Catchment Management: a holistic, interventionist approach to catchment management

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Many thanks to my co-workers over the years, the Environment Agency and Arup

Newcastle University

in partnership with Environment Agency

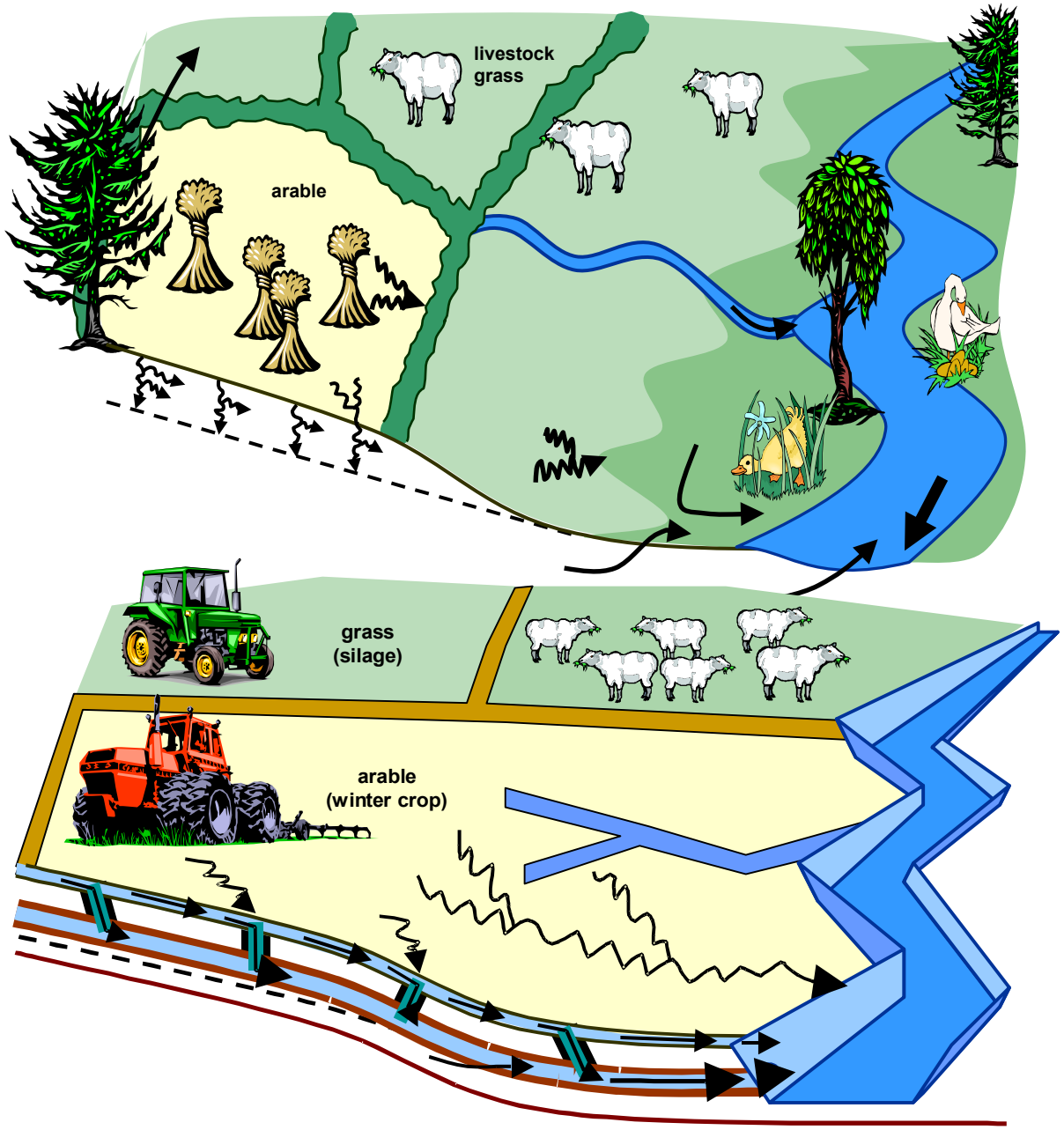
The James Hutton Institute

ARUP

Pressures to increase Runoff – see FD2114 or CIRIA

50 years of change

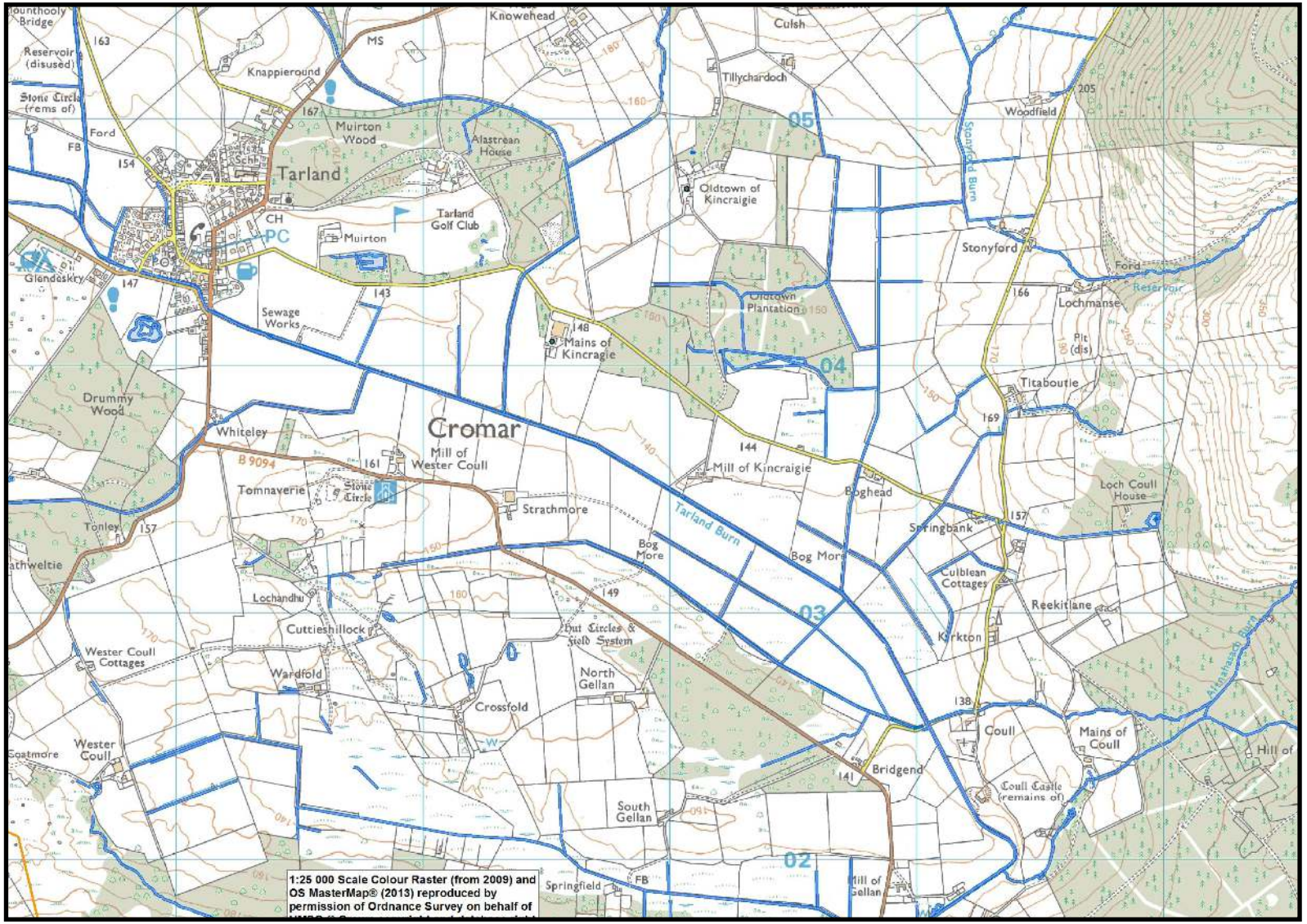
Intensive farming
Changes in land use
Mechanisation
Field drainage
Increased stocking rates
Removal of field infrastructure
Channel management
Soil degradation



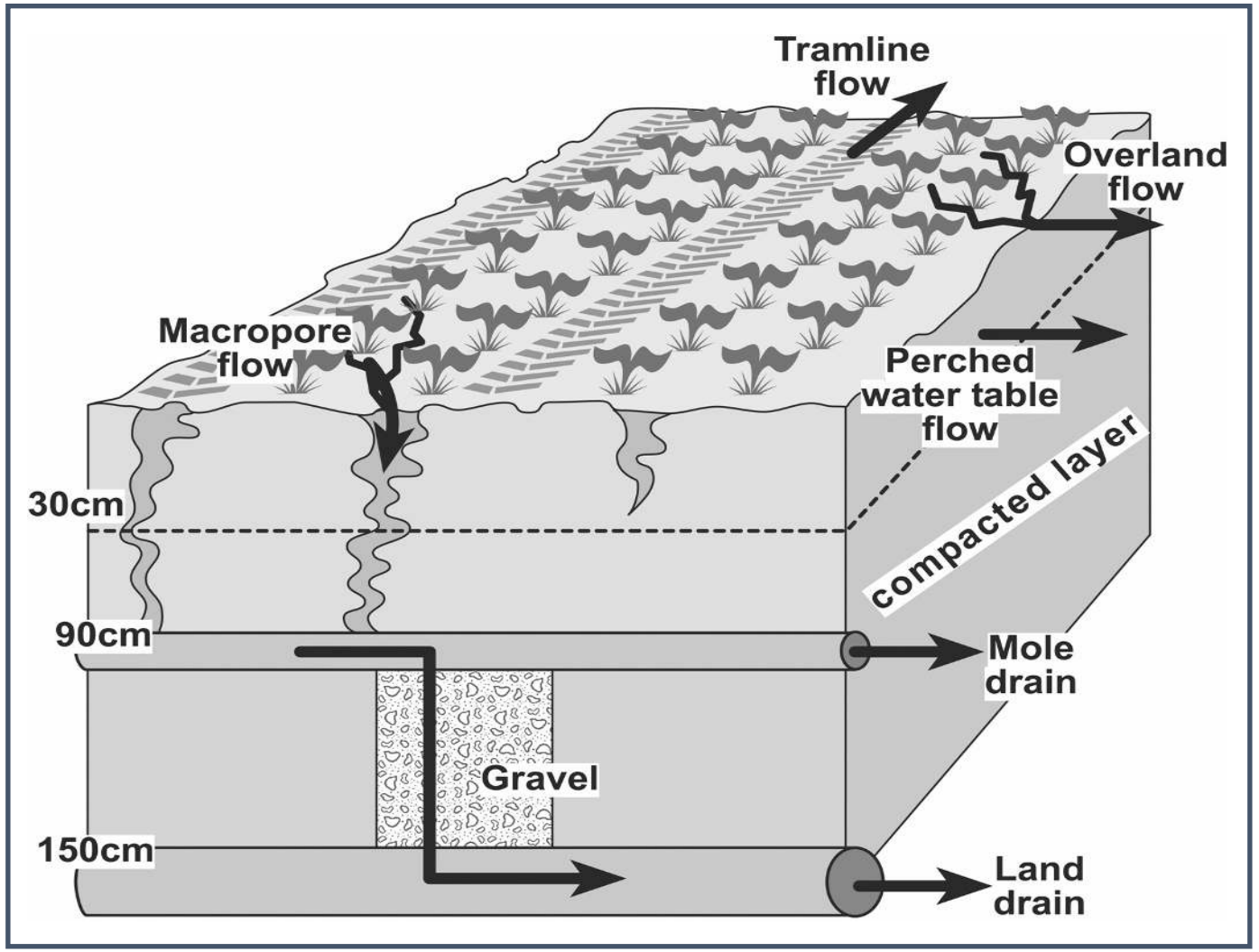
FD2114 - Review of Rural Land Use and Management on Flood Generation
CIRIA- Land use management effects on flood flows and sediments – guidance on prediction

Tarland:

2011



Microscale Mechanics of Flood Generation



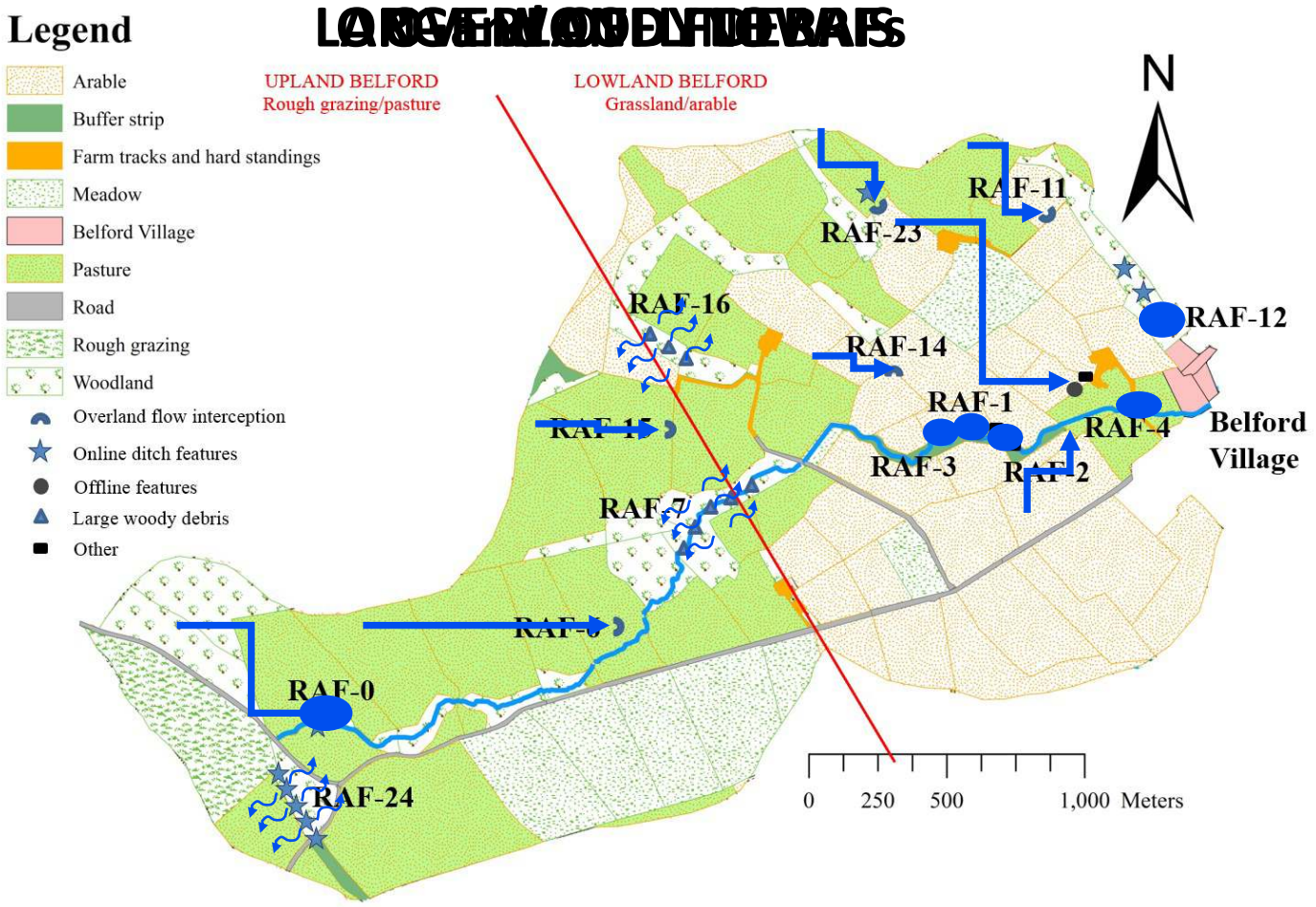
Catchment Systems Engineering:
Belford
Runoff Attenuatio

Pond 3 Runoff Attenuation Feature (RAF)

SLOW, STORE, FILTER ---

For example, making buffer strips do more work

Belford NFM: Mitigation Explained



RAF types – Permeable timber barrier (RAF-6)

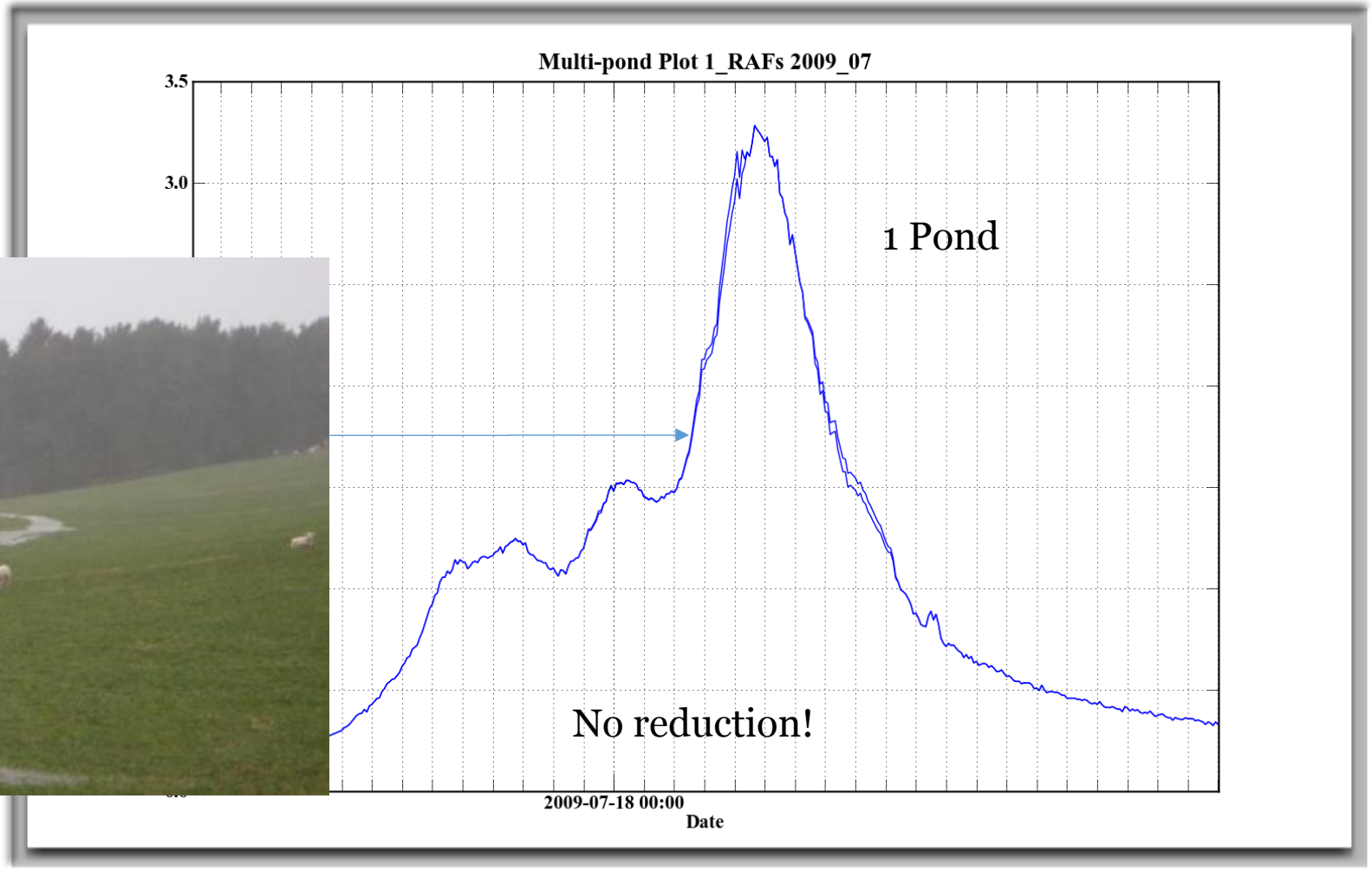
RAF types – Soil interception bund (RAF-11)

Photo provided b

RAF types – Large Woody Debris (RAF-7)

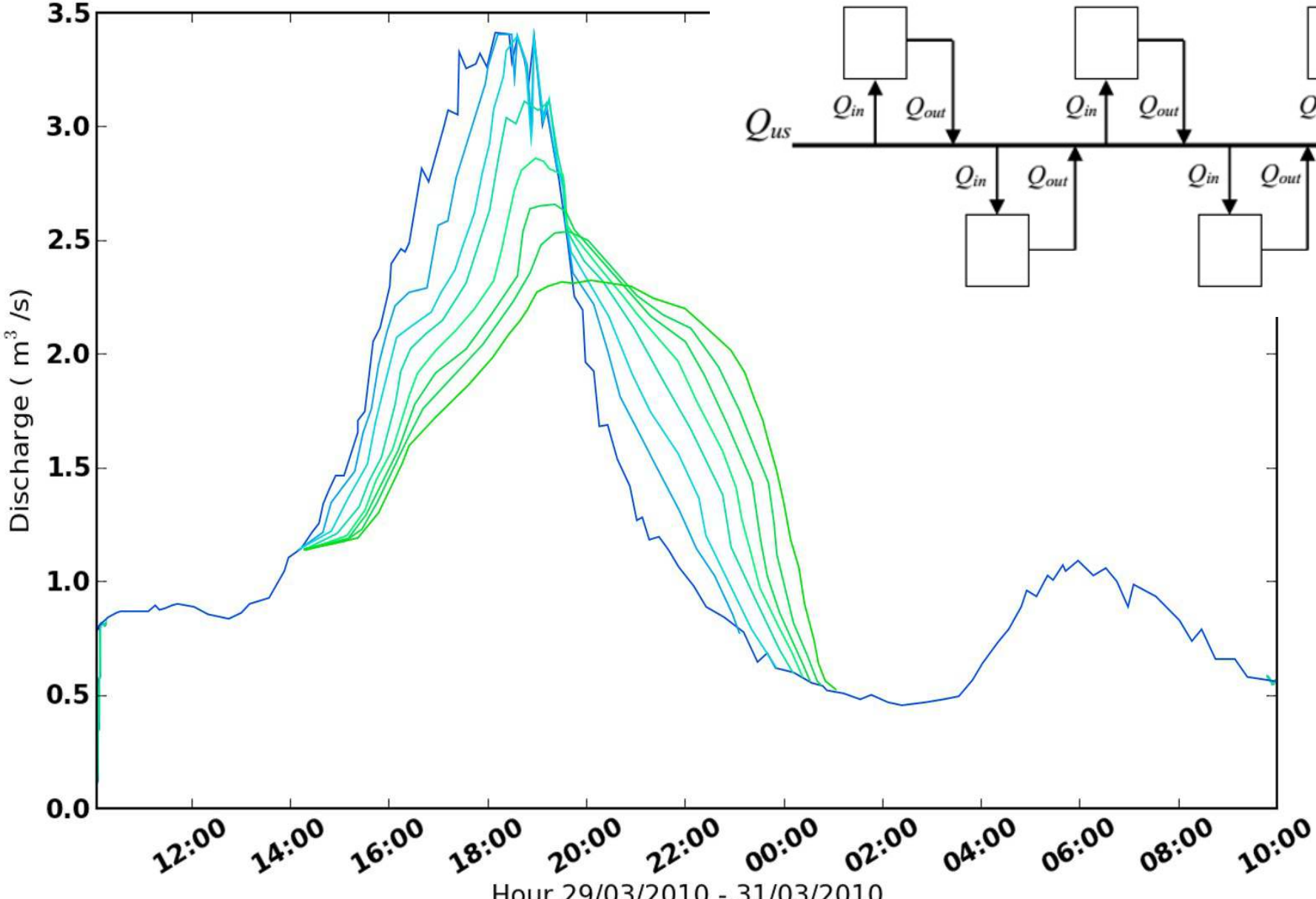
RAF types – Ditches -Wooden Screens

What is the Impact of a Pond?

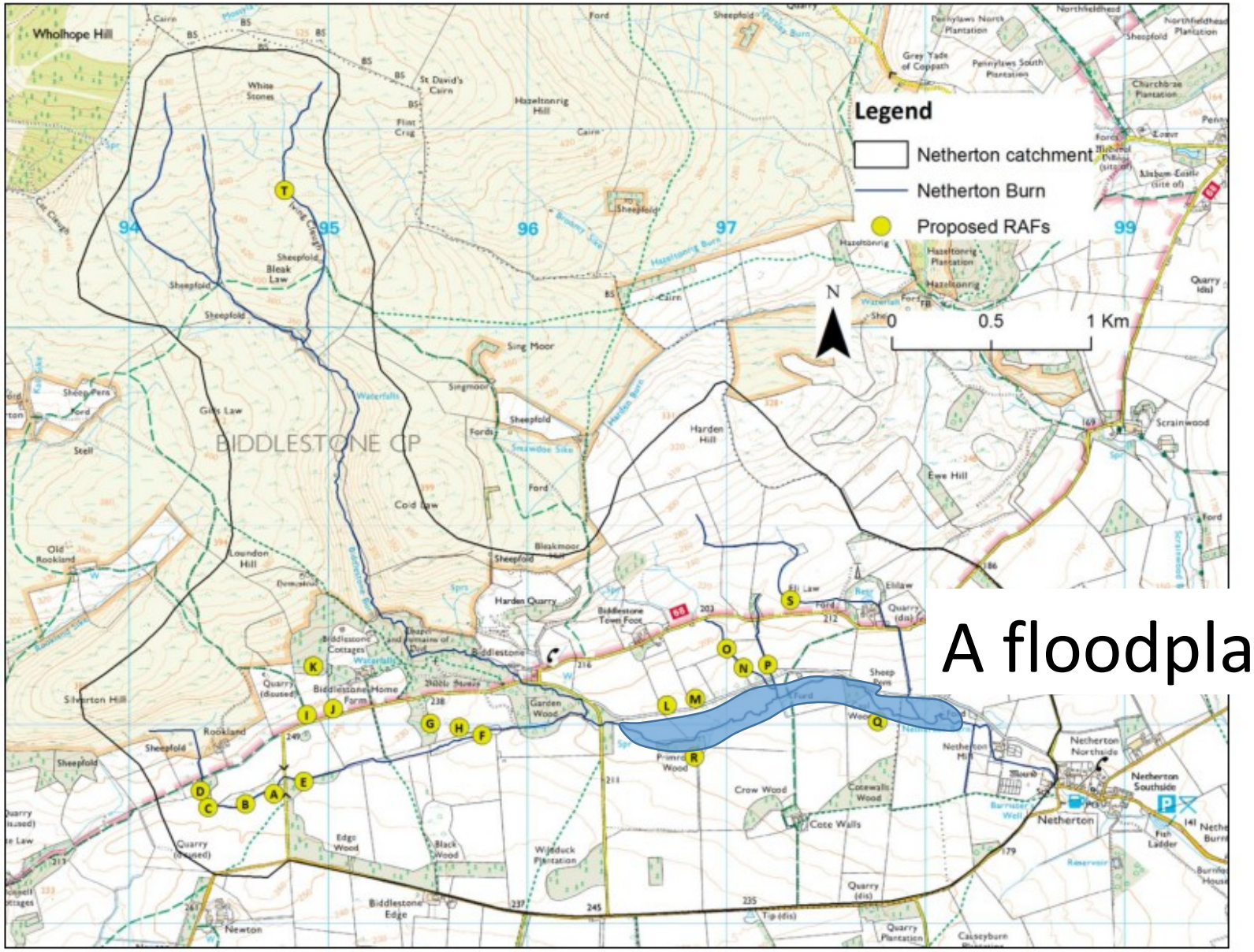


- Post change:
- Volume capacity = 560m3
- Inlet height = 0.55m

Pond Network Model



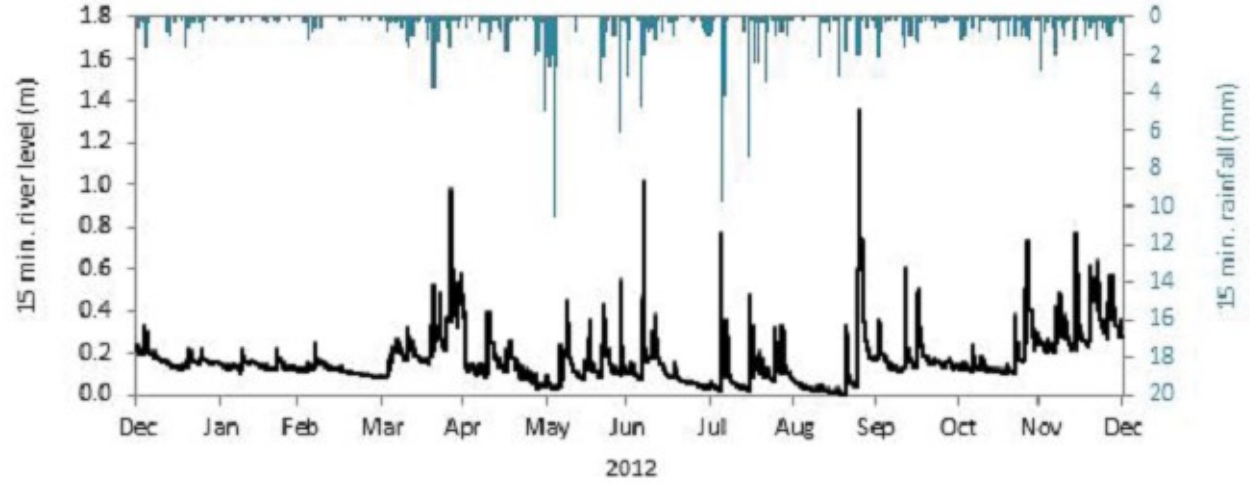
Netherton Burn – Catchment plan

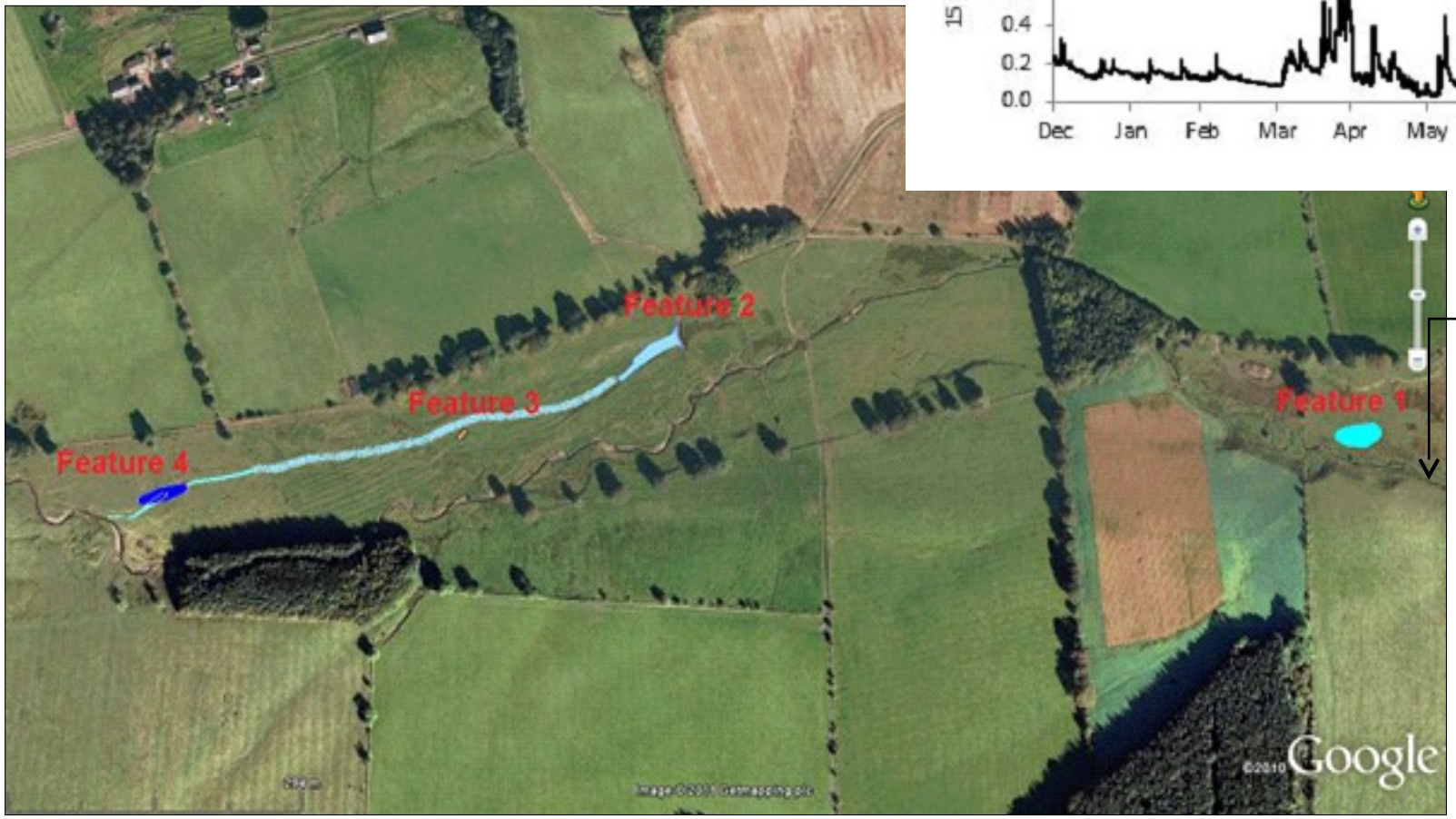


A floodplain!

Flood plain scheme

Useful data,
An estimate of the flow regime

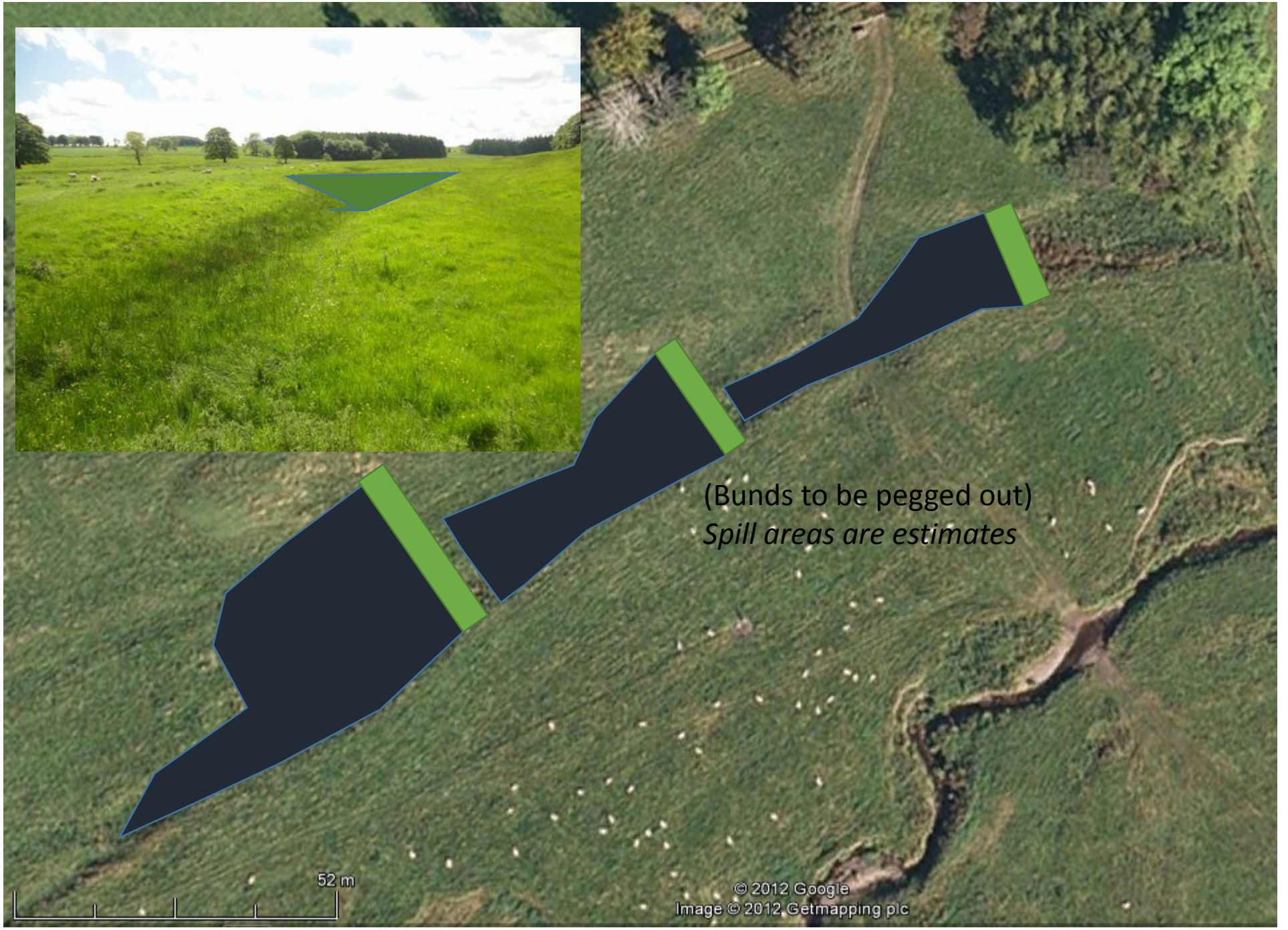




Connecting flow to a remnant channel

Swale draw off point

Sluice to back up a second ditch on the flood plain


(Bunds to be pegged out)
Spill areas are estimates
52 m
© 2012 Google
Image © 2012 Getmapping plc

Farm Pond -- at the request of the farmer!

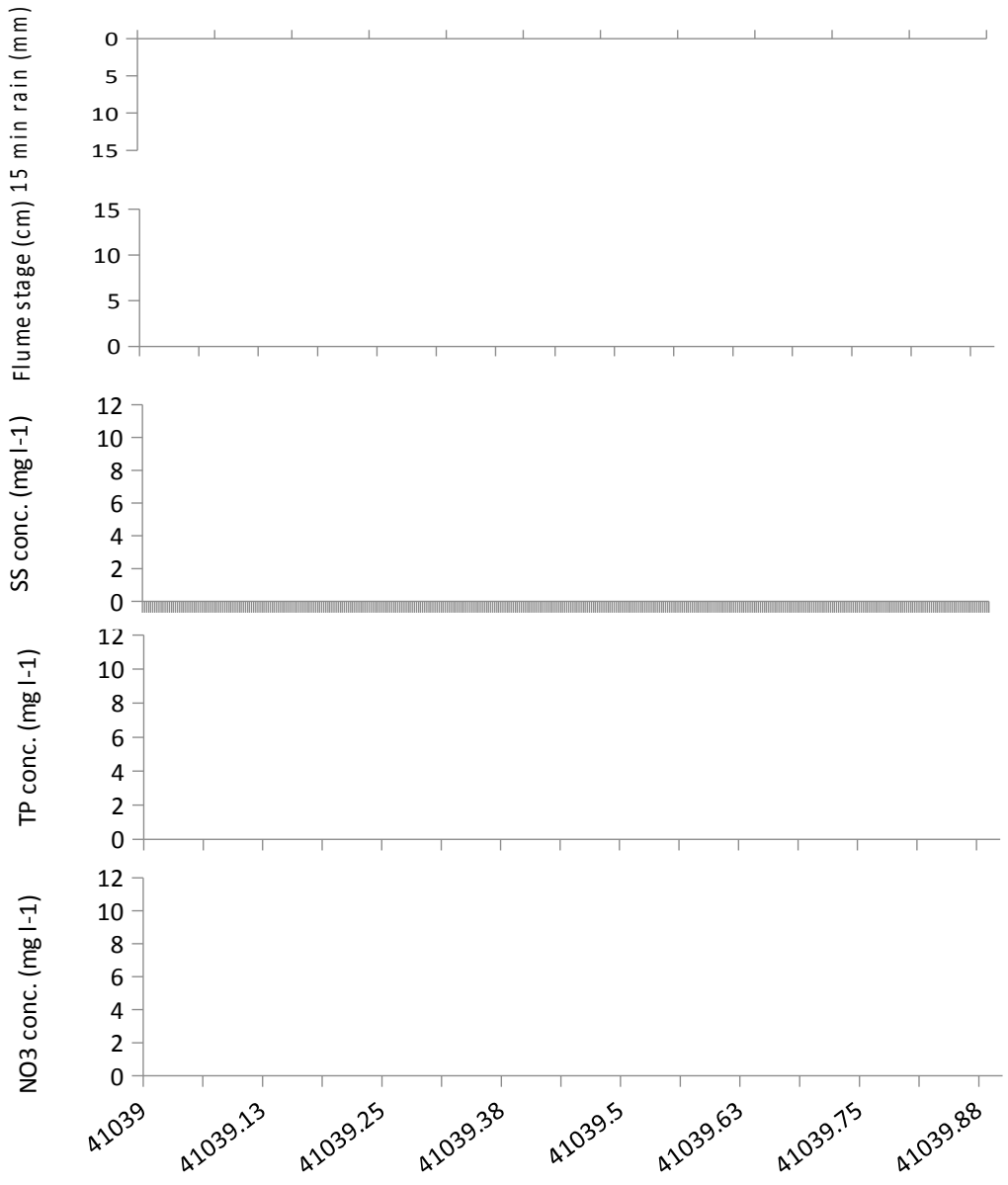
£13K from a £20K scheme

Netherton Flood scheme - Phase I mitigation

Three-tier RAF sediment trap

- Water storage capacity ≈ 280 m3
- 70 ha contributing area

RAF performance – Three-tier sediment trap



Retention (% concentration)

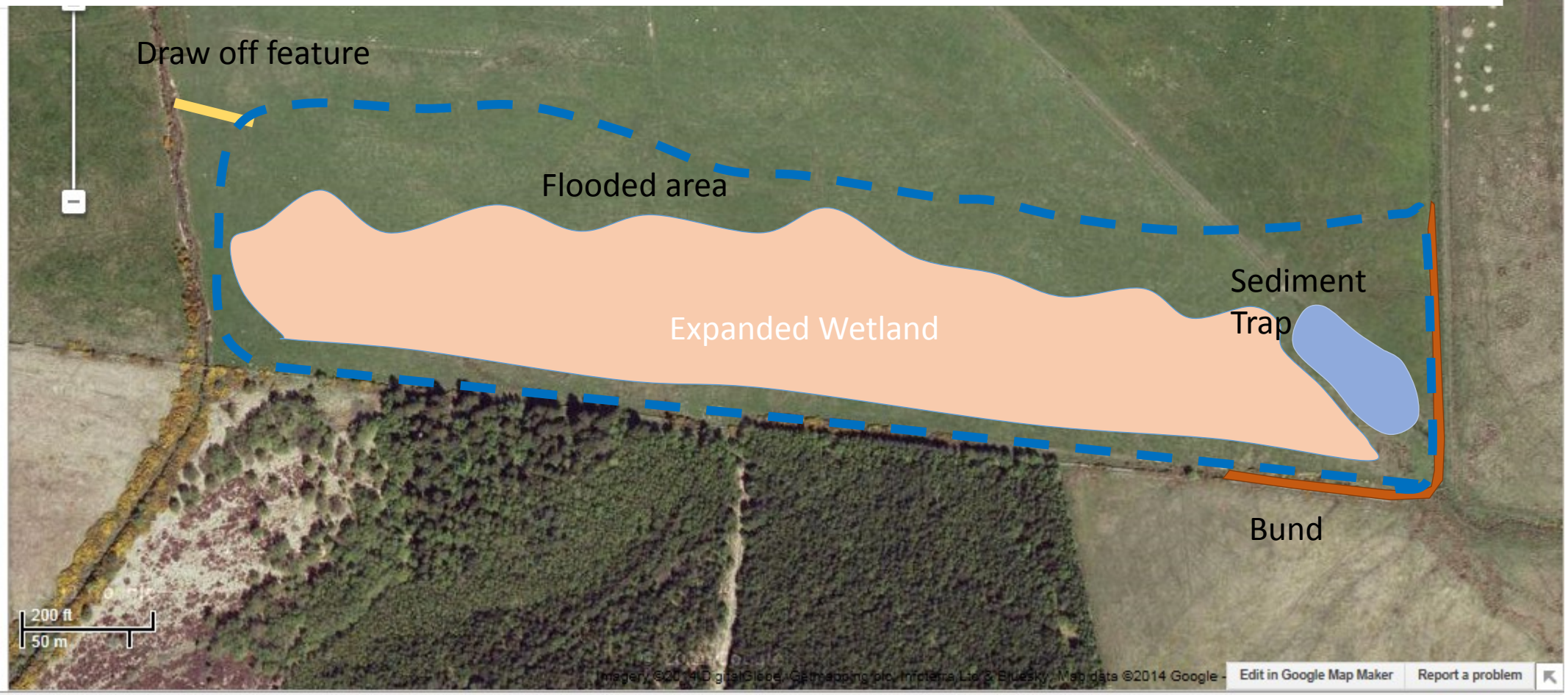
- SS: 25 – 67 (49% net retention)
- TP: 16 – 44 (33% net retention)
- NO3: 5 – 85 (18% net retention)

Dyke head Wallington Hall Estate (National Trust)

Re-establish a wetland

Add flood storage

Trap nutrients



Upper site

Lower site

“Natural Based Solutions”

For floods, droughts and pollution manag

Haltwhistle July 1st

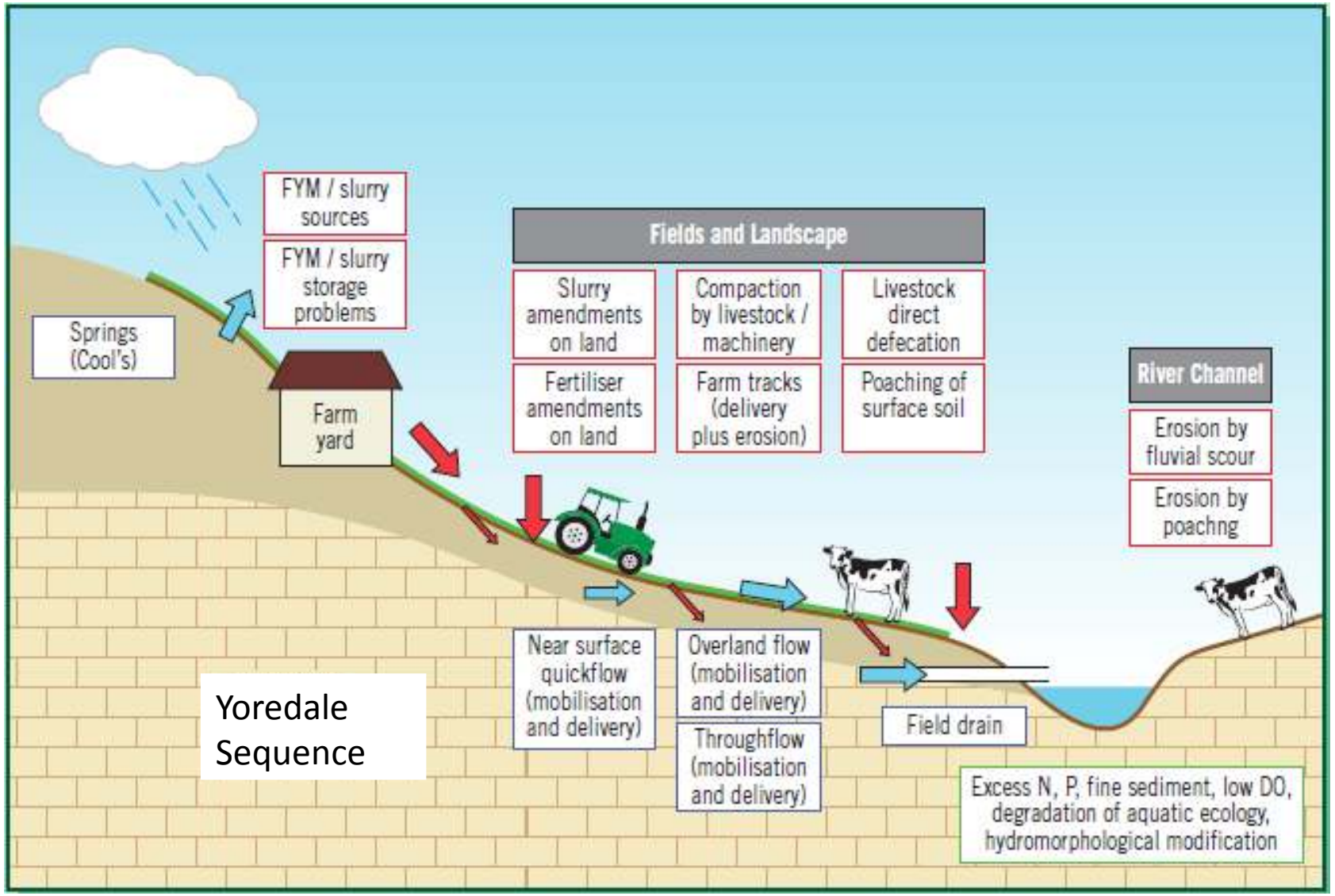
Ker-Plunk

Large sediment

Pulses of nutrients

Perception of the problem

Modified Hydrological Flow Pathways



DTC measures

EdenDTC
A National Demonstration Test Catchment

DTC measures

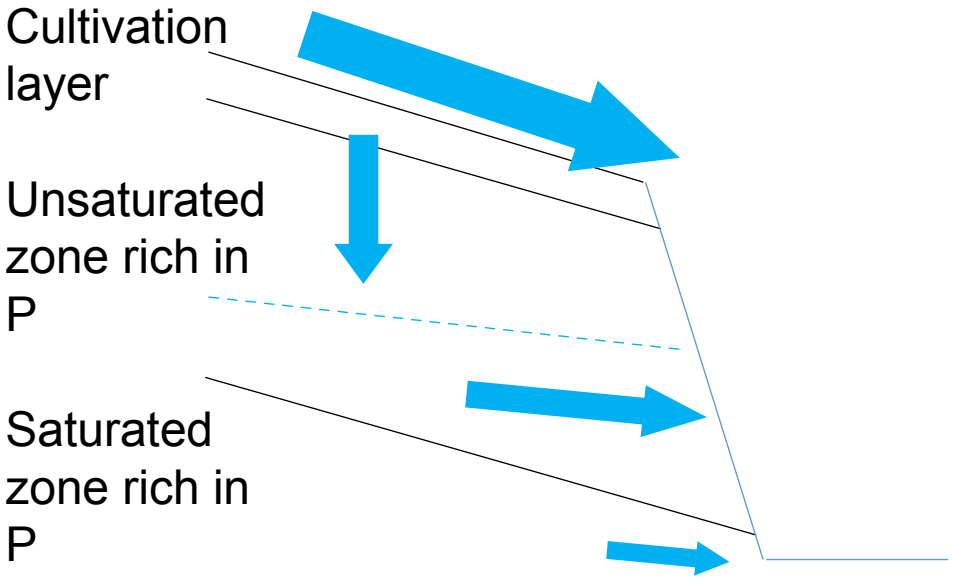
Ponding zones

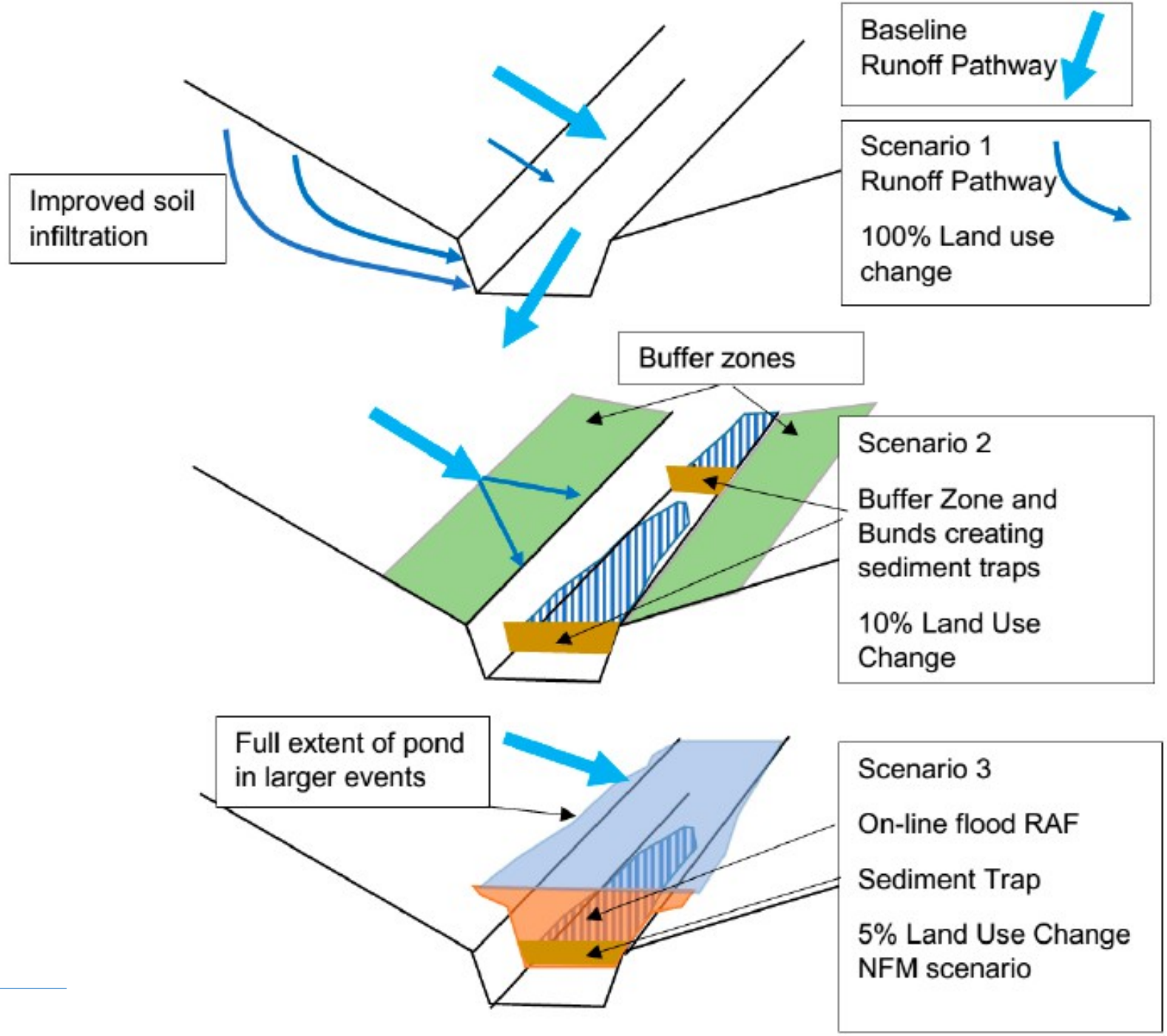
Improving farming conditions

Three-tier RAF sediment trap – The ditch of the future

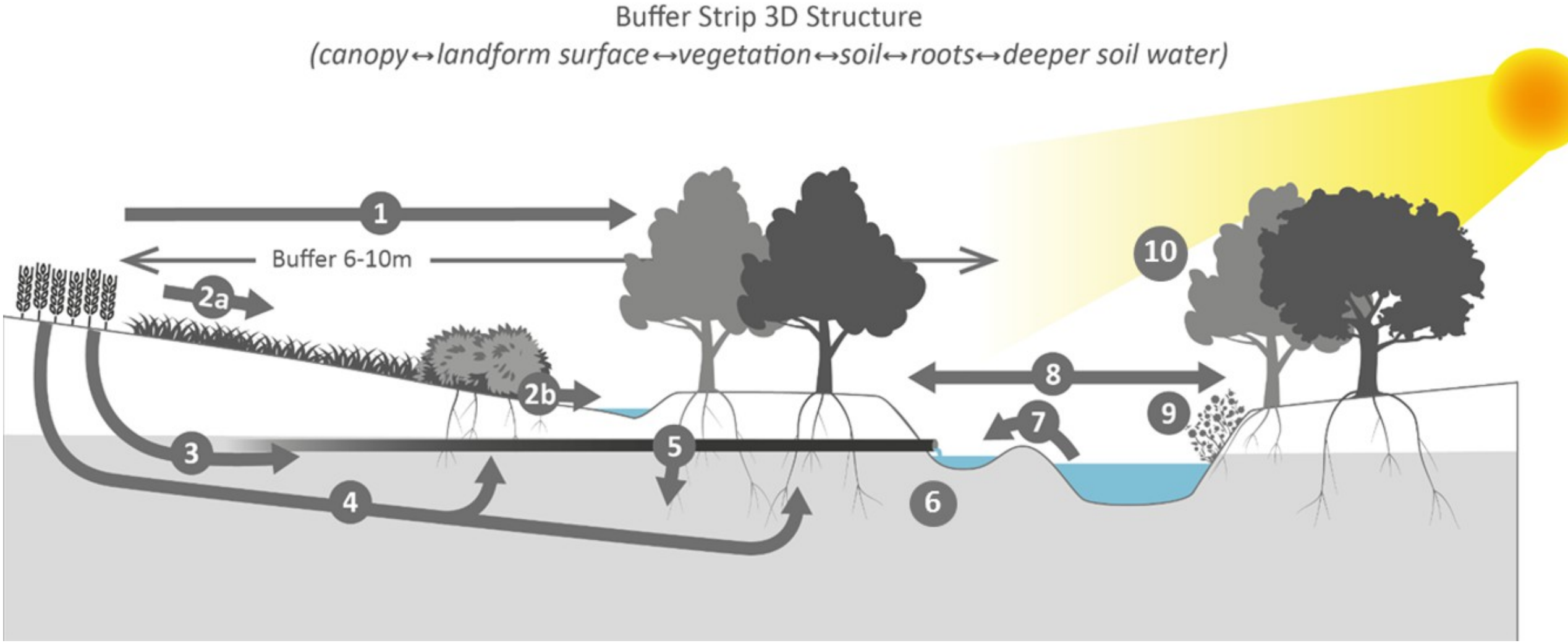
- Water storage capacity ≈ 280 m3
- 70 ha contributing area

Targeting flow pathways

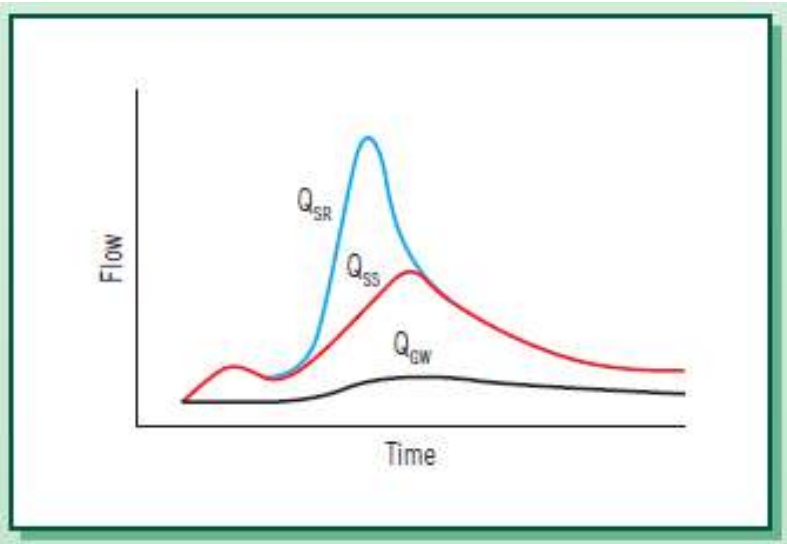


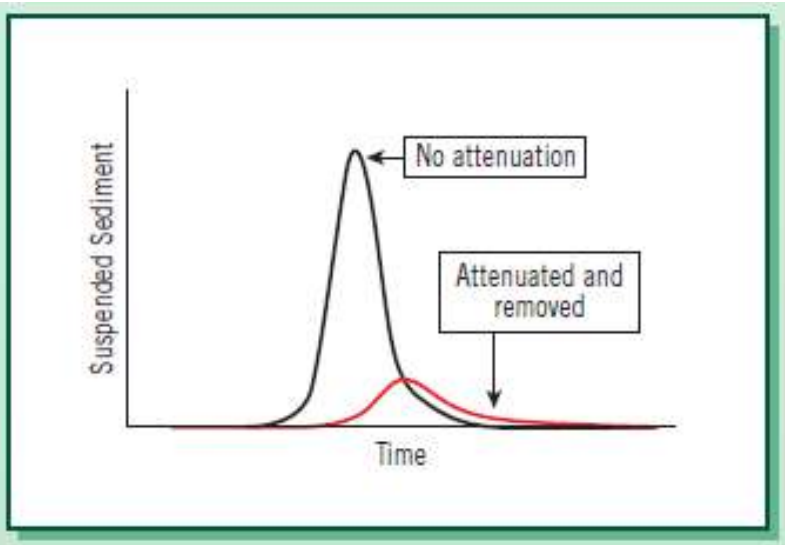


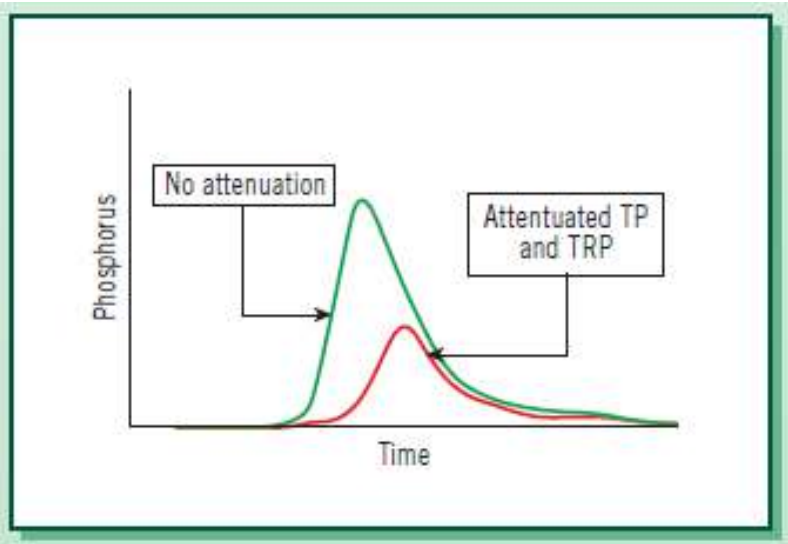
EA 3D Buffers Report
Best Use of Buffer zones

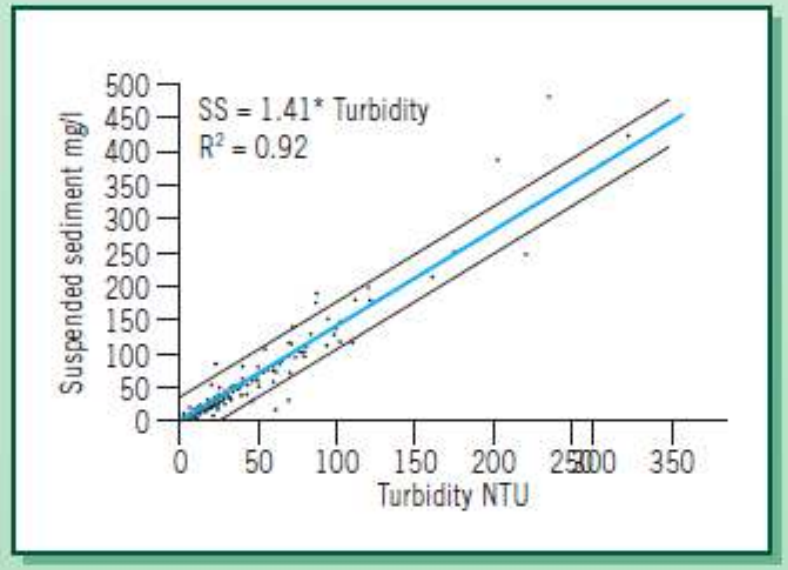


So what is happening and what is the impact of policy decisions and management?









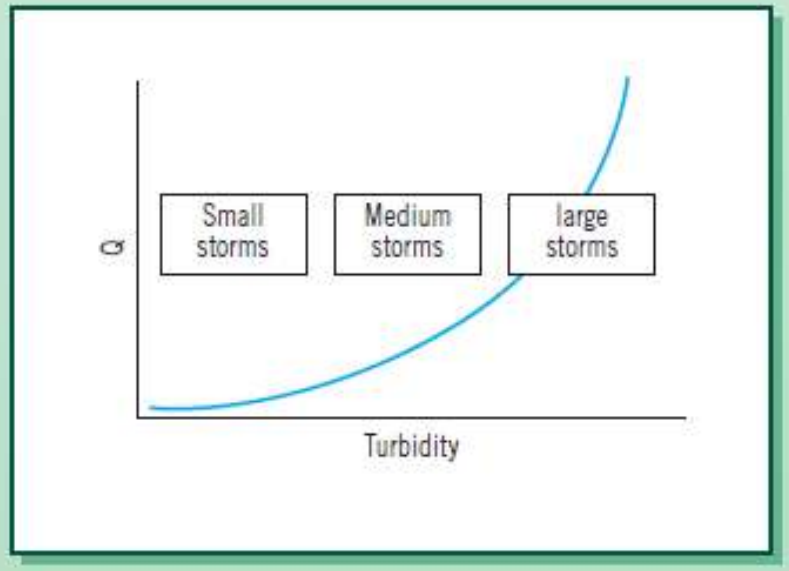


Figure 2 The 'treatment train' approach

Examples of holding water measures and their placement

Sustainable Drainage Features: swales, bunds, ponds and grassy filters.

Buffer Strips: where designed to hold water.

The 'Ditch of the Future': the prime location for holding water and recovering lost top soil through erosion.

Small Headwater Floodplains: storing water, recreating wetlands, woodland, woody debris and new habitats.

The 5% Future

5% of land out of production

And

5% of floodplains for temporary flood storage

http://research.ncl.ac.uk/proactive/5future/