Landowner Engagement Strategy for Transition to Delivery

Dr Miriam Glendell and Dr Paul Quinn

Motray Water Meeting

December 11th 6.30pm at Dunbog Village Hall

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Impact through Science

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NRF NATURE RESTORATION FUND

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Who we are & our expertise

Kerr Adams
project leader,
catchment modeller

Mark Wilkinson
senior catchment
hydrologist

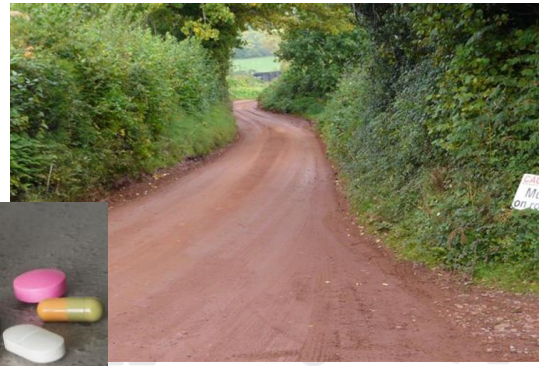
Camilla Negri
research assistant

Miriam Glendell
senior catchment
modeller

Paul Quinn
engineer & hydrologist

We monitor catchments to gain greater understanding of hydrological processes, transfer of pollutants and the influence of management activities on mitigating pollution.

- **Water pollution** is one of the main reasons for the failure of water courses to reach Good Ecological Status (GES). In Scotland, 13% of water bodies fail to reach GES on account of poor water quality. Nutrients, pesticides, pharmaceuticals, anti-microbial resistance
- **Water resources** – future extremes, the frequency of drought events in Scotland is projected to double by 2050 under future climate
- **Climate change adaptation is needed**
- **Integrated modelling** underpinned by empirical data from catchment to national scales



Scotland's freshwater landscape and its resilience to change: An assessment to support future policy

Kerr Adams
project leader,
catchment modeller

The James Hutton Institute

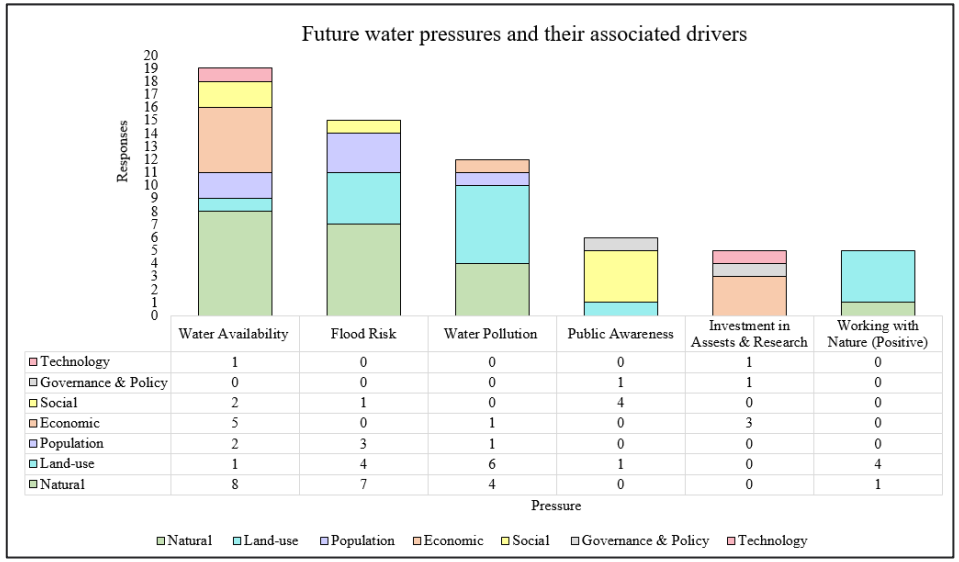


Fig source : Adams2022

- Understanding future water quality pressures in the Eden catchment
- Importance of stakeholders' involvement in building resilience
- Landowners want to learn about mitigations at larger spatial and temporal scales
- Siloed approaches should be left in the past

Understanding river catchment resilience under future change scenarios

Kerr Adams
project leader,
catchment modeller

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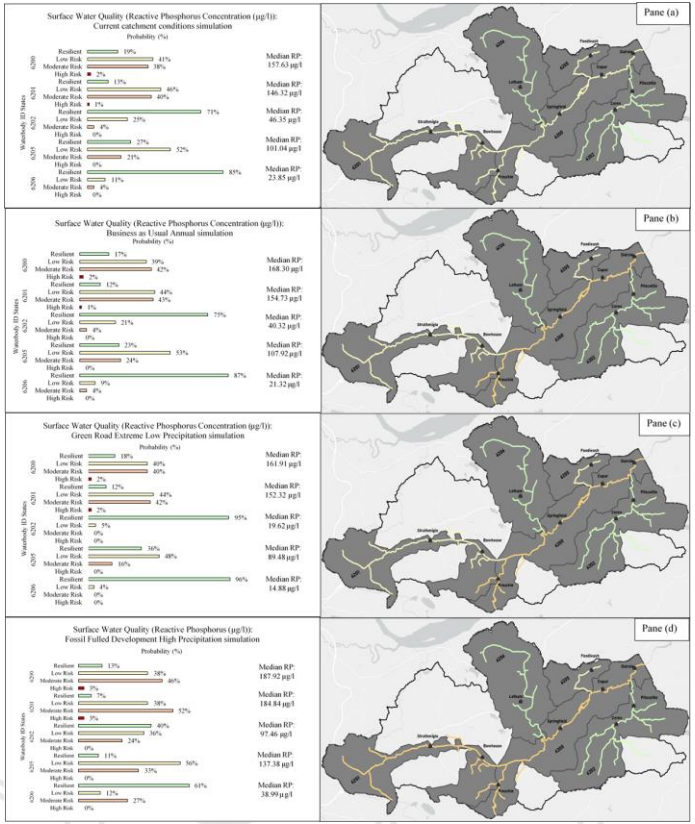

Fig source : Adams2023

- **'Best Available Technology'** scenario (including aerobic granular sludge treatment), and **'Resource Centre'** scenario (phosphorus recovery from wastewater treatment works and constructed lagoons for crop irrigation) support achieving good ecological status.
- **'Nature Based'** management scenarios (including wetland wastewater treatment methods and rural sustainable drainage systems) are interesting to stakeholders but more uncertain in their ability to achieve the desired outcome.

Source : Adams2024

Decision support

- Need for decision support tools that:
  - can be developed with available knowledge and data
  - represent different pollution sources (agriculture, STWs, STs, farmyards..)
- Simulate **phosphorus concentration in streams**
- Simulate the **effectiveness of mitigation measures**:
  - fertiliser input reduction
  - buffer strips
  - rural septic tank management
- Produce **probabilistic risk maps of source areas**

Miriam Glendell
senior catchment modeller
The James Hutton Institute

Seven study catchments covering different climate and land use in Scotland

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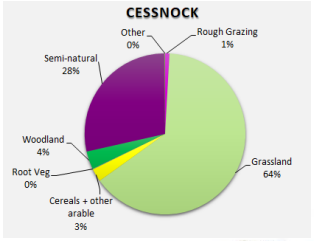
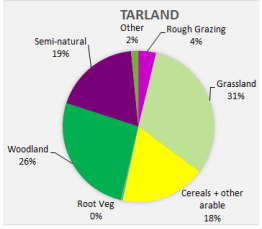
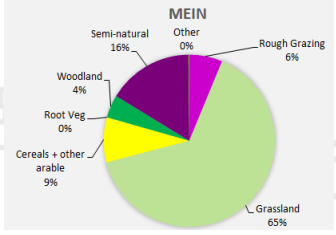
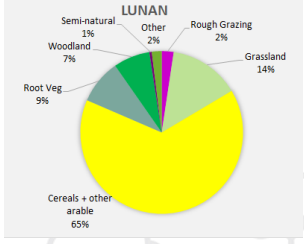
Catchment size
12 – 134 km^2









Source Glendell2022

Management scenarios

- Fertilizer application rates (below, at, above agronomic optimum)
- Buffer strips – increasing 2m to 2-8m in 80% of arable/cereal/root vegetable fields
- ST tertiary treatment level, full maintenance, and absence of direct discharge

©Dee catchment partnership

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Fertilizer management scenario

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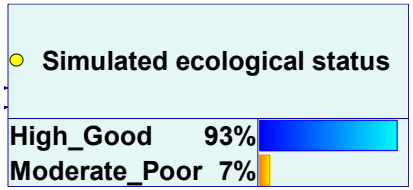
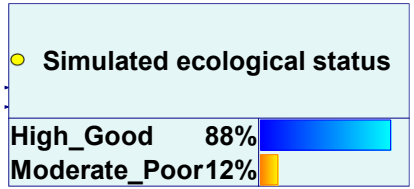
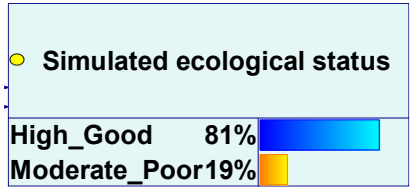
a) Below optimum

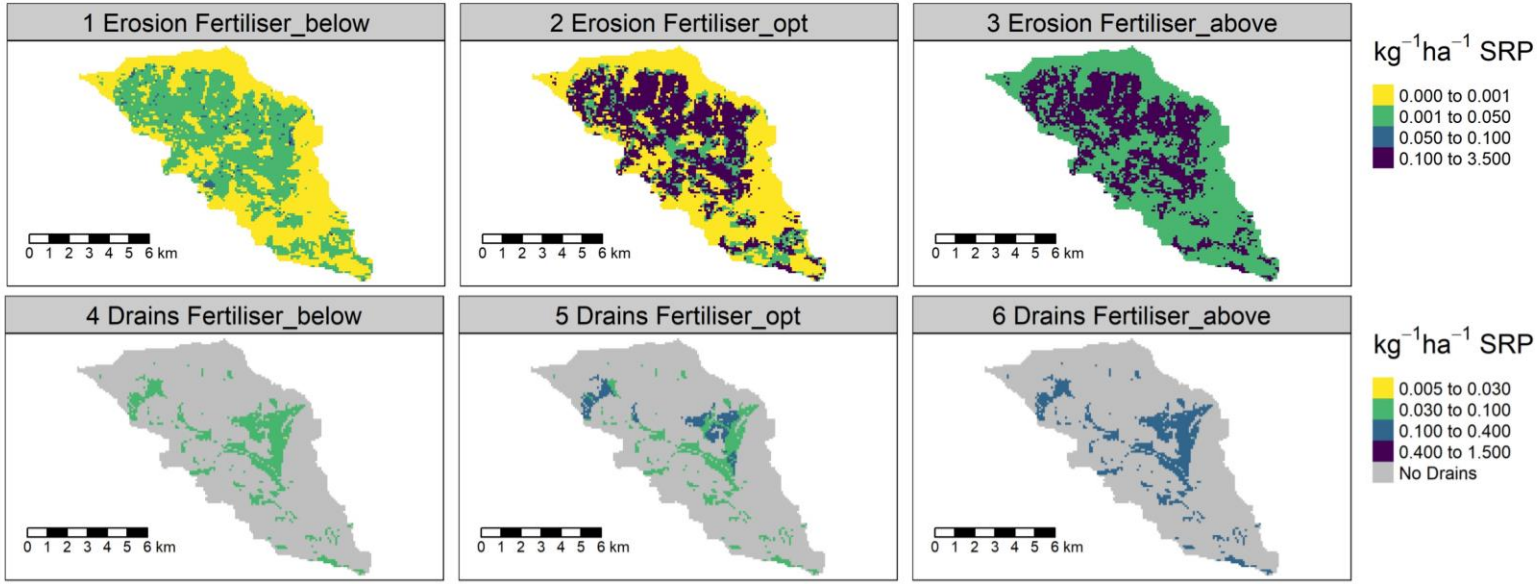


b) At optimum



c) Above optimum





Erosion - 67% reduction + 52% increase

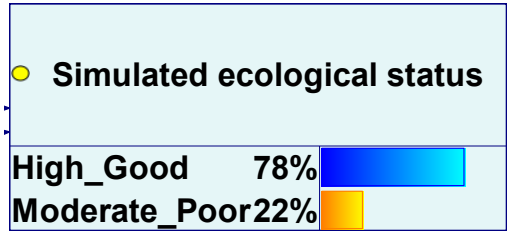
Drains - 41% reduction + 58% increase

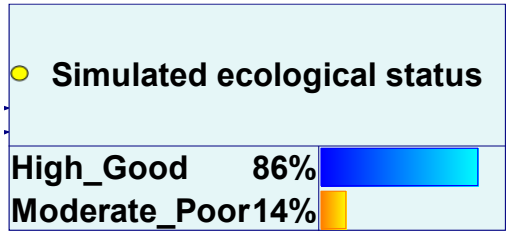
Source Glendell2022

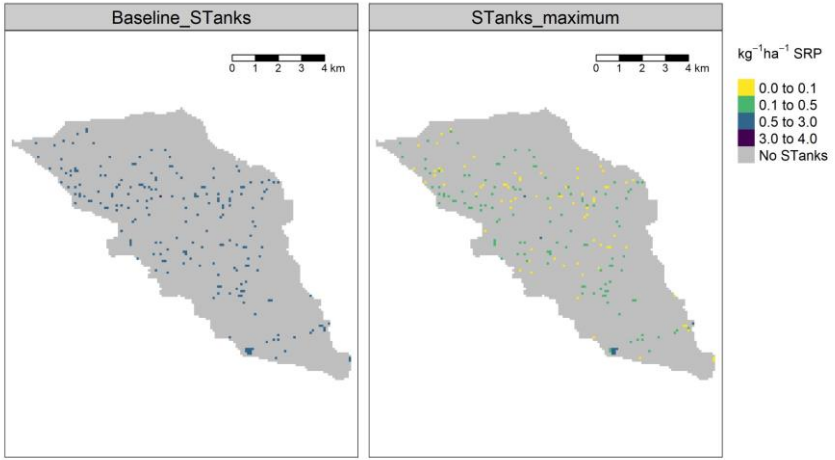
The septic tank management

Baseline

Combined scenario: tertiary treatment + no direct discharge + well maintained







82% reduction of SRP losses from STs

Source Glendell2022

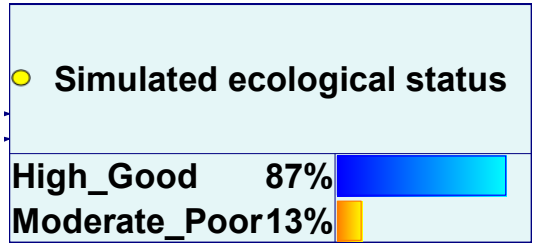
Buffer management scenario

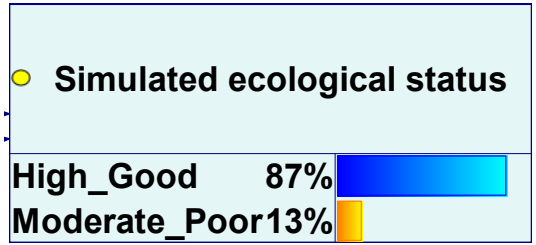
Current

98% riparian arable, cereal and root veg crops have 2m and 2% have 2-8 m buffers

Scenario

80% of cropped fields have the wider 2-8 m buffers

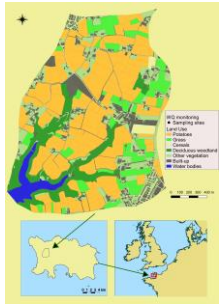




- No real difference between effectiveness of different buffer widths – system complexity and importance of other sources
- Only assumed to be effective on undrained soils in riparian areas, not effective on drained soils – need to model 'smarter' buffers

Source Glendell2022

Modelling pesticide risk in a 5km^2 drinking water catchment on the Island of Jersey



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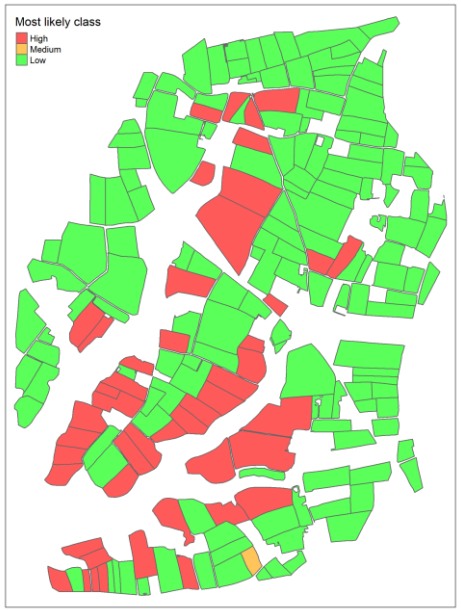
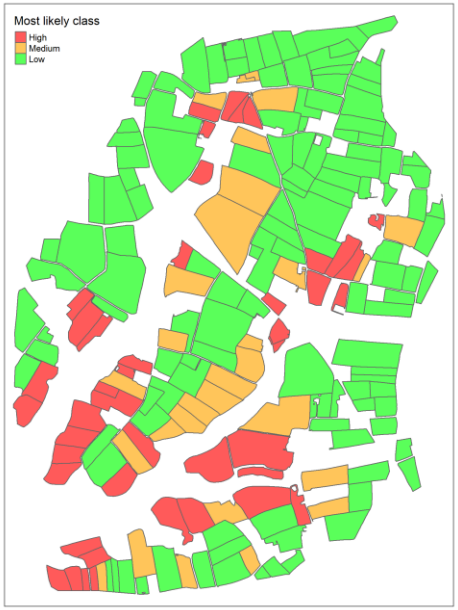
Fluorpyram baseline overland risk



Fluorpyram overland risk - 50% reduction scenario in March with buffers



Field level risk-based model for five pesticides. We simulated:

- **timing and rate** of pesticide application (10%, 25%, 50% reduction)
- presence/absence of **plough pan**
- inclusion of additional **buffers**

Source: Troldborg2022

Landowner Engagement Strategy for Transition to Delivery: Project Aim

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To deliver stakeholder engagement activities to gather **local perspectives and expertise** to facilitate the **identification of river restoration projects** in the **Eden and Motray Water catchments**.

Our Delivery Plan

Nov-Dec 2024

Jan-Feb 2025

April 2025

Fig source : RESP

Why are we here?

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- What are current landowner views on the condition of the catchments?
- What are their main issues/interests?
- What are they doing to address the issue?
- What are their views on restoration and what is feasible?
- Would they be willing to allow restoration to take place on their land?

Potential measures

Measure	Site identified by consultancy?	Reference to further guidance
Two-stage channel		CREW flood risk
Re-meandering	Yes	CREW flood risk & SRUC flood management guide
Removal of constrictions		CREW flood risk
Riparian buffers & fencing	Yes	CREW flood risk & SRUC flood management guide
Sediment traps, bunds & retention ponds	Yes	CREW flood risk & Rural Suds Report & SEPA Flood Handbook
Aeration/ Mole ploughing		CREW flood risk
Tree planting/ woodland creation	Yes	CREW flood risk & SEPA Flood Handbook
Hedgerows		CREW flood risk & SRUC flood management guide
Cover crops		CREW flood risk & SRUC flood management guide
Wetlands/ Constructed Wetlands	Yes	SRUC flood management guide & Rural Suds Report
Swales, soakaways, rainwater harvesting, effluent tanks	Yes	Rural Suds Report

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engineer & hydrologist

Mark Wilkinson
senior catchment hydrologist

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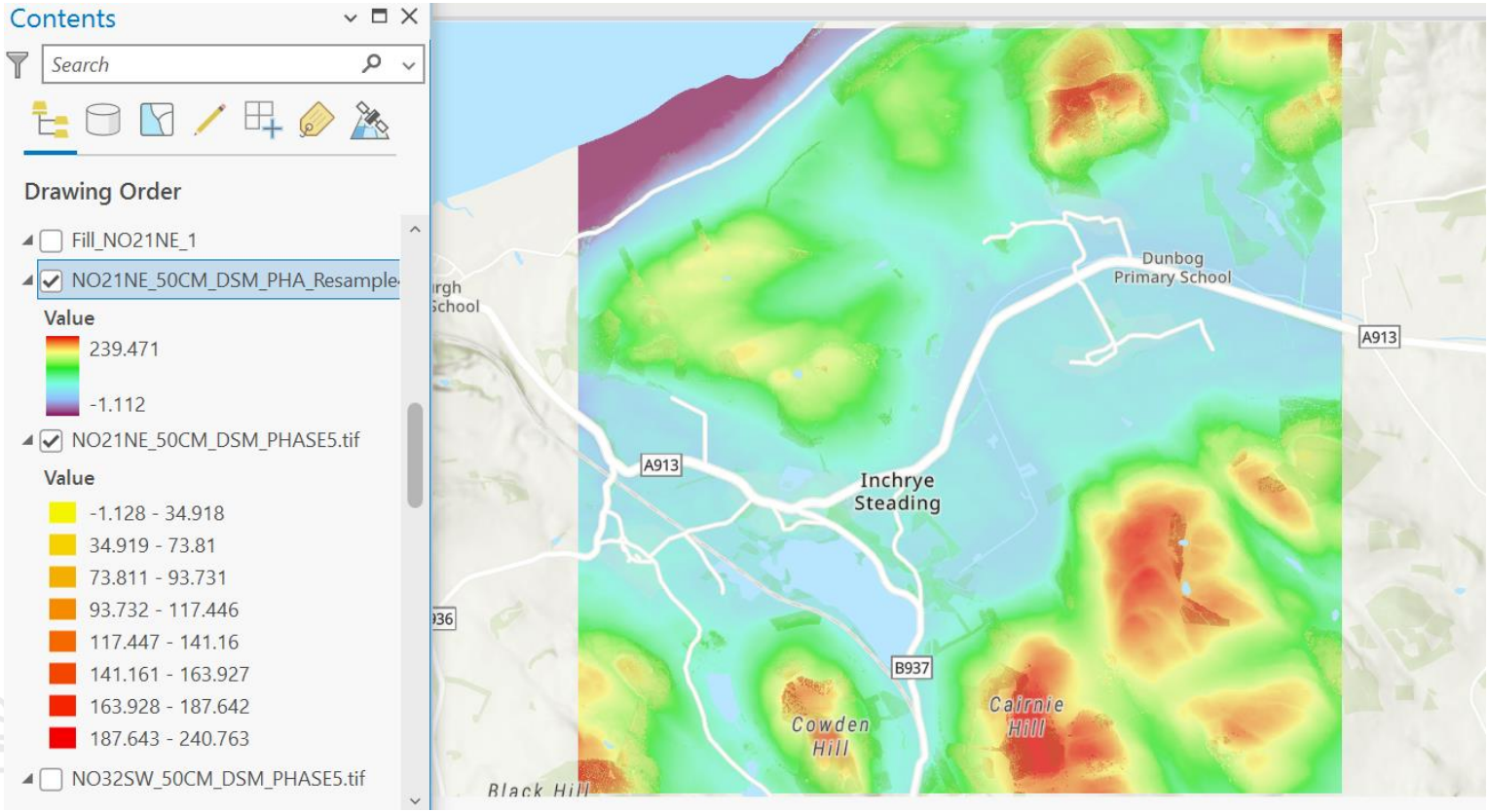
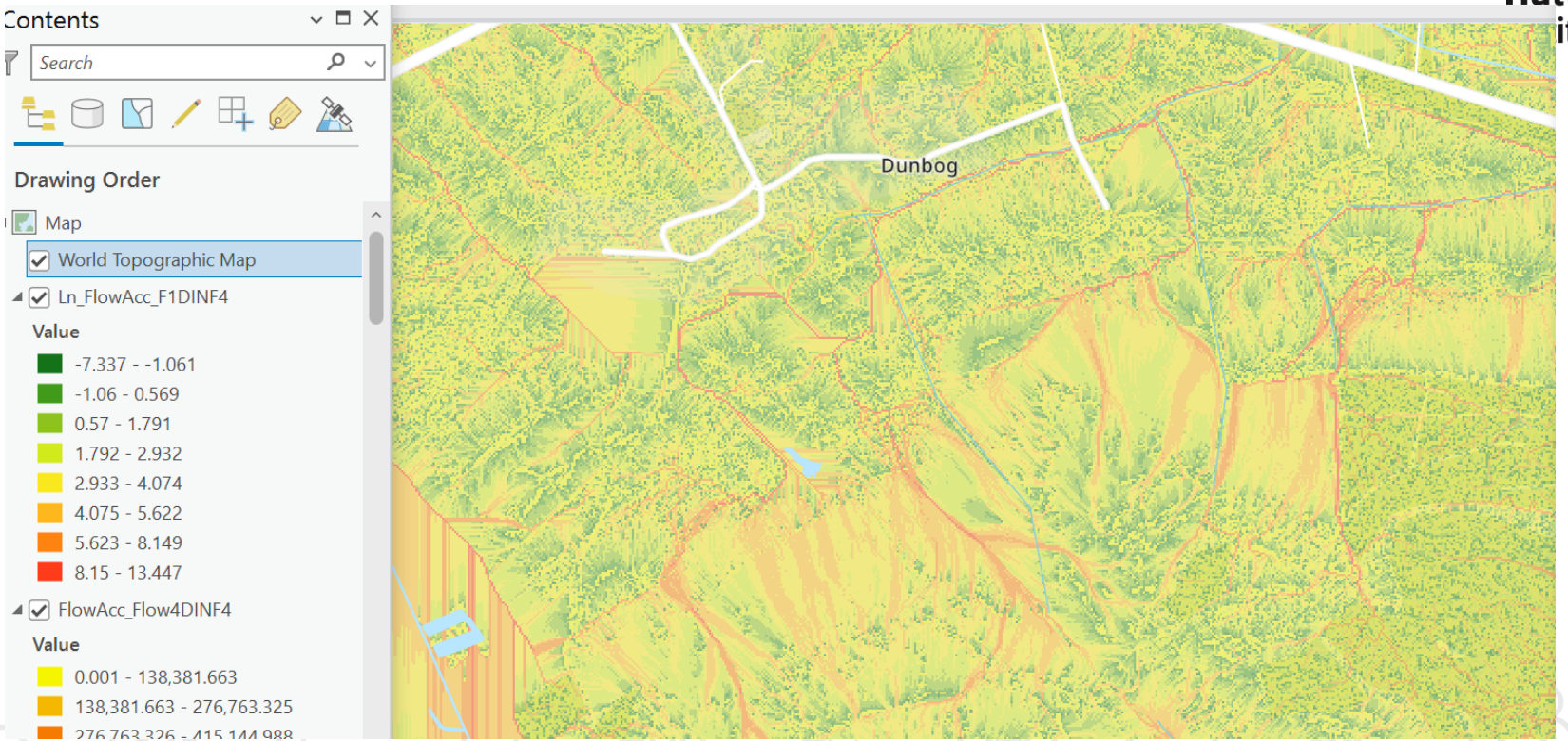
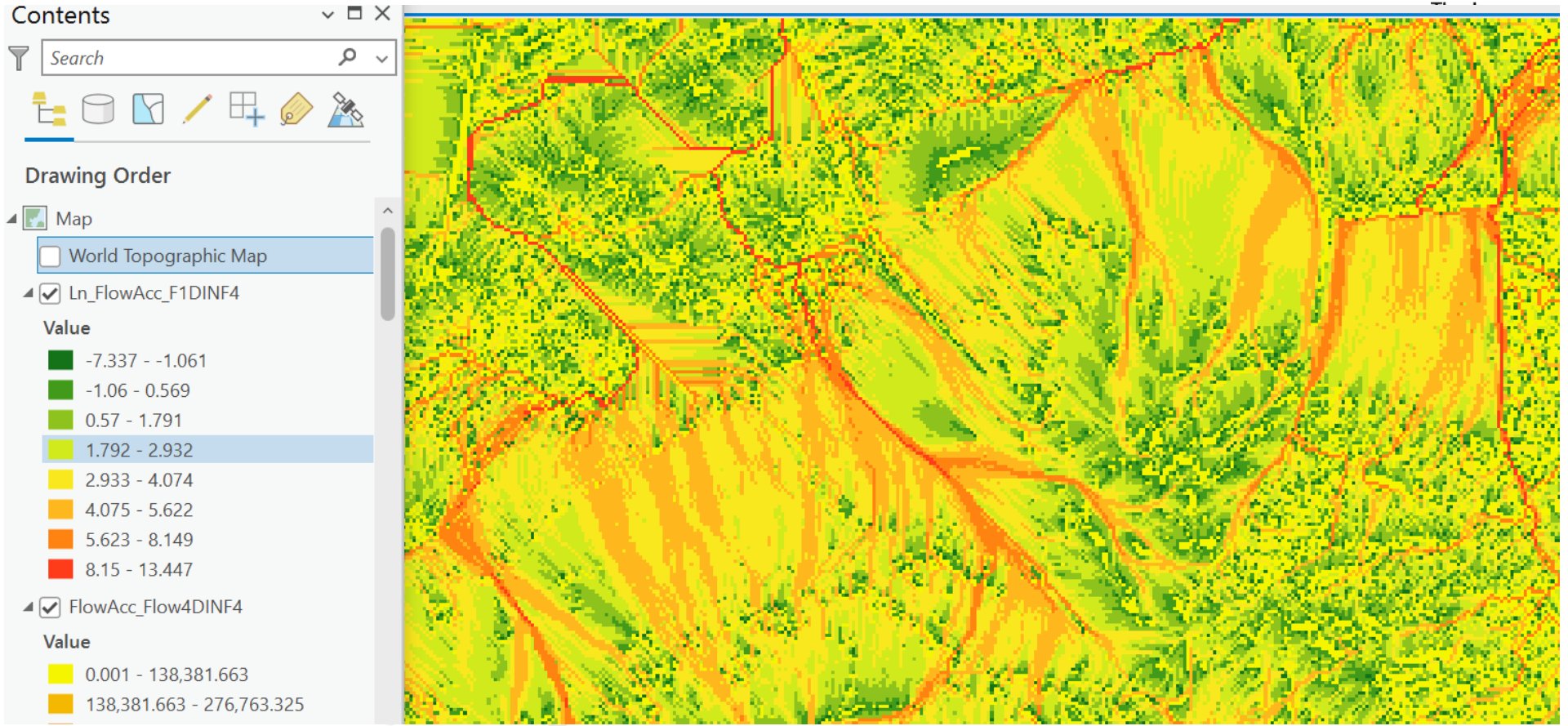
Flow accumulation mapping - elevation Map

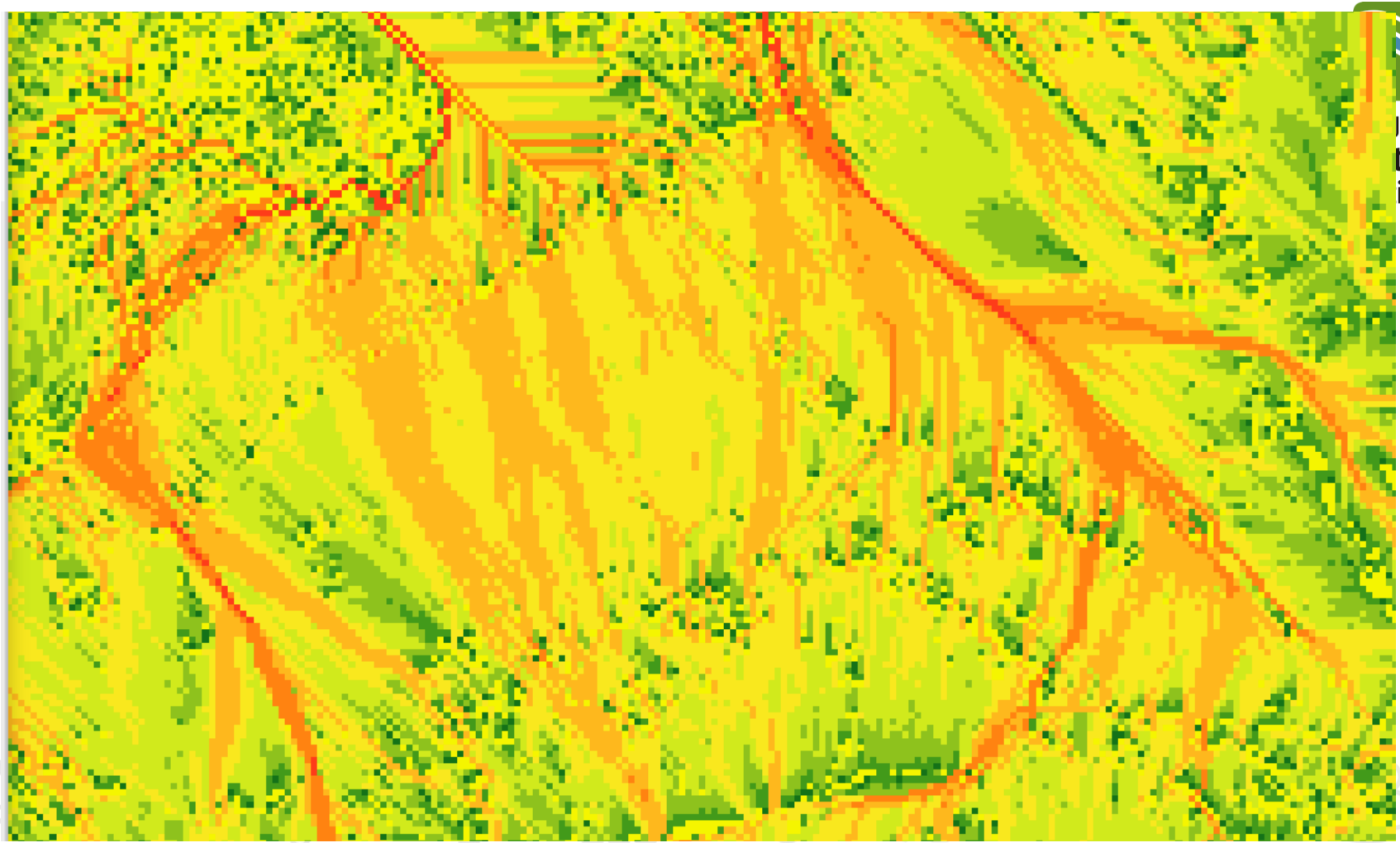


Flow Accumulation map 4m resolution



Zoom in


Contents
Search
Drawing Order
Map
World Topographic Map
Ln_FlowAcc_F1DINF4
Value
-7.337 - -1.061
-1.06 - 0.569
0.57 - 1.791
1.792 - 2.932
2.933 - 4.074
4.075 - 5.622
5.623 - 8.149
8.15 - 13.447
FlowAcc_Flow4DINF4
Value
0.001 - 138,381.663
138,381.663 - 276,763.325



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Balruddrey Farm

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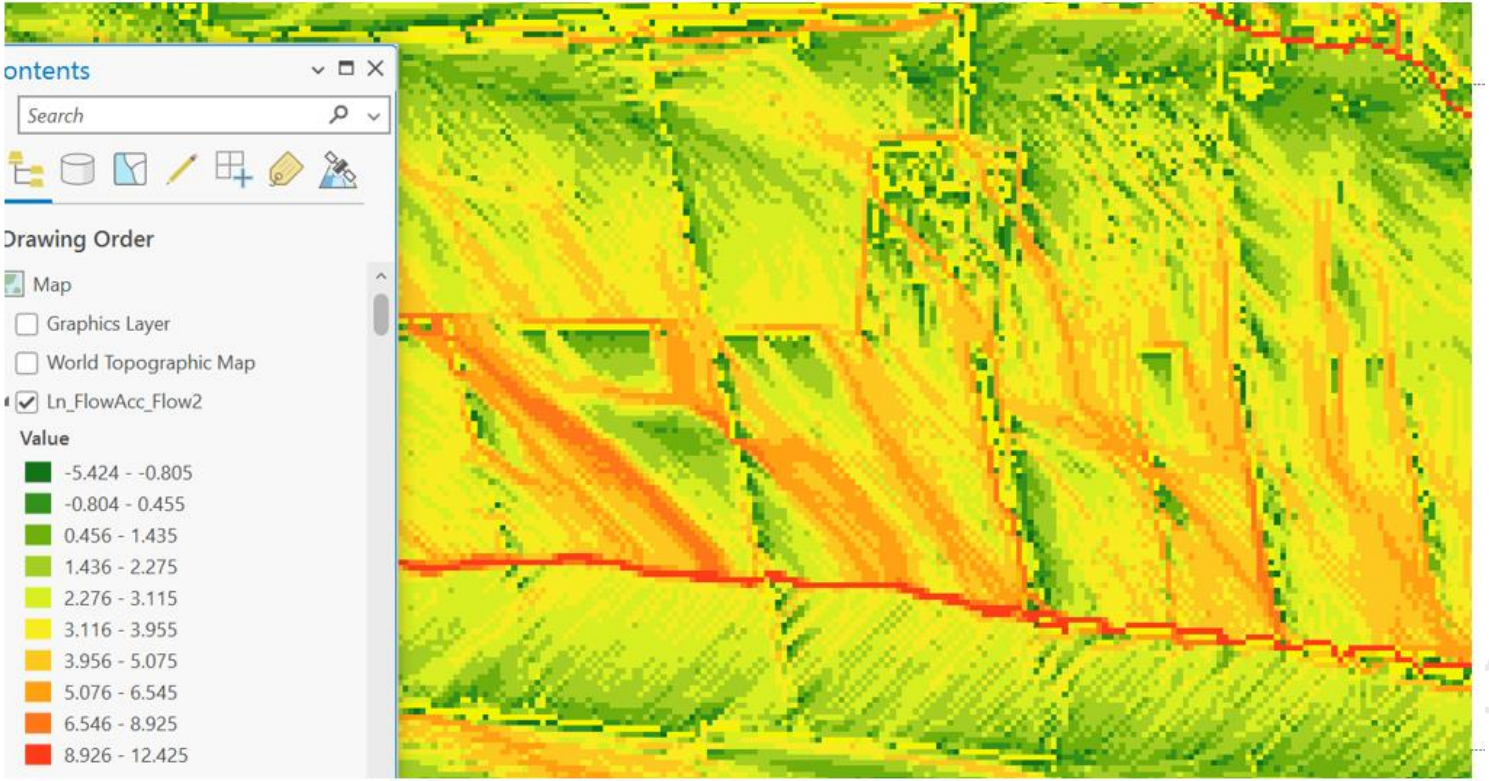
A TRAFFIC LIGHT SYSTEM – Buffer zone function



- Green is wasted Buffering Capacity
- Red is overloaded Buffering Capacity
- Orange is probably best zone without much more work (i.e. a passive margin)

Balruddrey Plan

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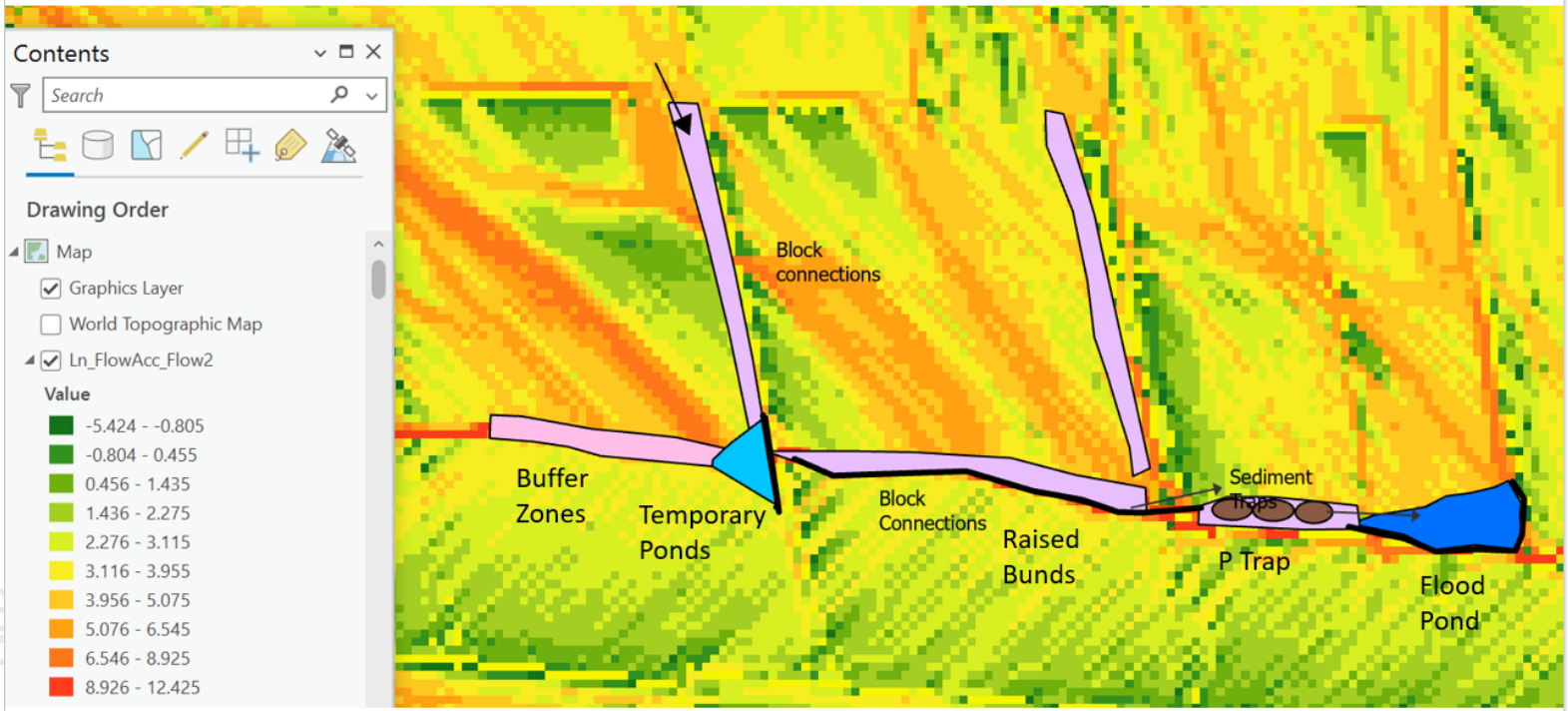
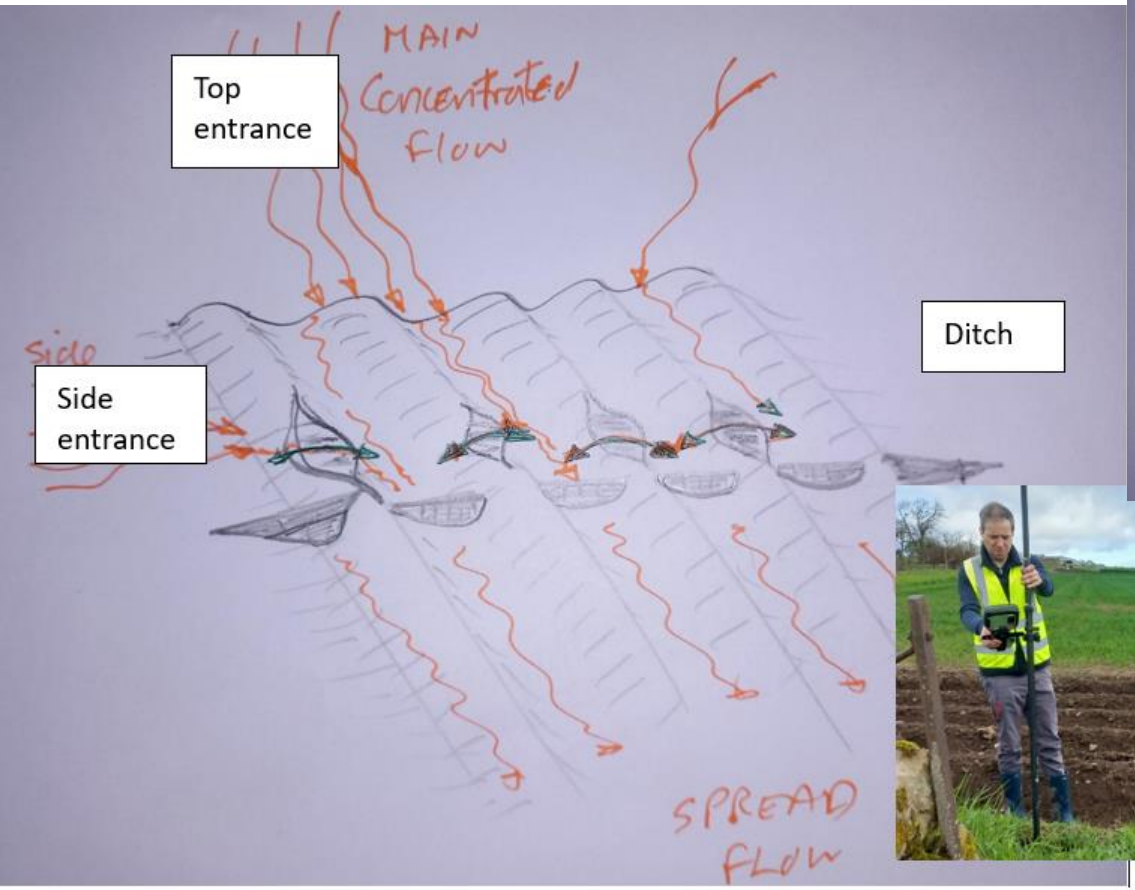
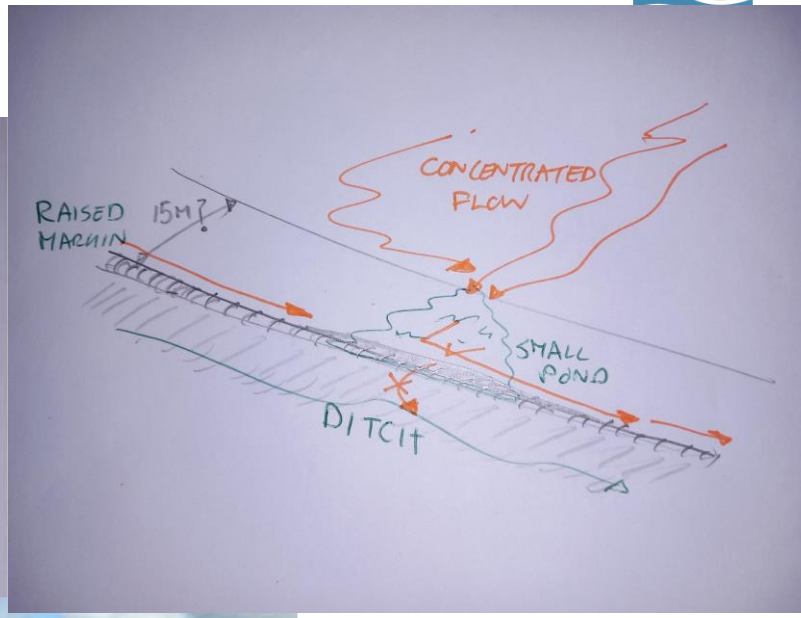
Proposed Runoff Plan for Farm Team




Top entrance
MAIN Concentrated Flow
Side entrance
Ditch
SPREAD FLOW


RAISED MACHIN
15M?
CONCENTRATED FLOW
SMALL POND
DITCH

Within field ponds and sediment traps

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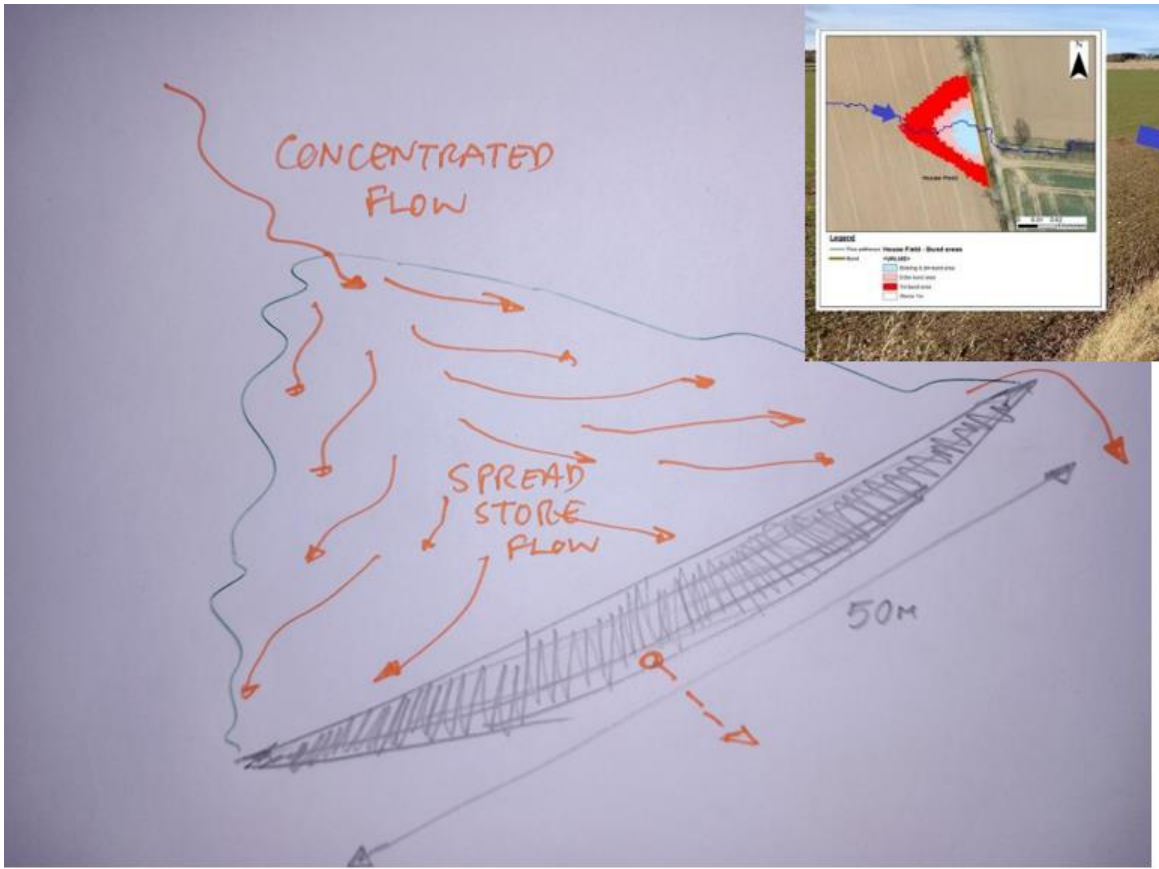

Flooded Buffer strips?

A hierarchy system for measure placement: The three-tier system

Level 1 – Fixed linear 2m width, basic measure	• A default 2 m wide buffer (where appropriate fenced cattle exclusion) following a watercourse or ditch. • Retention of existing wooded features is required.	
Level 2 – variable width at flow delivery points with enhanced wooded features	• Additional measures to level 1 including; (i) increases in width where flow delivery requires it; (ii) enhancement of wooded features if justified by runoff trapping or absence of such features for habitats on a natural stream reach.	
Level 3 – bespoke measures considering many aspects and upstream areas	• Additional measures to level 1 often instead of level 2 option. • Includes a wide range of measures bespoke to the field situation (16 measure database). Consider the wider functioning of the catchment in terms of collective flow from areas through the channel network as well as wider aspects of infrastructure development/improvement.	 

1. Diffuse to convergent management
2. Increasing engineering required
3. Increasing effectiveness

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Netherton Flood scheme

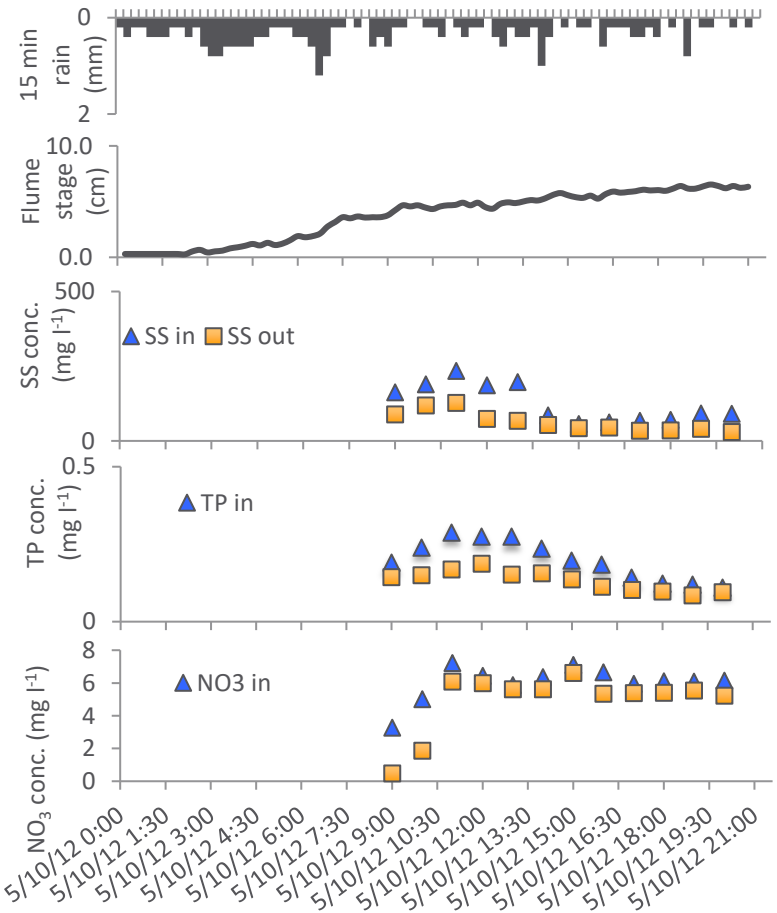
Three-tier RAF sediment trap

- 70 ha contributing area (arable)

Newcastle University

cheviotfutures

Performance – Three-tier sediment trap



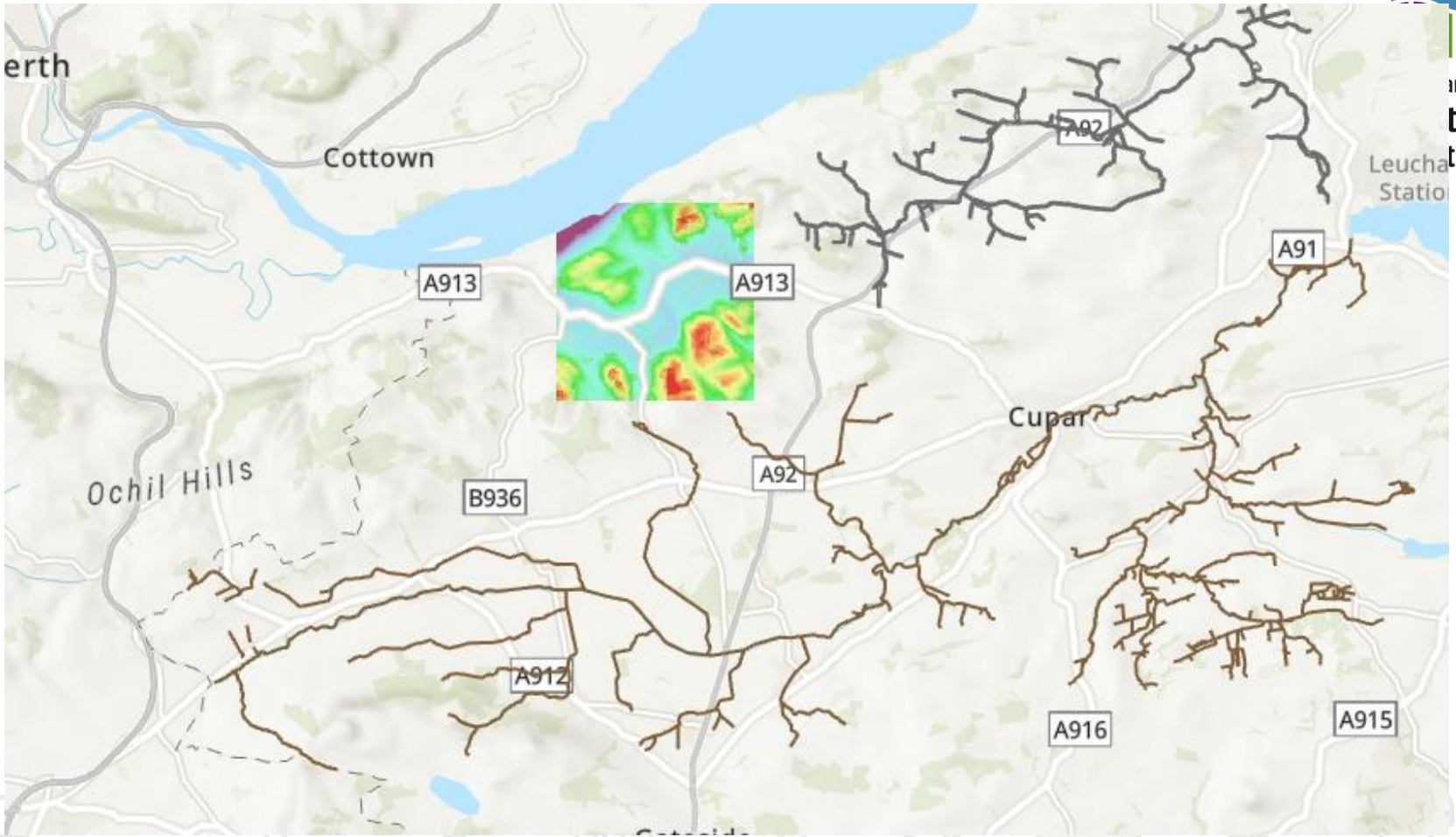
Retention (% concentration)

- Sediment SS: 25 – 67 (49% net retention)
- Phosphorus: 16 – 44 (33% net retention)
- Nitrate: 5 – 85 (18% net retention)

~ £2000 of work

Newcastle University

cheviotfutures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Cottown
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A913
A92
A91
Leucha
Statio
Cupar
Ochil Hills
B936
A92
A912
A916
A915

Delivery, governance, and financing workshop

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Stakeholders, landowners, land managers, academics, local government and communities meet and discuss the practicalities of delivering restoration projects in these catchments.

- Existing restoration
- Delivery of future restoration
- Financing
- Prioritization
- Recommendations

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Scottish Water
Always serving Scotland

Dreel Burn

Fife Council

FIFE COAST & COUNTRYSIDE TRUST

TAY rivers trust

River Eden Fife
RIVER EDEN SUSTAINABILITY PARTNERSHIP

CREW CENTRE OF EXPERTISE FOR WATERS

Some of the stakeholders we'd like to invite…

Thank you for your time, please stay connected

The James Hutton Institute

Kerr Adams

Miriam Glendell

Paul Quinn

We thank the River Eden Sustainability Partnership, Sustainable Cupar, the Eden Angling Association, the Neighbourhood Ecosystem Fund and Inspiring Scotland Partners for supporting and funding the Transition to Delivery Project.

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