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River Dove Restoration Plan

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River Dove Restoration Plan

‘Letting the Dove Flow’

trent rivers trust

in partnership with Environment Agency

National Trust

NATURAL ENGLAND

PEAK DISTRICT NATIONAL PARK

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Cover images: View of Dovedale ©National Trust, John Millar Stepping Stones ©Natural England, Dovedale weir ©National Trust/John Millar

This report identifies potential restoration actions based on a strategic assessment of the river. All the potential actions require further detailed planning with relevant landowners.

All restoration works will require permission from Natural England and some or all of the following; the lead flood authority, Peak District National Park and Environment Agency.

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Section 1 – Summary

The River Dove in Dovedale and Wolfscote Dale is one of the most renowned stretches of river in Britain. In recognition of its ecological value, the river is designated as part of the nationally important Dove Valley and Biggin Dale Site of Special Scientific Interest (SSSI). The River Dove is further recognised as being internationally important for its wildlife and is designated as part of the Peak District Dales Special Area of Conservation (SAC). Dovedale is also a National Nature Reserve managed by the National Trust.

Perhaps because of this natural heritage, Dovedale and Wolfscote Dale are well loved and used for a range of leisure and other activities and are protected as part of the Peak District National Park, while a significant part is owned by the National Trust. Though much less affected than many of our rivers, these activities along with historic mills and bridges have changed the river and affected the habitats for typical river species. To restore the river sections of the SSSI to a favourable condition the physical habitat of the river needs to be restored to be more natural and this is just one element of its management.

At its simplest a river is a flow of water from source to sea. It is also a flow of material, or sediment from source to sea carried by the river, a natural environment with a rich history, economic and social value. 'Letting the Dove Flow' recognises that all of these aspects shape the river and its valley and influence those who protect and manage it. By working with different interest groups we aim to form a restoration plan that is accurate, well informed, realistic and achievable. We believe this approach will also deliver wider benefits to all.

A catchment wide fluvial geomorphological study was undertaken in 2011 to assess the physical functioning of the rivers Dove, Hamps and Manifold. The study considered the processes of water and sediment movement in the river catchments, channels and their floodplains, along with the forms produced by those processes. A 2012 Restoration Vision for the Dove then considered how the physical functioning of the river broadly impacts on its ecology and identified potential restoration approaches.

'Letting the Dove Flow' builds on the findings of the previous studies and aims to develop a long term plan to restore the river and a partnership to implement it in the short, medium and long term. Together they will form a real programme for action. It is a long term plan, whose approach is to work with landowners and other interested parties to deliver gradual improvements, gathering information and carefully evaluating the work we do together.

The following organisations were represented on the Steering Group which has developed this document and is the start of what we hope will be a wider long term partnership.

Natural England
Environment Agency
National Trust
Trent Rivers Trust
Peak District National Park
Staffordshire County Council
Derbyshire County Council

In addition, Staffordshire and Derbyshire Wildlife Trusts are invited and receive minutes.

The University of Loughborough and Buxton Museum and Art Gallery in particular have provided helpful information.

This Plan has been written as far as possible in an accessible style and it is aimed at all who own or contribute to the management of the river.

The plan comprises the following sections:

Section 2: This section introduces Dovedale and Wolfscote Dale in terms of landscape, recreation, wildlife, fisheries, historic environment and public engagement.

Section 3: Here the method used to compile this report is described, including the processes of involving stakeholders.

Section 4: The Ecological Vision. Here we draw heavily on the 2010 Vision Report to explain the ecologically based restoration vision it proposes, based on the Fluvial Audit and ecological information.

Section 5: The ecological issues affecting the river and the impacts they are having, where they occur and briefly the potential solutions.

Section 6: The potential solutions for the ecological issues and what they should achieve in more detail, the benefits, other considerations and how they can be managed, along with sources of further information.

Section 7: Reach based summaries of potential restoration. The river has been divided into river reaches that share similar characteristics. There is a summary of each reach, photographs to illustrate issues and opportunities, detailed maps showing where the potential solutions can be applied (subject to obtaining relevant permissions), and a table to explain the measures identified with the benefits of applying them in this reach.

Section 8: An Action Plan prioritising actions that together will achieve a shared vision for the river.

Please note that this report identifies a suite of potential restoration actions based on a strategic assessment of the river, not all these potential restoration actions will be appropriate or desirable on every river reach. All the potential actions require further detailed planning with relevant landowners. All restoration works will require permission from Natural England and the lead flood authority (relevant County Councils) and Peak District National Park and/or Environment Agency.

In the short term work will be done with interested parties to implement agreed restoration and to gather evidence of the benefits. By demonstrating the benefits, hopefully it will be possible to work with all relevant landowners to implement restoration action in the longer term.

1.1 Dove Catchment Partnership

The Trent Rivers Trust hosts the Dove Catchment Partnership which is working to achieve ‘An ecologically diverse and connected catchment which supports a thriving rural and urban economy and provides a wide range of recreational opportunities.’

The Dove Catchment Partnership comprises over 20 statutory, voluntary, business and academic and recreational organisations in this iconic river system and is a wide partnership of parties who are interested in the river environment. It is through the Catchment Partnership that this Plan was commissioned. Delivering the actions within it will be an important example for the Catchment Partnership of greater benefits being achieved by working together.

1.2 The Trent Rivers Trust

The Trent Rivers Trust (TRT) is a registered charity which seeks to conserve, protect and enhance the rivers and streams of the Trent catchment. Since September 2014 TRT has been reading a wealth of prior studies and consulting a wide range of people and organisations to draft this plan on behalf of Natural England. If we have inadvertently missed you, please accept our apologies.

Section 2 - Introduction to Dovedale and Wolfscote Dale

This plan relates to units 42 and 43 (Dovedale) and 40 (Wolfscote Dale) of the Dove Valley and Biggin Dale Site of Special Scientific Interest (SSSI) shown in the map below. The plan does not cover Biggin Dale, which does not contain a permanent water course.

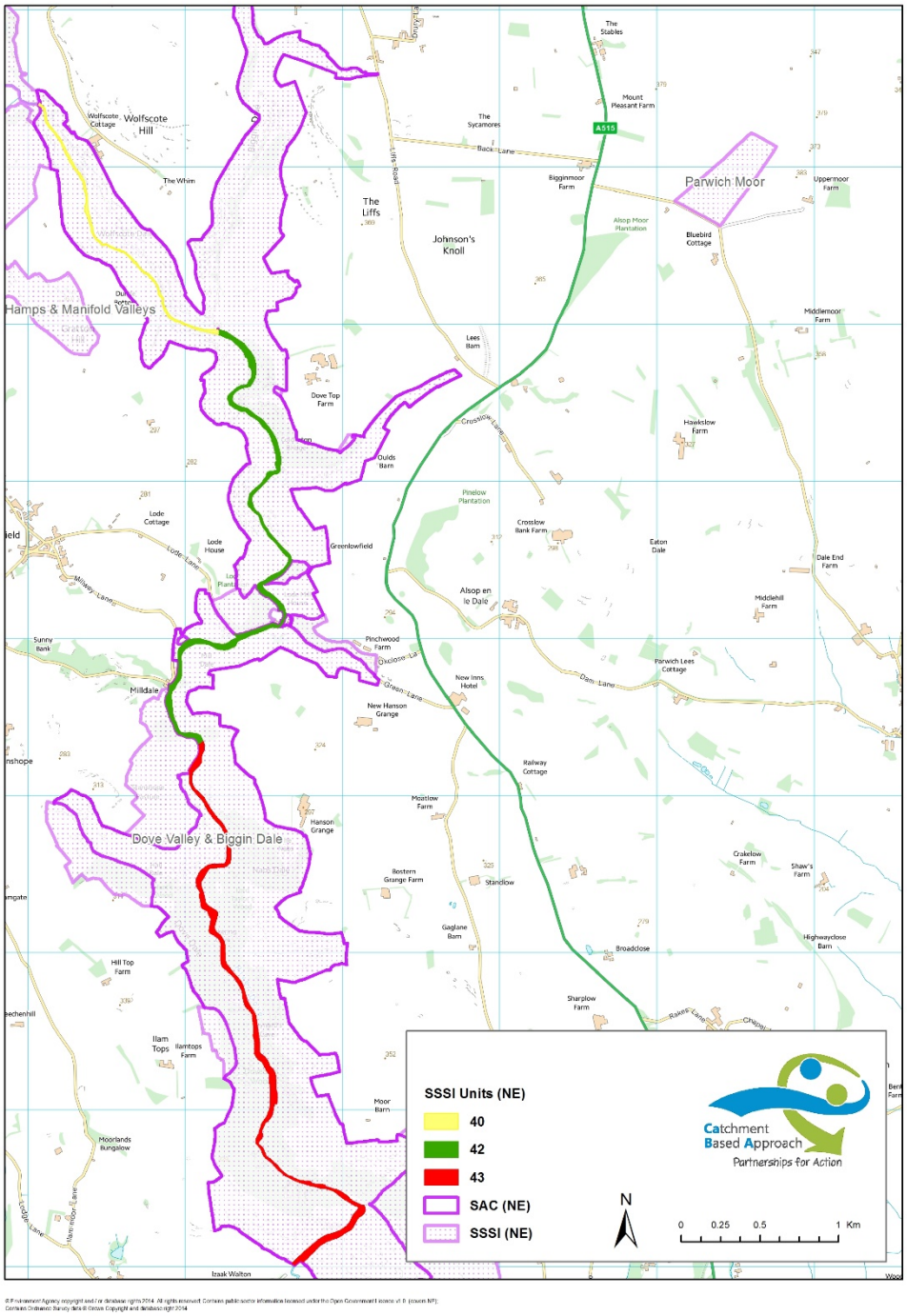


Figure 1 Map showing river SSSI Units within Dove Valley and Biggin Dale SSSI.

2.1 Landscape

The River Dove arises to the north and west in sandstones and undifferentiated silt/mudstones and then flows into a spectacular carboniferous limestone gorge through Wolfscote Dale and Dovedale. Dovedale lies at the heart of the White Peak, a highly valued landscape whose limestone dales form a distinctive landscape type. It has narrow incised valleys with steep slopes which are often scree covered, extensive exposed rock with blocks of ancient woodland, areas of scrub dominated by hawthorn and rough grassland grazed by sheep. The limestone dales are of outstanding wildlife value for their flower-rich limestone grasslands, ancient ash woodlands, scrub, limestone rivers, wetlands, caves and rocky outcrops.

Many of the dales in the White Peak are dry, with no river flowing on the surface. Others, such as Biggin Dale support ephemeral watercourses, while the Dove always flows through Wolfscote Dale and Dovedale, making it particularly valuable for angling and other forms of recreation.

Derbyshire County Council's Character Description of the White Peak (DCC, undated) eloquently makes the point that Dovedale's steep, rocky valley sides and very confined valley floor, coupled with its strong history of conservation, mean there are no roads and little infrastructure other than for walkers and anglers. It retains a tranquil and secluded character, although paradoxically this tranquil character attracts heavy recreational use.

The National Character Area Statements of Environmental Opportunity (Natural England, 2014) aim to 'Protect and enhance the area's clear limestone rivers, streams and springs, limestone aquifer and dramatic karst geology, to provide a source of clean water, support strong populations of fish and other wildlife, enhance recreational and educational opportunities and contribute to the White Peak's strong sense of place and history.' (SEO1)

This is to be achieved by:

- Encouraging and supporting the removal of artificial barriers to fish migration, where this is compatible with historic and landscape objectives;
- Exploring opportunities for the creation of small-scale natural storage of floodwater in flood plains, ponds and wetlands;
- Encouraging sympathetic management, restoration and creation of riparian habitats, particularly grassland, woodland and wetland;
- Protecting geological features and maintaining their visibility by removing/managing vegetation;
- Continuing to develop and enhance interpretation material, using new media to increase public understanding and appreciation of the White Peak's geodiversity, especially its karst features.

A further Environmental Opportunity, SEO 4 aims to 'Maintain and enhance opportunities for enjoyment and understanding of the White Peak's distinctive limestone features and historical, cultural and natural heritage by providing recreational opportunities for a wide range of users. Continuing to develop interpretation and education facilities using new media and delivered by a wide range of people and organisation'.

Relevance for this Plan

This whole landscape is facing the challenge of achieving conservation whilst promoting and managing its use for public recreation and understanding. The principles and drivers for managing the wider landscape are relevant to restoration of the Dove.

2.2 Recreation and Conservation in Dovedale

As the National Landscape Character Area Assessment explains, 'The White Peak' is an immensely popular area for outdoor recreation, and receives large numbers of visitors. The landscape can be easily accessed by large populations in the nearby cities of Manchester, Sheffield, Nottingham, Derby and Stoke-on-Trent. It offers excellent opportunities for traffic-free walking, cycling and horse riding. The concentration of exposed rock faces, vast cave networks and abandoned mines makes it an important destination for climbers and cavers, and the clear-running rivers support healthy populations of fish that attract many fly fishers.'

Dovedale in particular attracts an estimated million visitors per year, particularly in summer, to walk across the stepping stones, play in and around the river and experience the beauty of Dovedale. Its appeal is enhanced because it is one of the few Dales with a river that flows all year round. The southern end of the dale is the most popular with visitors who enjoy the challenges of crossing the stepping stones or climbing Thorpe Cloud. The majority do not venture beyond the rocky outcrop known as Lover's Leap about 1km up river of the car park. (Simon Nicholas, pers. comm).

2.2.1 The Peak District National Park and the National Trust

Dovedale and Wolfscote Dale lie within the Peak District National Park (PDNP) which was the first National Park to be formally declared in England in 1951. National Parks have two aims:

1. Conserve and enhance the natural beauty, wildlife and cultural heritage;
2. Promote opportunities for the understanding and enjoyment of the special qualities of National Parks by the Public.

The Peak District National Park 2012-2017 Management Plan brings together and coordinates the work of many different partners who help achieve the purposes and duty of the Peak District National Park. It includes aims and actions to benefit rivers, including improving water quality and water resources.

Much of Dovedale is owned by the National Trust (NT) which manages the dale for its varied interest including geological, biological, hydrological, archaeological and historical features, as well as providing access and interpretation for visitors.

The National Trust's long term objective for the river as set out in the Dovedale NNR Management Plan (2008) is to have high quality, clear water with minimal pollution and near-natural sediment dynamics and areas of naturally developing marginal, submerged and floating aquatic vegetation. They aim for the ecology of the river to be balanced, with an un-stocked, sustainable fish population, a thriving reintroduced white-clawed crayfish population, occasional otter sightings and an established water vole population. The National Trust works with local fishing clubs to improve the habitat and re-naturalise the river by methods such as weir removal and introduction of, or retention of Large Woody Material.

Their policy is to leave the western bank largely undisturbed and concentrate public access on the eastern bank.

The National Trust is an active partner in the Derbyshire Dales Catchment Sensitive Farming Initiative to address water quality issues upstream.

The National Park and National Trust both have a key role in championing the restoration of the River Dove. They both have networks of volunteers, a strong public presence and initiatives including habitat management are highly relevant to this restoration plan.

Both the Peak District National Park Authority and the National Trust support this restoration plan. We recommend incorporating and building on the relevant parts of their management plans in implementing this plan.

2.3 Protecting Wildlife

In Wolfscote Dale and Dovedale the valley and river are designated as a Site of Special Scientific Interest (SSSI) as part of the Dove Valley and Biggin Dale SSSI (English Nature 1988). The river is a nationally important example of a nutrient poor limestone river. Approximately 10.5km of the River Dove is designated as a SSSI. The River Dove is further recognised as being internationally important for its wildlife and is designated as part of the Peak District Dales Special Area of Conservation (SAC) (English Nature 2005).

The nearby rivers Hamps and Manifold, together with the Hoo Brook, a small tributary of the Manifold, are also notified as part of the Hamps and Manifold Valleys SSSI, whilst Long Dale in Hartington SSSI lies just to the north. Figure 2 shows the location of Dovedale in relation to other protected sites in the vicinity.

The importance of managing these designated rivers is described (Hyder, 2011), as follows:

> ‘SSSIs are the country's very best wildlife and geological sites including some of our most spectacular and beautiful habitats … and are important as they support plants and animals that find it more difficult to survive in the wider countryside. Protecting and managing SSSIs is a shared responsibility, and an investment for the benefit of future generations.’

The Peak District Dales SAC citation states that the site supports the following river related species, all of which are listed on the EC Habitats Directive:

- White clawed crayfish;
- Brook lamprey;
- Bullhead.

Sadly, in 2005 an episode of crayfish plague was recorded on the river and no white clawed crayfish have been recorded in the SSSI since that date. However, a single individual was recorded upstream of the SSSI in 2014 (Mott, N. 2015), which indicates that there may be potential for future natural recolonization of the river Dove, as long as suitable habitat conditions are maintained throughout its length, something in which this project can play a vital part.

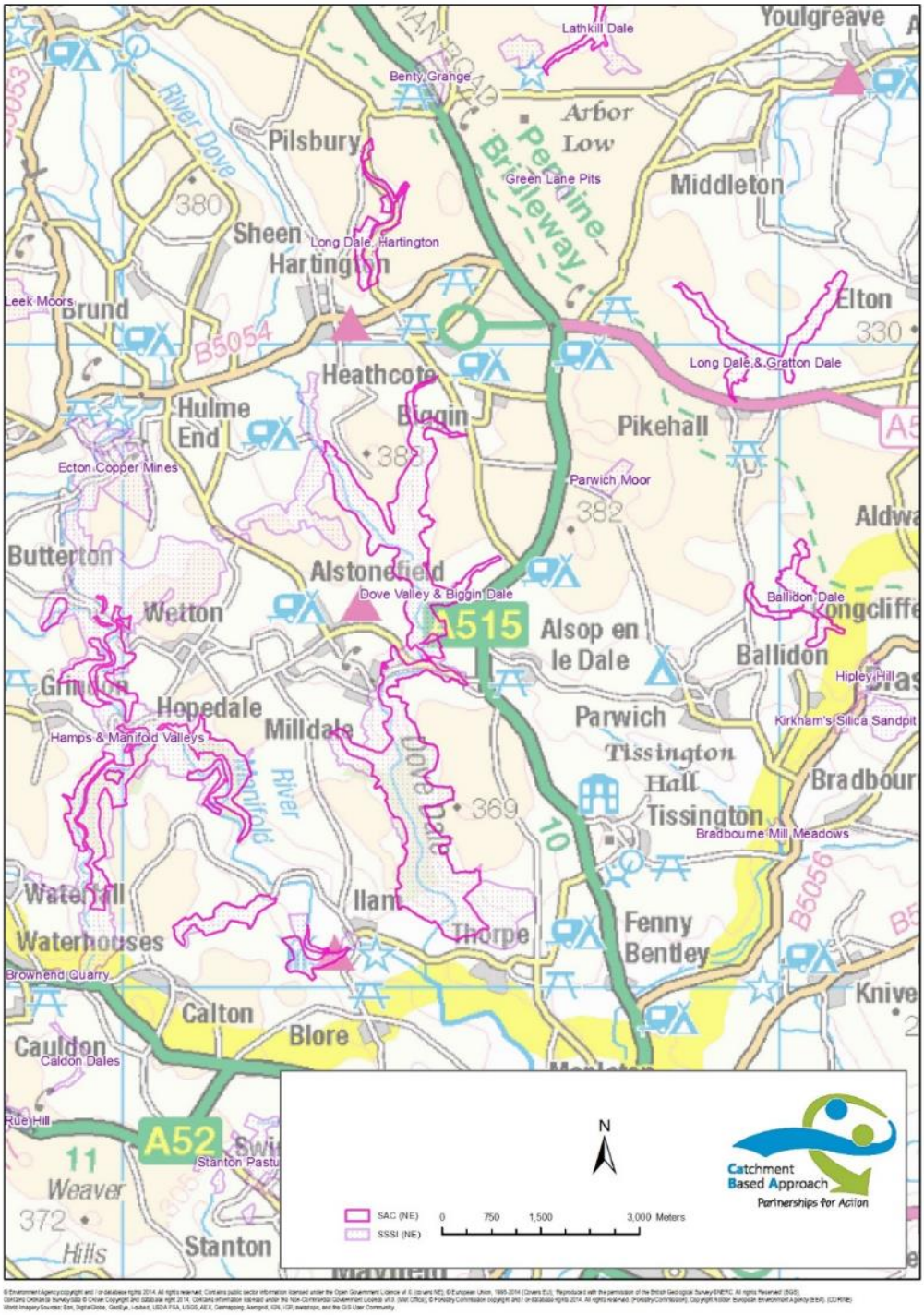


Figure 2 Peak District Dales SAC and SSSIs in and around Dovedale.

The Peak District Dales SAC also supports the following terrestrial habitats:

- European dry heaths;
- Calaminarian grasslands of the *Violetalia calaminariae*; Grasslands on soils rich in heavy metals;
- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); Dry grasslands and scrublands on chalk or limestone;
- Alkaline fens; Calcium-rich springwater-fed fens;

- Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*); Base-rich scree;
- Calcareous rocky slopes with chasmophytic vegetation; Plants in crevices in base-rich rocks;
- *Tilio-Acerion* forests of slopes, screes and ravines; mixed woodland on base-rich soils associated with rocky slopes.

2.3.1 Restoring favourable condition

Common Standards (JNCC 2015) have been agreed for setting conservation objectives, and assessing the condition of freshwater SSSIs and SACs against those objectives. Conservation objectives define the desired state for each SSSI site in terms of the features for which they have been designated. When these features are being managed in a way which maintains their nature conservation value, then they are said to be in 'favourable condition'. Natural England has a target set by the government of ensuring that 95% of SSSIs are maintained in 'favourable' or 'recovering' condition.

Conservation objectives are based on the environmental integrity of the river ***habitat*** to support the characteristic flora and fauna of the habitat type. Integrity is defined in basic terms by a range of chemical, hydrological and physical attribute targets (some quantitative, some descriptive) considered to represent 'Favourable Condition'.

The favourable condition targets (FCT) for Dove Valley and Biggin Dale includes targets related to maintaining (or restoring where it is currently below standard) the following:

- Habitat extent (rivers and streams);
- Characteristic flow regime;
- Water quality;
- No artificial barriers significantly impairing sediment or wildlife migration;
- Predominantly unmodified and characteristic channel form;
- No excessive siltation levels;
- Appropriate wildlife species composition and abundance;
- No impact on native biota from alien of introduced species.

A condition assessment on the riverine units of the Dove Valley and Biggin Dale SSSI in 2010 described the condition of the river units of the Dove as 'Unfavourable no change' condition because of:

- Weirs, dams and other structures;
- Water pollution - agriculture/run off;
- Water pollution - discharge.

Table 1 Summary of condition of riverine Dove Valley and Biggin Dale SSSI management units.

Unit	Unit name	Condition	Reasons for failure	Action in place	Action required
040	River (Wolfscote Dale)	Unfavourable - no change	Inappropriate weirs dams and other structures, siltation	Catchment Sensitive Farming	Investigation, River restoration
042	River (Mill Dale)	Unfavourable - no change	Inappropriate weirs dams and other structures, siltation	Catchment Sensitive Farming	Investigation, River restoration
043	River (Dove Dale)	Unfavourable - no change	Inappropriate weirs dams and other structures, siltation	Catchment Sensitive Farming	Investigation, River restoration

Diffuse pollution aspects are being addressed through Catchment Sensitive Farming and other means and so it is the 'inappropriate weirs, dams and other structures' that indicate a need for river restoration planning and subsequent implementation.

The 2014 Site Improvement Plan (SIP) for the Peak District Dales SAC (Natural England 2014) states that weirs, dams and other structures create pressures on the River Dove for white clawed crayfish, bullhead and brook lamprey and prevent natural hydrological processes acting, limiting natural habitat development. It recommends that this should be addressed through a River Restoration Strategy. This document implements that recommendation.

All future restoration works will require detailed planning and design, which will need to take into account the conservation objectives[1] for all the features of the Special Area of Conservation. Projects will require permission from Natural England and the lead flood authority (relevant County Councils) and some or all of the following; Peak District National Park and Environment Agency. A Habitats Regulations Assessment will form part of the permitting process.

2.3.2 Water Framework Directive

In December 2003, the Water Framework Directive (WFD) was transposed into national law by means of the Water Environment (WFD) (England and Wales) Regulations 2003. These

[1] European Site Conservation Objectives for Peak District Dales SAC. These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 as amended ('the Habitats Regulations') and Article 6(3) of the European Habitats Directive. They provide a framework which should inform any 'Habitats Regulations Assessments' (which may include an Appropriate Assessment) that a competent authority may be required to make under the legislation referred to above. In addition, they can be used to inform any measures necessary to conserve or restore the European Site and/or to prevent the deterioration or significant disturbance of its qualifying features as required by the provisions of Articles 6(1)and 6(2) of the Habitats Directive respectively.

Regulations provide for the implementation of the WFD through the designation of all surface waters (rivers, lakes, transitional (estuarine) and coastal waters) and groundwater's as water bodies and the aim to achieve Good Ecological Status in them by 2015. It should be noted that the standards required to achieve favourable condition for SSSIs may be more stringent than those required to achieve Good Ecological Status (GES) and Good Chemical Status (GCS).

The Water Framework Directive requires protected sites including Special Areas of Conservation to be meeting their objectives by 2015 (or in cases where there are significant pressures to address, 2021 or 2027). For SSSIs the targets for Favourable Condition can be more stringent than for WFD due to the particular requirements of the wildlife or habitats at these sites and the WFD states 'where more than one objective relates to a given body of water, the most stringent shall apply'.

The ecological status of a river is determined by the quality of the plant, invertebrate and fish communities it supports, the flow and physical habitat conditions, and the quality of chemical parameters such as pH, temperature and concentrations of various pollutants. These are assessed according to stringent standards. When a body of water does not reach these standards, the Environment Agency is the competent authority who works with the responsible parties, for example water companies, industry and landowners to improve its quality and aim to achieve compliance with the WFD in England.

The River Dove at Dovedale is located in water body GB104028057780 (River Dove source to River Manifold). The waterbody was assessed to be meeting the target of Good Ecological Status in 2009. However, an interim report in 2014 suggests that the river is now classed as Moderate Ecological status because fish are failing to reach the required standard.

This means that the Environment Agency, Natural England and others will be obliged to undertake work to ensure that GES is achieved in the future. Development of the river restoration strategy and its subsequent implementation will help maintain or improve the status of the river, contributing to achieving Good Ecological Status.

Table 2 Summary of water body status - River Dove from Source to River Manifold.

	2009 Cycle 1	2014 Cycle 2	Objectives
Overall Water Body	Good	Moderate	(Cycle 2) good
Ecological	Good	Moderate	(Cycle 2) good
Biological quality elements	Good	Moderate	(Cycle 2) good
Fish	Good	Moderate	(Cycle 2) good
Invertebrates	High	High	(Cycle 2) high
Macrophytes	-	-	-
Macrophytes and Phytobenthos Combined	-	High	(Cycle 2) high
Hydromorphological Supporting Elements	Not high	Not high	(Cycle 2) not high
Hydrological Regime	High	High	(Cycle 2) high
Morphology	Supports good	Supports good	-
Physico-chemical quality elements	High	High	(Cycle 2) high
Specific pollutants	High	High	(Cycle 2) good
Chemical	Good	Good	(Cycle 2) good

Data sourced 1/7/15 from Environment Agency Catchment Date Explorer

2.4 Fisheries management and angling

Dovedale has been described as one of the finest trout streams in the world, made famous in the “Compleat Angler” by Izaak Walton & Charles Cotton, 1676. However during the twentieth century the waters were stocked with fish reared in artificial conditions. This offers what devotees of wild trout fishing consider to be less challenging though reliable angling. These stocked fish have very different needs from wild fish and many weirs and bank reinforcements were installed in the 1920 and ‘30s to create good conditions for them and the anglers who enjoy catching them. Trout fishing is a highly prized activity and can be a valuable business.

A wise person once said to a river restoration conference ‘**Always remember, it’s not your river!**’ and this is certainly pertinent here. Angling has been crucial in celebrating and then modifying the River Dove, and engaging positively with current landowners and fishery managers is a key factor in the successful restoration of the river.

Many of the land owners and angling clubs now provide angling for wild trout whose populations have been restored in several fisheries by encouraging a more naturally functioning river system. This has included the removal of some artificial weirs and is supported by the Wild Trout Trust, a conservation charity that focuses on practical work to improve habitat for trout across the UK and Ireland.

2.4.1 Fishing interests in Dovedale

The fishing interests along the river are crucial in managing the river. This section draws on information publicly available on their websites (and all have been consulted individually too) to consider the range of views which this Plan must seek to accommodate so we can build working relationships with those who own it or have legal rights.

The Derbyshire County Angling Club lease the fishing rights to approximately 3 miles of Wolfscote Dale, which their website describes as ‘probably our best small river fishery which holds lots of wild brown trout and grayling…… If you want to catch large brown trout this is probably not the place for you.’ They describe their fishing as varied, with many rock weirs.

Moving downstream the Fifty Nine Flyfishers Club fish some 2 ¾ miles of fishing around Milldale and further north. They work very closely with the landowner to whose family the river has belonged since 1931. Their website explains their ancestor rebuilt old weirs, created new ones, and constructed the Trout Hatchery just upstream from Dove Cottages. Between 1992 and 2001 the current owner carried out ‘an ambitious restoration project to try and recreate the sort of fishery that might have existed …. (carrying out) repairs of the banks and weirs’.’

The reaches are largely run as a traditional fishery and they are proud of their family’s long history here and of its role in building and maintaining weirs and bank reinforcements to cater for stocked fish. They see the weirs as contributing actively to the river’s health, including rich populations of mayfly and numbers of wild trout.

From about 1km downstream of Milldale Leek and District Fly Fishing Association (LADFFA) lease the fishing rights on the Derbyshire bank to the confluence with the Manifold, though there are small pockets in the ownership of the Fifty Niners. The Club has worked closely with the Wild Trout Trust and the National Trust to restore more natural management

practices, removing a weir and installing woody material in the river to enhance the habitat in places. Three years ago the club stopped stocking fish in all their waters as an experiment and in 2014 their members voted to continue with this policy, reflecting its success in providing them with the type of angling they most value.

At the southern end of Dovedale, the Izaac Walton Hotel owns the fishing rights on the Staffordshire bank from Ilam Rock some 3 miles to the confluence with the Manifold and it is fished by a private consortium. Their website explains that 'target species are wild brown trout and grayling, the resulting fishing is both challenging and rewarding, no stocking takes place and all fish caught must be released.'

2.5 The Historic Environment

The history of Dovedale has been explored with the archaeologists for the Peak Park and National Trust, Staffordshire County Council and Buxton Museum, which is part of Derbyshire Museums.

2.5.1 Statutory and non-statutory historic environment designations

The Heritage Gateway and MAGIC Map were consulted in order to identify relevant historic records. Those in the immediate vicinity of the river in this area are listed in Table 3 and there would be a general presumption in favour of conserving them. There are a number of mill and other buildings at Lode Mill just north of Milldale, and so at least one impoundment in the river is likely to be linked with them.

In Milldale there are a number of records and those closest to the river are listed below including Viator's Bridge and the National Trust's interpretation barn which are important features.

There are three caves listed in Dovedale, however it would not be envisaged that river restoration would affect them.

Table 3 Selected Statutory and Non Statutory Historic Environment Designations.

Grid reference	Feature	Description	Reach
Lode Mill area			
SK1459 5507	Lode Mill Bridge	A listed 19th century bridge of coursed limestone rubble construction, which has a single semi-elliptical arch spanning the River Dove at Alstonefield (on the Staffordshire-Derbyshire border).	3
SK 1459 5510	Lode Mill	A listed 19th century stone watermill with three pairs of stones and a drying kiln. On the site of an earlier mill.	3
SK 1458 5515	Lode Mill House	An early to mid-19th century house of rendered limestone rubble with a tiled roof.	3
SK 1460 5513	Greenlowfield Mill	Documentary evidence for a mid-18th century lead smelting mill, which is suggested to have been located on or near to the site of the later Lode Mill (PRN 02270).	3

Milldale			
SK 13909 54664	Viator's Bridge	A listed and scheduled stone bridge across the River Dove at the boundary between Staffordshire and Derbyshire. The stone bridge is of possible early 16th century date and is mentioned in Izaak Walton's 'The Compleat Angler'.	3
SK 1389 5468	National Trust Barn	A stone barn and lean-to linked with an historically documented mill (PRN: 20648) located to the north-northeast in the 18th and 19th centuries.	3
Dovedale			
SK 146 508	Reynard's Cave	A large cave featuring a single chamber and a rear passage. Evidence of Neolithic, Roman and Medieval activity.	5
SK 14505230	Dovedale Church Cave	A shallow cave shelter on the western side of Dovedale at Dovedale Church.	5
SK 1491 5127	Castle Cave	A cave with two chambers. The date of the shelter is unknown	6

Archaeological reports and old maps can be used to form an understanding of the likely historical value of any structure in order to inform decision making about appropriate ways to design and implement restoration actions.

Between 2004 and 2006 a detailed archaeological field survey of the National Trust's South Peak Estate was undertaken by Peak District National Park's survey archaeologists (Ullathorne, 2005-6). This concentrated on recording the identified historic environment features of the Estate and included river furniture, though these features were not researched in detail.

An archaeological study was carried out of all historical river furniture on the River Dove north of and including Wolfscote dale for the Peak District National Park in 2010 (Bennigsen, 2010). It states of the weirs that 'most would appear to be of relatively recent construction, in that with the exception of the mill weirs, small stone fishing weirs do not show up on any maps until the 1922 O.S. edition.' A database of all the river furniture accompanies this report and is integrated within the geographic information database that accompanies the restoration plan.

We recommend that the information in the South Peak Estate Archaeological survey report be used as the basis for further research in to, and recording of, river furniture from the southern end of the Bennigsen report to the Dove Manifold confluence in consultation with the National Trust's regional archaeologist as part of this initiative. This work would enable decisions to be made on the treatment of individual features in the context of the restoration vision for the river.

Archaeologists should be consulted over individual structures early in project development so that they can consult relevant records and advise. This is important as it will allow the local archaeology services to consider the relevant structures in detail at the relevant time -

something they are unable to do in advance for all 90 of the Dovedale and Wolfscote Dale weirs.

2.5.2 Historical collections

After the publication of the edition of The Compleat Angler in 1676 which included Charles Cotton's section on Dovedale, visitors began to make the treacherous journey here in increasing numbers. They came to experience wild, spectacular nature and recorded it in words, paintings, books and etchings of which Buxton Museum has an impressive collection. Visitors included the poet Lord Byron, who spoke of beauties in Derbyshire to rival those of Switzerland and Greece.

History shows people that the river has been modified from a former, wilder state which was highly prized. Therefore, restoring it towards this former state whilst taking into account modern constraints has historical validity. By removing weirs we will uncover natural cascades and rapids as well as riffles and pools which have not been seen in living memory.

Old pictures and post cards can be used to help establish how the river looked before the weirs and bank reinforcement were put in and help provide a 'reference condition' to to restore. However, paintings may not be accurate representations, and hydrological and other conditions have changed and so they should be used as one piece of information amongst many. Those who built the weirs may have first done so where it was already rocky, where there were cascades or boulders. Some parts of the river may have been naturally impounded behind these falls and boulders as this painting shows.

Dovedale in Derbyshire, Philip James de Loutherbourg 1740–1812, courtesy of York Museums Trust.

Dovedale No.2 Aquatint, 1805, John Bluck, courtesy of Derbyshire County Council, Buxton Museum and Art Gallery.

Figure 3 Historic pictures of the Dove in a more natural condition circa 1800.

Figure 4 Photograph of Ram Pump.

Similarly there may be interest in researching the history of angling on the Dove. Approached sensitively, these studies could help to bring people together and reduce differences.

Ram Pumps are heritage features present in Dovedale and Wolfscote Dale at Tissington Spires, Dove Holes and Iron Tors. These pumped water to the farms above the valley using water power. There may be weirs associated with them which may be a priority for conservation.

The weirs and bank reinforcements are historical features and whilst many may not merit physical conservation on historical grounds, researching them will conserve and value this history by recording and publicising it. It will also bring valuable information about how they were constructed and where the stone came from that will inform decision making if weirs are removed.

2.6 Interpretation and public engagement

Both the Peak Park and National Trust are keen to interpret the landscape as we have seen. During site visits for this report it was observed that most people do not notice that the river is highly modified. However when this is pointed out they find it very interesting. There is therefore a great opportunity to tell the story of the history of the management of the river, and the effects of the modifications have had upon natural processes together with the benefits restoration brings. This can be communicated to visitors in various ways, from small, simple notices, through exhibitions, activity days, phone "apps" etc. This could have wider benefits in drawing people's attention to issues that are important in rivers where they live too.

Much is being done by Buxton Museum and Art Gallery to engage people in the history of this landscape in partnership with many partners including the National Trust and Peak District National Park (see websites for 'Dovedale Family Activity Trail', 'Enlightenment! Derbyshire setting the pace in the eighteenth century' and 'Collections in the Landscape', which are all in the Further Information section below). There is a great opportunity for 'Letting the Dove Flow' to build on the links made through researching for this plan and share the story with the public in partnership.

The fact that Dovedale attracts some 1 million visitors a year is both a challenge and an opportunity. It will be vital to explain any changes being made, and the fact that access is largely restricted to a predictable linear 'there and back' route offers the opportunity to tell the story effectively.

2.7 Summary of issues raised in this section

Table 4 Summary of statutory and other factors and their relevance to this plan.

Factor	Summary	Relevance
Peak District S and Dove Valley and Biggin Dale SSSI	On designated sites, necessary conservation measures are to be established, preventative measures taken to avoid the deterioration, and assessments made of new plans and projects. **STATUTORY: Habitats Regulations Assessment and SSSI consents will be required**	In order to achieve the conservation objectives for the river units of the site, a range of actions are required, including this river restoration plan. River restoration projects will need to take into account all the designated features of the site (riverine and terrestrial).

Factor	Summary	Relevance
White Peak National Character Area Statements of Environmental Opportunity	SEO1 (summarised): Protect and enhance the rivers, streams and springs, aquifer and karst geology, to provide clean water, support fish and other wildlife and enhance recreational and educational opportunities, sense of place and history. SEO4 (summarised): Maintain and enhance enjoyment and understanding of the historical, cultural and natural heritage by providing recreational opportunities, interpretation and education delivered by a range of organisations.	1. Supports the inclusive approach of this Plan to integrating conservation with enjoyment and engagement. 2. Supports working in partnership. 3. Provides context for balancing a range of needs.
Peak District National Park	National Parks 'Conserve and enhance the natural beauty, wildlife and cultural heritage' and 'Promote opportunities for the understanding and enjoyment of the special qualities of National Parks by the Public'. The PDNPA holds some statutory responsibilities including as a Planning Authority. National Park Management Plan: *Encouragement should be given to fisheries where river habitats are managed for self-sustaining populations of native fish such as brown trout, and where artificial stocking is avoided.* **STATUTORY: Planning permission may be required**	Supports the inclusive approach of this Plan to integrate conservation with enjoyment and engagement. Supports the aims of the restoration plan in relation to more naturally functioning river.
Lead Local Flood Authorities.	SCC (west bank) and DCC (east bank). Issue consents for altering, removing or replacing certain structures on the Dove here as it is an 'ordinary watercourse'. **STATUTORY: Ordinary Watercourse Consent will be required**	Must be consulted to ensure any proposals are acceptable in terms of flood risk.
Land ownership	Legal owners of the bank of the river and the bed to the middle of the river. They may own the weirs.	Must be fully involved and ownership clarified.
Fishing rights	A legal contract giving rights for fishing. The details of the legal arrangements differ.	Anglers must be fully involved and legal rights understood.

Factor	Summary	Relevance
Historical designations	Statutory and non-statutory historic environment designations **STATUTORY: Scheduled Monument Consent may be required**	Presumption in favour of conserving designated sites. Opportunity for interpretation.
Water Framework Directive	Requires that all rivers reach Good Ecological Status (GES). WFD status provisionally assessed as moderate in 2014 so action required to achieve GES. Works may require a WFD detailed assessment, depending on preliminary screening, to determine impact on achieving GES/no deterioration in status.	Supports improving the ecological condition of the river environment. The Water Framework Directive requires protected sites including Special Areas of Conservation to be meeting their objectives by 2015 (or in cases where there are significant pressures to address, 2021 or 2027). For SSSIs the targets for Favourable Condition can be more stringent than for WFD due to the particular requirements of the wildlife or habitats at these sites and the WFD states 'where more than one objective relates to a given body of water, the most stringent shall apply'
Highways Authorities	**STATUTORY: Any proposals which involve realignment of a public right of way may require a diversion order.**	Liaison required if works which might affect public rights of way are proposed.
Operational matters	**STATUTORY: Pollution Control (PPG5) and waste regulations**	Pollution control measures will need to be applied (PPG5) and disposal of removed material will need to comply with waste management licencing (detail will depend on makeup of material removed and quantities)
Weir removal	**STATUTORY: Impoundment licence may be required**	An impoundment licence may be needed for works on the existing weirs depending on whether one is already in place (will require revocation). A low risk impoundment not requiring a licence can be determined through applying regulatory assessment.
Protected species and ecology	**STATUTORY: Must comply with protected species legislation**	Planning of works needs to include appropriate survey and mitigation for protected species and compliance with associated legislation, i.e. WCA 1981
Fisheries	**STATUTORY: Must comply with Salmon and Freshwater Fisheries Act 1975 (SAFFA).** This includes a statutory duty to maintain, improve and develop salmon, trout, freshwater fish and eel fisheries.	Supports habitat enhancement for fisheries, including addressing barriers to migration.

Section 3 - Developing a river restoration plan

Mainstone (2007) explains 'The aim of the (river restoration) planning process is to generate whole-river physical restoration plans, through geomorphological assessment and ecological interpretation that can be considered consistent with the favourable condition of the SSSI. The plan then directs available resources in the most cost-effective way, making the most of all available delivery mechanisms and budgets. Progress with implementing the plan becomes a key measure of site condition going forward.'

3.1 Method

3.1.1 Desk Study

A thorough desk study was carried out of all available information to inform the geomorphological assessment and ecological interpretation required. This included the following references, details of which can be found in the list of references at the end of this report.

- Hyder Consulting (UK) Limited (2011) - River Dove Ecological Vision;
- The SSSI Citation for the Dove Valley and Biggin Dale;
- The Natura 2000 data form for the Peak District Dales SAC;
- Mainstone C. and Clarke S. (2007). Coastal and Freshwater Ecosystems - River Dove Site Visit;
- Mainstone C. (2007). Rationale for the physical restoration of the SSSI river series in England;
- Rice S.P. And Toone J.A. (2011). Fluvial audit of the Upper Dove Catchment. Loughborough University;
- Jacklin T. (2009). Advisory Visit - River Dove, Dovedale, Derbyshire;
- Aquascience (2013) Catchment Sensitive Farming, CSF delivering ecological improvements in the River Dove Catchment;
- Bennigsen, R, 2010, Dove Weirs Project 2010. Available from the Peak Park;
- Derbyshire County Council (undated) Landscape Character Descriptions, 2. White Peak;
- Natural England, National Character Area Profile, 52. White Peak;
- Ullathorne, A, 2005/6 National Trust South Peak Estate Survey, Peak District National Park Authority.

In 2011 Natural England commissioned a Fluvial Audit of the Upper Dove catchment. A Fluvial Audit is a detailed study of how a river is transporting sediment though erosion and deposition, how it has changed over time and how it is likely to change in future. It is this flow of sediment over different timescales that shapes the river and its valley and provides the basis for wildlife and people. However, this flow can be interrupted by different changes including human kind's activities.

The Upper Dove fluvial audit involved three months of intensive fieldwork, mapping and measuring cross sections to analyse the river function and form, and made recommendations for potential restoration action (Rice and Toone, 2011).

Natural England then commissioned an Ecological Vision (Hyder, 2011) report which built on the Fluvial Audit. The report describes an ecologically based restoration vision and begins to set out how restoration of the river can be achieved.

In addition to a desk study using the documents listed above, a web search was conducted to find publically available information about the angling clubs and several land holdings.

3.1.2 Involving stakeholders

It has been vital throughout to involve relevant stakeholders in compiling this plan. It relies to a great extent upon land owners and other stakeholders being willing and able to implement it and so it is crucial to explore with all concerned how the plan might benefit them. In this way 'win-wins' can be identified where the plan can be progressed with mutual benefit.

A Steering Group was set up and consulted through meetings, emails and phone calls. Its input has been hugely valuable. Its members are listed in the Preface to this report.

Site visits have been carried out to the whole length of river that the report covers, usually with relevant land owners or angling clubs. In this way very useful 1:1 meetings have been held with most of the land owners and angling interests along the river.

A meeting was held with the archaeologists for the National Trust and Peak Park to consider how archaeology should best be considered within this plan, and then with the head of Derbyshire Museums to ensure that the plan benefited, as much as possible, from knowledge of the history of the area.

A briefing note was drawn up as a quick summary to introduce the topic and the purpose of the plan, at the draft stage. All the organisations that make up the Steering Group used this to make their own organisations aware of the plan. This was important as many organisations span different interests as conservation, recreation, historical heritage, flooding, and pollution control.

The first draft report was read and commented on by all Steering Group members.

An 'internal launch' was held at the National Trust at which feedback was taken from a range of different specialists. This was also offered to the other Steering Group members.

Historical information was kindly provided by the archaeologists of the Peak Park and National Trust which led to more detailed discussions with Buxton Museum and Art Gallery. Information was also gathered from Professor Steve Rice of Loughborough University and Tim Jacklin of the Wild Trout Trust.

A formal consultation was held from February 26th to March 22nd. All the land owners, angling clubs, Parish councils and members of the Dove Catchment Partnership were contacted individually and invited to respond to the plan, which was placed on Trent Rivers Trust's website for comment here: http://www.trentriverstrust.org/site/letting_the_dove_flow

Consultation responses

We are grateful for seven responses. All were constructive and most were largely or totally positive. All have been carefully considered and several amendments and additions have been made as a result as summarised in Appendix 1: Summary of Stakeholder comments

Comments comprised:

- Helpful typographical, stylistic and technical corrections;
- Suggestion that over grazing and footfall cause what the Vision report highlights as naturally eroding ‘cliffs’ and that removing bank protection could lead to accelerated erosion and wide, shallow river profile;
- Concern that removing weirs might lead to insufficient deep water habitat upstream of Milldale when low flows occur. (Downstream the river receives spring water so this is less of an issue);
- One response disagrees that weir removal is appropriate. This was expected from prior discussion and highlights the need to be able to evidence benefits through careful evaluation and monitoring. It is positive that they are nevertheless willing to work with ‘Letting the Dove Flow’ by conducting limited experiments. Additional evidence for the benefits of weir removal has been added to Section 5;
- Concerns about monitoring, timescales, funding and implementation and questioning the degree to which the plan dictates or suggests action;
- Concern that funding for feasibility studies might outweigh resources for practical action;
- Limitations of historical pictures, land management to improve water quality, querying green engineering, cumulative effects, funding for monitoring, support;
- Largely general or full agreement with the plan, with some comments being extremely positive and offers of practical help.

It is important to fully consider the range of views which this plan must seek to accommodate (where compatible with achieving favourable condition) and to build working relationships with those who own the river or have legal rights to it. In the short term we will seek to work with interested parties to implement restoration and to gather evidence of the benefits. By demonstrating the benefits of restoration, we aim to work with all landowners to implement restoration action in the longer term.

3.2 Overview of the following chapters

The report will now set out the key findings from the Fluvial Audit and Vision report in Section 4. We will describe the main physical habitat modifications and their effects in Section 5 and then potential restoration solutions and considerations in taking them forward in Section 6. We then explain how these apply to distinct sections or ‘reaches’ of the river and outline an action plan for each reach in Section 7. The Action Plan in Section 8 prioritises actions and considers in some detail how key stakeholders and opinion formers can become part of the journey, and help to implement the physical solutions proposed.

Section 4 - Ecological Vision for the River

We will now focus more closely on the ecology and geomorphology of the river.

Weirs and reinforced banks dominate the geomorphology of the River Dove channel and have a significant effect on flora and fauna. Mainstone (2007) provided an eloquent summary of the consequences of physical modifications upon the ecology of the river:

"Specifically, impacts (in relation to weirs) *arise from the loss of variations in current velocities, water depth and substrate, and an increased propensity for the substrate to accumulate fine sediment. Bank reinforcements exacerbate the effects of the weirs by preventing movement within the small floodplain terraces, movement which would generate considerable habitat diversity through the generation of meanders and riffle-pool sequencing.*

This loss of habitat diversity can be expected to result in adverse changes to the characteristic flora and fauna, most notably suppression of riffle-dwelling invertebrates, recruitment within populations of lithophilous fish spawners (particularly brown trout), and possibly problems with the establishment of Ranunculus and other submerged plants. The uniformity of hydraulic conditions generates losses in substrate diversity at both the coarse and fine ends of the spectrum – sites for small silt beds to develop are limited, leading to restricted potential for lamprey ammocoete development."

4.1 A challenging vision

The Ecological Vision report (2011) considered the impact of physical habitat modifications on the ecology of the River Dove and how this relates to the favourable condition targets for river habitat. It then set out a challenging vision for the river based on the characteristic habitat for a river of this type under more naturalised conditions, taking account of valid societal constraints such as flood risk, historic environment and infrastructure.

The Ecological Vision articulated in the Hyder report is for a river that is:

4.1.1 Dynamic:

- Geomorphologically active and capable of creating its own energy and diversity, increasing the quantity of gravels and other coarse sediments creating alluvial bars and reducing fine sediment deposition;
- Free to change its planform (as far as possible given the narrow floodplain terraces and critical infrastructure) and cross section in response to active geomorphological processes.

4.1.2 In good ecological condition:

- Naturally functioning and self-sustaining and with a full range of characteristic habitats and species and enough of each habitat and species to enable the ecology to adapt in response to the dynamics of the channel;
- Passable for species to migrate along the channel at both low and high flows.

4.1.3 Connected to the `floodplain:

- There should be a hydrological and physical connection between river and floodplain to enable the river system to function naturally, with;
- Rich floodplain habitats, in particular riparian (river bank) trees and dead wood;
- Floodplain storage used to reduce downstream flood risk so that during high flows the river continues to gently overtop its banks and then drain freely back into the river channel.

4.1.4 Resilient to the effects of climate change:

- Having a variety of habitats including deeper water at both high and low flows;
- Able to maintain water temperatures as far as possible.

4.1.5 Set within a cultural heritage and landscaping setting:

- Features of significant heritage value within the river and floodplain setting are retained so that there is an appreciation of past and present land uses;
- The natural form and dynamics of the channel are complemented by low intensity adjacent land use and areas of semi-natural habitat;
- Public access and fishing continue, respecting the cultural and historical importance of the river valley.

4.2 What a restored river could look like

The Dove Ecological Vision Report and Fluvial Audit are based on detailed evidence and describe a more naturally functioning river. An important aspect of determining the more natural state of the river for this location (or the "Reference Condition") is the JNCC's River Types[2], which the Vision quotes and builds on. This describes the geomorphology and habitats expected in River Types V and VI streams such as the Dove as;

> *'Rivers of these two related types tend to have … intermediate stream gradients and substrates dominated by gravels and pebbles. Outcropping bedrock and boulders are a relatively common feature of the channel, generating a characteristic mosaic of exposed rock and fast-flowing runnels at low-to-intermediate flows, with some upstream ponding of water behind strata particularly resistant to erosion. A mixture of riffles, pools and glides can be expected under conditions of low physical modification. Exposed shingle bars, occurring in mid-channel and along channel sides and both vegetated and non-vegetated, are common features of these types under conditions of low anthropogenic impact, along with sparsely vegetated sandy margins.'*

In addition, old pictures can help to inform reference conditions, although as noted previously, they may be romanticised views of the river and should be used as one piece of information amongst many.

[2] Holmes, N.T, Boon, P.J., & Rowell, T.A**. (1999)** Vegetation communities of British rivers - a revised classification. This comprehensive classification of rivers in England, Wales and Scotland improves and expands the Nature Conservancy Council's earlier classification of British rivers (Holmes 1983, Focus on nature conservation, No. 4 - now out of print). Both are based on the macrophyte composition of rivers and use the same survey method.

The most spectacular sections of reaches 4 and 5 (see next chapter) were painted from the 1700s. These show us that as well as the sequence of faster riffles and pools the Dove would also in places naturally have cascades and a ‘step pool’ sequence more characteristic of higher gradients.

Figure 5 Dove Dale No.3, 1805 by John Bluck, Derbyshire County Council, Buxton Museum and Art Gallery.

The old paintings show that the outcropping bedrock and boulders mentioned were clearly an important aspect of the Dove here before the weirs were built and the National Trust South Peak Estate Survey (Ullathorne, 2005/6) says that old maps show four waterfalls which are no longer present. Their locations were not listed but the picture above seems to be one of them.

The following pages explain existing river conditions and what general restoration measures are required. Figure 6, Figure 7 and Figure 8 below illustrate how the restored river might look and behave. The left hand side of the figures shows examples of the river in a near natural state, including the geomorphological features to be expected, whilst the right hand side shows the impacts of physical modifications and explains the general restoration measures recommended.

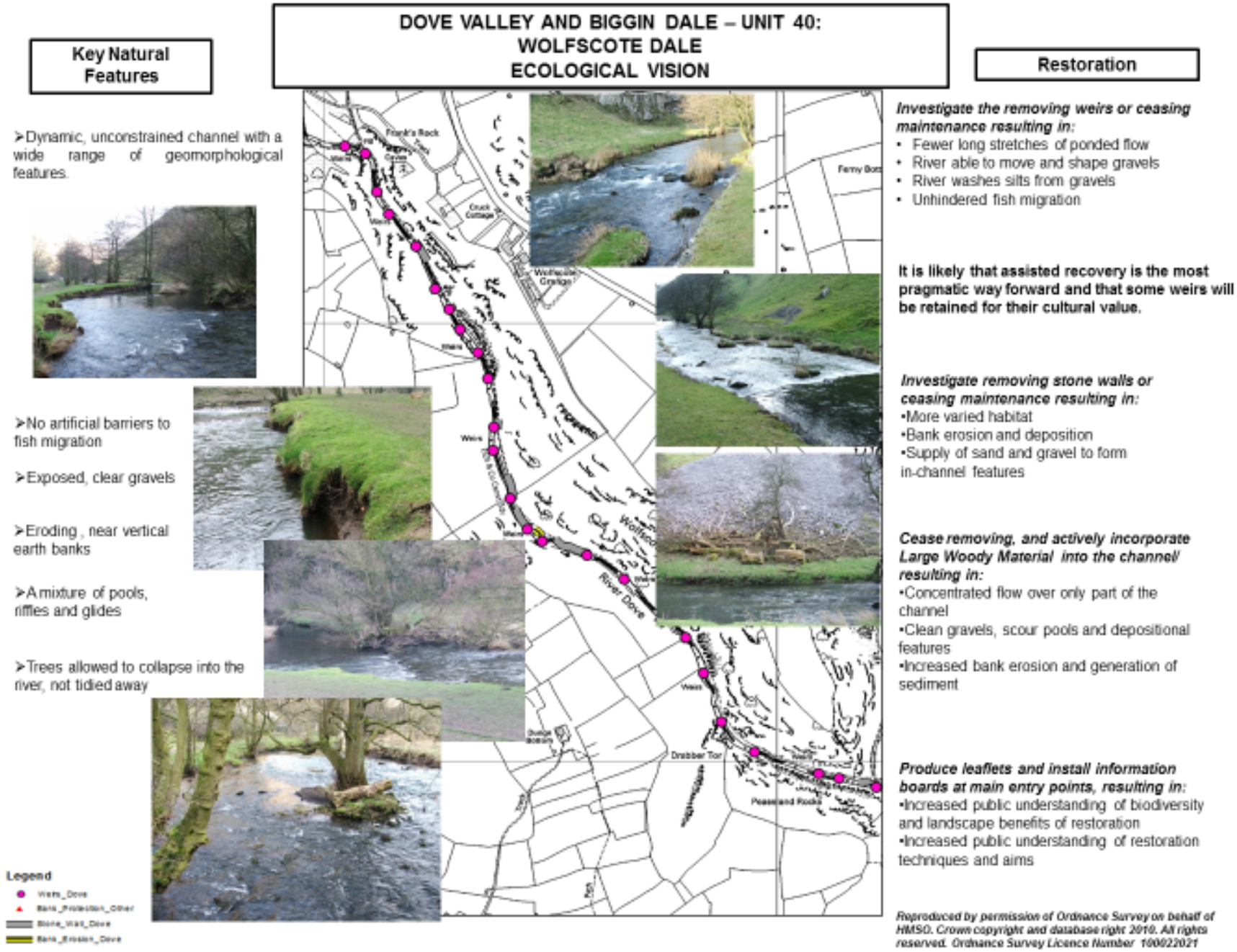


Figure 6 Ecological Vision for SSSI Unit 40.
Note that in this and the following figures only weirs are shown on the maps, though bank protection covers 50 to 90% of the banks (Rice and Toone, 2011).

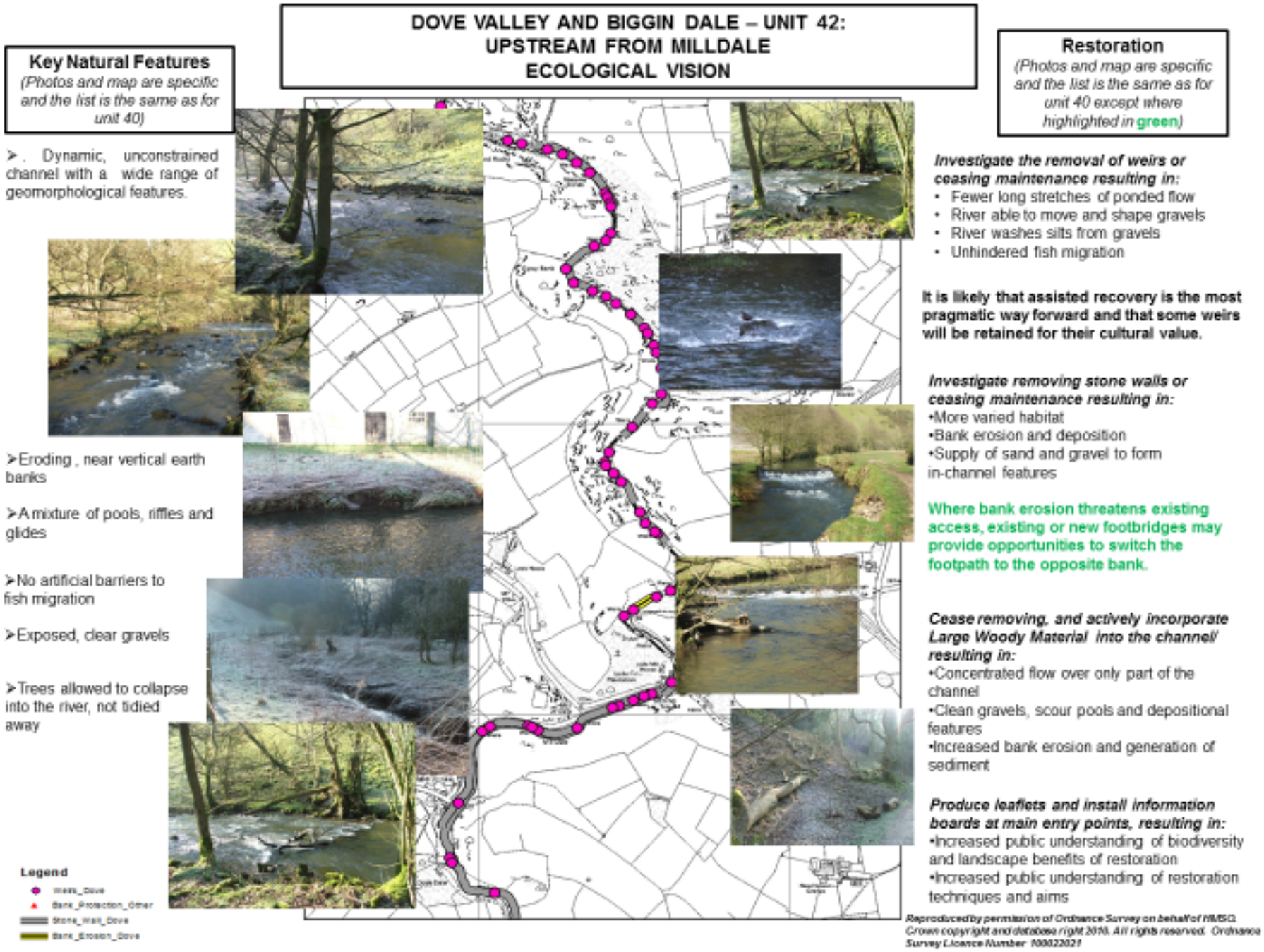


Figure 7 Ecological Vision for SSSI Unit 42.

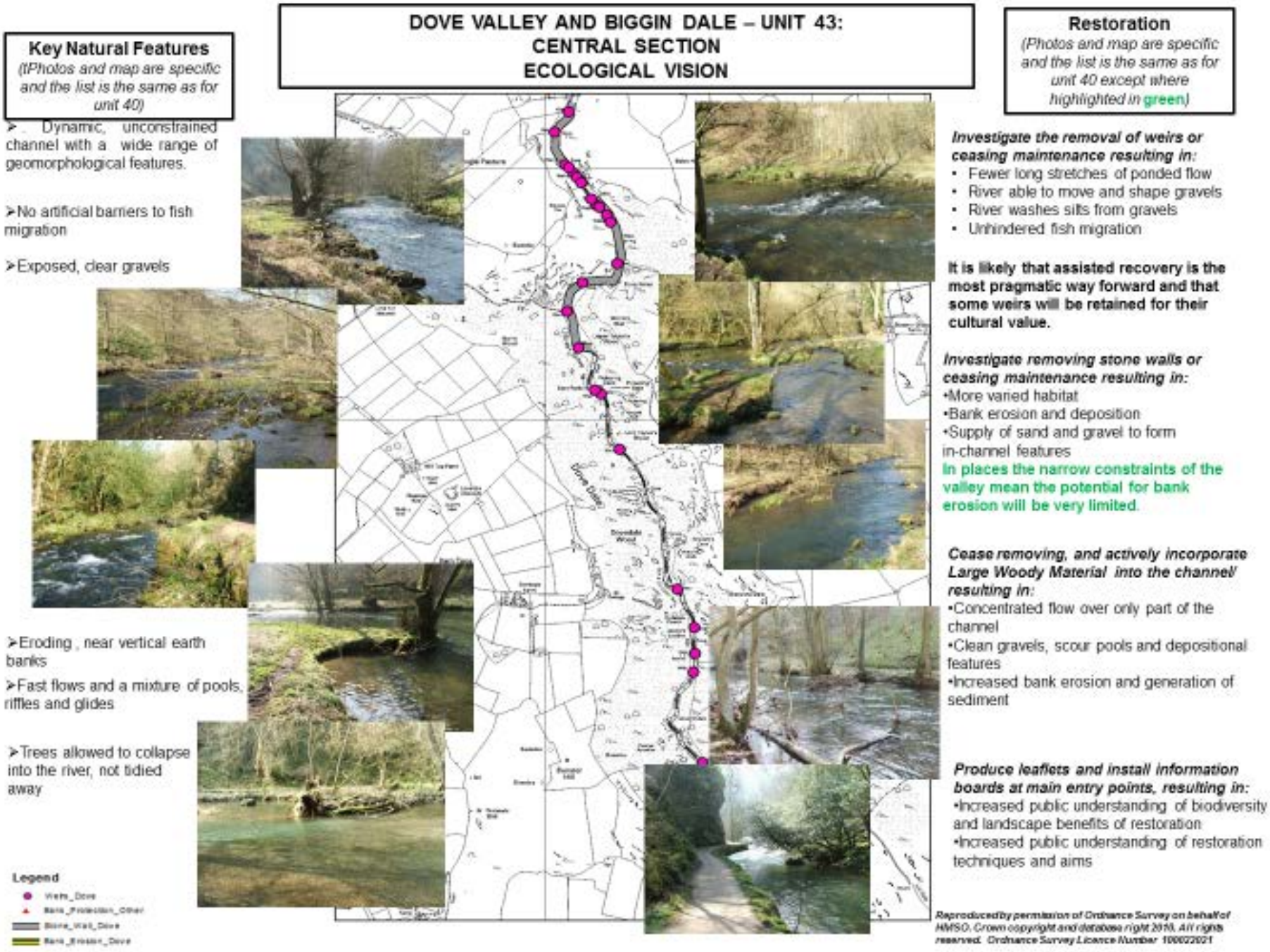


Figure 8 Ecological Vision for SSSI Unit 43.

4.3 Moving towards this ecological vision depends on:

- Forming working relationships with everyone with legal rights and powers - land owners, angling clubs and government organisations and understanding that they agree with this vision to different extents;
- Having a plan with a clear vision and use it in practice, reviewing progress and adapting to new challenges, opportunities and information;
- Finding areas of shared interest and using these to identify ways to achieve our vision and secure the resources to carry them out;
- Planning actions carefully, consulting all relevant parties and taking into account all relevant aspects;
- Understanding that sustainable recovery will take place over short, medium and long timescales and requires resources;
- Engaging the public in our journey;
- Having a culture of ongoing learning - from work carried out, from all stakeholders, from research and good work on other protected rivers.

4.4 In physical terms achieving this vision means:

- Allowing the river to recover where its own natural processes are already working well;
- Working with the river to assist its natural recovery by changing management and undertaking targeted river restoration works;
- Removing, or altering where removal may not be appropriate, manmade features where these are limiting the function and ecology of the river;
- Ensuring the river is adaptable into the future to be able to cope with new pressures such as climate change;
- Recognising the need to provide recreation, celebrating and conserving historic and landscape aspects and protecting people and property from flooding.

Section 5 - Key Ecological Issues affecting the River

Natural England has a target set by the government of ensuring that 95% of SSSIs are maintained in 'favourable' or 'recovering' condition. A condition assessment on the riverine units of the Dove Valley and Biggin Dale SSSI in 2010 described the condition of the Dove as ‘Unfavourable no change’ because of:

- Weirs, dams and other structures
- Water pollution - agriculture/run off
- Water pollution - discharge

The Site Improvement Plan for the Peak District Dales SAC also states that weirs, dams and other structures create pressures for white clawed crayfish, bullhead and brook lamprey and prevent natural hydrological processes acting, limiting natural habitat development. It recommends that this should be addressed through a River Restoration Strategy, by 2014. This document implements that recommendation.

The pollution aspects are being addressed through the Catchment Sensitive Farming initiative and other means. It is the ‘inappropriate weirs, dams and other structures’ that indicates a need for river restoration planning and subsequent implementation.

The Water Framework Directive requires protected sites including Special Areas of Conservation to be meeting their objectives by 2015. For SSSIs the targets for Favourable Condition can be more stringent than for WFD due to the particular requirements of the wildlife or habitats at these sites and the WFD states ‘where more than one objective relates to a given body of water, the most stringent shall apply’.

The Dove at Dovedale was assessed to be meeting the Water Framework Directive objective of Good Ecological Status in 2009. However, a 2014 interim report classed the waterbody status as moderate, due to a revised assessment of the fish fauna quality element. Action is therefore also required to restore the waterbody to Good Ecological Status.

In order to explore further the impacts of the weirs, dams and other structures on the functioning of the river, Natural England commissioned the fluvial audit of the Upper Dove (Rice and Toone, 2011). The study considered the processes of water and sediment movement in the river catchments, channels and their floodplains, along with the forms produced by those processes. The audit involved an evaluation of river form, bank and bed dynamics and controls on geomorphological processes during a three month period of fieldwork. The key points of the audit are that:

- The River Dove has a lack of coarse sediment recruitment into the river;
- The majority of the sediment that the river does receive is fine grained and the weirs are contributing to the storage and deposition of this sediment within the river; and
- There is a lack of vertical and lateral movement of the river channel due to the extent of artificial bank protection;
- In-stream coarse woody material is rare, reflecting the limited number of riparian trees and the disconnection of the river channel from sources of such material.

The fluvial audit also provides a detailed account of sediment loading in the River Dove which reflects the underlying limestone geology and surrounding land use. The fluvial audit identifies that in the limestone section of the River Dove levels of fine sediment are almost equal to that recorded from an unidentified lowland limestone river, which would suggest that the proportion of sediment <1 and <2mm in the river bed is higher than would be expected.

The audit pooled data for the Rivers Dove and Manifold and found that they contained on average 13-25% sediment <1mm in the top 30cm of bed substrate, which is higher than the 10% recommended in Joint Nature Conservation Committee guidelines (JNCC 2005). Using these 10% criteria it could be suggested that bed substrates are currently sub-optimal for use as spawning gravels. Finally, the high density of weirs in the Dove has resulted in sediment deposition such that the bed can be seen to have a 'dirty veneer' of sediment and organic material.

The Ecological Vision report (2011) further considered the impact of physical habitat modifications on the ecology of the River Dove and identified potential restoration approaches. Both the fluvial audit and vision have informed the assessment of issues and potential solutions set out in Sections 5 and 6 of this report.

5.1 Weirs and bank Reinforcements

5.1.1 What the issue is

Weirs and reinforced banks dominate the geomorphology of the River Dove channel and have a significant effect on flora and fauna. There are over 90 weirs here in Dovedale and Wolfscote Dale, mostly about 50cm to 1m high and at an average spacing of 20-50m and stone bank reinforcements are associated with most of these structures. The Fluvial Audit found that stone bank protection now covers between 50% and 90% of the banks of the River Dove within the SSSI. Figure 9 illustrates the effect of weirs and bank reinforcement by comparing conditions as captured in a painting circa 1925 and now. Figure 10 illustrates the effect of stone weirs using contemporary images.

5.1.2 Where it occurs

The weirs and stone walls are widespread through the plan area. The condition is variable with some being well maintained and others breaking down. In reaches 2 and 3 in particular they are strongly maintained, whereas in reaches 4 to 6 most are being allowed to break down.

5.1.3 How weirs and bank reinforcements affect the SSSI

The net result of the stone weirs and bank reinforcement has been to:

- Create artificial barriers to the migration of fish species such as brook lamprey and bullhead (Maitland 2003, Tomlinson and Perrow 2003);
- Create uniform flow and morphology such that the channel does not exhibit a naturally diverse morphology; instead there is, principally, a series deeper ponded sections behind each weir with a lack of shallow water and pools and riffles. This is an issue as species at different lifecycle stages rely on different flow velocities and habitats (Bunn and Arthington, 2002);
- Lead to fine sediment deposition, degrading river bed gravels used by spawning fish (Hyder, 2011);

- Cut significantly the supply of coarse stony material to the river and limit the river's ability to transport it (Rice and Toone 2011). This results in a lack of larger stones and gravel in the river and a lack of depositional features such as gravel bars and fast flowing stony riffle areas. These habitats are particularly important for trout, bullhead and lamprey;
- Cause a slightly unusual channel shape with a higher than expected width to depth ratio (Rice and Toone, 2011).

The comparison of old paintings with present day photo below highlights the effect of the bank reinforcements in eliminating natural variety in the banks, leaving them straight. In this condition they offer much less length (quantity) and variety of habitat for fish and other aquatic and bankside wildlife, such as native crayfish, which need the full range of naturally occurring river habitats, including naturally eroding cliffs and banks, mid channels bars, riffles and pools, bankside vegetation, softer banks for burrowing, and structures such as rocks or tree roots for shelter (Mott, N. 2015).

Figure 9 Changes at Pickering Tor - old picture and contemporary photograph. (Proctor's Hoopla circa 1925: Landscape Scene, Pickering Tors, Dovedale, Derbyshire, Barnes and Son Belper, courtesy of The Fairground Heritage Trust).

The image above shows natural ‘rapids’ in the 1920s. The contemporary image shows these have been formalised as a weir so the water behind is very smooth and slow flowing. (The river is flowing away from the viewer in these pictures of Pickering Tor).

Once a weir is built maintenance is required to stop the water from flowing round it and eroding the river banks. You can see that the banks have been straightened and reinforced with stones too.

The combination of the weir and bank reinforcement removes the natural variation that provides a home for wildlife, especially young fish and other river creatures. By preventing bank erosion, the reinforcements mean the river cannot form cliffs and deep pools or gain gravels from the banks and deposit them to form beaches and fast flowing riffles. The weirs slow the flow of water down, meaning the river bed becomes silted, and there is no variety in water depth or speed.

Effects of Physical Modifications

Weirs

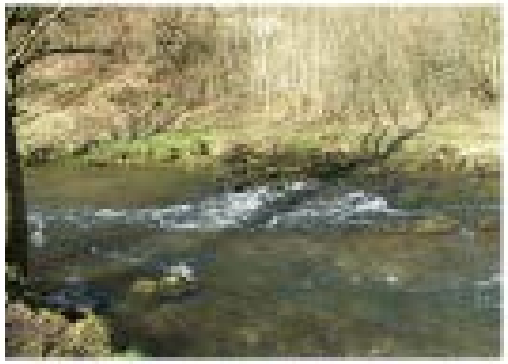
Sequence of low stone weirs closely spaced in the Mildale section of the river. Over 90 similar weirs are present in the three riverine SSSI sections.

The physical effects of the weir are to slow flow rate, the water deepens and fine silt is deposited making conditions less suitable for spawning fish species.

The slow ponding effect of water together with bank reinforcement reduces in-channel diversity.

Overview
Flow is invigorated as it passes over the top of the weir, but this is short lived as almost immediately the next weir in the sequence slows flow rates and causes ponding of water flows. Weir sequence effectively traps coarse sediments such as cobbles and gravels reducing occurrence of deposition features such as point and side bars.

Bank reinforcement



Relatively natural sections of the River Dove showing diverse in-channel features and flow conditions, active erosion and movement of river channel that have established following weir degradation.

Bank reinforcement prevents lateral movement of river channel leading to a lack of in channel diversity and reduces supply of coarse sediment.

Figure 10 Effects of Physical Modifications, Hyder (2011).

5.1.4 Potential solutions

Findings suggest that weir removal, lowering or modification can generate a range of hydromorphological and ecological benefits, as demonstrated by the work carried out in 2013 on the Dove immediately upstream of the SSSI units covered by this report, and documented by Everall 2014. However, it is fully acknowledged careful planning is required in order to avoid undesirable impacts (Environment Agency 2013).

Allowing weirs and stone bank reinforcements to break down over time would be an important and cost effective step towards promoting a more natural river. The time this takes will depend on the condition of the weirs and reinforcements and the power of the river; this might take a long time.

Removing weirs and stone walls either totally or partially is an important solution to bring about ecological improvements more quickly and to manage any associated change. It should be noted, however, that according to the Fluvial Audit there has been very little lateral movement through Dovedale at least since about 1800 when we have maps to analyse. This suggests that the river would naturally be reasonably static, possibly due to the river naturally having bedrock and limestone in the river banks. Therefore it is likely that if the stone walls are removed there will not be dramatic lateral movement.

Because of the number of weirs and quantity of stone walls it is difficult to predict the cumulative effects. Removing structures may affect others either upstream or downstream. Critically, the removal of any water structure should be assessed with a thorough appreciation and understanding of reach hydromorphology, river corridor connectivity and catchment sediment dynamics. It is also possible that weir removal will require a flood risk assessment to ensure that there is not an increased flood risk to others. It is recommended that there is early consultation with the Lead Local Flood Authority to identify if a flood risk assessment or flood defence consent is needed (Environment Agency 2005). The sequencing of weir and wall removal, monitoring the effects and ‘adaptive management’ responding to changes where required are all important considerations and should be the subject of a strategic study.

5.2. Lack of Large Woody Material (LWM) in the river

Much of this section is quoted directly from Tim Jacklin (Jacklin, T. 2009), whose excellent account is well worth repeating here.

5.2.1 What the issue is

There is relatively little large wood in the river channel through Dovedale. LWM is a general term referring to wood naturally occurring in streams including branches, stumps and logs derived from trees on the banks and valley sides. Rivers and streams with adequate LWM tend to have greater habitat diversity, a natural meandering shape and greater resistance to high water events. Therefore LWM is an essential component of a healthy stream’s ecology and is beneficial by maintaining the diversity of biological communities and physical habitat.

There is a need to develop plans to maintain the existing stock of ash trees as far as possible, and to re-establish and manage appropriate native species where ash trees are lost.

Figure 11 Examples of Large Woody Material in Wolfscote Dale and Dovedale.

5.2.2 Where it occurs

Throughout the SSSI there is less wood in the channel than would be expected naturally. The Vision report found that Reaches 2 and 3 are particularly lacking in wood. Traditionally, many land managers and riparian owners have treated LWM in streams as a nuisance and have removed it. This is frequently unnecessary and negates the benefits described above.

5.2.3 How it affects the SSSI

The presence of LWM has been shown to be extremely important in several respects:

- An increase in the variety of flow patterns, depths and localised velocities; LWM influences flow to sculpt natural features in the river, promoting a pool and riffle sequence;
- Provides submerged exposed root systems that provide in-channel habitat for fish and invertebrates (such as white-clawed crayfish (Mott, 2015)), potential holt and resting sites for otters, a source of woody debris and leaf litter for the river, and varying within-channel light and temperature regimes;
- Development of high in-channel physical habitat diversity, including the sorting of bed substrate to provide clean gravel of the right size for spawning trout, grayling, brook lamprey and bullhead;
- Work from North America has consistently demonstrated that woody debris enhances salmonid spawning and rearing habitats in small streams. A systematic

review (Stewart et al, 2006) summarises research on the benefits for fish, including salmonids;

- Significant benefits to the control of run-off at the catchment scale. Woody material helps regulate the energy of running water by decreasing the velocity. Thus the 'travel time' of water across the catchment is increased and flood peaks reduced (Odoni et al, 2010, Wolff and Burgess, 1994);
- It gives shelter for fish, and the accumulated leaf litter is an important food reserve for shredding macro-invertebrates. Research in the UK (Godfrey, 2003) showed 147 invertebrates, some rare, were strongly associated with woody debris;
- Adult bullhead require sheltered sections created by woody debris, tree roots, leaflitter, macrophyte cover or large stones (Tomlinson and Perrow 2003);
- White-clawed native crayfish need refuge from predators in order to maintain a breeding population. A recent survey for white claw crayfish (Natural England 2015) found limited evidence of white-clawed crayfish upstream of the riverine SSSI units. The study recommended the introduction of significant amounts of woody material into the channel to provide foraging habitat for the remaining population. Introduction of large woody material in the riverine SSSI units would ensure suitable habitat is available to encourage re-colonisation with native crayfish from upstream;
- Coarse woody material provides a habitat in itself for a number of specialised local and scarce invertebrates (Godfrey 2003).

5.2.4 Potential solutions

- Allowing wood to remain where it falls or anchoring it if there is a risk of it washing down to sensitive infrastructure;
- Planting and managing appropriate native trees on river banks which over long timescales will supply the river and its floodplain with wood;
- Installing wood artificially at key locations.

The retention of large woody material should not have significant flood risk impacts except potentially where large items are not secured or located appropriately or too close to sensitive infrastructure. Substantial branches could become lodged in critical locations, especially bridge crossings, which could initiate rapid build-up of debris during a flood and cause bypassing, scour and ultimately collapse of bridge structures (Hyder, 2011). This risk can be minimised by ensuring that LWM is retained or installed securely, and the management of LWM takes account of infrastructure such as roads and bridges. Fortunately due to the rural setting there are few bridges and other infrastructure, and any risks to these can be assessed.

5.3 Lack of coarse grained sediment

5.3.1 What the issue is

The Fluvial Audit concluded that the Dove has much less coarse sediment than would be expected, and that through Dovedale gorge it has very few tributaries to bring in sediment. The LUTEN map in Figure 14 on Climate Change and Water Temperature shows this very clearly. In addition, the sediment transfer system is severely modified by the large number of weirs, each of which acts as a sediment trap. Natural connectivity is also restricted by the bank reinforcements which prevent lateral river movement and associated access to stores of sediment in the floodplain and from scree. Scree slopes are an important historic source

of coarse sediment to the river, and currently they are ‘de-coupled’ from the slopes by the footpaths slopes (Rice and Toone 2011).

Scree slope on the side of Thorpe Cloud at the southern end of the dale.

Scree slope in Wolfscote Dale. Scree is active (gathering around the trees) but is cut off from the valley floor by the path.

Here you can see how the stones are raising the footpath level, and again the material cannot reach the river.

Where the stones have crossed the path they could be manually moved into the river without altering the ‘angle of repose’ of the stones on the other side of the path. The volume of material would be small however.

Figure 12 Scree slopes along the river.

5.3.2 Where it occurs

This occurs in the downstream part near Thorpe Cloud car park and more widely upstream in Wolfscote Dale.

5.3.3 How it affects the SSSI

Gravels are an important element of a river of the Dove's type, providing the material for a range of characteristic features such as riffles and bars which offer important habitat for wildlife including brook lamprey and bullhead. The lack of gravels, exacerbated by the presence of the weirs, means that these features are rarely present.

5.3.4 Potential solutions

Re-routing the footpaths to the other side of the river or redesigning them to raise them above the scree would ensure that coarse material reaches the channel. An easy start would be to feed the stones into the river where they have already crossed the path. However, if there are well maintained weirs downstream then this coarse sediment would be trapped in the slow flowing areas behind them rather than moving downstream. Is therefore important to remove or breach weirs to allow any reinstated sediment supply to flow.

5.3.5 Constraints and their management

The stones on the valley slopes naturally lay at the 'angle of repose' that is the balance between gravity and the frictional forces. Any action to remove stones from the bottom would increase the angle and possibly create instability. Conversely this very instability could be very useful if carefully managed to provide a steady, safe supply of coarse material to the channel. Expert advice would be required in order to manage valley side material appropriately. This issue could be looked at in more detail by a specific project. It may be a topic for long term university studies.

5.4 Water quality

5.4.1 What the issue is

Poor water quality can affect the range of wildlife which lives in a river, even if physical improvements are made. Runoff from farmland upstream can bring the nutrients that are contained in natural and artificial fertilizers and other agricultural treatments to the river, upsetting the natural chemical balance of the water.

5.4.2 Where it occurs

Aquascience (2013) have reported extensively on water quality on the Dove for Natural England, the Environment Agency and others for several years using detailed examination of river invertebrates to detect changes in or possible impacts upon water quality. A major survey of the Upper Dove catchment was conducted by Aquascience in 2009 (Everall, 2010) for Natural England and Catchment Sensitive Farming (CSF) (see below, Section 5.4.4). The water quality data from this work was later presented by Aquascience for CSF in mapped form (see Figure 13, below) in the 2012 update report (Everall, 2012). This shows that there have been concerns, sometimes significant, about water quality in the SSSI, for a number of years, and that these are most marked at the upstream end of Wolfscote Dale. As the main

inputs of water further down are from spring water the water quality improves as we move downstream.

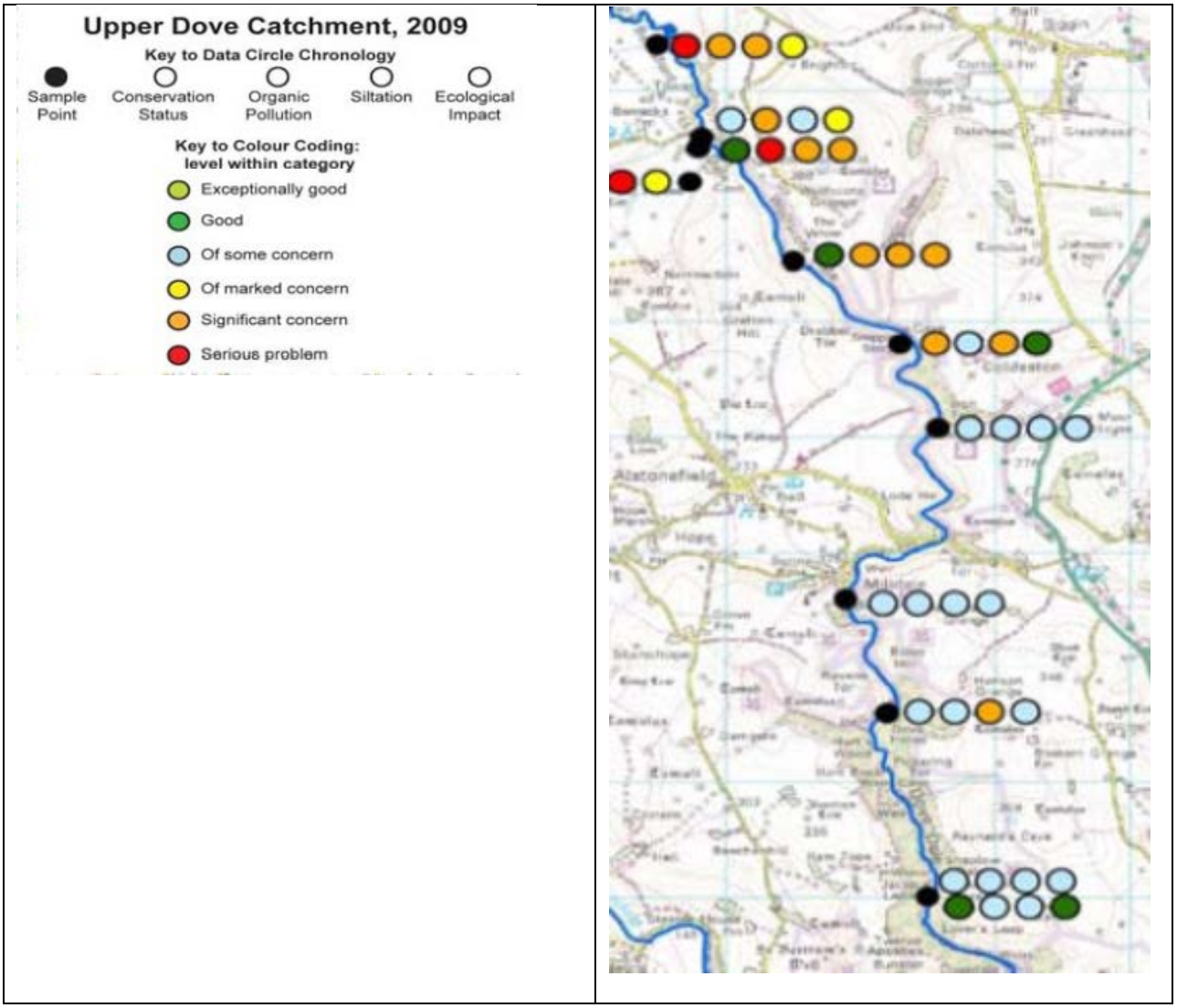


Figure 13 Map showing water quality issues in the Upper Dove catchment based on data gathered in 2009.

5.4.3 How it affects the SSSI

Water quality can limit the ecology of the river so that even if habitat is improved, wildlife will not benefit.

The SSSI sections of the River Dove are monitored against targets relating to water quality, water flow, and river morphology. These targets must be met in order to achieve both favourable condition (SSSI condition assessment) and the relevant SAC conservation objective targets, which must also be worked towards in order to achieve WFD compliance. Water quality, when assessed against these targets, was identified as an issue affecting the condition of the SSSI in 2010, requiring measures to be put in place to address phosphate levels and sediment inputs. Measures required were for example the use of the catchment sensitive farming initiative, which offered capital grants for farm infrastructure improvements such as slurry storage and covered yards to reduce runoff, as well as targeted farm advisory visits.

Revised water quality targets for SSSI rivers are now being proposed, with reduced phosphate limits being set for all rivers to make sure that the targets are sufficiently protective for SAC freshwater species. These revised targets have been agreed with the Environment Agency and are included for consultation within the relevant draft updated River Basin Management Plan (Environment Agency, 2014).

Water quality data obtained from the Environment Agency in 2013 (Matt Lawrence, EA Catchment Coordinator, pers comm) suggests that phosphate levels recorded at the nearest upstream sampling point (Hartington road bridge) have improved since 2010, attributed in no small part to the improvements in the management of farm runoff and slurry storage funded through CSF, although the frequency of monitoring appears to have been reduced to 4 times a year rather than monthly. However, in the light of the revised SSSI/SAC targets for phosphate levels and the concerns expressed about localised inputs further downstream causing local failure of these targets and associated potential impacts upon wildlife, it is important that consideration is given to monthly water quality sampling within the SSSI sections of the Dove. This may be required so as to be certain as to whether or not additional measures should be put in place to address any future risks to water quality in the Dove.

5.4.4 Potential solutions

The River Dove is located in the Peak District Dales priority catchment for Catchment Sensitive Farming (CSF). This is a scheme run by Natural England in partnership with the Environment Agency and The Department for Environment, Food and Rural Affairs. It raises awareness of diffuse water pollution from agriculture (DWPA) by giving free training and advice to farmers within the priority catchments.

An evaluation of CSF 2009 to 2012 has shown ecological improvements as a result of these methods (Everall 2012) (see Section 5.4.3 above).

Continuing the CSF approach and associated monitoring should ensure that as habitat is improved, water quality does not limit ecological recovery. The new Countryside Stewardship scheme contains a range of options to address water quality issues and could be targeted to address future water quality issues related to land management if required.

5.5 Climate change and Water temperature

5.5.1 What the issue is

Recent work suggests that mean river water temperatures across England and Wales increased by 0.3°C/decade since 1990 (Orr et al., 2010). River temperatures are rising globally and are expected to continue to rise under climate change. Climate change is also predicted to result in more frequent storms and intensive rainfall. Extreme high and low flow events may occur more frequently in future (UKCP09).

Water temperatures can be increased by a lack of shading from trees or valley sides and by water being impounded by weirs. Temperature rises affect aquatic organisms in a number of ways, including increasing stress on insects and fish that prefer cooler temperatures.

The modifications to the River Dove have resulted in an artificial shaped river channel which has less variation in depth and width than might be expected naturally (Rice and Toone 2011). In low flows a uniform channel tends to result in shallow slow flow across the whole

river bed, whereas a more naturally varied channel would allow low flow to be focussed in the lower parts of the channel such as pools associated with boulders and large woody material. This essentially makes a little flow go further in terms of providing suitable habitat. Similarly, a more varied river channel and riparian trees provides refuges for fish and insects behind tree roots and in the river margins so they are better able to withstand very high flows, and provides variation in temperature in the channel.

5.5.2 Where it occurs

The Loughborough University Temperature Network http://www.luten.org.uk/home has been undertaking research into temperature effects in the upper Dove catchment for several years. Their research has shown that water is warmed where it is held behind the many weirs and where spring water is warmed by sunlight before it reaches the river. According to Toone et al (2011) maximum water temperatures in summer in the upper Dove and the Manifold already achieve values that can affect brown trout behaviour. However, natural shading in the steep valley reduces the impact of water warming through Dovedale. Nevertheless, if tree re-establishment is planned and there is an opportunity to encourage shading of the springs that feed the river Dove, this opportunity should be taken.

Changes to the flow regime of the Dove would potentially affect the whole river system, and the spatial impact will depend on how overland and underground flow of water into the river system is affected. We have seen that the lack of natural deeper pools in the river is widespread.

5.5.3 How it affects the SSSI

The combination of a lack of shading, particularly in Wolfscote Dale, and widespread lack of natural deep pools, combined with the threat of tree diseases reduces the SSSI's resilience to climate change.

5.5.4 Potential solutions

Increasing shading to keep water temperatures stable is a " low regrets" measure and will help increase resilience of the river to climate change. Given the presence of alder disease (*phytopthera*) in the catchment, re-establishing tree cover is an important measure in order to maintain or increase shading, and to provide in-channel habitat.

Removing or modifying weirs and bank protection, and retaining or establishing large woody material in the channel will all contribute to establishing more varied physical habitat in the river. This will in turn mean that the associated river flora and fauna will be more resilient to extremes of flow and temperature. This is particularly important for fish species such as brown trout as they can become stressed at elevated water temperatures.

LUTEN is a useful source of information about temperature effects on the Dove and actions with water temperature benefits that may be appropriate when planning restoration projects.

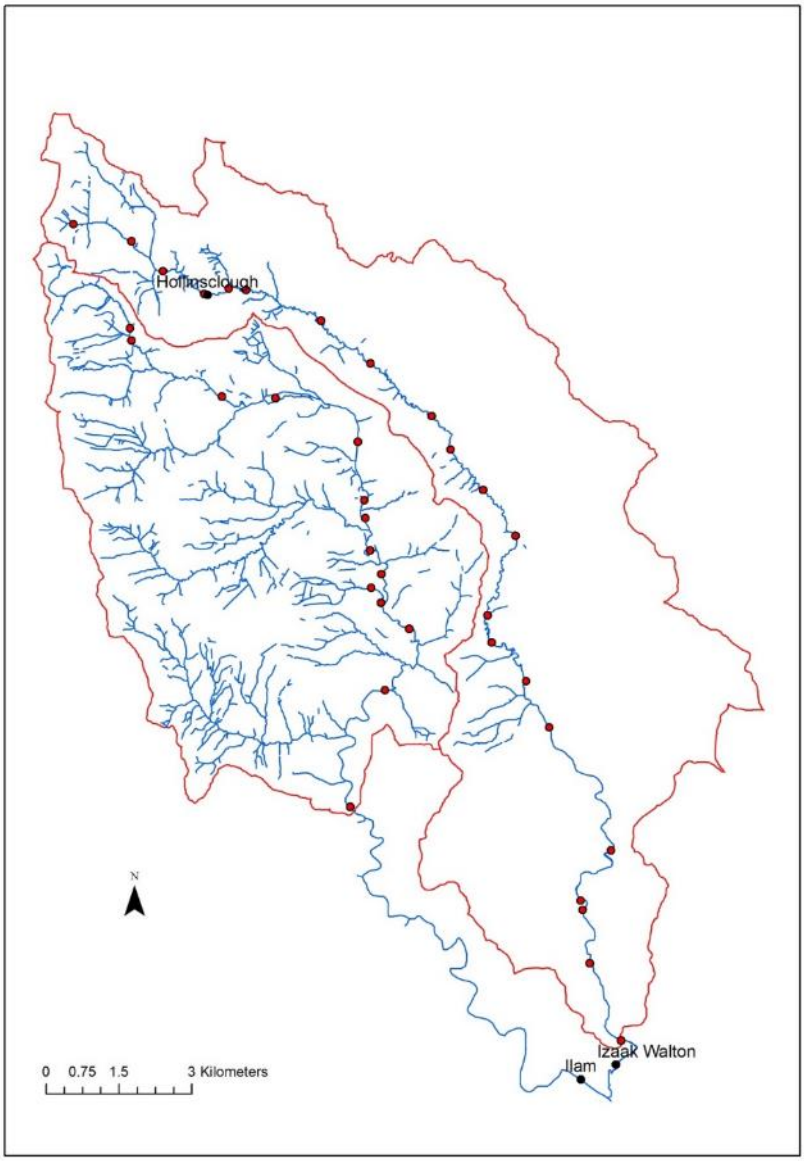


Figure 14 Map of the Upper Dove Catchment showing sampling points for the Loughborough University Temperature Network (LUTEN). Note that Wolfscote Dale and Dovedale at the east side of the map have very few tributaries. *Map courtesy of Matt Johnson and Rob Wilby (2014)* www.luten.org

5.6 Tree Disease

5.6.1 What the issue is

Ash dieback disease or Chalara is a fungal disease that was first noted in England in 2012 and causes leaf loss, crown dieback and bark lesions in affected trees. Once a tree is infected the disease is usually fatal. (Forestry Commission website). We have seen that ash is a key species at a landscape scale in Dovedale and although the full impact of the disease is not known, it may kill many trees if it spreads to this area.

Phytophthora is a fungal disease affecting alder. It is often fatal and its greatest impact is on riparian alders. It was first noted in England in 1993 (Forestry Commission, 2004).

5.6.2 Where it occurs

Ash dieback disease is not known to occur in Dovedale or Wolfscote Dale at present, though has been reported in other parts of the East Midlands, North West and Yorkshire.

Phytophthora has been seen in Reach 1.

5.6.3 How it affects the SSSI

The potential effects of ash dieback will need to be taken into account in managing trees in the SSSI.

Alder are the main bankside tree in Reach 1 and if it kills the trees, then tree cover will be severely affected. This will severely reduce bankside habitat for all species, cover for fish and other aquatic wildlife and shading. Consideration is required as to how to best manage this threat.

5.6.4 Potential solutions

Steps should be taken to re-establish tree cover using natural regeneration in order to maintain or increase shading, provide in-channel habitat and a source of future large woody material.

Any trees affected by ash dieback disease should be reported and appropriate advice sought. It may be important to dispose of infected wood appropriately and so it may not be possible to leave it in the river as woody material. The Forestry Commission has an informative website with interactive mapping to show reported cases here: http://www.forestry.gov.uk/chalara

Coppicing encourages the regeneration of new growth in trees infected by Phytophthora, especially if the tree has a diseased root system that can no longer support the entire crown. Ideally, trees should be cut for coppicing 20–30 cm above ground level, leaving a tall stump to develop new shoots under favourable space and light conditions (Forestry Commission, 2004). It would be beneficial for such steps to be supported in Reach 1 to reduce the risk of phytopthera spreading downstream. Good practice biosecurity procedures should be followed at all times, including in disposal or reuse of diseased material.

5.7 Invasive non-native species

There are many invasive non-native species nationally and a consultation response raised concerns about mink, signal crayfish and Himalayan Balsam. They have not been highlighted as a problem in Dovedale and Wolfscote Dale. If discovered here they should be tackled pro-actively using best practice.

Section 6 - Potential Solutions

In this chapter the solutions are described in more detail. The recommended approach is to restore, as far as possible, the natural physical processes to the river. The emphasis is on encouraging assisted natural recovery. Recommendations have incorporated previous suggestions made by Natural England (Mainstone 2007), the Wild Trout Trust (Tim Jacklin 2009), Fluvial Audit (Rice and Tone 2011) and the Ecological Vision (Hyder 2011).

Table 5 summarises the restoration actions proposed by the Fluvial Audit, along with their benefits and other considerations.

Table 5 Summary of restoration actions recommended by the Fluvial Audit (Rice and Toone, 2011).

Action	Benefit	Also consider
Removal of some or all of the weirs	A first step to gain a more natural geomorphology of clean substrates, natural pools and riffles and throughput of coarse sediments.	Success depends on a wider approach to balance this with other requirements. There are potential risks including flood risk, channel incision and lateral movement, contaminated sediments, and temporary effects on fisheries which must be assessed. An integral part of risk assessment is scenario modelling to consider the timing, sequence and number of weir removals.
Removing stone bank reinforcements	Regain more natural geomorphology and enable river to access coarse sediment supplies.	The balance with access and recreation-may need to manage lateral river movement at access pinch points.
Recoupling the river with its hill slope sediment supplies through the dales	The river can gain coarse sediments, of which it currently has a notably short supply.	The balance with access and recreation, and potential risks related to slope stability, and the SAC scree plant community.

The Vision report, taking the Fluvial Audit amongst other studies as its starting point, recommended an approach to restoration planning which is here quoted verbatim:

1. Monitor the restoration measures that have already been implemented on the River Dove (see Section 6.3) and actively disseminate this information, highlighting both positive and negative aspects (if any) to angling clubs and other interested stakeholders;

2. Maintain…the most natural stretches in favourable or near favourable physical condition allowing continued change in channel planform and cross section in response to active processes;

3. Undertake active restoration on each Unit through:

    a. Allow to degrade, or remove of sections of, dry stone bank stabilisation where appropriate (incorporating green engineering techniques, as outlined in the River Restoration Centre Manual of Restoration Techniques, where required). This will allow some lateral and vertical movement of the river channel creating morphological diversity and providing a source of sediment. It is recommended that active removal of dry stone banks is targeted at sections which will be most geomorphologically active, e.g. on the outside of channel bends and at the foot of scree slopes;
    b. Use of green engineering techniques to increase flow rates in selected locations to scour gravels clean and lead to the beginnings of natural pool and riffle sequences;
    c. Habitat re-creation within the limits of specific constraints, such as available space, flood risk etc. These constraints are likely to apply to these reaches and thus habitat creation is likely to be limited to localised, small-scale features (meanders, backwaters, addition of gravels and coarse sediments to allow re-establishment of alluvial bars etc.);
    d. Increasing the quantity of locally derived coarse woody material within the channel by felling and coppicing riparian trees and fixing to the bed and banks of the river. This will promote localised scour and sediment deposition, encouraging habitat diversity;
    e. Considering a programme of riparian tree planting (where appropriate and using native species resistant to alder disease) to increase the supply of natural sources of coarse woody debris and increase the extent of exposed bank side tree roots which offer refuges for a variety of aquatic flora and fauna. ***(Note - The SSSI status means that there is a presumption against planting trees and natural regeneration will be the preferred option).***

4. Allow to degrade, remove completely or remove sections of weirs where there are no/limited cultural heritage/flood protection constraints, and allow natural processes (both upstream and downstream) to re-assert their influence. Upstream weirs to be removed first where possible, to allow channel to adjust and enable the effective management of flood risk consequences (if any). Such works should be carried out at an appropriate time of year to minimise ecological disturbance and comply with current best practice. Partial removal of weirs may reduce these impacts whilst providing the same benefits;

5. Reduce agricultural intensity on land upslope of the River Dove on the limestone plateaux through continued support of the Defra CSF' initiative.'

This approach has been adopted and summarised into six general restoration measures in the table below. These align with those used in the restoration plans for other riverine SSSIs and will be used in the reach based plans which follow in Section 7. The emphasis of any 'green engineering' techniques advocated is on establishing vegetation and the use of woody material in limited cases where infrastructure may be at risk from bank erosion or where increased flow rates are sought to scour gravels. The solutions are grouped into:

1. Those that can be addressed by management practices. These are generally long term and particularly cost effective solutions working with the river. This can also be called 'Assisted Natural Recovery';

2. Those requiring physical restoration;
3. There is an important group of actions requiring strategic review to answer important questions for successful implementation;
4. Other actions, which include engagement, monitoring and dissemination.

Table 6 Proposed Solutions and the Issues they will address.

Solution	**Vision Report action (above)**	**Key issue addressed**			
		Weirs and bank reinforcements reducing habitat diversity & geomorphological process	**Lack of Large Woody Material**	**Lack of coarse sediment (gravels)**	**Fine sediment covering gravels**
Management Practices to Assist Natural Recovery					
Conserve the most natural stretches	2	✓	✓	✓	✓
Cease or continue not to maintain weirs and bank reinforcements where possible. If the river is eroding around a weir consider lowering or removing the weir.	3a, 4	✓		✓	✓
Leave Large Woody Material in the channel and banks where possible.	3d		✓	✓	✓
Tree Management	3d		✓		
Restore					
Introduce Large Woody Material	3d		✓	(✓)*	✓
Remove, lower or breach weirs	4	✓		✓	✓
Remove bank reinforcements	3a	✓		✓	

Solution	Vision Report action (above)	Key issue addressed			
		Weirs and bank reinforcements reducing habitat diversity & geomorphological process	Lack of Large Woody Material	Lack of coarse sediment (gravels)	Fine sediment covering gravels
Strategic Review					
Assess sediment trapped behind weirs – quantity, composition, any contamination	Noted within the Vision report	✓		✓	✓
Sequencing of weir removal	Relates to Fluvial Audit	✓			
Archaeological survey of weirs and other river furniture		✓			
Study of old paintings	New point raised here	✓			
Establish how much stone from weirs and bank reinforcements came from the river		✓			
Review EA gauging weir	New point raised here	✓			
Review routing of footpaths or innovative design solutions	Noted within the Vision report	✓		✓	
Explore re- coupling screes with river channel	Relates to Fluvial Audit			✓	
Other					
Monitor and disseminate results	1	✓	✓	✓	✓
Explain Letting the Dove Flow and involve people.	Key point made within the Vision report				

All restoration works will require permission from Natural England and the lead flood authority (relevant County Councils) and some or all of the following; Peak District National Park and Environment Agency. A Habitats Regulations Assessment will form part of the permitting process. Protected species requirements must also be considered, including water voles and native crayfish.

Since a case of crayfish plague in 2005, native crayfish are not thought to be present in the site, however recent information (Natural England 2015) suggests there is a remnant population with the potential for recolonisation. As restoration such as weir and bank protection removal may disturb or harm white-clawed crayfish and their habitat advice must be sought from Natural England, the County Council or the Environment Agency when planning works. A survey and a licence may be required.

The Action Plan in Chapter 8 of this report recommends drawing up more detailed plans with each land holding and at that point there should be discussion with both so that the associated permissions can be obtained and agreed plan can be implemented over time.

6.1 Management Practices to assist Natural Recovery

6.1.1 Management - Cease to maintain weirs and bank reinforcements where possible

Description

Over time, the river will degrade and eventually wash away the weirs and bank reinforcements. This will gradually release the sediments from behind the weirs which the river will form into different habitat features. As the bank reinforcements break up, more habitat niches will be formed and sediment of all sizes will be released into the river.

Benefits

This is a no cost solution but how long it will take is unpredictable. It is gradual and easy to monitor and intervene if necessary. As bank reinforcements degrade over time, the river bank will become more varied, with habitat niches forming in the margins of the river, including undercut banks and exposed tree roots. This will provide varied flow conditions, refuge areas and cover for juvenile trout, bullhead and lamprey, and encourage the establishment of vegetation on the bank face, which is good for invertebrates.

Constraints, risks and their management

It could look ‘untidy’ and so it will need to be explained to the public and if possible they should be engaged in the process, for example by ‘citizen science’ monitoring, fixed point photography etc.

Landowners will need to be aware that the river is likely to adjust as weirs and reinforcements degrade, and consider the implications before deciding to reduce maintenance. However, examination of historical maps shows the river plan form has been relatively stable since the 1800’s, so large scale channel movement is not expected.

Change is most likely to happen in ‘fits and starts’ during high flows. Inspection will be needed after high flows to ensure that no hazards are left, although such hazards are not likely to be major. Examples include footpaths crumbling, although this is a danger anyway

after high flows, even with high maintenance. Most of the landowners would inspect their property after storms and manage any hazards so this is not an additional cost.

6.1.2 Management - Cease to remove Large Woody Material from channel where possible

Description

When large trees and branches (large wood) wood fall into a river it is very often removed with the aim of maintaining a “tidy” river as well as avoiding risks of damage to infrastructure such as bridges etc further downstream. However, it could instead be left, as Figure 11 shows.

Benefits

Leaving large wood in place when it falls into a river creates valuable habitat, and provides shelter in its natural nooks and crannies for many river creatures. It also creates variations in the way the water flows, which is good for a range of aquatic wildlife. Large woody material directly provides important habitat, but also acts as a natural river engineer, helping to scour out pools, and clean spawning gravels.

Constraints, risks and their management

Large woody material should be secured safely where necessary to avoid it washing downstream and getting wedged in bridges during floods if this would damage infrastructure. Where this is not possible, it might be necessary to remove them from the channel.

It could look ‘untidy’ and so it will need to be explained to the public and if possible they should be engaged in the process, for example by ‘citizen science’ monitoring, fixed point photography etc. Change is most likely to happen during high flows and landowners and river keepers would generally inspect their land for damage after major floods and storms so could easily incorporate a check on any LWM.

Further information

There is detailed guidance on the Environment Agency Website ‘Management and use of Large Wood – Design Guidance http://evidence.environment-agency.gov.uk/FCERM/en/SC060065/MeasuresList/M5/M5T3.aspx?pagenum=2

6.1.3 Management - Tree Management

Description

Tree management will involve protecting areas from grazing and human disturbance to allow natural regeneration of trees and a range of practices such as complete felling, coppicing and pollarding of trees. These can be carried out on whole stands or isolated groups to give structure diversity to riparian woodlands and a range of habitats both on the banks and in channel. In Dovedale the dale-side ash woods and wet alder woods are valuable habitats. Ash Die-back is likely to be a challenge for landowners in the near future and the National Trust have plans to try to mitigate the effects.

Where possible and appropriate any material produced from tree management should be used within the river as large woody material (see description of this proposal below and associated risks) if required in that reach.

Benefits

Trees provide leaf letter to the river which is vital for the food chain. They provide wood to the river which we have seen above provides valuable habitat, shade and cover for fish to hide from predators. The shade can also act to reduce water temperature. Their roots can protect against erosion and also provides important habitat for fish (including bullhead), birds and invertebrates.

Constraints, risks and their management

As this is a SSSI the details of any tree management should be agreed with Natural England as part of a more detailed woodland management plan that refers to the wider interest features of the SSSI. This is addressed in the Action Plan through the recommendation to draw up more detailed plans with each landholding. NE agreement to a detailed plan will mean that it can then be carried out in stages if necessary.

Parts of the SSSI are affected by alder disease (Phytopthera) and reuse of diseased material in channel is unlikely to be appropriate in these areas. There may also be a risk of ash die back affecting the SSSI in future. Best practice biosecurity guidance should be followed when working in the site and further advice should be sought to ensure that any reuse of woody material does not risk spreading alder disease or ash dieback.

The National Trust has Woodland Grant and Stewardship schemes which inform woodland management. Maintaining visibility of rock features is a man plan objective.

The LUTEN project has made a detailed evaluation of tree cover, particularly in relation to water temperature. See for example, Figure 15. Their data can be used as an aid to decision making.

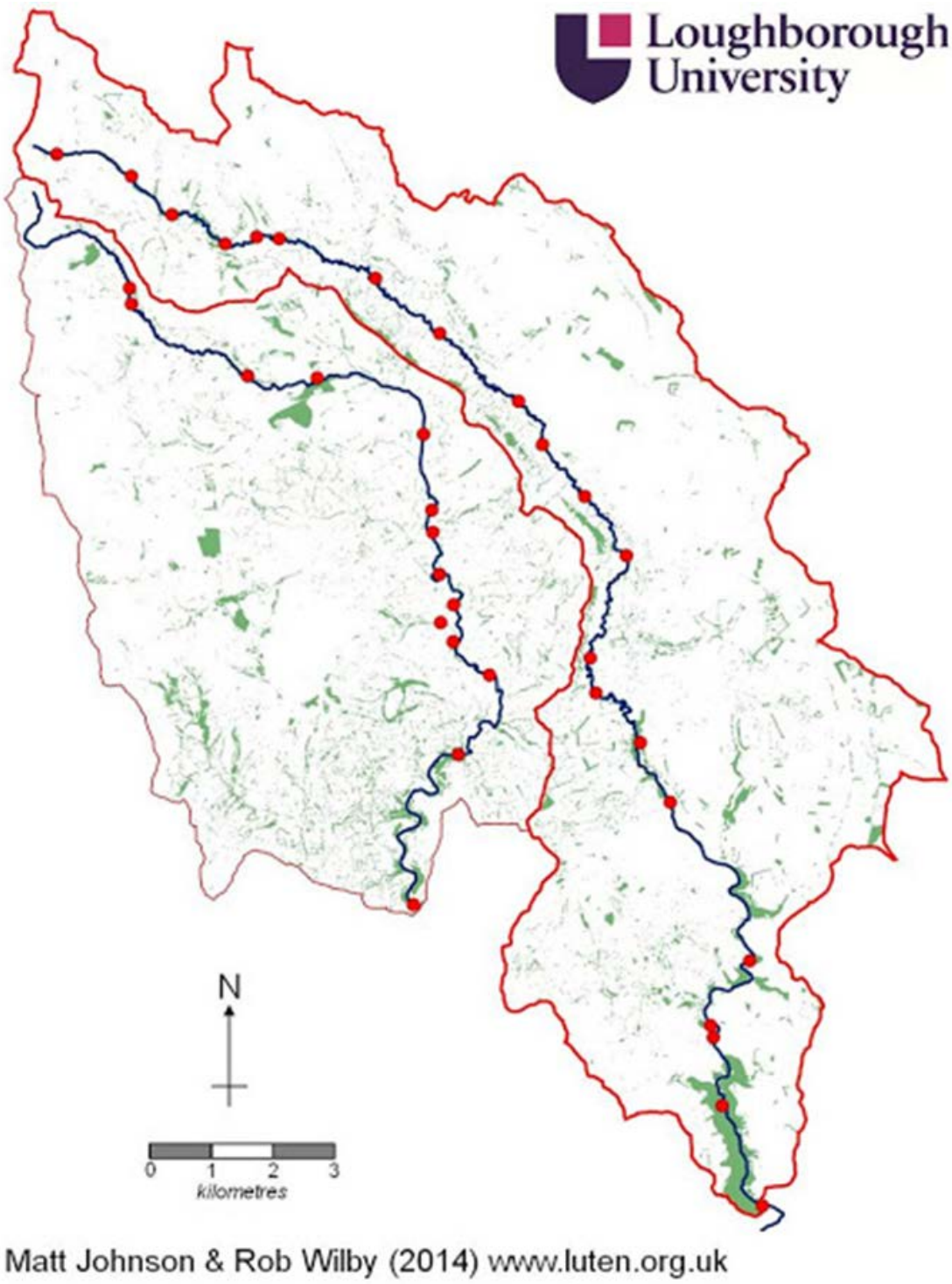


Figure 15 Map of tree cover in the Upper Dove Catchment, to individual tree level.

6.2 Restore

6.2.1 Restore - Introduce Large Woody Material (LWM)

Description

Large wood can be introduced to rivers in strategic locations. It is often secured with pins and cables to prevent it from being washed away. It can be carefully angled to have desired effects on the river bed and banks through erosion and deposition.

Benefits

The benefits are the same as those for ceasing to remove LWD (see 6.1.2).

When weirs are removed there is a time lag before more varied habitats are created by the river which has become free to move gravels. It would be useful to install Large Wood in strategic locations close to weirs which are to be removed so that varied habitat is maintained.

Constraints and their management

The constraints are the same as for ceasing to remove LWM in the river. If required, large woody material can be pinned down using wooden stakes and cables, or cables and pins, though often this will not be needed. Cables and pins should be removed after the wood has rotted away to avoid littering the river.

Parts of the SSSI are affected by alder disease (Phytophthora), reuse of diseased material in channel may not be appropriate in these areas. There may also be a risk of ash die back affecting the SSSI. Best practice biosecurity guidance should be followed when working in the site and further advice should be sought to ensure that any reuse of woody material does not risk spreading alder disease or ash dieback to unaffected areas up or downstream.

It is likely that any works that affect the flow of the river will require Land Drainage Consent from the Lead Local Flood Authority who will carefully assess any risks. As the Dove forms the boundary between Derbyshire and Staffordshire, both are engaged through 'Letting the Dove Flow' and we plan to ensure there are clear and fair arrangements.

Further information

The River Restoration Centre has an excellent Manual of Techniques, with case examples http://www.therrc.co.uk/manual-river-restoration-techniques. See also Mott, 2006.

Impact of phytopthera in trees http://www.forestry.gov.uk/fr/INFD-737ESG

Ash Die back (chalara) http://www.forestry.gov.uk/forestry/INFD-8UDM6S

6.2.2 Restore - Remove, lower or breach weirs

Description

Many of the weirs present are relatively small, 50cm to 1m high and made of loose stone. They will often have been built over natural boulders, and can be physically quite easy to remove. In many cases a team of willing volunteers can take one down in a day.

Where weirs cannot be completely removed, they can be adapted by partially removing, lowering or breaching. Nevertheless, there may still be some weirs that will be retained for their importance to infrastructure, history, abstraction or other reasons.

Figure 16 Weir removal photographs July 2010, Leek and District Fly Fishing Association.

Figure 17 Clean gravels after weir above was removed.

Benefits

Removing weirs allows the river to flow again, creating more varied flow conditions as the photographs above show. This natural variety will be aesthetically attractive, with riffles, pools, boulders and rapids and in some places cascades. It will allow the river to transport the sediment that has collected behind them, sorting it into bars of coarser gravels and areas of fine sediment as this photo from the weir removal above shows. The weirs act as barriers for fish like bullhead and brook lamprey and their removal will allow them access to more habitat and resources for their life cycle.

Following the removal of fishing weirs through Beresford Dale Fishery (2011-13), initial invertebrate monitoring shows that the work has improved both the biological signatures for habitat river flow and reduced sediment impacts (Everall 2014). In 2014 the Beresford reach of the river continued to show marked ecological improvement, water quality appearance and it was holding more fish than had been observed in a number of years (Dr. Nick Everall *pers. obs.*, 2004-2014). Angled wild brown trout of ~1-2lb that have been inspected by the author have been in excellent physical condition from 2012 to date (Dr. Nick Everall *pers. obs.*, 2012-2014).

Constraints and their management

The importance of good liaison and planning. Although removing many of the weirs is technically simple, it is important to liaise with all interests, assessing the potential constraints which might apply to any individual weir and managing these through good project planning. Several strategic studies are required, as we shall see below. These will enable risks to be assessed and managed effectively and the best available information to be gathered and used.

Public opinion. Dovedale is a well-loved visitor attraction, and many visitors incorrectly assume that it is natural. Information and engagement will be valuable in questioning this assumption and changing this perception.

Landowner opinion. Where landowners and /or fishery managers are in favour of retaining their weirs, and view them as a key part of the river habitat it is important to understand their reasons and see whether what the weirs provide for them can be provided in other ways in a more naturally functioning restored river system. Engaging them in small scale pilot studies on their land or on adjacent land might be helpful.

Flood risk. The removal of some weirs can restore river floodplain connectivity and create more storage which can be important from a flood risk perspective. In other instances the removal may increase flood risk so it is important that the Lead Local Flood Authority is contacted at the start of any removal project to discuss potential issues and if a flood risk assessment is needed. Removal of weirs could cause a local lowering of flood level upstream of the weir for the more frequent floods, but this effect is likely to be very limited (Environment Agency 2012). During low frequency (i.e. high discharge) floods it is likely most of these weirs would be drowned and thus no longer exert control on upstream river levels. As they are small, the volume of water held behind individual weirs is also very limited and removal of this storage is not likely to have a significant effect on flood flows or velocity. An immediate concern with removal is the sudden mobilisation of sediment (Bednarek, 2001), which may exacerbate flood risk, particularly further down the catchment at sensitive locations such as bridges. This should be considered in all cases on a site-by-site basis.

It is likely that any weir removals will require Flood Defence Consent from the Lead Local Flood Authority who will carefully assess any risks, and from Natural England. (Hyder, 2011). Protected species requirements will also need to be taken into account as part of this assessment.

Sediment movements: deposition and erosion. Releasing sediment that is trapped behind a weir is one of the major benefits of weir removal as we have seen. However, release of fine sediments can affect fish spawning and for this reason the Environment Agency advise that work should not be done between June and October inclusive.

Removing weirs re-introduces the original gradient which gives the river more power and this can also lead to erosion upstream.

In general, it is recommended to remove weirs starting upstream. However, given the large number of weirs and the opportunities presented by the different land owners and angling clubs this may not be appropriate here. Loughborough University, with support from Natural England are planning research for a PhD thesis to model and investigate the cumulative effects of weir removal relating to sediment and flow. If this research is not carried out, consideration should be given to commissioning a study to evaluate the cumulative effects of weir removal.

In the meantime, the development and implementation of an assessment sheet for individual weir removal and a commitment to proceeding with caution, monitoring the results should ensure that these issues are assessed and appropriate action taken.

Where weir removal has been carried out it may be possible to gain valuable information in hindsight, though controlled studies may not have been carried out. A monitoring protocol should be developed alongside the assessment sheets so that knowledge can be built up.

Fisheries. Some anglers and fisheries managers are concerned that weir removal will result in the loss of localised flow variation at the weir site. This is particularly a concern in reaches with a uniform cross section, which ironically may be due to the presence of weirs and bank protection and relative scarcity of LWM. Weir removal and other habitat restoration provides more variation in flow and habitat overall than localised variation at weirs. However, there will be a time lag until sediments are reworked and a varied habitat established, predict (Environment Agency 2012). It will be important to monitor early projects to evaluate the effects of weir removal, and demonstrate benefits to fisheries long term.

Removing bank protection before removing weirs and using the stone to create varied niches and flow conditions without creating a total barriers and ensuring that there is LWM in the river can help the channel to adjust and to establish habitat with varied flow, depth and substrate reasonably quickly.

Low flows and dewatering. Low flows are a concern to angling interests upstream of Milldale who see the weirs here as important in retaining deep water in low flows, benefitting fish and other aquatic wildlife. Low flows are less of a problem downstream of Milldale where springs bring a year round supply of water (Rice and Toone 2011).

This point is also raised in the fluvial audit which points out a theoretical risk that by removing the weirs the residence time of water in Dovedale is reduced, meaning it will flow through more quickly, and this could lead to natural dewatering into the underlying limestone. Historical records show no evidence of the Dove being dewatered before the weirs were built (Ros Westwood, Buxton Museum and Art Gallery, pers. comm) but it is hard to verify their accuracy, and as hydrological conditions have changed, this risk should be assessed.

An initial strategic assessment of the hydrology and geology should be made to assess whether dewatering is a risk, and if so, where it could occur. This should be linked to the strategic assessment of weir removal sequencing. In the meantime, removal of some weirs could progress in the section downstream of Milldale with careful monitoring and creation of

habitat diversity through addition of LWM. The stones can easily be rebuilt into weirs provided they are not removed.

Summary of strategic work required

- Assessment of sequencing, number and location of weir removal or modification;
- Simple assessment of quantity of sediment trapped behind each weir and its composition – gravels and fines;
- Assessment of likely contaminants to inform decisions about reuse or disposal of sediment;
- Monitoring protocol to build evidence base on effect of restoration actions;
- Study of the stone used in weir building to determine how much should be left in the river if they are removed;
- Study of old paintings and maps;
- Assessment of hydrology and underlying geology to determine risk of dewatering.

These will be described in more detail below.

Further Information

The BBC website Your Paintings is an excellent resource in which you can search across all paintings in the country, by area. A search for Dovedale yielded this collection:

http://www.bbc.co.uk/arts/yourpaintings/mypaintings/~0a9afc1c7a869b19d8c1aefbcfc77af0e1c678aa/my-collection

The River Restoration Centre has an excellent Manual of Techniques, with case examples

http://www.therrc.co.uk/manual-river-restoration-techniques

Environment Agency 2013 'Weir removal, lowering and modification: A review of best practice'

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291470/LIT_8946_8863ea.zip

6.2.3 Restore - Remove bank reinforcements

Description

Between 50% and 90% of the river banks in the SSSI are reinforced with stone. In general the stone is not cemented and could be moved by hand. The reinforcements are often particularly notable near weirs, where they appear to have been installed to prevent the river from flowing around the weirs. Where reinforcements are being eroded this is usually next to weirs and consideration should be given to removing or lowering the weir rather than 'mending' the reinforcement.

The reinforcements are closely associated with the weirs and it is possible that when weirs are removed the reinforcements will be 'perched' above water level, and will no longer impede the river processes as much. It will be easier to assess the extent and impact of stonework after a weir is removed. On the other hand, removing the stone walls and creating in channel diversity with the stones prior to removal will create diversity during the time lag between weir removal and natural diversity being established.

Benefits

Removing bank reinforcements will allow the river to renaturalise and create more varied habitat for wildlife. The river will also be able to adjust through the process of erosion and deposition. This will help create a more diverse range of physical habitats and bring the river into contact with new sources of coarse sediment. The banks will form a more gently sloping cross section which will provide a greater variety of conditions as water levels rise and fall.

Constraints and their management

The risk of erosion of infrastructure such as roads and paths should be evaluated for each case. The Fluvial Audit notes that the river course has been very stable since 1800 and so large scale erosion is not expected. Where this may be an issue, consideration should be given first to whether paths or infrastructure may be moved. If not, establishing tree cover and establishing sensitive bank protection approaches should be considered.

It has been suggested through the consultation process that some of the eroding ‘cliffs’ shown in Figure 6, Figure 7 and Figure 8 are due to grazing and high human footfall and that removing bank reinforcements could cause accelerated erosion leading to an over wide, shallow river channel. This needs to be evaluated in each case and where appropriate bank stability needs to be developed by a combination of managing grazing and human footfall rates to allow marginal vegetation including natural tree regeneration to develop.

It is likely that bank reinforcement removal will require Land Drainage Consent from the Lead Local Flood Authority who will carefully assess any risks, and from Natural England. Protected species requirements will also need to be taken into account as part of this assessment.

6.3 Strategic Review

6.3.1 Strategic Review - Assessment of risk associated with sequencing and location of weir removal

The removal of any structure should be assessed with a thorough appreciation and understanding of reach hydromorphology, river corridor connectivity and catchment sediment dynamics. An integral part of this assessment would be scenario modelling of the timing, sequence and number of weirs to be removed to assess likely risks such as sediment mobilisation, upstream instability, and dewatering. Current morphological and hydrological conditions would be established and appropriate modelling of the river done to investigate the effects of different decommissioning scenarios both in the reach where a weir is removed as well as up and down stream.

6.3.2 Strategic review - Assessment of de-watering risk

An assessment of hydrology and geology should be made to assess whether dewatering following weir removal is a risk, and if so, where it could occur. This should be linked to the strategic assessment of weir removals.

6.3.3 Strategic Review - Assessment of quantity of sediment trapped behind each weir and its composition

As there are over 90 weirs, it is important to assess the total and cumulative amounts of sediment that would be released during weir removal. Measuring the depth and extent of material trapped behind each weir will give an approximate volume. Simple sediment sampling is needed. 'Options might include taking a few sediment samples from behind the weir and estimating the composition in terms of average gravel size and percentage fines.' (EA, 2013). Knowledge of the quantity and composition of sediment will allow a better picture of likely sediment movement following weir removal to be built up using modelling based on topographic surveys.

6.3.4 Strategic Review - Assessment of possible contaminants

It is not currently known whether the sediments contain any contaminants, for example lead or sheep dip. The sediments are also likely to contain organic matter which will reduce the oxygen content of the water temporarily and this can be harmful to aquatic life. Contamination tends to be associated with fine sediment so assessment of sediment quantity and grade will form a basis for assessing likely contamination. This can be done cost effectively by sampling at a number of priority weirs or where a higher likelihood of contaminations is identified. This information will form a basis for project design and decisions about whether to reuse or dispose of sediment currently stored behind weirs.

6.3.5 Strategic Review - Determine the source of the stone used to build weirs and bank reinforcements and develop a protocol for its use or disposal

There are over 90 weirs and between 50% and 90% of the whole 10.5 km of river has stone walls (Rice and Toone, 2011). This equates to between 10.5 and 18.9 km of stone walls. Taking a conservative estimate of walls being 33 cm thick and 50 cm high would yield a total of between 1,312 and 2,362 m3 of stone. Per linear metre of river this is a potentially very useful, 1/6 to 1/3 m3 of stone.

Some of the stone used to build weirs and walls will have come from the river and its removal in itself may have reduced in-channel diversity significantly. It seems likely that if the fish weirs were built to create deep water upstream, then stone would have been taken from upstream of them. We do not know if other stone was brought in. It is therefore important to research the source of the stone in order to deal with it appropriately. A request to landowners, museums and the public for any information about the construction of the weirs would be helpful. A study of the geology or lithology may be able to determine whether the stone is local. A protocol can then be developed to guide whether the stones should be placed back in the river channel, piled up on the banks or removed elsewhere. Experimenting with a range of approaches and recording the outcomes would be useful.

6.3.6 Strategic Review - Detailed study of old maps and pictures

This would help to determining the appearance of the former river and where former cascades were located so that they can be restored. This also will inform the removal of other weirs so that any boulders and natural cascades that which may have been originally in place are left rather than removed wholesale and guide the appropriate spacing of boulders and stones if it is deemed appropriate to place them in the channel.

6.3.7 Strategic Review - Monitoring protocol

Monitoring existing and future works carried out under this plan will be important in building up an evidence base to guide its ongoing implementation. The River Restoration Centre has very useful guidance Practical River Restoration Appraisal Guidance for Monitoring Options (RRC, 2011) provides useful guidance including a Monitoring Planner. A partnership approach to developing and implementing a monitoring protocol specific to 'Letting the Dove Flow' by agreeing the key questions to ask, methods to use and a central place to store the information will enable this to be done cost effectively in partnership with landowners, angling clubs, universities and other technical experts.

6.3.8 Strategic Review - Review EA gauging weir

The biggest weir on the Dove within the SSSI is the Environment Agency gauging weir which lies at the downstream end of Dovedale. It provides valuable information about flow levels, which will be useful as this programme goes forward. Nevertheless, a review should be undertaken of its impact and options to mitigate this explored.

6.3.9 Strategic Review - Review routing of footpaths

Dovedale is fortunate not to have much major infrastructure, and the main constraint is the public footpath where it runs very close to the river, and the road leading to Milldale village. It would be useful to review the possibility of re-routing the footpath in key places in the long term, as the Vision report suggests. Key places are shown below in the reach based maps.

6.3.10 Strategic Review - Explore re- coupling screes with river channel

A feasibility study is required of options for enabling this stone to reach the river. Safety risks would need to be carefully considered.

6.4 Communication, interpretation and engagement

Description

Dovedale is extremely popular with locals and visitors alike, and for this project this is a huge strength. Both the National trust and the Peak District National Park are keen to do more to promote understanding of the river and more generally, effective communication, interpretation and engagement are essential parts of engaging people in restoring the river.

Letting the Dove Flow will require ongoing relationship and partnership building and is likely to benefit from all of the following, which is not an exclusive list:

- Face to face meetings and site visits;
- Interpretation panels;
- Media, including apps and social media;
- Printed materials;
- Citizen science, including monitoring using fixed point photography, RiverFly approach (see Further Information);
- Requests for historic information, pictures etc;
- Demonstration projects;
- Monitoring and publicising outcomes;
- Events.

Benefits

The recommended restoration solutions can only be achieved by engaging with those who can agree to or prevent the restoration actions from being implemented.

Engaging with an individual or group can provide more information and/or a fresh perspective which helps to inform our actions. Challenges to accepted views can be helpful too in raising useful questions.

Through engaging with people, a sense of purpose and excitement about this journey can be developed and maintained which will allow progress to be made more quickly and effectively in the long run, and maintained over the long timescales required, by engaging with different people, more resources can be brought to bear.

Constraints and their management

Good communication will help to reduce anxieties. A clear strategy for publicity and public relations work is required in order to articulate the restoration Vision and benefits to a wide audience, and to minimise the risk of adverse publicity. The public consultation on this report is the start of this. An initial Communications Plan was written for the first stage of the project and this will need to be developed for the medium and long term.

Section 7 - Reach based recommendations

This section sets out high level potentially suitable restoration options. The detail of any specific restoration projects will need to be developed in conjunction with landowners and other stakeholders, in order to identify constraints and design appropriate restoration options. Actions will only be taken forward once agreement has been gained from the relevant stakeholders, and will be carried out in close partnership to ensure effective delivery and viability of the solution. It will be vital that those who own, have legal rights such as fishing rights, or use the river and land surrounding it wish to proceed. Consents will to be required from a range of authorities, depending on the issues: Natural England, Flood Authority, Peak District National Park Authority if planning permission is required, and Environment Agency for any waste licences. A Habitats Regulations Assessment will form part of the relevant permitting processes. On National Trust land their archaeologist must also be consulted. This can be quite complex and takes time and proposals are made within the Action Plan to streamline this process.

In practice, to take forward the potential solutions set out in the following pages for each reach, there will be some important considerations that need to be taken into account. It is important to also regard reaches collectively and consider potential cumulative effects, particularly if working ‘out of sequence’ as opportunities present themselves. In many cases the first action to be taken towards implementing the solution at a particular location will be to investigate whether the solution is sustainable and to consider whether it takes into account how the river will function for both wildlife and those who use the river now and in future. A key part of this must also be to take into account how adaptable the solutions are to climate change.

Before any works are undertaken on the ground, it is important that ecologically valuable habitats (e.g. fish spawning grounds, crayfish and otter habitat) are identified and measures are adopted to ensure that the river continues to provide suitable habitat for the long term survival of the species concerned. Access routes and site compounds, and arrangements for ground reinstatement must be agreed with landowners and managers in advance of works.

For the purposes of this Restoration Plan, the River Dove has been divided into six Management Reaches based on the prevailing geomorphological and ecological characteristics of each reach, in line with the Fluvial Audit and Vision Report. A brief breakdown of the boundaries of each management reach and their relationship to the fluvial audit reaches and SSSI units is provided in Figure 18. The reaches are very closeley aligned to land holdings which will be helpful help when it comes to implementing solutions.

The following pages contain summary sheets which identify the potential solutions recommended for each management reach. The solutions are colour coded according to the type of actions required, as explained in the previous section. For each reach there is:

1. A Reach Summary based on the fluvial audit and more recent site visits outlining the character, challenges and opportunities of that reach;
2. Photographs illustrating the current characteristics of the reach;
3. A table of the solutions described, how they can be applied to this reach and the benefits here;
4. An annotated aerial photograph showing reach location, potential solutions and constraints.

It is intended that these summary sheets be used as a basis for detailed discussions and development of plans with land owners and angling club.

Reach ID this report	SSSI Unit	Reach ID in Fluvial Audit	Location description	Length (m)
1	40	19	Wolfscote Dale (Frank's Rock Bridge to Biggin Dale)	2002
2	42	20	Biggindale to Coldeaton Bridge	1204
3	42	21	Coldeaton Bridge to Lea Plantation	2655
4	43	22	Lea Plantation to Pickering Tor	1680
5	43	22	Pickering Tor to just below Lovers Leap	1691
6	43	22	Lovers Leap to Dovedale Carpark	1245

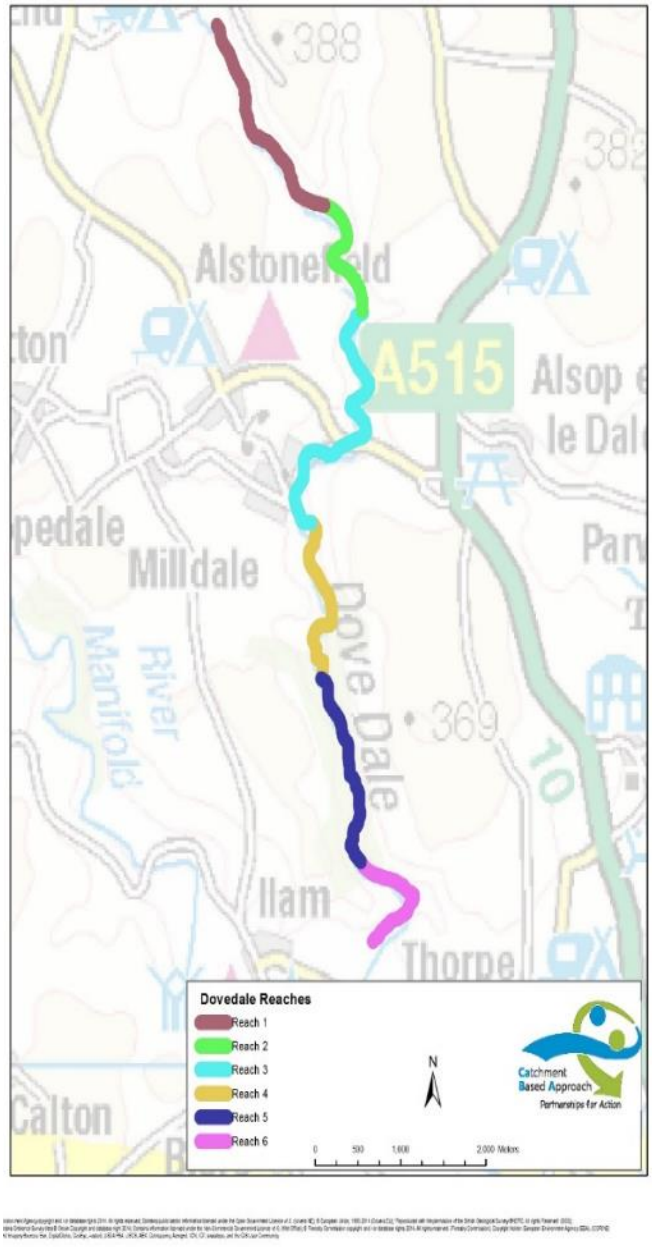


Figure 18 Table and map showing river management reaches.

7.1 Reach 1: Top of Wolfscote Dale to Biggin Dale confluence

Reach Summary

Characteristics

This reach has steep and often scree covered valley sides and the floodplain is narrow, with the footpath running between river and valley side. There are 23 weirs, some of which are beginning to break down naturally. Banks are often reinforced limiting lateral movement and coarse sediments from the screes rarely reach the river. Tree cover is sparse, much of it alder, an estimated 80% of which is infected by phytopthera which has killed some and is likely to kill more. (Stephen Moores, River Keeper, pers. comm. 20.1.2015). The channel gradient is fairly high and constant and there is flowing water between the weirs. There is occasional woody material in the channel. Water levels were fairly high when visited for this report (Jan 2015) and bedrock was not evident in the channel. Conditions in this reach appear particularly uniform.

Challenges and Opportunities

- Lack of tree cover and presence of phytopthera;
- Weirs, bank protection and footpaths limit the supply and movement of coarse sediment which could in time form a riffle pool sequence here and downstream
- Footpath follows the river very closely;
- Low flows and potential for shallow or insufficient water for fishing interest should weirs be removed if other steps are not taken to provide deeper pools and habitat variety;
- Straight channel confined by steep limestone dale sides with constant gradient;
- Weirs currently provide some variety in flow depth and speed in what is an otherwise uniform channel. Weir removal would ultimately provide more varied habitat, but there would be a time lag before this was achieved (Rice and Toone 2011). Care is needed to ensure there is a good mosaic of habitats including some deeper areas for fish and silty areas for mayfly is encouraged (potentially by introduction of large woody material) if weirs are removed;
- Adjacent scree slopes on the right (west) bank are SAC designated.

NOTE: PROJECT DESIGN MUST CONSIDER IMPACTS ON THE ADJACENT SAC DESIGNATED SCREE SLOPES ON RIGHT (WEST) BANK OF RIVER WHEN RESTORING LATERAL RIVER MOVEMENT. CONSIDER EARLY IN DESIGN PROCESS AND CARRY OUT HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH.

Typical view.

Gravels could feed the river.

Woody material.

Backwater feature.

Weir beginning to break down.

Signs of phytopthera.

Figure 19 Reach 1: Photographs.

Table 7 Reach 1: Solutions and their rationale.

Management Reach 1	**Fluvial Audit Reach: 19**	**SSSI unit: 40**
Solution	**Application to Reach 1**	**Benefit**
Management practices to Assist Natural Recovery		
Continue not to maintain weirs and bank reinforcements.	Gradient makes this effective over time. Assist natural recovery by selective breaching. Use stone to create varied niches.	Sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied habitat niches.
Continue not to remove large woody material	Leave LWM in place where possible but apply best practice to ensure that any reuse of woody material does not risk spreading phytopthera.	Greater habitat varieties, as weirs break down or are removed. Scouring of pools to retain water at low flows and cleaning of gravels.
Tree management	Management required to combat phytopthera, with coppicing and burning diseased trees. Best practice should be followed. Encourage natural regeneration of trees. Some fencing may be needed.	Manage and maintain tree cover where appropriate despite phytopthera, and limit its spread.
Restore		
Introduce large woody material	Introduction of LWM may be necessary if it is deemed that using local material may spread phytopthera to unaffected reaches up or downstream. Place where tree cover is sparse or where weir removals are planned.	Greater habitat variety for all aquatic life will be provided as weirs break down or are removed. LWM will encourage scouring of deeper pools to retain water at low flows and cleaning of gravels.
Remove or modify weirs	Identify some weirs which could be removed or modified to allow coarse sediment to be mobilised. Work in stages to enhance and maintain habitat diversity as weirs are removed.	Key for long term river health. Weir removal, combined with LWM will enable the river to re-work sediments, forming riffles and pools here and downstream. Re-use stone to provide habitat variation.
Remove bank reinforcements	Habitats Regulations Assessment of impacts on the SAC designated scree slopes and assessment of the risk of erosion to public footpath needed in relation to specific locations where this is proposed. Any risk identified managed appropriately. Initial removal on the right bank would pose least risk to the footpath for example, and might therefore be the priority.	Allow lateral movement of the river so that it can bring coarse sediment from scree slopes on non-footpath bank, and provide varied habitat.

Management Reach 1	**Fluvial Audit Reach: 19**	**SSSI unit: 40**
Solution	**Application to Reach 1**	**Benefit**
Reconnect scree stones with river	Consider options to reconnect river to supply of scree slope gravels. In short term, gravel from the river side of the path may be recovered and reused in channel but avoid destabilising foot of the scree slope. Longer term, removal of bank protection may bring river into contact with scree gravels. Link with strategic review of footpaths, scree slopes and Habitat Regulations Assessment for each individual section.	Increased gravels in river, providing habitat for crayfish, lamprey, bullhead, salmonids and invertebrates.
Strategic review		
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel.	Reuse of stone could provide vital habitat variety.
Feasibility of reconnecting scree stones with river	This reach has the most potential for scree slopes to add stone and gravel into the river system, where this material is in short supply. This review is needed to inform the restoration action above. Note requirement above for Habitat Regulations assessment.	Increased supply of coarse sediment throughout as it is moved downstream. Vital for natural recovery.
Review routing of footpaths	Consider this alongside actions to recouple the river with scree slopes, weir and bank protection removal.	As above.
Assess impact of low flows if weirs removed.	Low flows affect this reach and there is a concern that removing weirs might lead to insufficient deep water habitat.	Ensures that if weirs are removed there is sufficient diversity of water depth to sustain populations of fish and other aquatic wildlife.
Monitor	Monitor and review actions to ensure aims met and to achieve the best balance between restoration actions.	Improved understanding of effect of restoration measures. Evidence of restoration contributing to establishing a healthy self-sustaining river system.

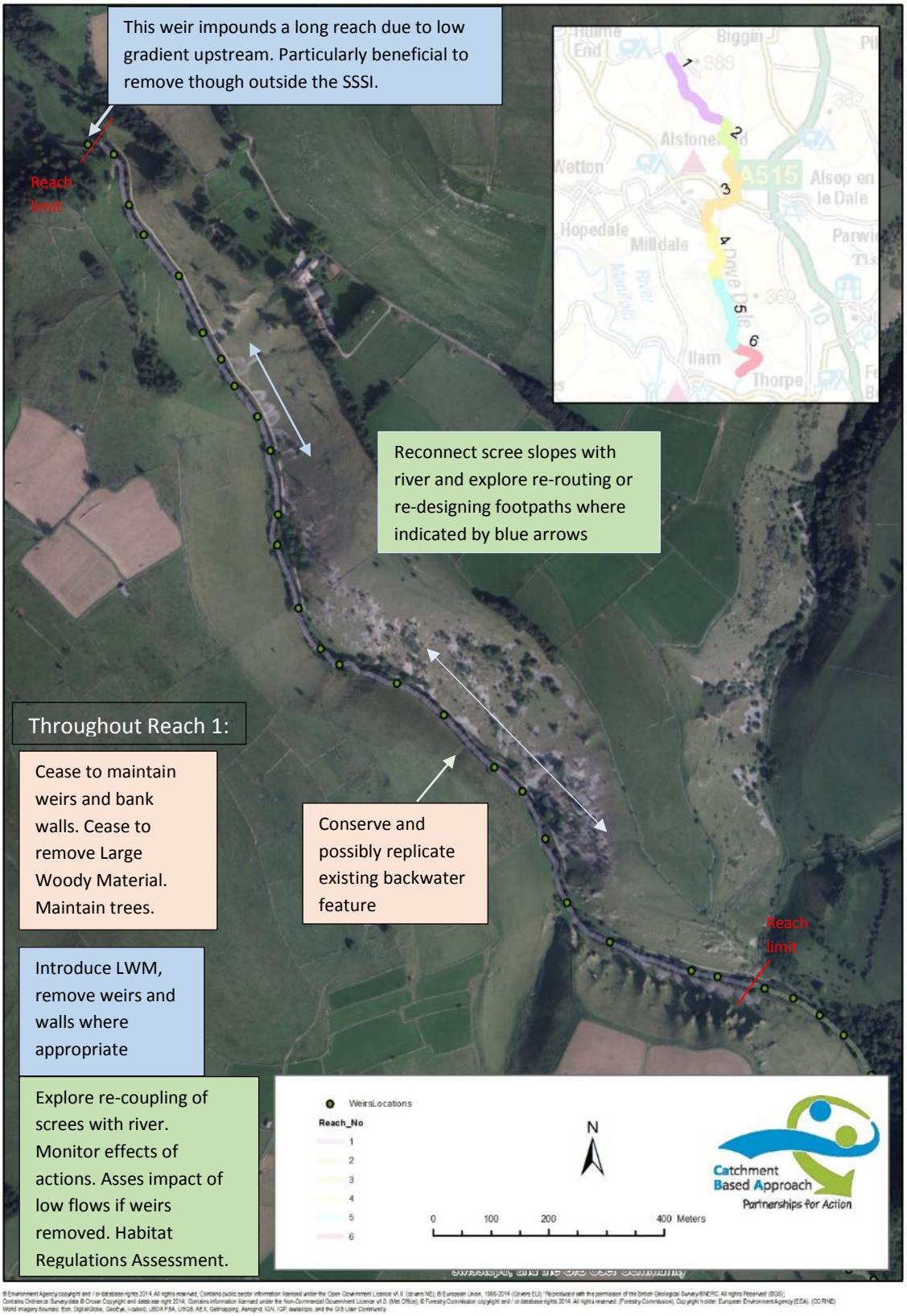


Figure 20 Reach 1: Aerial photograph with potential restoration solutions.

7.2 Reach 2: Confluence with Biggin Dale to Coldeaton Bridge

Reach Summary

Characteristics

Reach 2 contains 23 weirs which are often closely spaced and considerable lengths of bank reinforcements. Some of the weirs are showing signs of beginning to break down naturally and the bank reinforcement is quite low and breaking up in places. The eastern valley side is wooded and there is much more, and more varied tree cover here than in Reach 1, with occasional naturally occurring LWM in the channel. The valley is more varied here than in Reach 1 and there are some stretches within this reach where the river can flow freely. There is an area of floodplain woodland, a ram pump and a concrete weir.

Challenges and Opportunities

- There is more tree cover in this reach. However, with phytopthera upstream in Reach 1 and risk of ash die-back, there is a risk that trees will be affected here
- There could perhaps be an opportunity on this reach to look to develop a business case promoting angling exclusively for wild trout, allowing natural habitats to develop, should the fishery wish to pursue it
- The footpath does not follow the river as closely and there are areas of floodplain, some tree-covered

NOTE: PROJECT DESIGN MUST CONSIDER IMPACTS ON THE ADJACENT SAC FEATURES (SCREE SLOPES, GRASSLAND AND WOODLAND) WHEN RESTORING LATERAL RIVER MOVEMENT. CONSIDER EARLY ON IN DESIGN PROCESS AND CARRY OUT HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH.

Braided channel below Biggindale confluence.

Varied banks.

Wet woodland – conserve.

Iron Tors Ram Pump.

Figure 21 Reach 2: Photographs.

Table 8 Reach 2: Solutions and their rationale.

Management Reach 2	**Fluvial Audit Reach 20**	**SSSI unit 42**
Solution	**Application to Reach 2**	**Benefit**
Management practices to Assist Natural Recovery		
Continue not to maintain weirs and bank reinforcements.	Weirs will break down gradually over time. Experiment with selective breaching. Use stone to create varied niches.	Sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied niches.
Continue to retain large woody material	Leave LWM in place where possible but best practice to manage phytopthera should be used.	Greater habitat variety as weirs break down or are removed. Scouring of pools to retain water at low flows and cleaning of gravels.
Tree management	Monitor for signs of phytopthera and ash die-back disease.	Maintain tree cover despite phytopthera upstream and limit its spread.
Restore		
Introduce large woody material	Place where tree cover is sparse or where weir removals are planned.	Greater habitat variety for all aquatic life as weirs break down or are removed. Scouring of deeper pools to retain water at low flows and cleaning of gravels.
Remove Weirs	Identify weirs which could be removed or modified to allow coarse sediment to be mobilised. Work in stages to enhance and maintain habitat diversity as weirs are removed.	This will allow gravel from upstream scree slopes to be transported downsteam. Combined with LWM will enable the river to re-work sediments, forming riffles and pools here and downstream. Re-use stone to provide habitat variation.
Remove bank reinforcements	In places where the footpath is away from the river this could be achieved with low risk. Assess impacts on adjacent SAC features – screes, woodlands, grasslands.	Allow some lateral movement of the river to create more varied bankside habitat.
Reconnect gravels with river	Add gravel from the river side of the path to river where there is a scree slope.	Increased gravels in rivers.

Management Reach 2	**Fluvial Audit Reach 20**	**SSSI unit 42**
Solution	**Application to Reach 2**	**Benefit**
Strategic review		
Feasibility study of removing concrete weir	Establish its ownership and purpose. Informal discussions suggest it may be linked to water supply of neighbouring village.	If possible, remove this weir which forms the largest barrier in Reaches 1 and 2.
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel.	In the absence of weirs this would provide vital habitat variety.
Assess impact of low flows if weirs removed.	Low flows affect this reach and there is a concern that removing weirs might lead to insufficient deep water habitat.	Ensures that if weirs are removed there is sufficient diversity of water depth to sustain populations of fish and other aquatic wildlife.
Review routing of footpaths	Consider this in one location to allow scree to feed river. Conduct Habitat Regulations Assessment of SAC feaures.	Increased supply of coarse sediment throughout as it is moved downstream. Vital for natural recovery.
Other		
Experiment and Monitor	Small scale experiments with weir removal and monitor results.	Increased evidence base for restoration solutions downstream.

Figure 22 Reach 2: Aerial photograph with potential restoration solutions.

7.3 Reach 3: Coldeaton Bridge to Lea Plantation

Reach Summary

Characteristics

There are 35 regularly maintained weirs in this long reach which also includes the village of Milldale, with Viators Bridge and the only stretch of road adjacent to the river in the SSSI crossing the river at Lode Bridge. The National Trust have an interpretation barn at Milldale which provides an opportunity to tell the story of the river. Tree cover here is limited and trees are carefully managed to enable anglers to cast their lines with little obstruction. This reach is stocked annually with 750 fish.

Challenges and opportunities

The weirs here are viewed by the owners as an important part of the family history and for the angling on which the family business depends. The owners consider that the weirs keep the river in good health, with good populations of fish and invertebrates, and maintain them accordingly.

It is important ensure any changes are made gradually and do not affect the economic viability of the fishery. In the short to medium term, it is recommended that restoration is limited to small scale demonstration projects in this reach. Data collection, implementation of projects and monitoring of the effects could all be carried (with support) by the fishing club during their monthly work parties. This would help ensuring that all parties are fully involved in testing and evaluating restoration options, and developing a shared way forward:

- There is a good opportunity to provide information about the river and its management and restoration in the village of Milldale;
- Most of the historic structures with statutory and non-statutory designations are in this reach and are potential constraint;
- The road runs close to the river in this reach and is potentially a constraint to restoration of lateral movement;
- Low flows affect this reach and there is concern that there could be shallow or insufficient water for fishing interest and other wildlife should weirs be removed;
- There is considerable floodplain area where the footpath is at a distance from the river;
- Large woody material could be perceived as interfering with fishing, however there are ways to manage large woody material (such as trimming it above the waterline so that lines do not snag on it), and ensuring that bankside trees are managed carefully to allow casting. Close working with angling clubs should enable large woody material to be located and managed to reduce the risk of it affecting the fishing experience negatively.

Where it is agreed that weirs and bank reinforcement can't be removed due to legitimate constraints such as proximity to the road, the target for favourable physical habitat condition may be reduced accordingly.

HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH WILL BE REQUIRED.

Closely spaced weirs with little natural flow diversity.

Rebuilding the weirs – photo courtesy of Dove Cottages website.
www.dovecottages.co.uk/history

Near Coldeaton Bridge - potential location for interpretation.

Example of stone bank protection typical of much of the river.

Weirs and walls carefully maintained.

Backchannel, the former trout hatchery, restored by Derbyshire Wildlife Trust.

Figure 23 Reach 3: Photographs.

Table 9 Reach 3: Solutions and their rationale.

Management Reach 3	**Fluvial Audit Reach 22**	**SSSI Unit 42**
Solution	**Application to Reach 3**	**Benefit**
Management Practices to Assist Natural Recovery		
Cease to maintain weirs and bank reinforcements.	Long term aim. Develop trial/demonstration projects in short to medium term.	Sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied habitat niches.
Cease to remove large woody material	Leave LWM in place where possible	Provides greater habitat variety for all life stages of trout, including scouring pools to retain water at low flows and cleaning of gravels. Retention of large woody material is particularly important as weirs break down or are removed.
Tree management	Refine management to retain more overhanging branches, whilst still enabling angling. Monitor tree health.	Shading, cover and habitat.
Restore		
Introduce large woody material	Experiment with introduction of LWM and monitor results.	Greater habitat variety for all aquatic life. Scouring of deeper pools to retain water at low flows and cleaning of gravels.
Remove weirs	Develop trial/demonstration projects in medium term.	Sediment can be shaped by the river to form riffles and pools here and downstream. Key for long term river health. Use stone to provide varied niches.
Remove bank reinforcements	Risk of erosion to footpath would need to be assessed in relation to specific locations.	More variety in river bank habitat. Allow lateral movement of river, likely to be minimal.
Strategic review		
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel.	In the absence of formal weirs this would provide vital habitat variety. Preserve the history of the weirs by appropriate recording.
Assess impact of low flows if weirs removed.	Low flows affect this reach and there is a concern that removing weirs might lead to insufficient deep water habitat.	Ensures that if weirs are removed there is sufficient diversity of water depth to sustain populations of fish and other aquatic wildlife.

Management Reach 3	Fluvial Audit Reach 22	SSSI Unit 42
Solution	**Application to Reach 3**	**Benefit**
Demonstration and monitoring	Monitor contrasting features eg weirs heavily maintained and breaking down. Demonstrate the value of implementing this restoration plan.	Engagement with landowner and angling club. Demonstrate that change can be beneficial to conservation and fishery.
Archaeological survey	Establish age and function of river furniture.	Inform future decision making.

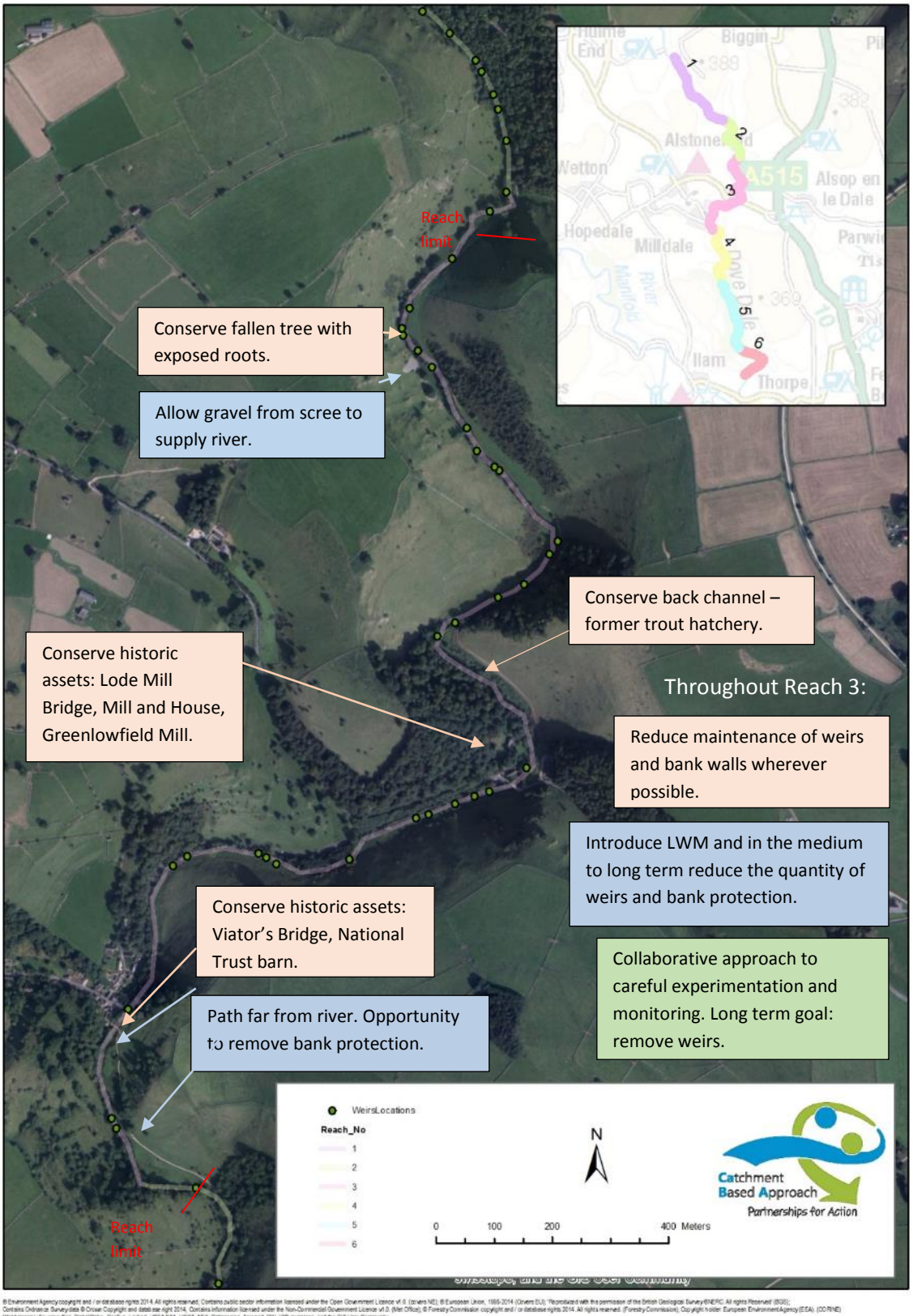


Figure 24 Reach 3: Aerial photograph with potential restoration solutions.

7.4 Reach 4: Lea Plantation to Pickering Tor

Reach summary

Characteristics

In Reach 4 there are areas of floodplain alternating on either side of the river channel before the valley becomes more confined and wooded. There are 16 weirs within the reach, many of which are showing signs of breaking up leading to varied flows and habitat diversity. Where there is a wider floodplain and the gradient is less steep, the weirs impound flow up to 100m upstream. The structures themselves tend to be wide, with evidence of them being extended as the river has worked its way around them. In the more confined, straighter sections the impounded lengths are much shorter.

Challenges and opportunities

The mixture of ownership and fishery management responsibility provides both challenges of different views on management and an opportunity for collaboration. The footpath here is often further away from the river in terms of distance and height, which means it would be less affected by restoration actions such as weir and bank reinforcement removal. This does however mean that access is more difficult. Removing the weirs in the gentler gradient stretches would have most benefit in terms of removing long impoundments.

Weir impounds reach for a long way upstream.

Typical weir in more confined section.

Figure 25 Reach 4: Photographs.

HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH WILL BE REQUIRED.

Table 10 Reach 4: Solutions and their rationale.

Management Reach 4	**Fluvial Audit Reach 22**	**SSSI unit 43**
Solution	**Application to Reach 4**	**Benefit**
Management Practices to Assist Natural Recovery		
Continue not to maintain weirs and bank reinforcements.	Effective over time. Assist natural recovery by selective breaching. Use stone to create varied niches.	Sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied niches and natural cascades and boulders will be uncovered.
Cease to remove large woody material	Leave LWM in place where possible.	Greater habitat variety as weirs break down or are removed. Scouring of pools to retain water at low flows and cleaning of gravels.
Tree management	Agree appropriate tree management plan. Monitor tree health.	Appropriate tree management compatible with angling, gives views of the tors, creates variety of bankside conditions and prolongs life of trees.
Restore		
Introduce large woody material	Introduce LWM and monitor results.	Greater habitat variety for all aquatic life. Scouring of deeper pools to retain water at low flows and cleaning of gravels.
Remove weirs	Remove weirs, reducing effect of impoundment on the reach.	Sediment can be shaped by the river to form riffles and pools here and downstream. Key for long term river health. Use stone to provide varied niches.
Remove bank reinforcements	Risk of erosion to footpath would need to assessed case by case. Check for impacts on footpath.	More variety in river bank habitat, river free to move laterally.
Strategic review		
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel.	In the absence of weirs this would provide vital habitat variety. Preserve the history of the weirs.

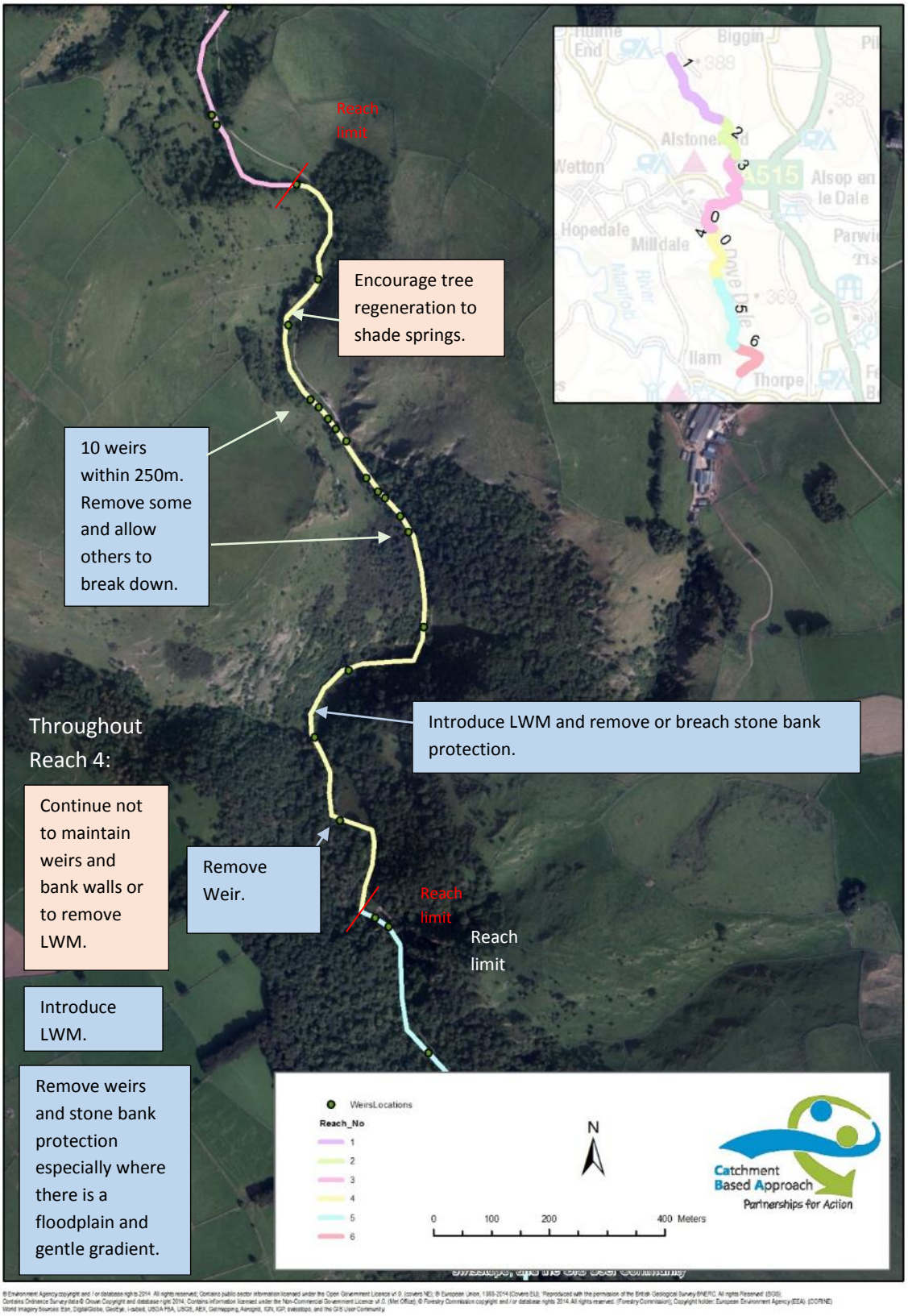


Figure 26 Reach 4: Aerial photograph with potential restoration solutions.

7.5 Reach 5: Pickering Tor to just below Lovers Leap

Reach summary

Characteristics

In Reach 5 the river enters a spectacular gorge. The river is very confined and follows a largely straight course with a high gradient. The footpath is squeezed into the same space, and is on a causeway in places. A study of old pictures shows that before the weirs were installed there were several stretches that were naturally impounded behind boulders. The river flows over bedrock, and conforms to the 'cascades' typology that is part of this river type (type V and VI as described by the JNCC, along with the gravel features which the Vision Report describes). There are fewer weirs in this reach and most are showing strong signs of breaking down to the extent that they impound the flow much less. There is a wider variety of features here including mid channel bars, eroding banks, individual boulders and large woody material. The angling club has already taken steps to remove a weir and install LWM as a first step in restoring natural channel characteristics.

Challenges and Opportunities

There is a great opportunity within this reach in particular to work with angling interests and the Wild Trout Trust to re-naturalise the river, with the shared aim of renaturalising the river and managing it as a self-sustaining wild trout fishery.

The old pictures are a helpful resource, as they to show us how the river potentially looked historically, sometimes several hundred years ago. By using this historical evidence, we get an impression of how the Dove looked here prior to the weirs, and there is therefore now the opportunity to uncover these old cascades and rapids, thus returning the Dove to its former glory.

The valley here is very constrained and the river has to share the narrow valley floor with the footpath, which relies on major bank reinforcement in places. The constrained valley and steep gradient mean that the river has high stream power to move sediment and natural recovery occurs effectively. The impact of the footpath on river function and the potential to re-route it should be explored, so that in the longer term as repairs are required more sympathetic alternatives can be considered which are more sustainable in terms of maintenance and river habitat.

HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH WILL BE REQUIRED.

Stone path.

Causeway and associated bank reinforcement.

Naturally braided channel.

Large woody material.

Weir has been breached naturally. Remove introduced stone.

Weir built over natural boulders.

Figure 27 Reach 5: Photographs.

Philip James de Loutherbourg 1740–1812, Dovedale in Derbyshire, York Museums Trust.

Dove Dale No.3, 1805 Aquatint by James Bluck, Derbyshire County Council, Buston Museum and Art Gallery.

Figure 28 Reach 5: Old paintings.

Table 11 Reach 5: Solutions and their rationale.

Management Reach 5	**Fuvial Audit Reach 22**	**SSSI unit 43**
Solution	**Application to Reach 5**	**Benefit**
Management Practices to Assist Natural Recovery		
Continue not to maintain weirs and bank reinforcements	Weirs are no longer being maintained, thereby assisting natural recovery.	Coarse sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied habitat niches.
Cease to remove large woody material	Leave LWM in place where possible. Monitor effects on footpath.	Greater habitat variety as weirs break down or are removed. Scouring of pools to retain water at low flows and cleaning of gravels.
Tree management	Agree appropriate tree management plan. Monitor tree health.	Appropriate tree management compatible with angling, gives views of the tors, creates variety of bankside conditions and prolongs life of trees.
Restore		
Introduce large woody material	Introduce LWM and monitor results.	Greater habitat variety for all aquatic life. Scouring of deeper pools to retain water at low flows and cleaning of gravels.
Remove weirs	Remove all the weirs through this reach over time unless they have historic conservation value and re-establish/uncover cascades and rapids.	Scouring and shaping of gravels, habitat improvements.

Management Reach 5	Fuvial Audit Reach 22	SSSI unit 43
Solution	**Application to Reach 5**	**Benefit**
Remove bank reinforcements	In the short/medium term where not impacting on footpath. Longer term seek to move (set back) paths, or where there is no alternative route, establish more sympathetic approach to bank protection.	More variety in river bank habitat.
Strategic review		
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel. Retain as much as possible.	Key to project design as carting away 'waste' stone would be costly.
Study old pictures	Establish reference conditions.	Natural boulders are left in situ, valuable habitat. Good for public engagement.
Monitor and publicise	The removal of all weirs in this reach is ambitious and should be closeley monitored to learn the lessons for here and elsewhere. There is a fine balance between maintenance of stone reinforcements and safety of footpath, which should be carefully monitored.	Data to demonstrate the value of restoring the river.
Sequencing of weir removal	There is potential to remove a number of weirs in one project here.	A study would help to evaluate impacts and inform planning of the sequence of removal and project design.
Study of impact of footpath and consider re-routing	Potential impacts of footpath on river habitat where it is built into the gorge side.	Long term sustainable solution with lower maintenance requirement.

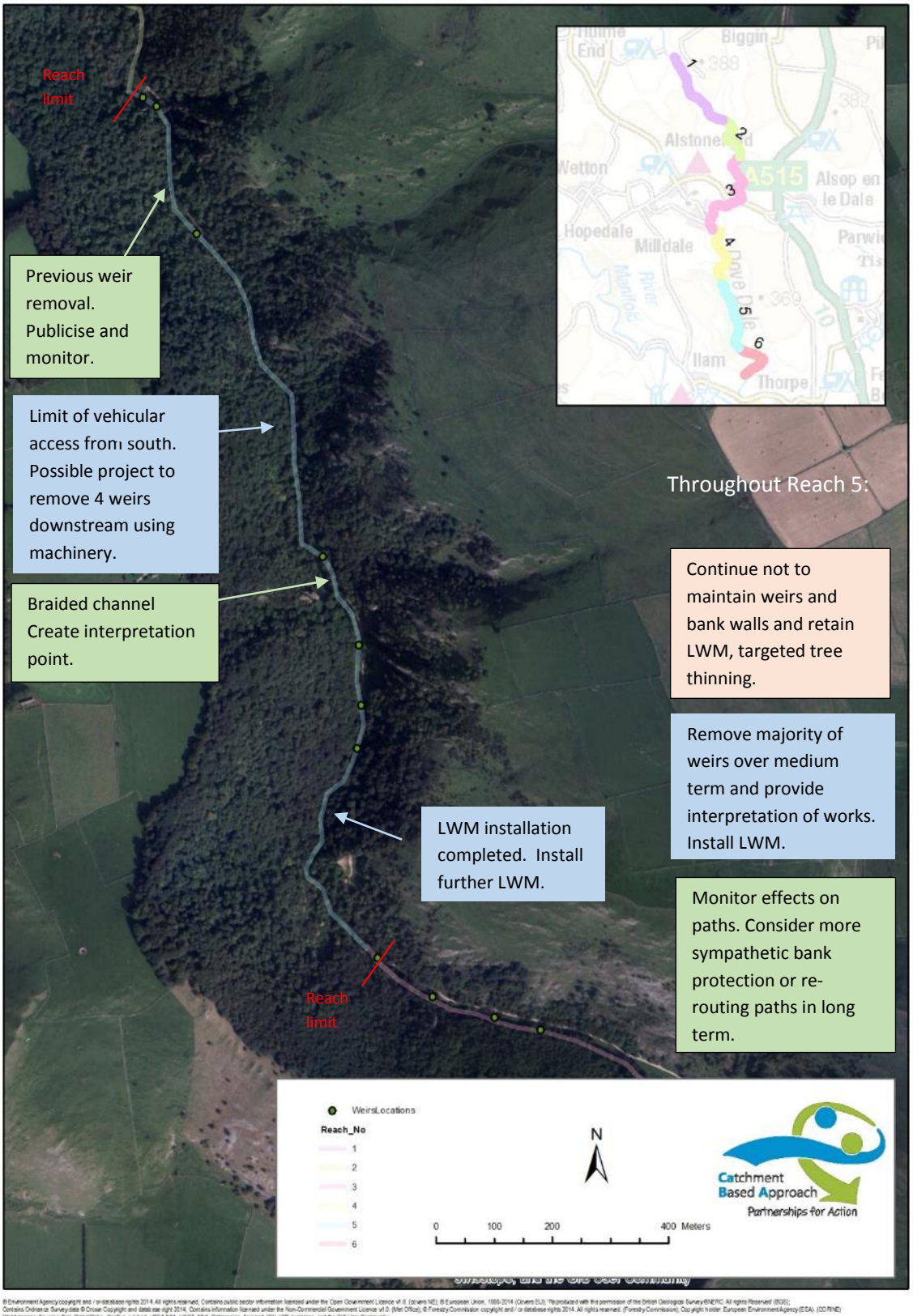


Figure 29 Reach 5: Aerial photograph with potential restoration solutions.

7.6 Reach 6: Lovers Leap to Dovedale Carpark

Reach Summary

Reach 6 is the most popular reach with visitors, ending with the Dovedale car park at the downstream end of the reach, where most visitors will start and finish their walk. Here the channel is much wider and generally less steep, though still constrained in parts by the valley sides where scree slopes stretch towards the river, separated by a footpath. Upstream of the stepping stones is a weir which impounds the river significantly, providing a much loved view and popular play area. There are six weirs in total along this reach. Below the stepping stones are longer sections without weirs where there are riffles and pools, gravel bars and eroding banks. Small weirs are still seen here, but have a limited influence.

Challenges and Opportunities

The high visitor numbers and popularity of this reach may limit how much it can be altered, with some locations such as the stepping stones and weir immediately above being highly valued from a cultural heritage and landscape perspective. However, the readily accessible nature of this reach also offers an opportunity to explain the issues to a wide audience and to engage them in the restoration 'journey'. Where it is agreed that weirs and bank reinforcement can't be removed due to legitimate constraints, the target for favourable physical habitat condition may be reduced accordingly.

NOTE: PROJECT DESIGN MUST CONSIDER IMPACTS ON THE ADJACENT SAC DESIGNATED SCREE SLOPES ON RIGHT (WEST) BANK OF RIVER WHEN RESTORING LATERAL RIVER MOVEMENT. THIS MUST BE CONSIDERED EARLY IN DESIGN PROCESS. **HABITAT REGULATIONS ASSESSMENT OF INDIVIDUAL PROJECTS IN THIS REACH WILL BE REQUIRED.**

Weir by the stepping stones.

Long impoundment above this weir.

LWM provides habitat variety.

Smaller weirs upstream.

Potential to demonstrate approach to retaining large woody material in the river near car park and interpret for the public.

Habitat variety in the lower part of the Reach 6 and scree slope with footpath at its foot.

Figure 30 Reach 6: Photographs.

Table 12 Reach 6: Solutions and their rationale.

Management Reach 6	**Fluvial Audit Reach 22**	**SSSI Unit 43**
Solution	**Application to Reach 6**	**Benefit**
Management practices to Assist Natural Recovery		
Continue not to maintain weirs and bank reinforcements	Weirs will break down gradually over time. Experiment with selective breaching. Use stone to create varied niches.	Sediment available for river to form riffles and pools here and downstream. Key for long term river health. As weirs break down stone will provide varied habitat niches.
Cease to remove large woody material	Continue to leave LWM in place where possible and employ best practice to manage tree disease.	Greater habitat variety as weirs break down or are removed. Scouring of pools to retain water at low flows and cleaning of gravels.
Tree management	Monitor tree health	Resilience to tree disease
Restore		
Introduce large woody material	Introduce LWM, intpret for visitors and monitor and share results.	Greater habitat variety for all aquatic life. Scouring of deeper pools to retain water at low flows and cleaning of gravels. Public awareness.
Remove weirs	Short – medium term demonstrate value of weir removal to public. Longer term develop programme of weir removal and modification that takes into account which structures have particularly high cultural and landscape value.	Scouring and shaping of gravels, habitat improvements.
Remove bank reinforcements	Recommended where footpath and roadway are not close to the river bank.	If some weirs cannot be removed here in particular, removing bank reinforcements may add important habitat variety.
Reconnect gravels with the river	Consider options to reconnect river to supply of scree slope gravels. In short term, gravel from the river side of the path may be recovered and reused in channel. Avoid destabilising foot of the scree slope.	More gravel supply for the river to shape into riffles, pools etc. Benficial for trout, lamprey, bullhead, crayfish and invetebrates.
Strategic review		
Study origin of stone in weirs and walls	Establish how much stone should be retained in channel. Retain as much as possible.	Key to project design as removing ‘waste’ stone would be costly.

Management Reach 6	Fluvial Audit Reach 22	SSSI Unit 43
Solution	**Application to Reach 6**	**Benefit**
Monitor and publicise	Involve the public in monitoring and understanding the 'story' of Letting the Dove Flow.	Data to demonstrate the value of restoring the river.
Explore re-coupling of screes with river	Below the stepping stones Reach 6 has scree slopes which could supply the river with coarse sediments. This needs to be balanced with importance of bankside access. Need to avoid destabilising foot of the scree slope. Potential to redesign or re- route footpath.	Increased supply of coarse sediment.
Environment Agency Gauging weir	Consider removal, modification or alternative gauging method. Strategic importance of structures, accuracy of record, and alternative gauging methods suitable at this location are all important factors to take into account.	Evidence with which to consider whether removal or alternatives are beneficial and feasible.

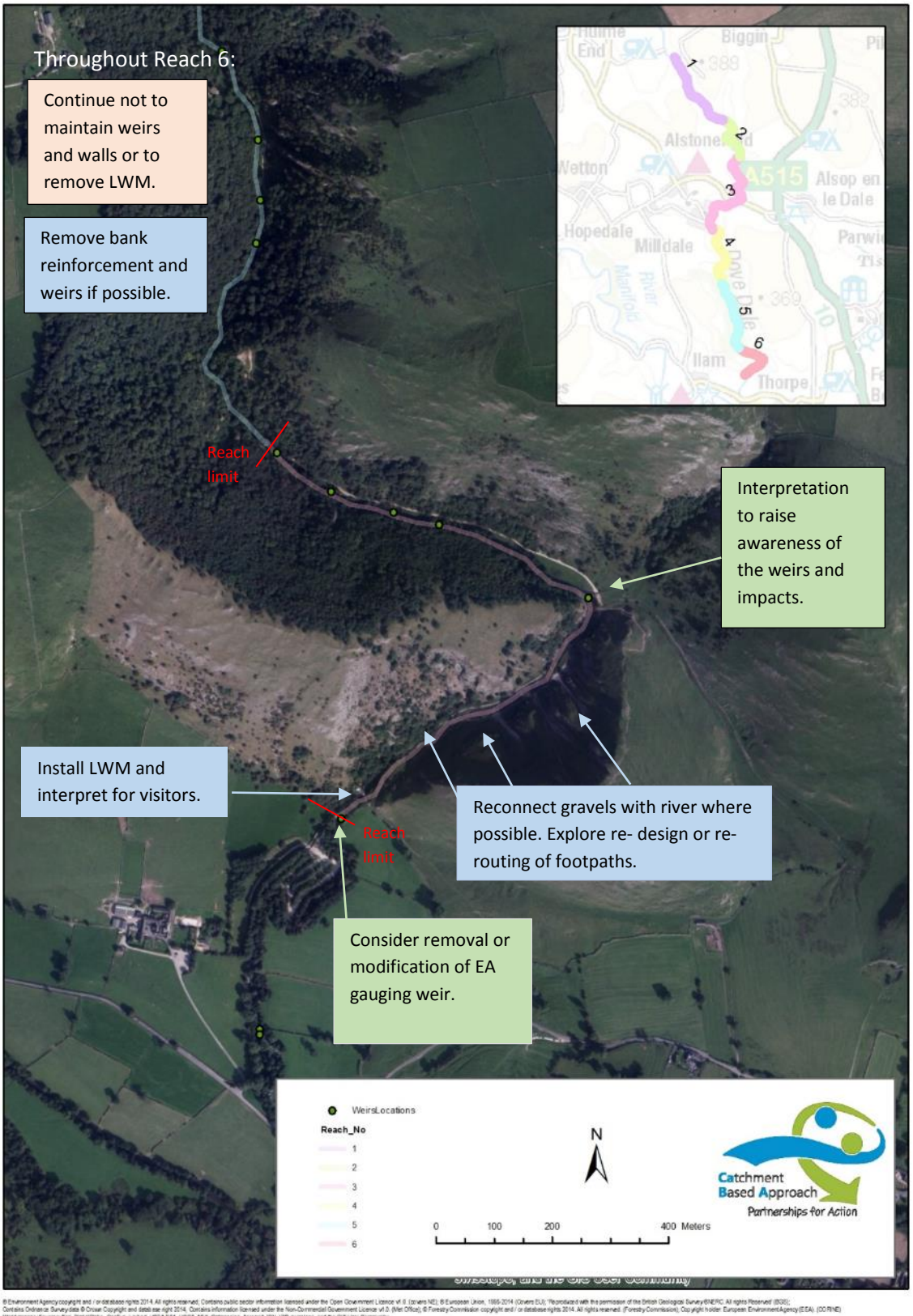


Figure 31 Reach 6: Aerial photograph with potential restoration solutions.

Section 8 - Action Plan

This Action Plan describes the solutions that are proposed to address the ecological issues. It follows discussion with many interested parties and importantly it considers these in the context of wider priorities and concerns. It will be important to build on the work to draw up this plan by maintaining good communication and continuing to build on the existing working relationships to move forward. All appropriate legal and regulatory consents should be obtained for all works and it is hoped that this plan will help all parties to engage with this process effectively.

Sustaining and developing the partnership and Public Engagement

There are many statutory bodies and other knowledgeable people who are interested in Dovedale and Wolfscote Dale and a wealth of scientific, archaeological and historic information available. People and organisations including angling clubs and river keepers, National Trust staff and volunteers and The Trent Rivers Trust are keen to be involved. Working in partnership to deliver the restoration strategy means the skills of each organisation involved can be used to maximise what can be delivered overall.

Developing interpretation, public engagement and citizen science approaches to support 'Letting the Dove Flow' will all help to engage the wider public too. This will have several benefits:

- Engaging the public in a restoration journey and helping to address any concerns;
- Potential for 'Citizen Science' where different groups can undertake research. The Riverfly Partnership is an example of such an approach;
- Access to resources in partnership to implement the plan;
- Increasing public awareness of rivers in general, the opportunities they present and the challenges they face.

There are therefore many 'Engagement' actions which should be prioritised early and throughout.

The Action Plan should be updated with all concerned periodically and certainly at the end of each of the timescales described below.

Timescales

For this Action Plan the following timescales are used:

Short Term actions	By 2018
Medium Term actions	By 2021
Long Term actions	By 2027

Principles for prioritisation

Principles for prioritisation to:

- Prioritise adaptive management actions;
- Sequence work from upstream to downstream where possible;

- Develop solutions to deliver actions over different timescales (ie a mixture of feasibility and construction).

Strategic Studies

Where strategic studies are needed to investigate actions further before carrying them out they should be done early if resources can be found to help plan further actions.

Strategic feasibility studies would normally address these key questions:

1. Will the solution successfully deliver the required objectives;
2. What are the potential constraints and benefits in terms of biology, morphology, water quality, land use, flood risk, fisheries, recreation and heritage;
3. Is the solution sustainable? This takes into account whether the physical river processes, wildlife and people will sustain it;
4. Is there a way of funding it?

The strategic studies recommended are detailed in Section 6.3 and summarised below.

Table 13 Recommended strategic studies.

Strategic Study Recommended	Value
Sequencing of weir removal.	Evaluate impacts – sediment movements and possible flood risk, inform planning of the sequence of removal and mitigation.
Assessment of risk of de-watering. Consideration of underlying geology, hydrology and historical records. Links to weir sequencing study.	To ensure that there is no risk of the river becoming seasonal. NB there is no known history of this prior to the large number of weirs being constructed.
Assessment of quantity and quality of sediment stored behind weirs.	To determine volume of sediment to potentially be mobilised and inform project design including whether to reuse or dispose of sediment.
Archaeological survey.	Establish age and significance of weirs to inform future decision making.
Study of old maps and pictures.	Use to understand likely river features if weirs are removed.
Establish whether stone in weirs and walls should remain in the river. (How much came from the river originally?)	Reuse of stone if appropriate could provide vital habitat variety and reduce project costs.
Feasibility of reconnecting scree stones with river. To include impacts on footpaths and possible solutions.	Increased supply of coarse sediment throughout as it is moved downstream. Vital for natural recovery.
Study of impact of the river on footpath and vice versa through the gorge and consider re-routing.	Long term sustainable solution with lower maintenance requirement.

Strategic Study Recommended	Value
Experiment, monitor, demonstrate and publicise, including developing monitoring protocol.	Data to demonstrate the value of restoring the river. Involve landowners, angling clubs and the public. Ensure aims met and to achieve the best balance between restoration actions and other considerations.
Studies for two weirs: Environment Agency, Gauging weir and the concrete weir of unknown purpose in Reach 2.	Evidence with which to consider whether removal or alternatives are beneficial and feasible.

The need for assessment tools for the most frequent works required

In Dovedale and Wolfscote Dale, the main proposed physical actions are removing or adapting weirs, removing bankside reinforcements and retaining or installing more wood in the river, and these are all proposed for many locations. A way to streamline the feasibility work for projects that are essentially similar but require site specific assessment would be very useful. We therefore propose development of a suite of standard assessment sheets with which interested parties can gather all the relevant information and present it consistently for their own analysis, to plan actions in partnership and to help obtain any required consents. We propose:

1. A 'Dovedale Weir Assessment' sheet. This would be developed in partnership with landowners, angling clubs and agencies so that it could be used to assess weirs thorough the SSSI. It would include information on: location, dimensions, constraints, materials, length of impoundment, sediment depth and size, possible contamination, sketches to show various characteristics, consideration and consents required for conservation, archaeology and flooding, land ownership, fishing rights, date and river stage etc. and would be based on best practice;
2. Once this is done, 'Dovedale Bank Reinforcement Assessment' and 'Managing Large Woody Material in Dovedale Assessment' sheet should be developed. The latter should cover both the management of existing large wood and its installation;
3. A standard monitoring protocol using simple techniques where possible such as fixed point photography. This could be developed alongside development of the Dovedale Assessment Tools.

Baseline Studies

There is already a wealth of data available. A means of collating this and making it available should be considered, via Letting the Dove Flow and/or the Dove Catchment Partnership, both of which could be carried out by Trent Rivers Trust. In addition, the following would be useful:

1. A detailed record for each weir and structure, with measurements of weir height and width and the length and depth of the sediment 'plug', photographs taken during high, low and medium flow conditions and cross references with any old pictures;
2. A simple measurement of length of the Dove that is free flowing. This would need to be related to a particular stage (flow level). If done using GIS it could also be mapped, which would be useful;

3. A longitudinal section of the river, measuring its slope. Slope is a key driver (along with discharge) of Stream Power which is a measure of the ability of the river to transport sediment. It can therefore be used as a measure of the river's ability to restore itself. See for example Downs and Gregory (2004). Management practices, restoration decisions and monitoring can be related to the slope of the river which could enable useful predictions for application elsewhere in this stretch of river. It may be possible to derive from the Flood Authority's data and at a coarse level from the Fluvial Audit cross sections or even by students undertaking surveys as part of their studies;
4. Monitoring using aquatic invertebrates. Consider whether there is already a good coverage of invertebrate data and whether any work is needed to ensure it gives full coverage as a baseline. This is particularly relevant because EA routine monitoring is carried out at Hartington and Dovedale, so there may be a lack of baseline data in between. Collect post weir removal data in reach 5 to assess the effect.

The Trent Rivers Trust is compiling a relational database of the geomorphological data which could form the basis of 1, 2 and 3 above.

Sequencing of weir removals

This is the first feasibility study listed and is an important priority. Baseline study 1 above (detailed record of each weir) can be used to inform it. In practice, pending this study, it is suggested that sequencing proceed as follows:

1. Angling and landowners clubs who are keen to remove weirs (in reaches 4-6). Provided this is done gradually and planned and monitored carefully (with expert advice about likely risks and issues relating to sequencing) using the assessment tools, this should be supported;
2. Removing weirs in low gradient stretches should be a priority. This is because stream power here will be less so natural degradation will be slow, the impounded, silty stretches are longer due to the low gradient, and often the footpath is distant from the river so there are few constraints;
3. In general the principle of moving from upstream to down should be employed. The benefit of this is that parts of the river are only disturbed once when adjusting to the new conditions after a weir upstream is removed, rather than repeatedly being subjected to erosion or deposition. However, a purist approach to this with over 90 weirs would miss important opportunities and so we recommend identifying sequences of adjacent weirs where removal might be possible, assessing them together and removing them from upstream to down. Before removing each weir a quick updated assessment can be made of the sediment gathered behind it to inform decision making about any mitigation required.
4. All are subject to obtaining relevant consents.

Action Plan Tables

Below are short, medium and long term potential action plans. The section 'Other drivers and delivery mechanisms' contains suggestions for possible support or funding. There is naturally a degree of overlap with the organisations that are suggested to be involved in each action. An estimate is made of the possible cost of each action, though this is easier for the short term actions which are more predictable. The final column gives an indication of

the development time that will be required to ensure these actions are carried out. Each is a mini project that will take time and skill to ensure that it is planned and commissioned effectively, services are procured, consents obtained, opportunities are taken to complete work economically, momentum is maintained, and each action is linked with the overall plan. This will ensure that progress is made and the plan implemented.

The greatest detail is given to the short term because if momentum can be maintained then significant progress can be made within the next year to set firm foundations for progress towards a shared vision in future years.

Abbreviations used in tables below:

ANR	Assisted Natural Recovery
DCC	Derbyshire County Council
LDF	Letting the Dove Flow
LU	Loughborough University
NE	Natural England
NT	National Trust
PDNPA	Peak District National Park
RRC	River Restoration Centre
SCC	Staffordshire County Council
SWT	Staffordshire Wildlife Trust
TRT	Trent Rivers Trust
WTT	Wild Trout Trust

8.1 Short Term Actions by 2018

Short Term Actions to 2018					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
Prioritisation	Prioritise the strategic and baseline studies.	Various.	LDF Steering Group.		2+ days
	Secure resources and carry out first strategic and baseline studies.	Various.	LDF Steering Group members.	£10-£100k	>10 days
Plans, studies and tools	Develop Dovedale assessment sheets for weirs.	Natural England, HE funding sources, Other?	TRT, LU, NE.	£5-10k	2-10 days
	Develop Dovedale assessment sheets for managing and installing LWM and soft bank protection if needed.	NE, WFD implementation.	NE, TRT, WTT, SWT, RRC.	£5-10k	2-10 days
	Develop Monitoring Protocol.		NE, TRT, RRC.	£1-5k	2-10 days
	Assess impact of weir removal on low flows.		NE.	£tbc	tbc
	PhD to study weir removal sequencing, hydrology and sediment.	Loughborough University.	LU, NE.	> £10k	>10 days
	Develop detailed Action Plan for each Reach.	WFD implementation, Fisheries/angling club funding.	TRT, NE, WTT	£1-5k each	2-10 days each
Engagement	Further develop and implement Communications Plan.	PDNPA and NT Plans, HLF.	LDF Steering Group.	£1-5k	>10 days
	Maintain page on TRT website.	Other TRT work.	TRT.	<£1k	2-10 days

Short Term Actions to 2018					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
	Riverfly sessions with angling clubs. Include monitoring for native white-clawed crayfish.	Angling clubs, DCP, NT.	TRT, Riverfly partnership.	£1-5k	2-10 days
	Interpretation panels and projects commenced.	PDNPA and NT Plans, HLF.	PDNPA, NT.	£5-£10	>10 days
Resources	Significant Heritage Lottery Fund bid.		TRT, LDF Steering Group, Derbyshire museums, Staffs Museums.	£1-5k	>10 days
All Reaches	Detailed Action Plans devised where landowners are willing.	Landowners and angling clubs, NE, HLF, EA fisheries.	Landowners, angling clubs, TRT, WTT, NE.	£1-5k	2-10 days each
Reach 1 Assist Natural Recovery (ANR)	Prioritise tree management to counter Phytophthora and maintain tree cover where appropriate. Continue to not maintain weirs and bank reinforcements or remove LWM.	Landowners and angling club, Angling and fisheries funding, NE.	Landowners and angling clubs, TRT, WTT.	£1-5k	2-10 days
Restore	Install LWM, remove or modify a small number of weirs and bank reinforcements.	Landowners and angling club, Angling and fisheries funding, NE.	Landowners and angling clubs, TRT, WTT.	£1-5k	2-10 days
	Small scale movements of gravels from screes on river side of path to river.	Public footpaths – DCC and SCC Rights of Way.	PDNP, SCC and DCC volunteers.	< £1k	<2 days

Short Term Actions to 2018					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
Reach 2 ANR	Continue to not maintain weirs and bank reinforcements or remove LWM.	Landowners and angling club.	Landowners, angling clubs.	0	0
	Monitor results of reduced maintenance here compared with Reach 3.	Landowners and angling clubs, Angling and fisheries funding, NE, HLF, EA, Riverfly partnership.	Landowners and angling clubs, TRT, Riverfly partnership.	£1-5k	2-10 days
Restore	Experiment with modifying or removing one or two weirs.	Landowners and angling club, Angling and fisheries funding, NE.	Landowners and angling clubs, TRT, WTT, universities.	£1-5k	2-10 days
	Small scale movements of gravels from screes on river side of path to river.	Public footpaths – DCC and SCC Rights of Way.	PDNP, SCC and DCC volunteers.	< £1k	2-10 days
Reach 3 ANR	Leave LWM and overhanging branches in place where possible.	Landowners and angling club.	Landowners and angling club.	0	0
Restore	Experiment with introduction of LWM and monitor results.	Landowners and angling club, Angling and fisheries funding, NE.	Landowners and angling clubs, TRT, WTT, universities.	£1-5k	2-10 days
Study	Study this reach as a baseline, contrast with the others and conduct limited experiments in different management practices.	Landowners and angling club, Angling and fisheries funding, NE.	Landowners and angling clubs, TRT, WTT, unis.	£1-5k	2-10 days
Reaches 4-6 ANR	Continue to not maintain weirs and bank reinforcements or to remove LWM.	Landowners inc NT, angling clubs.	Landowners, angling clubs.	0	0

Short Term Actions to 2018					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
	Natural regeneration for erosion protection where needed near weirs. May require temporary protection – fencing or tree guards in places.	Landowners inc NT, angling clubs, NE.	Landowners, angling clubs.	£1-5k	2-10 days
Restore	Remove weirs and bank reinforcements and introduce LWM in selected locations.	Landowners inc NT, angling clubs.	Landowners, angling clubs, TRT, WTT, NE.	£1-5k	2-10 days
Reach 6 Study	Compare old paintings and maps with existing weirs – determine reference condition for restoration, public engagement.	Derbyshire Museums. National Trust, HLF.	TRT, NT, PDNPA, Derbyshire Museums.	£1-5k	<2 days
Restore	Small scale movements of gravels from screes on river side of path to river	NT.	NT volunteers.	0	<2 days
Interpretation and engagement	This reach has by far the highest footfall and interpretation for the public should focus here initially.	Heritage Lottery Fund.	NT, TRT, Derbyshire Museums.	£5-10k	>10 days
	Install LWD very close to car park with a small interpretation board.		NT.	< £1k	2-10 days
Events – general	Partnership event May 2015 to develop Dovedale Weir removal assessment tool via Dove Catchment Partnership.	L'boro Uni, HE funding sources, Dove CP.	TRT, LU, DCP.	£1-5k	2-10 days
	Event for landowners and managers to promote Management Practices to Assist Natural Recovery as described for each reach.	NE	NE, TRT.	<£1k	2-10 days

8.2 Medium Term Action by 2021

Medium Term Action to 2021					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
Strategic	One or more funding bids secured to carry out action below.	Landowners, PDNPA, NE, EA, LEPs, LIFE funding, County Councils (footpaths).	LDF Steering Group.		2-10 days
	Further funding applications.	As above.	LDF Steering Group.		>10 days
	Carry out any remaining feasibility studies and use to inform planning.	Various.	LDF Steering Group, LU.	£10-£100k	>10 days
	Carry out remaining baseline studies and use to inform planning.	Public engagement, HLF.	TRT, LDF Steering Group, Angling clubs, universities.	£5-10k	> 10 days
	Monitor and evaluate against the aims of restoration. A key activity for the medium term.	NE, RRC, universities, HLF for citizen science.	All.	>£10k	>50 days
All Reaches	Continue with ANR. Implement detailed action plans.	Landowners, angling clubs, NE, EA fisheries.	Landowners, angling clubs, TRT, WTT, NE.	?	?
Reach 1 Restore	Experiment with designs to enable scree slopes to feed gravels to river – e.g. raised causeways based on findings of feasibility study.	DCC and SCC Rights of Way, PDNPA, NE.	PDNPS, HLF.	?	?
Reach 2 Restore	Remove concrete weir if feasible.	NE, EA.			

Medium Term Action to 2021					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
Reach 3 ANR	Make any possible moves towards a more freely flowing river, depending on outcome of monitoring.	Landowner, angling club.	All.	?	?
Engagement	Conserve and celebrate historic heritage assets.	HLF, PDNP, SCC and DCC.	PDNP, TRT.	£5-10k	>10 days
Reaches 4 -6 Restore	Uncover and restore historic cascades and rapids.	HLF, Landowners, angling clubs, public.	NT, PDNP, TRT.	£5-10k	>10 days
Engagement	Interpretation –phone applications developed with Derbyshire Museums.	HLF.	TRT, Derbyshire Museums, NT, PDNP.		
	Series of small and discrete interpretation signs to encourage people to look out for weirs.	HLF.	TRT, NT, PDNP.		
	TV/radio coverage.		TRT, NT, PDNP, NE.		
	Citizen science projects.	HLF.	TRT, Angling clubs, landowners, community groups.		
	Publicise the increase in the length of free flowing Dove.	HLF.	TRT, Angling clubs, landowners, community groups.		

8.3 Long Term Actions – by 2027

Long Term Actions – 2021 to 2027					
Type or Reach	**Action**	**Other drivers and delivery mechanisms**	**Organisation**	**Cost band**	**Development**
Strategic	Use understanding of natural recovery and effect of restoration gained through monitoring and evaluation to determine what actions still required.	RRC, unis, NE, EA, Rivers Trust.			
	Construct redesigned or re-routed footpaths as existing ones fall in need of repair.	Innovative approach to creating rights of way.	PDNPA, SCC, DCC.		
	Complete any actions not achieved within Medium term plan.				
All Reaches	Continue with Assisted Natural Recovery.	Landowners, angling clubs, NE, EA fisheries.	Landowners, angling clubs, TRT, WTT, NE.	?	?
	Review, update and continue to implement detailed Action plans.	Landowners inc NT, angling clubs, NE, HLF, EA fisheries.	Landowners, angling clubs, TRT, WTT, NE.	£1-5k	2-10 days
	Ongoing maintenance where necessary to achieve a balance between more natural river and human interests.				
Restore	Remove any remaining weirs that are not deemed to be necessary.	Landowner, angling club.	All.	?	?
Engagement	Ensure there is a good archive of the Letting the Dove Flow project.		TRT, Derbyshire Museums, Staffordshire Museums.		
	Good interpretation to explain the story and celebrate the important heritage features that can be seen.		NT, PDNP, NE, TRT, Derbyshire Museums.		

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Appendix 1: Summary of Stakeholder comments

Stakeholder	Issue, reach or suggested action mentioned	Comment	Addressed by
Angling groups and Wild Trout Trust			
1 response	Fish stocking, fishing rights, sediment supply and transport.	Some helpful suggested amendments to clarify text.	Accepted and reworded accordingly.
1 response	Suggestion that over grazing and footfall cause what the Vision report highlights as naturally eroding 'cliffs' and that removing bank protection could lead to accelerated erosion and wide, shallow river profile.	This should be evaluated and where appropriate, bank stability developed by a combination of managing grazing and footfall to allow marginal vegetation (including natural tree regeneration) to develop.	Addition in Section 6.2 where removal of bank reinforcements is discussed, as a constraint to be evaluated and risks managed.
3 responses	There is a concern that removing weirs might lead to insufficient deep water habitat upstream of Milldale when low flows occur. Also suggested that if the weir removal reduced summer flow depth the river would no longer be a barrier to stock, potentially meaning fencing was required. Downstream the river receives spring water so this is less of an issue.	There is a need to assess this risk and it is now highlighted more fully in the report. The river does not always provide a permanent barrier to stock due to low flows and this and the potential need for fencing should be considered.	Point made explicitly in Section 6.2 (Remove, lower or breach weirs, Constraints and their management). This is followed through in Section 7 with specific reference in the relevant reach summary, table and map and finally included as a required study in the Action Plan tables.
1 response	General – agreement Weir removal	In depth knowledge of the river for over 10 years. Wholly supports the removal of weirs, though recognises the need for a measured and gradual process where impact is carefully monitored. Really wants to promote healthy populations of wild fish and other aquatic wildlife.	Comments based on in depth local knowledge are welcomed. Beautifully expressed response. Thank you.

Stakeholder	Issue, reach or suggested action mentioned	Comment	Addressed by
1 response	General – agreement	Considers it a great summary of much that is desired and hopes it will get the full support it deserves. Welcomes it as the start of a catchment plan to guide joined up action and considers it gives hope for the future. Happy for attention to be focused upstream although he fishes downstream, as improvements will have wider benefits.	Feedback welcomed
1 response	Invasive non-native species.	These have not been noted other than absence of native crayfish.	Issue noted in section 5 with recommendation that it should be tackled pro-actively using best practice if discovered.
1 response	Weir removal Reach 2 – concrete weir Reach 3	a. In depth knowledge of the river for 40+years. b. Considers weir removal not appropriate, questions whether the evidence base justifies it, questions benefit of unauthorised weir removal upstream. c. Concerned re low flows (included above). d. Weirs were home to native crayfish when such populations existed here. e. Points to historical evidence that some weirs date from 1800s rather than 1920s. f. Questions whether weir removal would be permitted for SAC/SSSI and whether there are statutory powers to impose weir removal.	a. Such in depth knowledge is greatly valued. b. 'Letting the Dove Flow' advocates progressing cautiously and gathering data before and after any action so evaluate success. Appropriate permissions will be required in all cases. Additional evidence for the benefits of weir removal has been added to Section 5. c. See above. d. All in channel works will require permission from Natural England which will include consideration of all SSSI interest features, including native crayfish. e. Welcomed. A historical study is recommended within the report.

Stakeholder	Issue, reach or suggested action mentioned	Comment	Addressed by
		g. Concrete weir Reach 2 is there for a reason. h. Reach 3 holds good populations of wild trout and grayling and trout have been seen spawning here. i. Willing to try small scale experiments with LWM.	f. River restoration has been identified as necessary in order to help achieve favourable condition in the SSSI. Reach specific projects will require detailed development and landowner agreement, and appropriate permissions. g. Investigation of purpose of concrete weir is recommended. h. Letting the Dove Flow would like to gather and analyse all evidence. i. Welcomed.
1 response	Monitoring, timescales, funding, implementation.	a. Broadly welcomes the restoration plan. b. Not sure if it was a plan to be implemented or outline guidance for interested parties. c. The issues outlined are all valid but there is a need to ensure monitoring of any changes are included and perhaps measured. d. Additional measures - Research into declining invertebrate and white clawed Crayfish populations along with other methods of natural management, grazing for example. e. Concerned at timescales and uncertain funding. f. Welcomes improvements to environment and highlights work	a. Welcomed and look forward to working together. b. Mentioned in the preface and will be explained more clearly in the introduction or summary of the final report. c. Monitoring and measurement are important features of this plan. d. Crayfish now specifically noted alongside Riverfly and Citizen Science in the Action Plan. Management of grazing is now addressed in Section 6.2 (see above). e. Having a clear plan will make securing funding more likely. Much of the capital work is relatively cheap though the studies required will require

Stakeholder	Issue, reach or suggested action mentioned	Comment	Addressed by
		already carried out by their fishing club. Hopes the plan will link well with their existing management plan.	resources. f. We look forward to action planning with them and land owner concerning the sections of the river that they fish.
2 responses	Concern that funding for feasibility studies might outweigh resources for practical action.	Both responders are concerned with practical action and also raise valid questions about same.	The plan identifies practical action and studies required to help effective action and answer the questions they and others rightly raise. A long term approach that integrates practical action, careful planning and ongoing monitoring and evidence gathering is advocated.
Statutory			
1 response	Limitations of historical pictures, land management to improve water quality, querying green engineering, cumulative effects, funding for monitoring, support.	a. Some helpful minor corrections. b. Glossary. c. Move PhD from Medium to Short term Action Plan. d. Caution about using historical paintings which might be inaccurate. e. Suggests more consideration of Catchment Sensitive Farming and Countryside Stewardship in relation to water quality. f. Concern about use of green engineering methods are appropriate here. g. Funding required for long term monitoring if EA monitoring to be augmented. h. Agree that describing actions at reach scale makes sense, stresses	a. Corrections made. b. Reference to Glossary removed. Our 'trial run' showed no technical terms that were not explained. c. Moved. d. Added in Section 2, historical collections. e. Added in Section 5, water quality. Water quality is not the main focus of this report so not described in detail. f. Addition made in Section 6 to explain it is considered here only in terms of LWM and tree and vegetation regeneration. g. Monitoring would be very useful but always difficult to fund. Addition made in 'Baseline Studies' part of Section 8.

Stakeholder	Issue, reach or suggested action mentioned	Comment	Addressed by
		the need to consider reaches collectively and cumulative effects i. Supports the approach taken and actions identified subject to relevant legal and regulatory consents. j. Continue to support the project and suggest annually review of the plan by Steering Group.	h. Added in Section 7. i. Addition made at start of Section 8. j. Support and suggestion appreciated.