



BART Tree Planting Strategy and Approach to Delivery

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Bristol Avon Rivers Trust's (BART) Approach to Tree Planting

Why BART support tree planting

As an environmental charity BART supports the widespread national interest in trees as a major component in environmental strategy and as a contributor to managing the effects of climate change.

As a river based charity we intend including trees as key component in our work in the following areas.

- 1. Trees are a component in our Natural Flood Management approach** and form part of our portfolio of our "Working with Natural Processes" solutions to mitigate flooding, which includes creation of wooded wetlands where appropriate. To be effective for this purpose trees need to be planted in the right place, indeed in some places trees can exacerbate flood issues.

Our Working with Natural Processes strategy is to map the most effective places for tree planting and those areas that should be avoided. We will also work with partners to plant the correct trees in the correct places.

We will achieve this through a combination of modelling, economic appraisal, surveying and partnership working. We will carry out planting as part of our Natural Flood Management (NFM) projects using our local relationships and partners.

- 2. Trees are a vital component in our strategy for restoring and maintaining the health of rivers.** They form a crucial provider of shade in our rivers helping to cool rivers which is important for many species of fish, particularly game fish such as wild brown trout. They also form a key provider of habitat and food for river creatures through woody debris and insects. As a contrast trees also cause problems without regular riparian management due to overshadowing - as other plants growing in rivers need access to light to thrive and provide the essential biodiversity our rivers can provide. These areas are vital wildlife corridors and important to insects, birds, bats and mammals.

Like many Wildlife Trusts BART believe that natural rewilding of areas may be preferable in many instances to simply planting trees or that the two aspects may be combined. Our approach will always look for the best long-term solution that will be valued and maintained by local stakeholders as this will ultimately provide sustainable long-term benefit. In order to achieve this BART will always seek to work with partners with a similar aim and always seek to maintain vital long-term relationships where we work

How Trees are integrated into Natural Flood Management (NFM)

BART's approach to NFM tree planting

Tree planting forms an integral part of our NFM work (when natural processes are used to reduce the risk of flooding e.g. restoring bends in rivers, changing the way land is managed so soil can absorb more water).

What is demonstrated through our NFM work is that planting trees in the correct place can contribute towards "slowing the flow" of water during a range of rainfall events. For example, planting trees on mid-slope and down slope field edges can be effective in increasing water infiltration, reducing and slowing runoff and intercepting nutrient and sediment.

Winford Brook Case Study

During 2019, BART applied the approach of "Working with Natural Processes" to the Winford Brook catchment with the aim of supporting nature and people. The measures were designed and implemented to contribute towards improving water quality by reducing sediments and nutrients entering the waterbody as well as slowing the flow of water as the brook responds to rainstorm events. Careful vegetation management, including tree planting and additional 'engineered' design features including the creation of bunds, scrapes and mini wetlands also captures and retains diffuse agricultural pollutants.

Prior to the on the ground work, the potential impact of afforestation on a per-field basis was also investigated to provide greater detail as to where afforestation measures could provide the most effective and efficient peak flow reduction at the confluences with the main river (Fig 1.). It is worth noting that new afforestation measures would take several years to develop and potentially display the benefits shown in this modelling approach.

¹ Working with Natural Processes (WWNP) to reduce flood and coastal erosion risk (FCRM) involves implementing measures that help to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast. WWNP takes many different forms and can be applied in urban and rural areas, and on rivers, estuaries and coasts. Environment Agency, (2015). Working with Natural Processes – the evidence base Project Summary. SC150005. <https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk>

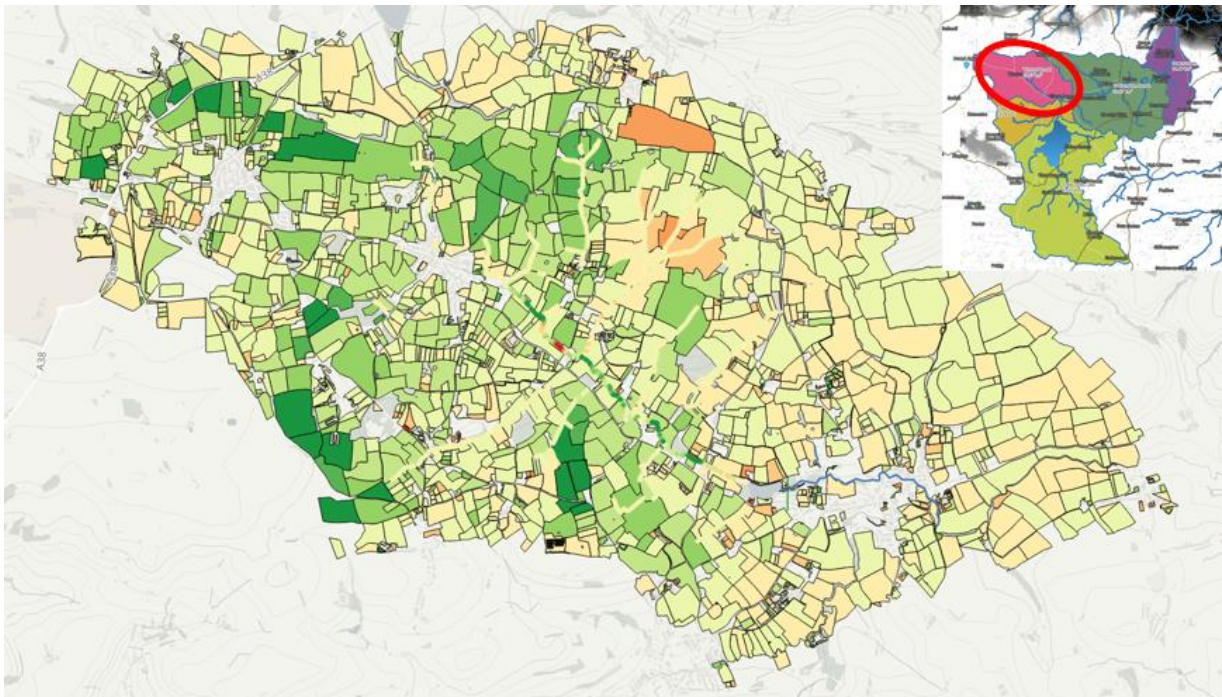


Fig 1. BART example of catchment modelling – Green represents benefits in relation to tree planting, light green/yellow no significant impact and orange represents a disbenefit to flood risk.

Field scale mapping generated from catchment modelling identifies which fields show potential to be most beneficial to a natural flood management woodland planting scheme. Theoretically, woodlands lead to greater reduction in peak flows due to the greater infiltration of water in woodland soil. Trees also generate surface ‘roughness’ which contributes towards slowing the flow of surface water. Fig 1. also demonstrates the areas which have little to no impact for attenuating flow and areas if planted into large-scale woodland could cause a disbenefit to local flooding. A disbenefit could arise as a result of two waterbodies becoming synchronised – for example, “slowing the flow” on one waterbody could cause flood peaks to match those of another, causing peak flows to arrive at the confluence of the main river at the same time. It is however important to note that smaller minor planting schemes in these areas are unlikely to cause an impact, but large field-scale woodland creation in these areas may cause a disbenefit.

Our combined approach of walkover surveys and modelling help to identify a programme of measures that include tree planting alongside wider interventions such as restoration and re-introduction of natural processes – a combination of which will complement one another and deliver multiple benefits. Creating a mosaic of habitats whilst also considering other benefits is our guiding principle. Whilst BART staff have a wide ecological background we would always welcome other partners views to maximise these opportunities and the long term relationships we develop allow this to take place as an ongoing contribution to any project ensuring legacy benefits.

BART’s approach allows us to develop landowner engagement plans that focuses on the areas with the most benefit. The approach integrates the model outputs into landowner and community discussions, including a site visit with the landowner to discuss feasibility and limitations. Our skilled survey team ground truth the site and formulate planting plans that deliver for multiple benefits including ‘slowing the flow’, improved habitat connectivity, more diverse habitat, and enhanced carbon sequestration. Throughout the process we test that plans are feasible for delivery on the ground with the landowner - ensuring that commitment to long-term stewardship and maintenance is paramount.

During this process, we cultivate strong landowner partnerships which include wider discussions around opportunities identified during the survey process - including prospects for in-stream restoration and addressing wider land-use concerns. We, therefore, utilise this opportunity to establish an ongoing relationship with landowners to build wider river and riparian improvements.

The important role of riparian trees

Changing pattern of riparian vegetation

Historically in the UK, the land beside rivers, streams and brooks, including floodplains, were more extensively wooded than they are today. Much of this tree cover has been lost – not just in the UK but throughout the temperate regions of Europe and North America. Woody debris would also have been a common feature in river channels which in turn would have created dynamic river conditions very different to what we are used to seeing today.

Multiple benefits of riparian vegetation

There is a substantial body of evidence that establishing wooded buffers improves most ecosystem functions. Research delivered by the Environment Agency², provided a set of data that demonstrates that wooded and engineered buffers within the riparian zone score the highest and grass vegetated buffers the lowest score for diffuse pollution control, carbon retention, and geomorphic and flood management benefits.

Trees also help to stabilise the riverbanks, manage river temperature and help improve aquatic habitats. Trees were highlighted as an important feature of buffers as they reduce airborne spray drift of agrochemicals, utilise soil nutrients and provide many ecosystem services (the benefits that we freely gain from the natural environment), over their long lifespan.

Fig 2. exemplifies how vegetation and additional features within the riparian zone next to a watercourse can also capture and retain diffuse pollutants from land-use that would otherwise become waterborne and impact upon water quality.

Importantly we believe that this approach, which encourages careful vegetation management, including tree planting and additional ‘engineered’ design features such as incorporating ridges, swales, and mini wetlands, will capture and retain diffuse agricultural pollutants most effectively.

²Environment Agency (2020). 3D buffer strips: Designed to deliver more for the environment. <http://www.gov.uk/government/publications>

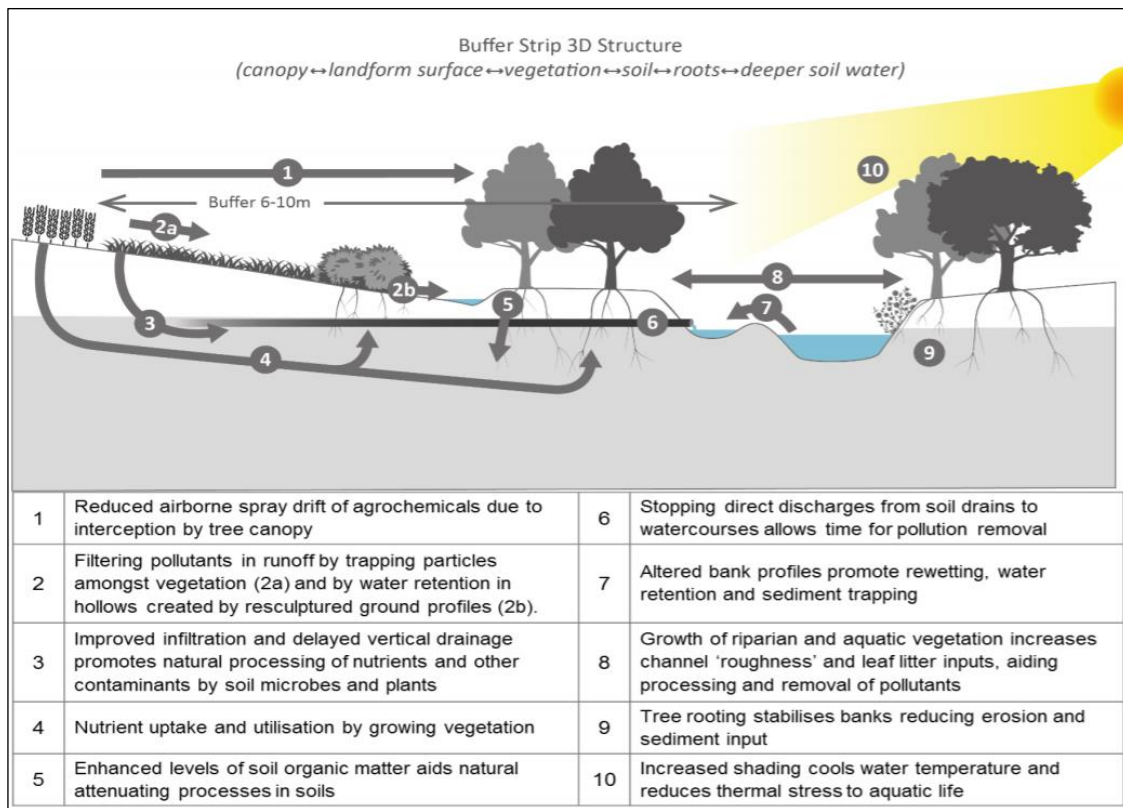


Fig 2. demonstrates how vegetation and additional features on the buffer zone next to a watercourse can capture and retain diffuse pollutants (Environment Agency, 3D buffer strips – designed to deliver more for the environment. Oct 2020)

The threat from climate change to river ecosystems cannot be ignored – within the next 60 – 70 years, projected increases in water temperatures will make some rivers inhospitable for our freshwater wildlife, upsetting finely balanced ecosystems (Keeping Rivers Cool Partnership, 2016³). Planting trees, shrubs and other vegetation within the riparian zone to create shade is low-risk - it can deliver a range of ecological benefits and provide a good start to keeping rivers cool during periods of hot weather – vital for maintaining a balanced ecosystem.

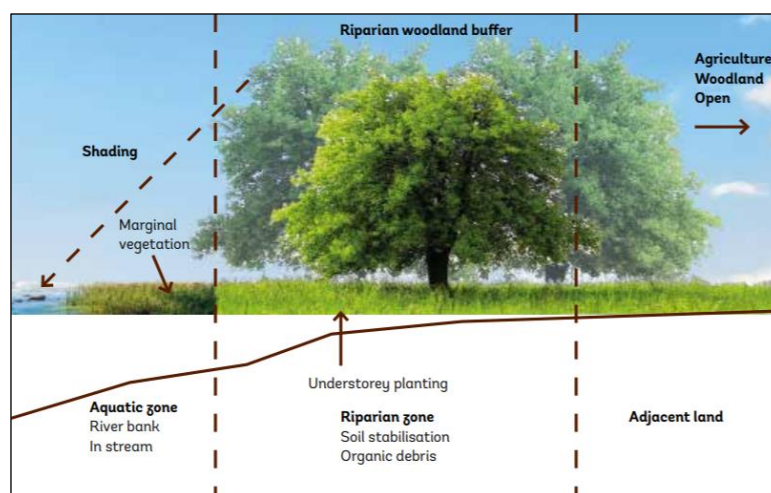


Fig 3. The riparian zone is defined as the area of land adjoining a river channel and includes the riverbank but not the wider floodplain. Trees in the riparian zone can provide shade to cool the stream, stabilise stream banks and act as a source of nutrients and woody debris (Keeping Rivers Cool, 2016)

Many rivers have very few trees along their banks, often as a result of overgrazing or optimising land-use. Where tree numbers alongside rivers are very low, it is prudent to replant the riparian zone – trees should be protected from livestock via fencing as well as from grazing rabbits (tree guards).

It's important to maintain a balance between light and shade and planting schemes should aim to create a mosaic habitat of tree cover to produce dappled shade (Fig 4, 5 & 6). Generally, a ratio of around 60% open water to 40% shaded represents a reasonable balance. Reducing shading on the outside of bends of rivers will also promote the growth of vegetation that may help protect banks from excessive erosion. Thinning riparian tree cover immediately below a spawning riffle will similarly promote the growth of fringing cover, increasing habitat for fry and creating habitat niches necessary to support biodiversity.

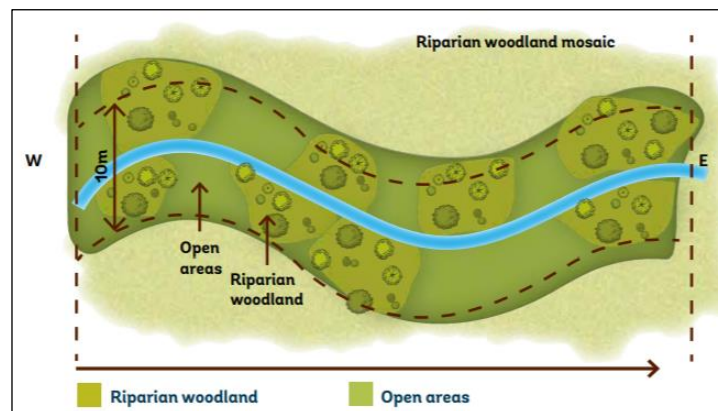


Fig 4. Riparian planting should create a mosaic of tree cover to produce dappled shade (Keeping Rivers Cool Partnership, 2016)

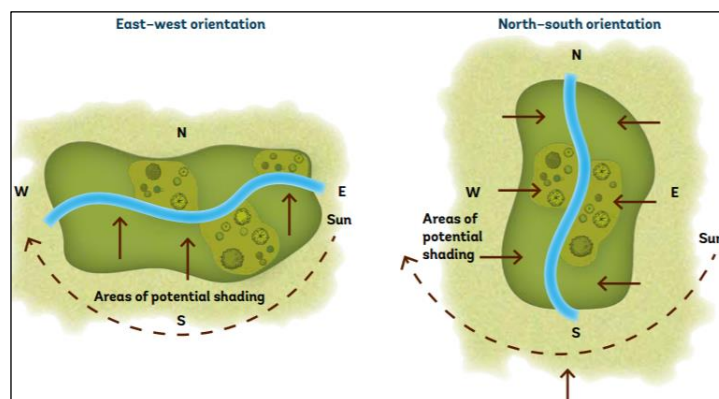


Fig 5. Direction of sun travel showing the areas where new planting could create effective shade (Keeping Rivers Cool Partnership, 2016)

³Keeping Rivers Cool Partnership (February 2016). Keeping Rivers Cool: A Guidance Manual Creating riparian shade for climate change adaptation.



BART's approach to riparian tree planting is more ambitious than just linear tree planting along a rivers course. It is also more ambitious than the arbitrary legislation regarding buffer strip sizes. We wish to utilise the maximum possible riparian space including headlands and land in river bends as well as less productive land to create wider – rewilded, naturally regenerated - riparian habitats for the benefit of all wildlife as well as the adjacent river. We believe that future Government schemes such as ELMS will support these wider ambitions and that they will be more sustainable than a basic “miles of trees planted by rivers” strategy.

Changes in attitudes to improve water quality have created an opportunity for restoring some more natural river dynamics and habitats. With the government's call to plant trees to tackle climate change, with some additional thought, planting the right tree in the right place could deliver multiple benefits that also improve the health and functioning of our rivers – the lifeblood of our planet.