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CASE STUDY
006

Riparian Woodland

Wooded buffer strips along watercourses that filter runoff, stabilise banks, provide shading, and improve water quality and habitat.

Overview

Riparian woodlands are planted along watercourses to reduce diffuse pollution and improve aquatic habitats. Trees intercept diffuse flow pathways, capture nutrients, and stabilise banks, while canopy cover intercepts agricultural spray drift, provides shade to regulate water temperature, and enhances aquatic habitat.

Primary Function

Reduce sediment and nutrient pollution entering watercourses while stabilising banks, shading streams, and enhancing biodiversity.

Location Considerations

- > Middle and upper catchments are generally most suitable; with wider and longer riparian woodlands resulting in greater benefits. Riparian planting should be part of a catchment management plan.⁶
- > Plant along watercourses prone to bank erosion or adjacent to diffuse or small convergent pathways.
- > Avoid planting in existing priority habitats (e.g. wetlands, species-rich grassland).⁵
- > Connect with existing riparian woodland to maximise ecological and water quality benefits.⁵
- > Avoid planting immediately upstream of culverts or bridges where large woody material could increase blockage risk.⁶

How They Work

1. Runoff Filtration

Woodland buffers slow runoff, enhance infiltration, and trap sediment and nutrients before they reach the channel.^{1,2}

2. Bank Stabilisation

Root systems bind and reinforce soils, reducing erosion and risk of bank collapse.¹

3. Nutrient Uptake

Trees absorb nitrogen and phosphorus from soil and shallow groundwater.^{1,2}

4. Shading & Intercepting Spray Drift

Riparian trees provide shade to regulate water temperature and help intercept agricultural spray drift.¹

5. Flow Attenuation & Habitat Creation

Established trees increase hydraulic roughness and contribute natural large woody material (e.g., branches, fallen trees), which slows the flow locally and creates in-channel habitats.³

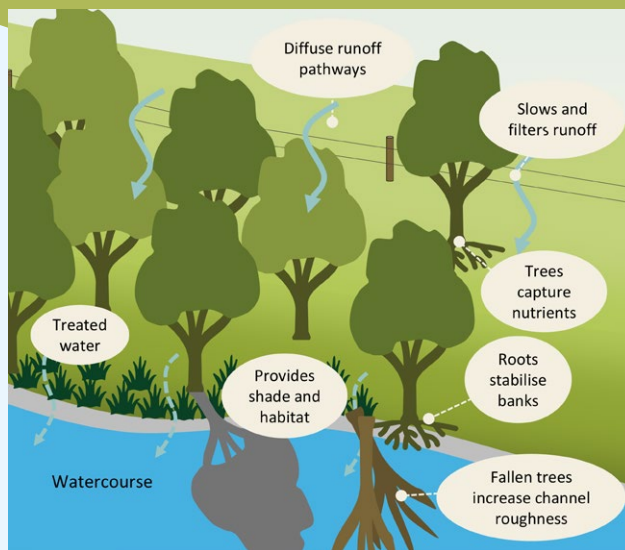


Figure 1: Riparian woodland schematic showing key hydrological and ecological functions, including filtration, stabilisation, nutrient uptake, shading, and flow attenuation.

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Figure 2: Riparian woodland planting. (a) Floodplain planting increasing hydraulic roughness and habitat. (b) Slope planting slowing and filtering runoff from adjacent land (photos: Mark Wilkinson, JHI).

Design and Maintenance

- > Use predominantly native broadleaved trees suited to local conditions.⁴
- > Wooded buffer strips can be on one or both banks, either continuous or scattered.⁵
- > Maintain fencing, manage weeds and check for flood damage during establishment (first 3–5 years).⁴
- > Buffer width could be adjusted based on site sensitivity, waterbody status, and convergent flows.^{1,3,5}
- > UK Forestry Standard (UKFS) recommended buffer widths per bank:
 - 10m each side for channels <2m wide.⁵
 - 20m each side for channels >2m wide and along lakes, reservoirs, large ponds, and wetlands.⁵
 - Narrower buffers may be acceptable on minor (<1m) or ephemeral channels, especially where slope or land take limits width.⁵

NbS Measure Summary

Aspect	Notes
Set-up cost	Costs mainly from planting, tree shelters, fencing and initial weed control.
Maintenance effort	Active weed control and fencing maintenance for first 3–5 years; thereafter low. ⁴
Lifespan	Woodland delivers benefits over many decades once established.
Flow attenuation	Increases hydraulic roughness and floodplain connectivity, contributing to local peak-flow reduction. ⁶
Sediment retention	Effective for coarse sediment; fine sediment requires wider buffers or infiltration. ⁵
Phosphorous (P) removal	Mainly via trapping sediment-bound P; wider buffers needed for dissolved P uptake. ⁵
Nitrogen (N) removal	Removal through plant uptake and denitrification, most effective in warm, wet soils; harvesting can export stored N. ⁵

Further Information

- ¹ Stutter et al. (2020). 3D buffer strips: Designed to deliver more for the environment. Environment Agency, Bristol. (G)
 - ² Ó hUallacháin et al. (2025). Effectiveness of Riparian Mitigation Measures for Enhancing Ecosystem Functions: A Holistic Summary of Selected Measures. Environmental Management, 1-16. (R)
 - ³ Broadmeadow & Nisbet (2004) The effects of riparian forest management on the freshwater environment: a literature review of best management practice. Hydrol. Earth Syst. Sci. 8, 286-305 (R)
 - ⁴ Scotland's Farm Advisory Service (FAS). Riparian Planting. (Web Link) (G)
 - ⁵ Forest Research (2024). Creating and managing riparian woodland. (PDF Link) (G)
 - ⁶ Monger et al. (2024). Investigating the impact of woodland placement and percentage cover on flood peaks in an upland catchment using spatially distributed TOPMODEL. Journal of Flood Risk Management, 17(2), e12977. (R)
- G = Guidance, R = Research

MATCH FUNDERS



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