The role of place and scale on effectiveness of temporary storage areas for surface runoff attenuation

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1. Introduction

Flooding is a natural process, but due to urbanisation[1], changes in land use[2] and climate change[3] there is an increasing exposure to flood risk across many regions globally.

Flood damage costs Scotland an estimated ~£250m per year[4].

Intensive agriculture often causes soil structure degradation[5], which increases local runoff, water quality issues, soil erosion and flood risk[6].

Flood risk management is shifting from a sole emphasis on structural defences, to considering multiple catchment-based measures which attenuate surface runoff. A measure being used in a variety of landscapes is a **Temporary Storage Area (TSA)**.

2. Temporary Storage Area (TSA)

Definition of Temporary Storage Area:

*'Intercepts and attenuates surface runoff, providing **NEW** storage during storm events'*

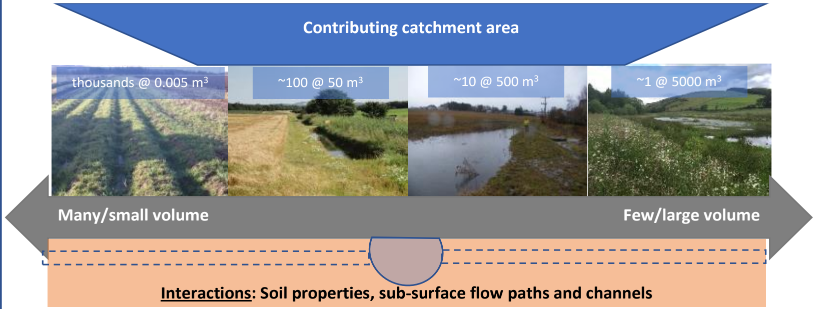

***Figure 1:** TSAs examples of varying volumes. Many small features vs one large measure?*

3. Aims and Objectives

Aim: Understand the functioning of TSAs regarding scale and place.

Objectives:

1. Analyse existing TSA datasets to measure TSA functioning.
2. Explore the role of soil management on soil properties and how it impacts upslope runoff generation and TSA drainage.
3. Evaluate the relative role of scale, place and soil properties on TSA functioning.
4. Develop a decision support framework tool.

4. Methods

Analyse TSA datasets → **Field assessment of TSAs** → **Analysis of soil properties** → **Create hydrological modelling tool** → **Develop decision support framework**

5. Temporary Storage Area – Conceptual Model

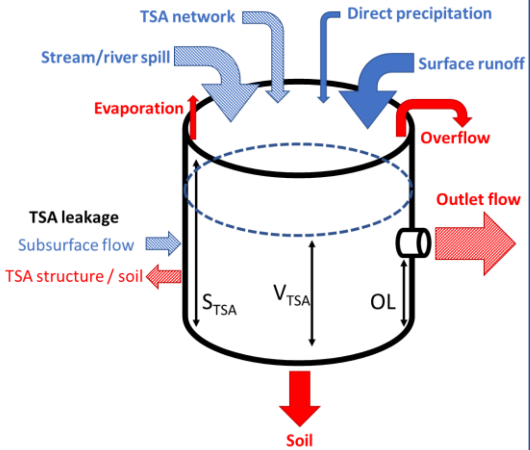

***Figure 2:** Conceptual model of TSA inputs and outputs.*

Overview

- Identifies the water inputs and outputs that impact the functioning of TSAs.
- Larger arrows represent dominant processes and solid arrows are applicable to all TSAs.
- If inputs exceed outputs, the volume of water increases within the TSA.

KEY

- Core TSA inputs
- Scenario dependent TSA inputs
- Core TSA outputs
- Scenario dependent TSA outputs

S_{TSA} = TSA storage capacity
V_{TSA} = Volume of water in TSA
OL = Outlet level

6. Future work

The TSA conceptual model **(Fig. 2)** will be used to analyse existing datasets to partly assess TSA functioning during storm events. This will cover a range of TSA volumes **(Fig. 1).**

Detailed field assessment of soil hydraulic and physical properties within the TSA footprint and contributing area. Investigating how soils respond to differing land management practices and rainfall storm characteristics sites with contrasting TSA volumes.

Ultimately, the project aims to provide policy and practitioners with the required tools to effectively target and manage future TSAs.

Offline storage area at Belford (NE England)

Leaky barriers at Glenlivet (NE Scotland)

7. References

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