Advisory Visit

River Maun, Nottinghamshire

May 2017

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the River Maun, Mansfield, Nottinghamshire, on 24th May, 2017. Comments in this report are based on observations on the day of the site visit and discussions with Ryan Taylor and Simon Ward of the Environment Agency (EA) East Midlands Area Fisheries Team. The visit was requested to assess the suitability of the River Maun for wild brown trout (*Salmo trutta*), which are thought to be absent from the river because of historic chronic water pollution and barriers to migration.

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. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience. The Ordnance Survey National Grid Reference system is used for identifying locations.

2.0 Catchment / Fishery Overview

The River Maun rises in the conurbation of Mansfield and flows north-eastwards past Ollerton to join the River Meden at Conjure Alders (SK6589872033). The rivers then separate again and re-join approximately 6km downstream near West Drayton (SK7027875118) to form the River Idle (a Trent tributary with its confluence at West Stockwith SK7896894718).

River	River Maun
Waterbody Name	Maun from Source to Vicar Water
Waterbody ID	GB104028052960
Management Catchment	Idle and Torne (Idle River)
River Basin District	Humber

Current Ecological Quality	Overall status of **Moderate** ecological potential sustained through two assessment cycles from 2009 – 2015 (Designated a Heavily Modified Waterbody – Poor for Fish and Invertebrates in 2015, Bad for same in 2009).
U/S Grid Ref inspected	SK5544363250
D/S Grid Ref inspected	SK5617263670
Length of river inspected	~1.3km in total

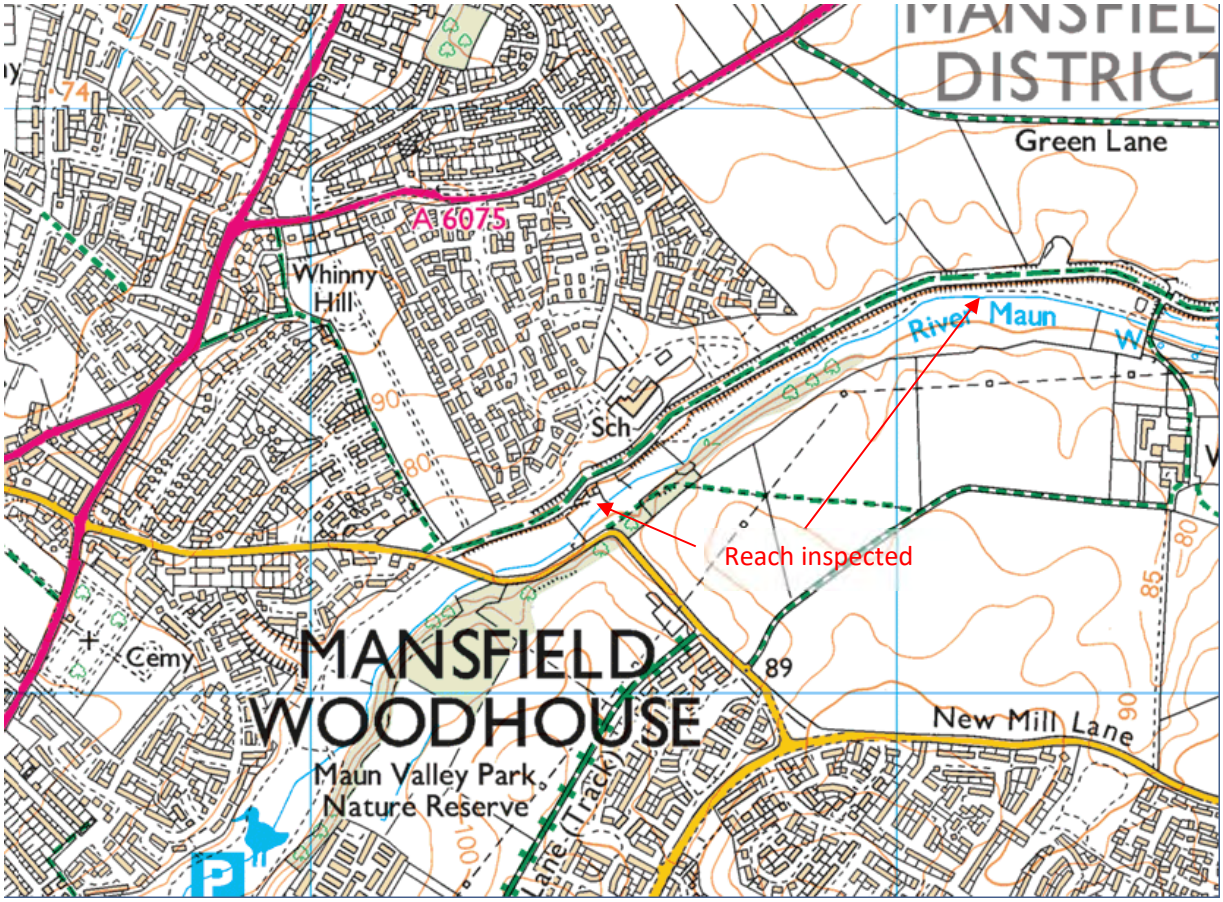

Figure 1 Location of visit

Since 2001, twenty-four EA fishery surveys of the River Maun and its tributaries have recorded only three trout, all of which occurred downstream of the confluence with the River Meden (which is known to have thriving

trout populations; WFD fish status for the Meden in 2015 was high). The absence of trout from the Maun is thought to be because of the extreme pollution of the river in the early C20th from coal washing and other heavy industry destroying the fish populations, and a number of significant barriers to fish migration that prevent recolonisation.

Ryan Taylor is considering a project to re-introduce wild brown trout to the River Maun and is gathering data to assess the likelihood of success and potential impacts. The following is a summary of information provided by Dr. Taylor:

- As noted above, trout have only been found in the Maun downstream of the Meden confluence.
- Ten barriers to fish migration have been identified on the River Maun which appear to be preventing recolonization of trout in an upstream direction from the River Meden (Table 1, Photos 1 - 4). The cost of addressing fish passage at these weirs is estimated at £5 million.

Local Barrier Name	National Barrier ID	NGR	Derived head drop (m)
MVCP Gauging weir	None given	SK5598563617	None given
Warren Farm 1	7302	SK5671363611	1.793
Warren Farm 2	7303	SK5672863623	1.767
Badger Hill	5247	SK5744063986	3.735
Edwinstowe	5162	SK6271766463	4.023
Ollerton Mill 1	5391	SK6517867299	2.386
Ollerton Mill 2	6406	SK6525567343	1.905
Ollerton Road Bridge 1	9384	SK6545267633	1.638
Ollerton Road Bridge 2	6685	SK6545467670	3.116
Ollerton 3	5773	SK6547067768	1.687
Ollerton 4	7072	SK6549067847	2.1
Whitewater	26149	SK6632270412	Not Known

- The tributaries of the River Maun are Vicar Water and Rainworth Water. Vicar Water suffers from low flows, and is dry for most of the year because of abstraction from the Nottinghamshire sandstone aquifer. Rainworth Water has poor water quality and supports low numbers of coarse fish. There are no known trout populations in tributaries of the River Maun.

Photo 1 Edwinstowe

Photo 2 Ollerton Mill 1

Photo 3 Ollerton Mill 2

Photo 4 Ollerton Road Bridge 1

- Recorded water quality parameters for the River Maun since 2010 are within the range suitable for supporting trout.
- Three locations on the River Meden have been identified as potential donor sites from which trout could be cropped for introduction to the River Maun. All have abundant, self-sustaining trout populations. The proposal is to transfer brown trout (50 to 100 trout aged 1+ or 2+) from the River Meden to the River Maun to establish a wild population in the latter. The brown trout would be stocked at Maun Valley Country Park (SK 54691 65835) every other year for between 3-5 years.

3.0 Habitat Assessment

The River Maun at Maun Valley Country Park (Figure 1) was walked in a downstream direction from approximately SK5544363250. The river bed

comprises rounded gravel and finer sediments, indicating the river is sourcing and transporting material through active geomorphological processes. There are several riffle areas which are suitable spawning habitat for gravel-spawning fish, including trout (Photos 5 and 9).

There are few areas of deeper water within this reach, such as that seen in Photo 6, where a shoal of chub (*Squalius cephalus*) were observed. The river here has evidently been the subject of past channel engineering given its straightened planform and uniform width. The legacy of this is a general lack of deeper pool habitat, the main habitat types being riffle and shallow glide (Photo 8). This restricts the amount of habitat available for larger fish, although several shoals of chub were seen, comprising individuals up to approximately 40cm length (this may not be typical, given that the visit was at the time of year that chub could be expected to frequent shallow, gravelly areas for spawning). Chub have been previously stocked into this section of river by the Environment Agency from their National Fish Farm at Calverton, Notts.

Photo 9 shows an area where the channel width has been pinched (at a low level) by the spillway from an outfall pipe. This narrowing has speeded up the flow and created bed scour and increased depth (aided by the tree opposite providing bank stability). This indicates the potential for creating similar effects with introduced structures, such as brushwood berms and anchored large woody material.

Brushwood berms would also improve the habitat for juvenile life stages of brown trout. At present, there is little in the way of cover that could provide over-wintering habitat for 0+ trout (a time of high mortality and often a crucial bottleneck in the lifecycle). The natural river substrate is gravel and finer material, so there are no cobbles or boulders to shelter trout parr, and overhanging bankside vegetation is restricted by the artificial steepness of the banks. Reprofiling the banks (for example, in combination with narrowing the low flow channel with brushwood berms) would improve this situation.

Photo 5 River-washed gravel of a suitable size for trout spawning is abundant in this reach of the River Maun. The river is over-wide here because of dog access, something common along the reach inspected.

Photo 6 At the upstream end of the reach, there are reasonable amounts of low cover over the water which provide shelter to adult fish; shoals of chub were observed in these areas.

Photo 7 Aquatic macrophytes present in the channel, including *Callitriche* sp., *Elodea canadensis* and *Potamogeton pectinatus*.

Photo 8 Long, shallow glides dominate the instream habitat, a legacy of past channel straightening and widening. Creating narrower "pinch points" within the low flow channel (with brushwood berms and anchored large woody material) would benefit habitat in these areas.

Photo 9 Pinch points in the channel, such as this spillway beneath an outfall, create increased scour and depth, providing better adult fish habitat. The bank stability and cover provided by the tree and roots on the far bank enhance the effect. Note how the width u/s allows the retention of gravels and potential spawning areas, while the pinch creates scour that creates and maintains pool depth.

Photo 10 Flow gauging weir at SK5587763487. This is a barrier to fish migration. If the weir face was continued down to the bed, a low-cost baffle array could be fitted, or the weir replaced with an open-channel flow gauge.

Photo 11 Downstream of the flow gauging weir the channel is steeper and dominated by sandstone bedrock, providing diverse juvenile salmonid habitat.

Photo 12 Deeper "pots" within the bedrock provide more adult fish habitat downstream of the weir.

Photo 13 Gravel substrate returns downstream of the steep bedrock section below the gauging weir. The channel however remains uniformly straight and wide, leading to poor sorting of the gravel.

Photo 14 Low intensity land use within Maun Valley Country Park, and space for a river re-naturalisation project.

The width of the river corridor within the country park provides the potential, funding permitting, to carry out a river restoration project (re-meandering, floodplain re-connection), which would address the root cause of the habitat deficiencies (past river engineering) and potentially provide flood risk benefit. Presently, adjacent land use is low intensity within the country park and riparian habitat is reasonably good, with tall herbaceous vegetation and occasional bushes. The steep angle of the banks (because of past channel engineering) does, however, restrict the extent of overhanging riparian vegetation and hence its value as cover for fish. Trees are present along the right bank upstream of the gauging weir, providing shade and some low cover over the water, although this could be much more extensive. The excellent low cover in Photo 6 is the exception rather than the rule and open banks such as in Photos 8 and 13 are more typical. Increasing the amount of low cover from trees and bushes is recommended, for example on banks opposite where any channel narrowing structures are introduced.

Upstream of the gauging weir (Photo 10), the river is impounded for a short distance and finer sediment dominates the bed substrate. Downstream of the weir, the river channel has a higher gradient and the bed comprises mainly sandstone bedrock. Gravel is largely absent from this steeper section, indicating it is either being starved of sediment from upstream by the impoundment, or gravel is being transported through this section. Further downstream, where the channel gradient lessens, gravel substrate reappears (Photo 13); this may be locally sourced downstream of the weir, as areas of active bank erosion are present.

The steeper bedrock section contains numerous deeper ‘pots’, bounded by rock shelves, providing both pool habitat and overhead cover for adult fish. Some perch (*Perca fluviatilis*) were observed here.

In summary, the instream habitat observed within this reach appears to be sufficient to support a wild trout population, although there is room for improvement of adult (deeper water, cover) and juvenile (over-winter cover) habitat.

4.0 Recommendations

From this walkover survey, it appears that the instream habitat observed within the Maun Valley Country Park reach is currently suitable to support

wild brown trout, although there is scope for habitat improvement and some suggestions are made below. It is clear that the proposal to re-introduce trout from the River Meden has been very carefully considered and poses minimal risk to the donor and receiving water; essentially the Meden trout population would be likely to recolonise the Maun if they could access it. However, the following points should be considered in the wider context of a scheme to move trout from the Meden to the Maun.

- The Wild Trout Trust recommends that any watercourses which have lost their trout populations through historic or recent pollution problems are allowed to recolonise naturally. Wild trout native to the catchment provide the best basis for a quick recovery of the population and rehabilitation efforts should be targeted on improving habitat within, and facilitating access to the affected area. There are numerous examples of post-industrial rivers staging remarkable recoveries in their trout populations following the resolution of water quality problems (e.g. River Don, South Yorkshire; River Irwell, Greater Manchester).
- Consider whether the receiving reach of the Maun is capable of sustaining a trout population long-term, in isolation, i.e. remaining cut off from downstream populations and without suitable conditions in the tributary streams of Vicar Water and Rainworth Water. Given the location of Maun Valley Country Park, immediately d/s of Mansfield, there is always a risk of an acute pollution incident, which could eradicate the introduced population with no opportunity for natural recolonisation.
- Consider further assessment of water quality on the Maun. The water quality parameters recorded are unlikely to be from continuous monitoring (leaving the possibility of periodic impacts) and the waterbody was assessed as ‘poor’ for invertebrates and fish in 2015.
- Consider further investigation of fish populations in the lower River Maun, downstream of the barrier at Whitewater; there is 2.5km of river here which appears accessible for fish from the River Meden. If trout are absent from this reach, then it would suggest water quality may be a problem. If trout are present, then it would lend weight to a project to restore them to the Maun.
- Investigate the barrier at Whitewater (SK6632270412). If improved fish passage could be secured there, it would open up a significant length of the lower river up to Ollerton.

- Consider whether trout translocated from one part of the catchment to another will remain in the area they are released. Wild fish dispersing into new territories, or the offspring of wild fish that have strayed into an area by choice, are likely to have a far greater affinity to that area than fish that are stocked or translocated there. This is demonstrated by tracking studies where relocated wild fish have been traced back to their point of origin (Armstrong & Herbert, 1997). For this reason, it is best practice to address barriers to natural recolonisation and allow the process to take its course, thereby populating an area with animals that choose to establish and defend territories there.

It is therefore recommended that the project to re-establish trout in the Maun should focus equally on the causal issue which is a lack of connectivity to populations elsewhere in the catchment and poor quality tributaries. Introducing trout from the Meden and carrying out in-stream habitat improvements could be a way of raising the profile of the project and engaging local interests in the fish passage and tributary issues, but it should be recognised that the translocation aspect is not the solution. Weir removal and fish passage improvement to provide full habitat connectivity on the catchment represents the only sustainable solution.

Recommended habitat improvements within Maun Valley Country Park include:

- Narrowing the low flow channel with brushwood berms and bank re-profiling in selected areas (Photo 15). Guidance as to the extent of narrowing can be derived from areas such as Photo 9 above. The overall conveyance capacity of the channel can be retained by keeping the structures low level and re-shaping the banks. Flood risk in the immediate locality of the country park appears low.

Photo 15 Installation of low level brushwood berms (before, above; after, below). Note the bank on the left of the picture, which has been re-profiled to a shallower angle to tie in with the new bank toe created by the brushwood bundles.

- Introduction of anchored large woody material to narrow the low flow channel and create localised scour and depth variation (Photo 16).

Photo 16 Example of large woody structure anchored in the channel margins.

- Carry out tree planting in selected areas to improve low cover over the water. Co-ordinate the planting areas with above works, for example locating the planting on the outside of 'bends' created by the introduced berms. Take care not to shade out berms and prevent them vegetating.

5.0 Making it Happen

The Wild Trout Trust is willing to assist with furthering this project and can help with preparing more detailed proposals for habitat improvement works, environmental permit application, practical habitat demonstration days with volunteers and project management (subject to available funding).

We have 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 stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

The WTT website library has a wide range of materials in video and PDF format on habitat management and improvement: http://www.wildtrout.org/content/library

6.0 Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

7.0 Disclaimer

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8.0 References

Armstrong JD, Herbert NA (1997) Homing movements of displaced stream-dwelling brown trout. J Fish Biol 50(2):445–449