The Dart & Teign River Improvement Project

A Catchment Restoration Fund Project

Dartmoor National Park

Forestry Commission England

Westcountry Rivers Trust

Environment Agency

Natural England

South West Water

The University of Plymouth

Woodland Trust

Duchy of Cornwall

Westcountry Rivers Trust

The Dart & Teign River Improvement Project (DTRIP) was a Defra-funded Catchment Restoration Fund Project administered by the Environment Agency. The project was written and delivered by the Westcountry Rivers Trust, and steered by its catchment partnership.

The project was delivered over three years (2012-2015), with the primary aim of delivering targeted action to make significant steps towards achieving Water Framework Directive (WFD) waterbody objectives set out in the 2009 River Basin management Plans.

This report documents the works delivered under the DTRIP and describes how these works were targeted to ensure that efficient on the ground management was delivered effectively throughout the catchment.

Although the DTRIP has completed its final year, the work that has been delivered and the valuable information and data that has been collected will provide a solid foundation to build upon in the future. This not only provides wider benefits to the society and the environment, but also provides a valuable tool to aid in building a sustainable future for the catchment as whole.

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Image: River Teign by Nick Paling

The Catchment Restoration Fund

The Department for Environment, Food and Rural Affairs (Defra) created the Catchment Restoration Fund (CRF) in 2012 to help achieve the Water Framework Directive (WFD) status objectives set out for waterbodies in the 2009 River Basin Management Plans (RBMPs).

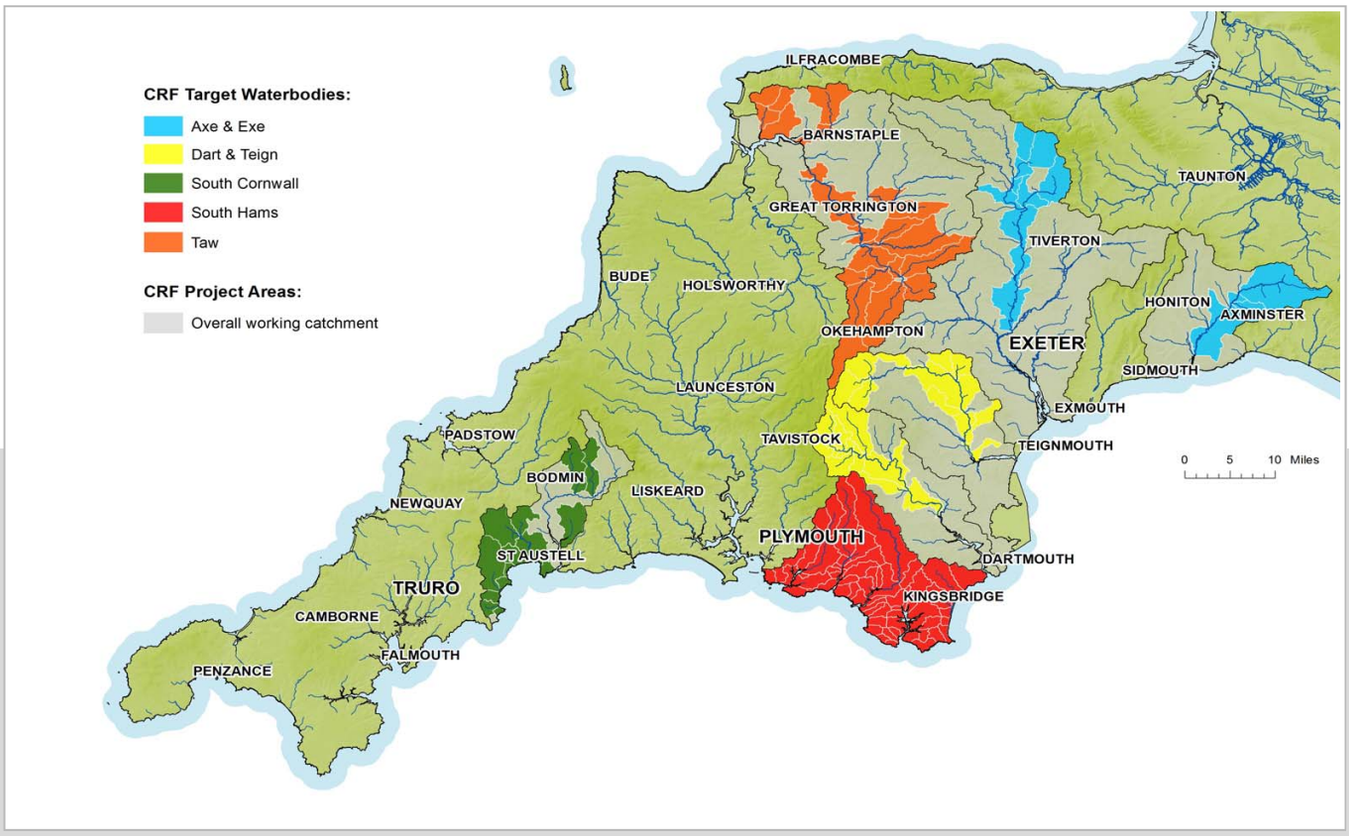
The fund was allocated for projects in England to be delivered in 2012/13, 2013/14 and 2014/15. The CRF was administered by the Environment Agency to support third sector organisations to deliver catchment-level projects designed to fulfil the following objectives:

- Restore natural features in and around watercourses;
- Reduce the impact of man-made structures on wildlife in watercourses;
- Reduce the impact of diffuse pollution that arises from rural and urban land use.

While the South West of England has some of the UK's most iconic and beautiful rivers, many of them are experiencing pressures, both current and historic, that limit their ability to function naturally and which cause them to become ecologically degraded.

In 2012, responding to these problems, the Westcountry Rivers Trust (WRT) secured CRF funding to deliver over £4 million of river restoration and catchment management work over three years on river catchments across the South West. These river and catchment restoration projects have been delivered on the rivers of the South Hams, the Axe and Exe, the Dart and Teign, the Rivers of South Cornwall and the Taw.

These river improvement projects were specifically developed using a rigorous evidence-led, partnership approach to mitigate the pressure acting on these rivers and improve the health of these precious and vital river ecosystems.



River Catchment Overview

The Dart Catchment

The Dart rises on Dartmoor as the East and West Dart and drains a catchment of approximately 473 km^2. These two rivers join at Dartmeet and proceed to flow in a southerly direction, becoming tidal at Totnes, and meeting the sea at Dartmouth.

The Dart's estuarine coastline is designated as an Area of Outstanding Natural Beauty. Five SSSI's in the Dartmoor National Park have been designated as a Dartmoor Special Area of Conservation, with species including Atlantic salmon (*Salmo salar*) and Otter (*Lutra Lutra*) being site interest features.

Many of the headwater streams in the Dart catchment provide valuable spawning grounds for salmonid fish, including the migratory anadromous salmon and sea trout, as well as resident populations of brown trout (*Salmo trutta*) and catadromous eels (*Anguilla anguilla*).

The Teign Catchment

The River Teign rises as two tributaries at a height of 520m on Dartmoor. The North and South Teign join at Leigh Bridge, Chagford. The river becomes tidal at Newton Abbot and reaches the sea at Teignmouth. The Teignmouth Estuary is a Designated Shellfish Area and supports a diverse fishery renowned for flounder and grey mullet.

The Teign catchment covers approximately 570km^2 and the length of the main river is 42km. Fernworthy and the Kennick, Tottiford and Trenchford Reservoir Complex are the main sources of raw drinking water for supply to the catchments local communities.

The main industries in the catchment are tourism, agriculture and ball clay extraction. Agriculture is varied in the catchment with land use mainly grassland on higher and steeper slopes, arable on gentler slopes and some forestry and horticulture.

River Dart	
Catchment Size	570 km^2
Source	Dartmoor
Mouth	Dartmouth
Designations	SAC, Shellfish Area
Species	Atlantic salmon, trout, otter, eel, lamprey
WFD RFF	Fish, pH, phytobenthos

River Teign	
Catchment Size	473km^2
Source	Dartmoor
Mouth	Teignmouth
Designations	SSSI, SAC, AONB
Species	Atlantic salmon, trout, otter, eel, lamprey
WFD RFF	Fish, pH, Phytobenthos

Dartmoor

Dartmoor is predominantly open moorland with high rainfall and acid, peaty soil. Its perimeter is characterised by steep, undulating land with many of the valley sides covered by deciduous woodland.

Much of it is also used for extensive grazing by cattle, sheep and ponies. However, field size and agricultural pressure becomes progressively larger further away from the Moor.

Dartmoor National Park consists of a Special Area of Conservation (SAC), of which the migrating Atlantic salmon is a feature of interest.

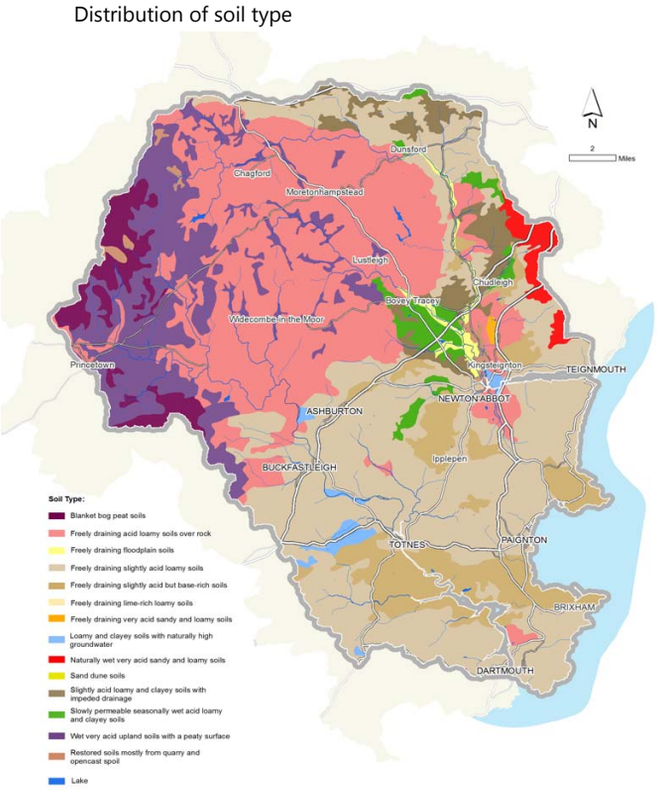
River Catchment Overview

Map showing an overview of the small streams, tributaries and rivers of the Teign and Dart river catchments.

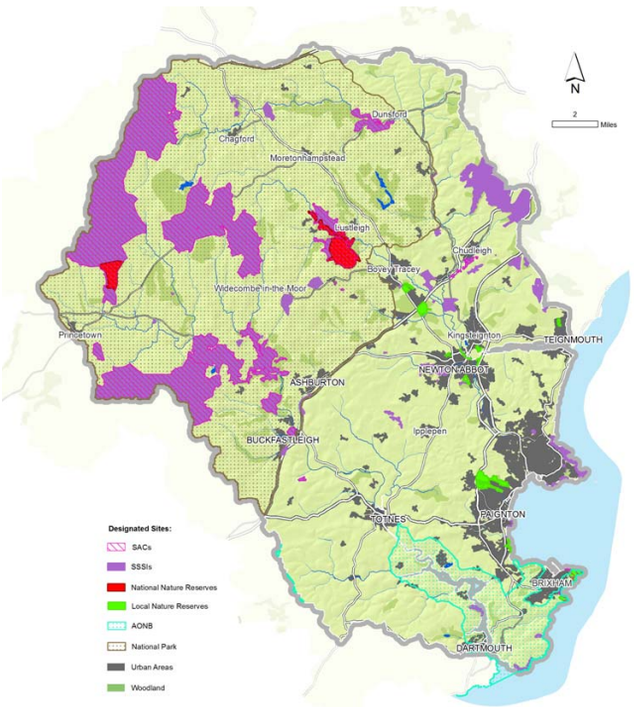
River Catchment Overview

Landscape Characteristics of the Teign & Dart

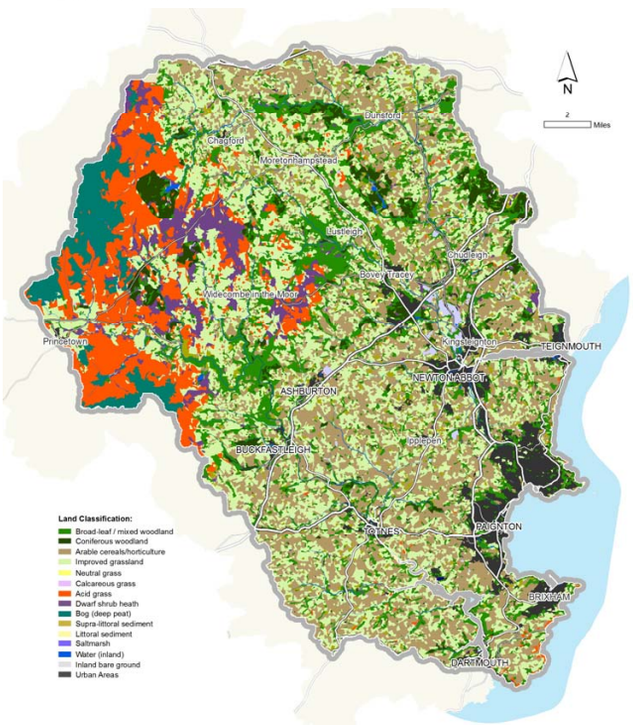
Distribution of soil type



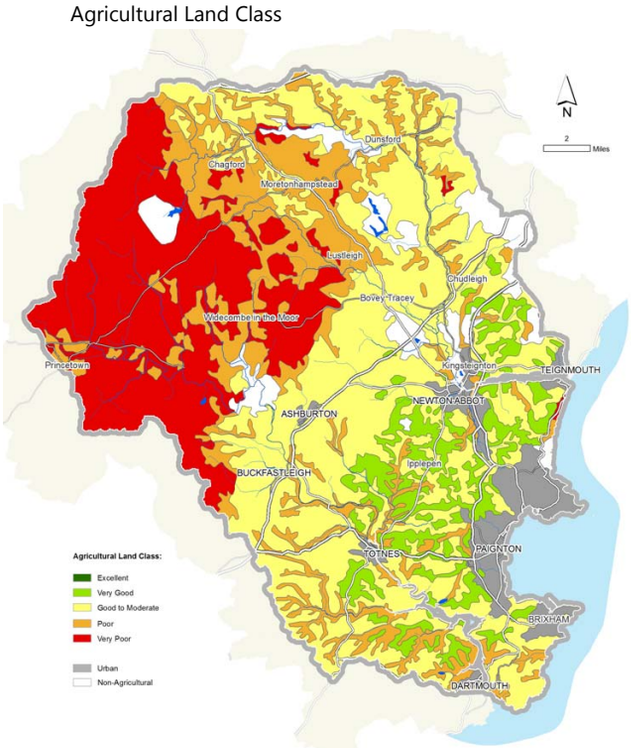
Designated Sites & Protected Areas



Land Classification



Agricultural Land Class



WFD Classification

The most important set of evidence that we can use to assess the condition of the waterbodies in the Teign and Dart river catchments is their Water Framework Directive (WFD) classification. The associated Reason for Failure information collected by the Environment Agency also helps us target interventions to mitigate pressures acting on these waterbodies. This data is shown on the following two pages.

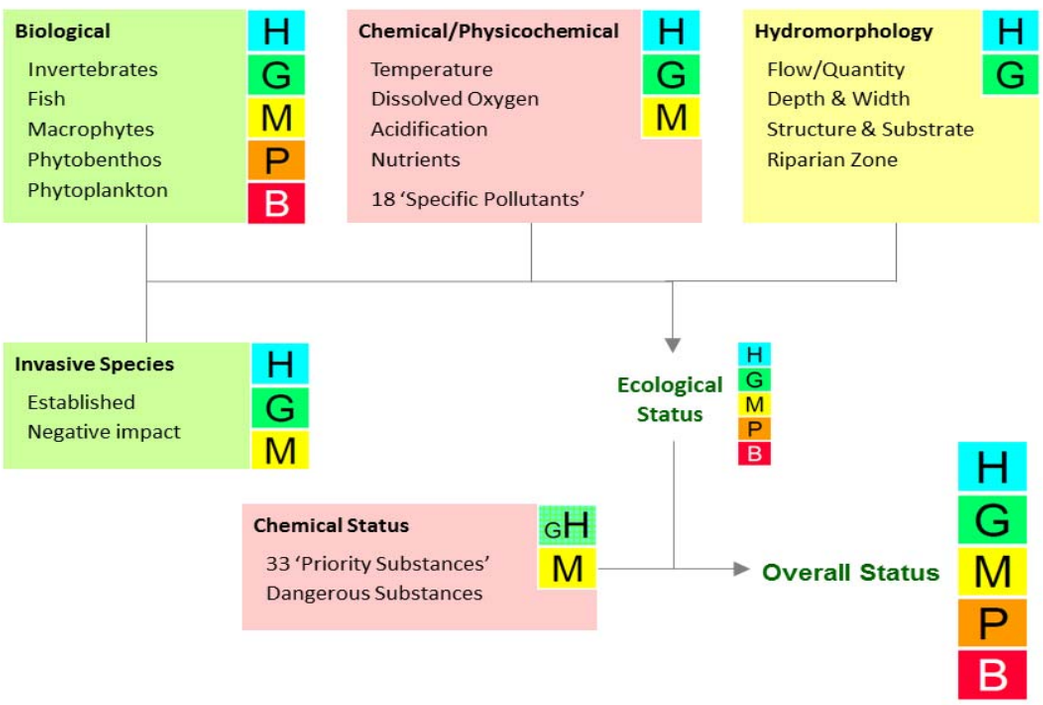
WFD condition assessments are currently undertaken by the Environment Agency using methodologies agreed with the UK Technical Advisory Group (UK TAG) and recommendations for remedial catchment management interventions are made through River Basin Management Plans (RBMPs).

For surface waters, such as rivers and lakes, the 'overall status' of a waterbody is comprised of an ecological and a chemical component. The ecological status of a waterbody is primarily measured using a series of biological parameters and is recorded on the scale high, good, moderate, poor and bad (with moderate or worse being regarded as failure).

To determine a WFD classification the degree of disturbance to each quality element is assessed against a 'reference value or set of values' for that element. A reference value for a biological quality element is a value identified from the range of values the quality element may have when subject to no or only very minor alteration as a result of human disturbance (i.e. when it is in a reference, or high status, condition).

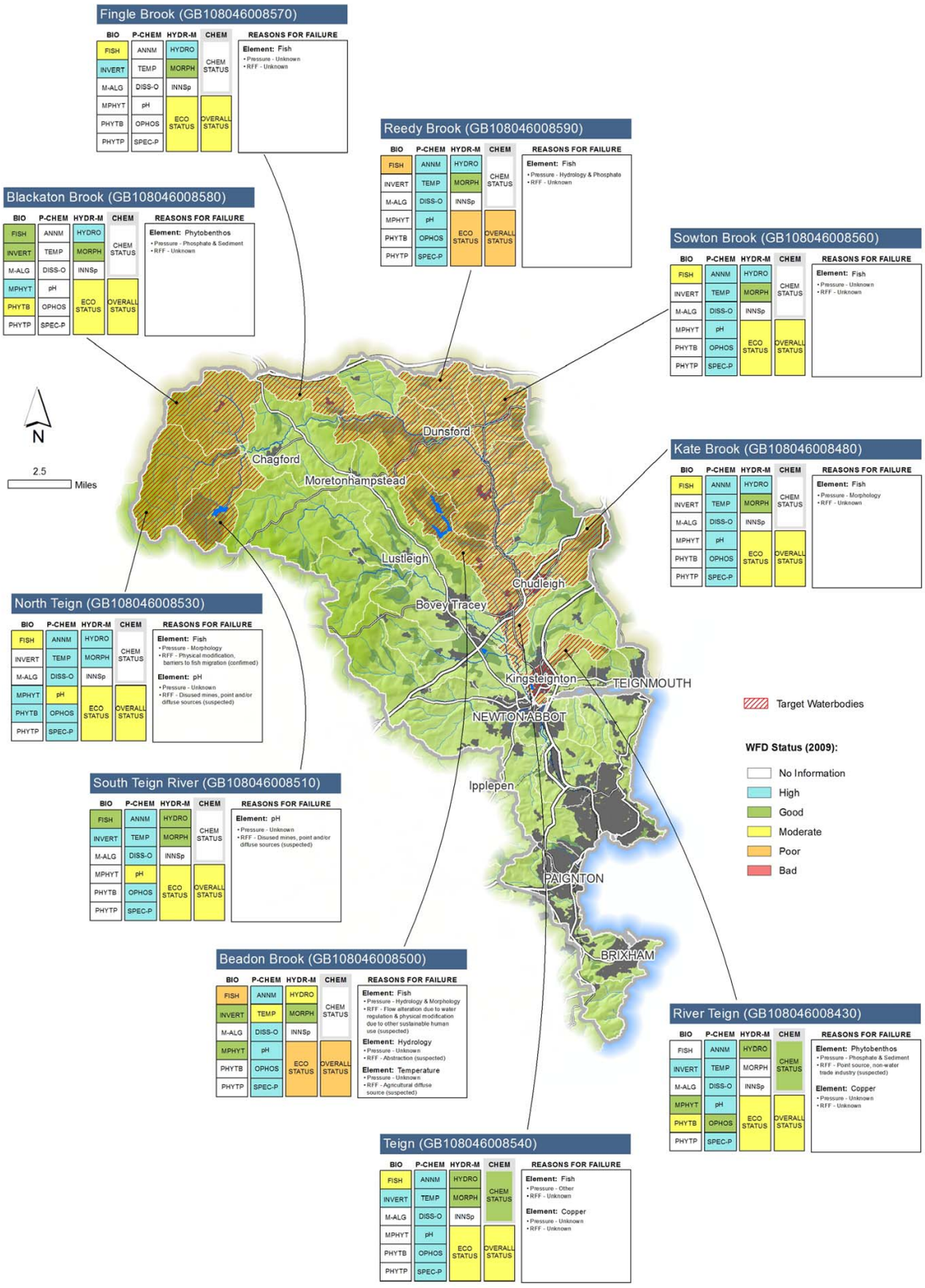
In addition to the biological characterisation of waterbody condition, classifications are also supported by assessments of three further components of the environment: 1) morphology (physical structure); 2) hydrology (flow and water levels), and 3) chemistry (including general water quality, physico-chemistry, and chemical pollutants.). Annex V of the WFD identifies these components as 'elements supporting the biology'.

The schematic below shows how Overall WFD status is determined. Once the individual elements have been assessed the lowest classification recorded for any of the parameters will form the final WFD classification for that waterbody (this is referred to as 'one out, all out').



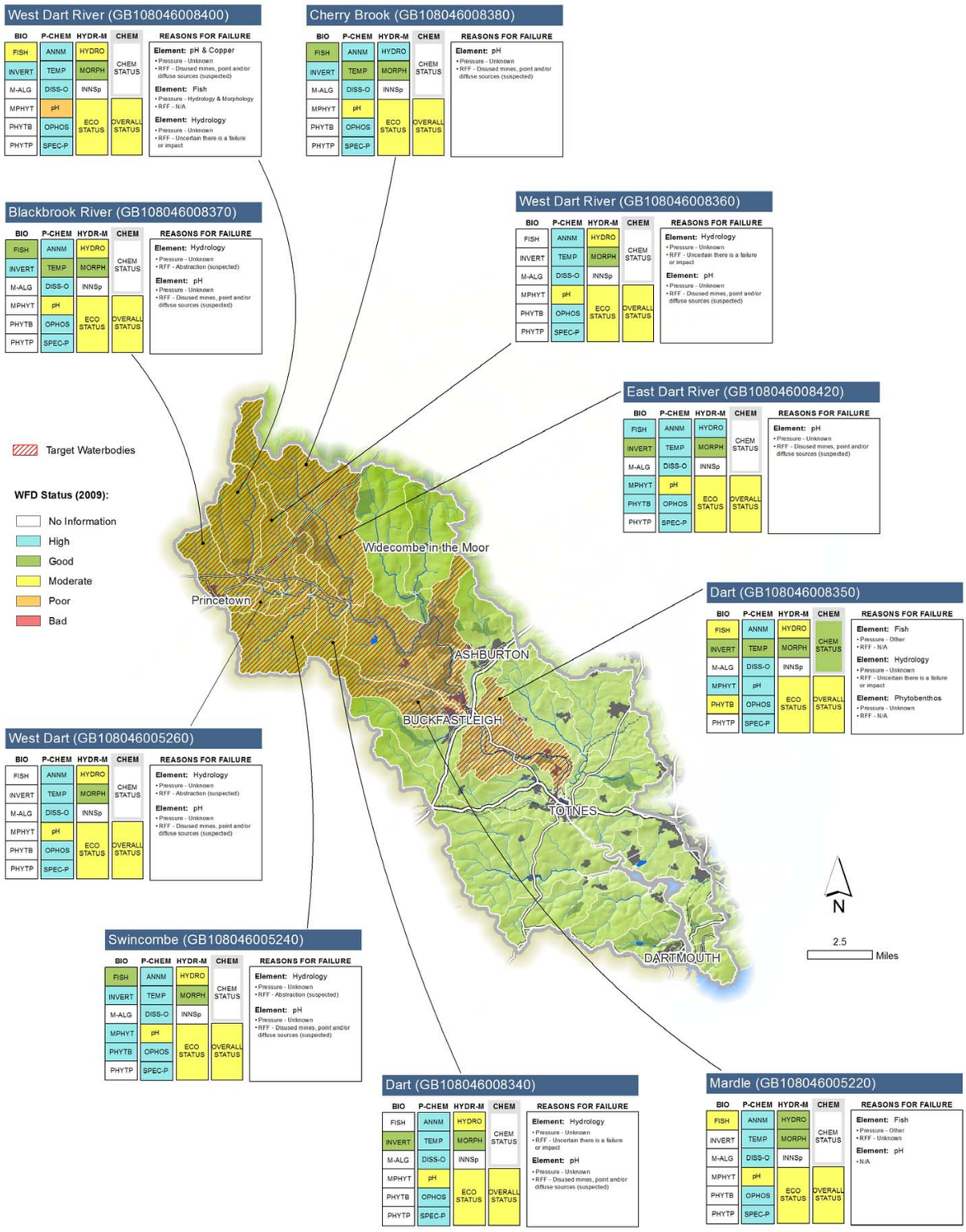
Teign Catchment Report Card 2009

Map showing 2009 WFD Classifications and Reasons for Failure



Dart Catchment Report Card 2009

Map Showing 2009 WFD Classifications and Reasons for Failure



The Dart & Teign River Improvement Project (DTRIP)

The main aim of the Dart and Teign River Improvement Project (DTRIP) was to improve both the overall status and water protection objectives of the catchments under the Water Framework Directive (WFD) classification.

The Dart and the Teign catchments are geographically comparable, both rising on Dartmoor, and have waterbodies which share similar reasons for failure under the WFD. For these reasons, the project targeted works on both catchments, therefore significantly improving the potential to enhance the overall status of all connecting waterbodies.

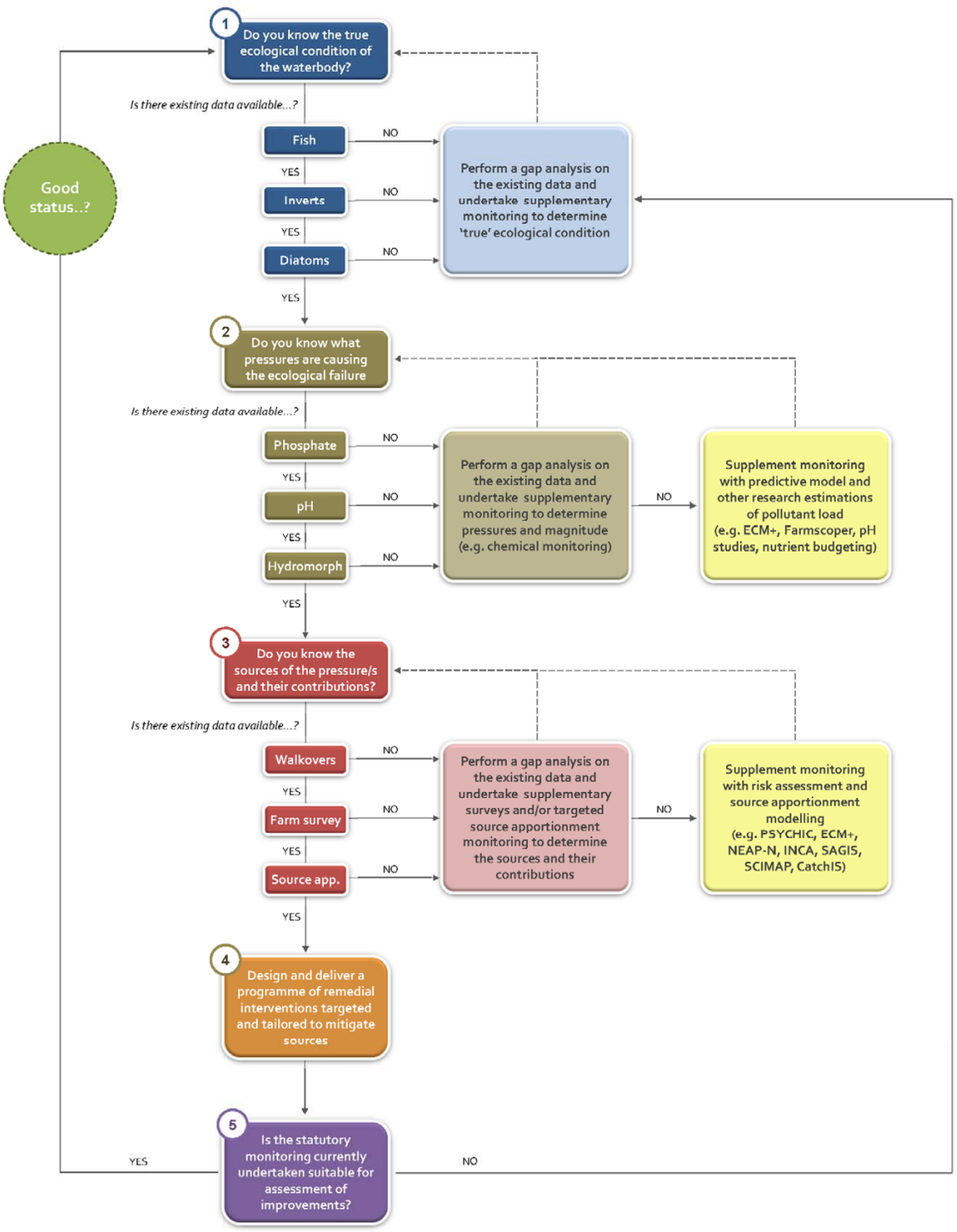
Some benefits of the DTRIP include improving water resource management; helping to improve water quality; stabilise pH and ensure a more consistent supply of water; improve the ecological health and biodiversity of the river and surrounding habitats; improve the leisure environment for recreation and angling; conserve and restore fish populations; contribute to flood attenuation and management and increase capacity for carbon sequestration within the catchments.

The DTRIP project was led by WRT in partnership with the Environment Agency, Natural England, Dartmoor National Park, the Dart Fisheries Association, the Teign Fisheries Association, the Duchy of Cornwall, the Dartmoor Hill Farm Project, Fountains Forestry, The Woodland Trust, South West water, The Forestry Commission, University of Plymouth and University College London.

East Dart River, Dart Catchment (2013)

This report

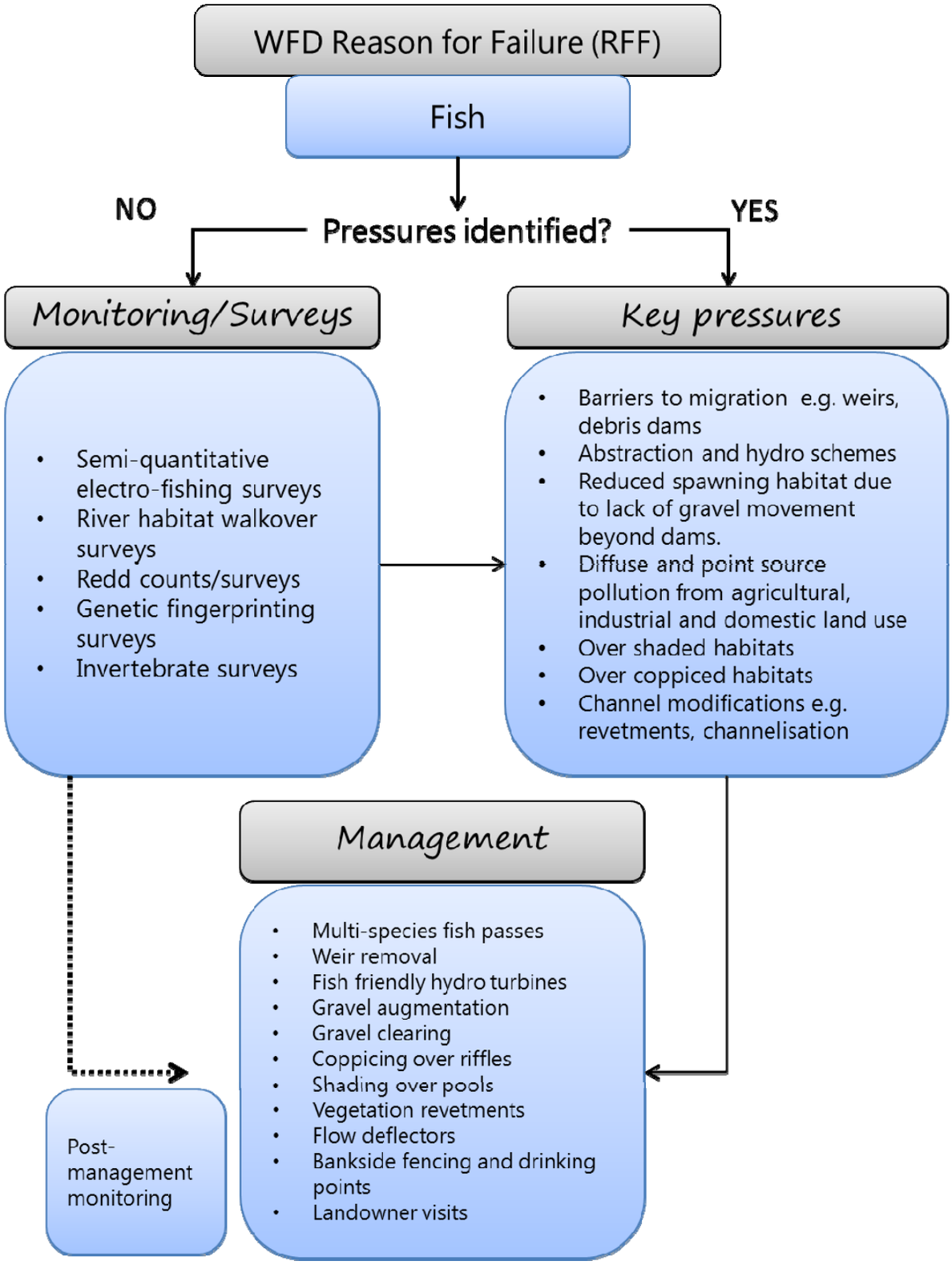
This Catchment Restoration Funded Project report has been written from a WFD Reason for Failure point of view. This is because all of the work conducted within the project was designed to address specific environmental pressures, aiming to restore freshwater habitats to their natural condition and target waterbodies failing to reach good ecological status under the WFD. Therefore the report has been divided into specific chapters relating to each reason for failure, where a full account of the investigations and works conducted to address those failures have been made.




FISH

Targeting interventions for fish

Flow diagram to illustrate how CRF works within the DTRIP were targeted and driven by WFD.



Identification of pressures & Reasons for Failure

Investigative monitoring: a key component of fisheries management

Monitoring is a key component of fisheries management. It is used to investigate the pressures which are causing the failure of a waterbody to reach WFD objectives and it is used throughout a management programme to asses its effectiveness. Monitoring is most effective if it is conducted regularly so that data can be collected even once a management project has ceased, as this ensures future management can be targeted efficiently and effectively.

Electrofishing surveys are the primary method to assess fish population densities, diversity and distribution within a river. Electrofishing is especially effective at monitoring the impact of a barrier on fish movement and the effectiveness of the intervention once the barrier has been removed or mitigated. Redd counting is another survey method which can be very useful in investigating the impacts of barriers and their mitigation.

The biological and physiochemical components of water quality can be measured in a number of ways. Biological methods commonly adopted include diatom, macrophyte and invertebrate sampling, which uses indicator species to assess the levels of nutrient enrichment or pH aberration within a river. In addition to the biological measures of river ecological health, the physical and chemical properties of the water are assessed through the taking and analysis of monthly water samples to determine whether the water is able to support the good ecological health of the river.

Barriers to Migration and Abstraction

Many fish, particularly species that are highly migratory, require different riverine environments for the different phases of their lifecycle. Anadramous species in particular, such as salmon and sea trout, migrate in order to reproduce; therefore barriers to migration such as weirs, culverts and structures related to abstraction (such as hydro-electric machinery) can be significant factors underpinning failures in WFD fish status.

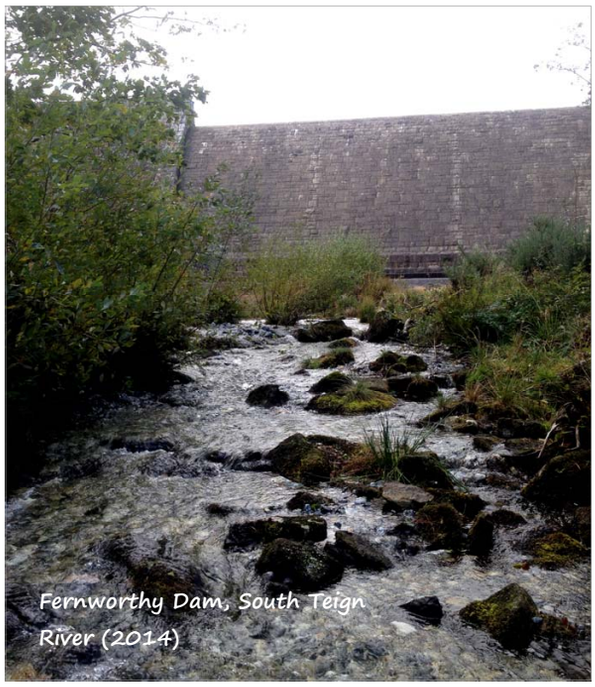
Other barriers, such as dams, not only inhibit migration, but they can also have a negative effect on the morphology of the river and the natural movement of substrate or bed-load material. Where dams are present, rivers downstream can become starved of substrate material and gravel (depletion) and therefore fish spawning potential in this downstream reach is decreased.

Habitat management, such as; weir removal, the installation of multi-species fish passes, fish friendly hydro turbines and the introduction of gravels below dams, are all effective but site specific options to adopt.

These methods, combined with appropriate monitoring, can be highly effective management tools that help to maintain or improve the connectivity within a river and improve the breeding potential for migrating fish.

Management options include:

- Multi-species fish passes
- Weir removal
- Fish friendly hydro-turbines
- Gravel augmentation/rehabilitation



Fernworthy Dam, South Teign River (2014)

Lack of habitat management

When rivers have not been managed correctly, there are a number of factors that can negatively affect the its potential to support healthy fish populations.

A healthy river system requires a patchy mosaic of shaded and open areas. Shading stabilises water temperature and provides protection for many fish species from predation. However, there is also a need for open unshaded areas as they play a key role providing sunlight to areas where juveniles fish occur. Light is needed to sustain the benthic community of the river, it encourages epithetic algae to grow which communities of scrapers and grazing invertebrates are reliant on, therefore providing valuable feeding grounds for juvenile fish.

In the past woody debris in the channel was thought to cause negative effects such as flooding and increased bankside erosion. However, if woody debris is secure, correctly sited and does not cause increased potential for erosion or flood risk, it is more commonly accepted to have many ecological and hydrological benefits.

Channel modifications such as revetments and channelisation can have significant negative effects on the river fauna. These homogeneous habitats often lack riparian vegetation; therefore shelter availability is low leading to a loss of suitable habitat to support fish and other aquatic species.

Management options include:

- Coppicing of riparian trees & woody debris management
- Vegetation revetments to protect banks
- Flow deflectors to create heterogeneous flow

Poor land management & diffuse pollution

Land management practices, such as intensive farming, can place pressures on river health through sediment inputs caused by erosion and chemical pressures through the use of pesticides and fertilisers. These pressures can negatively impact macrophyte, invertebrate and fish communities, which, in turn, has a knock-on effect on the health of the whole ecosystem.

Fish populations, especially salmonid species, are extremely dependent on the supply of clean and well oxygenated water. For example, the accumulation of silt in spawning gravels can smother eggs and fry, while also impacting on the invertebrates which they feed on.

Management options include:

- Landowner engagement to give advice & grants
- Bankside fencing & alternative livestock drinking points
- Gravel cleaning

Dartington Elver Pass

In 2011 the European Commission issued their Eel Recovery Plan. The plans outlined the current eel conservation status and were intended to achieve the targets required by the European Regulation. Under this plan, 11 Eel Management Plans were prepared, one for each River Basin District (RBD) in England and Wales.

In the Eel Strategy 2011, four of the ten 'pass priorities' and eight out of ten 'habitat improvement priorities' identified in the South West RBD were in the Dart Catchment. The Eel Strategy 2011 Habitat Creation Strategy Opportunity Model found that the areas of 'greatest benefit to eel' were in the Dart catchment.

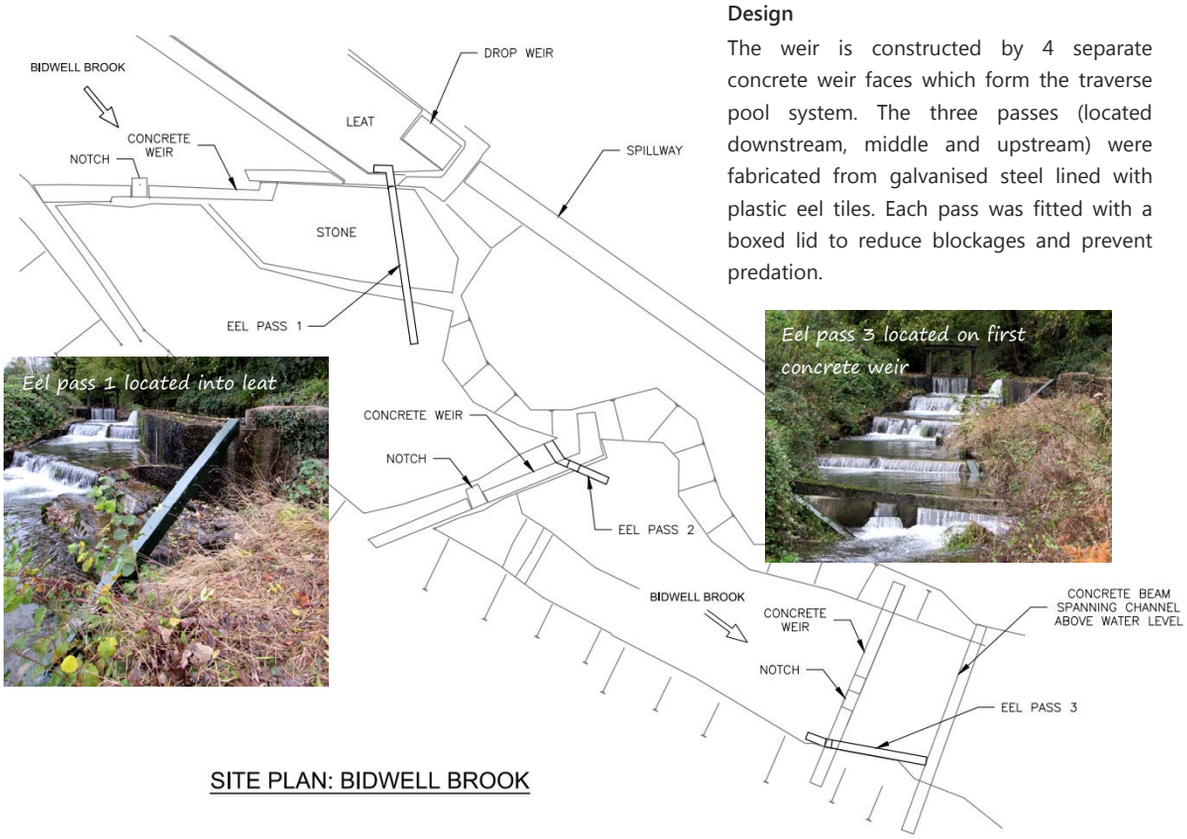
In 2012 the WRT contracted Fishtek, under the DEFRA River Improvement Project, to design and install a fish pass improvement to the existing pool and traverse weir at Dartington on the River Dart. The weir was also highlighted by the EA as a priority barrier to eels, but the Defra project could not fund further work.

The Bidwell Brook is a tributary of the Dart located in the lower catchment. Due to its close proximity to the tidal limit, the tributary provides important habitat for both juvenile and adult eels.

Following a consultation with the EA, it was decided that Dartington Weir should be prioritised for action under the CRF. In December 2014 Fishtek were contracted by WRT to design, fabricate and install a suitable elver pass on this barrier in the Bidwell Brook.

The eel pass is thought to greatly improve eel migration on the Bidwell Brook and access to more habitat; equal to an additional 6 kilometres or 3.7 miles.

WATERBODY	Bidwell Brook
CATCHMENT	Dart
WFD STATUS	FISH (GOOD)
INVESTIGATION	Barrier Assessment
PRESSURE	Barrier to migration
MANAGEMENT	Barrier easement
DESIGN	Galvanised steel & eel tiles
DATE:	December 2014



SITE PLAN: BIDWELL BROOK

Design

The weir is constructed by 4 separate concrete weir faces which form the traverse pool system. The three passes (located downstream, middle and upstream) were fabricated from galvanised steel lined with plastic eel tiles. Each pass was fitted with a boxed lid to reduce blockages and prevent predation.

Buckfast Abbey Weir Elver Pass

Buckfast Abbey Weir, on the main River Dart, was originally highlighted for action in a WRT-contracted barrier report undertaken by Fishtek Consulting in 2011.

A large weir has existed at Buckfast Abbey since the early 19th century. However, the weir was re-worked with concrete 25 years ago and it was at this stage that a pool-traverse fish pass was incorporated into the weir. Our current knowledge in declining eel stocks has now stimulated a need for eel passes on large weirs too.

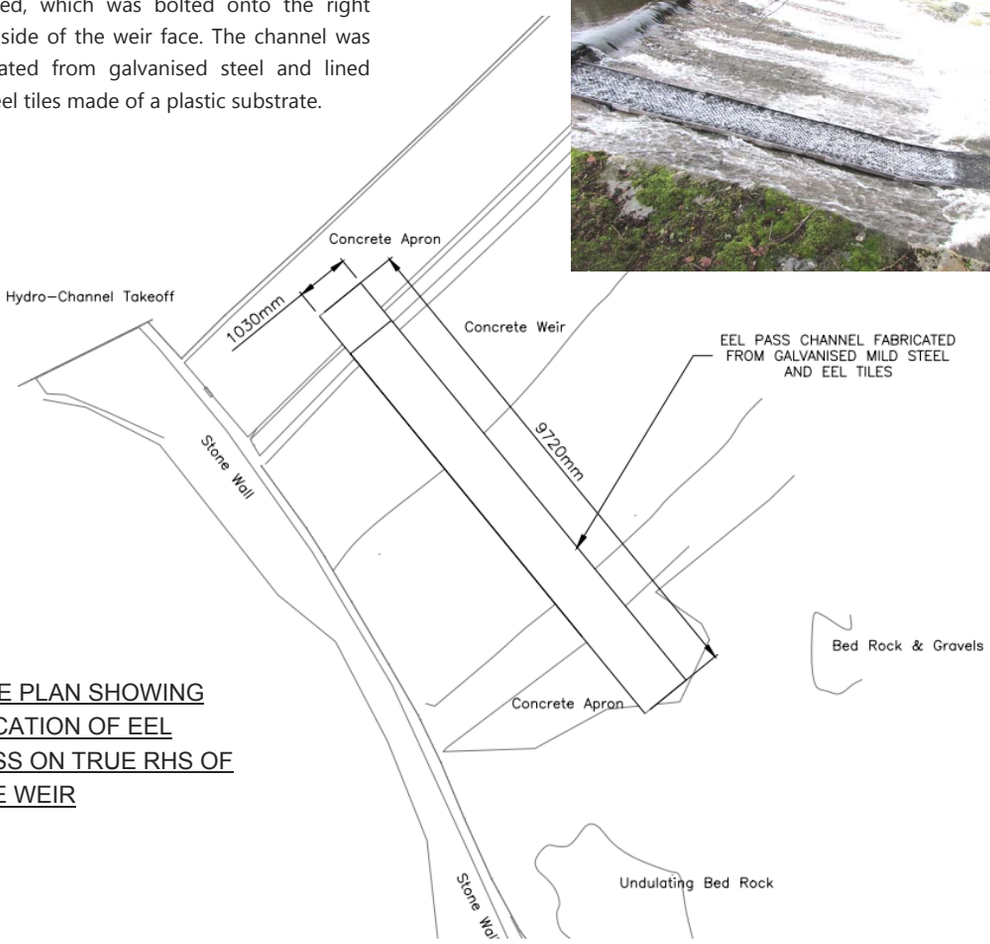
Buckfast Abbey Weir is situated just below the confluence of the Holy Brook. The WFD Fish Classification indicates that the Holy Brook is failing to reach good status for fish and that eels were notably and significantly absent from this waterbody.

Following in-depth consultation with the Environment Agency, it was decided that Buckfast Abbey Weir should be prioritised for action under the CRF and consultants were contracted to design, fabricate and install a suitable elver pass.

WATERBODY	The Dart
CATCHMENT	Dart
WFD STATUS	FISH (MODERATE)
INVESTIGATION	Barrier assessment
PRESSURE	Barrier to migration
MANAGEMENT	Barrier easement
DESIGN	Galvanised steel & eel tiles
DATE:	November 2014

Design

A 10 metre long elver pass was designed and installed, which was bolted onto the right hand side of the weir face. The channel was fabricated from galvanised steel and lined with eel tiles made of a plastic substrate.



SITE PLAN SHOWING LOCATION OF EEL PASS ON TRUE RHS OF THE WEIR

Chagford HEP

The River Teign is fragmented by multiple weirs along its length, many of which are barriers to migrating fish especially during low flows.

Rushford Weir was originally highlighted for action in the CRF project proposal, but after consultation with and agreement with the Project Advisory Group (PAG), it was decided that it would not be possible to complete it within the available budget.

It was therefore decided that Chagford HEP, the next upstream barrier, would be a better alternative. There is an abundance of valuable spawning sites upstream of this structure, which is one of the reasons it was highlighted by the EA as a priority barrier for action.

WATERBODY	Teign
CATCHMENT	Teign
WFD STATUS	FISH (MODERATE)
INVESTIGATION	Barrier Assessment
PRESSURE	Barrier to migration
MANAGEMENT	Barrier easement
DESIGN	Boulder realignment
DATE:	July 2014

This structure represents a major barrier to the upstream migration of salmon and sea trout, especially in low flow conditions. Fishtek Consulting conducted a hydrological assessment of the Chagford HEP, the results are summarised in the table below:

Exceedance %	River Flow (m^3/s)	Turbine Flow (m^3/s)
80	0.20	0.40
70	0.25	0.50
60	0.50	0.50
50	0.80	0.50

At low migration flows (Q60-70) 250-500 l/s of water remains in the main channel. Migratory salmonids, especially sea trout will migrate at low flows and the issue at this site is that water was dispersed across a number of small channels severely reducing depths.

Through the consultation with the EA, Dartmoor National Park and the Landowner, WRT contracted specialist consultants and engineers to design and help install an appropriate easement to encourage the upstream migration of salmonid fish at low flows.

Design

Boulders were repositioned at two locations downstream of the depleted reach to create a low flow channel and a mid flow channel. This method allows salmonids to migrate upstream during all potential flows. The physical works were conducted comprising both specialist contractors and project volunteers.

Fingle Brook Culverts

Examination of the WFD classification for the waterbody revealed that the Fingle Brook was failing to reach good WFD status for fish, however the reason for this failure were unknown.

In 2011, WRT conducted habitat walkover surveys over 102 km of the River Teign and its tributaries. During these walkover surveys potential pressures were noted such as barriers to migration and inputs of pollution from the surrounding landscape.

Among the various potential barriers to migration that were recorded on the Fingle Brook, was a road culvert (see photo), which it was decided may have potentially been a contributing factor for its moderate status for fish.

The culverts have four pipes, each 800mm diameter and 5.5m long. Water depth in the pipes in low flows is a few centimetres and in addition there is a drop of 100mm at the downstream end.

The culverts have concrete sills leading both upstream and downstream from its base. The sills have no low flow channel and the depth of water is only limited to a few centimetres. During times of spate the culverts have also been recorded to become blocked with woody debris.

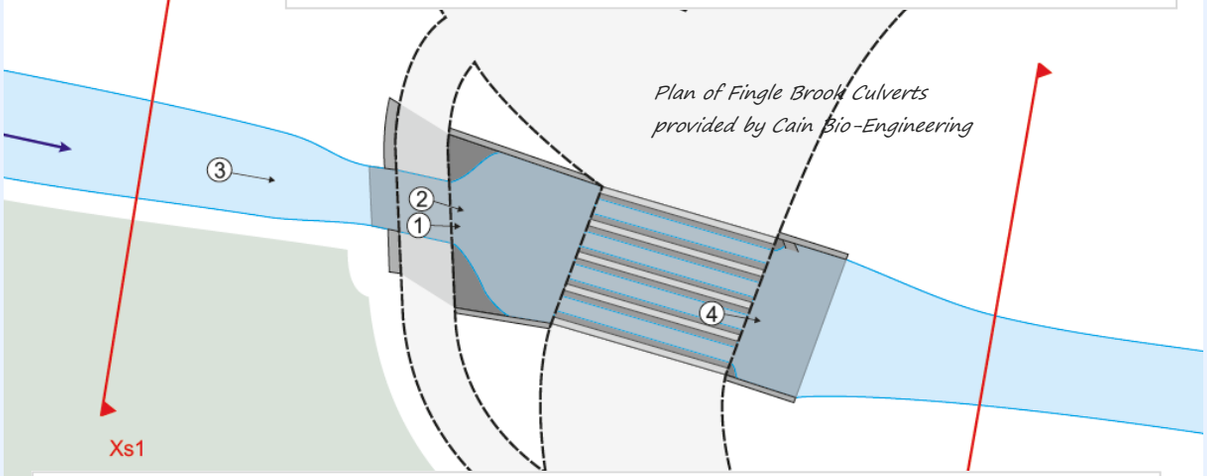
Downstream of culverts during a low flow exposing concrete sill

WATERBODY	Fingle Brook
CATCHMENT	Teign
WFD STATUS	FISH (MODERATE)
PRESSURE	Barrier to migration
MANAGEMENT	Survey & Feasibility Assessment
DATE:	March 2013

Conclusion

Unfortunately the cost for installing either preferred option was estimated to be higher than the available budget. Though this meant that the work could not be completed under the DTRIP, the extensive preparatory work undertaken will enable us to efficiently target this barrier in the future.

Specialist engineers were contracted by WRT to conduct a survey and feasibility assessment of the culverts. They provided a detailed document offering three potential options: 1) improve passability for the whole structure; 2) improve passability of the pipes, and 3) improve passability of the concrete sill structure.



Out of the 9 options provided in the feasibility assessment, the preferred 2 options were: 1) modify with baffle gravel/boulders/ timber installed onto the concrete sill to narrow the channel and concentrate flows into a low flow channel, or 2) modify to raise bed downstream by installing 3 gravel riffles downstream of the pipes to impound water through pipe structure and increase water levels within the pipes so that they are rendered passable to fish.

Fingle Brook WQ Investigation

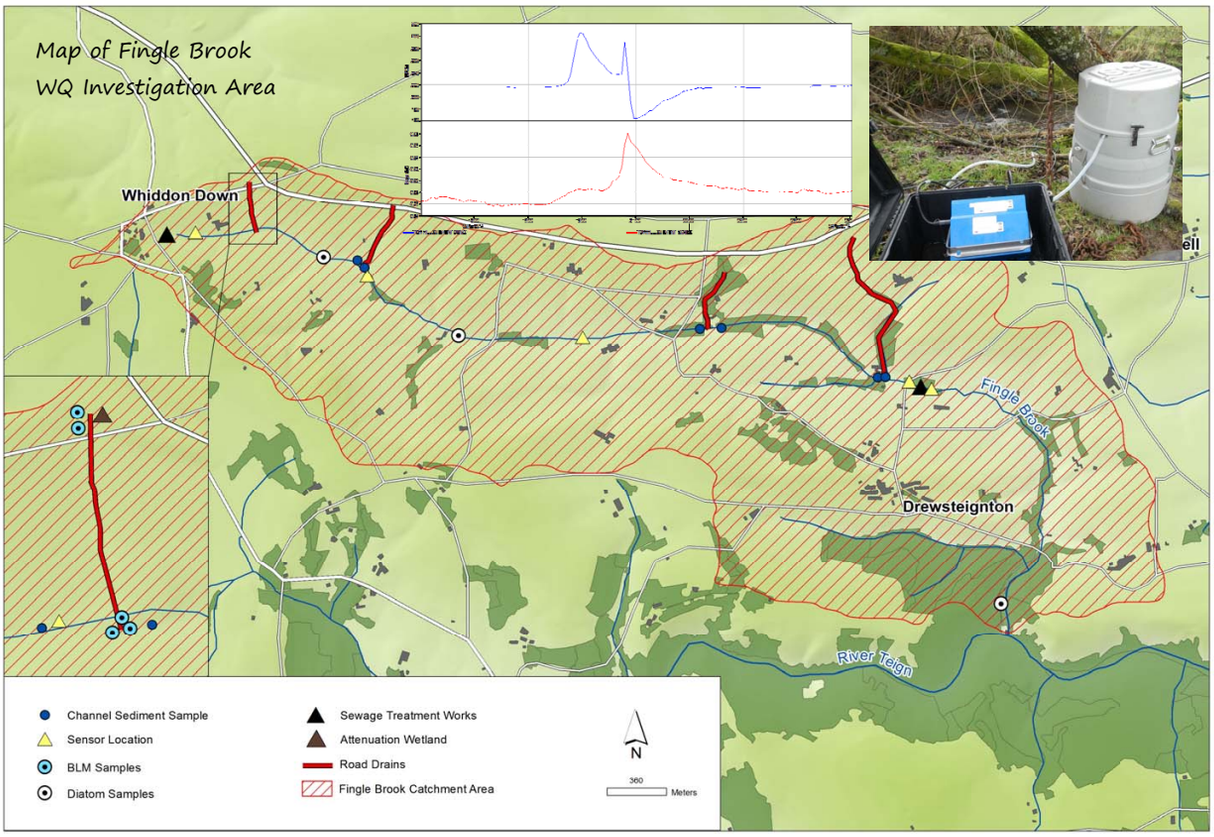
The Fingle Brook tributary of the River Teign has been shown to be failing to achieve good status for fish (specifically brown trout). It is has been speculated by others that diffuse inputs of road-derived contaminants could be impacting upon the system and causing the failure of Fingle Brook to reach 'Good Ecological Status' under WFD. As part of the Dart and Teign River Improvement Project, WRT headed a research programme, alongside staff of the Plymouth University Catchment and River Science Research Group to investigate the Fingle Brook and identify the reasons for it WFD failure.

Four research packages were undertaken:

1. Diatom assessments & walkover surveys
2. Monitoring of water & sediment chemistry in the river channel
3. Assessment of water chemistry against environmental quality standards (EQS)
4. High spatial resolution monitoring of water chemistry to identify key contaminant sources & pathways

Key Findings

1. Diatom samples suggested that sites were not heavily impacted by nutrients from sewage treatment works or agricultural sources. The WRT walkover survey did not detect factors likely to specifically impact upon brown trout, further emphasising the need for chemical investigation.
2. Elevated concentrations of road-related metals, such as lead and zinc, were found in water and sediment. Storm sampling using automatic water samplers and conductivity monitoring showed an early flush of solutes in the main channel below road drains.
3. Concentrations of zinc were above EQS (biotic ligand model-derived) potentially owing to road drainage inputs and drainage from an historic mine site.
4. Detailed spatial sampling showed elevated dissolved concentrations of metals below road drainage inputs, particularly lead, with values above EQS. It is possible that the legacy of sediment-bound lead in the channel bed is a source of lead to the water column under certain environmental conditions.



Restoration Measures: Fish Habitat

Gravel Cleaning

There are many factors that can cause the turbidity of water to increase, but the most common are the presence of algae, bacteria, organic waste materials (animal waste, decomposing vegetation etc.) or silt (soil or mineral sediments) in the water column. These materials are often released into the water following disturbance of the river or lake substrate, but can also enter the water as a result of run-off from the land. Suspended material in the water of rivers can cause significant damage to the ecology of the aquatic ecosystem by blocking the penetration of light to aquatic plants, clogging the gills of fish and other aquatic organisms, and by smothering benthic habitats which suffocates the organisms and eggs that reside in the interstitial spaces of the substrate.

The Rivers Dart and Teign have historically contained extremely valuable spawning grounds for salmonid fish, but many of these once highly productive waterbodies are now failing to reach good status for fish (moderate). A combination of qualitative and quantitative data were used to target the DTRIP habitat improvement works (especially gravel remediation), including; historical electro-fishing results (EA & WRT), redd count records, walkover surveys and local intelligence provided by the Dart & Teign Fisheries Associations.

Methods

Over the last decade the Dart Fisheries Association have volunteered their time to conduct the annual gravel cleaning programme on the Dart. Their involvement was invaluable in designing the habitat improvement programme and they played an active role advising the contractors on site.

Two separate contractors were hired to conduct the gravel cleaning works under the DTRIP Project. A variety of methods were adopted to conduct the works, each method was tailored for each site. The contractors were advised to work downstream to avoid siltation of cleaned areas.

All pools were left unchanged and, where possible, only riffle sites were cleaned. Most works were conducted by hand using rakes and forks to release fine sediment.

Water pumps were used for more vigorous cleaning of compacted gravels. A mini digger was used on three sites which had very heavily compacted gravels and where gravel bars needed to be reinstated back into the river.

Water pump method (Stannon Brook, 2012)

Weed being pulled by hand on the Wallabrook (2012)

Teign Waterbodies	Year	Sites *
Teign (Rushford Mill)	2012	2
Blackaton Brook (Blackaton Copse)	2012	3
	2013	3
Blackaton Brook (Thorne Farm)	2012	3
	2013	6
Total sites *		**17**

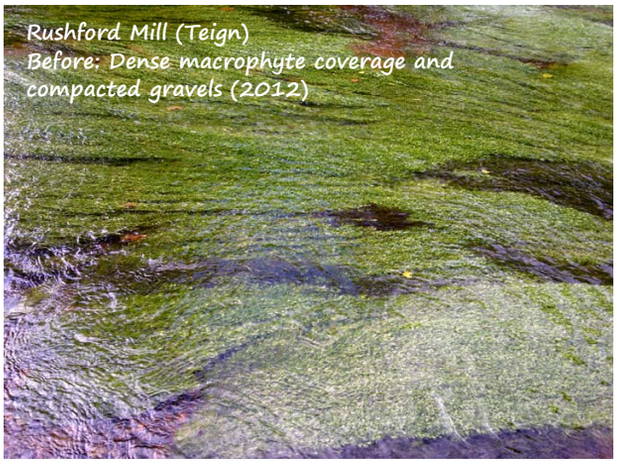
Dart Waterbodies	Year	Sites *
Stannon Brook (Lower)	2012/13	2
	2013	5
Blackabrook	2012	2
	2014	2
Cherry Brook (Lower & Higher Bridge)	2012	3
	2013	3
Wallabrook	2012	4
	2013	7
	2014	3
Total sites *		**31**

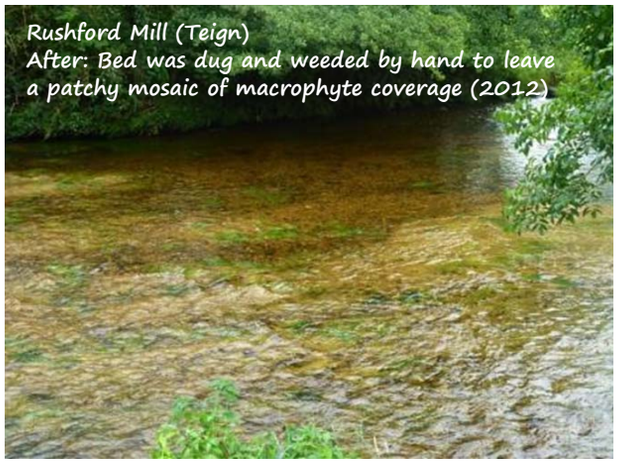
INVESTIGATION	Habitat walkover surveys , Electrofishing & Redd Observation Data
PRESSURE	Sediment input causing silted and compacted gravels
MANAGEMENT	Gravel cleaning and weeding

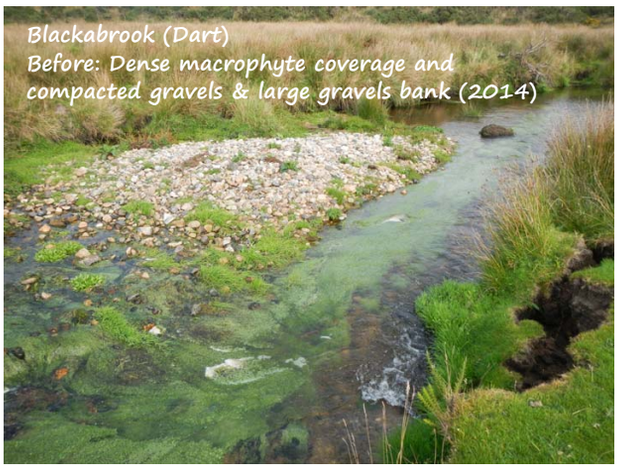
*Note: 1 site = 100m stretch

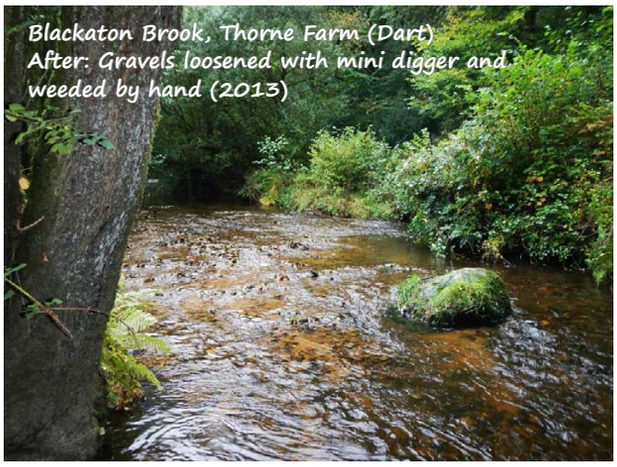
Restoration Measures: Fish Habitat

Gravel Cleaning—Before, during & after









Restoration Measures: Light & flow

Coppicing & Woody Debris

A lack of shade management can negatively affect a river's potential to support fish populations, consequently reducing its WFD status. A river system with a patchy mosaic of shaded and open areas will have a more functional mix of habitat types. Shading stabilises water temperature and provides protection for many fish species from predation. However, some open sections are equally as important for providing sunlight to areas where juveniles are growing. Light is needed to sustain the river's benthic community, it encourages algae to grow that communities of scrapers and grazing invertebrates are reliant upon, therefore providing valuable feeding grounds for juvenile fish.

Although excessive amounts of loose woody debris in a water coarse can increase the potential for debris dams and flood risk, if managed correctly woody debris can add many ecological benefits to the river system:

- Provides shelter and food for a variety of fish and invertebrate species
- Increases channel diversity through bed scouring and improves spawning gravels
- Provides bank protection, reduces erosion

Approach

Sites targeted for action were identified using EA evidence, habitat walkover surveys and the local Fisheries Associations. Coppicing management was divided into two areas.

1. Fisheries Management—coppicing aimed to improve fisheries habitat
2. Land management—coppicing conducted prior to fencing being installed and/or aimed to reduce erosion and stabilise banksides, which also indirectly benefits fisheries habitats (see Phytobenthos section).


Before: Heavily shaded spawning site (Blackaton Copse, 2012)


After: Heavily coppiced to allow maximum light onto riffles (Blackaton Copse, 2012)

Fisheries coppicing aims to provide a patchy mosaic of shaded and open areas. The contractors were advised by WRT to coppice over highlighted riffle sites, and leave the pools shaded for resting fish. All debris dams were assessed by WRT and removed if they posed a risk to obstruction or flooding.

At suitable sites, woody debris was secured into the banksides or river bed to improve habitat diversity and river morphology. All contracts specified that works near or in the watercourse must be compliant with PPG5 and CDM.

Teign Waterbodies	Coppicing (km)
Blackaton Brook, Thorne Farm (2012 & 2013)	1
Blackaton Copse (2012 & 2013)	0.8
Total (km)	**1.8**

Dart Waterbodies	Coppicing (km)
Wallabrook, Babeny (2014)	1.6
Blackabrook	2 2
Total (km)	**1.7**

Case Study: Habitat management on the Wallabrook

Coppicing & woody debris on the Wallabrook

The Wallabrook is a historically valuable salmon spawning tributary of the River Dart. Although the Wallabrook has a 'good' WFD status for Fish, electrofishing data indicated that there had been a significant decline in salmon fry numbers in recent years.

Electrofishing results for 2009 (EA), 2010, (EA), 2012 (EA & WRT) and 2013 (EA & WRT) show that salmon fry numbers were absent from all sites on the Wallabrook. These alarming results triggered WRT to conduct an investigation of the potential pressures causing the fry declines.

In 2013, WRT conducted an extensive habitat walkover of the Wallabrook. The survey highlighted long stretches of heavily shaded river and riffles. A large woody debris/tree blockage was also noted near the confluence. This combined with the previous dry autumns was thought to be a potential contributing factor to the recent decline in salmon fry.

In 2013/14 WRT designed a habitat improvement programme for the Wallabrook. Contractors were hired to remove the debris blockage and 1.6 km of carefully selected coppicing was completed. In addition, 480m of riparian fencing was erected in areas prone to erosion, and 3 gravel sites (300m of river) were cleaned and loosened. Other farm works included 45 metres of guttering and downpipe on a local farm to aid the separation of dirty water.

In 2014, WRT's electrofishing surveys recorded salmon fry at all three sites on the Wallabrook for the first time in three years. This was welcome news following the WFD targeted approach to riparian management and fisheries habitat improvements adopted by DTRIP the project team in response to the alarming electrofishing results recorded in the Wallabrook.

Before: Tree and woody debris blockage at Babeny (Wallabrook, 2012)

After: Removed blockage and re-opened channel (Wallabrook, 2014)

South Teign Gravel Augmentation

The Water Framework Directive identifies fluvial geomorphology or hydromorphology as a supporting element to the biological function of waterbodies.

Reservoirs can play a significant role in the control of geomorphic processes. They can affect the hydrological regime of a river system, which in turn influences the ability of the river system to erode, transport and deposit sediments.

Furthermore, reservoirs directly act as a sediment sink for sediment transported from upstream and their dams can act as a barrier to sediment transport downstream. This disruption of movement in gravels can have a significant negative effect on many parts of the rivers ecosystem, especially on the maintenance of spawning gravels.

In July 2014, WRT worked with Julian Payne from the EA to conduct a River Geomorphology Impact Assessment of Fernworthy Reservoir. The resulting assessments suggested the following mitigation measures should be introduced to improve the hydromorphological condition of the waterbody:

- Introduction of gravels in the 5mm-40mm size range downstream of the dam;
- Cobbles and small boulders (130-300mm size range) with occasional larger boulder, could be added (or hand placed) in the middle reaches;
- Channel width variations could be introduced in the middle reach where the river banks have been reinforced with the river boulders.

Although 'fish' was not highlighted to be the reason for failure on the South Teign, the impact assessment indicates that Fernworthy does have a negative impact on the movement of bed material, which may consequently reduce spawning potential on the waterbody below the dam.

After consultation with the EA, it was decided that the River Teign below Fernworthy Reservoir should be prioritised for a gravel augmentation programme under South West Water's PR14 Objectives.

In October 2014 WRT organised a small gravel augmentation trial with the primary aim of improving salmonid spawning potential on the South Teign and maintaining its 'good' WFD status for Fish. Three augmentation sites were originally planned (one site directly below the dam and 2 sites in the middle reaches), but poor weather prevented the 2 middle sites going ahead.

WATERBODY	South Teign
CATCHMENT	Teign
WFD STATUS	FISH (MODERATE)
PRESSURE	Fernworthy reservoir upholding gravels
MANAGEMENT	Gravel augmentation assessment
MONITORING	Morphology assessment & electrofishing
DATE:	October 2014

Prior to augmentation, all granite gravel was screened and washed to remove any fine silt. Due to poor river access, all 15 tonnes of gravel was wheel barrowed into the shallows to form riffles, then levelled and raked by hand. All pools and areas suitable for resting trout were avoided.

Following on from the augmentation, WRT have agreed with South West Water to extend the augmentation programme for a further 5 years. This not only ensures management sustainability, but it improves the spawning potential for three generations of salmonids and of course helps maintain a 'Good' status for Fish.

Loading the gravel into a dumper, then into wheelbarrows ready to be augmented into the river by hand.

Augmented Gravel beds in situ below dam

Monitoring

River Habitat Walkover Surveys

Habitat Walkover Surveys use a fast but detailed method to assess the provision of fish habitat in a river system and to determine its condition. Walkover surveys also identify where there are potential threats to the condition of the fish habitats present and where barriers or obstacles exist in the river that may act to stop fish accessing those habitats.

Prior to the start of DTRIP 110 km of river had been surveyed and this data was invaluable when writing the project and targeting works. A further 53 km of river (Dart & Teign waterbodies) were surveyed within DTRIP (see output map page 46). This archive of catchment wide baseline data not only provides a tool to inform works on the ground, but is also a way of monitoring any changes in the catchment during and/or after the project.

Redd Observation Surveys

Redd counting has taken place on the Dart & Teign catchment for many years, (some records date back to the 1970's) and has proved to be a very useful fishery management tool.

When collecting qualitative data it can become very subjective between surveyors. Therefore is it important that a standardised technique is used to ensure the data collected is as reliable and consistent as possible. To avoid such limitations, in January 2013 DTRIP held a redd recording training day for the recording volunteers within the Teign & Dart Fisheries Associations. The training was conducted by a member of the EA, who primarily focussed on accurately identifying redds and survey technique. Overall, when conducted properly, and under the correct conditions, redd counting provides a detailed indication of salmonid spawning abundance within the river catchment.

Electrofishing Surveys

Over the three year (2012, 2013, 2014) DTRIP, WRT conducted annual catchment wide electrofishing surveys, undertaking 136 semi quantitative, and 2 fully quantitative surveys in total.

The only comparable electrofishing surveys are those carried out by the Environment Agency (EA) on the Dart and Teign, approximately every 6 years (the last EA catchment wide survey conducted in 2014).

The semi-quantitative survey is not intended to replace the existing EA sampling and monitoring programme mentioned above. The strength of this survey is to enable a quick, affordable, baseline semi-quantitative catchment wide view of the fry life stage only.

Electrofishing surveys aided as a tool to inform appropriate habitat restoration works, and were also used to assess the effectiveness of those works against the Water Framework Directive (WFD) driven criteria.

Case Study

The Dart & Teign
River Improvement Project

North Teign Boulder Re-alignment (match funded work)

Over the years, the River Teign has had numerous weirs constructed along its length, all of which represent some kind of obstacle to fish migration. Two of the most significant obstructions are the Fernworthy Reservoir on the South Teign and a boulder dam on the North Teign.

The boulder dam is a natural formation, caused by large boulders falling into the river from the steep sided gorge which flanks the river. Historical records show that fish were able to pass this obstacle in the past but for much of the last century the boulder dam has been so large it has effectively stopped all but the fittest and most determined fish from reaching their spawning grounds beyond. Fernworthy reservoir, on the other hand, is a complete blocker to fish migration.

Either one of these two obstructions on its own would not cause an insurmountable issue for salmon on the Teign but in combination they effectively cut off access to all of the upper spawning areas of the Teign system. Fernworthy is an essential part of the water supply system for Devon, so this cannot be removed, but the boulder weir was more tractable.

WATERBODY	North Teign
CATCHMENT	Teign
WFD STATUS	FISH (MODERATE)
PRESSURE	Barrier to migration
MANAGEMENT	Barrier Easement
DESIGN	Boulder realignment
DATE:	September 2014

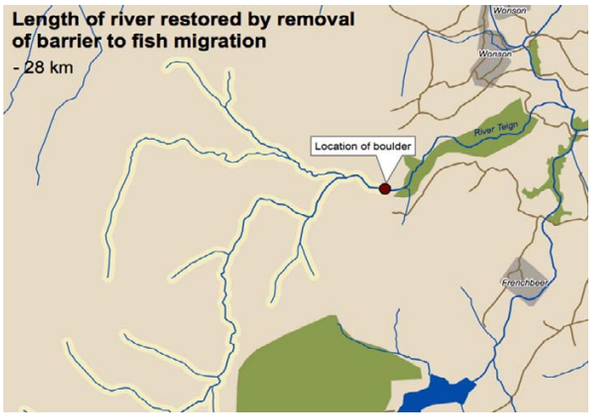
There was much debate as to whether, as a natural feature, the boulder dam should be removed at all. However, as part of a match funded project and after much consideration with project partners, it was agreed that to restore the function of the upper reaches of the Teign the boulders should be moved.

Following the intervention it can be seen that the river flowed sufficiently well for migrating salmonids to surmount the obstacle, and has the action is thought to have restored 28km of river to the breeding habitat of these important migratory fish.


Before: the large boulder causing a complete channel obstruction


During the process of realigning the boulder


After: Re-opened channel

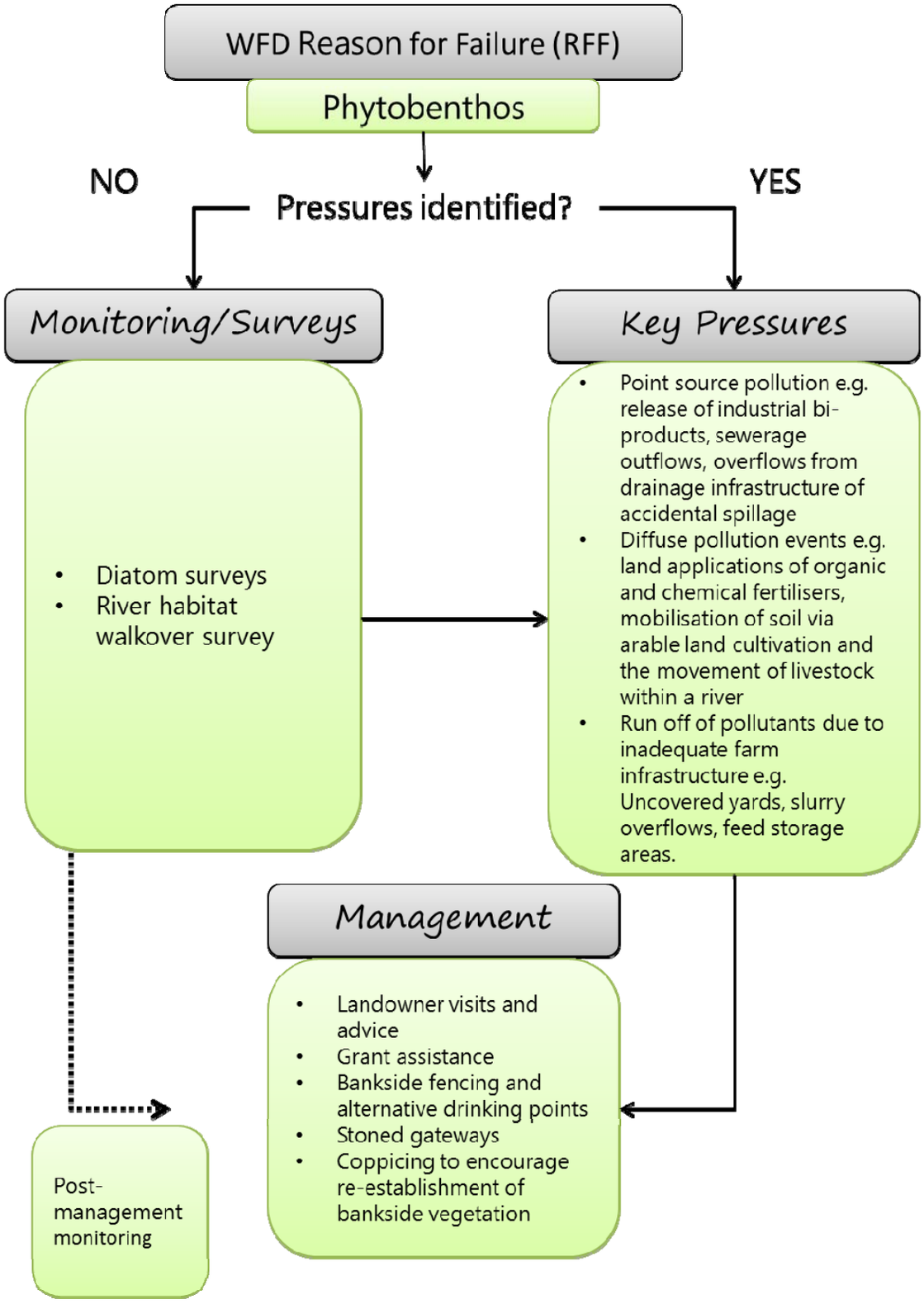


Case Study: North Teign Boulder Re-alignment

PHYTOBENTHOS

Targeting interventions for Phytobenthos

Flow diagram to illustrate how CRF works within the DTRIP were targeted and driven by WFD.



Phytobenthos

Phytobenthos are a benthic (they live attached to substrates such as rock/stone or large plants) sub-group of diatom algae. Most are unicellular, but they can exist as colonies in the form of filaments or ribbons.

The assessment of phytobenthos in a river is a well-established method for assessing water quality. It is widely accepted that a detailed evaluation of the structure and function of phytobenthic (diatom) communities in a river can provide robust evidence for assessing its ecological condition.

The criteria for the assessment of diatom communities for WFD classification were developed through the Diatoms for Assessing River Ecological Status (DARES) Project. This project assessed diatom assemblages at a series of reference sites and developed a model that allows the composition of the benthic diatom assemblage in a river to be predicted. Comparison of the predicted assemblage with that found through sampling allows the ecological condition of the river to be assessed.

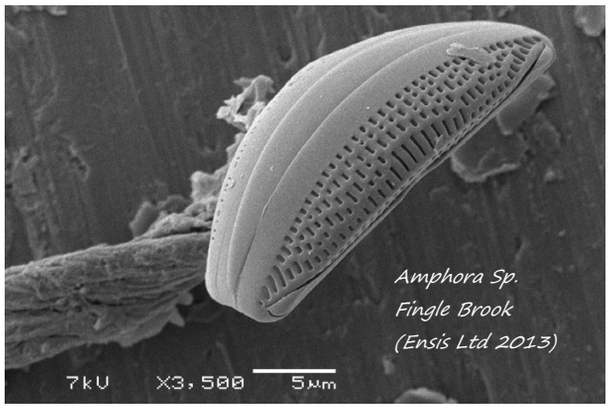
Pressures

Phytobenthic community composition can be affected by a wide array of pressures, but they are particularly sensitive to changes in the pH and nutrient levels in the water and can be used to identify rivers impacted by these types of pollution.

Pollution of this type can be derived at specific locations along a river (point sources) or from the cumulative effects of many small, highly dispersed and often individually insignificant pollution incidents (diffuse sources).

Highly localised point sources of pollution occur when human activities result in pollutants being discharged directly into the aquatic environment. Examples include the release of industrial bi-products, effluent produced through the disposal of sewage, the overflows from drainage infrastructure or accidental spillage.

Diffuse pollution can occur when large amounts of slurry, manure, chemical phosphorous-containing



Amphora Sp.
Fingle Brook
(Ensis Ltd 2013)

fertilisers or agrochemicals are applied to land. If these processes coincide with high rainfall events, it can lead to run off or leaching from the soil and to the subsequent transfer of contaminants into a watercourse.

In addition, the intensive cultivation of land or the over disturbance of soil by livestock (poaching) can mobilise fine sediment, which may transfer to drains and watercourses by water running over the surface. Other diffuse sources include pollutants mobilised from farm infrastructure such as uncovered yards, slurry pits, feed storage areas and dung heaps.

Monitoring

Waterbodies failing to reach good ecological status for Phytobenthos were monitored, and rivers that lacked biological data were investigated with diatom surveys. DTRIP conducted a catchment wide biannual diatom sampling programme, with surveys carried out in Spring and Autumn. (2012,/13/14). The samples were analysed and reported by APEM and UCL/ENSIS. The diatom results played a vital role informing and targeting the farm advice.

Restoration Measures: Phytobenthos

Land management advice & investment

All waterbodies failing (or indicated to be failing though investigations e.g. walkover surveys, diatom results and electro-fishing results) to reach good status for phytobenthos and fish were targeted for farm visits and advice.

These integrated land advice packages were delivered by an experienced farm advisor which covered many aspects of a farmer's practice. The advisor identified where the adoption of good practice or best practice may minimise the risk that an activity will have a negative impact on the environment, and where it may enhance the provision of a particular ecosystem service and improve WFD.

In addition to broad advice on good practice, the advisor also produced a targeted and tailored programme which, through the provision of free soil tests included specific advice on pesticide, nutrient and soil management on the farm to mitigate any potential environmental impacts (please see output map on page 46 for distribution of works).

A proportion of the DTRIP budget was allocated for a farm capital grants scheme. Funds were available to contribute towards 60% of the total cost of advised farm improvements. Works covered by the grant scheme would generally include:

- Riparian fencing and preparatory coppicing
- Alternative animal drinking points
- Free soil tests
- Culverts
- Gravelled tracks
- Gate relocations

Farm Works Outputs

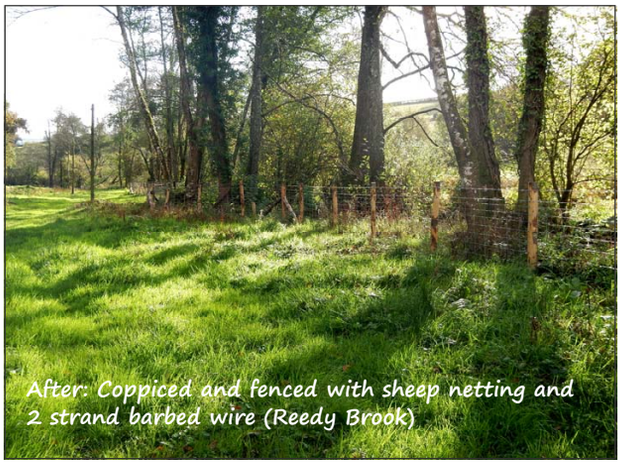
Waterbody	Catchment	Number of Farms	Fencing (m)	*Coppicing (m)	Drinking Points	Guttering (m)	Crossing Points	Effluent Tank
Cherry Brook	Dart	1	450		2			
Blackabrook	Dart	1	280	100				
Wallabrook	Dart	1	480			45		
Harbourne River	Dart	2	522		4		2	
West Webburn	Dart	1	1,600	200	3			1
Blackaton Brook	Teign	3	1,620	100	5			
Fingle Brook	Teign	6	2,561	746	6	50	2	
Reedy Brook	Teign	2	955	955				
South Teign	Teign	1		440				
Sowton Brook	Teign	1	380	380				
Teign	Teign	3	810	220	1	205	1	
Total Outputs		**22**	**9,658**	**3141**	**23**	**300**	**6**	**1**

* Note: Coppicing conducted as a preparatory measure before the fencing is installed. However, coppicing will always be conducted in way which will provide multiple benefits to the river ecosystem, including fish habitat improvements.

Restoration Measures: Phytobenthos

Land management advice & investment—Before & after

Before: Poached field with minimal buffer strip along bankside (Reedy Brook)



After: Coppiced and fenced with sheep netting and 2 strand barbed wire (Reedy Brook)

Before: Overgrown and unprotected banksides reducing light to riffle habitat (Sowton Brook)

After: Coppiced and fenced with 3 strand wire and sweet chestnut posts (Sowton Brook)

Before: Open floodplain grazing marsh habitat (W.Webburn)

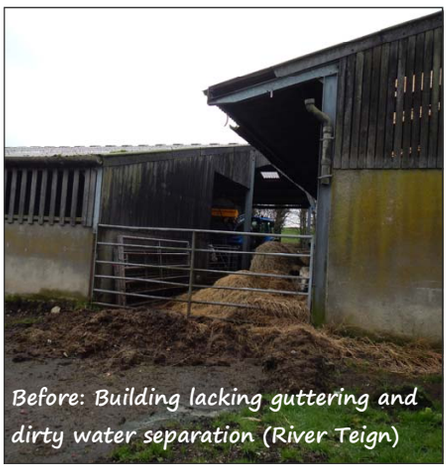
After: Fenced to provide a large riparian buffer strip and protect the floodplain grazing marsh which is a Biodiversity Action Plan habitat.

Restoration Measures: Phytobenthos

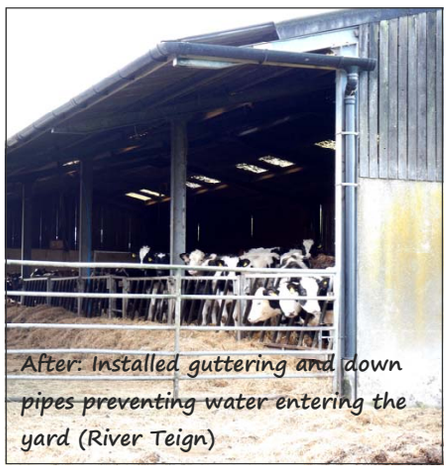
Land management advice & investment—Before & after

Before: Poached track crossing stream (Blackaton Brook)

After: Gravelled track to reduce sediment input (Blackaton Brook)



Before: Building lacking guttering and dirty water separation (River Teign)



After: Installed guttering and down pipes preventing water entering the yard (River Teign)

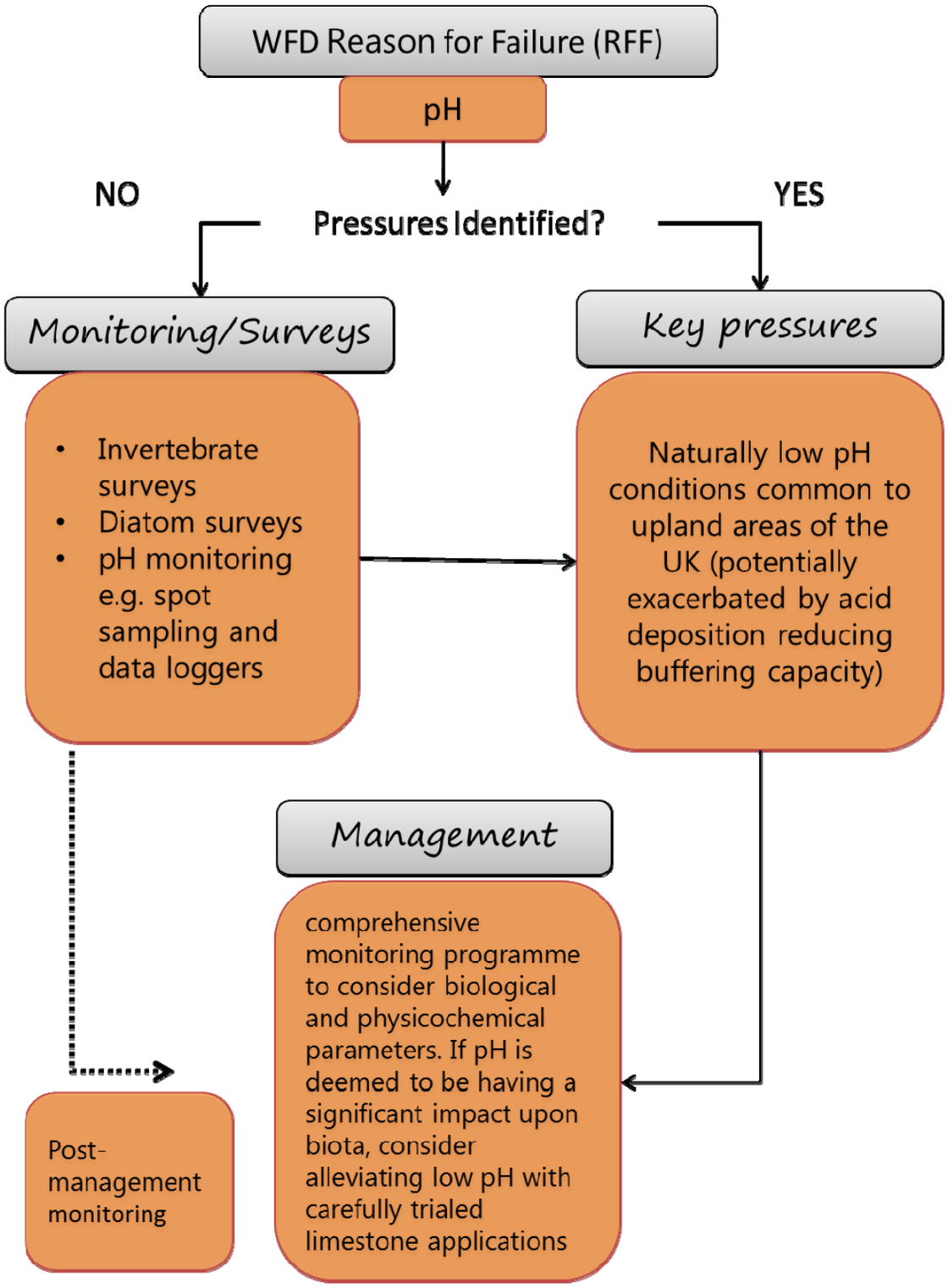
Before: muddy water and slurry waste spilling into drain (W. Webburn)

After: Concreted Yard and drain connecting to an effluent tank (W. Webburn)

pH

Targeting interventions for pH

Flow diagram to illustrate how CRF works within the DTRIP were targeted and driven by WFD.



pH & the environment

Pressures

The naturally acidic conditions found in upland areas of the UK are exacerbated by acid deposition caused by atmospheric pollution.

The effect is such that the natural buffering capacity (Acid Neutralising Capacity (ANC)) of the soil is impaired leading to low pH conditions in surrounding waters. Many Dartmoor rivers, including the West Dart, are reported as being below reference ANC values, highlighting that these reaches remain acidified (Battarbee et al., 2012).

Ecological impact

Numerous studies document the effect of low pH conditions upon aquatic biota, which are largely associated with aluminum (Al) toxicity. Al can exist in numerous states (species) in freshwaters and is most toxic in its monomeric inorganic form (Al_i). The formation of Al_i is strongly correlated with pH with higher concentrations found as conditions become more acidic. There is a large body of literature reporting that exposure to brief periods of low pH and moderate levels of Al_i can impact upon the survival of Atlantic Salmon (*Salmo salar*) mainly owing to impaired osmoregulation, which reduces tolerance to seawater (Kroglund et al. 2007).

Upper West Dart

East Dart

Mitigation

Many systems are expected to recover naturally given overall reductions in acid deposition and sites currently below reference ANC values should be closely monitored to assess change.

It is possible to treat highly acidic catchment systems with limestone ($CaCO_3$) and this approach has been widely adopted in Scandinavia to reduce acute and chronic acidification episodes.

There are number of different methods for treating watercourses with limestone, which involve direct application to the river channel or surrounding land in the catchment. Evidence suggests that limestone application to highly acidic areas can have ecological benefits with salmon and acid sensitive invertebrates showing a general increase in abundance following treatment (Mant et al., 2013).

Case Study

The Dart & Teign
River Improvement Project

Investigating pH in the Upper West Dart

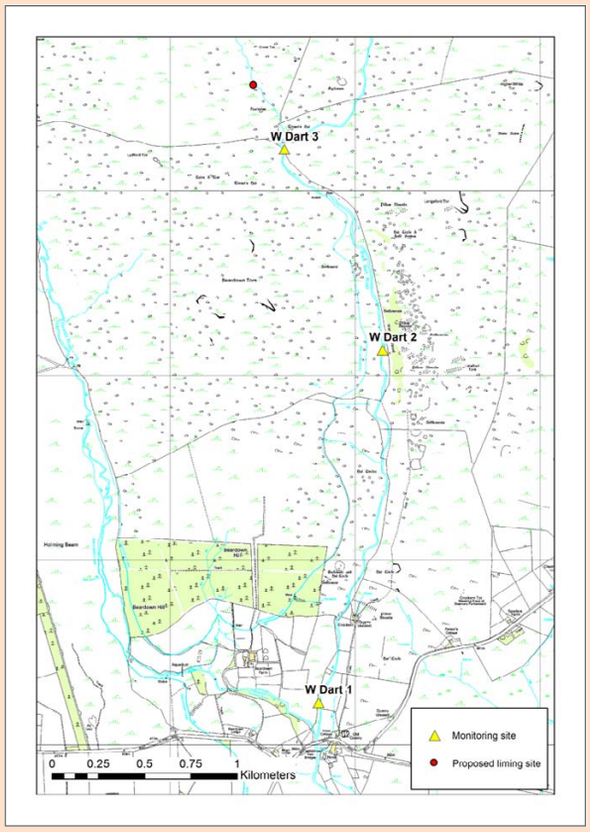
The Upper West Dart River is failing to achieve good overall status under the WFD, in part owing to unfavourable (low) pH conditions.

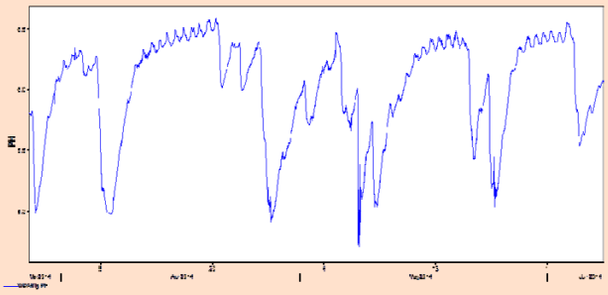
Evidence suggests that low pH conditions occur when rivers are in spate, particularly in upland locations in the UK (Stutter et al., 2001). Pulses of low pH in rivers are likely to be pronounced following dry spells and there is a large body of literature reporting that exposure to these short events can have deleterious effects upon biota (Nilsen et al., 2013).

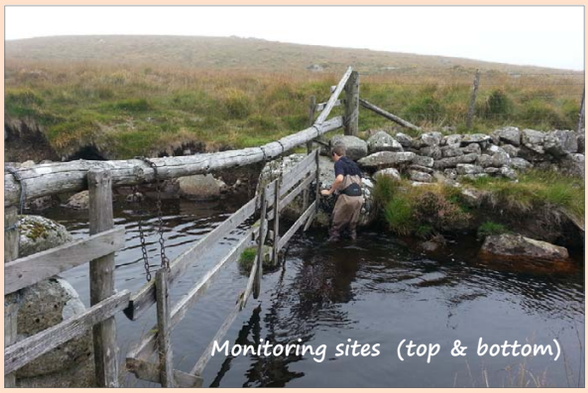
To improve the spatial and temporal resolution of pH data for the West Dart, WRT has undertaken continuous monitoring to determine pH conditions across a 12 month period. pH sensors (Aquistar TempHion, INW) were deployed at three locations in the Upper West Dart to record pH at 15 minute intervals.

Data show the regular occurrence of low pH episodes during rainfall events, when pH can drop to below pH 5. To investigate the potential impacts of these low pH events upon biota, WRT is planning to undertake a comprehensive monitoring programme to include biological surveys (diatoms, macro-invertebrates and electric fishing) alongside continued pH monitoring.


The West Dart River






Monitoring sites (top & bottom)

Nilsen, T.O., Ebbesson, L.O.E., Handeland, S.O., Kroglund, F., Finstad, B., Angotzi, A.R., Stefansson, S.O., 2013. Atlantic salmon (Salmo salar L.) smolts require more than two weeks to recover from acidic water and aluminium exposure. Aquat. Toxicol. 142-143, 33–44. doi:10.1016/j.aquatox.2013.07.016

Stutter, M., Smart, R., Cresser, M., Langan, S., 2001. Catchment characteristics controlling the mobilization and potential toxicity of aluminium fractions in the catchment of the River Dee, northeast Scotland. Sci. Total Environ. 281, 121–139. doi:10.1016/S0048-9697(01)00841-5

Case Study: Upper West Dart pH Investigation

Partnership & Stakeholder Engagement

Partnership & Stakeholder Engagement

Land management advice & investment

The DTRIP developed an integrated stakeholder-driven assessment of the catchment prior to, and through out the project. This provided a comprehensive understanding of the challenges the catchment faces and, helped develop a strategic, targeted, balanced and therefore cost-effective catchment management intervention plan.

The DTRIP management plan was achieved through engaging with catchment stakeholders by building diverse, engaged and empowered catchment partnerships comprised of environmental practitioners, businesses and community groups.

Once brought together, the partnership developed a shared understanding of the issues in their catchment, which aided in building a consensus about what actions needed to be delivered to achieve this shared vision for their catchment in the future.

Project Advisors Meetings

Over the three year project the DTRIP developed a strong partnership that helped steer the project forward in a positive and effective direction. Every six months the DTRIP held a Partnership Advisory Group Meeting (PAG) where each project officer would present a project progress update. This offered an opportunity for all the project partners to ask questions, provide feedback and agree any changes to the original bid.

In order to ensure the partnership were regularly updated a project newsletter was sent every three months, these provided brief concise updates on project progress and what was planned for the following months ahead. Alongside the regular PAGs, other specific meetings were held which followed on from specific PAG agenda items or meetings to discuss particular project works. All of which have been documented and archived.

Volunteering & Stakeholder Involvement

The DTRIP was fortunate to have some very active stakeholders who volunteered their time to the delivery of the project.

In particular, the Dart and Teign Fisheries Associations played a vital part in delivering some of the fisheries aspects of the project, from simply sharing their extensive knowledge of the catchment to helping target works, attending initial site visits, to river habitat works supervision and annual redd counting. Their time was donated as time in-kind contributions and all volunteered hours were evidenced by timesheets. All volunteer time was contributed by non-funded partners.

Publicity & Press

In June 2013 the DTRIP was featured in an episode of BBC Countryfile. The main focus of this feature was looking at fish stocks in the river Teign and the pressures the catchment is under. During the filming WRT presented the importance of fish population monitoring and gave a very professional demonstration of electrofishing!

DTRIP PAG Meeting (2015)

Filming on the River Teign

Partnership & Stakeholder Engagement

Community Engagement

In order to inform and involve the wider community about the importance of catchment management and the role of the DTRIP, two community volunteer training events were held, these were:

- Redd Recording Training – On 12th December 2012 a training event was held for members of the Dart and Teign Fisheries Association. The event taught volunteers how to identify and record redds onto a WRT survey sheet. Mike Maslin from the EA kindly agreed to be the guide.
- Volunteer Electrofishing Training - between 20th and 21st May 2013 WRT organised a three day introductory electro-fishing course. The aim of the course was to introduce CRF volunteers to semi-quantitative electrofishing methodology and to train them to be bankside field assistants .


Redd Recording Training 2012

WRT Staff Training—prepared to deliver

To ensure that all the staff working on the CRF projects were well informed and prepared to deliver the projects as efficiently as possible; a number of staff attended a variety of appropriate training courses for their particular role. These include:

- GIS training
- NEC3 contract training
- Health & Safety training (All senior management)
- IOSH Health & Safety training
- Home Office Licence under the Animals (Scientific Procedures) Act 1986
- Electro-fishing training
- Macrophyte ID training
- Awareness of Moving Water Safety Course
- First Aid
- Construction Design & Management (CDM)
- Pinpoint Farm Advisory Training


WRT Pinpoint Farm Advisory Training 2013

Project Summary

Overall the DTRIP has been extremely successful in its delivery. All works within each failing WFD waterbody have been informed through sound science and investigation prior and post delivery. This not only ensures that a more accurate ecological condition of each water body is identified, but it ensures that all works delivered are both efficient and effective.

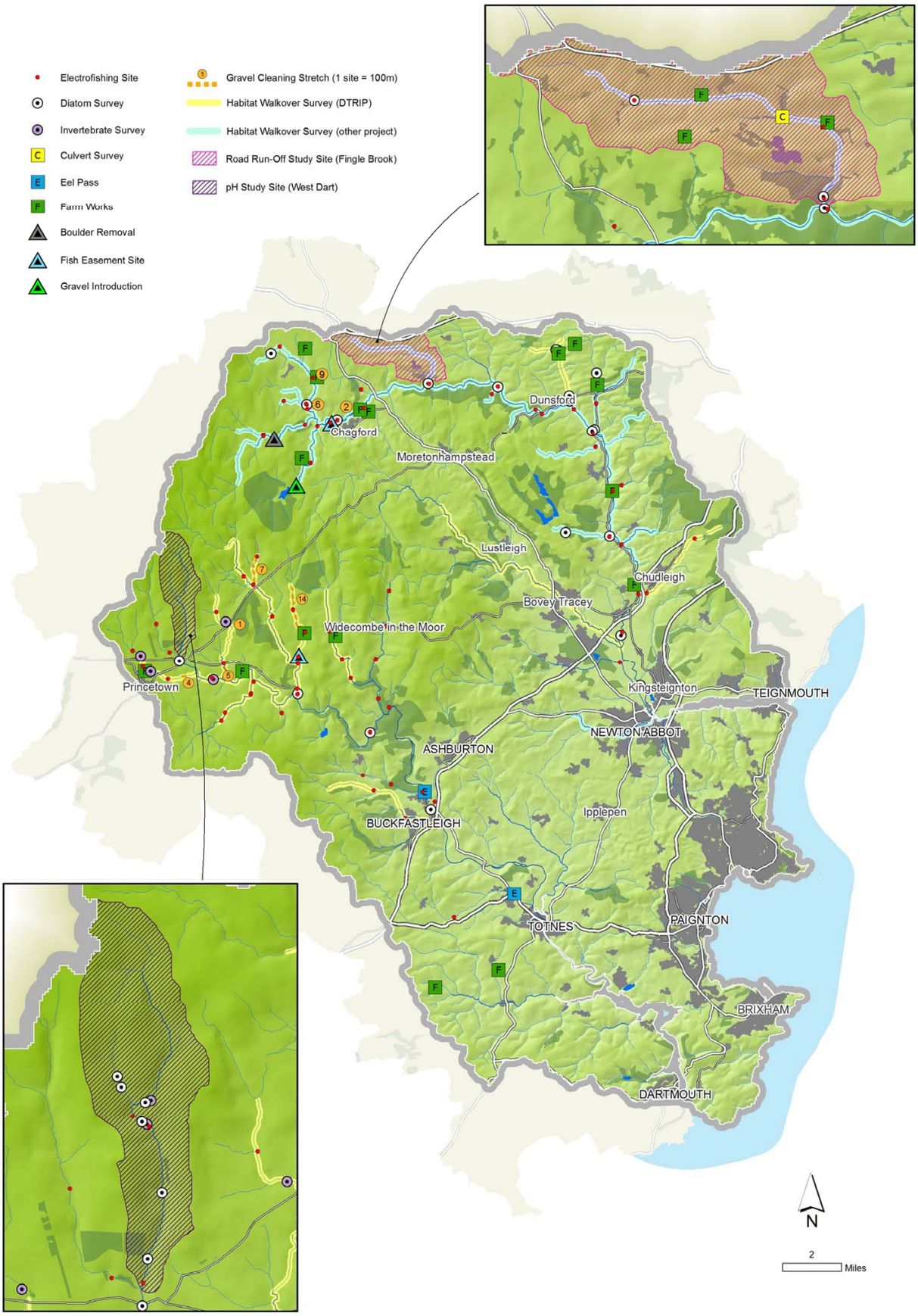
Although it is evident that the three year DTRIP project has been successful in its delivery, three years is a relatively short period to expect significant improvements of water quality. However, we can safely be reassured that works such as barrier easements will improve the rivers connectivity for migrating fish species, and farm works such as fencing will most definitely prevent damage caused by livestock entering the river, and reduces pressure such as bankside erosion. Although these delivery outputs have a small positive impact individually, the cumulative impact though out the catchment will be significant.

The project has provided a strong baseline to continue working from. We have conducted many investigations and works, all of which have provided valuable information on the current condition of the river, and pinpointed the locations of some specific pressures that still need to be targeted within the Dart and Teign catchment. It is therefore crucial that this work is continued into the future, not only to ensure that the funds provided under the CRF have been spent efficiently, but also because DTRIP has provided a management foundation, which if built upon will ultimately provide a sustainable future for the catchment.

Summary of DTRIP Project Achievements

In the original project application a number of targets were proposed. The table is a summary of these targets giving an indication of whether each outcome was achieved within the DTRIP Project (Green = complete, yellow = partly complete, red = not complete). These outputs are also summarised on the map over the page:-

Project Outcomes	Outcomes achieved?	Comments
Rushford concrete-block fish pass		After consultation with the EA and project partners it was decided that Rushford was not a priority barrier that required easement. Instead the funds were used to address Chagford weir, the next barrier upstream from Rushford which posed a worse threat to salmonid migration than Rushford.
Buckfast Weir Eel Pass		Works complete
Rushford Weir Eel Pass		Rushford was ruled out after an assessment and Dartington Weir Eel Pass was installed instead.
2 x Culvert Adjustments		A detailed survey and feasibility assessment of the Fingle Brook culverts was completed. Unfortunately the remediation methods proposed within the assessment was too costly for the DTRIP budget. Therefore further funding will be sought to complete the works in the future.
10 km of fencing		9.6 km of fencing was installed
Coppicing and woody debris management		6.6 km of riparian habitats were managed for woody debris and coppiced to improve fisheries habitat.
Gravel cleaning and management x 12 sites		31 sites complete
Livestock drinking points x 10		23 alternative livestock drinkers installed
Dog bathing area signage x 10		PAG agreed not to undertake this work following opposition from stakeholders
Nature balancing ponds to buffer A30 road run off		WRT are in discussion with the Highways Agency to conduct regular maintenance on the existing nature balancing pond.
Post pH feasibility study remediation work		The works have now been approved after a long consultation process and monitoring programme, and funding has also now been secured.
Reservoir Offtake Level trials		Feasibility study on Fernworthy Reservoir revealed intervention not possible.
Electrofishing pre & Post works		Complete
Redd Counts		Complete where weather conditions allowed
Acid Feasibility Study		Complete
Diatom monitoring pH Data Loggers		Complete In situ


Electrofishing Site
Diatom Survey
Invertebrate Survey
Culvert Survey
Eel Pass
Farm Works
Boulder Removal
Fish Easement Site
Gravel Introduction
Gravel Cleaning Stretch (1 site = 100m)
Habitat Walkover Survey (DTRIP)
Habitat Walkover Survey (other project)
Road Run-Off Study Site (Fingle Brook)
pH Study Site (West Dart)
Dunsford
Chagford
Moretonhampstead
Lustleigh
Chudleigh
Bovey Tracey
Widecombe in the Moor
Princetown
Kingsteignton
TEIGNMOUTH
NEWTON ABBOT
ASHBURTON
Ipplepen
BUCKFASTLEIGH
TOTNES
PAIGNTON
BRIXHAM
DARTMOUTH
N
2
Miles

Future Works

Future works on the Dart and Teign catchment which have been planned by WRT following the completion of DTRIP.

Monitoring

- An annual semi-quantitative catchment wide electro-fishing programme is hoping to be continued. WRT have been discussing plans with the local Dart and Teign Fisheries Associations who are potentially offering to fund the future programme.
- The Dart Fisheries Association have also offered to fund WRT to conduct habitat walkovers on the West Webburn and the remaining stretches of the West Webburn which have not yet been surveyed.
- South West Water have provided funds to conduct an experimental liming trial on the West Dart to mitigate against low pH. A detailed monitoring programme is ongoing
- The DTRIP's monitoring and investigation programme has already contributed some valuable data. This contribution not only adds data to an already detailed archive, but it has also provided data on some waterbodies which are completely data deficient.

Physical Works

- WRT are co-hosts for the South Devon CaBA and the work of DTRIP will be used to build upon future bid work and find gaps in evidence or action. A Catchment Partnership Action Fund Project has now been developed and funding secured to address diffuse nutrient pollution issues in Salcombe/ Kingsbridge and Slapton.
- Through the cooperation of existing catchment partners, such as the local fisheries associations, it is hoped that future Catchment Fisheries Plans will be develop improved fisheries management of the Dart & Teign.
- The five year Upstream Thinking 2 Project on the Dart catchment starts in April 2015. This will deliver extensive work to target water quality issues within the catchment and build upon the work already delivered under the DTRIP.
- The WRT and Duchy of Cornwall have discussed continuing future habitat works on the catchment. Habitat works have been agreed to be delivered by the Duchy and the landowners for the next 7-10 years ensuring that the work delivered under DTRIP is not only maintained, but also continued into the future.
- The Highways Agency have agreed with WRT to ensure that the maintenance of the settlement lagoon at Whiddon Down will be maintained, helping address one of the water quality issues on the Fingle Brook.
- WRT will continue to seek funding for future works which will help build upon the foundations laid by DTRIP. One example will be to seek funding to complete the culvert mitigation work on the Fingle Brook.
- WRT have reached an agreement with South West Water (SWW) who have now committed funding for a 5 year gravel augmentation programme on the South Teign. Work will be funded under SWW's PR14.

The Dart & Teign River Improvement Project (DTRIP) is a Catchment Restoration Funded Project, which was administered by the Environment Agency. The project was written and delivered by the Westcountry Rivers Trust, and steered by its catchment partnership.

The project was delivered over three years (2012-2015), with the primary aim of delivering targeted action to make significant steps towards achieving Water Framework Directive (WFD) waterbody objectives set out in the 2009 River Basin management Plans.

This report documents the works delivered under the DTRIP and describes how these works were targeted to ensure that efficient on the ground management was delivered effectively throughout the catchment.

Although the DTRIP has completed its final year, the work that has been delivered and the valuable information and data that has been collected will provide a solid foundation to build upon in the future. This not only provides wider benefits to the society and the environment, but also provides a valuable tool to aid in building a sustainable future for the catchment as whole.

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