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CASE STUDY
08

In-ditch Sediment Trap

Small barriers in artificial ditches or swales that slow concentrated flows, reduce erosion, and trap sediment.

Overview

In-ditch sediment traps are small structures constructed across ditches, swales, or other artificial channels. They slow water, reduce erosive energy, and capture sediment in a place where it can be safely removed. When installed in series, they stabilise flow pathways, reduce pollutant transport, and contribute to downstream flood risk mitigation.

Primary Function

Trap and retain sediment within artificial drainage channels, reducing erosion and diffuse pollution, and providing a managed point for recovery.

Location Considerations

- > Suitable for small artificial ditches, swales, and concentrated-flow areas.
- > Not suitable for natural streams.
- > Site selection should consider slope, soil infiltration capacity, and evidence of erosion or runoff pathways.¹
- > As channel size increases, higher flow and sediment loads raise the risk of structural failure and localised scour.
- > Sites should be fenced off and allow machinery access for periodic sediment removal.

How They Work

1. Flow Reduction

Barriers reduce water velocity and effective slope, lowering erosive energy.

2. Sediment and Pollutant Trapping

Slower water encourages deposition of sediment and nutrients in a defined location where they can be excavated and removed.

3. Infiltration

Ponded water can infiltrate, contributing to groundwater recharge.

4. Series Effect

Multiple structures in sequence can improve sediment and nutrient capture efficiency.

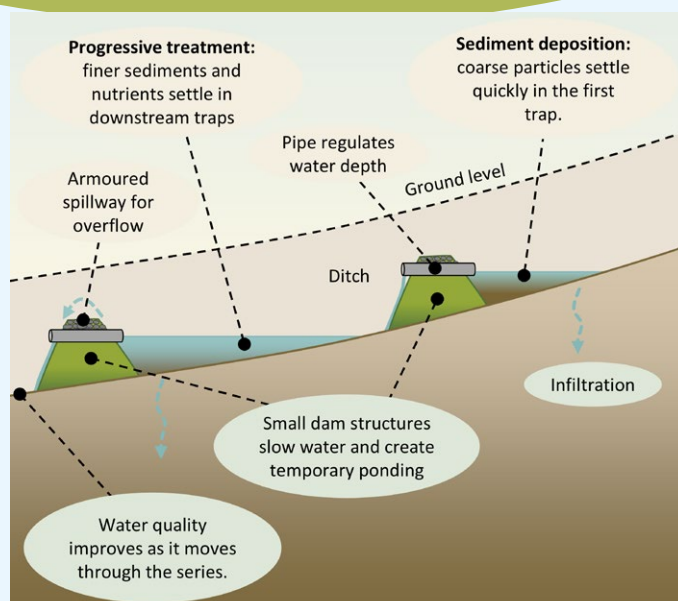


Figure 1: Cross-section of a typical farm channel with in-ditch sediment traps schematic illustrating key design principles and associated hydrological processes.

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In-ditch Sediment Trap



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Figure 2: Examples of in-ditch sediment traps. (a) Series of traps installed in a field ditch (photo: Farming for Water EIP). (b–c) In-ditch sediment traps located upstream of a runoff storage pond; (b) photo: Mark Wilkinson (JHI), (c) photo: Newcastle University.

Design and Maintenance

- > Construct barriers across the full channel width, with a slightly lower centre section to direct overflow.
- > Height up to 0.6m (maximum 1m) for safety reasons and side slopes of 1 in 3 for stability.²
- > Features can be built from wood or stone, consolidated with geotextile for stability and barriers should not be impermeable to maintain seepage.¹
- > Earthen dams are not recommended due to erosion risk.¹
- > Install barriers in series, ensuring the toe of the upstream dam aligns with the crest of the downstream dam.²
- > Inspect regularly after storm events, removing sediment once accumulation reaches half the dam height.³
- > Place excavated soil away from runoff pathways to prevent re-erosion and include in the farm nutrient budget.

NbS Measure Summary

Aspect	Notes
Set-up cost	Low for wooden or stone barriers; can increase where filter media (e.g. ochre) are used. ¹
Maintenance effort	Requires regular inspection after storm events and periodic sediment removal.
Lifespan	Long lifespan but dependent on frequency of sediment removal and construction materials used.
Flow attenuation	Some attenuation through flow velocity reduction. ⁴
Sediment retention	Primary function: effective at settling suspended solids.
Phosphorous (P) removal	Particulate-P captured well; dissolved-P requires additional filter media (e.g. ochre). ¹
Nitrogen (N) removal	Retention time assumed too short for N breakdown. ¹

Further Information

- ¹ Environment Agency (2012). Rural Sustainable Drainage Systems (RSuDS) (PDF Link) (G)
 - ² Wren et al. (2022). The natural flood management manual, C802, CIRIA, London, UK (ISBN: 978-0-86017-945-0) (G)
 - ³ Duffy et al. (2016). RSuDS: A Practical Design and Build Guide for Scotland's Farmers and Landowners. CREW. (PDF Link) (G)
 - ⁴ Quinn et al. (2022). The role of runoff attenuation features (RAFTs) in natural flood management. Water, 14(23), 3807. (R)
- Wilkinson et al. (2014). A framework for managing runoff and pollution in the rural landscape using a Catchment Systems Engineering approach. Science of the Total Environment, 468, 1245-1254. (R)
- Smith & Muirhead (2024). A review of the effectiveness of sediment traps for New Zealand agriculture. New Zealand Journal of Agricultural Research, 67(5), 547-564. (R)
- G = Guidance, R = Research

MATCH FUNDERS



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