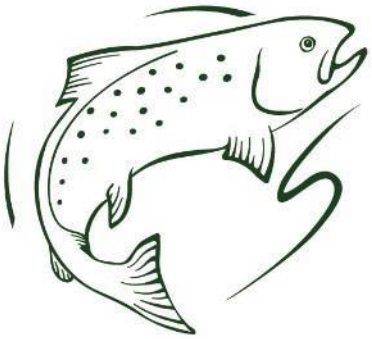

WILD TROUT TRUST

River Bain

(River Witham Catchment)

Lincolnshire

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Contents

Key Findings

- The Bain and Stenigot Beck have some excellent riparian habitat due to the low-intensity land use on the Estate.

- River channel habitat lacks diversity, is moderately incised and is disconnected from its floodplain, probably because of past modification for land drainage.

- Opportunities for river and floodplain restoration are identified towards the downstream end of the Estate's ownership on the River Bain.

- Further similar opportunities for restoration may exist on upstream sections of the Bain and Stenigot Beck, subject to further inspection and examination of potential constraints, such as adjacent land ownership and land use.

1. Introduction

A visit to the River Bain, Stenigot Estate, was undertaken on the 6th October, 2023 by Tim Jacklin of the Wild Trout Trust.

Specific locations are identified using decimal latitude and longitude (e.g. **56.044896098, -3.16176523829**), which can be pasted straight into Google Maps to identify locations. Hyperlinks within the text of the report can be navigated by Ctrl and left-clicking to move to that point within the document.

2. Background

The River Bain is a small chalk river rising in the Lincolnshire Wolds close to Ludford, flowing south through Horncastle and Coningsby, and joining the River Witham at Dogdyke. The section inspected during this visit was on the Stenigot Estate, between the villages of Donington-on-Bain and Goulceby, within the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB).

The environmental quality of rivers is assessed by the Environment Agency against Water Framework Directive targets. Each river catchment is sub-divided into waterbodies, within which sites are sampled for fish, invertebrates, plants and algae, as well as physical and chemical parameters. An overall ecological status on a scale from 'high' to 'poor' is derived from these measures, based on the lowest scoring category.

The reach inspected falls approximately in the middle of the 33km of river which constitute the Upper Bain waterbody, between Ludford and Horncastle (*Table 1*). The most recent assessment (2022) gives an overall ecological status of 'moderate'. Invertebrates (sampled twice a year, nearest sites at Biscathorpe and Hemingby) are rated 'moderate' (down from 'high' in 2019). Fish are also rated 'moderate', but the most recent sampling appears to have taken place in 2017. Detailed ecology data is available at https://environment.data.gov.uk/ecology/explorer.

Table 1. Waterbody details – from https://environment.data.gov.uk/catchment-planning/WaterBody/GB105030062301

River	Bain
Operational Catchment	Lower Witham
Waterbody Name	Upper Bain Waterbody
Waterbody ID	GB105030062301
Current Ecological Quality	Moderate ecological status
U/S limit inspected	TF2320182229
D/S limit inspected	TF2419480011
Distance inspected (Km)	c.4.2km

3. Habitat Assessment

The river was walked in sections and is described below from the upstream boundary at the disused railway embankment to the downstream limit, followed by a tributary, the Stenigot Beck. Access to the river was difficult due to dense undergrowth and some reaches were not inspected for this reason (Figure 1).

The majority of the land owned by Stenigot Estate is under Organic Entry Level plus Higher Level Stewardship (magic.defra.gov.uk), with the exception of a short reach at the downstream end of the Bain.

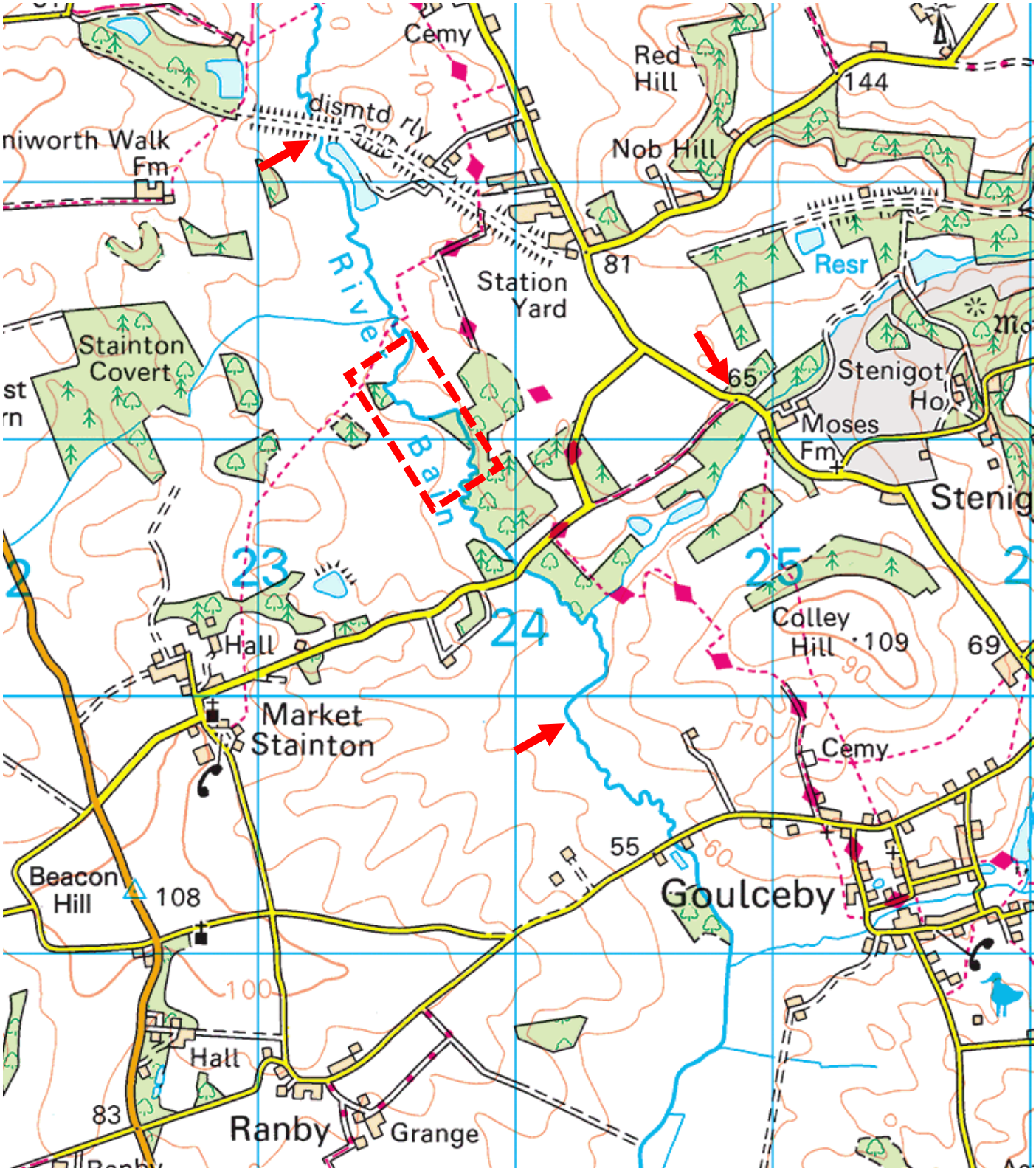

Figure 1 Extent of rivers inspected (red arrows). Area within the dashed box not inspected due to limited access. (1:50000 OS Map, www.streetmap.co.uk).

3.1. Disused Railway Line – Dinah's Plantation

This section of river generally has a meandering planform but an absence of a natural pool-riffle sequence, which suggests there has been some channel modification in the past (most likely bed lowering / dredging to facilitate land drainage). The result is a uniform channel shape (trapezoidal cross section) and lack of diversity of flow patterns, sediment sizes and habitat.

Some of the river is bordered by arable land on the right bank, but there are also long reaches within an unmanaged corridor which provides some excellent riparian habitat and a source of large woody material in the channel.

Figure 2. (53.32262, -0.1517844) The culvert beneath the disused railway line has a natural bed gradient and does not present any barrier to the free movement of aquatic organisms nor sediment transport. Woody material within the river channel provides good in-stream habitat.

Figure 3.(53.322598, -0.151713) Downstream of the railway line the river borders a lake on the LB. The lake is offline, with a controlled inflow and overspill from the river. The planform of the river is meandering and does not appear to have been modified by the creation of the lake. Alongside the lake the river flows through a corridor of wet floodplain with aquatic vegetation and mainly willows and sallows. Where tree shading is denser, the channel is more open, whereas less shaded areas have more emergent aquatic vegetation (reeds, rushes).

Figure 4. (53.32119, -0.1508911) Looking west from the lake embankment across the river. The land on the RB of the river (different ownership) is used for arable agriculture, with a grass buffer alongside the river (the land is under Entry Level plus Higher Level Stewardship, (magic.defra.gov.uk).

Although the river within this reach is not entirely straight, it is less meandering than adjacent stretches and it is probable that it has been altered in the past for land drainage. This is likely to have involved dredging to deepen the river channel and provide outfall for drains. Dredging has a detrimental impact on river and floodplain habitat by removing the pool-riffle sequence, lowering the adjacent water table and drying of the land, and disconnecting the river from its floodplain. Where adjacent land is in agricultural use, and the land drainage function is still required, this may be a constraint on river and floodplain restoration.

Figure 5.(53.317703, -0.148828) Not all this reach is bordered by agricultural land, with some meandering sections contained within a corridor of natural vegetation providing good riparian habitat. The in-stream habitat however remains poor quality, comprising uniform channel dimensions, flow pattern (glide) and a dominance of unsorted, fine sediments.

Figure 6. (53.316837, -0.148170) Land use on the east bank of the river is low intensity compared to the west bank (below). The quality of in-channel river habitat here is poor - incised, straight and full of emergent vegetation, suggesting past modification.

Figure 7.(53.316837, -0.148170) A view across the river to the west where land use is arable agriculture.

Figure 8 (53.315968, -0.146902). Near the public footpath crossing (Viking Way) the river has a more meandering planform and the floodplain headlands have been planted with cricket bat willows.

Figure 9. (53.315510, -0.147480) More varied flow patterns are evident here where the channel appears to have a steeper gradient. There were some larger stones on the river bed here (cobble-size and larger) – larger than would be expected to occur naturally, possibly the remains of a man-made structure (weir or ford?). The riparian habitat here is excellent, with thick beds of sedge overhanging the margins.

Figure 10 (53.315743, -0.146742) A sinous section of river downstream of the faster section in Figure 9.

3.2. Dinah's Plantation to Road Bridge

Only the downstream section of this reach was inspected because of difficulty accessing further upstream through the undergrowth. The upstream areas inspected contained some excellent lowland river habitat, with evidence of modification and impact increasing with progress downstream to the road bridge.

Figure 11. (53.30895, -0.1434275) A typical view towards the upstream extent inspected – a wildness rarely seen on a lowland river in the UK, and an example of some excellent habitat.

Figure 12. (53.308800, -0.143635) Fallen wood occurs regularly within the channel and contributes to the good habitat seen. It provides numerous benefits including diversifying flow patterns and sorting of sediments, and trapping leaf and weed litter; this provides habitat niches for various invertebrates and spawning opportunities for fish.

Figure 13. (53.308483, -0.142557) The river channel becomes more incised with downstream progress, indicating some modification has occurred in the past.

Figure 14. (53.30766, -0.1413704) As above – note the high RH bank.

Figure 15 (53.30710, -0.1405909) A view upstream from the road bridge shows more uniform channel dimensions.

3.3. Road Bridge – Downstream Boundary

This reach is more open and has a wider floodplain. The river channel is generally meandering (apart from one obviously straightened section), but remains incised and disconnected from the floodplain. Land use is tree plantation and woodland on the left bank downstream to the Stenigot Beck, which joins from the left bank. Land use downstream of the Stenigot Beck and on the Bain right bank is cattle grazing.

Figure 16. (53.306950, -0.140100) Downstream of the road bridge the river is bordered by a poplar plantation on the left bank and land used for grazing on the right bank. The river channel is quite incised, potentially indicating past drainage works.

Figure 17 (53.30674, -0.1398493) A wider view from the same perspective as Figure 16. The flood plain here is wet, although this may be from seepage from the base of the valley side rather than the river.

Figure 18.(53.306389, -0.138788) Meander bend at the downstream end of the plantation, downstream view.

Figure 19. (53.30592, -0.1388630) View down the valley from the meander bend in Figure 18.

Figure 20. (53.30546, -0.1364610) Ford crossing at downstream end of plantation, just downstream of the Stenigot Beck confluence; view to the west. The use of crushed aggregate is good practice, helping to limit the input of fine sediment to the river.

Figure 21. (53.305191, -0.136772) Downstream of the ford, showing the low, well-connected floodplain area on the left bank.

Figure 22 (53.302975, -0.136690). View upstream along the artificially straight section of channel between the ford and the downstream boundary. The river channel here is over-wide, incised and disconnected from its floodplain. This section may present an opportunity for a river and floodplain restoration project. See also Figure 31.

Figure 23 (53.302528, -0.137655). The bend at the downstream end of the section of river in Figure 22.

Figure 24. (53.30267, -0.1380627) A pond adjacent to the river in Figure 23. This has evidently been created by excavation with the spoil used to form the island and bund surrounding the pond.

3.4. Stenigot Beck

The Stenigot beck was inspected from the Bain confluence up to the lakes and below the road at Moses Farm. The photos below are in downstream to upstream order.

Figure 25 (53.30566, -0.1366430) The downstream end of the Beck follows a straight course along the south-eastern edge of the plantation to join the Bain just upstream of the ford in Figure 20. The beck is fenced from livestock and bordered by dense vegetation growth.

Figure 26 (53.306191, -0.135572) The lower section of the beck is largely confined to a straight channel indicating it may have been ditched in the past. There are a few small areas where the banks are lower and wetter, possibly developed through livestock poaching. Grazing pressure generally appears to be low and livestock do not have access to the beck channel.

Figure 27 (53.306576, -0.134673) Further upstream there are wet flushes draining to the beck providing some good habitat.

Figure 28 (53.306736, -0.133728) The southern valley side of the beck showing the transition from grazed pasture to rough grassland, to willow (behind a livestock fence).

Figure 29 (53.30846, -0.1322346) The online lake formed by damming the valley approximately halfway between the Bain confluence and Moses Farm; view upstream from the dam. There is another lake just west of this point, perched at a higher elevation on the valley side.

Figure 30 (53.311733, -0.125865) View down the valley of the Stenigot Beck from the field adjacent to Moses Farm. The beck channel here is straight and bordered by dense vegetation. There may be opportunity here for channel and floodplain restoration works.

4. Recommendations

The area which seems to have the most potential for habitat improvement is the section of straightened river and floodplain towards the downstream end of the Bain (Figure 31). It appears the land on either side of the river is within the ownership of Stenigot Estate, and land use is low intensity cattle grazing. There is a reasonably wide floodplain here that extends up to the road bridge and is already quite wet in places, so there may be potential for restoration works to encompass a wider area of floodplain than just the section alongside the straightened channel.

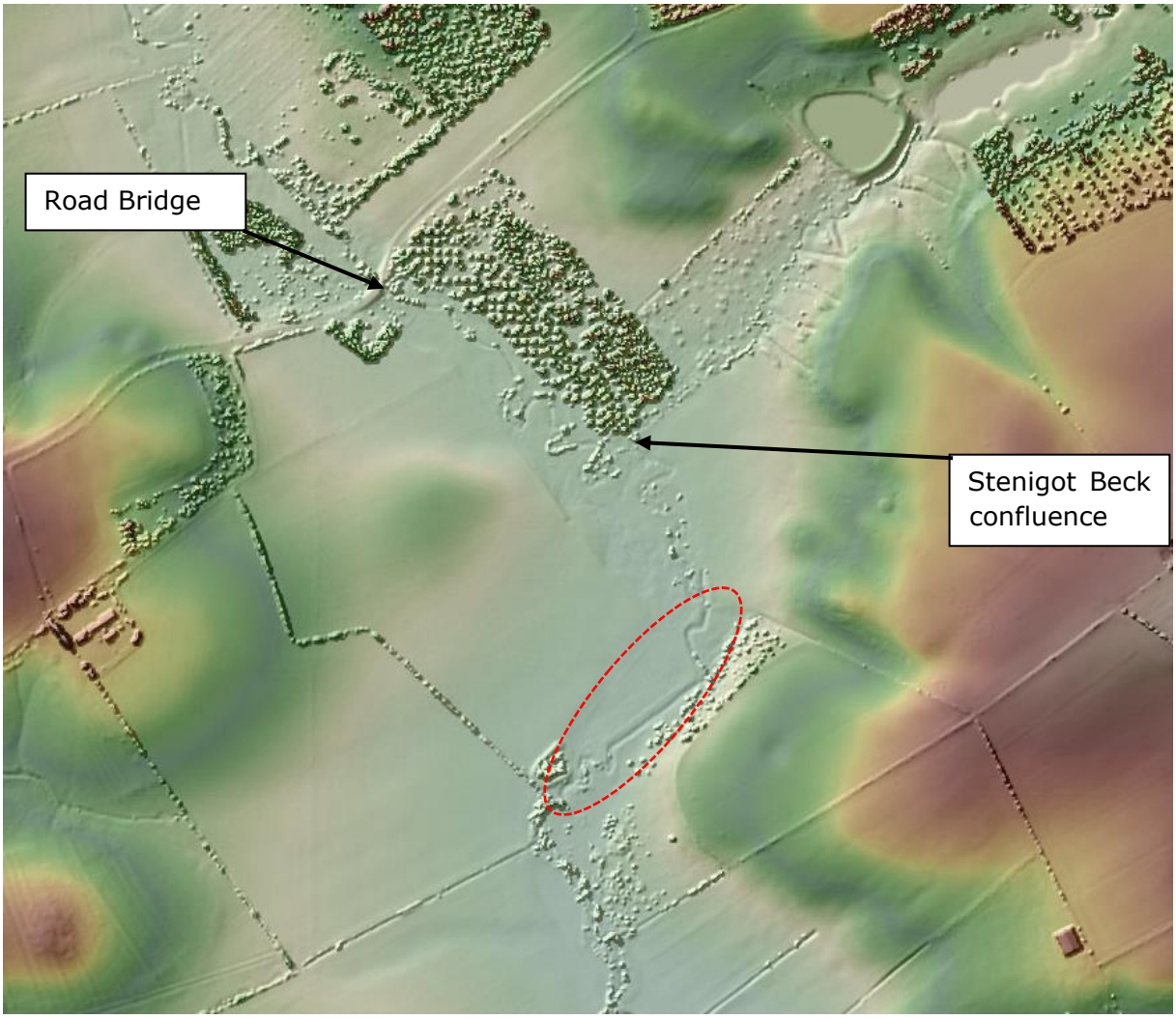

Figure 31 LiDAR map showing the straightened and incised section of channel (red ellipse) and adjacent floodplain that is a potential candidate for a restoration project. The low-lying floodplain and low intensity land use in the valley bottom here may give scope to extend such a project upstream towards the road bridge and/or the lower reaches of the Stenigot Beck.

The aims of restoration work here would be to increase the connectivity between river and floodplain (aiming for the river to exceed bankfull and spill onto the floodplain at a return period of around 1-in-2 years), and to increase the diversity of channel habitats. Techniques to achieve this include:

- Raising the river bed level by introduction of gravels (of appropriate size and local provenance) and large woody structures.
- Removal or lowering of bunds/levees alongside the river channel at strategic points to encourage higher flows onto the floodplain.
- Introduction of large woody structures to the floodplain to diversify flow and channel patterns.
- Excavation of features within or alongside the river channel, for example meanders (along the straightened section), bank reprofiling, channel widening, backwater creation.
- Breaking of land drains within the floodplain (if present).

In addition to the above, seepage ponds and scrapes could be excavated at the base of valley slopes. Figure 32 - Figure 34 illustrate some of the described features at a recently completed project at Colsterworth on the Upper Witham.

It is important to consider subsequent land management as this will have a large bearing on the development of habitats after completion of the works; however, a conservation cattle-grazing regime similar to the current situation would be beneficial.

Figure 32 Upper Witham, Colsterworth, pre-project. A sinuous but deeply incised channel disconnected from its floodplain.

Figure 33 Colsterworth post-project showing bank-reprofiling (inside of meanders), gravel introduction, backwater creation. River flow is away from camera.

Figure 34 Colsterworth post-project showing wetted floodplain from an intercepted spring, but equally this could be created by encouraging the river to spill onto and off the floodplain. River flow towards camera.

Similar restoration works would be appropriate on other sections of the Bain inspected, but there may be more constraints, for example single-bank ownership; arable land-use adjacent to the river; existing tree plantations. Also, some sections could not be reached or fully appraised due to dense vegetation, but may have potential (e.g. Figure 35). A further site visit in late winter is recommended when vegetation has died down.

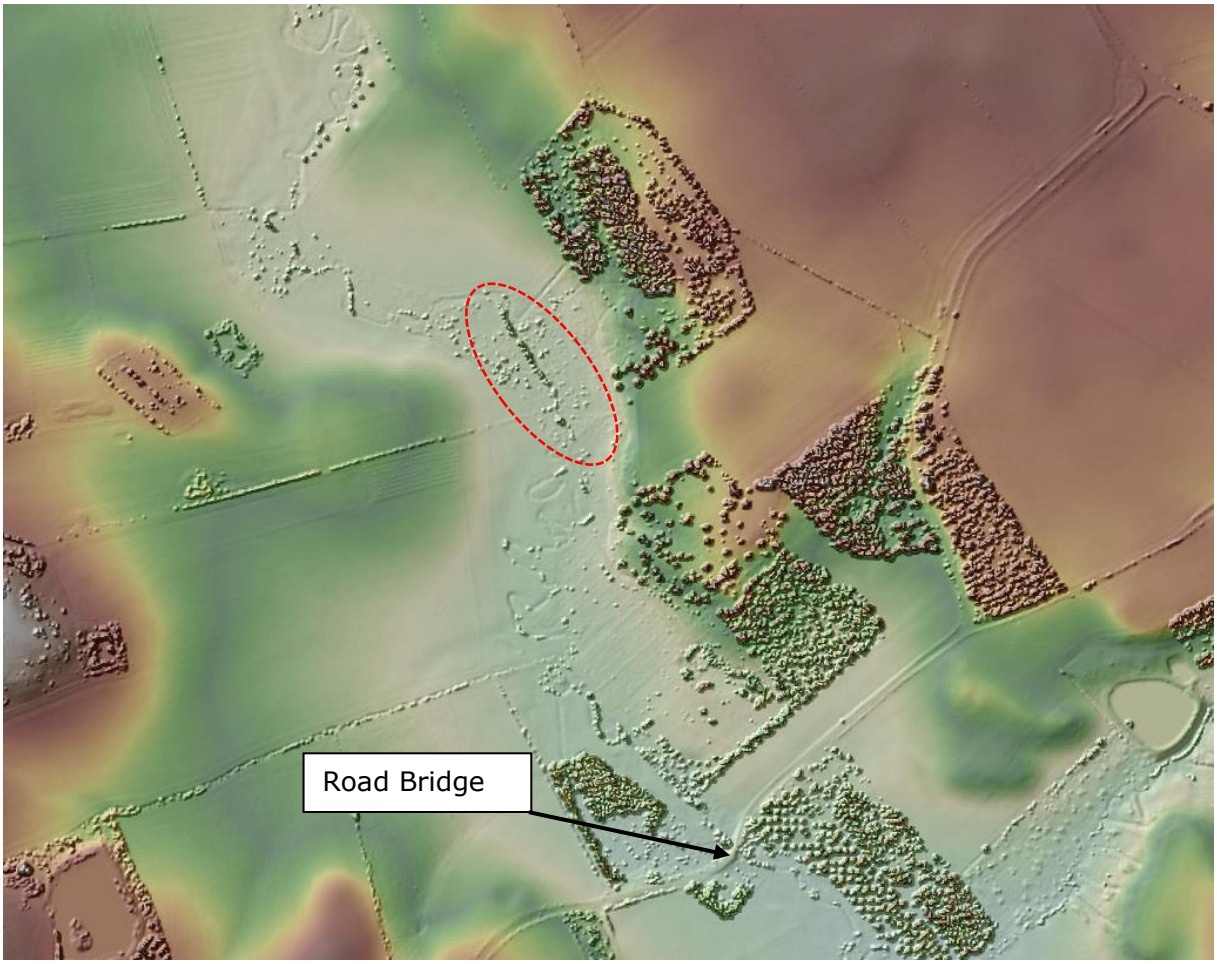

Figure 35 Another section of the Bain (red ellipse) which appears to have been straightened and is possibly a candidate area for restoration.

The section of the Stenigot Beck between Moses Farm and the lake was not inspected but could also be a candidate area for restoration works.

5. Next Steps

The next steps in developing a restoration project should include an appraisal of the feasibility and potential constraints including but not limited to:

- Service and utility searches
- Archaeological and heritage interests
- Public rights of way
- Land use and existing/potential agri-environment schemes
- Ground investigations

- Assessment of flood risk and effects on drainage

The latter bullet point could be incorporated into the next phase of considering design options, followed by working up a detailed design for the chosen option. The detailed design can then be used as the basis for application for permissions and consents and for tendering.

6. Disclaimer

This report is produced for guidance; 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 guidance made in this report.

Legal permissions must be sought before commencing work on site. These are not limited to landowner permissions but will also involve regulatory authorities such as the Environment Agency, local Council – and any other relevant bodies or stakeholders. Alongside permissions, risk assessment and adhering to health and safety legislation and guidance is also an essential component of any interventions or activities in and around your land and/or fishery.