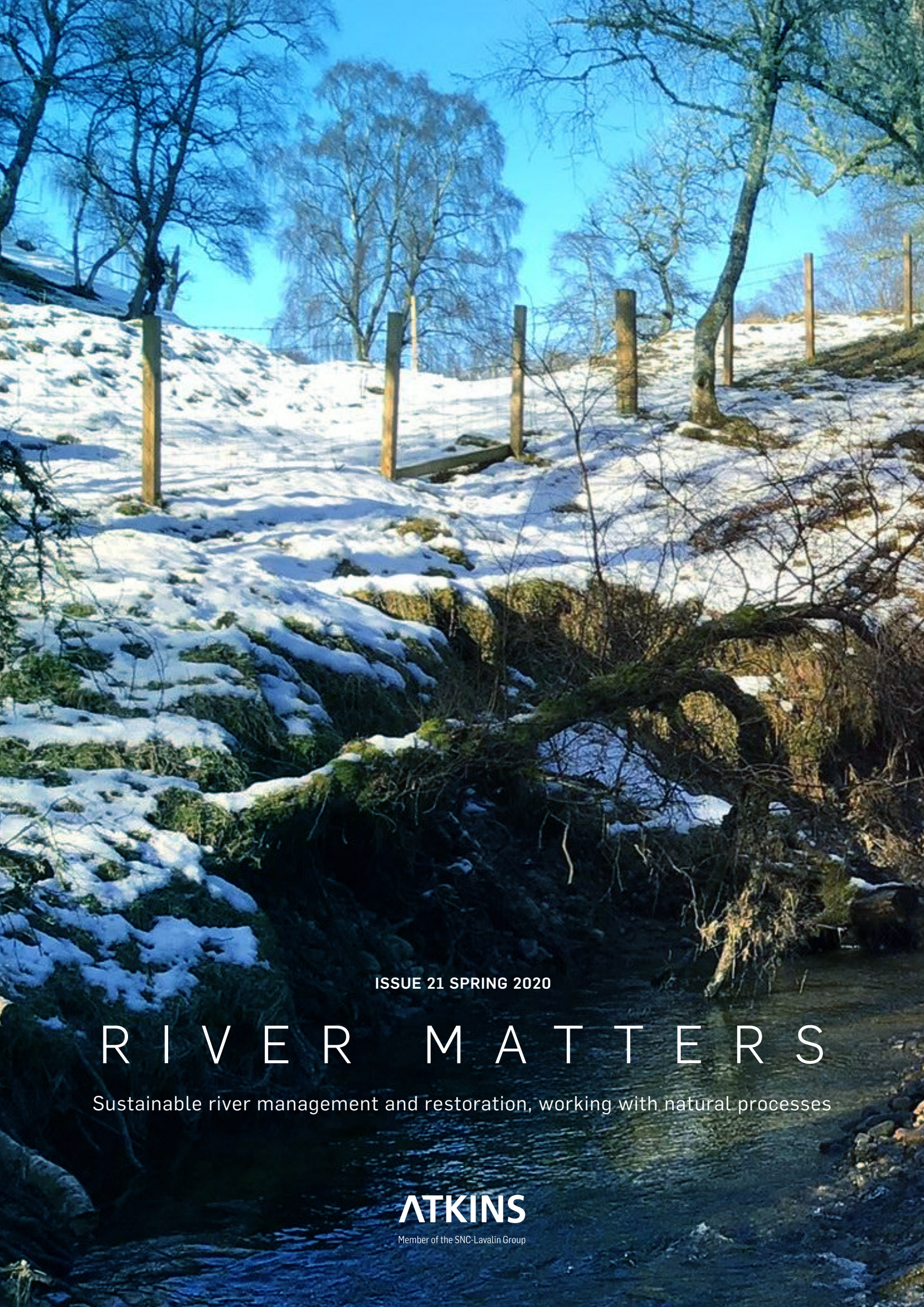


ISSUE 21 SPRING 2020

RIVER MATTERS

Sustainable river management and restoration, working with natural processes

ATKINS

Member of the SNC-Lavalin Group

Welcome to the 21st edition of River Matters, dedicated to what's going on in the world of river restoration and management. As usual, we aim to bring you a blend of internal and external news and updates.

Since the last edition of River Matters, we have been busy across the country on a range of river management projects with many different clients. This edition includes some latest developments on the re-introduction of beavers to Essex, Natural Flood Management (NFM) on the Soar catchment trial and an article on our Natural Capital Studio. We also have a discussion piece on fish passage and also a review of the DEFRA NFM schemes to date. If there is anything you would like to discuss further, then please contact someone from our contact list.

Front cover photograph - Dunachton Burn. Atkins has been undertaking a significant amount of work along the A9 in Scotland for Transport Scotland. Bank erosion and slope retrogression have been monitored along this site to assess the potential risk to an access road located the other side of the fence. The monitoring demonstrated that the slumped block is now acting to protect the toe of the slope from bank erosion, and the apex of the meander bend is migrating further downstream and thus no intervention is necessary. This demonstrates the value of understanding the problem before intervening.

Contacts

The team offers expertise in aquatic ecology, civil engineering, geomorphology and hydrology. For the full integrated range of services please refer to the Atkins, member of the SNC-Lavalin group, news section at the end of this newsletter.

If you would like any further information or to contact any of the team, please send an email to **RiverMatters@atkinsglobal.com.**

Pace on the pilot – delivering Natural Flood Management in the River Soar catchment

Extensive persistent flooding across the country this winter has yet again focussed attention on how flood risk is managed in the UK.

There is growing consensus that there is no single "silver bullet" solution. Rather, the answer lies in an integrated approach in which flooding is managed proportionately to risk, using a suite of measures. In a speech given in February at the World Water-Tech Innovation Summit in London, the head of the Environment Agency echoed the views of many by recognising that nature-based solutions have a place in this integrated approach. These solutions include restoring the meanders in rivers, planting trees and creating wetland habitats to slow the flow of water down river.

The Soar Catchment Partnership has been exploring how nature based solutions can contribute to management of flood risk to Leicester as part of a £15M pilot sponsored by Defra. Atkins was commissioned in January 2019 to support the Partnership through the critical delivery phase of the Soar pilot. The partnership had identified locations within the catchments upstream of Leicester with potential for piloting Natural Flood Management (NFM) measures but needed specialist support to rapidly determine which of these schemes were viable, turn the concepts to designs and finally deliver schemes on the ground by April 2020.

Atkins' role has been to facilitate the accelerated delivery of schemes. This process started by rapidly collating key information about each of the potential schemes in twelve site specific "storybooks" that allowed the Partnership to make informed decisions on which to take forward for delivery. From there, Atkins has led the rapid delivery of design and associated technical information to generate pre-construction information packages that support consenting and planning processes. At the same time, the Environment Agency has led on procurement of contractors and negotiating the consenting process.

Persistence has delivered. In just over a year we have taken two schemes from concept to construction with a third being delivered within the next month. Key to this success has been a close and trusting working relationship between all parties whilst each partner plays to their strengths. Intuitive designs and visuals have been vital to smooth navigation of the consenting process. However, our biggest lesson has been to really listen to landowners.

If a scheme can benefit landowners and manage flood risk everyone is a winner. We have learnt that what we call an offline storage feature many farmers see as an attractive pond and recreational feature. We have also worked hard to ensure woody floodplain attenuation features act to improve habitat complexity and the condition of wet woodland owned by a Wildlife Trust. It is all about listening and then promoting multiple benefits.

The pilot now moves into a monitoring phase. We have already started collecting water level and webcam footage during recent flood events. Now we look forward to finding out more about how effectively the variety of features that we have installed store and slow flow. Just as importantly, we will see whether they deliver against our landowner partners' expectations.

Ian Morrissey and Marcus Huband

Enderby Bridge pond extension nearing completion, providing over 700m³ of additional storage

Finishing touches being applied to a large wood bund at Narborough Bog Site of Special Scientific Interest (SSSI), positioned to store water within a floodplain oxbow feature

Introducing our new recruit to the flood risk management team: the beaver, nature's engineer

Figure 2. Beaver dam in the Spains Hall Estate, storing water and slowing the flow downstream

Reintroducing the beaver to Essex

Beavers are increasingly being reintroduced to the UK to 'rewild' and restore natural landscape functioning. Beavers are ecosystem engineers, modifying the landscapes where they are released to provide multiple ecosystem services to all of us. They fell trees and build dams, to create a wetland network interconnected by canals. These wetlands can store water, potentially trap and cycle sediment and pollutants, increase biodiversity and generally slow the flow of water moving downstream, which may help to reduce flood risk. Best of all, this storage and treatment system is managed and maintained by the beavers themselves.

For the last two years, Atkins has been working with the Spains Hall Estate, the Environment Agency, Essex and Suffolk Rivers Trust and the Essex Wildlife Trust to deliver a suite of Natural Flood Management (NFM) schemes to help reduce flood risk to the village of Finchingfield, Essex. Flooding in Finchingfield in 2014, along Finchingfield Brook, caused considerable disruption and heartbreak to its residents; the Environment Agency estimate that local roads, 12 residential and six other properties are susceptible to flooding in the village.

Part of the NFM scheme involved the release of a pair of Eurasian Beavers in March 2019. The beavers were released into a 4-hectare fenced enclosure within the Spains Hall Estate. Elsewhere across the Estate, a network of woody features was constructed along upstream watercourses to push water out of the channel onto riverside meadows and fields during floods.

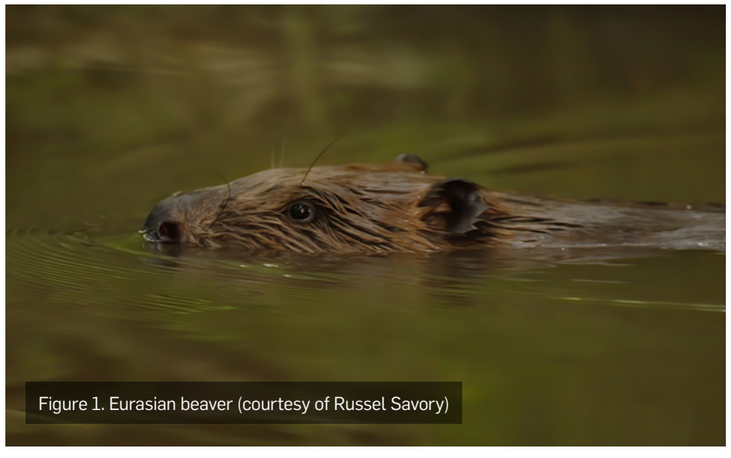


Figure 1. Eurasian beaver (courtesy of Russel Savory)

Crowd-sourcing an evidence base

Monitoring the effectiveness of the beaver and other NFM interventions on flood risk and the ecosystem is critical to build an evidence base that can help others implement similar schemes. A crowd-sourcing approach has been used by the Spains Hall team with individual organisations working together to collect a range of datasets across the site including:

- **Baseline survey** of the beaver enclosure collected during a BioHack of 30 volunteers from multiple organisations, including Atkins.
- **Water quality sondes** have been installed by the Environment Agency recording a range of parameters every 15 minutes.
- **Nutrient and pesticide** spot samples are taken monthly by Affinity Water and Essex and Suffolk Water upstream and downstream of different interventions.
- **Water level, weather and soil moisture** loggers have been installed by King's College London across the site using FreeStation technology.
- **Botanical monitoring** within the beaver enclosure is being conducted yearly by the Shropshire Botanical Association.
- **A hydraulic flood model** of the catchment has been built by Atkins to simulate the effects of the interventions of flood peaks in Finchingfield.

All the work is being shared through a website that hosts an open-source platform showing real time water levels, water quality, weather and time lapse photographs of the beavers (https://www.spainshallestate.co.uk/nfm_beavers). The ecology survey results are available on GitHub (https://joejcollins.github.io/atlanta-shore/).

The data will be analysed and extended by BSc, MSc and PhD students working in partnership with the project.

Beavers on film

A strong focus of the project is collecting imagery of the beavers and their impacts on the landscape. Remote cameras are used to capture the movements of the beavers every hour and a drone survey of the landscape is conducted annually. We are also working with a wildlife film-maker, Russel Savory, to track the evolution of the beaver enclosure and he is working to produce a film.

Delivery in partnership

The project is a partnership in the truest sense of the word. It would not have been possible without the energy and enthusiasm of the Spains Hall Estate and the kind contributions of close to 100 volunteers and specialists that have contributed their time and expertise to making the project happen.

Indeed, it is estimated that the overall contributions in kind provided by all these individuals and organisations have contributed an additional £100,000 to the project value.

The local community have been involved throughout the project, attending a series of local events at different project staging posts.

One year on from release

A year after release, the landscape has already changed dramatically. Previously, the enclosure land was predominantly a woodland with species associated with wetland margins and a narrow stream running through it. A year in, the beavers have created a number of areas of standing water behind three main, and a series of minor, wood dams along the main stream. These have been formally surveyed to produce the map shown in Figure 3. Monitoring is ongoing to track the continued effects of beavers on the local landscape.

Open-source data platform: www.spainshallestate.co.uk/nfm_beavers

Botanical survey GitHub: https://joejcollins.github.io/atlanta-shore/

Film of the beaver enclosure: https://youtu.be/kyxlGzNnXjM

Film of the Spains Hall woody dams in operation: https://youtu.be/UKxWgaBNUwg

Eleanore Miles and Dave Gasca

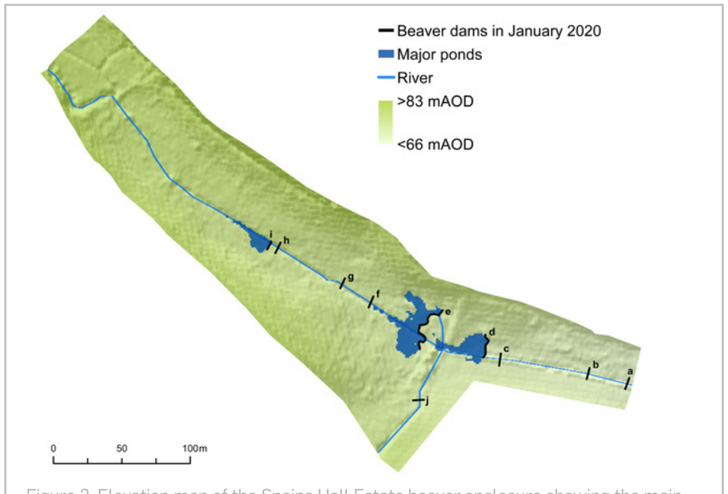


Figure 3. Elevation map of the Spains Hall Estate beaver enclosure showing the main dams and areas of open water one year after beaver introduction

Natural Capital Studio: Atkins' Natural Capital Assessment Tool

What is Natural Capital?

Natural capital extends the concept of assets to the natural environment. It considers natural assets such as air, water and all living things in the same way we might consider roads as physical assets. Without estimating monetary value, the costs and benefits of ecosystem services and underlying natural capital can be undervalued or overlooked, resulting in environmental over-exploitation and degradation.

How does Natural Capital Studio Work?

Natural Capital Studio uses land cover data prior to and following scheme implementation to estimate the potential impact on ecosystem services. The tool uses existing valuation evidence applied to a new context, an approach called 'value transfer', to assess the value delivered in monetary terms. Recreational benefits are estimated using the Outdoor Recreation Valuation Tool (ORVal: Version 2.0). National Water Environment Benefit Survey (NWEBS) assessments and alteration of parameters such as kg Phosphorus loss per ha using Farmscoper (a Defra-funded tool developed by ADAS) can also be added.

Work so far

The Atkins tool has been used to assess a wide range of projects including:

- River restoration assessments;
- Habitat creation scheme evaluation; and
- Additional benefits assessment for catchment management.

Ockwells park river restoration and recreation enhancement

A natural capital assessment was completed for Ockwells park, near Maidenhead. The scheme aims to enhance the local recreation resources by developing new zones of use, enhancing aquatic ecology and improving access. The assessment used scheme designs and land cover data in the valuation enhanced by a qualitative assessment of the park. This was completed with the addition of a NWEBS assessment.

Overall, despite a minor reduction (-£48 per year) in air quality value due to woodland cover changes the scheme has the potential to increase ecosystem services provision by £273k per year or £5.87m in present value (PV) terms over 25 years. In other words, assuming a £1m investment this scheme could provide a 6-fold return.

Evenlode Phosphorus Catchment Management Trial

The Evenlode Catchment is the focus of a pilot programme to evaluate the implementation of land management measures, such as buffer strips and resurfacing gateways, to reduce phosphorus.

Natural Capital Studio was used to complete an additional benefits assessment at farm and catchment scale. The assessment used scheme designs and land cover data, enhanced by site specific Farmscoper data including Kg phosphorus reduced per year, Kg sediment loss reduced per year and Kg energy use reduced per year.

The outcome of the assessment shows that implementation of catchment management measures has the potential to increase ecosystem service provision by £126k per year or £2.16m in present value (PV) terms over 25 years.

This result was then combined with cost effectiveness analysis to determine if land management measures are viable alternatives to traditional sewage treatment works. Overall, with the inclusion of additional benefits the number of measures found less costly than intensive sewage treatment increases 3-fold.

What Next?

Natural capital assessments can be used in diverse ways, including to enhance and support other analyses.

Increased regulation, including the 25-year environment plan, sees an expansion in opportunities to include natural capital approaches, such as the use in evaluating catchment management approaches in combination with cost effectiveness. Further prospects, include environmental impact assessments incorporating natural capital valuation and, in particular, using the Natural Capital studio in addition to other Atkins tools such as to evaluate Natural Flood Management approaches.

Amy Winlow

The fish pass conundrum – nature-based or technical?

Technical fish passes are engineered solutions which allow fish and eels to overcome river obstructions. Designed well, technical fish passes are effective and relatively simple to maintain. They facilitate an efficient use of space, which often makes them a cost-effective option (Figure 1).

Figure 1: Larinier Pass at Bagnor on the River Lambourn

Nature-based channels have potential to offer much more to natural and human environments. Creating new river, floodplain and wetland habitats adds complexity to the landscape and often acts as a focus for recreational activities. With careful design, natural channels can be used by a wider range of fish species across all life stages (for instance less powerful or younger fish).

They also facilitate the movement of other aquatic species such as small invertebrates. They are less likely to interrupt sediment movement and are less vulnerable to becoming blocked (Figure 2).

Figure 2: Natural by-pass at Shaw on the River Lambourn

However, nature-based channels generally need more land, sometimes require technical elements at inlets or outlets, and may be geomorphologically less stable.

Technical passes tend to be seen as a lower-risk option in constrained locations, and where the consequences of flood risk or bank instability may be severe. The need to manage project risks and budgets is critical. However, a balanced option appraisal is also crucial. Natural channels present design challenges, but the additional benefits can be substantial and should not be overlooked.

In locations where flood risk and channel instability can be managed through design and stakeholder consultation, a natural channel can enhance or revitalise a river environment in ways that a technical fish pass cannot.

Marc Huband, Alex Humphreys and Ian Morrissey

Review of Defra Natural Flood Management Schemes – progress to date

In 2016 Defra established their Natural Flood Management (NFM) Programme, providing funding to 58 competition winners who each received a portion of a £15 million funding allocation for NFM projects.

As part of my MSc thesis, I undertook a review of the progress of the projects to date, including conducting interviews and questionnaires with those involved. Several key themes were investigated such as partnerships, engagement and monitoring. Participants also provided three pieces of advice they would offer to future projects.

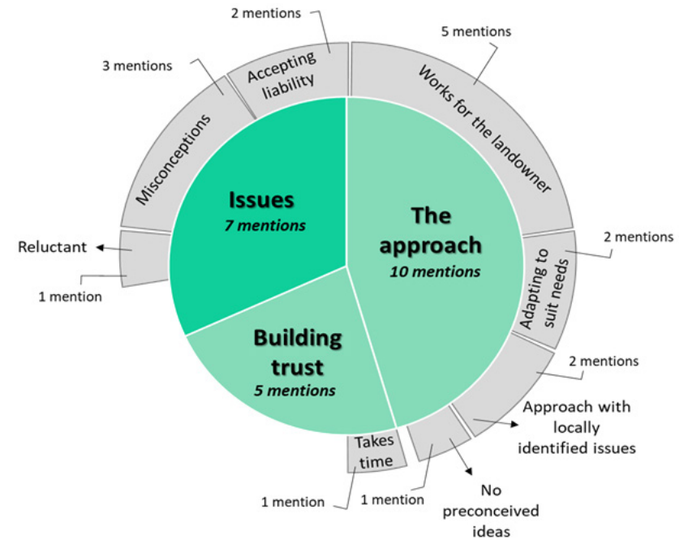
Landowner engagement was found to be fundamental to the progression of projects and 36% of projects offered advice related to this (Figure 1). Several respondents highlighted the importance of developing relationships and building trust with landowners early on to prevent barriers forming in the project's development. Additionally, it was suggested to arrive at discussions with landowners with no preconceived ideas and to engage with the farmer on what they thought was appropriate for their land. Incentives for landowners were suggested to encourage landowners to allow NFM to be undertaken on their land.

Concerns were raised regarding the longevity of projects in terms of maintenance and monitoring due to funding restrictions once the programme concludes in March 2021.

In response, citizen science will be used in numerous projects and some have developed training courses and apps to support volunteers. Universities are also involved with several projects. For the evidence on NFM to be developed further and encourage future NFM projects, continuous monitoring and analysis of data is essential, but with limited funding this raises concerns.

Bryony Holdridge

Figure 1: Landowner engagement - number of times each theme mentioned and percentage of projects stating each theme



Atkins news

Staff Announcements

We are delighted to welcome a further range of new starters into our overall team. Bryony has joined us as a graduate in Epsom. Emma joined us in March as a Principal Geomorphologist in Birmingham after arriving from Jacobs. We also welcomed back Rob Sewell in Glasgow. Finally, Eleanore joined us at the start of the year in Oxford having finished her PhD titled 'Catchment-level effects on river habitats: a spatial data-science study of rivers in England' at King's College London.

CEEQUAL Exceptional Achievement Awards 2019

We were delighted that one of our projects - Staffordshire Area Improvements – Norton Bridge Grade Separation Project won two awards at the CEEQUAL Exceptional Achievement Awards 2019. It won the Water Environment and Resources award category and was Highly commended in Ecology and Biodiversity category. Our four river realignments and associated wetlands were integral in this achievement. The judges noted that the 'Project achieved excellent outcomes way beyond what normal practice would require.'

National Infrastructure Planning Association Awards 2019

The extension to Tilbury port, Tilbury2, won the 'Best Project' award in the Inaugural National Infrastructure Planning Association Awards 2019 which recognises best practice in participating in the Development Consent Order Process (DCO) for a Nationally Significant Infrastructure Project (NSIP). Judges praised the team behind the DCO planning process of Tilbury2. We led the whole of the Water Framework Directive assessment throughout this process.

River Restoration Centre annual conference September 2020

In September 2020, our team will attend the re-arranged River Restoration Centre's 21st Annual Network Conference on 'River Restoration: Scaling up our Ambition' in Harrogate. We will be presenting four papers over the course of the two days. We look forward to seeing you there.

Environment Agency EcoSF3 Framework

We're delighted to confirm that we have been reappointed to the Environment Agency's Ecological Services Framework (EcoSF). For EcoSF3, we will be supporting the delivery of river restoration, geomorphological services, habitat creation and fish passage design.

Over the last two iterations of the framework, we have enjoyed supporting the Environment Agency on a wide range of projects that have delivered meaningful environmental improvements. We look forward to continuing our input, helping the Environment Agency achieve even greater success.

Natural Capital brochure

We are excited to have launched our Natural Capital brochure which outlines how we approach our Natural Capital assessments in Atkins. These assessments have become integral in many of our river restoration and wetland schemes. It is downloadable from our website: www.atkinsglobal.com/en-GB/uk-and-europe/sectors-and-services/sectors/water#resources.

"Way beyond what they needed to do"

Services

Atkins recognises that river management and restoration requires sustainable long-term solutions. To meet this challenge, Atkins has developed a multi-disciplinary team of scientists, engineers and policy makers who understand these opportunities and challenges. They can provide:

- River restoration and river alignments
- Hydro-ecological impact assessment
- Aquatic ecological survey and assessment
- Habitat Enhancement
- Water Level Management Plans
- Water Framework Directive Assessments
- Catchment management and land-use
- Geomorphological/ Hydromorphological assessments
- Programme management and Policy advice
- Natural Flood Management
- Weir removal assessments
- Integrated Monitoring
- Environmental low flow assessments
- Fish passage and weir removal assessment
- Bio-engineering
- Wetland creation
- Natural Capital Assessments

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