



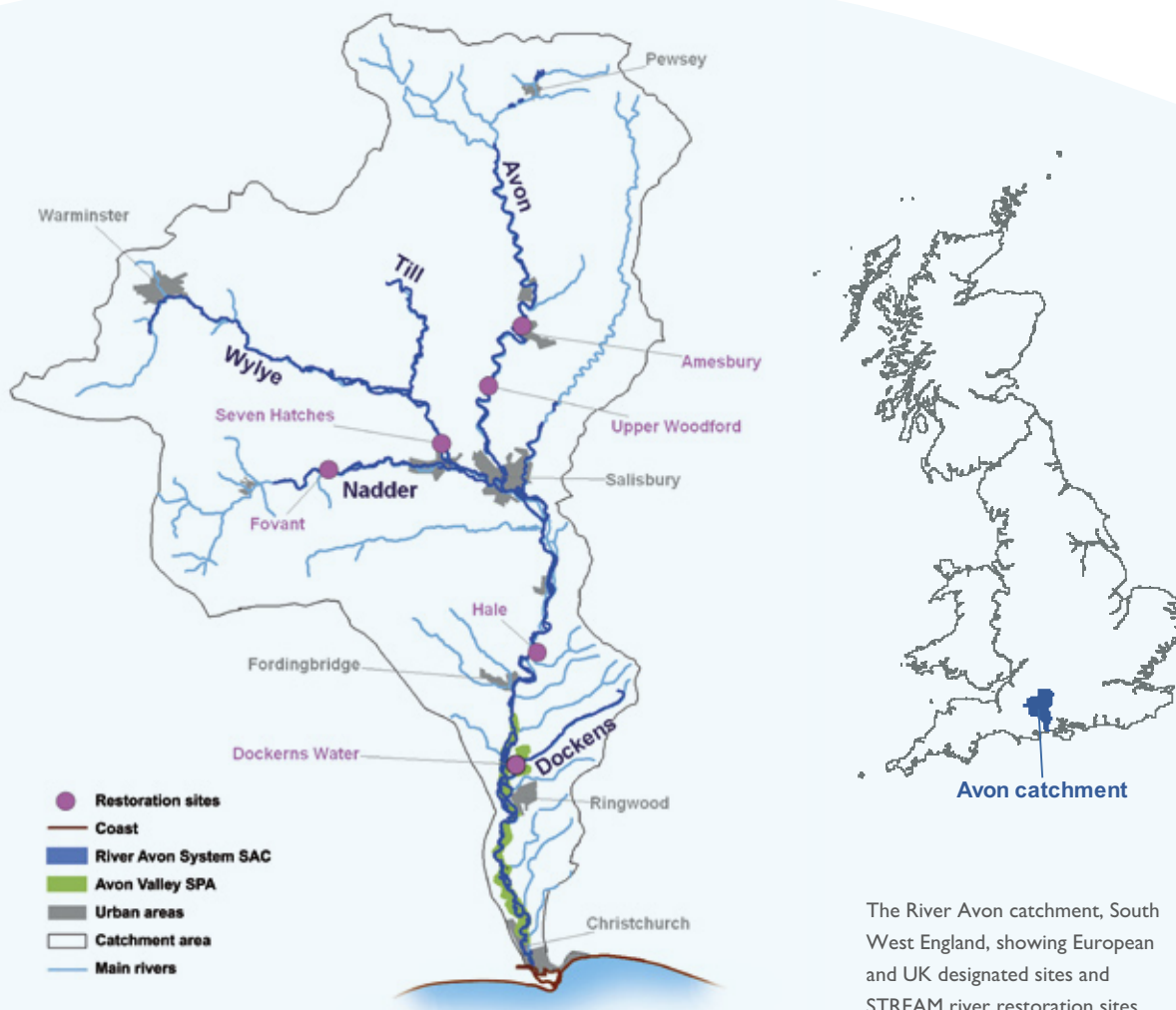
DEMONSTRATING  
**STRATEGIC**  
**RESTORATION**  
**AND**  
**MANAGEMENT OF**  
**THE RIVER AVON SAC**



## STREAM

Demonstrating Strategic Restoration And Management (STREAM) is a £1 million four-year conservation project centred on the River Avon and the Avon Valley in Wiltshire and Hampshire, Southern England. STREAM is supported financially by the European Commission's LIFE-Nature programme, Natural England, the Environment Agency, Wiltshire Wildlife Trust, Hampshire and the Isle of Wight Wildlife Trust and Wessex Water.

The crystal clear waters of the River Avon and its tributaries create special conditions for wildlife. The river system and lower Avon Valley contain some of the most rare or threatened species and habitats in Europe and are protected as Natura 2000 sites. The River Avon and its main tributaries are designated as a Special Area of Conservation (SAC) and the Avon Valley is designated as a Special Protection Area (SPA) for birds.





## PROJECT AIMS

The overall aim of STREAM is to demonstrate restoration of favourable physical habitat conditions in the River Avon SAC and to link its management with that of the adjacent Avon Valley SPA.

The project addresses the need to restore river channels that have been damaged by past land drainage activities. It is part of a broader initiative that encompasses restoration of flow, water quality and physical habitat in designated sites, wider biodiversity work and engaging the local community with the river.

### Restoration of the River Avon Special Area of Conservation

Parts of the River Avon system have been dredged in the past, with channels being widened and the gravel on the river bed removed. This damaged the habitat for fish and other wildlife, which need a mixture of clean gravel and muddy bits on the river bed and a range of water depths and speeds to thrive.

The STREAM project tackled the effects of past engineering and loss of good quality habitat by restoring the river channel at six sites, improving over 7 km of river habitat and:

- restoring suitable conditions for the River Avon SAC habitats and species
- demonstrating innovative techniques and proven habitat enhancement methods
- sharing best practice through advice notes, demonstration days, conferences and seminars and public open days.



# RESTORATION OF THE RIVER AVON SPECIAL AREA OF CONSERVATION

STREAM aims to reinstate lost physical habitat by putting back a more natural river channel, making it inviting for rare plants, fish and many other species, and encouraging natural processes to maintain and enhance it. The STREAM project has particularly focused on restoring the river for rare or threatened European species and habitats: Atlantic salmon, bullhead, brook and sea lamprey, Desmoulin's whorl snail and typical chalk river plants including water crowfoot.



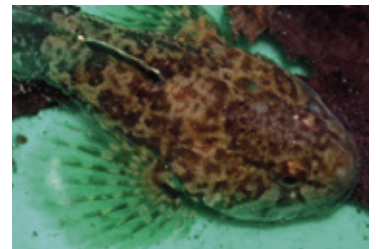
## Desmoulin's whorl snail

Desmoulin's whorl snails love boggy areas with tall plants. They climb and feed on them in summer and hide amongst them in winter.



## Atlantic salmon

Atlantic salmon return from the sea to the river they were born in. They rest in pools before laying eggs in clean gravel and fast waters.



## Bullhead

Bullheads hide amongst tree roots and plants and stick their eggs to large stones. The father scares egg thieves away by "clicking" at them.



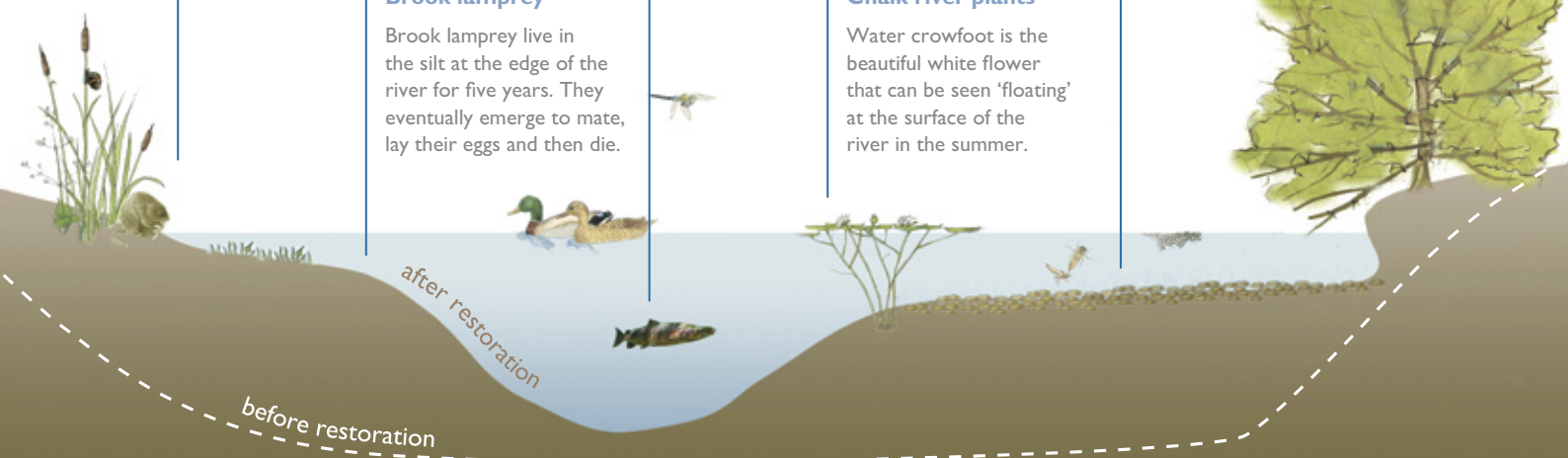
## Brook lamprey

Brook lamprey live in the silt at the edge of the river for five years. They eventually emerge to mate, lay their eggs and then die.



## Chalk river plants

Water crowfoot is the beautiful white flower that can be seen 'floating' at the surface of the river in the summer.



A summary of the techniques used at the project restoration sites is given below.

TECHNIQUE	WHAT IT DOES
<p>Large fallen trees (large woody debris)</p>	<p>Large fallen trees are a vital natural component of chalk streams. However, traditional river management has included their removal, on the grounds that they may restrict angling access, collect debris and could pose a risk of flooding. The retention or replacement of large woody debris in chalk streams can have a significant benefit in creating habitat. Large woody debris causes local changes in water speed and direction, cleaning the gravel bed in high flow areas, depositing fine sediment in areas of low velocity.</p>
<p>Flow deflectors</p>	<p>Deflectors function by concentrating flow vertically or horizontally, increasing the speed of flow locally, cleaning some areas of the river bed and depositing material in others. Knowing where you want areas of scour and deposition is the main consideration when planning where to install deflectors.</p>
<p>Channel re-shaping</p>	<p>Extensive past drainage activity has resulted in many river channels being widened, deepened and embanked and the natural bed material removed. Channel re-shaping aims to reinstate an approximation of the channel's "natural" cross-sectional area. Following restoration, natural processes encourage the deposition of fine sediment in marginal, low velocity areas, where it will consolidate, further reshaping the channel.</p>
<p>Gravel reintroduction/reinstatement</p>	<p>Past land drainage work often involved lowering the river bed, removing characteristic gravel dominated, fast flowing areas which are vital spawning and juvenile habitat for salmon, lamprey and bullhead. Deepened channels also tend to collect fine sediment, reducing the quality of any remaining spawning gravel. Replacing gravel raises the river bed speeds up flow, reduces the depth of water and can increase habitat diversity.</p>





## MEASURES OF SUCCESS

River restoration is increasingly seen as a way of improving ecology and habitat diversity in river systems. Monitoring against project aims is a key part of evaluating how successful restoration has been and to identify any problems with the techniques used. However, because it is relatively expensive, few UK projects are currently monitored.

STREAM has developed a monitoring protocol for assessing river restoration in lowland rivers. Using the protocol, flow speed and depth, vegetation type and quantity, river bed quality and numbers of fish were measured and photographs taken before and after the restoration works. This monitoring has been combined with a UK River Restoration Centre (RRC) expert assessment to evaluate the overall effect of the restoration.

The monitoring protocol and expert assessment demonstrate practical, cost effective ways to assess the physical and biological impact of river restoration projects.

Because rivers are complex and take several years to respond to restoration, it is not possible to draw any definite conclusions yet. However there are encouraging signs, such as salmon seen living and spawning in the restored River Wylde and improvements in the gravel river bed and the plant community at all sites. It is anticipated that future monitoring will show this success has been maintained.



# BENEFITS TO THE RIVER AND LESSONS LEARNT

## Amesbury on the River Avon

The river channel was reshaped, large woody debris put into the water and a small area of bed raised.

**Benefits:** Whilst flow remains generally slow, the large woody debris has created a more varied habitat and there is more water crowfoot growing. Sedimentation is now more concentrated in the channel edges, with the gravel bed being kept clean, creating fish spawning habitat.

**Lessons:** The very low gradient and depth of the channel remains a limitation on vegetation growth in the channel.



During & after



## Chilhampton on the River Wylde

The river channel was reshaped, three areas of river bed raised and large woody debris put into the water.

**Benefits:** Flow diversity has increased where the bed has been raised and the large woody debris is scouring the gravel clean. Water crowfoot is starting to grow and salmon have returned to the raised bed area. The re-shaped river bank is collecting silt and growing vegetation, creating good marginal habitat.

**Lessons:** The channel re-shaping could have been bolder and its impact is limited by the downstream sluices.



During & after



## Fovant on the River Nadder

Triangular flow deflectors were built and the sluices at the bottom of the reach opened up.

**Benefits:** These two approaches in combination mean that pools are being scoured in the river bed, whilst the areas between the structures are collecting silt. The establishment of emergent vegetation on and between the structures will eventually narrow the channel significantly. The gravel river bed is much cleaner, providing spawning habitat for salmon and trout.

**Lessons:** Longer, alternating flow deflectors that were lower in the water could work more effectively.



During & after





## Blashford on the Dockens Water

A new floodplain pool was created, reconnecting river and floodplain – the pool was intended to mimic natural chutes, which are channels that flow across the floodplain when water levels are high.

**Benefits:** A floodplain pool has been created and there have been small scale changes in the vegetation.

**Lessons:** As yet the pool only holds water periodically and looks unnatural. It is hoped that it will collect silt over time and hold water more consistently.



During & after

## Upper Woodford on the River Avon

The river channel was reshaped and small islands and flow deflectors created.

**Benefits:** The structures have increased flow variability and speed and created refuge areas of slow water. Habitat for young fish has also been created but may only be short to medium term as the deflectors fill with silt. The amount of water crowfoot has increased in the river.

**Lessons:** Vegetation may need to be planted in the structures, as consistent high flows mean it is not yet well established.



During & after



## Woodgreen on the River Avon

Part of the river bed was raised, existing gravel was reshaped and large woody debris was installed.

**Benefits:** The main bed raising has created good flow diversity, providing spawning habitat for fish. The reshaped gravel has also created some habitat diversity. The woody debris is creating local flow variation.

**Lessons:** More, bigger woody debris was needed to be effective. Practical limitations such as the availability and size of large trees that can still be moved with machinery may limit the use of woody debris in deep wide channels.



During & after



# LINKING RIVER & VALLEY MANAGEMENT

The management of the lower River Avon SAC is closely linked with the management of the grazing marshes of the Avon Valley SPA. The breeding waders and wintering birds that use the valley are dependent on suitable conditions being created, by controlling and retaining water on the floodplain at key times. Conditions for these species in the SPA are currently unfavourable, largely due to neglect of the watercourse network and inappropriate water level management.

Restoring the Avon Valley to favourable condition requires rehabilitation of the ditch network, tree and scrub removal and restoration or installation of sluices or structures. However, all these activities potentially affect fish populations. The STREAM project has developed practical ways to overcome these conflicts and contribute to both the integrated management of water levels in the Valley and the needs of migrating fish populations in the River Avon.

## Guidance on operating sluices and hatches

STREAM has developed guidance on operating protocols for structures (such as sluices), which can be used to help manage water levels for river and floodplain habitats and species.

## Planning floodplain restoration

STREAM has also developed a way to plan floodplain restoration works whilst avoiding trapping fish in the valley ditch network. This involves using available fishery data to generate colour coded maps, which are then used to assess the potential impact on fish of measures such as ditch reinstatement and new structures.

## Benefits of linking river and floodplain

The STREAM guidance is being used to achieve appropriate water level management at another 32 structures in the Avon catchment and is being used in other parts of the UK. The STREAM approach to planning floodplain restoration has now been applied to 35 kilometres of the River Avon.

The STREAM methods for prioritising floodplain restoration works and creating hatch operating protocols are valuable new management tools where there are potential conflicts between the needs of river and wetland habitats and species.





## SHARING INFORMATION

An increasing amount of restoration work is needed across Europe in order to improve rivers and floodplains, which have been damaged by decades of unsympathetic management. Sharing the STREAM project experience makes an important contribution to this work.

The project has run site visits, workshops and seminars for landowners, fishery managers, local planners and regulatory bodies from across Europe. Over a hundred river experts attended the STREAM international conference in July 2009. All the events gave people a chance to discuss technical aspects of the STREAM project, visit the restoration sites and pick up tips on how to restore Europe's rivers.

### Community consultation and involvement

STREAM consulted local people before carrying out the restoration works, explaining the aims and expected results and giving them a chance to raise any concerns they might have. The project also worked closely with its sister project the Living River to increase general awareness and appreciation of the River Avon and its tributaries.

Much of the River Avon system is on private land, so people have limited opportunities to visit it. STREAM and Living River have created and improved opportunities for those who live and work in the catchment to learn about the river system and get involved in the conservation of its natural heritage.

As part of a joint "Week of Water", the Salisbury Playday saw over 3000 children of all ages entertained by a model river, fly fishing practice, a river bug "explorer" and making their own sea horses. The Playday was run in conjunction with Salisbury International Arts Festival.

Local people also joined the project team on the river bank at open days, guided walks and family fun days. Activities such as pond dipping, Pooh stick racing, nature trails, an audio archive and interactive water exhibit all proved popular ways to raise awareness about the river system.



## AND THE WINNER IS...

STREAM won the Wild Trout Trust Conservation Award 2008 and the CIWEM Living Wetlands Award. STREAM and the Living River project were joint finalists in the prestigious 2009 International Thiers Riverprize, which recognises excellence in river management worldwide.



## WHAT HAPPENS NEXT?

STREAM has not solved all the problems affecting the River Avon system, but importantly has built strong partnerships, tested techniques and created tools that will be used to carry on river restoration work. A restoration plan covering the whole river system is already underway and the STREAM project partners are considering what further action is needed. An action plan will be developed over the next twelve months, setting out the priorities for the future.



# TIPS FOR LARGE-SCALE RESTORATION PROJECTS

STREAM has highlighted particular issues relevant to large-scale river restoration projects. STREAM technical advice notes on river restoration techniques, planning and implementing river restoration and linking river and floodplain are available on the project website. Based on the STREAM project experience, some tips for implementing river restoration programmes are given below.

## **Project partners and team**

A strong relationship with all project partners is crucial to project success. Having a range of partners from different sectors is beneficial as it allows access to a wider range of skills, experience and contacts.

## **Expect and incorporate restraints to final designs**

Restoration can improve river habitat and contribute to favourable condition of protected sites. The final design and implementation are influenced by constraints such as protected species, landowner aspirations, hydraulic controls, machine access routes etc., but must still meet the ecological objectives for restoration.

## **Monitor against targets**

Monitoring projects against clearly defined aims is a crucial part of evaluating the effectiveness of river restoration.

## **Establish close working relationships**

Close working with landowners and fishing clubs in developing and carrying out the river restoration work is crucial to securing sustainable long term management of the sites.

## **Carry out early consultation**

Early consultation is vital for obtaining the relevant permissions and often identifies a way to “design out” many issues. In a heavily regulated country such as the UK, particular aspects to consider include: waste licensing, planning permission, environmental impact assessment and flood risk assessment.

## **Plan time for contract management**

Large restoration projects need specialist construction contract management and the contracting process can be lengthy. This must be incorporated into the project planning

cycle, site facilities, supervision, reinstatement etc require a larger proportion of the budget than for smaller-scale restoration projects.

## **Split work between internal and external workforce**

The nature of the partner organisations and availability of staff involved can change during the project. Splitting the work between internal staff and consultants minimises risks to the project but still enables development of in-house expertise.

## **Extensive site supervision**

Partner staff may have carried out lots of river maintenance or more traditional river engineering but little river restoration. Clear communication and extensive site supervision are needed to ensure designs are feasible to build and implemented effectively.

## **Consistent, clear communication strategy**

Key messages, audiences and delivery mechanisms should be identified and used to guide all communication actions.

## **Communicate and consult with the public**

Local meetings, press releases and project briefing notes should all be used to communicate the aims of restoration and what people can expect to see in the short, medium and long term. This is particularly important where controversial action is planned e.g. felling large trees or works in existing areas of high flood risk.

## **Manage expectations**

One project cannot solve all the issues affecting a river system, but can act as a catalyst for future action.



The STREAM project has demonstrated techniques for river restoration work on the River Avon and its tributaries and linked the management of the river and its floodplain.



The River Avon System and Avon Valley contain some of the most rare or threatened wildlife in Europe. They are protected as Natura 2000 sites.



STREAM is supported by the LIFE Nature fund, Natural England, the Environment Agency, Wiltshire Wildlife Trust, Hampshire and the Isle of Wight Wildlife Trust and Wessex Water.



STREAM works closely with the Living River Project, which aims to increase local people's awareness and appreciation of the River Avon System.

## TO FIND OUT MORE

The experience of the STREAM project informs river restoration and floodplain management across Europe. Information on all aspects of the project, including guidance notes on river restoration techniques, permissions, linking river and floodplain, monitoring protocols and technical reports are available on the STREAM website.

[www.streamlife.org.uk](http://www.streamlife.org.uk)

