanese knotweed from the river banks. Supported by the Wildlife Trust, this work has primarily been organised and delivered by volunteers since 2012. Surveys in 2019 found only two Himalayan balsam plants upstream of Middlehill and volunteers removed all plants downstream of this to the A4 road bridge. WWT plan to maintain the success of this project, continuing the work in 2020.

In addition to the invasive plant projects work has been done to remove mink (*Mustela lutreola*) in an effort to encourage water voles into the catchment by the Cotswold and By Brook project, led by WWT.

Crayfish

The By Brook has historically held an extensive and regionally important population of white-clawed crayfish (*Austropotamobius pallipes*). The white-clawed population between Slaughterford and Ford was a source of donor stock for Ark sites since 2008, through the South West Crayfish Project.

A crayfish survey of the By Brook and its tributaries was conducted on behalf of WWT in 2000. At this time a healthy population of native white-clawed crayfish were present in the main River and plague free signal crayfish (*Astacus astacus*) were inhabiting the Broadmead Brook, co-existing with the native species for over 20 years (Lang & Wylde 2000).

Further studies conducted by Avon Wildlife trust (AWT), on behalf of Bristol Avon Rivers Trust (BART) and the Environment Agency (EA) in 2013 assessing the impact of weirs on crayfish distribution found expanding populations of signal crayfish down the main river spreading downstream from the confluence of the Broadmead Brook at Castle Coombe, competitively eliminating white-clawed populations (Robins 2013). There was no crayfish plague found during these surveys.

In 2016 the EA reported an outbreak of crayfish plague on the By Brook. This killed native crayfish over at least 8km of the river and is thought to have wiped out a large proportion of the remaining white-clawed population. It is not known whether any white-clawed crayfish survived this outbreak in the upper reaches of the tributaries, extensive surveys would need to be done to investigate this.

Flooding and Abstraction

There is a history of flooding across communities on the By Brook, with records dating back to 1882. Following a key flood event in 2012 the EA commissioned a report to map flood risk on the By Brook in 2013. Drainage outfalls from the M4 along with key potential blockage sites downstream were highlighted. Wiltshire Council have carried out watercourse clearance work in Burton. Further detailed investigation is needed to determine the impact of the M4 outfalls on flood risk and pollution of the By Brook.

Concerns about low river flows due to abstraction have been expressed for many years, resulting in the EA undertaking a Restoring Sustainable Abstraction (RSA) study. There are no Public Water Supply abstractions in the catchment now, with the Wessex Water spring abstraction at Widdenham ceasing in 2006. Abstraction from the Oolites aquifers in the Malmesbury Avon catchment to the north by Wessex Water have been a focus of concern. Wessex Water implemented spot gauging along the By Brook and associated groundwater level monitoring. This work concluded there is no adverse impact

on the By Brook and the EA closed the RSA study in 2014. Wessex Water continues to monitor the stream flows upstream of Ford to verify or refute current understanding. This will also feed into a wider investigation being carried out by Wessex Water to understand the impact of abstraction from public water supply groundwater sources on the Middle Bristol Avon on flow, and whether flow changes adversely affect WFD status.

Weirs

The By Brook valley has a strong history of milling, historically corn and in more recent times, paper. As a result of this the channel has been heavily modified, with evidence of at least 20 mills, 14 of which still have structures in the water. These weirs and sluices have many negative impacts on the river system, they impound the water upstream resulting in sluggish flows, high levels sedimentation and low habitat diversity. In addition to this they act as barriers to fish and European eel migration upstream and interrupt the natural process and sediment transport down the river.

The weirs on the By Brook were identified as a priority for investigation by the EA in 2013 when they EA commissioned BART to survey the By Brook catchment focusing on WFD failings. BART produced a catchment scale report highlighting issues for the river and potential solutions to bring the river up to 'Good' status in the 2016 WFD cycle. This report includes detailed investigation into the weirs and recommendations for by pass or fish passage solutions. The report details a Phase 2 however this has not happened to date due to a number of factors. The report is available on the Bristol Avon Rivers Trust Website, [here](#). BART also completed a fluvial assessment of the By Brook in 2015, this is available on the Bristol Avon Rivers Trust Website, [here](#).

Current Status

The BART report mentions a Phase 2 of the project, where designs were to be taken to planning and delivery level, this is yet to be taken forward. In the intervening years since the BART report there has been some updates to the status of the weirs and stakeholder priorities.

- Since the 2014 report Ford Fly Fishers (FFF), who maintain the 3 of the 4 structures between Ford and Slaughterford, have improved the protocol set in place for controlling the gates and therefore water levels and fish passage up the reach. By doing this they have improved sediment transport down the system and consequently habitat between structures for existing wild trout populations.
- FFF and the EA are currently detailing a plan for Slaughterford Gate weir. Plans are not currently available however they are expected to include a technical eel pass.
- The weir at Drewett's Mill was marked as deteriorated in the 2014 report. This has since been renovated.
- The EA have made improvements to fish and eel passage at Middlehill flow station.

Angling

There is a rich culture of angling along the By Brook with at least six angling clubs active across the catchment. The angling clubs vary in size and capacity however they all share a vested interest in protecting and enhancing the habitat of the By Brook to ensure populations of brown trout (*Salmo trutta*), grayling (*Thymallus thymallus*) and other fish species flourish. All clubs sensitively manage their stretch of water to varying extents as capacity allows. Outlined below is some work carried out by different clubs.

Ford Fly Fishers

Ford Fly Fishers (FFF) play an active role in riparian management along their beats, which stretch between Ford and Slaughterford. There are 4 impounding structures along the FFF stretch of the river for which FFF are responsible for the maintenance of 3 currently and have a set protocol for gate control. The fourth structure is Slaughterford Gate, FFF and the EA are currently working on a plan for this structure.

In addition to the impounding structures, cattle poaching is heavily impacting the river. The combination of impounding and poaching results in areas with a sluggish flow, little habitat diversity and high rates of siltation. FFF stock sections of their waters to maintain the fishery. There are however reaches that are fast flowing with clean gravels and good marginal habitat which support self-sustaining populations of brown trout (*Salmo trutta*). FFF have reported a 25% catch increase in wild trout over the last few years as a result of habitat improvements.

An advisory visit was carried out by the Wild Trout Trust in 2016. This details the stretch of river and includes recommendations for improving habitat for trout and other wildlife. The report can be found on the Wild Trout Trust website [here](#).

By Brook Fly Fishers

By Brook Fly Fishers' (BBFF) section of the river runs from just south of Slaughterford downstream to Drewetts Mill. These waters are relatively un-impacted by engineered structures, in contrast for FFF's waters, and sustain a healthy population of wild brown trout throughout as well as 'minor species' such as bullhead (*Cottus gobio*), minnow (*Phoxinus phoxinus*) and brook lamprey (*Lampetra planeri*). Livestock pressures are the main issue on this stretch of water, with livestock poaching leading to degraded banks, high silt levels and low diversity. BBFF, in partnership with the EA, carried out a small fencing project and installed a cattle drinking bay in 2017 (Figure 4), they continue to work closely with farmers and landowners to encourage fencing of marginal buffer strips along the water course



Figure 4. Image of fencing project done by By Brook Fly Fishers shortly after construction. © Environment Agency.

with alternative drinking sources provided for livestock.

Bathampton Angling Association

The Bathampton Angling Association (BAA) fish the waters from Box down to just upstream of the A4 road bridge. This stretch is left wild, with only naturally management when needed as BAA have limited resources available. This reach suffers with sediment and soil run-off and over shading in parts. Priorities are landowner engagement and sensitive bankside management to reduce over shading along their waters.

Farm Action and Advice

The Farming and Wildlife Advisory Group (FWAG), Catchment Sensitive Farming (CSF) and BART have been involved in farm advice in the By Brook catchment to date.

FWAG are providing on-going support and advice to arable farmers on the headwaters of the By Brook on buffer strips, land management and run-off issues.

The CSF priority area within the catchment is to the south east of Box. Here CSF officers have worked with landowners on yard capital works to reduce the impact of run-off and advice relating to stewardship schemes.

BART, part of the 2013/14 catchment project worked with riparian livestock farmers in the mid-catchment to advise on issues relating to poaching and sediment ingress into the water course and nutrient management plans. This resulted in several hundred meters of poached bank on the Lid Brook, a tributary to the By Brook that joins the main river just upstream of Box being fenced with designated cattle drinking access points, further details of this are available in the report on the BART website.

Cotswold AONB

With the exception of a 500m section of the river just upstream of the confluence with the Bristol Avon the By Brook lies within the Cotswolds Area of Outstanding Natural Beauty (AONB) (Figure 2). Cotswolds AONB has identified 19 different landscape character types across the AONB. The By Brook valley is a mix of 6 character types; Broad Floodplain Valley, Enclosed Limestone Valley, Dip-Slope Lowland, Cornbrash Lowland and High Wold. Landscape Strategy and guidelines have been produced for each character type ([available here on the Cotswolds AONB website](#)), these aim to guide and inform development and land management to ensure it fits the landscape to conserve and enhance the special qualities of the Cotswolds AONB.

The Cotswolds Conservation Board works to conserve and enhance the Cotswolds AONB with the assistance of Cotswold Voluntary Wardens. Any plans for works within the AONB need to be agreed with the Cotswolds Conservation Board.

Challenges and Priorities

Throughout PEBBLE there was a large amount of engagement with a wide range of stakeholders including landowners, NGOs, angling clubs and communities along the By Brook who were asked to consider:

- The challenges they see facing the river and wider catchment.
- Their priorities for the river, in terms of management, protection and improvements.
- Aspirations for the river going forward.

Key challenges and priorities are summarised:

Weirs

The history of milling in the By Brook valley dates back to roman times when the mills were exclusively used for grinding corn. By the end of the 12th century the use of the mills had changed when Wiltshire became an important centre for the wool trade. Corn mills were converted to cleanse and thicken wool in a process known as fulling. This continued until the decline of the wool trade in the 17th century when they were converted to paper mills to fulfil the demand for paper packaging from Bristol. The last of the paper mills ceased production in the 1990s (Tatem, 1996).

This history brings with it multiple challenges. The channel has been heavily modified to accommodate the milling practices which has resulted in a river that is un-naturally straight, over wide, dredged, impounded and silty lacking the habitat diversity and connectivity that should be expected of a healthy, dynamic river.

Restoring natural process to the river, through planform changes, structure removal and habitat improvements, as well as opening the river to migrating fish has been highlighted as a priority for the river. Protection of the heritage and history of these buildings and land use adds an additional challenge to future works.

Flooding and Pollution

Many communities along the By Brook have concerns with regards flood risk and pollution. There are a number of properties at risk of flooding, with a large flood event in 2012 highlighting this. A number of factors contribute to perceived flood risk, these include discharge outfalls from the M4 and the weirs present down the river.

In addition to discharge outfalls from the M4 adding to flood risk, it has been observed that these run very dirty after high rainfall events and discharge large amounts of sediment and other pollutants into the river. Further investigation is needed to determine the impact of this.

Restoring natural processes to the river, reconnecting it to its floodplain and improving land use practices will help the river cope with flooding and pollution pressures in the future.

Abstraction

Whilst flood risk has been highlighted a priority for investigation on the river during winter months, low flows in summer months have also been noted as a priority. Although no link between abstraction and low flow has been established, flow monitoring by Wessex Water and analysis is ongoing to understand how the river accretes whether and abstractions in neighbouring catchments have an impact. Improving and restoring the in-channel diversity and habitat of the By Brook will improve the rivers resilience to altered flows in the future.

Land Management

Livestock incursion on the river has been highlighted as an issue along certain reaches of the river. This poaching by livestock degrades the banks and depletes marginal vegetation causing sediment ingress into the river resulting in very low habitat value and high levels of siltation, opening potential pathways for nitrate and phosphate pollution. Landowners who allow livestock access to the river are breaking DEFRA's Farming Rules for Water which came into play in April 2018. Landowner advice and support reinforcing DEFRA's Farming Rules for Water (FRFW) is a priority for the river.

References

- Environment Agency, 2014. Restoring Sustainable Abstraction (RSA) in the By Brook. Briefing Note
- Lang, M. and Wylde, A., 2000. Some observations on surveying native and signal crayfish. *British Wildlife*, 11(6), pp.398-400.
- Robins, L., 2013. Positive and negative effects of fish passes in relation to population dynamics of the White-clawed crayfish (*Austropotamobius pallipes*) and invasive American signal crayfish (*Pacifastacus leniusculus*) in the By Brook, River Avon.
- Tatem, K., 1996. A History of the By Brook. Published by the Environment Agency.

Part 2 – Action Plan

The priorities highlighted through community, landowner and stakeholder liaison during PEBBLE have all fed into an outline action plan for the river By Brook. Suggestions within this action plan are in-line with combined ambition for the river and lead to WFD improvements. Table 1 summarises actions and each is detailed further below.

Table 1. Priorities for the river By Brook Action Plan.

Priority	Action	Benefits	Target Area	Feasibility
1	Livestock Exclusion	<ul style="list-style-type: none"> - Reduced bankside erosion. - Reduction in sediment and other pollutants entering the channel. - Improved riparian habitat. - Landowner compliance with DEFRA's Farming Rules for Water. - Community engagement through volunteer tasks. 	Catchment wide with particular focus on middle reaches from Ford to Widdenham.	Livestock poaching and sediment issues have been highlighted as a key priority for the river across all stakeholders engaged therefore livestock exclusion is highest priority for the Action Plan. Livestock exclusion is relatively low cost for the benefits achieved making it a very feasible solution for the river when done correctly with the required width of riparian margin.
2	Farm Advice and Action	<ul style="list-style-type: none"> - Engagement with DEFRA's Farming Rules for Water. - Reduction in pollution. - Action leads to livestock exclusion. - Action leads to improved arable land management. - Advice and action in preparation for the transition into the new Environmental Land Management Schemes. 	Catchment wide.	Issues of sediment ingress into the channel, bank poaching and pollution from farm run-off can be tackled at source through farm advice, supporting a farmer to make changes to practices or investing in capital projects (with funding assistance when available). Farm advice is a low cost, practicable solution leading to action to tackle many of the current issues facing the river.
3	Habitat Improvements	<ul style="list-style-type: none"> - Improved habitat value for aquatic and riparian wildlife. - Increased reliance of the river to environmental changes. - Improved angling. 	Catchment wide with particular focus on the Ford Fly Fishers and Bathampton	Habitat works can be delivered at relatively low cost with the help of volunteers with added benefits of community engagement. Habitat improvements are multi-benefit, meeting many of the issues highlighted for the river.

		- Community engagement through volunteers.	Angling Association stretches.	
4	Natural Flood Management	- Increased water storage. - Silt and pollutants filtered out of the watercourse. - Improved habitat in the headwaters.	Headwaters of the catchment.	Flood risk is a concern for many communities on the By Brook along with concerns over run-off from the M4 polluting the watercourse. Natural flood management schemes in the upper headwaters is a multi-benefit approach to tackling these issues. Depending on the intervention costs are variable but feasibility is high.
5	Invasive Non-Native Species	- Improved riparian habitat for wildlife. - Reduced bankside erosion. - Reduction in health risk from toxic invasive plants including giant hogweed. - Reduction in risk to infrastructure from damaging plants such as Japanese knotweed. - Community engagement through volunteer tasks.	Catchment wide.	Previous work has monitored and managed invasive non-native species (INNS) including Himalayan balsam, giant hogweed and Japanese knotweed. Continuation of this work is need to ensure these species don't spread resulting in negative impacts for the river, community and nearby infrastructure. INNS control is a relatively low cost measure that can easily be implemented with the assistance of the established volunteer group on the By Brook and support from NGO's such as WWT.
6	Connectivity	- Improved fish and eel passage. - Restoration of natural sediment transport down the system. - Improved habitat in impounded waters.	Catchment wide.	Connectivity within the By Brook has been highlighted as a priority for the river by multiple stakeholders. Although a high priority for the river and a main reason for WFD failings this is lowest priority on the action plan for reasons of cost and feasibility. Re-engagement with landowners has shown there is low potential for large-scale bypass or weir removal projects at this time. Smaller scale works such as technical fish passes and improved management of sluices have been implemented in recent years. Should funding be available weir removal is something that should be kept at the top of the list for the future.

Livestock Exclusion

1

A key action highlighted for the river By Brook is improved livestock exclusion. Large areas of the By Brook suffer from bank poaching. This is not only detrimental to water quality and habitat but also results in landowners losing valuable soil.

Benefits

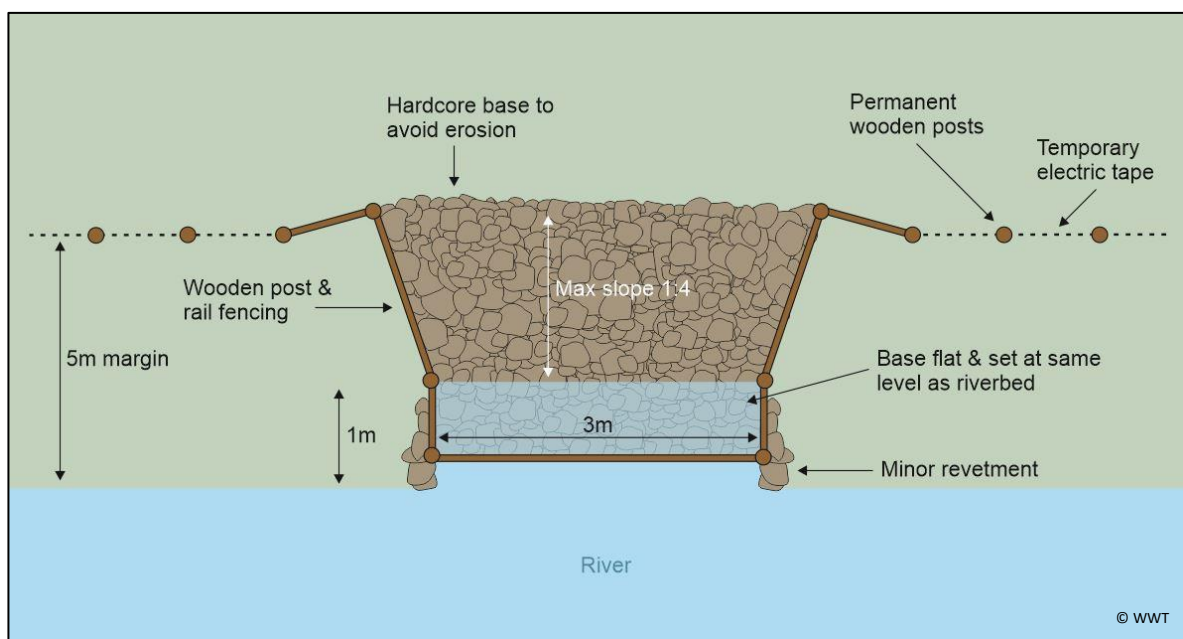
- Reduced bankside erosion meaning landowners aren't losing valuable soil.
- Reduced pollution from sediment and phosphates entering the watercourse.
- Riparian vegetation is able to grow benefiting a host of aquatic and terrestrial species.
- Healthy community of marginal vegetation stabilises river banks and protects against further erosion
- Landowner compliance with DEFRA's Farming Rules for Water.
- Prevention of livestock crossing the river during low flows and risk to livestock during high flows.

Design

Consultation with landowners has made clear that traditional stock fencing or fixed single strand electric wire are not viable options in many areas due to maintenance requirements and risk of vandalism. Permanent wooden posts with temporary electric tape which can be put up and taken down as livestock are brought into and removed from the field is the most desirable, cost effective solution. This method also makes sensitive management of the margin easier, such as invasive species

Concept design for a livestock exclusion project including livestock drinking bay and electric tape fencing 5m from the watercourse.

This design allows livestock access to water without them being able to enter the channel itself. This reduces erosion, minimises the opportunity for pollutants to enter the system as well as reducing any risk to the cattle during high flows. Hardstanding in the base of the drinking bay further reduces erosion and sediment pollution of the river.



control or works to prevent over shading of the river. To comply with DEFRA's FRFW livestock need to be fenced at least 5m from the watercourse.

There are a number of alternate drinking sources that can be made available to livestock, including mains-fed troughs, pasture pumps and ram pumps. If these are not feasible for reasons of cost or vandalism livestock drinking bays, although less ideal as pollutants are still able to enter the watercourse, are an option.

Feasibility

Livestock exclusion is a relatively low cost solution for the river. Conservation NGO's have successfully led livestock exclusion projects on the By Brook in the past, working alongside landowners to design interventions, source funding and deliver works. Grants are also available through Countryside Stewardship for farmers who are part of mid-tier or high-tier schemes.

Example photos of possible livestock drinking solutions. A) Pasture pump (©WWT) and B) Cattle drinking bay (©CSF).

The pasture pump (A) is activated by the cattle pressing on the lever with their nose to release water into the trough below. A pipe takes water from the river to the pump meaning the livestock can be fenced away from the watercourse allowing for a 5m riparian margin in-line with the Farming Rules for Water. The drinking bay (B) gives livestock access to water whilst preventing them entering the channel and reducing erosion along the bank. A margin is able to be maintained either side of the bay.



Example of successful livestock exclusion on the River Meon in Hampshire.

The top photo shows livestock poached banks prior to works, the bottom photo shows the same stretch of river after fencing with a healthy, diverse riparian margin.



For more advice contact **Wiltshire Wildlife Trust's Water Team**
Water@WiltshireWildlife.org or 01380 736066



Farm Advice and Action

Continued farm advice leading to action on the By Brook would work to reduce the issues of diffuse and point source agricultural pollution from phosphates and sediments that are leading to the WFD failings of the river.

Farm advice should focus on DEFRA's Farming Rules for Water which came into force in April 2018, there are 8 rules which aim to help protect water quality by standardising good farm practices requiring farmers to keep soil on the land, match nutrients to crop and soil needs and keep livestock fertilisers and manure out of water.

These rules have been rolled out in an advice led approach by the EA, working with farmers to meet the needs before enforcement action is taken. It is advisable that farmers adhere to these regulations as the EA are inspecting farms for compliance.

Defra's Farming Rules for Water

1. Matching crop and soil needs.

- a) Application of organic manures and manufactured fertilisers to cultivated agricultural land must be nutrient management planned to meet soil and crop nutrient needs without exceeding these levels and assessed for significant risk of pollution in advance
- b) Nutrient Management Planning must take into account the results of testing for Phosphorus, Potassium, Magnesium, pH and Nitrogen levels in the soil, which must be done at least every 5 years ([*more details here](#)).

2. Organic manures must not be stored on land:

- a) within 10 metres of inland freshwaters or coastal waters
- b) where there is significant risk of pollution entering inland freshwaters or coastal waters
- c) within 50 metres of a spring, well or borehole.

3. Organic manures or manufactured fertilisers must not be applied:

- a) if the soil is waterlogged, flooded, or snow covered
- b) if the soil has been frozen for more than 12 hours in the previous 24 hours
- c) if there is significant risk of causing pollution.

4. Organic manures must not be applied:

- a) within 10 metres of any inland freshwaters or coastal waters, except, if precision equipment is used, within 6 metres of inland freshwaters or coastal waters
- b) within 50 metres of a spring, well or borehole.

5. Manufactured fertiliser must not be applied within 2 metres of inland freshwaters or coastal waters.

- 6. Reasonable precautions to prevent significant soil erosion and runoff from:**
 - a) the application of organic manure or manufactured fertiliser
 - b) land management and cultivation practices (such as seedbeds, tramlines, rows, beds, stubbles (including harvested land with haulm), polytunnels and irrigation)
 - c) poaching by livestock

- 7. Any land within 5 metres of inland freshwaters and coastal waters must be protected from significant soil erosion by preventing poaching by livestock.**

- 8. Livestock feeders must not be positioned:**
 - a) within 10 metres of any inland freshwaters or coastal waters
 - b) within 50 metres of a spring, well or borehole
 - c) where there is significant risk of pollution from poaching around the feeder entering any inland freshwaters or coastal waters.

Stewardship

The recent Agricultural Bill set out a timeline for the transition of the current stewardship schemes over to the new Environmental Land Management Schemes (ELMS) over the next 7 years. It is not clear at this point what these will exactly comprise however the underlying concept is rewarding land managers for public goods they provide. Among the goals farmers will be encouraged to carry out works to improve water and air quality, mitigate flood risk, reduce waste and improve habitat for wildlife.

Getting one step ahead of ELMS and starting works to meet these goals now will benefit farmers when ELMS opportunities arise over the coming years.

Organisations

The Farming and Wildlife Advisory Group (FWAG), National Farmers Union (NFU) and Catchment Sensitive Farming (CSF) are the organisations best placed to offer advice for farmers on actions that will need to biodiversity gains.

For more advice contact **Wiltshire Wildlife Trust's Water Team**

Water@WiltshireWildlife.org or 01380 736066



Habitat Improvements

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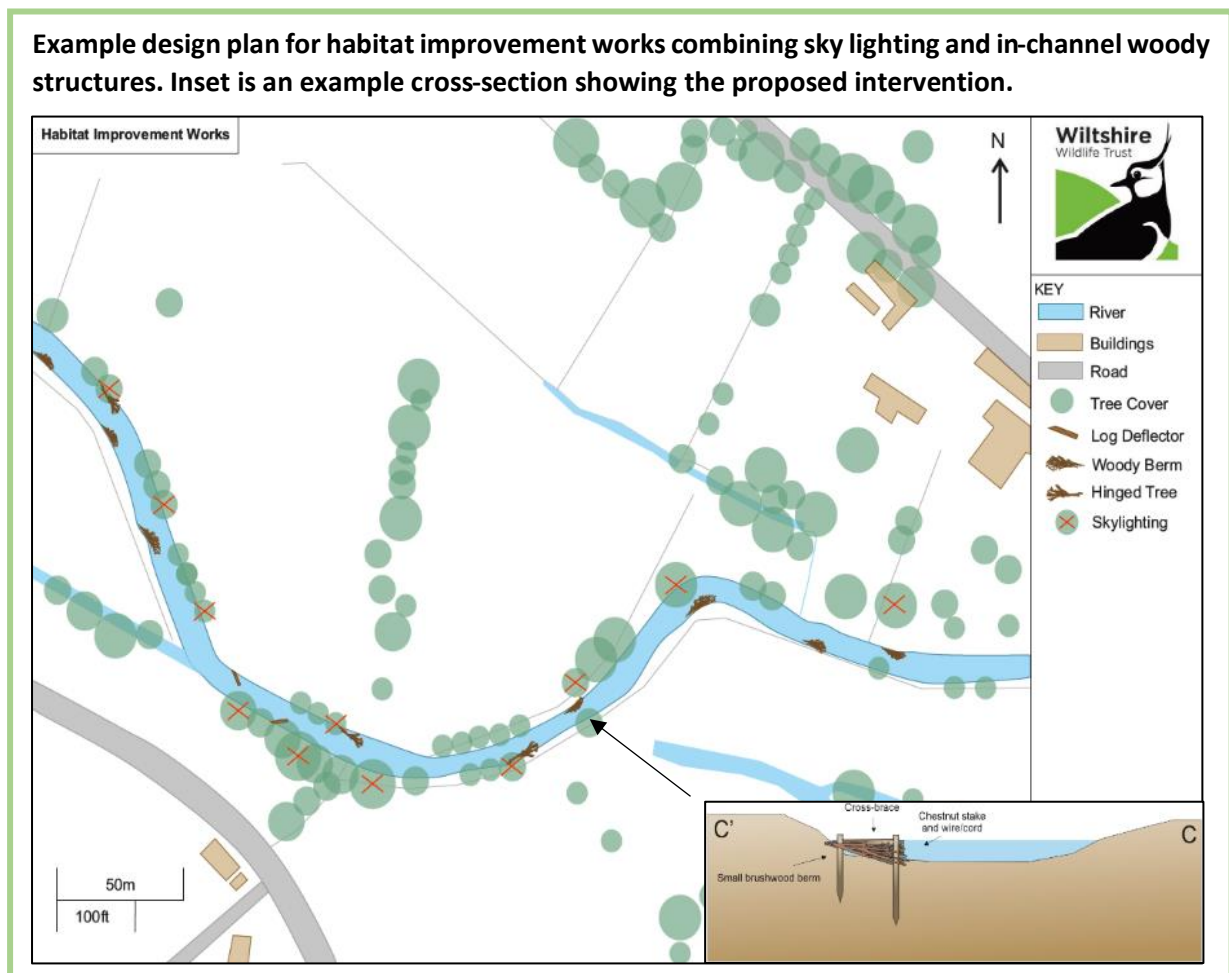
Improving in-channel and riparian habitat is a priority for many landowners and stakeholders on the By Brook. There is a need for habitat improvements as historic practices such as dredging and straightening of the river have reduced habitat diversity along its length.

Benefits

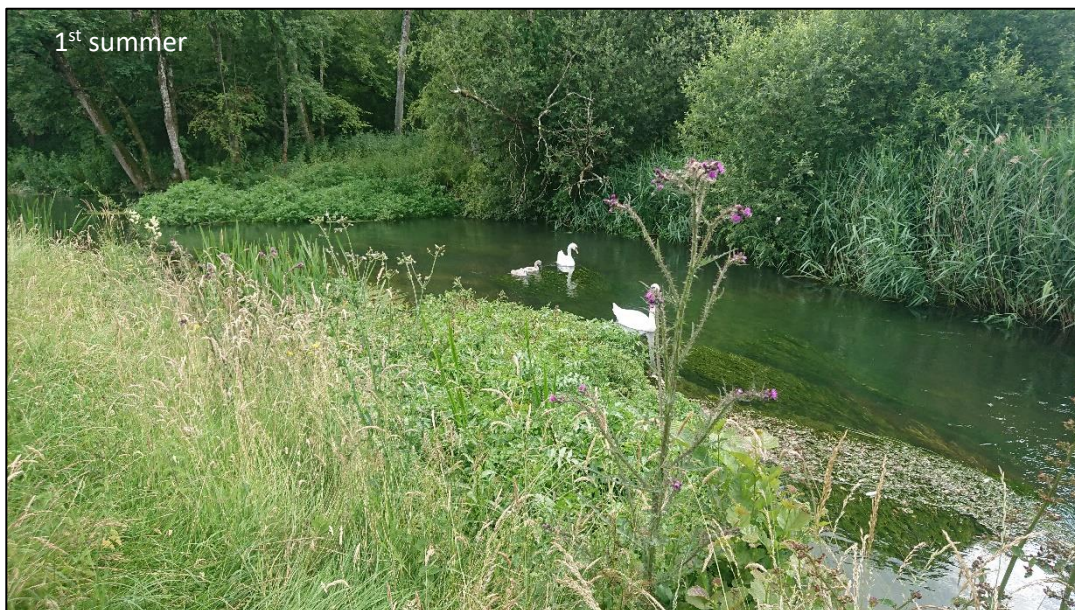
- Improved habitat will help support a diversity of species including brown trout, grayling, water vole, kingfisher and many invertebrate species crucial for the functioning of the river system.
- Increased ability to withstand to environmental changes including low flows.
- Improved angling.
- Vegetation in the margins will trap suspended sediment in the water reducing sediment pollution downstream.
- Community engagement through volunteer habitat improvement work parties.

Techniques

River habitat improvements vary in form depending on the needs and characteristics of the particular stretch of river. On the By Brook the main improvements needed are a) sky lighting, opening pockets of the canopy to allow light into the channel and b) introducing in-stream habitat using hinged trees, tree crowns cabled in to place or and boulders. The By Brook is a spatey river so any interventions need to be securely fixed in place.



Example of woody berms installed on an eroded bank to provide improved in-channel and marginal habitat on the River Wylfe. Photos show the resulting vegetation growth after just 6 months.



Permissions

All bank and in-channel works will need a Flood Risk Activity Permit from the Environment Agency. More information can be found [here](#). If proposed works fall within a SSSI Natural England will need to be consulted and if they fall within a Conservation Area consult with the appropriate county council.

For more advice contact **Wiltshire Wildlife Trust's Water Team**
Water@WiltshireWildlife.org or 01380 736066



Natural Flood Management

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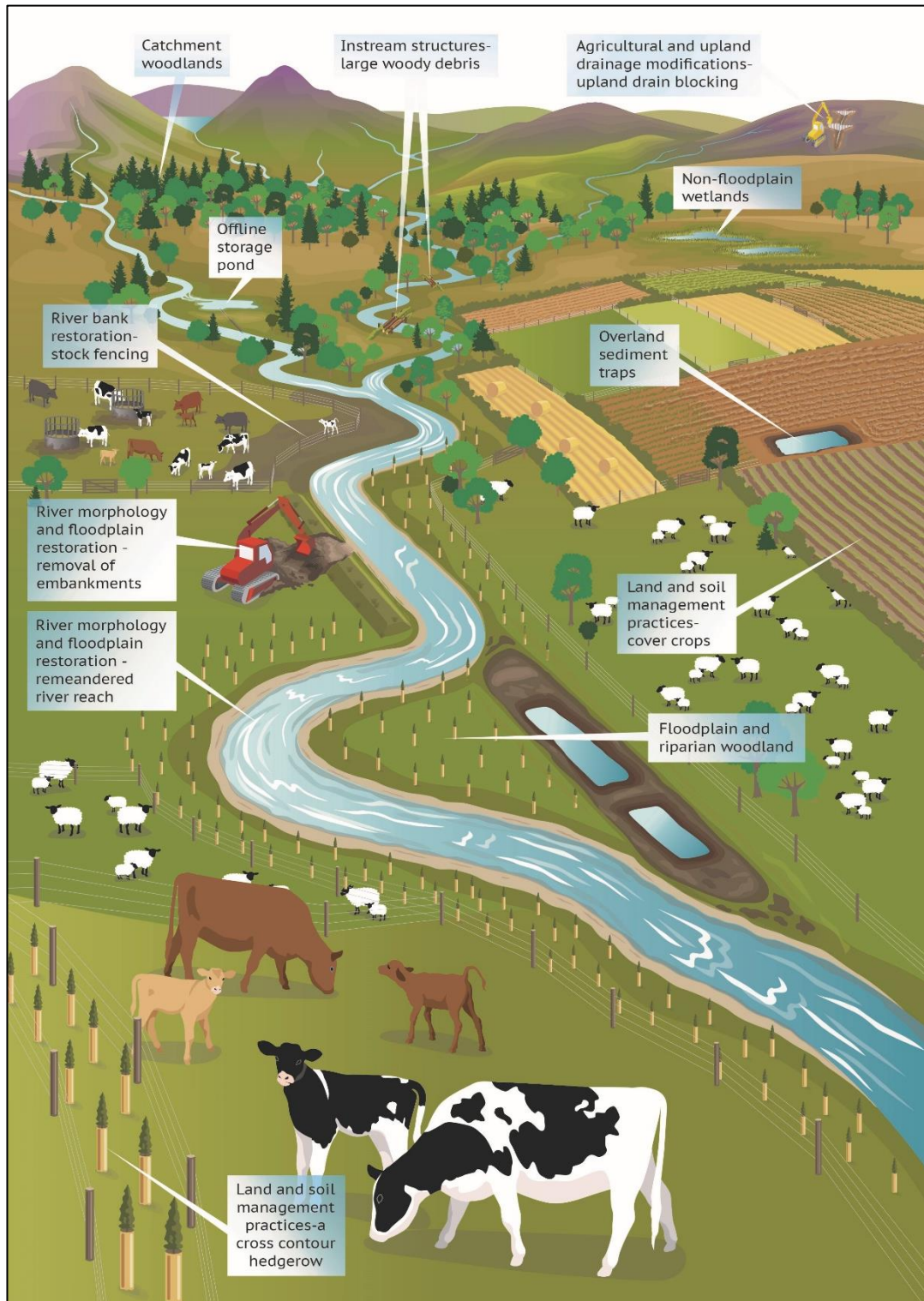
Flood risk has been highlighted as a priority for many stakeholders as the river forms the heart of many communities down the By Brook Valley. Natural flood management (NFM) involves implementing measures to 'slow the flow' and delay the arrival of flood water peaks downstream, enabling the river to manage the increased flows. There are 5 main mechanisms when it comes to NFM in rural catchments, each technique relies on one or more of these mechanisms:

- **Increasing soil infiltration** through free draining soil reduces.
- **Evaporation** from areas of vegetation.
- **Slowing water** by increasing resistance to its flow.
- **Storing water** using attenuation ponds, ditches and land.
- **Reducing water flow connectivity** by interrupting surface flows.

Example of a NFM technique. Leaky dams reduce the downstream flood peak by slowing peak flows. They are set above summer levels to allow low flows to pass uninterrupted. Ideally local materials such as tree root balls or hinged trees should be used to create a natural environment.



NFM techniques and how they fit into the rural landscape in practice.



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Work has been done on the By Brook for the last 10 years to tackle the threat of invasive non-native species (INNS). A dedicated team of volunteers, supported by Wiltshire Wildlife Trust have successfully removed Himalayan balsam, Japanese knotweed and giant hogweed. This work needs to be maintained and continued to prevent any INNS making a comeback

Impacts of INNS

- INNS outcompete native species resulting in a monoculture along the riverbank, this is also detrimental for pollinators who rely on a diverse array of flowers to get all the nutrients they.
- Himalayan balsam and Japanese knotweed die back over winter leaving large areas of exposed soil which are subject to erosion, polluting the watercourse with sediment.
- Giant hogweed is detrimental to human health, chemicals in the sap cause skin to react to UV light resulting in serious blisters and burns that can last years.
- Japanese knotweed is a threat to infrastructure. Shooting stems from its wide root structure are able to push through concrete, brick and asphalt posing a risk to building foundations, walls and drains.
- Signal crayfish not only outcompete the native white-clawed species but they are also carriers of crayfish plague which kills the native species. In addition to this signal crayfish burrow into the bank, destabilising it and causing erosion and sediment pollution of the watercourse.

Management

Each INNS requires different management, information on some species known to be present on the By Brook is listed below. Further information on species, including ID sheets and management guidance can be found on the GB Non Native Species Secretariat website [here](#).

- Himalayan balsam – the best way to remove Himalayan balsam is to manually pull it up and crush it before the seeds ripen and seed heads begin to burst. It can then be left to rot down on a compost heap. Balsam seeds can remain dormant in the ground for up to 15 years and are transported in the water down river systems so continued management is required over multiple years.
- Japanese knotweed – this is very hard to remove, it requires treatment over multiple years either by glyphosate* through stem injection or repeatedly cutting back to the ground. Each year it will grow back slightly smaller than the year before so the process needs to be repeated for a minimum of 3 years. Any plant material removed is hazardous waste and must be disposed of legally.
- Giant hogweed – similar to Japanese knotweed stem injection treatment with glyphosate is the most effective option. Manual removal is possible however ensure to take the appropriate precautions as even the smallest fragments are hazardous.
- Signal crayfish – once in a river, signal crayfish are very hard to remove. The current guidance is to encourage predation by creating habitat that is favourable to otters.

**Please note, where chemical control using glyphosate is the recommended treatment permissions and are required by the Environment Agency for use near a watercourse and the individual carrying out the work must be trained in herbicide use.*

ID guide to known Invasive Non-Native Species on the By Brook



Giant hogweed (*Heracleum mantegazzianum*)

Easily identified by its size, stems can grow up to 5m in height and leaves up to 3m in diameter. Leaves are sharply divided with bristles on the underside and along stems.



Japanese knotweed (*Fallopia japonica*)

Tall plant that grows in thick swards. Zig-zag stems with alternate, lush green leaves. Stems are speckled purple with regular nodes similar to bamboo. Clustered delicate white flowers.



Himalayan balsam (*Impatiens glandulifera*)

Tall plant easy to identify when mature due to pink flowers and explosive seed heads. Fleshy, hollow stems that are slightly translucent and brittle and red early in the summer turning pink with age. Slender leaves with finely serrated edges, grow in whorls of 3 or 5.



Signal crayfish (*Pacifastacus leniusculus*)

Much larger than the native white-clawed crayfish, up to 16cm in length compared to 10cm. Red underside to the claw and distinctive white/blue blotch at the hinge of the claw. Claws much larger in proportion to the body when compared to the native species.

For more information see the GB Non Native Species Secretariat website: <http://www.nonnativespecies.org/>

Reporting

It is important that any records of INNS should be reported, submit them through iRecord as well as to the Water Team at Wiltshire Wildlife Trust (water@wiltshirewildlife.org).

For more advice contact **Wiltshire Wildlife Trust's Water Team**

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Improved Connectivity

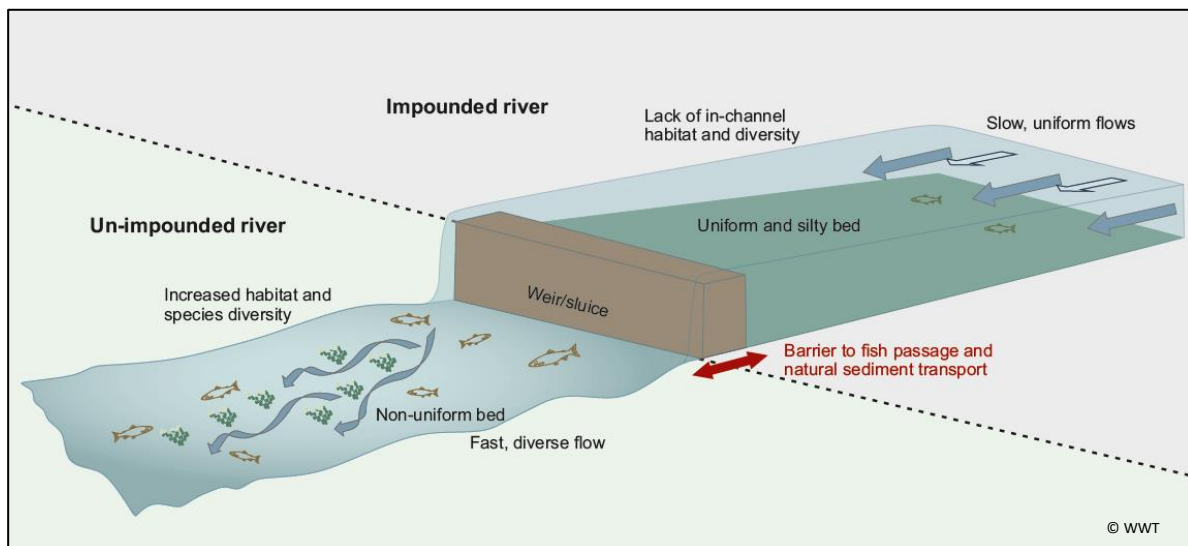
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There are 14 impounding structures up the By Brook, improving connectivity of the river as a result of these has been highlighted as a priority by many stakeholders. Impounding structures such as weirs and sluices which are the result of historic milling practices on the river have many negative impacts on ecology and hydrology of the watercourse.

Benefits of Connectivity

- Improved fish and eel passage up the river system.
- Restoration of the natural process of sediment transport down the river, reducing sedimentation issues.
- Removal of impoundments improves upstream and downstream habitat for a host of aquatic species.

The impacts of an impounding structure on river habitat and the disruption of natural processes.



Techniques

Total removal of a weir or similar impounding structure is the optimal solution, second to this is the creation of a bypass channel. In both cases notching, lowering or the creation of a step-down pool-riffle sequence with rock ramps can be used to manage the gradient whilst creating habitat that is immediately passable to a wide variety of fish.

If removal or bypass options are not feasible then it is possible to install a technical fish and eel pass. These vary depending on the conditions and target species but in general they create a series of smaller steps that enable the fish/eels to cross the barrier through a series of passable stages.

CASE STUDY – Weir fish passage easement carried out by river restoration contractors Cain Bioengineering in 2019 demonstrating what is possible on rivers like the By Brook.



Before: Weir bypass channel which was impassable to fish during most flow conditions.



After: The weir height was lowered by approx. 250cm and gradient redistributed across a series of baffles. An alternate notch sequence was cut into the baffles and weir to manage flow speeds and ensure fish passage during low flows.

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