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Enhancing Straightened River Channels

3.12 Establishing marginal habitat along a hard engineered bank

RIVER NENE

LOCATION - THORPE LEA, PETERBOROUGH TL18749817
DATE OF CONSTRUCTION - MARCH 2015
LENGTH - 400M OF BANK EDGE OVER A 640M REACH
COST - £65,300

Type	Low energy, clay
Status	Failing for fish (driver physical habitat modification). HMWB. Moderate (2015)
Waterbody ID	GB105032050381
Designation	None
Monitoring	Fixed-point photos, invertebrates

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Sheet pile and concrete bank – Feb 2015

Colourful marginal edge habitat – September 2015 © Salix

Description

The River Nene is a lowland river which begins in Northamptonshire, and flows to the Wash. It is an important navigable waterway as well as a popular coarse fishing river. The Nene has been extensively modified to allow navigation, extract gravels from the floodplain and prevent urban areas from flooding.

At Peterborough, the river is around 50m wide and has been modified to protect the nearby city centre and residential properties. It has been over-deepened, over-widened, impounded and constrained by hard bank protection. The north bank is reinforced with vertical sheet-piled concrete and brick walls, with a footpath alongside top. This looked unsightly and provided no marginal habitat for invertebrates and fish.

The aim of the project was to create a wetland ledge as habitat for fish and invertebrates, as well as provide a more pleasant view for residents walking, cycling or travelling along by boat. River Nene Regional Park worked with Peterborough City Council to identify a 639m reach where improvements could be made to the river margin. The project reach could not extend any further downstream because of boat moorings, and the upstream limit was defined by the end of the bank protection,

The impacts on flood risk and the width of navigable channel were the key limitations on design. As a result, improvements could not extend more than 800mm into the channel. The project reach contains two railway bridges and two footbridges

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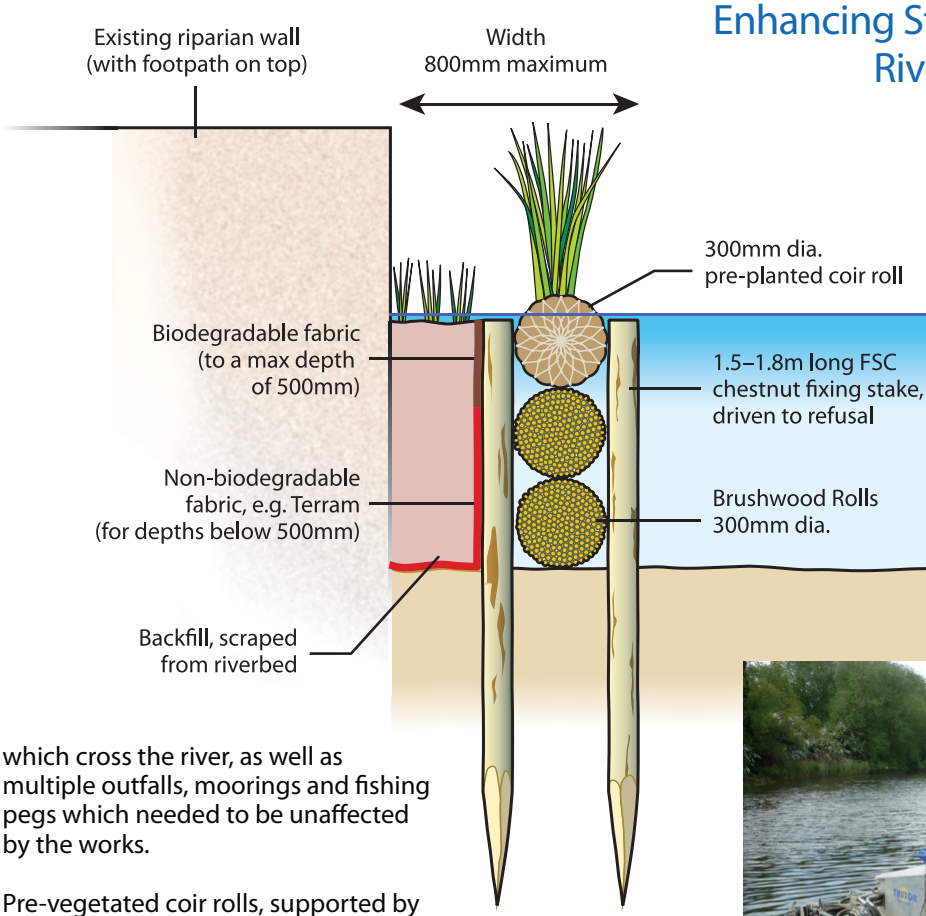

Figure 3.12.1
CROSS-SECTION OF MARGINAL EDGE CONSTRUCTION

which cross the river, as well as multiple outfalls, moorings and fishing pegs which needed to be unaffected by the works.

Pre-vegetated coir rolls, supported by brushwood faggots, were selected as the most suitable technique for this site. This was because they would immediately create amenity value along the reach. The brushwood faggots would ensure longevity by trapping silt and providing the future growing medium for the riparian plants.

Floating vegetated pontoons were considered as an option. However, there were concerns about the pontoons rising above the relatively low bank top in high flows and being 'beached' on the path.

A narrow path made access difficult for large sections of the bank. To get around this problem, a Truxor amphibious machine was used to provide access from the river itself.

The work comprised the following:

1. The Truxor and float units were used to transport materials to the work area. Once the Truxor was anchored in place, a hand held hydraulic rammer was used from the Truxor to drive FSC timber stakes into the bed.

2. The 100mm diameter and 1.5m - 3m long stakes (depending on the river depth) were positioned approximately 300mm into the channel and were driven into the bed at a depth of approximately 50% of the stake. Stakes were positioned 300mm apart in two rows, with 1m centres on the back row and 0.5m centres on the front row. At 2m - 3m centres, the front row was tied to the anchoring back row to provide additional support.

3. The required number (between 1 and 3 depending on depth) of hardwood brushwood faggots (2m x 300mm) were then placed between the two rows of stakes.

A Truxor provided access from the river – May 2015

A 'tried and tested' method using simple components – May 2015

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4. Finally a single planted coir roll was placed on top so that 60% would sit below the dry weather water line. The pre-established coir rolls contained local native species such as Yellow Flag Iris (*Iris pseudacorus*), Purple Loosestrife (*Lythrum salicaria*) and Lesser Pond Sedge (*Carex acutiformis*). Once in place, the coir rolls (3m x 300mm) were tied together end to end, laced across the top with polypropylene twine and fixed to the stakes with fencing tacks.

5. Before back-filling, a filter fabric was tacked to the back row of stakes, this was to prevent the escape of the backfill sediment. For deep sections and depths below 500mm an non bio-degradable membrane was used, as this would be permanently hidden and would retain its integrity longer. Above this level, either in combination or, in shallow areas, on its own, a bio-degradable fabric was used up to the top of the stakes.

6. The Truxor was then used to suction dredge material from the bed and back-fill the coir rolls. The backfilled area was narrower in the areas where the concrete bed restricted stake placement (as outlined above). Finally, temporary Tenax netting was fixed to the front of the structure with fencing tacks to prevent early damage from wildfowl.

Pre-grown, the plants survive well and quickly thrive (*see timeline below*) – March 2015

7. As the riverside pathway was heavily used, interpretation boards were made up to let the public know what had been done, why, and what the expected benefits were going to be.

On site adjustments

In some sections, a concrete bed was found during construction, located just out from the bank. This prevented stakes from being driven into the bed. The stakes then had to be driven in closer to the bank, where there was no concrete present. This reduced the size of the ledge, and the amount of backfill in these locations.

Subsequent performance – 2014 to 2019

Vegetation establishment and visual impact

The transformation of the bleak concrete edge was very quick. Within two months of the pre-grown coil rolls being installed, the rolls had successfully vegetated. By the summer, the entire concrete and sheetpile wall was hidden behind a dense green border and the tall marginal vegetation was up to knee height, acting as a visual safety barrier to the drop off into the river.

After four and a half years, the edge is still as well vegetated, showing that the initial silt backfill and subsequent ongoing deposition is sustaining these marginal plants

Timeline showing the development and visual impact of the new planted edge

Ecological assessment 13/8/15

An assessment of the macroinvertebrates inhabiting the River Nene at Thorpe Lea, Peterborough, was undertaken by the Environment Agency to determine the effect of a marginal enhancement project.

Two macroinvertebrate samples were taken on the 14th July 2015, one within the enhancement area and one in an unenhanced control section, using a standard FBA-pattern pond net.

Even within four months the habitat enhancement had clearly resulted in an increase in the number of supported taxa (23 taxa in the unenhanced control, rising to 37 in the enhanced section). ASPT and BWPM scores rose from 3.93 to 4.24 and 59 to 89 respectively. At this early stage, this did not result in an increase in Community Conservation Index (CCI), as all supported species in both sections are known to be common and widespread. CCI classified both control and enhanced sections as of low conservation value.

Close-up of the edge, sampled after only 5 months – July 2015

Particularly noteworthy is the buffering effect against invasion by a vigorous non-native predator. The invading amphipod, *Dikerogammarus haemobaphes*, was a dominant component of the fauna in the unenhanced section. A much less vigorous species, *Crangonyx pseudogracilis*, absent from the unenhanced section because of competitive exclusion, was not only present in the enhanced section, but in substantially greater abundance than *D.haemobaphes*.

Environment Agency Macroinvertebrate assessment

Macroinvertebrate species	Control Estimated + Number found	Coir rolls Estimated + Number found
Anisus vortex	1	10
Asellus aquaticus	8	20
Bithynia tentaculata	8	20
Chelicorophium curvispinum	2	1
Chironomi	10	10
Cladocera		2
Cloen dipterum	1	2
Coenagrildae		1
Crangonyx pseudogracilis	1	20
Dikerogrammarus haemobaphes	10	5
Erpodella octoculata		3
Erythromma najas		1
Gyraulus crista		3
Halipus lineatocollis		1
Hippeustis comlanatus	1	
Hydracarina	3	2
Lymnaea stagnalis		1
Micronecta		1
Notonecta	1	1
Notonecta viridis		1
Oligochaeta	4	20
Orthocladiinae	10	
Ostracoda	1	3
Physa fontinalis	5	8
Pisidium amnicum		8
Pisidium nitidum		1
Planorbarius corneus	1	1
Polyclis tenuis		3
Potamopyrgus antipodarum	2	5
Prodiamesa olivacea	2	2
Radix auricularia	2	

This provides superficial evidence that the raised habitat complexity provided by the enhancement acted as a refuge for the less vigorous species and is likely to have provided similar refugia against this and other predatory species for other invertebrate taxa.

In summary, there is clear evidence that the enhancement has been beneficial in raising the local richness of the aquatic macroinvertebrate fauna. Due to the success of this work, RNRP was confident enough to replicate the approach at two other nearby sites.

Management and Maintenance

At this location the River Nene is low energy with comparatively low levels of boat traffic. This technique would be less suitable for banks subject to heavy river traffic and/or high velocities and turbulence.

No work has been carried out or is expected to be carried out in the near future.

The assumption is that the faggots are now a matrix of silt and decomposing brushwood held together by a dense macrophyte root system. Longer-term, there remains a question as to how stable to edge will be once the structural timber posts begin to break down. With a soft earth bank edge, this is not an issue as the plant roots will anchor into the bank, but with a hard engineered edge, any anchoring will depend on the wall. This process could be helped, for example, by bolting a long-lasting (steel, etc.) bar along the face of sheet piling for plant roots to bind around.

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