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CASE STUDY
05

Wooden Leaky Barriers

Wooden barriers that mimic naturally occurring wood deposits. These slow water, trap sediment, and reconnect floodplains during high flows.

Overview

Leaky barriers are wooden structures, typically made from local logs, installed across small streams, ditches, or gullies. They mimic natural woody debris by slowing flow, trapping sediment, storing water temporarily, and reconnecting streams with their floodplains.

Primary Function

Increase surface roughness to slow water, trap coarse sediment, and promote temporary floodplain storage, reducing downstream flood risk.

Location Considerations

- > Position where there is a clear flow path (runoff or channel flow) and adequate space to install barriers in series for cumulative benefit.
- > Best suited to narrow watercourses (<5m wide) where barriers can safely span the channel.¹
- > Ensure structures do not impede fish passage or strand fish as floodwaters recede.^{1,2}
- > Sites with existing or planned woodland allow future fallen trees to form natural leaky barriers.
- > Avoid steep, highly erosive or unstable channels (e.g., sandy beds) where anchoring or stability is compromised or near pinch points (e.g., bridges, culverts).¹
- > Avoid locations where barriers could increase flood risk to neighbouring landowners, property or infrastructure.^{1,2}

How They Work

1. Flow Reduction & Surface Roughness

Wooden structures increase surface roughness, reducing flow velocity.

2. Floodplain Connectivity

Backed-up water spills onto adjacent land or floodplains, creating temporary storage.

3. Sediment Deposition

Reduced velocity allows coarse sediment to settle behind the barrier or across the inundated land.

4. Baseflow Support

Temporary storage and infiltration can help sustain baseflows during dry periods.

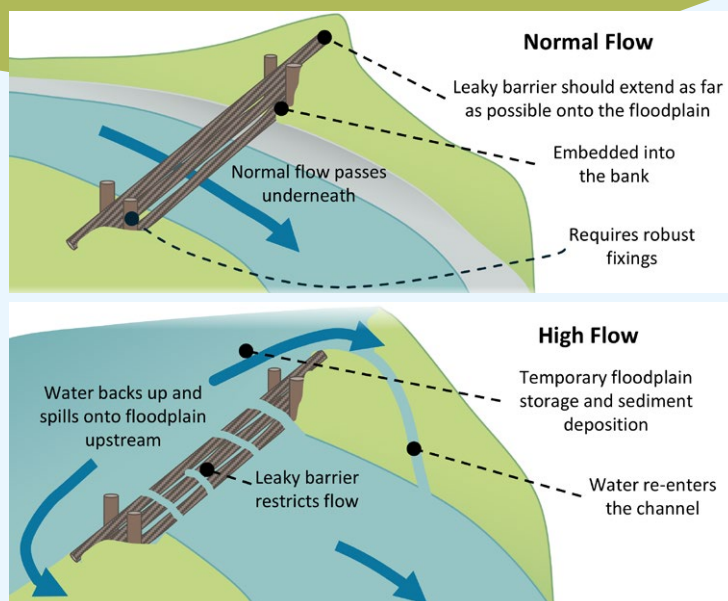


Figure 1: Wooden leaky barrier schematic illustrating key flow, storage, and sediment deposition processes.

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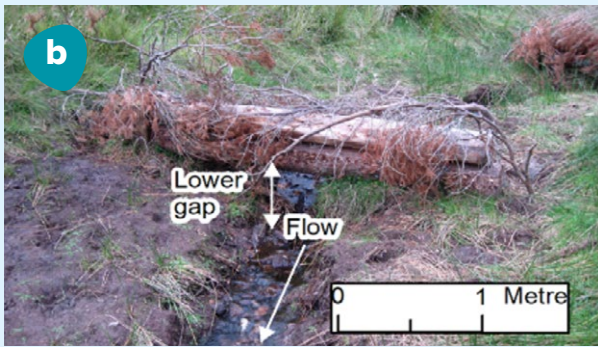


Figure 2: Example locations for leaky barrier installation. (a) Floodplain – promote temporary storage on adjacent land (Photo: Mark Wilkinson, JHI). (b) In-ditch – slow flow and trap sediment in agricultural ditches (Photo: Addy et al. 2025). (c) Ephemeral stream – barriers in small, seasonally flowing streams to intercept runoff (Photo: Martyn Roberts, JHI). (d) Woodland – barriers using natural woody debris (Photo: Nicholson et al. 2012).



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Design and Maintenance

- > Install many small barriers in series, keeping barrier height $\leq 1\text{m}$ to limit forces and failure risk.¹
- > Ensure barriers are wide, stable, and well anchored to avoid scour or outflanking.
- > Include a base gap to maintain baseflows and allow fish passage where required.^{1,3}
- > Space barriers appropriately (e.g., $\text{height} \div \text{channel slope}$) so they do not sit in the backwater area of another.¹
- > Monitor for decay or loose fixings; secure or replace as needed (natural decay over time is expected).¹
- > Redistribute sediment only if it blocks fish passage or creates stagnant pools.¹
- > Allow natural wood build-up, removing only blockages that pose a risk or reduce permeability.¹
- > At end of life, de silt before removal to avoid releasing silt and reducing downstream water quality.¹

NbS Measure Summary

Aspect	Notes
Set-up cost	Costs vary with access, anchoring requirements, material availability.
Maintenance effort	Inspect at least twice a year and after storms, checking for scour, movement, or blockages. ¹
Lifespan	Structures can last for many years but may require periodic repair due to natural decay. ¹
Flow attenuation	Most effective during smaller storms; performance depends on floodplain connectivity. ^{3,4}
Sediment retention	Field studies show upstream coarse sediment deposition and reach-scale aggradation. ³
Phosphorous (P) removal	Limited evidence; may capture some sediment-bound P depending on design.
Nitrogen (N) removal	Limited evidence for N removal.

Further Information

¹ Wren et al. (2022) The natural flood management manual, C802, CIRIA, London, UK (ISBN: 978-0-86017-945-0) (G)

² SEPA's Regulatory Guidance on the Placement of Large Wood in the Water Environment (PDF Link) (G)

³ Addy et al. (2025). The hydro-geomorphic effects of wooden leaky barriers in a steep headwater stream. Earth Surface Processes and Landforms, 50(6), e70079. (R)

⁴ van Leeuwen et al. (2024). Quantifying the natural flood management potential of leaky dams in upland catchments, Part II: Leaky dam impacts on flood peak magnitude. Journal of Hydrology, 628, 130449. (R)

⁵ Nicholson et al. (2012). Runoff attenuation features: a sustainable flood mitigation strategy in the Belford catchment, UK. Area, 44(4), 463-469. (R)

G = Guidance, R = Research

MATCH FUNDERS



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