



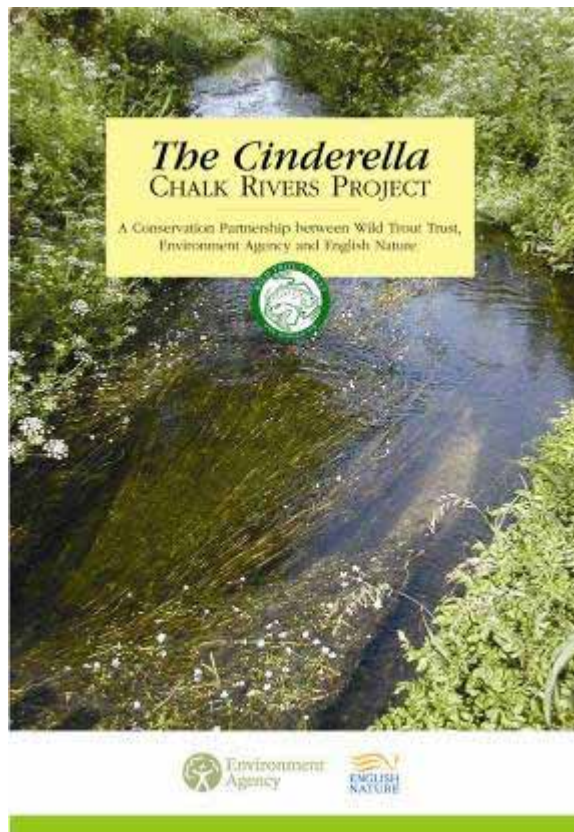
## Habitat Advisory Visit

Rivers Stiffkey & Burn  
Holkham Estate, North Norfolk

On behalf of Viscount Cook, Nick Zoll & Charles Rangeley-Wilson

19<sup>th</sup> June 2006

Sponsored By



## 1.0 Introduction

This report is the output of a site visit undertaken by the Wild Trout Trust on the Rivers Stiffkey & Burn within the Holkham Estate, Norfolk on 19<sup>th</sup> June 2006.

Comments in this report are based on observations on the day of the site visit and discussions with Viscount Cook and Mr Mark Watson (Holkham Estate), Mr Nick Zoll and Mr Charles Rangeley-Wilson (Burn & Stiffkey Fishing Syndicate).

Normal convention is applied throughout the report with respect to bank identification, i.e., the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

## 2.0 Fishery Overview

The Rivers Stiffkey and Burn that run through the Holkham Estate can be best described as typical examples of heavily modified lowland chalk rivers. Over many decades both rivers have been subjected to over-zealous flood defence works. Typically this has resulted in a channel that has been straightened, over-widened, and over deepened. Added to this run-off from arable fields within the catchment is thought to be adding a loading of fine sediment into the channel. In areas where the river has been canalised this has resulted in wide-spread deposition of sands and silts over the original gravel bed (where it remains in tact). In simple terms the river is currently failing to provide the mosaic of habitat types wild trout need to fulfil their 'life-cycle requirements' (Fig 1)



**Fig 1) The wild trout's 'life-cycle' habitat requirements**

Despite these impacts there are remnants of a population of wild trout. During the Stiffkey visit a handful of trout were spotted in the 2-4lbs range. These fish indicate there is some, albeit limited spawning activity in the catchment. Further to this there is evidence of the apparent capture of at least two sea trout in 2005/6. The North Norfolk Coastal rivers are known to be frequented by sea trout, however barriers to

migration such as dams, weirs and sluices severely limit the potential of both rivers to sustain a viable spawning migration / smolt run. The Environment Agency recently installed a smolt trap d/s of Warham. In a telephone conversation on 17<sup>th</sup> July, EA Fisheries Officer Andrew Hindes he confirmed that, to date, three smolts have been caught.

The problems listed above are not unique to Holkham and are common to many rivers in East Anglia. The potential scale and cost of actions to enhance and restore habitat can seem a daunting task. Viscount Cook and the Holkham Estate have recognised the need to restore the natural heritage of the rivers and fisheries in their care. In October 2002 The Estate undertook a project on the Stiffkey at Wighton to restore a sequence of three spawning riffles into a deep and straight section of the river. Although successful this project was expensive, costing in the region of £15000 (see later review).

Three years on from this and the Estate has formed a 'restoration syndicate,' comprising a dozen fishermen to undertake a long-term conservation project. Their aim is to restore the biodiversity and wild trout populations of both rivers. There are also plans to offer day rods to the general public, once the fishery is established.

While the syndicate is rich with enthusiasm it is poor both in-terms of funding and labour. With this in mind the main emphasis of this report will be to make suggestions for improvements that can be undertaken with low budgets, and a small but willing workforce of volunteers. In a further effort to keep costs down the use of local materials from sustainable sources will be recommended. Most importantly the need for the hire of costly specialist plant should be avoided. It is hoped that this initial 'rough guide' will be developed, refined and used as a model for improvement works on other reaches and rivers within the estate.

In 2002 The WTT undertook an Advisory Visit on both rivers. To avoid repetition readers are asked refer to this report as this forms the basis of good an overview of current habitat quality /issues. Many of the recommendations in this report are detailed in the WTT's new Wild Trout Survival Guide (WTSG), a copy of which is presented with this report. Relevant sections of the WTSG will be highlighted as footnotes.

### 3.0 – Site Visit and Recommendations

Broadly speaking the visit was broadly split into three sites:

- 1) Stiffkey at Wighton
- 2) Stiffkey u/s & d/s Warham
- 3) Burn Burnham Thorpe – Burham Overy Lower Mill

#### 3.1 Stiffkey at Wighton

In October 2002 the Estate installed three gravel riffles at Wighton. Nearly four years on and the riffles appear to be performing well, with good beds of starwort now present. Gravel appears to be fairly clean, however the low flows currently being experienced on the river are causing fine sediment deposition. Winter flows should mobilise this material but it may be worth considering the placement of in-stream logs (large woody debris) to scour material and create some deeper pool habitat. An information leaflet on large woody debris is included with this report. Another option may be to jet gravels on rotational basis using a high-pressure water pump<sup>1</sup>.

The new fence line has allowed marginal vegetation to establish on the berms, with species such as sedge, purple loostrife and great willow herb. All three riffle areas have extensive signs of otter and water vole presence. A female otter and two cubs were observed during the visit. Starwort and lighter areas of sand deposition can be seen clearly. Each riffle has scoured a deep pool.



<sup>1</sup> See appendix 1 for specification.

## 3.2 Stiffkey U/S & D/S Warham

### 3.2.1 – Overview

The river at this location is characterised by the presence of a straightened channel with steep sided banks, pointing towards having been previously dredged. There is extensive deposition of fine silts and sands and very little in the way of gravel riffle and pool habitat. In places the fence line is in a poor state and is being pushed into the river by cattle. From wading this section there appears to be a soft layer of fine sediment at least 0.5m deep. It is difficult to gauge the composition of substrate underneath this, however there appears to be gravel present. A few trout to 4lbs+ were observed in this reach, and two sea trout were caught here in the 2005 season. Land use is mixed grazing and arable.



**Straight ,steep, silted and shallow....**

There is a narrower wooded section (RHB) at the upstream limit of the beat below Warham where good flow velocities, gravels and in-stream vegetation are still evident. There is a cattle drink present here, which is a point source of yet further fine sediment entering the river.



Narrow wooded section – note silt entering river from cattle drink.

### 3.2.2 – Recommendations

**It is a legal requirement that all the works to the river and /or the on-line lake require written Environment Agency consent prior to undertaking any works, either in-channel or within 8 metres of the bank.**

Local EA Fisheries and Development Control staff should be contacted at the earliest opportunity to discuss any recommendations arising from this report the syndicate may wish to pursue.

The stream in both sections is over-wide (approx 7m). There are sections where channel width narrows to around 4m and stream velocities improve and exposed gravels are present. It is these sections that provide a good template for restoration works d/s and u/s of Warham. In over-wide sections a new bank line should be created using brushwood faggots staked along the RHB<sup>2</sup>. At various points it is also recommended that flows be 'pinched' by installing paired and single faggot deflectors to allow the river to scour pool habitat<sup>3</sup>. Backfill for these features can be sourced from the chalk pit which lies in close proximity to the river. The new bank should be set no more than 10cm above summer water level to allow the development of emergent wetland plants such as sedge, water forget-me-not, brooklime, yellow flag-iris and water mint, etc. Consideration should be given to transplanting well-established emergent vegetation from adjacent areas to facilitate the colonisation process. A density of four plants per square metre should achieve rapid results.

This habitat is particularly important for grey wagtails, reed warblers, southern damselfly and water voles, (which are known to forage along wet vegetated berms). Fringing vegetation will also provide cover for trout fry on emergence from spawning gravels. The new bank will have the added benefit of allowing angler access at the waters edge, rather than being 4-6 feet above the river, as is the current situation!

Woody debris<sup>4</sup> in rivers can provide habitat for a variety of animals. Brown trout numbers increase significantly with the presence of woody debris along the banks and in the river as they provide refuge and cover. They may offer lies for otters or perches for kingfishers. Woody debris in the river may also create pools and riffles in sections of the river that would otherwise have a dearth of aquatic habitats. They also retain leaf litter and act as an energy reservoir for the river section.

Fallen timber can be used to create flow deflectors. Deflectors need to be; 1) keyed into the bank to avoid localised erosion and; 2) staked and wired to the bed of the river to avoid being washed-away. During winter flows the deflectors will scour out pools and naturally sort and clean gravels suitable for trout spawning. As a very rough guide deflectors should be set at approximately 30 degrees to the bank with a length of between 40-50% of channel width, or staked in mid channel as paired submerged upstream facing logs. Deflectors key in from the bank should be just at summer water level. Scour pools have been shown to be very important habitat for all life stages of brown trout. Deflectors could be particularly useful if placed silted riffle areas.

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<sup>2</sup> See WTSG page 42

<sup>3</sup> See WTSG page 44

<sup>4</sup> See WTSG page 39



**Installation of new bank using faggots and chalk backfill on the River Wensum, Norfolk**





**Introduction of single u/s 'natural' deflectors (single, near bank and triangular' far bank) on the Wylde in Wiltshire formed a chicanes, sending flow from one bank to another. Note set just above summer water levels.**



**Installation of these upstream facing 'paired logs' has created valuable mid-channel pool habitat.**

The cattle drink needs urgent attention. All fine material should be scrapped back and replaced with layer of rounded flints approximately 20cm deep. This will allow cattle access to safe clean drinking water, whilst not allowing the ingress of silt into the river.



**Restoration of cattle drink with fencing to allow safe, clean access for cattle.**

In this section lack of mature tree growth is a significant problem. River bank trees are a vital part of any functioning streams ecology. Without them, no LWD or leaf litter would enter a river, which would be completely un-shaded with no fish cover provided by root systems. Tree planted buffer strips have also been shown to be very effective in the control of excessive surface water run-off, and associated sediment and nutrient run-off. It is recommended that the syndicate undertake a planting scheme backed up by a 7-10 year rotational coppicing and pollarding programme when mature growth is reached. This will eventually create a mosaic of light and shade allowing the development of fringing riparian vegetation and in-stream macrophytes, such as starwort. The resulting timber (or LWD as we now know it!) can be used for the creation of flow deflectors. Habitat created will be particularly useful for trout parr that are highly territorial and require good cover.



**Straightened  
section of Stiffkey  
upstream of  
Warham Bridge.**

**Note: Lack of tree  
cover and need for  
arable buffer strips**

It is recommended that all fields running adjacent to the river have buffer strips (5-9m) created to reduce the risk of fine sediment run-off from arable fields. This is of particular importance where maize is planted. Further to this it is also recommended that fences be installed in areas where stock may gain access to the stream.

Where stock has been excluded from the riverbank special crossing and drinking areas should be created, as highlighted earlier in this report<sup>5</sup>.

Buffer strips adjacent to a watercourse can be treated as non-rotational set aside. The same rules apply as strips adjacent to hedges and woodland edges, further information can be obtained from: -

<http://www.defra.gov.uk/farm/capreform/pubs/pdf/Setaside2006.pdf>

Grass buffer strips can be included as part of an Entry Level Scheme in the Defra environmental stewardship package.

Rules and points for grass margins are detailed in the ELS handbook - <http://www.defra.gov.uk/erdp/pdfs/es/els-handbook.pdf>

For capital works such as fencing, this would have to be part of a higher level scheme in environmental stewardship or, if there is already a Countryside Stewardship Scheme or an Environmentally Sensitive Area agreement in place this may be able to be added to any existing agreement. Entry to HLS is only available once an ELS scheme has been agreed. Further info on HLS can be found at - <http://www.defra.gov.uk/erdp/pdfs/es/hls-handbook.pdf>

Forty catchments across England, identified as priority areas for action, will be targeted under a range of measures aimed at improving farm practices and reducing water pollution from agriculture. The rivers running through the estate fall into of the Catchment Sensitive Farming 'Priority' Catchment 9. Newly appointed advisers will work on a one to one basis with farmers, as well as leading a series of initiatives including workshops and farm demonstrations to encourage best practice. The lead Defra officer for Norfolk is Dougal McNeill – 07771 1943651

[dougal.p.mcneill@defra.gsi.gov.uk](mailto:dougal.p.mcneill@defra.gsi.gov.uk)

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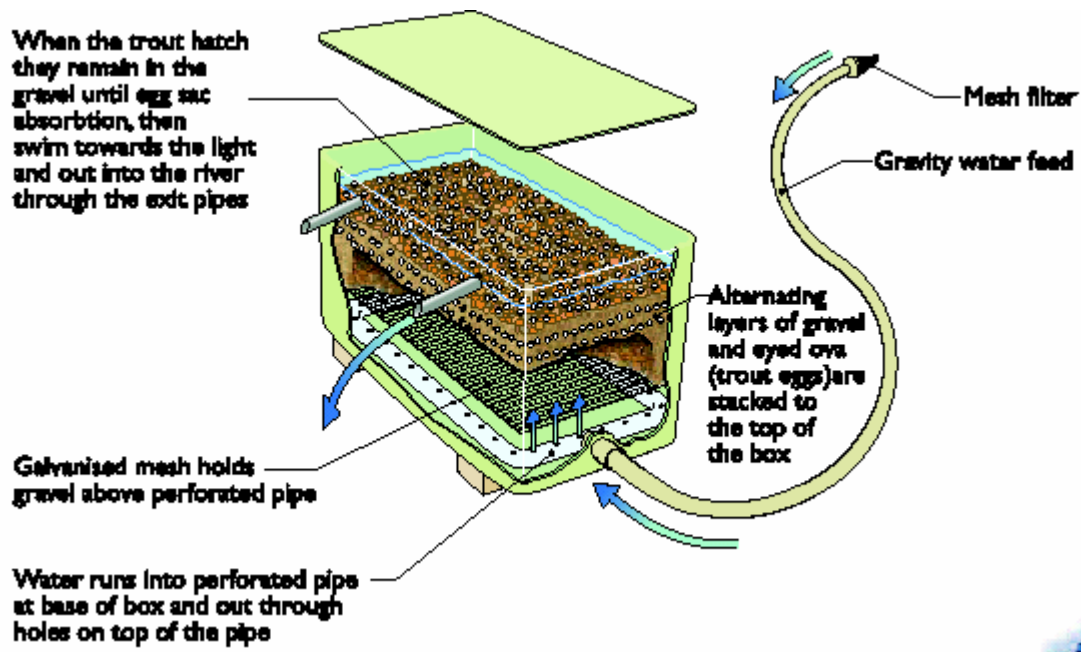
<sup>5</sup> See WTSG pages 32,33,34,35



**Example of where stock proof fencing is required down stream of bridge outside Warham village.**

The use of deep substrate incubation boxes on the Stiffkey could potentially be a useful short to medium term measure to address the apparent spawning habitat 'bottleneck'. These are gravel filled boxes, approximately 60cm in each dimension that are filled with suitably sized gravel and seeded with 10,000 –20,000 trout eggs.

A water feed at the bottom of the box allows the eggs to incubate and hatch. Once they reach the swim-up fry stage, they leave the box via the overspill pipes, stocking themselves into the river. It is vital however that good quality marginal habitat is available for fry to seek cover and develop into parr. Section 30 Consent, under the Salmon & Freshwater Fisheries Act, 1975, is required from the Environment Agency prior to the introduction, of fish, fry or ova into inland waters. A good head of water is required to get water to feed through the boxes.



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A potential location for the deep substrate box would be at the flow gauging station at Warham which would facilitate the downstream migration of fry / parr. Pipes could be located as to not inhibit data readings. This should not be an issue due to the recent placement of the screw smolt trap that has been at this site for several months.



Potential location of deep substrate incubation box.  
When the smolt trap is eventually removed!

<sup>6</sup> See WTSG page 53

### 3.3 – River Burn d/s Burnham Thorpe – Burham Overy Lower Mill

This 500m section of the River Burn d/s of Burnham Thorpe to the Sewage Treatment works is 'tunnel shaded' with very heavy mature tree and shrub growth. Where inspection of the channel was possible there appears to be widespread siltation that has probably been exacerbated by the low flow conditions this summer. This section of the river has been dredged with spoil plainly evident on the LHB. Although dredged the banks are not as steep as the Stiffkey and there is potential to develop the littoral margin.

A spring enters the river from the RHB rising from a source near the Manor House. This may be a useful spawning stream.

The quality of the water being discharged from the Sewage Treatment Works looked to be OK, in terms of low levels of suspended solids.



**Heavily over-shaded**

The river below Burnham Over Upper Mill the B1155 was inspected to evaluate the condition of a potential spawning stream / springs. The Spring rises near Friary Cottage and runs through an area of extensive reed and sedge beds before entering the main river Burn below the Lower Mill. At it's source there are gravel present, but soon after where the stream turns south and runs parallel with the burn the stream bed is dominated by silt where successive land drainage operations have 'slubbed out' gravels. In places the stream is heavily over-shaded. The main river Burn at this section is very wide (20m) and is shallow and dominated by silt and filamentous algae.

### 3.3.2 – Recommendations

Where appropriate a significant programme of felling, coppicing and pollarding is required on this section of river to let light back into the channel.<sup>7</sup> This will create conditions that will promote development of beds of starwort and crowfoot in the channel and a more diverse riparian plant community.

In effect the tree work will create a blank canvass to allow a proper assessment of in-channel conditions. Larger arisings from the tree management could be used for the introduction of LWD / creation of otter holts and the finer brushwood (brashings) can be converted into faggots for use in narrowing schemes, both on site and on the Stiffkey.

This 500m section of river will take a large effort from the syndicate and progress may be slow. It is recommended that the syndicate consider the use of qualified chainsaw operators / tree gangs, perhaps from the Estates Forestry Department. This should be a consideration on health and safety grounds alone. The syndicate can provide valuable assistance by dragging and sorting materials for respective uses. The larger boughs will require the use of mobile winches or a tractor with a chains to pull arisings out onto the marsh to be cut into manageable sections.

The Estate recently attended a site meeting regarding the development of a nature reserve alongside the river between Burnham Overy Upper and Lower Mills, as part of the Environment Agency's managed retreat project. This could potentially be a very large project that would seek to compensate for habitat lost on the fresh water marshes at Cley.

It is recommended that the Estate request that restoration of this potential spawning stream and / or further compensatory works upstream above the Upper Mill should be considered as part of this larger capital project.

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<sup>7</sup> See WTSG page 35, 36,37, 38



#### **4.0 – What next? – Making it all happen!**

This report makes a series of recommendations that will improve both the biodiversity and status of the wild trout populations in both rivers. Recommendations are low tech, low cost and can hopefully be undertaken by a band of willing volunteers whose greatest commodity is their enthusiasm!

However, the syndicate should very carefully consider its priorities. It is vital to maintain the enthusiasm of the syndicate, some of who are new to the world of stream restoration. With this in mind it is important for all concerned to see the benefits of their hard work. What may seem like endless hours spent clearing river banks on the Burn may not be perceived as to be as productive as a day narrowing the Stiffkey with faggots. It is suggested that in the short term the syndicates' efforts are directed towards the Stiffkey. After some quick gains on the Stiffkey when enthusiasm and team working are at a peak, works should perhaps commence on the Burn.

This report represents phase 1 of the Cinderella Chalk Project. At this point the Holkham Estate and the syndicate should evaluate the recommendations, before requesting Phase 2, a worked-up project proposal. However before this happens it is strongly recommended that the Estate make contact with the Fisheries, Conservation and Development Control functions of the local Environment Agency to arrange a 'pre-application meeting'. Pre-application meetings are extremely useful to help scope out design work and to take into consideration any issues that could affect proposed works. The worked-up proposal should allow the syndicate to complete a land drainage application. This legal consent from the Environment Agency must be obtained in writing before works can commence. Consents can take up to two months to process.

It is proposed that the WTT attends the pre-application meeting and then commences a detailed project specification / proposal the following day. This will avoid the need for unnecessary journeys / over-night stays.

On successful completion of phase two of the project the syndicate can make a further application (Phase three), for seed-corn funding to kick start the project. Typically this is between £1000-2000. Added to this the WTT runs a 'Rods for Conservation Scheme' whereby the syndicate can purchase a Sage or Hardy and Greys rod at very significant discount that can be used for fundraising purposes.

Works could be yet further 'kick-started' with the assistance of a WTT 'Practical Visit' (PV). The WTT will fund the cost of labour (two man team) and materials. Recipients will be expected to cover travel and accommodation expenses of the contractor. The use of specialist plant will be by separate negotiation.

Wet-work consultants will demonstrate one or more of the following techniques that are appropriate to the site.

- Tree management (coppice, pollard, sky-lighting)
- Tree Planting
- Fencing (Installation & Repair)
- Stream Narrowing (Faggots, Coir Rolls, Spilling)
- Flow Deflectors
- Introduction of spawning substrate
- Gravel Jetting
- Introduction / Management of Woody Debris

*Note: Recipients of the programme must have received a WTT AV and have obtained the appropriate consents from the Environment Agency, English Nature, SEPA, CCW , Rivers Agency, etc, prior to arrangements being made to undertake the PV.*

Applications for all the above should be made via [projects@wildtrout.org](mailto:projects@wildtrout.org)

## **5.0 - Sea Trout Strategy**

Sea trout are known to frequent the North Norfolk Rivers, possibly as a spin-off on the back of larger scale migrations to the North East Rivers, such as Tees, Tyne and Tweed.

There may be considerable opportunities to restore migrating sea trout to rivers such as the Glaven, Stiffkey, Burn and Nar. However little is known about the current status of sea trout in the North Norfolk inland and coastal fisheries.

The Wild Trout Trust would be keen to be involved in any partnership projects aimed at North Norfolk Sea Trout. Preliminary discussions with Mike Pawson of the CEFAS Laboratory at Lowestoft and Andrew Hinds of the Environment Agency in Norwich have been positive. It is proposed that a possible way forward would be production of a desk / field feasibility project in partnership with CEFAS and the EA. The study could assess such things as:

- Status of the Coastal Net Fishery
- Review of historical /anecdotal fishing records
- Walkover survey of potential barriers to migration
- Walkover assessment of spawning tributaries / habitat
- Production of a North Norfolk Sea Trout Action Plan

## **6.0 Disclaimer**

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.

## Appendix 1

It is suggested that the gravels are 'jetted' using a high pressure pump to purge the gravel matrix of fine silts to provide suitable conditions for trout eggs and alevins to develop to 'swim-up' fry stages. Riffles should be cleaned on a rotational basis and care should be applied to 'clean' less than 25% of each riffle each year. Large stones and cobbles should be left on riffles, as these are important habitat for native crayfish and invertebrates.

A suggested equipment specification, including approximate costs is listed below:

Pump - Honda WH20X water pump - **£475**

15m length 1" clear braided hose (outlet) - **£45**

2m length 22" green PVC suction hose (inlet) - **£25**

1.5m length 25mm steel pipe (attached to outlet and flattened at end to increase pressure) - **£10**

Adaptors 2" BSP swivel x 1" BSP male (to attach pump to outlet) - **£45**

Hose fitting 1" BSP female swivel x 1" tail (to attach outlet to pump) - **£15**



**Jetting riffles**

After costing many forms of gravel cleaning, pumps have been found to be the most effective way of cleaning gravel. They are easily transported, relatively light, and efficient.

Gravels need to be cleaned in September, prior to spawning (Dec-Jan) to an approximate depth of 20-30cm. Concreted gravels need to be broken up, by bashing away at them with the steel pipe, they do break up to leave loose gravel, it's just hard work!

It has been found that trout use cleaned areas preferentially over uncleaned areas, with the trout frequently cutting on an area in the afternoon that has been cleaned in the morning.

To reduce impacts of silts moving downstream the use of 'Sedimats' in conjunction with cleaning is recommended. These are pinned to the riverbed downstream of the cleaning and collect the silt blown up by the pumps. Being made of hessian they can then be removed from the river planted up and used for any bank work. They cost approximately £42 each.

Local Environment Agency Fisheries staff may own such equipment and be willing to loan it.