WILD TROUT TRUST

River Wye

(Litton Properties to Ashford Lake)

14/10/2020

River	Wye (Derbyshire)
Waterbody Name	Wye from Monk's Dale to Derwent
Waterbody ID	**GB104028057820**
Management Catchment	Derwent Derbyshire
River Basin District	Humber
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SK2071669490
D/S Grid Ref inspected	SK2146569016
Length of river inspected	1km

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1. Introduction

The Wild Trout Trust were invited for an advisory visit to the River Wye in Derbyshire by Cressbrook & Litton Fly Fishers and the Haddon Estate, who manage the river adjacent to the Riverside Business Park on the outskirts of Bakewell. This report will detail the findings of the visit, assessing the general habitat quality and highlight any areas in which improvements could be made.

Normal convention is applied throughout this report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream. The Ordnance Survey National Grid Reference system is used to identify specific locations.

2. Background

The River Wye in Derbyshire is famous among fly-fishers for its invertebrate hatches and the quality of the wild, catch & release fishing. While generally supporting diverse aquatic flora and fauna, it is (as all English rivers are) listed as failing under the Water Framework Directive (WFD) for the priority hazardous substances (Fig. 1) classified as polybrominated diphenyl ethers (PBDE). These compounds are typically used as fire retardant substances.

Cycle 2 classifications

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Classification Item	2013	2014	2015	2016	2019
Overall Water Body	Moderate	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate	Moderate
Biological quality elements	High	Good	Good	Good	Good
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	Supports Good
Physico-chemical quality elements	Good	Good	Good	Good	Good
Specific pollutants	Moderate	Moderate	Moderate	Moderate	Moderate
Chemical	Good	Good	Good	Good	Fail
Priority substances	Good	Good	Good	Good	Good
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
Priority hazardous substances	Good	Good	Good	Good	Fail

Figure 1: Overall summary of Water Body assessments under the Water Framework Directive for the River Wye from Monk's Dale to the River Derwent

The visit hosts enquired whether any habitat improvements were possible within a section of heavily modified channel (straightened and locked in place with artificially-constructed banks) running through the Riverside Business Park.

3. Habitat Assessment

The 1-km reach was walked (from a downstream to upstream direction) and examples of where habitat that was already good – as well as where improvements may be possible – were noted.

At the downstream limit of this visit (SK21465 69016) there is a low weir and a sluice-gate system (Figs. 2 & 3) that maintains a head of water in a parallel channel (upstream of this point) and a mill leat (forming a confluence on the RB) which historically served the Victoria Mill.

Figure 2: Weir impounding the central/main channel and feeding a mill leat, just visible on the opposite bank from the camera. A sluice gate mechanism - used to balance levels in this interconnected channel network is visible (bottom left)

Figure 3: Gravels being "sorted" by pinched flow below the sluice gate in the spit of land dividing the central "main" channel and left hand parallel "backwater" channel

The legacy of historic water management – coupled with surrounding development of premises and infrastructure – creates a very complicated set of conditions. Localised patches of useful habitat exist (e.g. deposits of spawning gravels graded into different particle-sizes by sluice gate structure; Fig. 3). Overall the impact of the weir is to contribute to poorer, more uniform habitat. Of equal importance to the lack of physical/spatial diversity is the *relative lack of variation over time* – due to the reinforced, engineered banks that have not allowed the channel to move and change position within its floodplain. Options to remove or notch weirs are subject to multiple constraints – such as the likely presence of contaminated sediment in the LH, backwater channel (see subsequent photos and information) and the current familiarity with the "water feature" currently maintained by the impoundment (e.g. Fig. 4). That being said, weir notching/removal represents probably the biggest single habitat improvement to this section. It could also create aesthetic improvements.

Figure 4: Smaller/lower weir which maintains a head of water (presumably as an aesthetic feature for properties on the LB). However, removing this weir and undertaking habitat improvements could actually improve the aesthetic appeal as well as the ecological status

Figure 5: Facing upstream showing height difference between the left hand/backwater channel (**right** of frame) and central/main channel (**left** of frame). The latter serves the Victoria Mill leat and is "perched" (i.e. a channel artificially raised above the valley-base)

The central/main channel contains habitat features that provide limited cover against predation and spate flows (e.g. Figs. 6 – 8 inclusive) – but overall is very uniform and likely to hold fewer fish than typical sections of the Wye.

Figure 6: Submerged tree roots

Figure 7: Low, trailing overhanging cover (LB)

Figure 8: Low, trailing overhanging cover (RB). It is very important to retain an abundance of this type of cover in order to help maintain predator/prey (and light/shade) balances

A connecting pipe runs between the central/main and left hand channels towards the upstream limit of the left hand channel (Figs. 9 and 10).

Figure 9: The perched (raised) right hand channel – showing the location of the upstream end of the pipe connection to the left hand channel (Fig. 10)

Figure 10: Outlet and sluice gate on the left hand channel at SK 21298 69016

As indicated. In this case there is a significant complicating factor stemming from historic battery manufacturing on the site of the current business park. It is likely that outfalls discharging to the left-hand channel around the reedbeds/bridge at SK 21279 69047 created a legacy of contaminated sediments. Sediment at this location is currently held back behind the beds of emergent macrophytes (Figs. 11 and 12).

Figure 11: Bridge over left-hand channel at SK 21279 69047 (site of significant historic pollution)

Figure 12: Macrophyte beds currently providing mitigation for historically-contaminated sediment. This effect could be adapted and used to stabilise "side-cast" sediment banks

Reduction or removal of downstream impoundments is likely to result in the remobilisation and release of contaminated sediment due to the process of head cut erosion/knickpoint creation during weir removal. However, although initially intimidating, there are precedents for stabilising contaminated sediment by pumping it out, placing in the margins and covering with a membrane before planting aquatic vegetation on top (e.g the River Wandle in Carshalton). That would enable physical/structural habitat AND pollution remediation benefits to this section of the Wye.

Upstream of the bridge, the flow is consolidated into a single channel – which is contiguous with the central/main channel below the bridge. This straightened, walled channel runs behind the buildings along the south-west perimeter of the business park. The substrate, depth and flow all show little variation over the cross-section of this engineered channel (Fig. 13).

Figure 13: Straightened channel with relatively uniform depth, flow-velocity and substrate characteristics spanning the full cross-section; a bad thing for ecological diversity

Just upstream of the business-park buildings (around the upstream limit of the site), bank-side vegetation is heavily cut back as part of the land-management (Fig. 14). This location also contains the site of a bridge that will be constructed to improve access. There may be an opportunity to instigate more sensitive land management and other habitat improvements as part of the installation of the new bridge. Additionally, widening the river at two to three locations here would shift habitat diversity toward higher-status examples seen further upstream – e.g. Fig. 18 of this report. This could be an easy way to create a pool and riffle sequence; thus remediating some of the impacts of this uniformly straightened and narrowed channel.

Surprisingly, allowing a more varied riparian (riverside) vegetation strip to develop tends to lend riverbanks greater stability. This is due to the formation of deeper and more robust root systems within the soil which help bind it together. Another advantage over harder/more angular engineered bank reinforcement is vegetation slowing and dissipating spate flows. This – *along with localised widening* - tends to favour deposition of gravels rather than erosion. It also avoids the creation of strong eddying flows associated with angular, engineered surfaces. Eddies created by the corners of hard revetments accelerate bank erosion at their downstream edges. Once those hard revetments start to break down, the rate of bank erosion is, ironically, accelerated by the creation of those vortices.

Figure 14: Cutting back bank-side vegetation on the LB at SK 20870 69199 (right of picture) removes cover habitat and tends to weaken the bank. Allowing riparian vegetation to develop and also widening the channel at points along that LB would create diverse pool and riffle habitat with good cover.

Continuing upstream, both the surrounding land and river channel become generally wilder and somewhat less managed (e.g. Figs. 15 and 16). The physical variation in habitat resulting from this change in land-management creates a wider range of opportunities for many aquatic plant and animal species.

Figure 15: Fallen woody material and bankside vegetation combining to create variation in scour and deposition of the riverbed (creating better quality habitat compared to uniform, straightened sections downstream)

In terms of fish habitat, this increased physical variation creates improved opportunities for all lifecycle stages within each species of trout, grayling and other fish. Variation in flow-velocity, depth and substrate sorting/deposition promoted by large pieces of stable woody material creates habitat for spawning, juvenile and adult fish. The LB trees are mainly present as a single line of veteran specimens of a broadly similar age and height (snapshot of one specimen; Fig. 17)

Figure 16: Deep scour hole (bottom of frame) created by woody material (shown in Fig. 15) creates the increased depth preferred by adult fish. Deposition of the material blown out of scour-pools creates spawning beds for gravel-spawning species. Note the wide variation of surface flow velocity in the centre of the channel compared to deeper pool habitat (bottom of frame) and in the shallower back-eddy (top of frame)

Figure 17: Bankside tree on the LB - opposite residential property

Some light coppicing could help to diversify the age and height structure by allowing regrowth from coppiced stumps on a staggered/rotational basis. This may also prevent damage to residential properties via wind-blown trees on the RB in this section (e.g. Fig. 17 at SK 20870 69292).

Material arising from coppicing works could be securely anchored in place to diversify flow, deposition and cover from predation/spate flows in the more uniform sections of channel. The much greater diversity of channel morphology and vegetative cover in the section upstream of the business park is shown in Figs. 18 to 20.

Figure 18: Variety of gravel beds, scour pools and low overhanging/trailing complex cover. Here the **greater channel width** allows deposition and retention of vital finer gravels, suitable for salmonid spawning and a range of invertebrates

Figure 19: Deposition of a gravel "point bar" on the inside of even a slight meander (bottom of frame) coupled with low, trailing cover above a scour pool. The result is cross-sectional variation in depth, velocity and substrate-character in combination with protective cover

The top of the visited reach was at the outlet from Ashford lake (Fig. 20). This was the site from which the Wye's wild rainbow trout were found to have colonised some time in the early 20th century.

Figure 20: Outlet from Ashford Lake discharging over a stepped weir into the River Wye

4. Recommendations

Here are some recommended actions based on the findings of this report. Prior to listing those recommendations, be aware that appropriate permissions should be obtained before carrying out any interventions.

The following short illustrations (Figs. 21 – 24) indicate how diversifying habitat structure helps to avoid bottlenecks for wild fish populations. There are three main types of habitat that trout require in order to complete their lifecycles (spawning, nursery/juvenile and adult). By providing for these key lifecycle stages through wide structural diversity in habitat, a wide range of flora and fauna is also created.

Ideally, by ensuring that there are no barriers between the various habitats utilised throughout a complete lifecycle, access for the widest diversity of fauna is also ensured. There is no biological separation between the aquatic and terrestrial components of the river corridor so it is also critically important to maintain maximum structural and biological diversity in the surrounding terrestrial habitat.

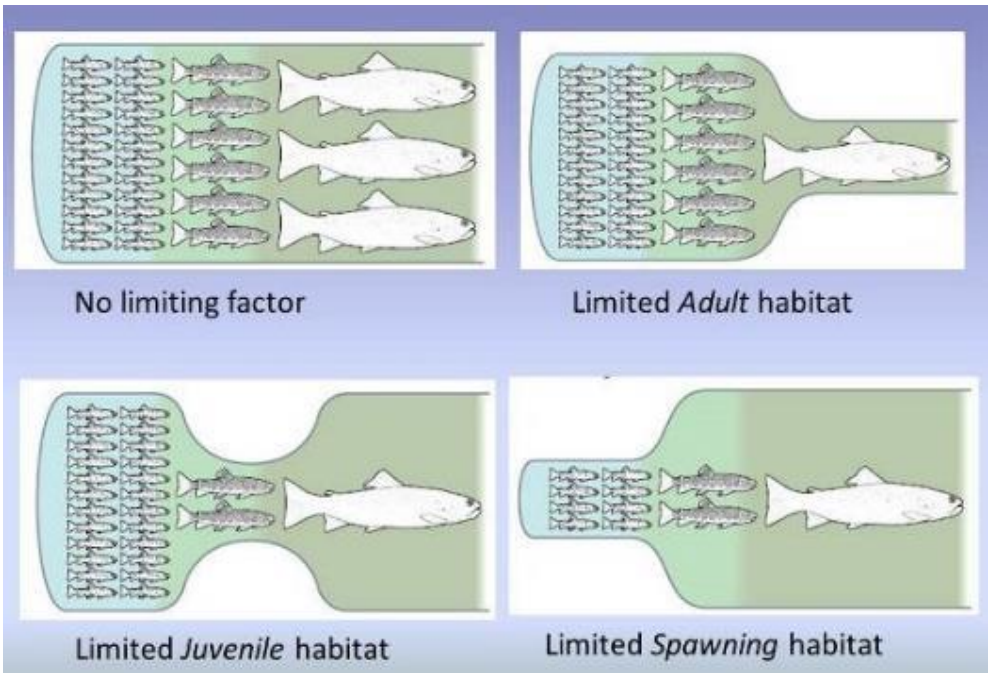

Figure 21: The impacts on trout populations lacking adequate habitat for key lifecycle stages. Spawning trout need to create loose mounds of gravel that maintain a good flow of oxygenated water between gravel grains. Juvenile trout need shallow water with plenty of dense submerged/tangled structure for protection against predators and wash-out during spates. Adult trout need deeper pools (usually > 30cm depth) with nearby structural cover such as undercut boulders, sunken trees/tree limbs and/or low overhanging cover (ideally trailing on, or at least within 30cm of, the water's surface). Excellent quality in one or two out of the three crucial habitats cannot make up for a "weak link" in the remaining critical habitat.

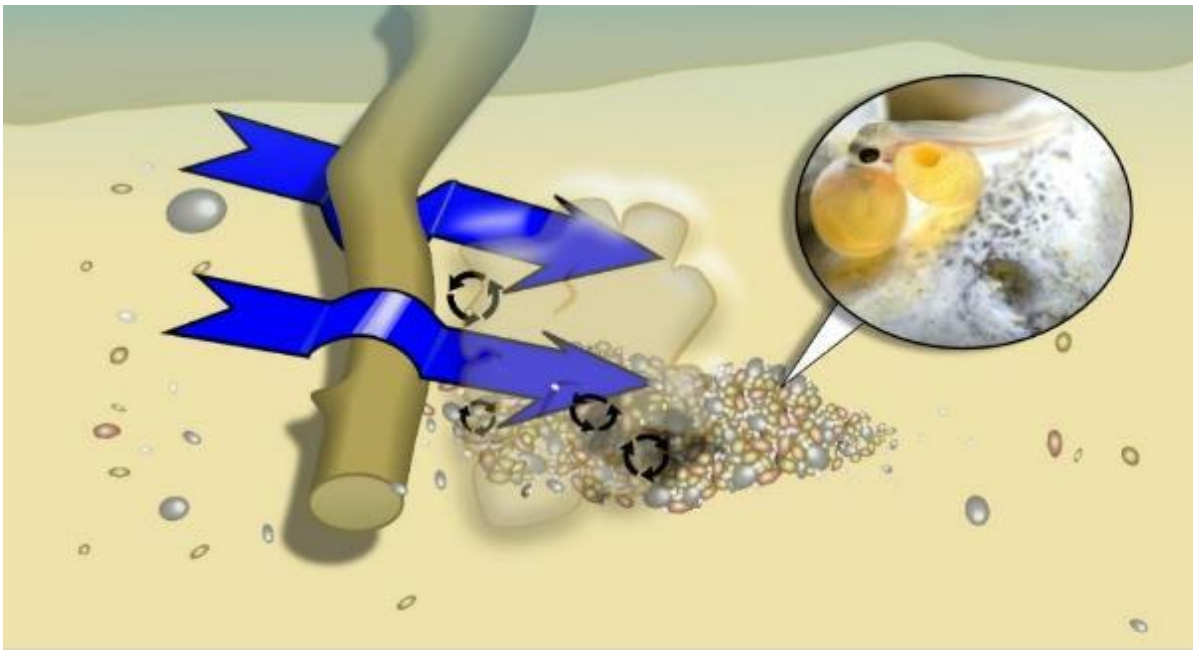

Figure 22: Features associated with successful trout spawning habitat include the presence of silt-free gravels. Here the action of fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river-bed that results in silt being mobilised from between gravel grains. A small mound of gravel is deposited just downstream of the hollow dug by focused flows. In these silt-free gaps between the grains of gravel it is possible for sufficient oxygen-rich water to flow over the developing eggs and newly-hatched "alevins" to keep them alive within the gravel mound (inset) until emerging in spring.

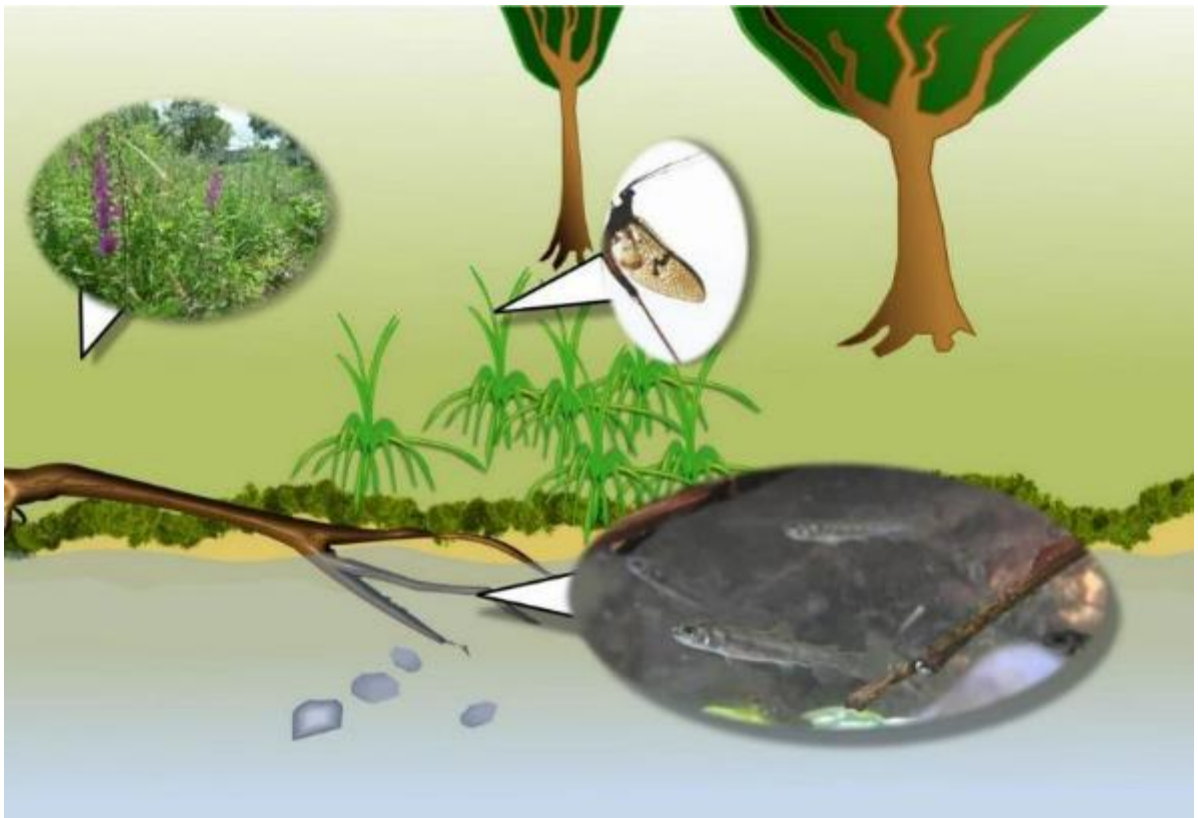

Figure 23: Larger cobbles and submerged "brashy" cover and/or exposed fronds of tree roots provide vital cover from predation and spate flows to the tiny juvenile fish in shallower water (<30cm deep) after they emerge. Trailing, overhanging vegetation also provides a similar function and diverse bank-side vegetation has many benefits for invertebrate populations (some of which will provide a ready food supply for the juvenile fish).

Figure 24: The availability of deeper water bolt holes (>30cm to several metres), low overhanging cover and/or larger submerged structures such as boulders, fallen trees, large root-wads etc. close to a good food supply (e.g. below a riffle and with prey likely to fall from overhanging tree canopy in this case) are all strong components of adult trout habitat requirements.

With these core habitat features in mind – a summary of recommended actions are as follows:

- Creating a collaborative group to carry out (with support and training where necessary) habitat protection and improvement
- Including representatives from the business park, the Haddon Estate and a small group of well-informed, conscientious anglers/angling guides could be a practical and innovative solution.
- Given the location of the reach, it may be helpful to include the group (and its members) within the wider "Trout in the Town" accreditation and support scheme (where good practice and inspiring case-studies can be shared among a national network).
- Certification at "First Contact", "Bronze", "Silver" and "Gold" levels are available under the Trout in the Town accreditation.
- Flexible guidelines on instigation (and governance) of Trout in the Town groups are a key part in the recently-published "Urban River Toolkit" (available in print via Amazon – or free of charge as downloadable PDFs on https://www.wildtrout.org/content/trout-town).
- The WTT, in conjunction with Haddon Estate river-keeping personnel can provide guidance on habitat diversification and management. Priority suggestions would be:
    - The light-touch rotational coppicing of veteran, bankside trees to diversify low-level cover and light/shade regime provided by the canopy
    - Secure cabling (or simple wedging of forked limbs/trunk) of woody material in the margins at selected locations to create overwintering cover for adult and juvenile fish - as well as patches of substrate deposition adjacent to a limited amount of gravel "sorting"/localised bed-scour; e.g. Figs. 25 and 26.
    - Establishing a marginal buffer strip of vegetation in the area pictured in Fig. 14
    - Planting of feature trees/shrubs in the more open reaches (e.g. Figure 14)
    - Selective widening (by sculpting the LB) of the reach in Fig. 14 to promote gravel riffle deposition and pool formation
    - Potential re-sculpting of the channel alongside the factories
    - Begin to look into options to lower and/or remove the weirs
    - Obtain quote for pumping sediment into stabilised/planted marginal berms
    - Riverfly monitoring at sites in the lower (right-hand channel in the split channel), middle (walled channel on business park perimeter) and upper (in wooded area upstream of business park to Ashford Lake) would provide an insight into any changes in the biological community over time – in either positive or negative directions

- Using the reach in a regulated manner as a site to introduce anglers, accompanied by approved guide(s), to fly fishing and entomology could be a means of enabling and managing sustainable angling pressure in appreciation of wild, self-sustaining fish populations

Figure 25: Securely-cabled woody material (attached at the upstream end only - to allow the crown to move up and down with spate flows). Note, slings can be incorporated to preserve valuable "anchor" trees by avoiding ring-barking. An even simpler, more natural (and equally stable) method is to lodge the felled material around a standing tree. This is achieved by slotting the "V" of a major limb and the main trunk of the felled tree around the trunk of the standing tree.

Figure 26: A wide size range of woody material (appropriate to situation and channel size) can be cabled – or lodged - in place

5. Further information

The WTT may be able to offer further assistance such as:

- WTT Practical Visit
  - Where recipients require assistance to carry out the improvements highlighted in an advisory report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days' work, with a WTT Conservation Officer(s) teaming up with interested parties to demonstrate habitat enhancement methods (e.g. tree kickers and willow laying etc.).
- WTT presentation/Q&A session
  - Where recipients are unsure about the issues raised in the AV report, it is possible that your local conservation officer may be able to attend a meeting to explain the concepts in more detail.

In these examples, the recipient would be asked to contribute to the reasonable travel and subsistence costs of the WTT Officer.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

www.wildtrout.org/content/wtt-publications

We have also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish populations and managing invasive species.

The DVD is available to buy for £10.00 from our website shop www.wildtrout.org/shop/products/rivers-working-for-wild-trout-dvd or by calling the WTT office on 02392 570985.

Acknowledgements

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