Putting Nature Restoration on the Map

The Nature Based Solutions Database & East of England Hub

Presented by: Heather Bell

Date: 14th May 2026

Cairn Beck Project

Eden Rivers Trust

The Rivers Trust

RIVER RESTORATION


North Devon Riverlands,
The National Trust
LEAKY BARRIERS
The Rivers Trust

The Rivers Trust

NBS Hub Guide & NBS Index

If nature-based solutions blend in completely, how do we?

- Know where they are
- Recognise their value
- Take care of them
- Plan for the future

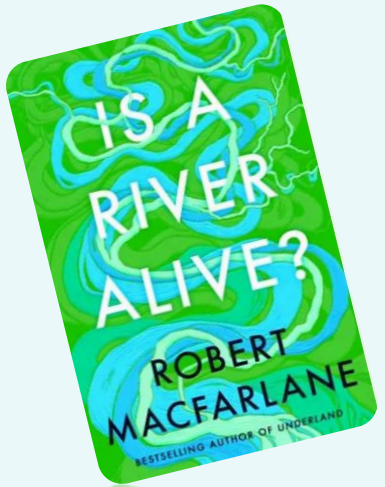
The Rivers Trust

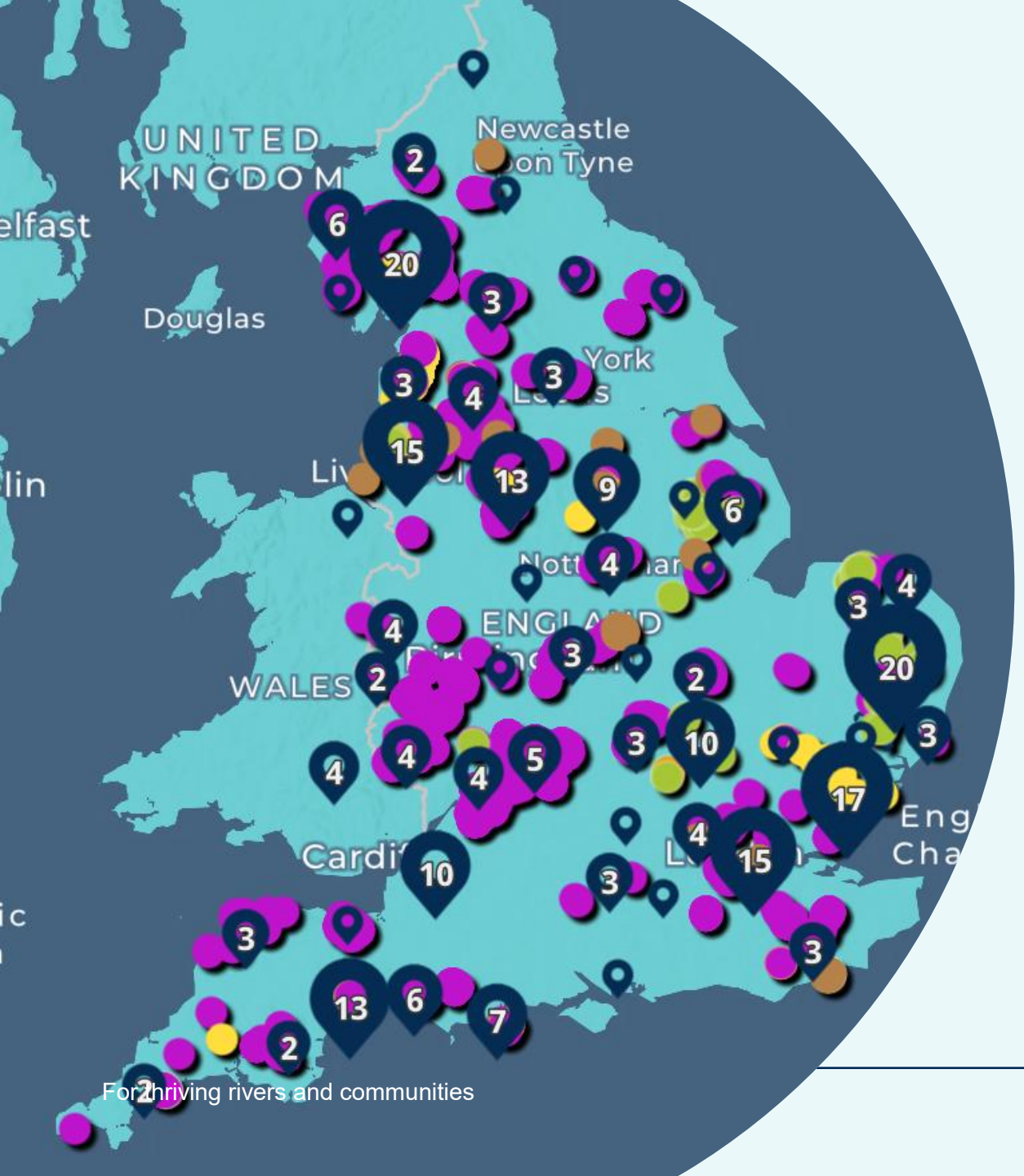
“

Without existence on the map, it has no legislative protection – for how can you protect a river who doesn’t exist?

Robert MacFarlane

Is a River Alive?





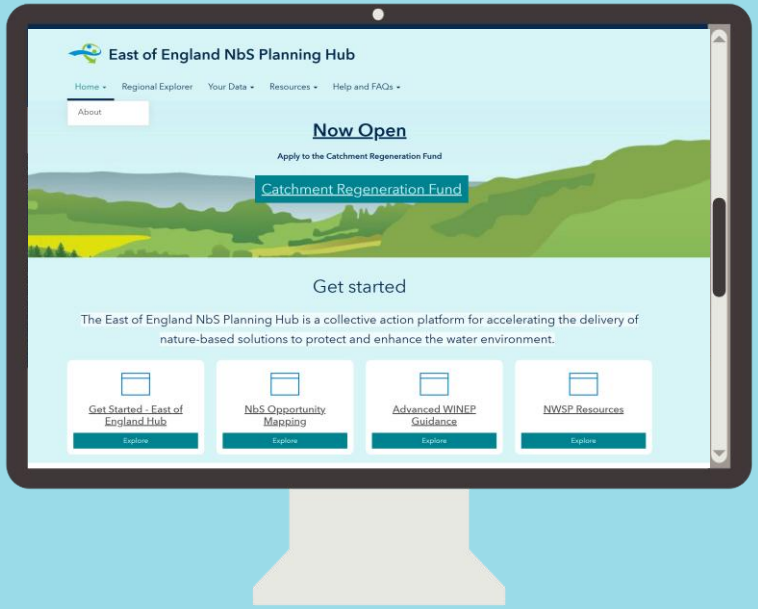
To put nature restoration on the map

- Reach a standardised data model
- National scale
- Reduce the burden on delivery organisations to record data

To put nature restoration on the map

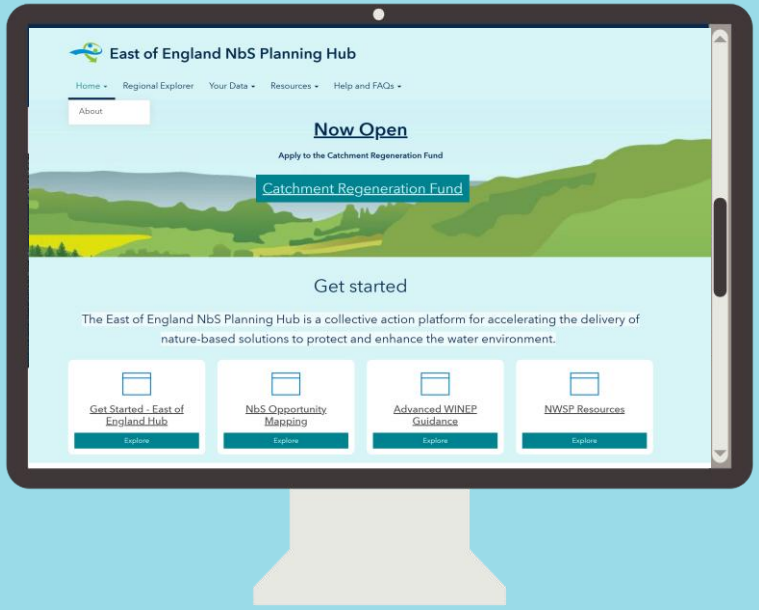
- Reach a standardised data model
- National scale

To put nature restoration on the map



- Reduce the burden on delivery organisations to record data

The NbS Hub



Plan

Identify coastal restoration and protection/ Nature-based Solutions (NbS) opportunities and put them on a map

Collaborate

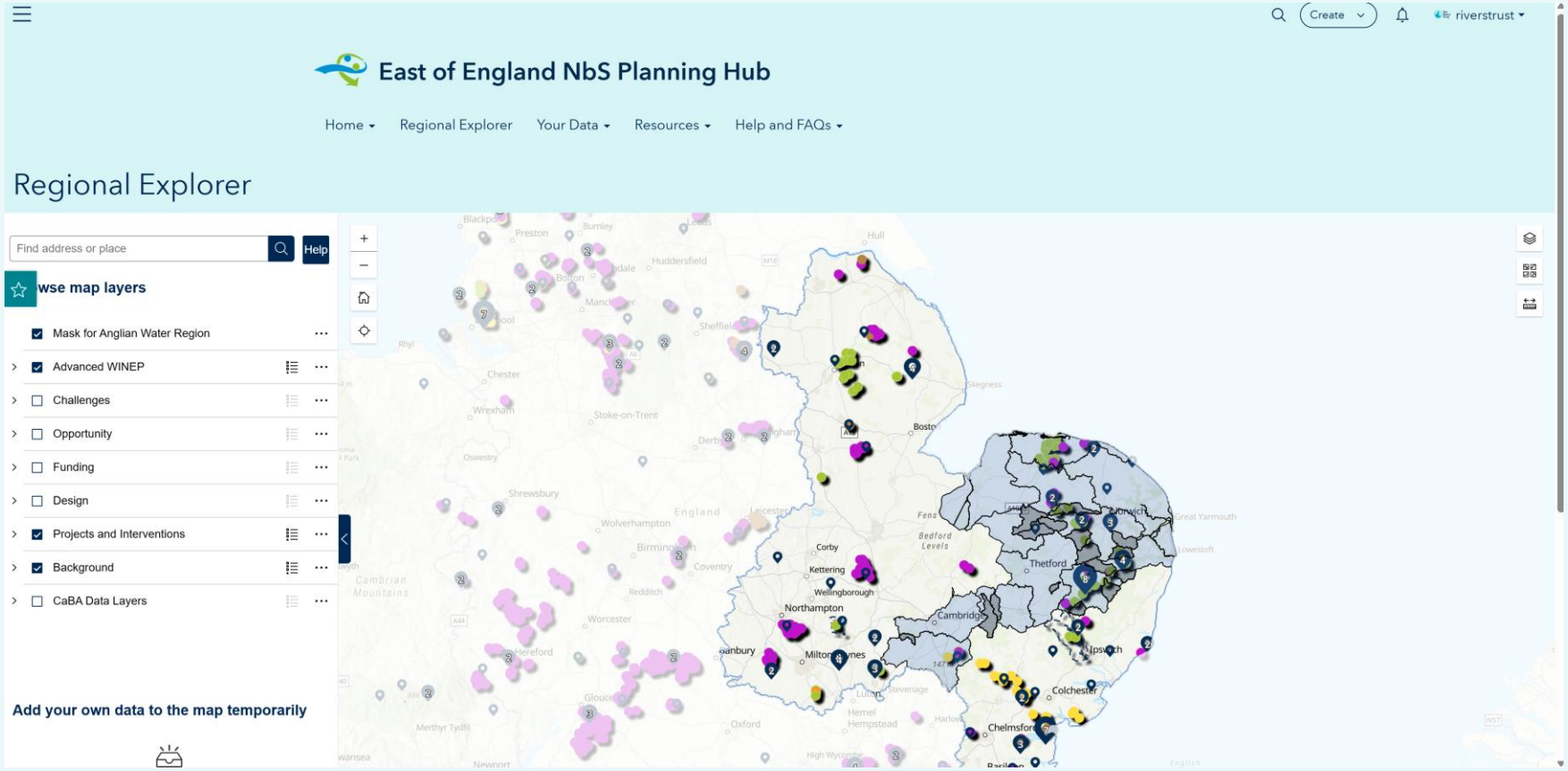
Enable collaborative action for nature restoration. See what others are doing and coordinate your work with them.

Deliver

Record the physical delivery of Coastal NbS and restoration projects and the multiple benefits of your work.

Maintain

Ensure that coastal NbS, restoration projects are maintained and adapted so that they can provide wider benefits for the long term.



NBS Hub:

https://east-of-england-caba-hub-theriverstrust.hub.arcgis.com/pages/progress-dashboard-east-of-england-hub

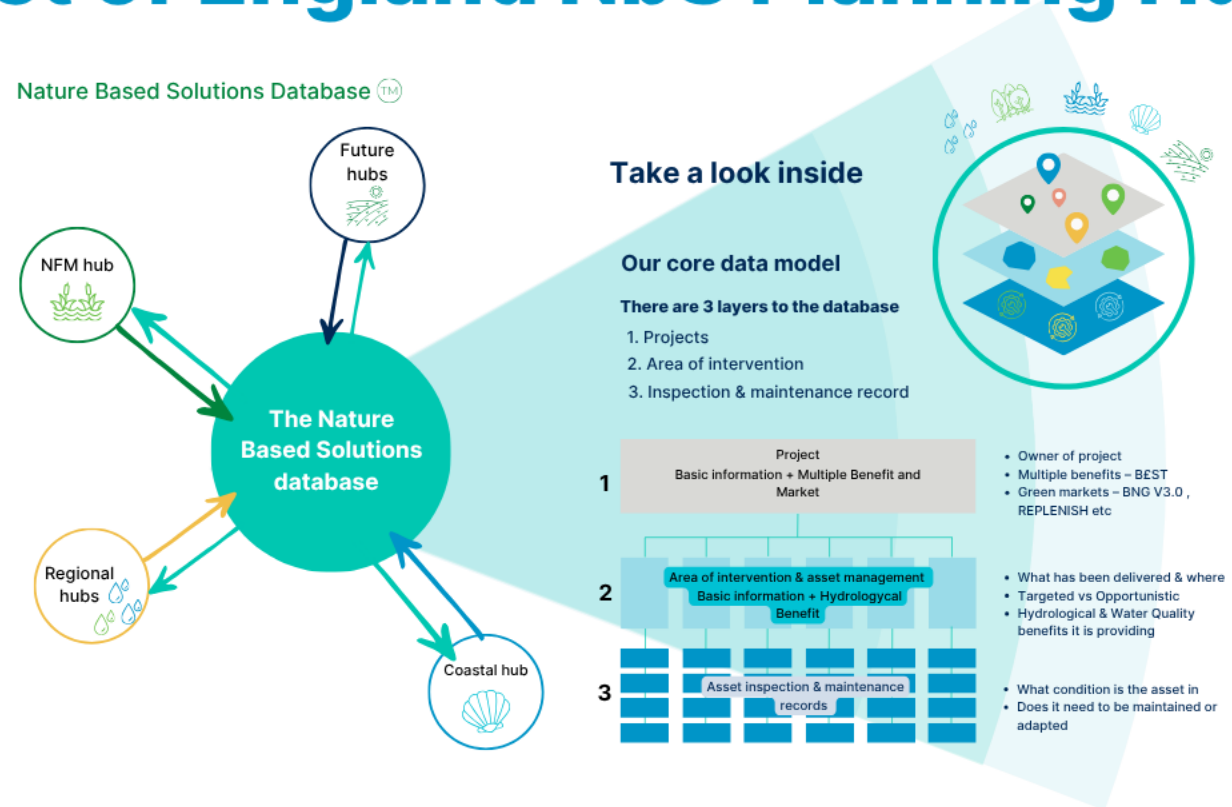
The NBS Database & East of England NbS Planning Hub

THE NBS DATABASE

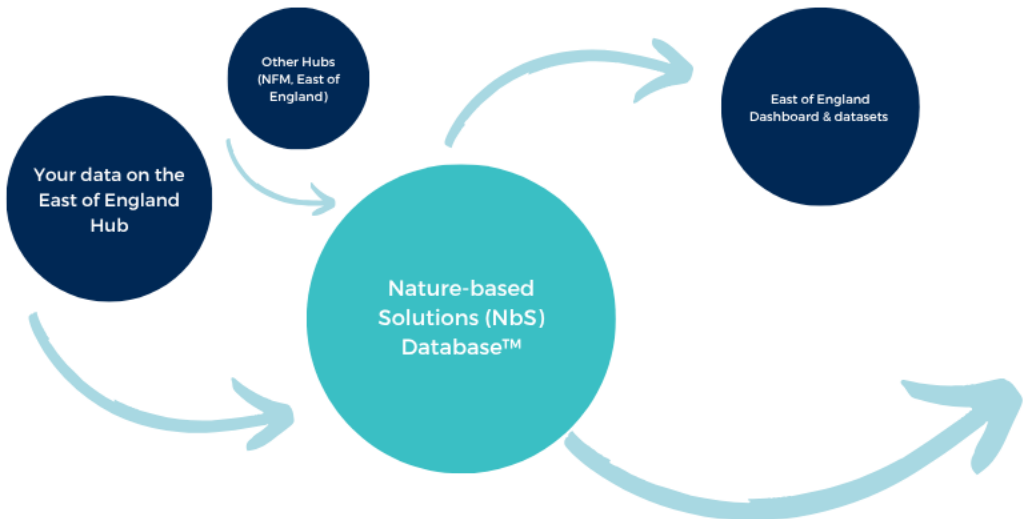
The NBS Database has been developed iteratively since the 2015 NFM Defra Pilot and is a geospatial database for mapping nature based projects, interventions and inspections. The NBS Database underpins a number of platforms led by The Rivers Trust and Catchment Based Approach:

- **The NFM Hub (winner of the Esri Collaborative Award 2024)**
- **The Coastal Hub**
- **The East of England NBS Planning Hub**
- **The NbS Hub**

There are over 6000 interventions and 700 projects registered in the database so far.



What happens to your data?



Used by regulators to:

- **EA NFM Programme – plan their maintenance of water courses and avoid damaging or removing NFM.**
- **EA – Report on progress towards delivering the Natural Flood Management Program. NE – Report on progress delivering 30X30 and - Wildlife Rich Habitat targets.**

Viewed by public:

To understand which projects are being delivered in the East of England

This means that your project can be integrated with delivery for Water Resource, Water Quality and Nature Recovery.

The East of England NbS Planning Hub

The East of England NbS Planning Hub is a collaborative site for mapping and managing nature based solution projects and interventions in the East of England.

The East of England Planning Hub has been developed to overcome barriers such as a lack of GIS software or training for users to add thier projects and interventions data to an online map:

- Free community licenses
- Apps to add and edit NBS Data - projects & interventions
- Map explorer
- Personalised dashboard of projects and interventions
- Guidance videos
- User guide

Get started today

User Guide

https://tinyurl.com/464ct8fz

Warton Mires Wetlands Creation
Led by the RSPB
Opportunity

Beneficial use of dredged sediment
Led by the RSPB
Active

Photo source: NBS Database, RSPB

East of England NbS Planning Hub

https://east-of-england-caba-hub-theriverstrust.hub.arcgis.com/

The Rivers Trust · Catchment Based Approach · NORFOLK WATER STRATEGY PROGRAMME · love every drop anglianwater · WRE WATER RESOURCES EAST

Thank you.
Any questions?

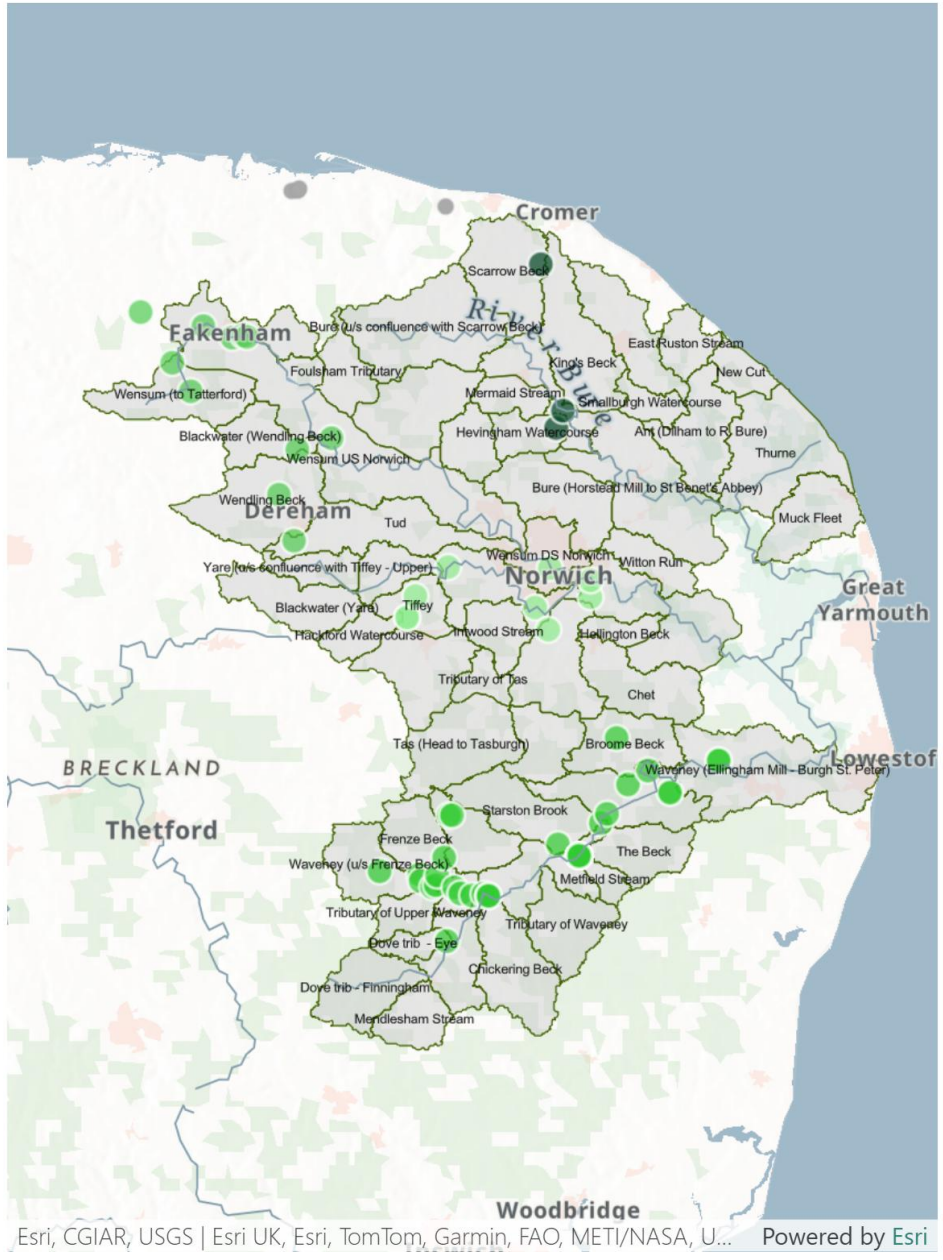
data@theriverstrust.org

NbS Selection: All
Lead partner: All
Project status: All
Funders: All
NWSP involved: All
Water body: All

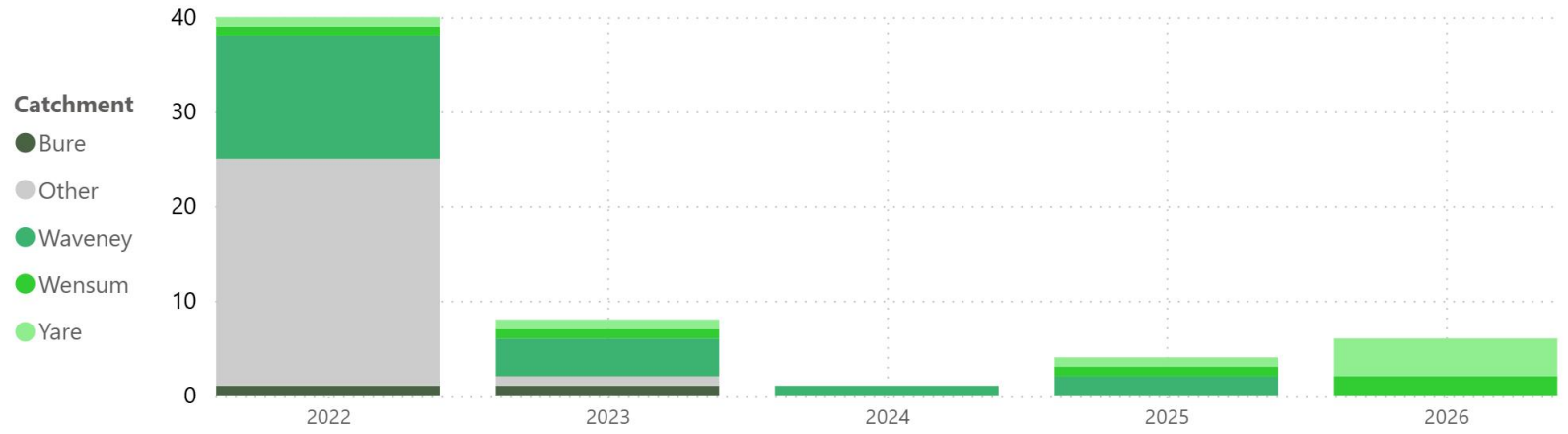
Implementation per year (ha)

Status		2018	2019	2022	2023	2026
delivered	**1.10**	**0.02**	**0.01**	**24.04**	**0.96**	**0.12**
Catchment Restoration				6.02		
Floodplain reconnection and restoration	1.01	0.01	0.01			
Riparian Zone Restoration					0.96	
Total	**420.59**	**0.02**	**0.01**	**218.58**	**0.96**	**0.12**

Water bodies and Project locations



Projects by catchment per year (number of projects reported in Hub)



Implementation by water body per year (ha)

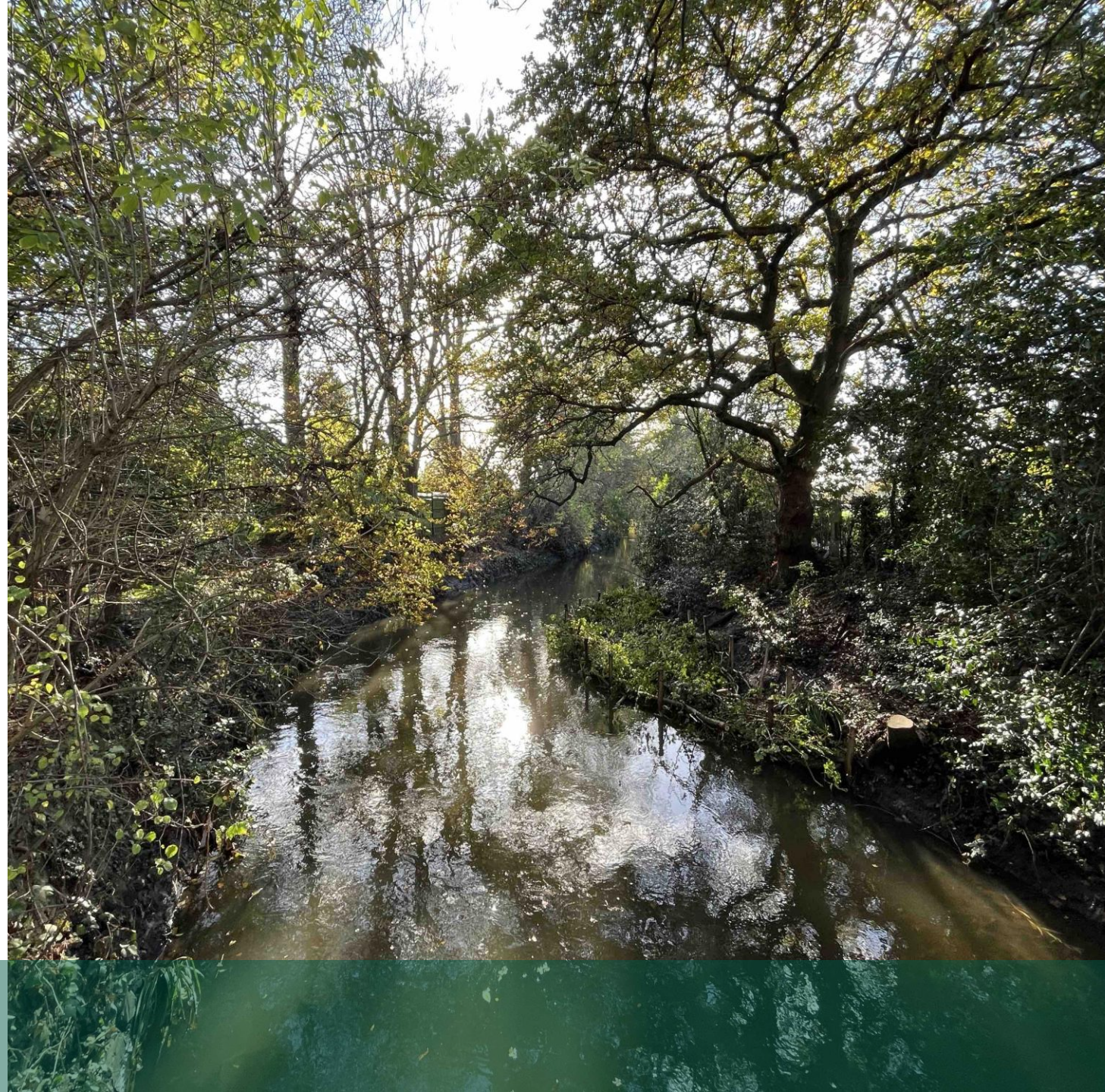
NbsCategory	Status	Catchment	Waterbody	2018	2019	2022	2023
Catchment Restoration	**delivered**	**Other**	Other			6.02	
	opportunity	**Other**	Other			5.41	
		Waveney	Waveney (Frenze Beck to Dove)			1.83	
		Wensum	Tud				
		Yare		**419.49**			
Floodplain reconnection and restoration	**delivered**	**Waveney**	Dickleburgh Stream	1.01			
		Wensum	Blackwater (Wendling Beck)		0.01		

Integrated monitoring framework for urban river restoration

Case study: Beverley Brook

Dr Rachel Walker

Barnes Conservation



Urban river stressors

Barnes Conservation

Beverley Brook restoration project

- Almost no natural parts of Beverley Brook remain.
- In 2024 a Rewild London Fund grant targeted a 1.5km stretch for restoration.
- Aim is to restore a more natural meandering flow and improve habitat diversity.

Barnes Conservation

Monitoring framework

- SmartRivers — WildFish.
- MoRPh Rivers — Modular River Survey
- Outfall surveys — ZSL
- Water quality — Water Rangers
- Electrofishing
- AudioMoth
- Riverfly — The Riverfly Partnership; Freshwater Biological Association

Barnes Conservation

Survey insights

Baseline data

- High abundance and low diversity of pollution and stress tolerant freshwater invertebrates.
- Highly modified channel.
- Seven raw sewage and utility waste-water misconnected outfalls.
- Poor water quality across all metrics.
- Inconsistent Riverfly scores due to episodic pollution incidents.
- Electrofishing and Audiomoths.

Post-restoration results

- Significant increase in abundance but no change in diversity of freshwater invertebrates.
- More natural meandering channel with varying flow speeds and an increase in exposed gravels.
- Increase in native riparian vegetation.
- One polluting outfall fixed.
- Number of invasive species increases.
- No change in water quality.

Project progress

Pre-works

Post-restoration

Barnes Conservation

Data-led decision making

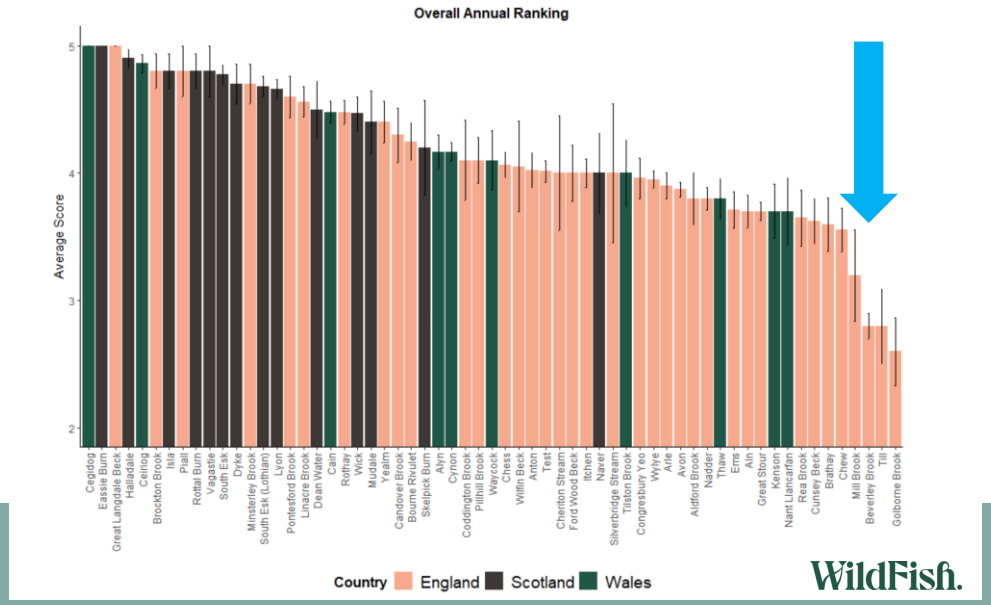
- Post-restoration responses are limited by:
  - recruitment and dispersal barriers (diversity)
  - environmental constraints e.g. pollution
  - physical urban surroundings

> **Adaptive conservation management**

> **Catchment-based approach**

Summary

- Beverley Brook is one of the most stressed rivers, reflecting the high pressures facing our urban waterways.
- A multi-method robust scientific monitoring framework can effectively inform practitioner interventions to improve conservation outcomes.



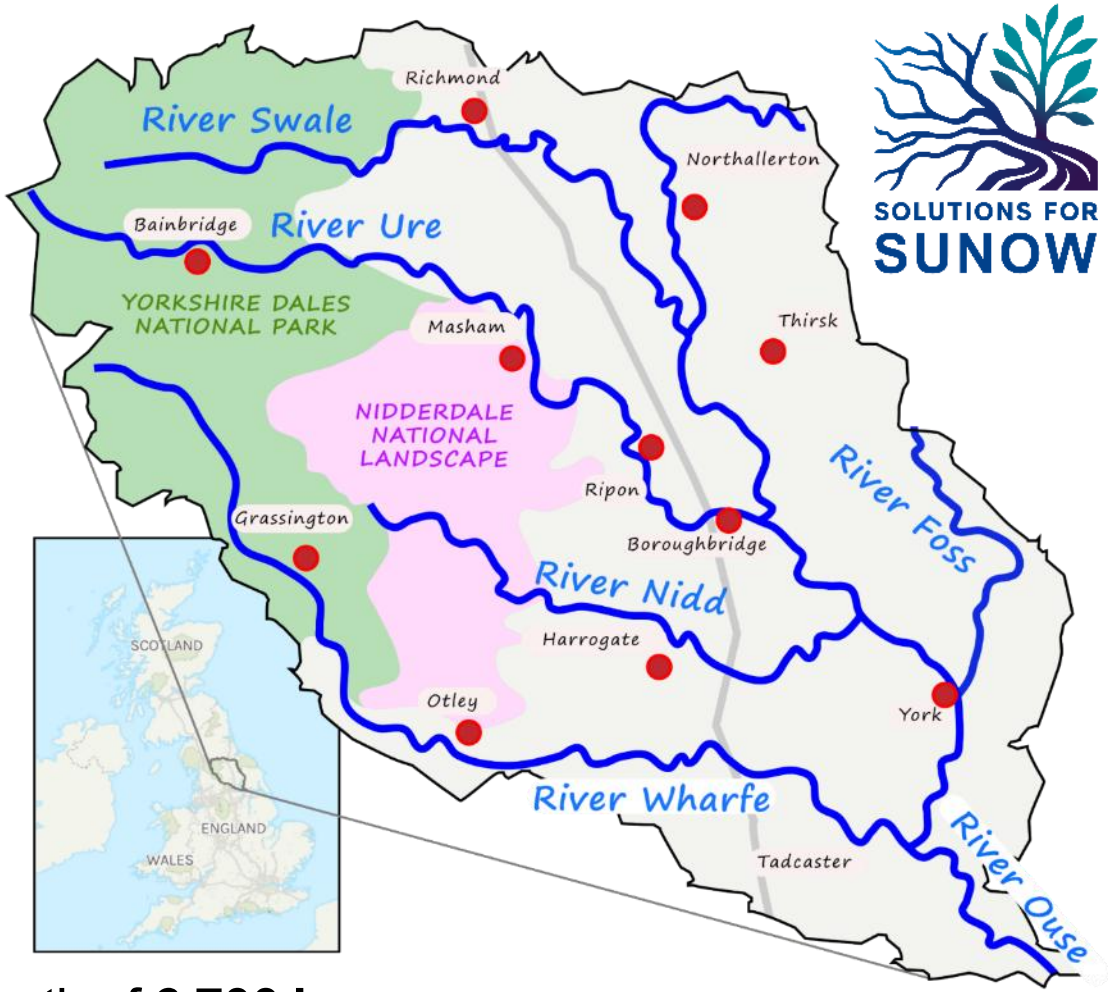
Barnes Conservation

Solutions for the SUNOW Project

funded by the Water Restoration Fund

The project's aims:

- **Keeping Rivers Cool** by increasing shade along riverbanks.
- **Improving Water Quality** by reducing the movement of pollutants into rivers.
  - Reduce fine silts and sediment erosion
  - Reduce agricultural and diffuse nutrient pollutants
- **Managing floods and mitigating droughts** by retaining water on land.
- **Increasing Species Resilience** by connecting habitats



YDRT Catchment over **4,000 km2**, Total river length of **6,700 km**

1. Identify the **best locations to work with natural** processes to protect river health

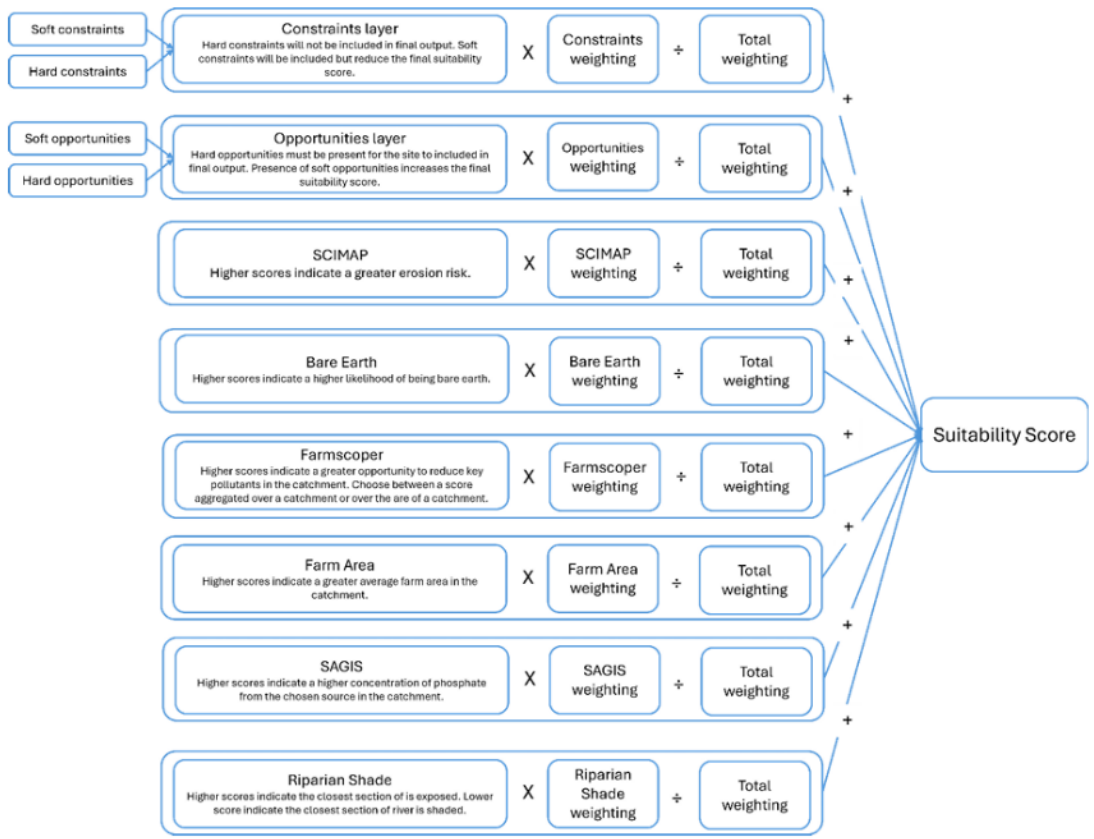
YDRT Suitability Modeller

GIS Toolbox - ArcGISPro Model Builder

- Catherine McIlwraith, Harry Shepheard, Rory MacGregor @ RT
- Building on 'Keeping Ure Rivers Cool' project

➢ **Multi Criteria analysis** weighing up the following datasets:

- **Constraints** that limit work
- **Opportunities** for interventions
- Sources of **risks** to river health



YDRT Suitability Modeller

Constraints that limit work

- Eg. protected habitats, designated sites, and existing woodlands.
- Set importance
  - Hard (exclude area) / Soft (include area) / None (no impact)

Opportunities for interventions

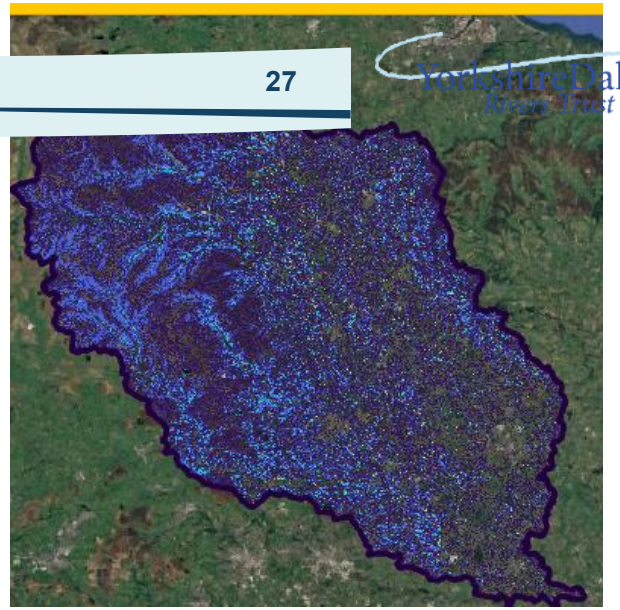
- Eg. WWNP, NFM priority areas, habitat connectivity.
- Set importance
  - Hard (mandatory presence) / Soft (include area) / None (no impact)

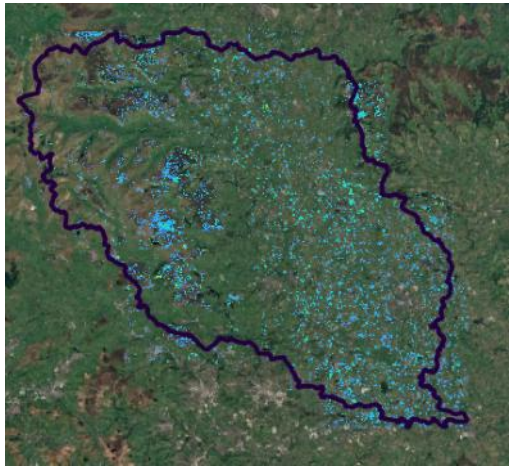
Constraint	Classification
Conservation areas	None
Peatland areas	None
CROW common land	Soft
Envrionmental stewardship schemes	Soft

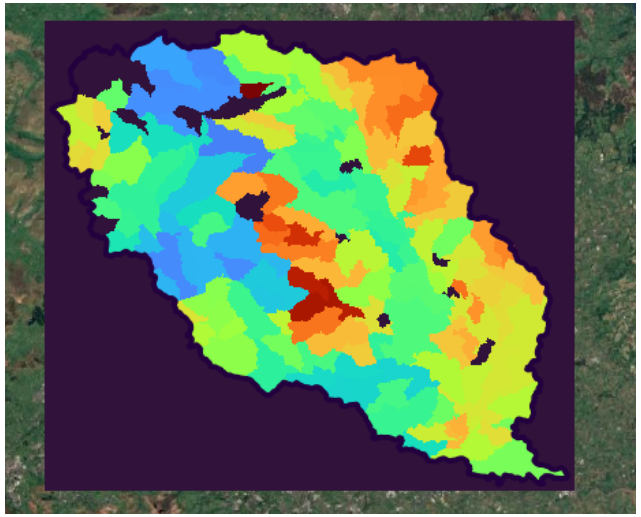
Opportunity	Classification in most scenarios (300-307)	Classification in NFM scenario (308)
WWNP Runoff attenuation 30	Soft	Soft
WWNP Catchment woodland potential	Soft	Soft
WWNP Riparian woodland potential	Soft	Soft
WWNP Floodplain woodland potential	soft	soft

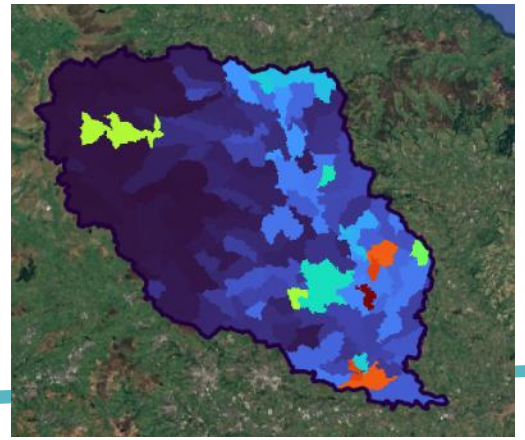
YDRT Suitability Modeller

Sources of **risks** to river health







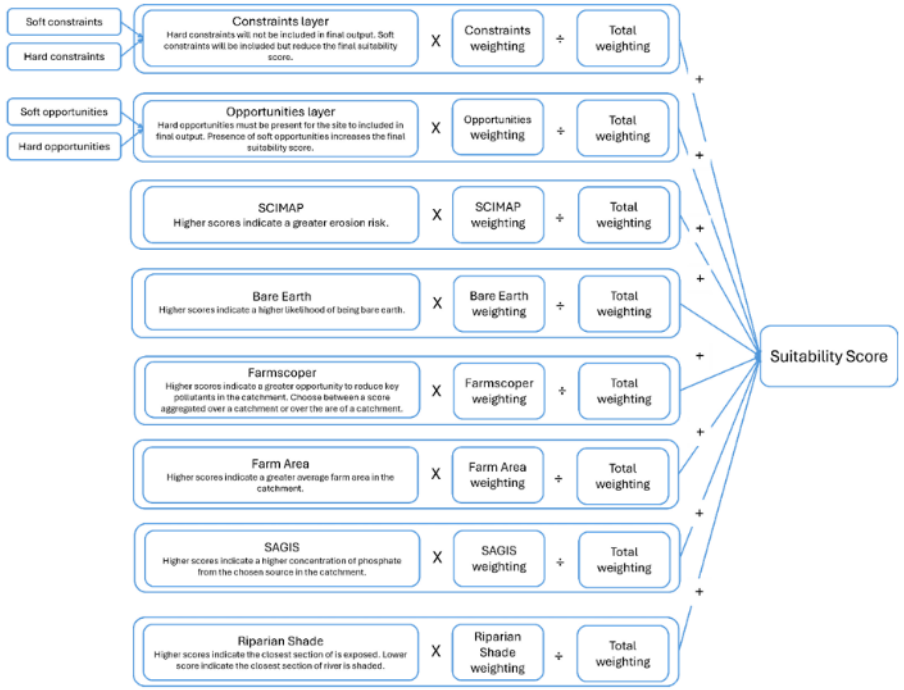


- **River Shading** – EA dataset:
  - River stretches vulnerable to warming
- **SCIMAP** – RT run:
  - Source areas of silts and erosion risk
- **Bare Earth Index** – RT from sentinel satellite data:
  - Regions with bare earth
- **Farmscoper**– RT run:
  - Pollutant load from farming activities
  - Nitrate, Phosphorus, Sediment Ammonia, Pesticides and FIOs.
- **SAGIS** – RT run:
  - Concentration of phosphate in river from all sources, averaged from point data

YDRT Suitability Modeller

GIS Toolbox - ArcGISPro Model Builder

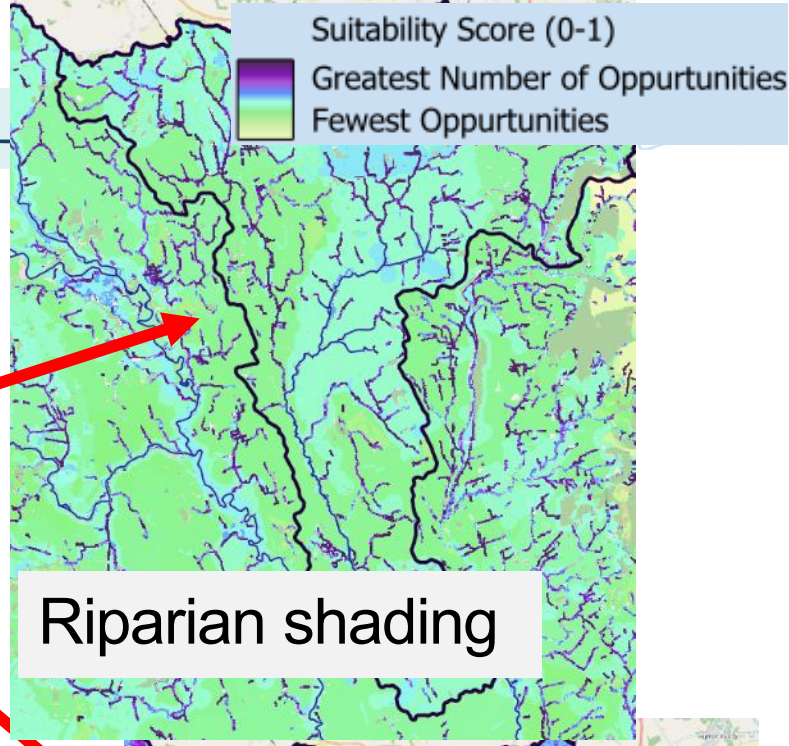
- Adjustable weightings
  - Classification of opportunities, constraints, and risks
  - Scenario testing
  - Prioritisation of interventions under different objectives.



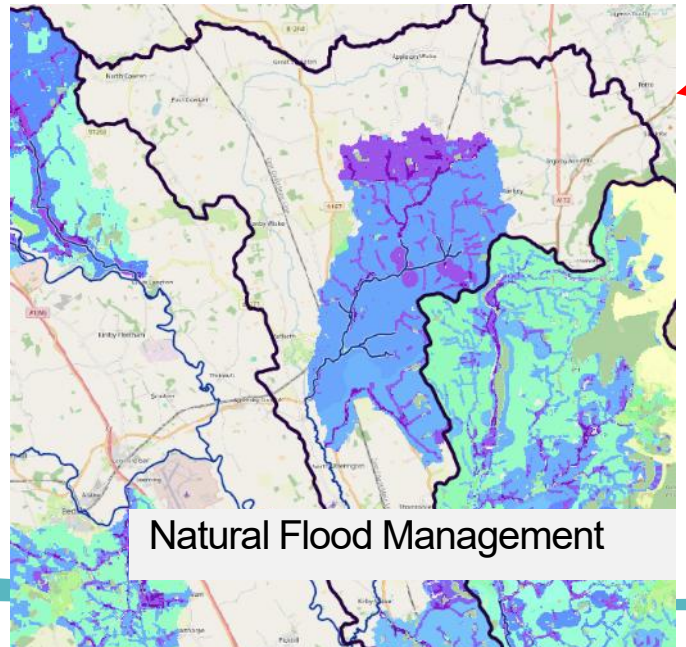
YDRT Suitability Modeller

Table 2-1: Model Scenarios

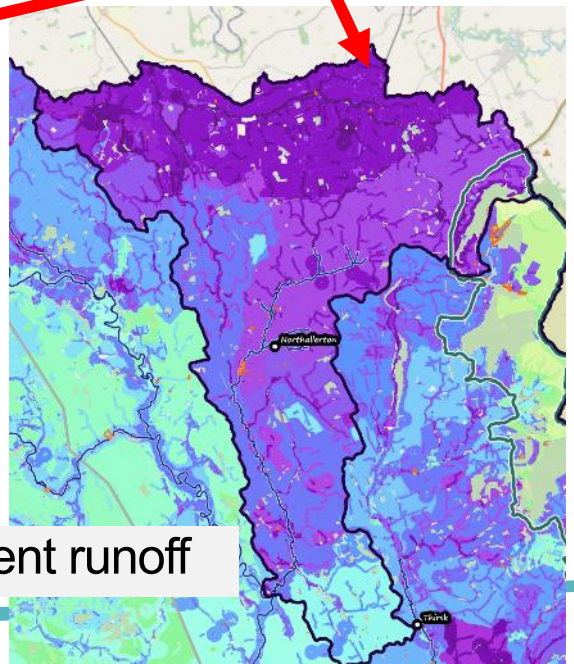
Aim	Relevant tools used	Model Run
1. Temperature Regulation	River Shading Map	306
2a. Reducing Fine silts and sediment erosion	SCIMAP: erosion risk + Bare Soil Index	302
2b. Reducing Agricultural and diffuse nutrient pollutants	FarmScoper + Sagis	304
3. Controlling floods and mitigating droughts	NFM high and medium risk areas	308



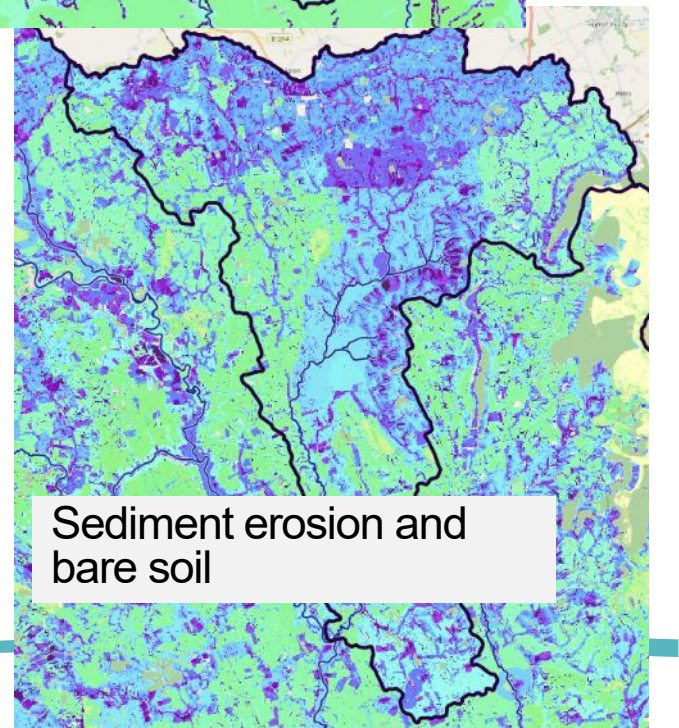
Riparian shading



Natural Flood Management



Nutrient runoff

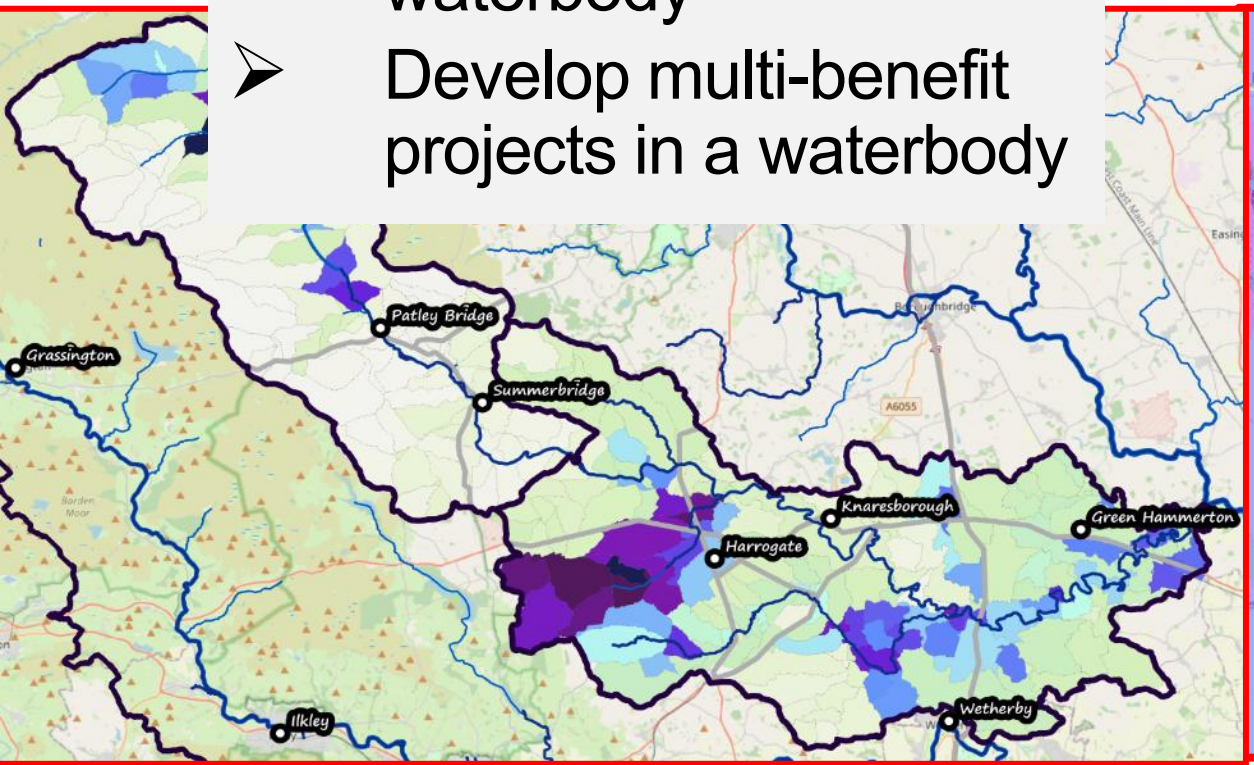


Sediment erosion and bare soil

Uses

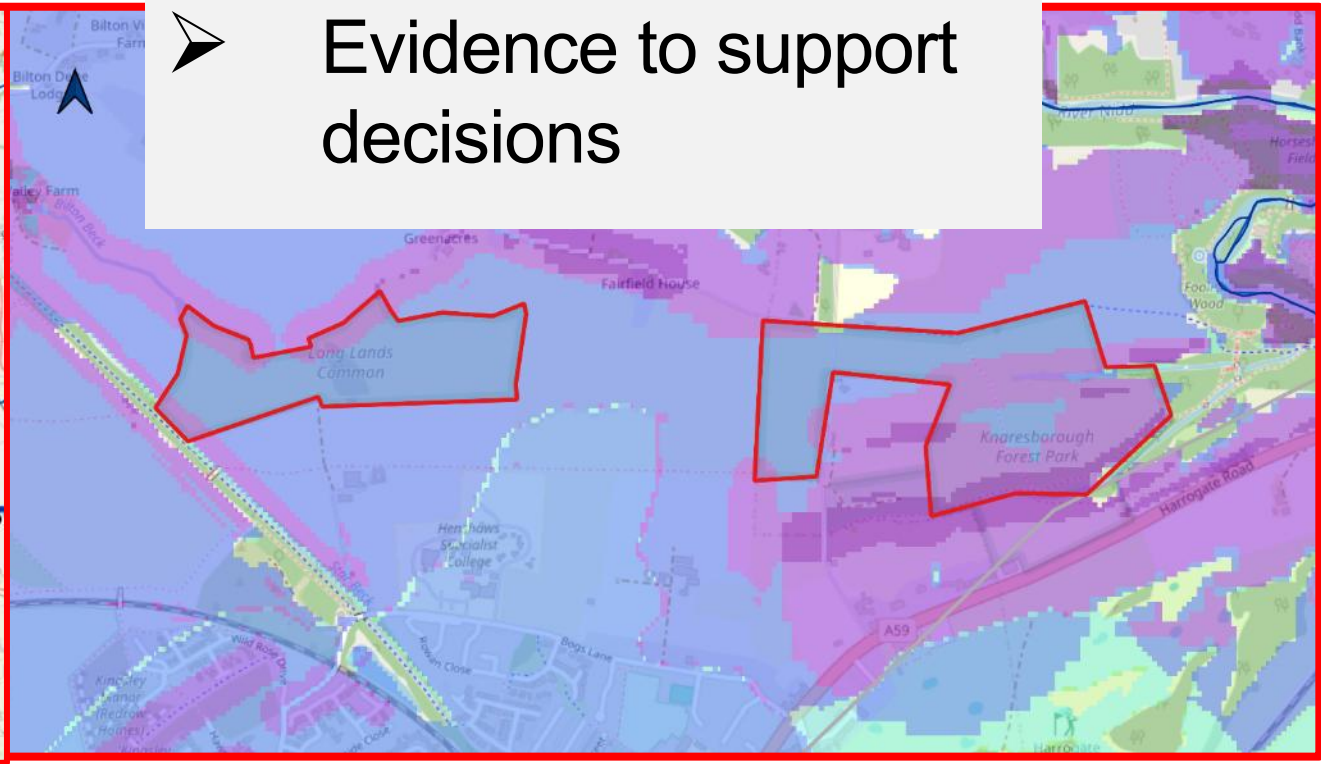
Catchment Level

- Spatial Analysis
- Guide Site Selection by waterbody
- Develop multi-benefit projects in a waterbody



Site Level

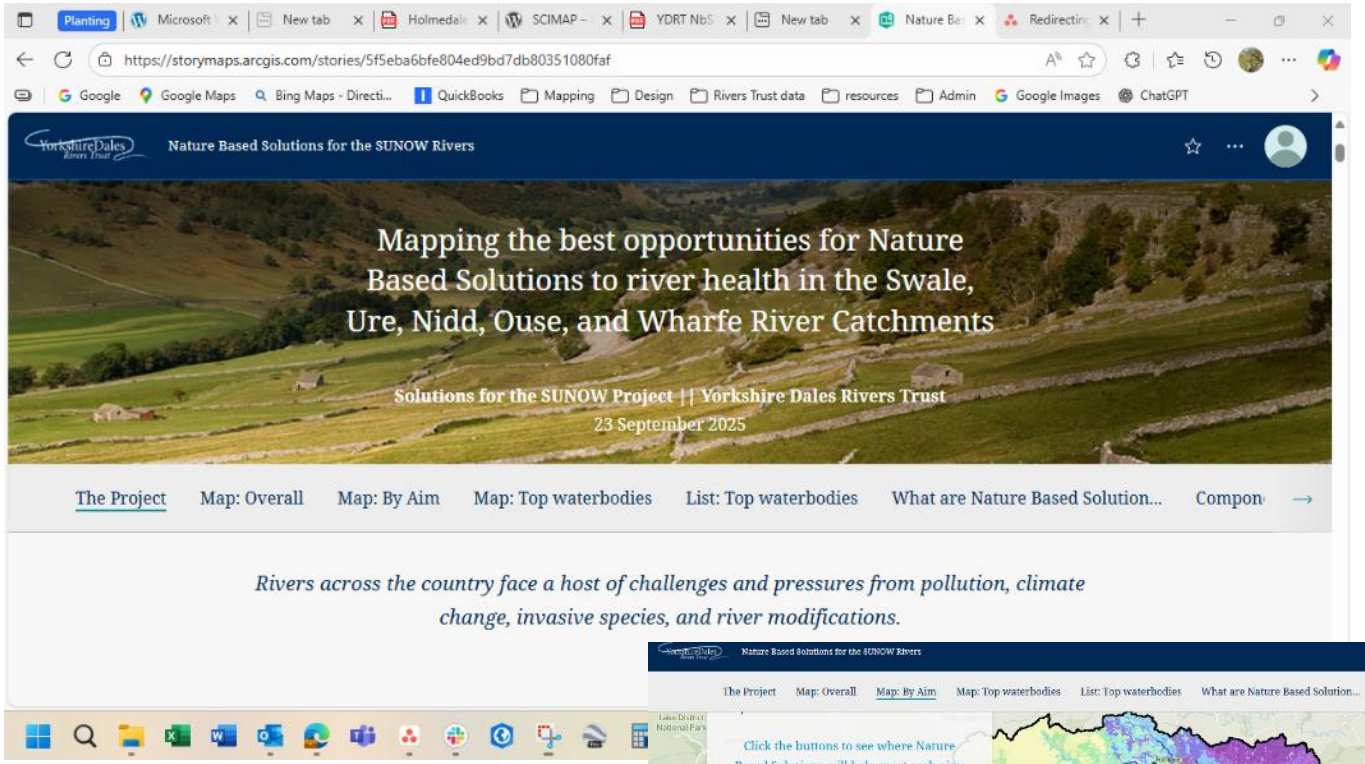
- Understand benefits of NbS work
- Evidence to support decisions

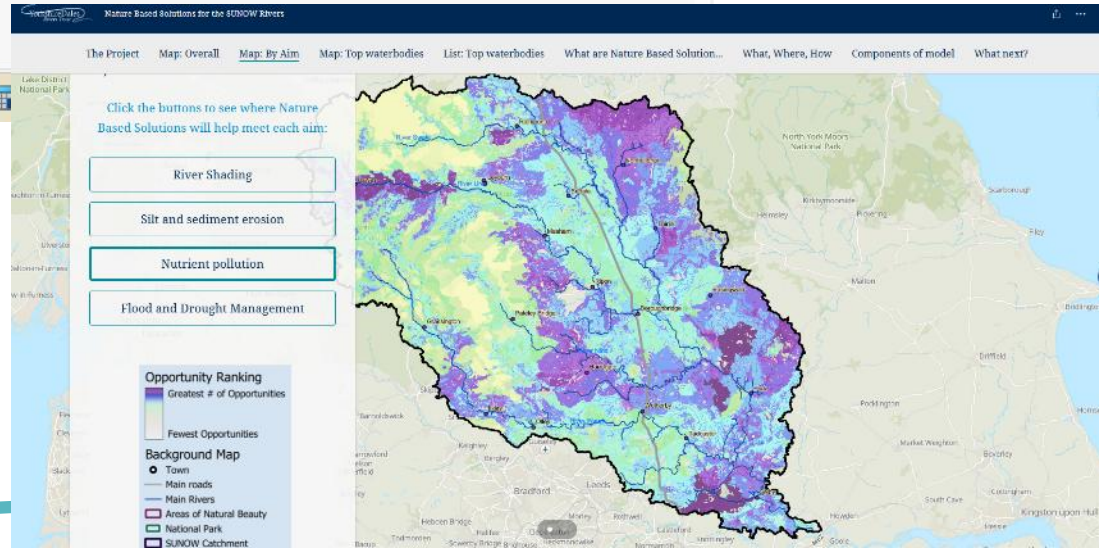


Story maps

Sharing Maps and resources:

https://arcg.is/rCjP9





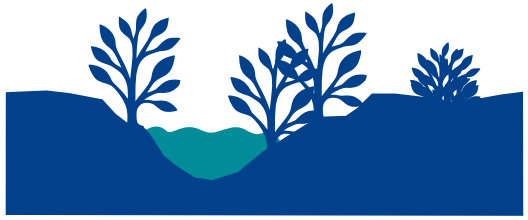
Next Steps

Working with Outputs

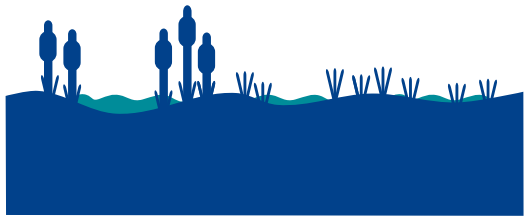
- **Engaging with land managers** developing NbS proposals

SOLUTIONS FOR SUNOW

Floodplain reconnection
Removing barriers



Riverbank planting
Hedgerow planting



Wetland Creation
Hay meadow Creation

Leaky barriers, ponds and scrapes

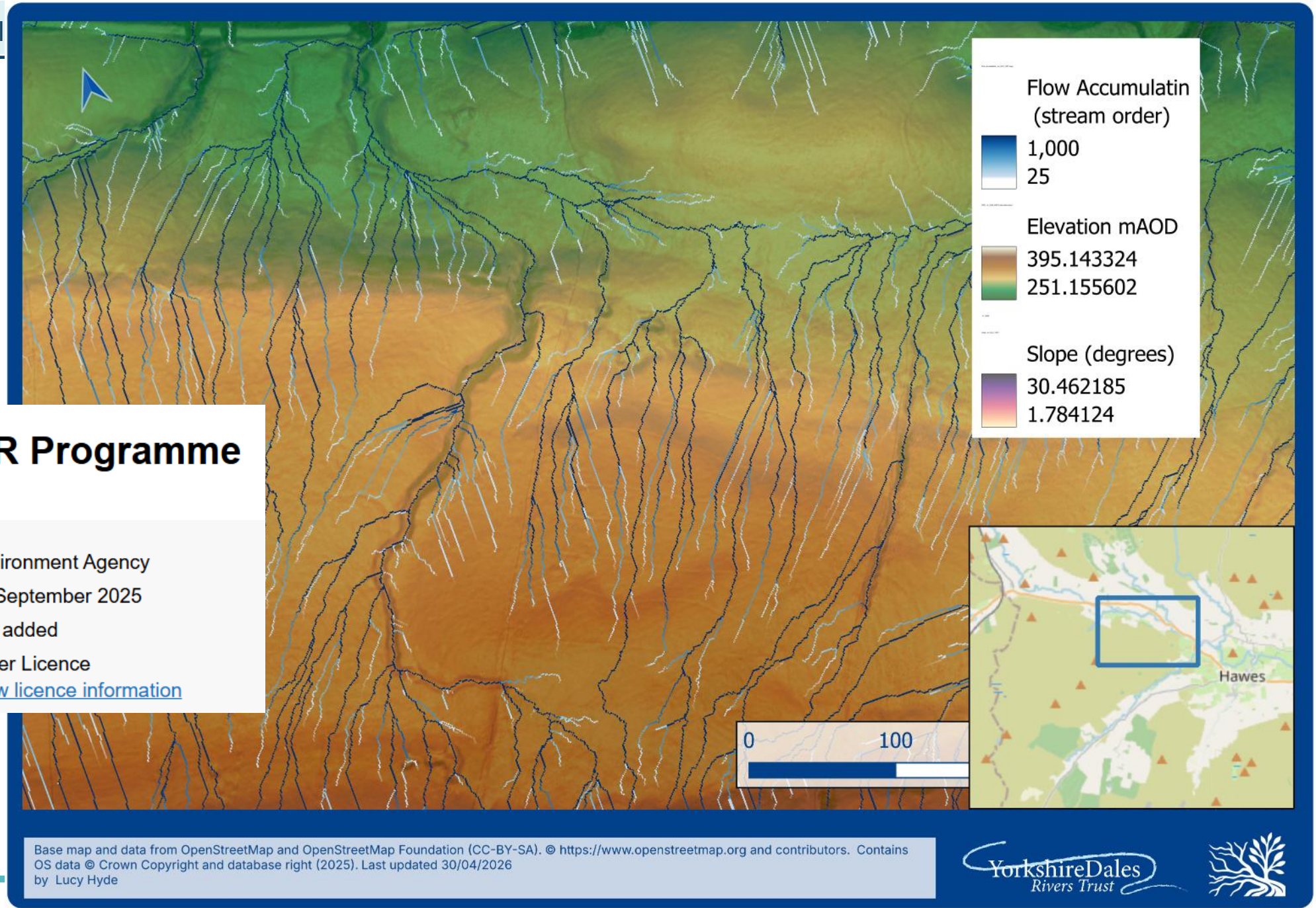
Open Source Tools + Open Data

QGIS

WebODM

data.gov.uk

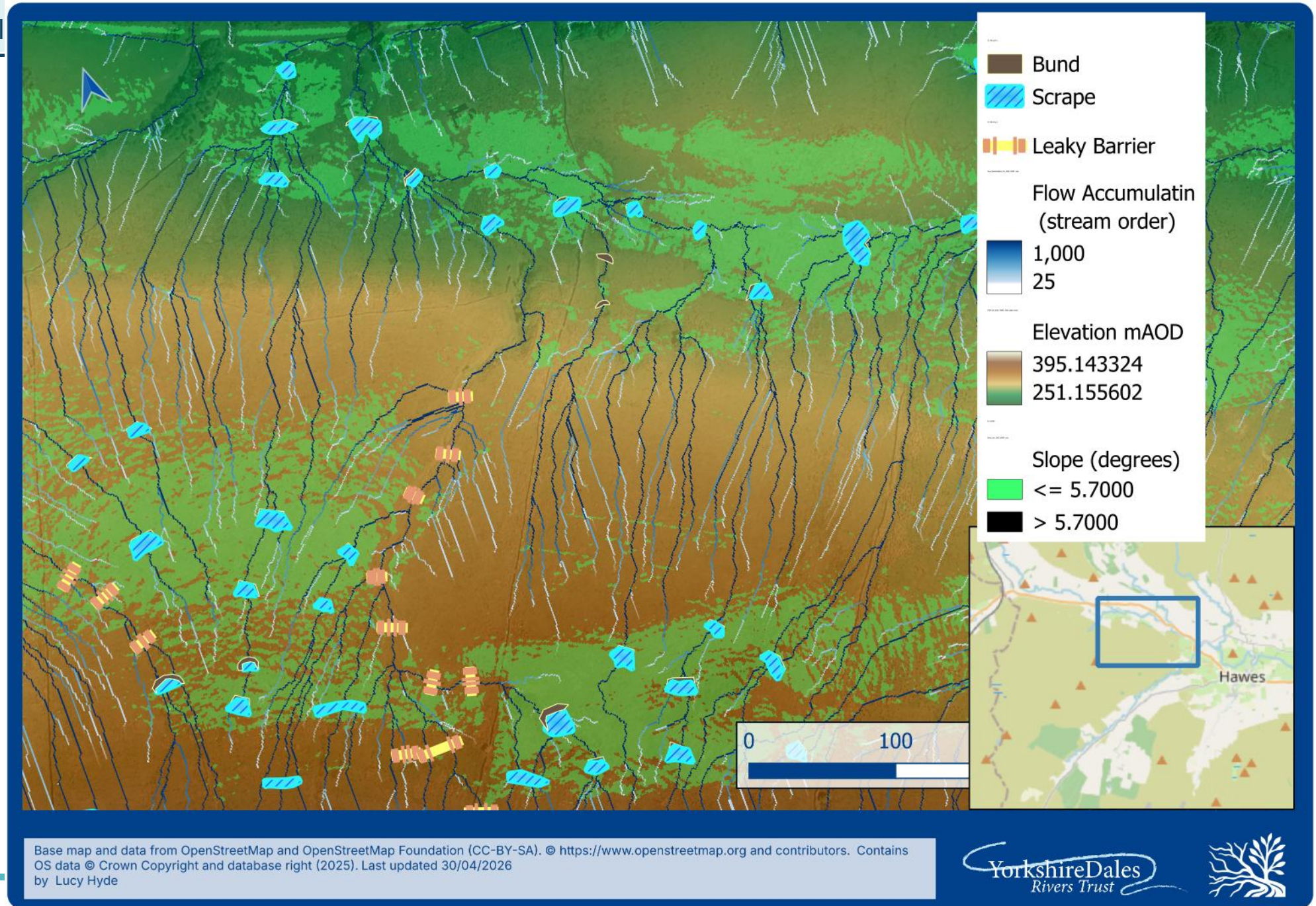
LiDAR Analysis



National LIDAR Programme

Published by:	Environment Agency
Last updated:	12 September 2025
Topic:	Not added
Licence:	Other Licence View licence information

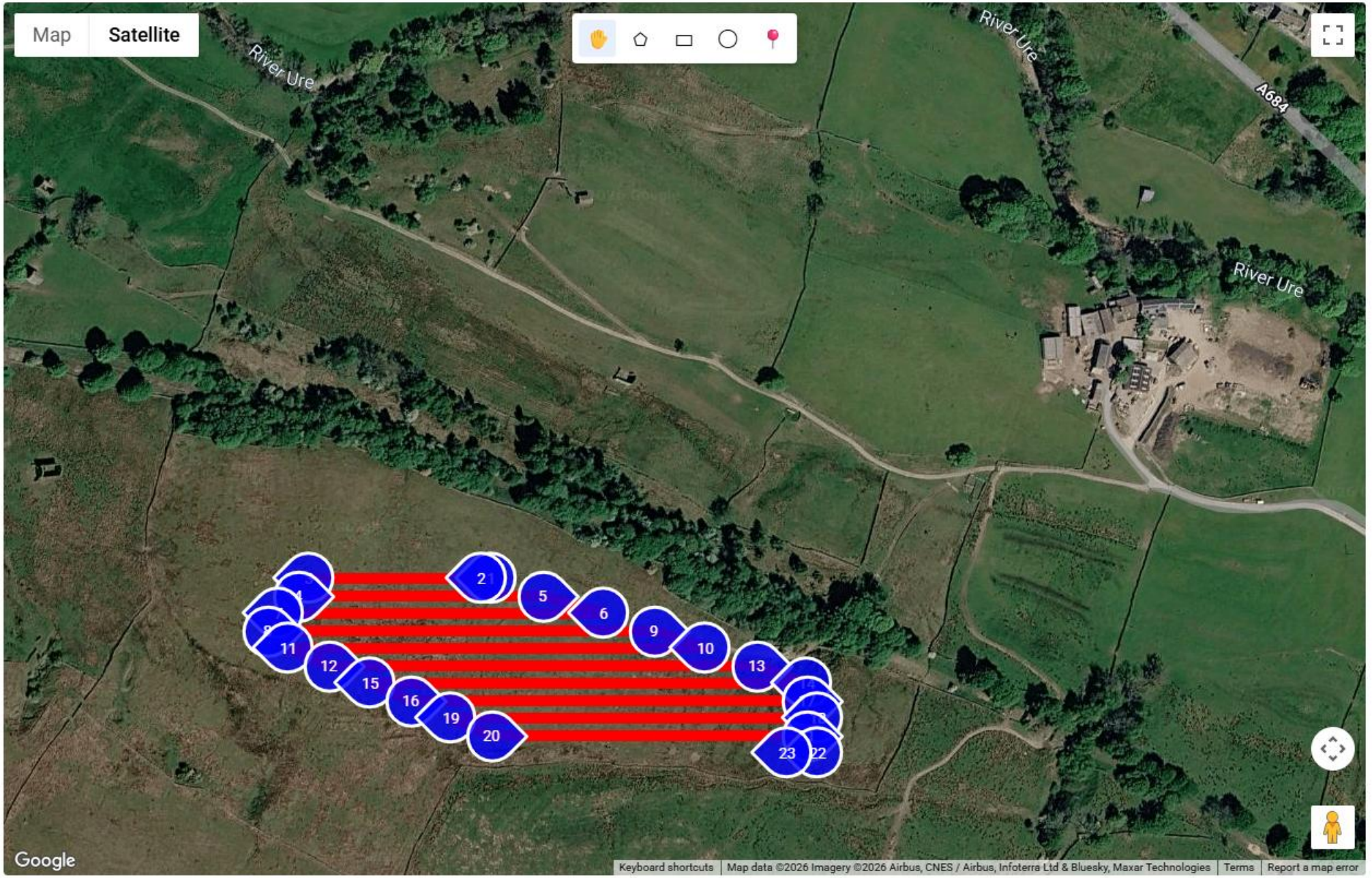
LiDAR Analysis



YorkshireDales Rivers Trust

Internal drone analysis

Drone funded through the FiPL programme



Metric (Meters)

Import Saved Waypoint Mission

Import DJI KMZ Waypoint File

WebODM

- Dashboard
- GCP Interface
- Lightning
- Diagnostic
- Processing Nodes
- Administration
- About

+ Add Project

laver house

Select Images and GCP | Import

1 Tasks | View Map | Edit

81_3_CC

Select Images and GCP | Import

6 Tasks | View Map | Edit | Filter | Sort

upper east — 161 — --:--:-- — Sending images to processing node

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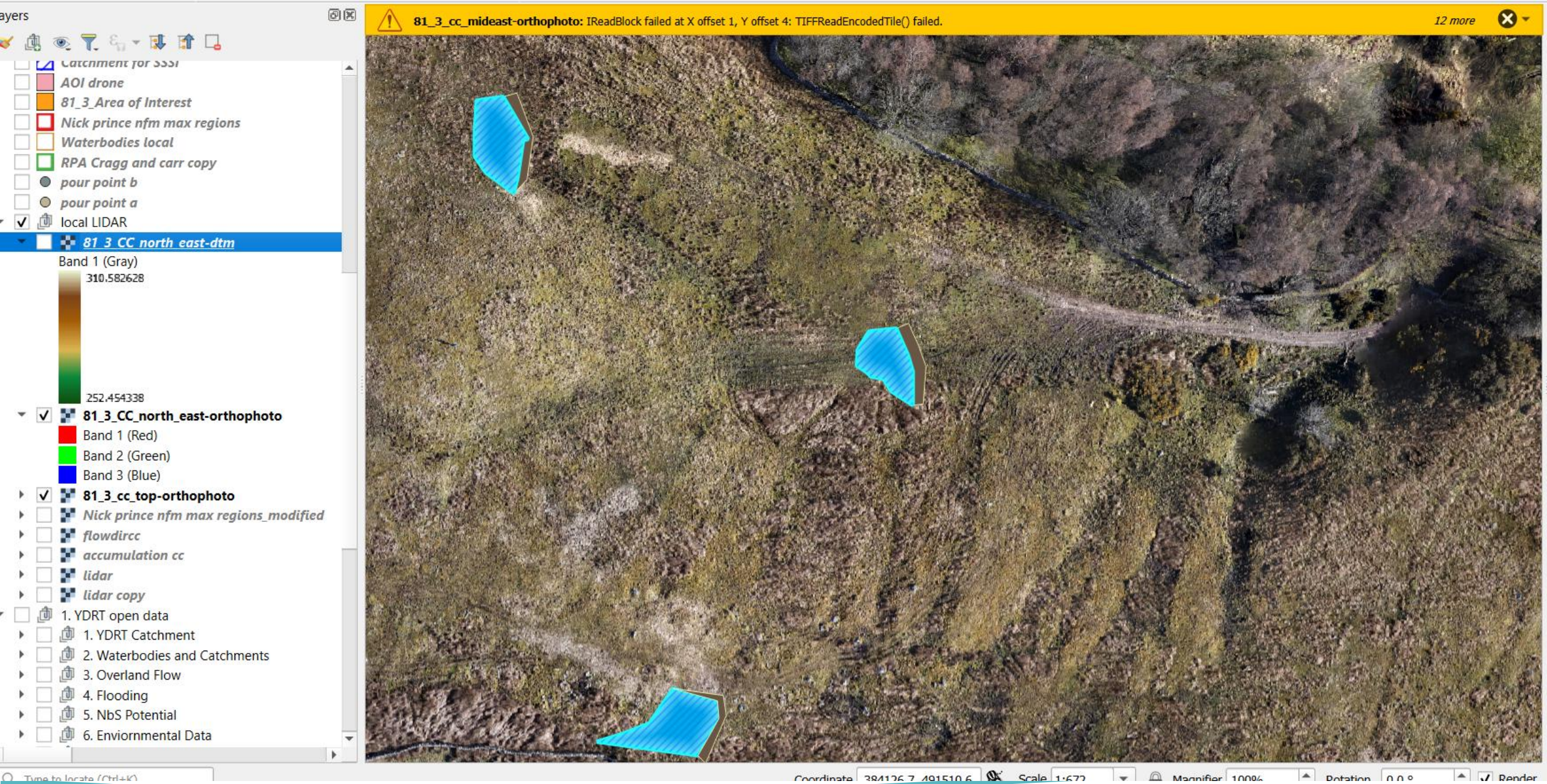
Processing Node:	node-odm-1 (manual)
Options:	dsm:true, fast-orthophoto:true
Disk Usage:	2.37 Gb
Task Output:	On Off

Cancel | Delete

81_3_CC_north_east — 119 — 00:03:52 — Completed

81_3_cc_mideast — 216 — 00:13:08 — Completed

Task ID:	be27a0c0-71d2-4a7d-8974-f32e4b731d5c
Created on:	15/04/2026, 08:58:25
Options:	auto-boundary:true, dtm:true, fast-orthophoto:true
Average GSD:	1.27 cm
Area:	70,213.38 m²
Points:	217,668
Georeferencing:	GPS
CRS:	WGS 84 / UTM zone 30N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Band 2 (Green)
Band 3 (Blue)
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Nick prince nfm max regions_modified
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1. YDRT open data
1. YDRT Catchment
2. Waterbodies and Catchments
3. Overland Flow
4. Flooding
5. NbS Potential
6. Enviornmental Data
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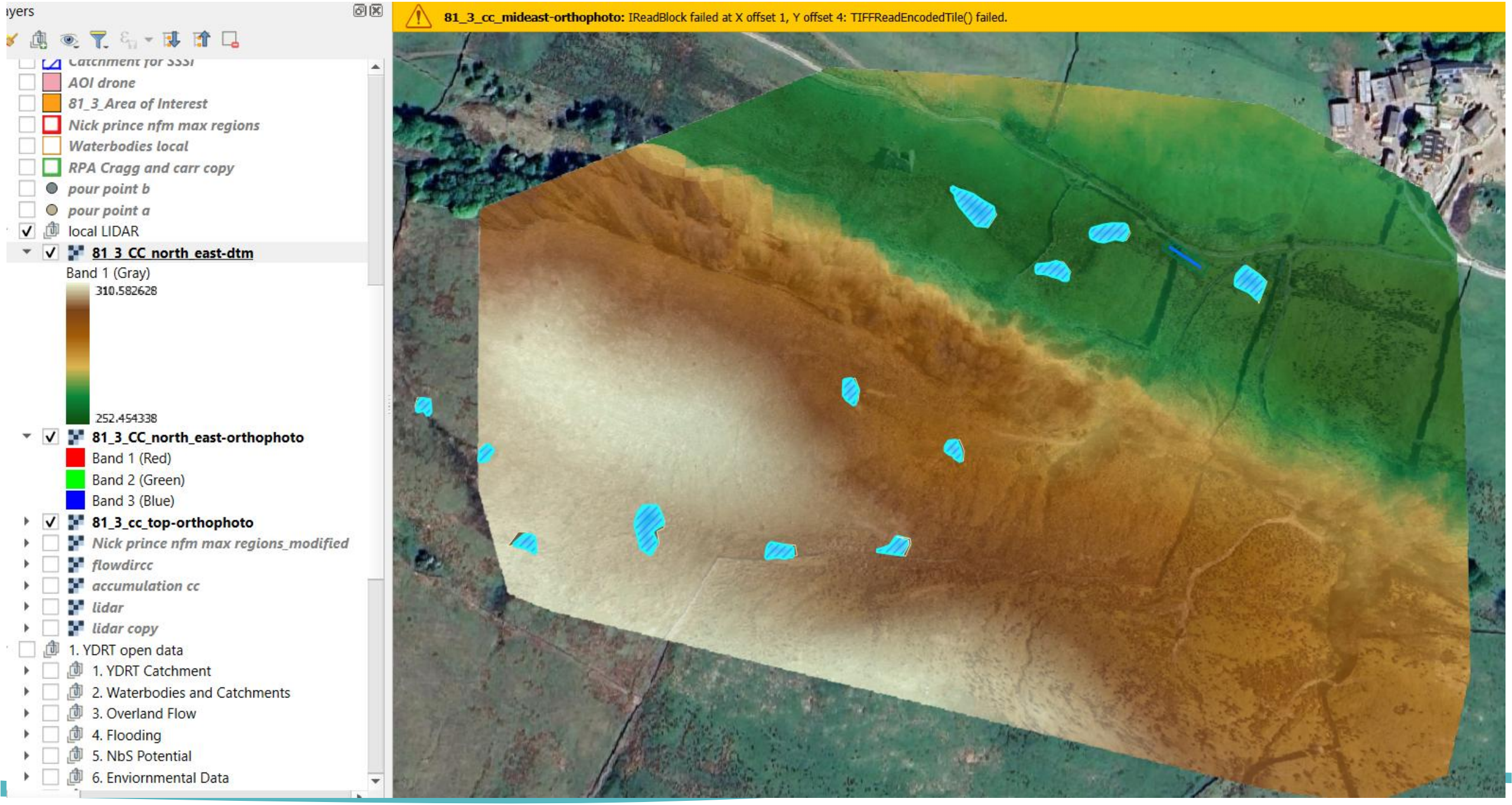
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AOI drone
81_3_Area of Interest
Nick prince nfm max regions
Waterbodies local
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81_3_CC_north_east-orthophoto
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
81_3_cc_top-orthophoto
Nick prince nfm max regions_modified
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1. YDRT open data
1. YDRT Catchment
2. Waterbodies and Catchments
3. Overland Flow
4. Flooding
5. NbS Potential
6. Enviornmental Data

Project designed Plugins

Patrick Lane (YDRT) designed 3 QGIS plugins

TreeCost

- **What it does:**

Calculates **costs for tree planting, hedging, fencing, and fence removal**

Outputs: total costs, detailed breakdown (trees, guards, posts, etc.), writes results to attribute table + CSV export

StorageCalc

- **What it does:**

Calculates **storage volume of scrapes / ponds** and assigns a **cost per feature**

Outputs:

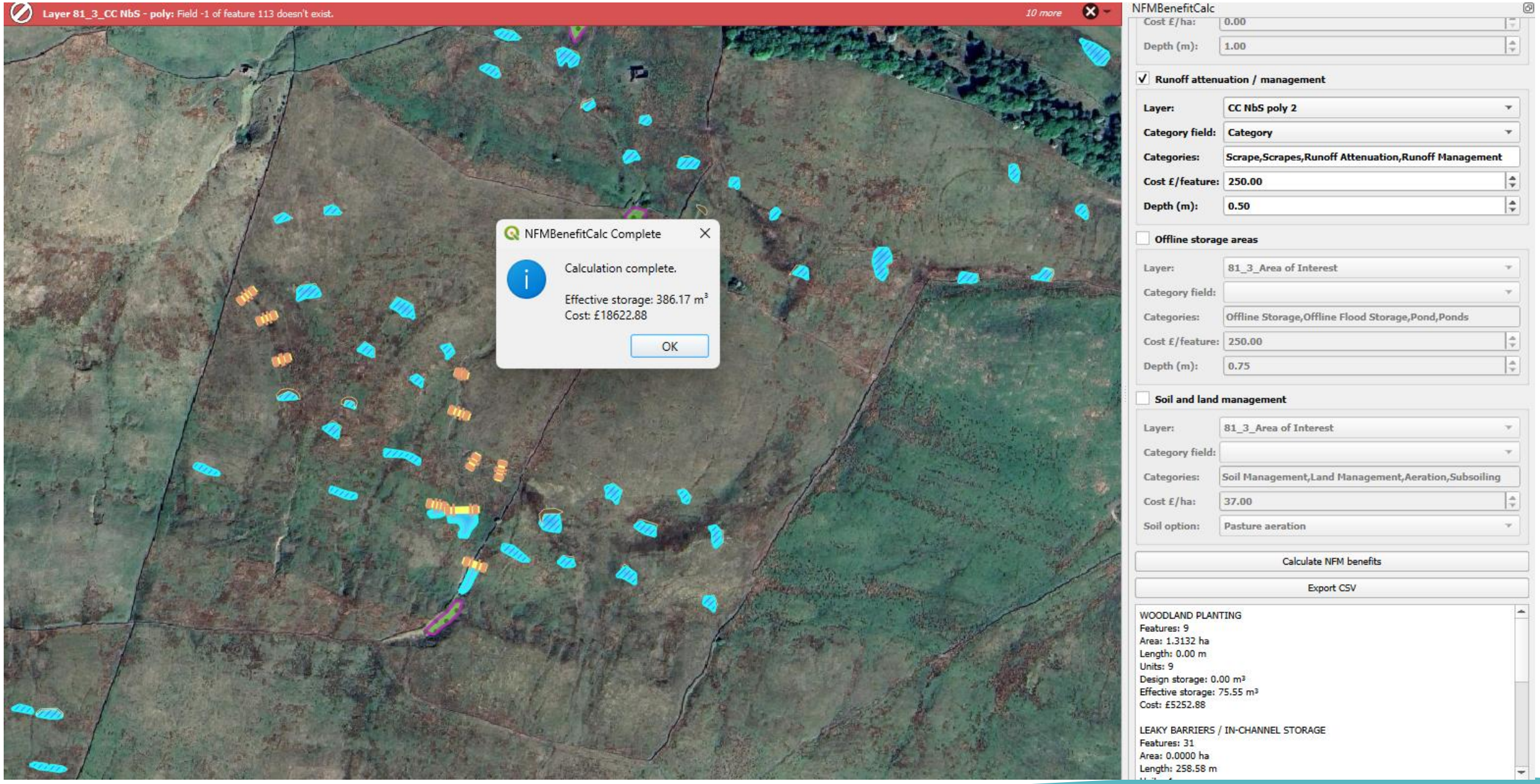
per-feature volume + cost, project totals, attribute fields + CSV export

NFMBenefitCalc

- **What it does:**

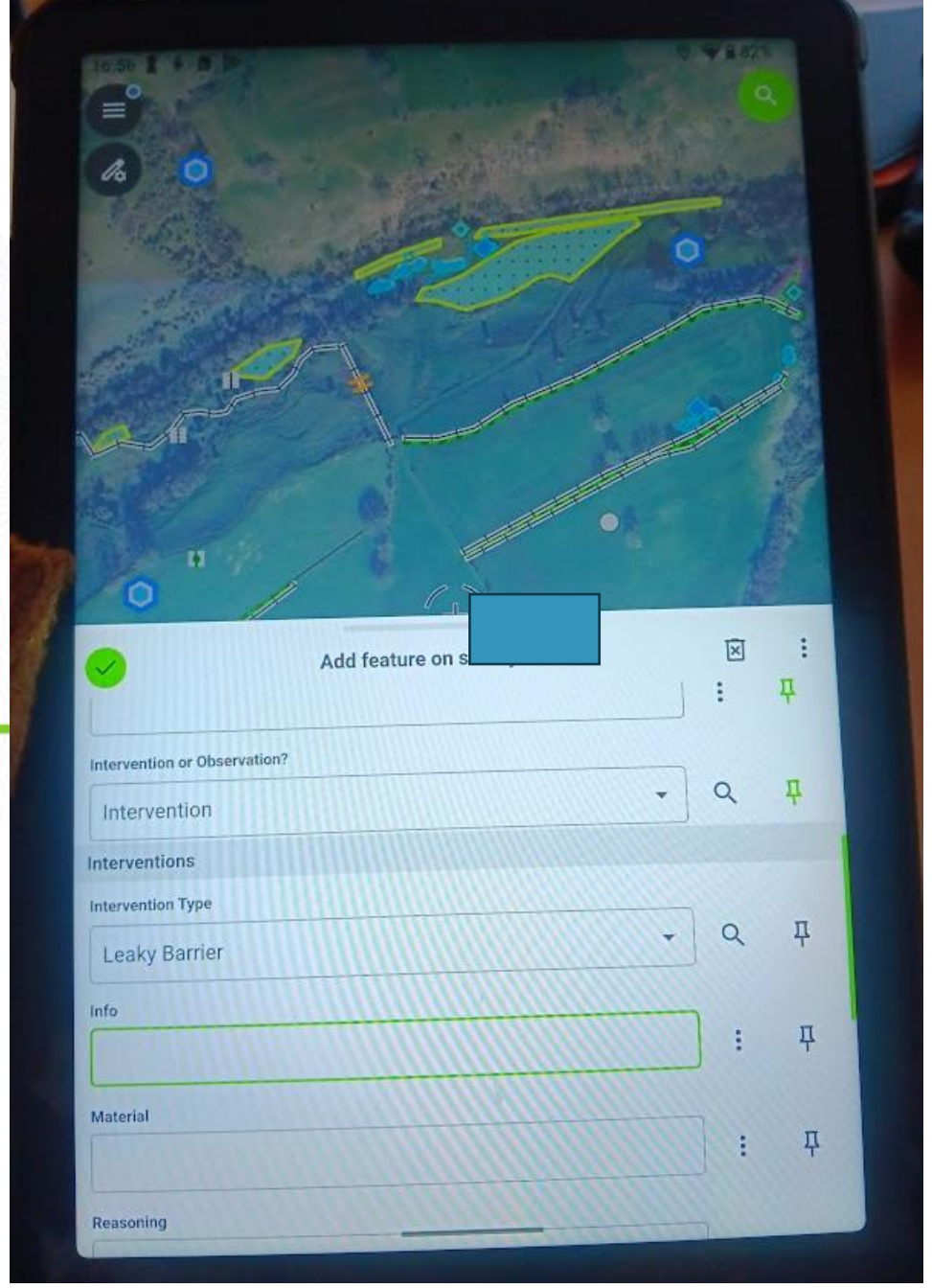
Calculates **flood mitigation effectiveness + costs** for NFM interventions

Outputs: effective storage (m^3), total cost, attribute fields + CSV export

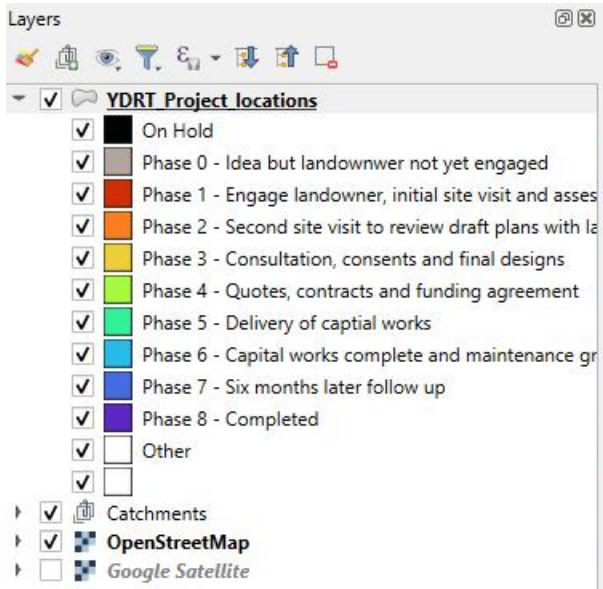

Layer 81_3_CC NbS - poly: Field -1 of feature 113 doesn't exist.
10 more
NFMBenefitCalc Complete
Calculation complete.
Effective storage: 386.17 m³
Cost: £18622.88
OK
NFMBenefitCalc
Cost £/ha: 0.00
Depth (m): 1.00
Runoff attenuation / management
Layer: CC NbS poly 2
Category field: Category
Categories: Scrape,Scrapes,Runoff Attenuation,Runoff Management
Cost £/feature: 250.00
Depth (m): 0.50
Offline storage areas
Layer: 81_3_Area of Interest
Category field:
Categories: Offline Storage,Offline Flood Storage,Pond,Ponds
Cost £/feature: 250.00
Depth (m): 0.75
Soil and land management
Layer: 81_3_Area of Interest
Category field:
Categories: Soil Management,Land Management,Aeration,Subsoiling
Cost £/ha: 37.00
Soil option: Pasture aeration
Calculate NFM benefits
Export CSV
WOODLAND PLANTING
Features: 9
Area: 1.3132 ha
Length: 0.00 m
Units: 9
Design storage: 0.00 m³
Effective storage: 75.55 m³
Cost: £5252.88
LEAKY BARRIERS / IN-CHANNEL STORAGE
Features: 31
Area: 0.0000 ha
Length: 258.58 m

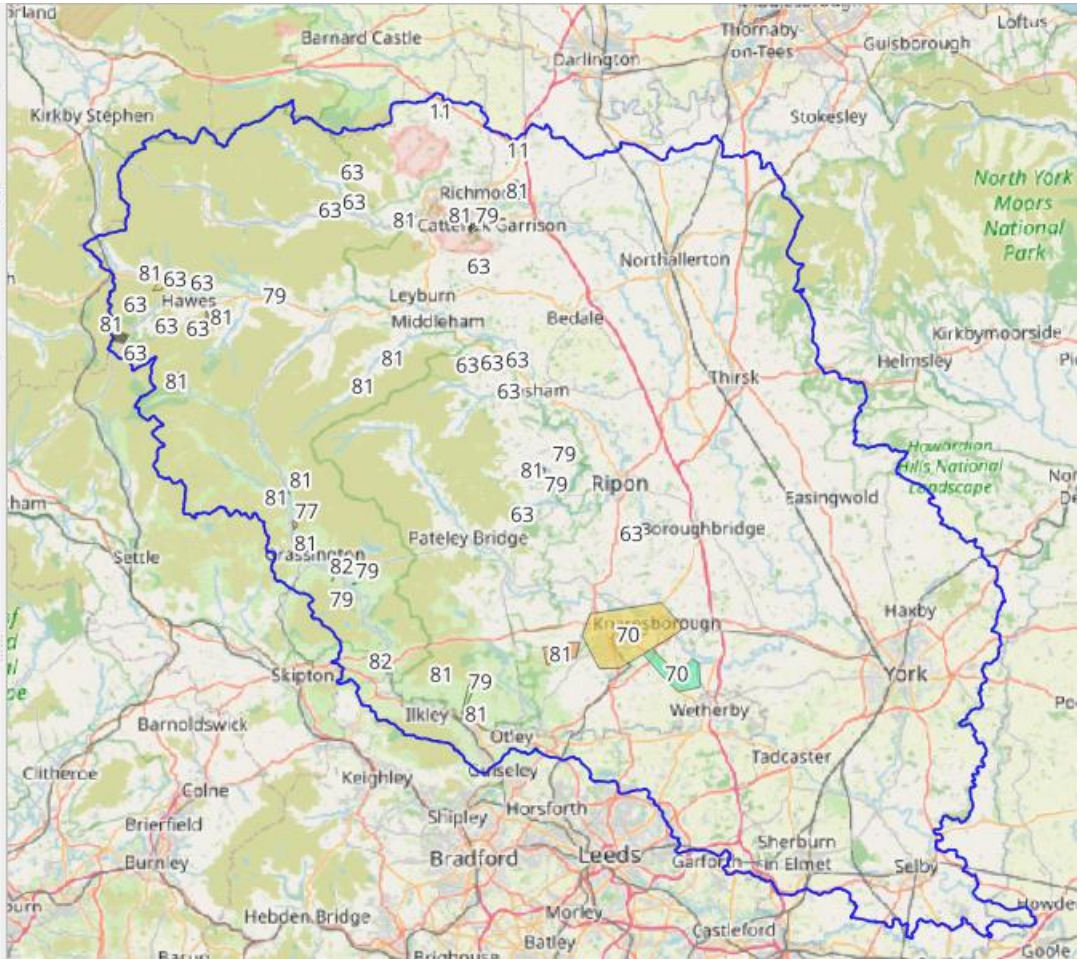
QField
for QGIS

QFieldCloud
by OPENGIS.ch



Internal Project Management





From the Riverbank to the Office, Turning Citizen Science into Real-Time Catchment Intelligence

Dr Sarah Taigel
Data, Evidence and Research Manager
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Norfolk Rivers Trust

The Wensum Data Platform (CaSTCo)

A custom Survey 123 app makes data collection straightforward and minimise error. CS can trigger a pollution report which is sent directly to the local EA land and water team (uses Make.com).

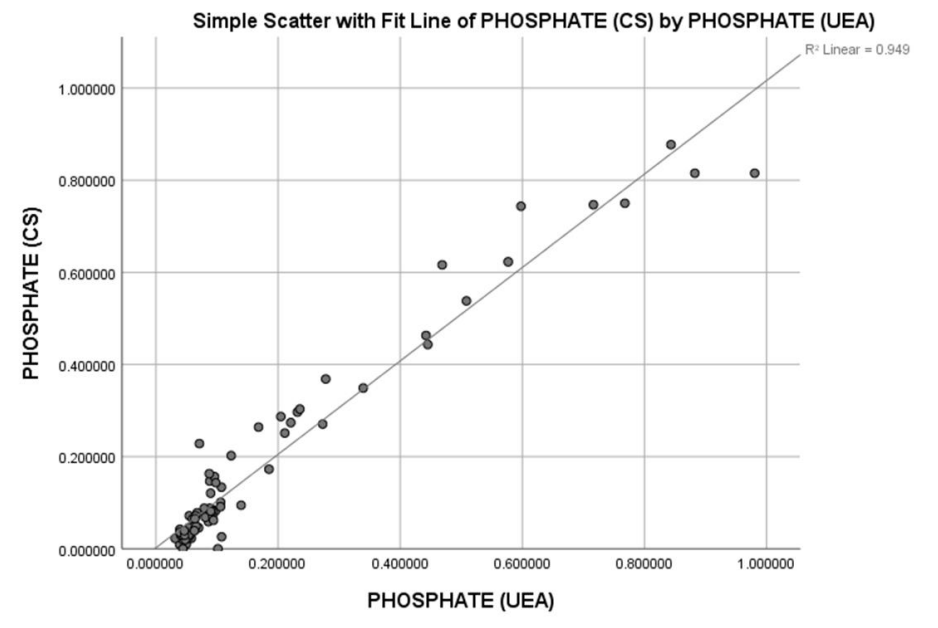
Training is provided by Wensum coordinator on both how to use the testing kit **and how to use the app.**

Data is stored within the NRT ESRI Cloud environment, permissions are set to ensure different groups of stakeholders get the right data.

Data is accessed via AGOL tools such as Experience Builder, Dashboard, Instant Apps - the data can also be exported as raw data, or (using desktop GIS) as custom graphs combined with other datasets.

Stakeholders within partnerships, agencies, CS themselves can all access the data to deliver change.

Validation → Trust



Results from CS Phosphate measurements compared to independent laboratory (UEA)

We trust our citizen scientists (training and regular QC of kit and methods)

The citizen scientists trust the system we have developed to reflect their observations

Regulators trust the data and act on it because it is validated and transparent

Norfolk Rivers Trust

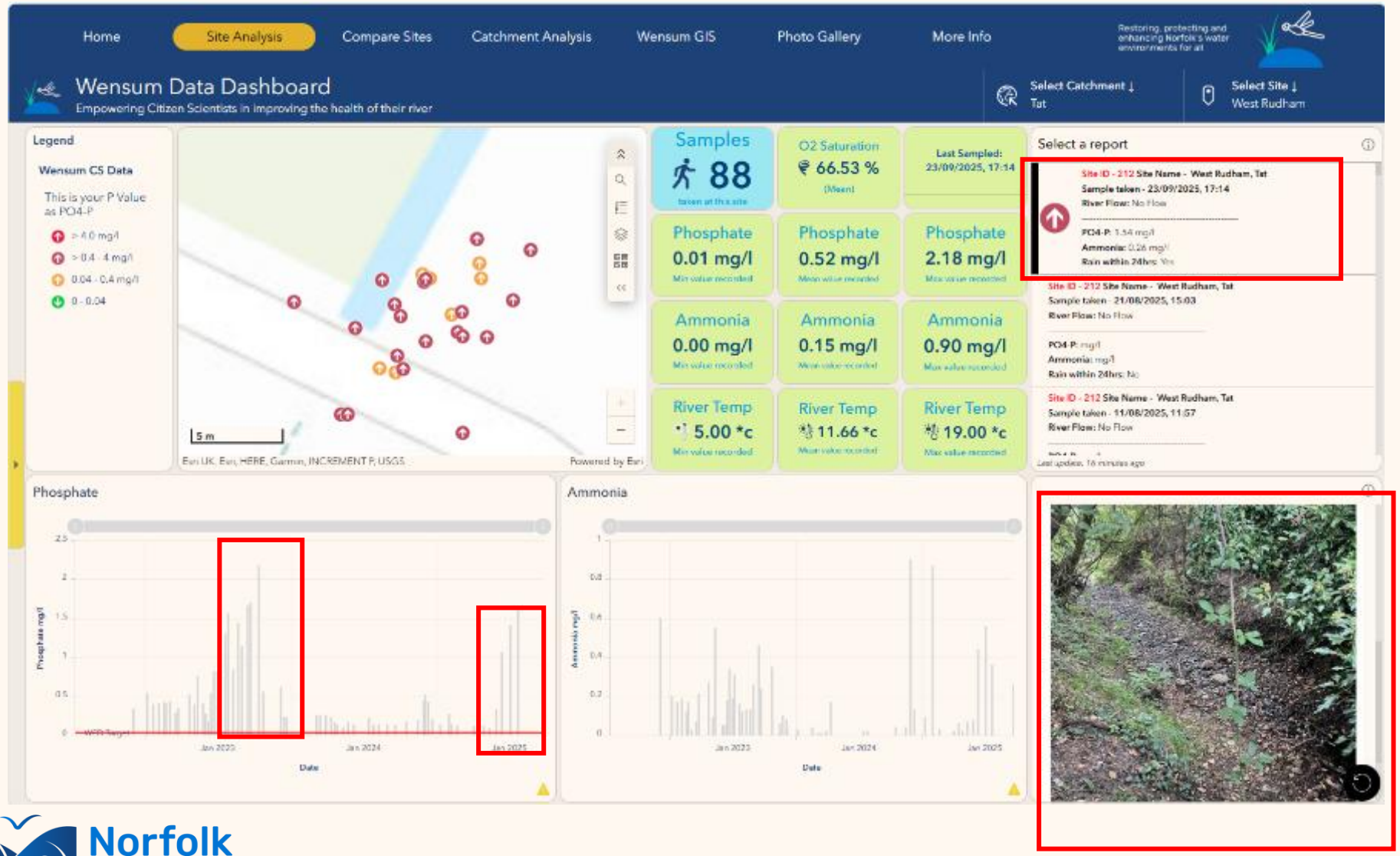
Insight 1 – Tat Catchment

Trib of the River Wensum (SSSI, SAC, SPA)

Issue – Phosphate Pollution

- Regulator accepts data, reminds owners of PTW and septic tanks in area of proper maintenance regime.
- Phosphate levels fall and stay down for months
- Another increase is seen but checking the photo attached to the report this is due to drought and lack of dilution.

Site Analysis



Regulator trusts data and send reminder to nearby properties to maintain septic tanks – nutrient levels fall

Nutrient level rises again but by reviewing the record details and the photograph it is evident that the stream is dry and not diluting the nutrients from the outfall

Norfolk Rivers Trust

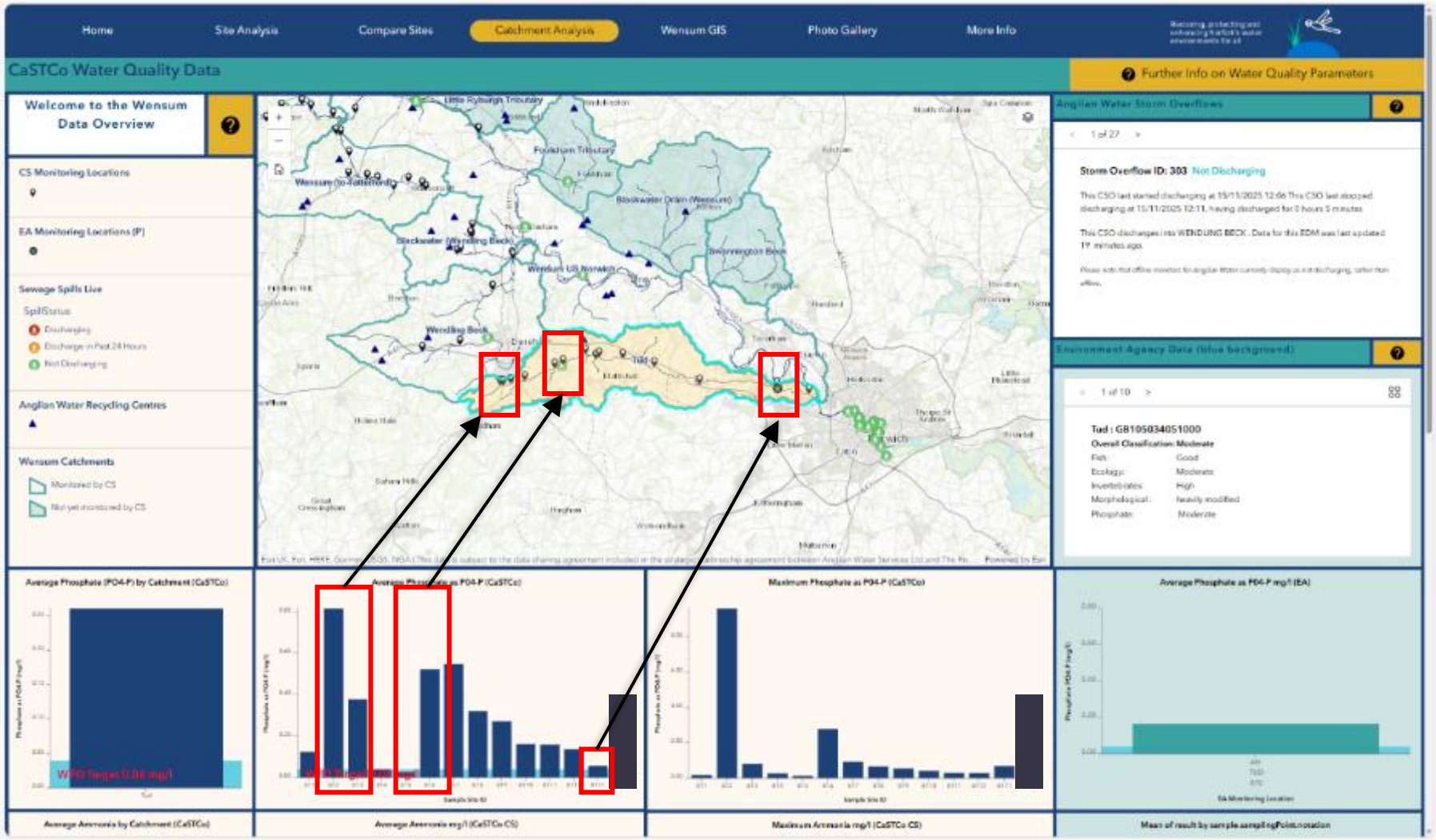
Insight 2 – Tud Catchment

Trib of River Wensum (SSSI, SAC, SPA)

Issue – Multiple Phosphate Sources

- The Tud has one EA monitoring site at the bottom of the catchment – the 12 month mean of this site for Phosphate is 0.16 mg/l – exactly the same as the Citizen Scientists 12 month average at the same site
- There is one Riverfly testing site – also at the bottom of the catchment
- To improve the water quality, secure investment and design interventions better understanding of the point sources of pollution is required

Catchment Analysis



The EA testing point at the bottom the catchment does not give a true picture of the water quality along most of the river

There is a serious ongoing pollution impact in the headwaters which would not otherwise have been picked up

The impact of the STW outfall on water quality

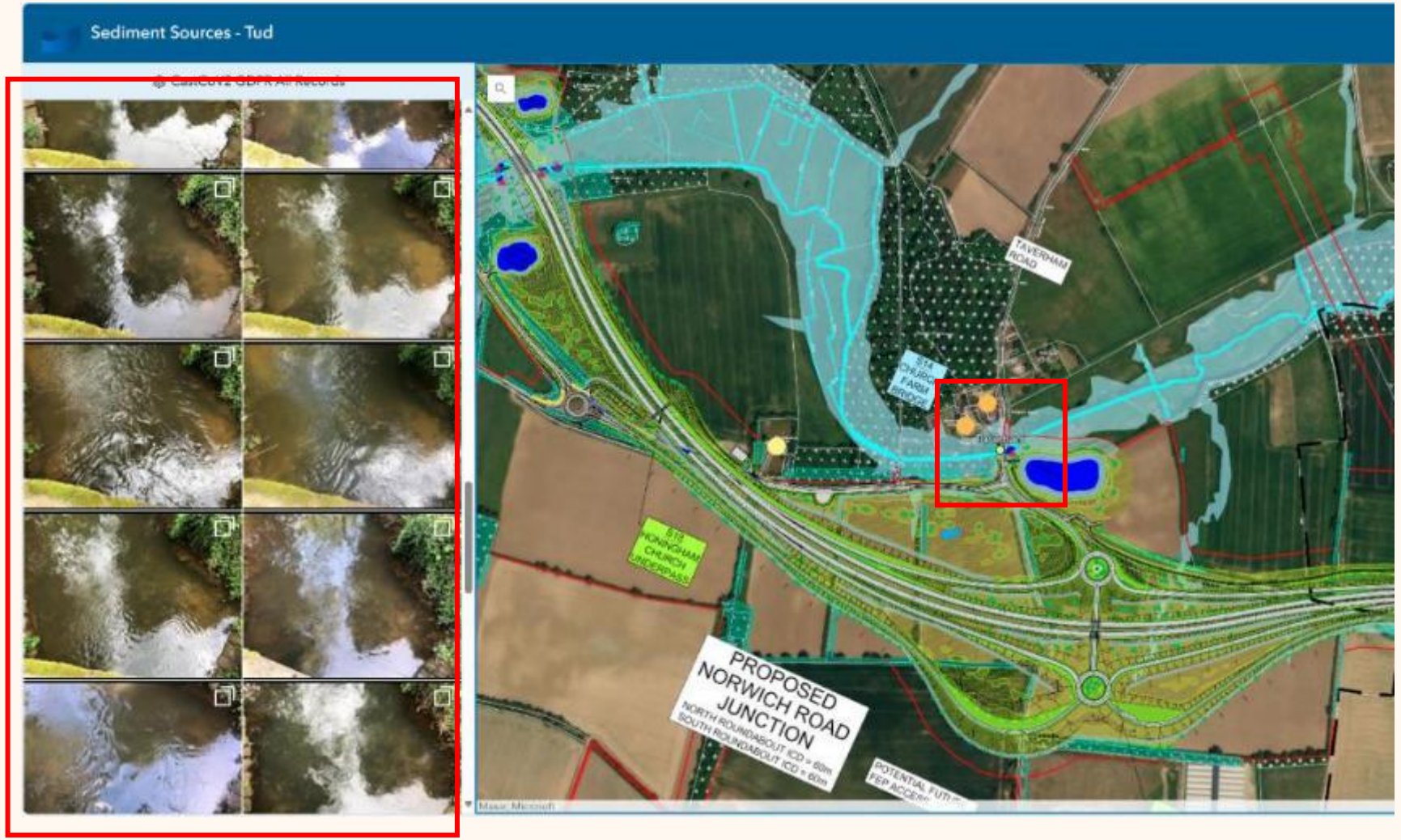
Insight 3 – Tud Catchment

Trib of River Wensum (SSSI, SAC, SPA)

Issue – Increase in Sediment affecting river health

- £300m upgrade along a 8.9 km stretch of the A47 between North Tuddenham and Easton
- Almost the entire length of the Tud Catchment
- Alongside WQ data the Wensum data collection protocol includes taking a photo
- This visual record can be accessed via an instant app to show the movement of sediment across the catchment over time

Fixed Point Photography (Instant App)



On the map the user can zoom to a monitoring location, here the construction drawing for the highways work has been overlain as a separate feature layer to provide additional information.

The photos associated with that location are shown in date order in the panel on the left, clicking on them will bring up all the record details – its very clear that the outfall is loaded with sediment

What's next?

Flow monitoring

- Standardised citizen flow monitoring:
- Presence / absence of flow
- Focus on chalk stream headwaters
- Repeated observations over time
- Custom visualisation tool

The Wensum Data Platform has been developed with funding from Anglian Water and as part of the National CaSTCo project – it is publicly accessible

Thanks to my colleagues;
Elle Claiborn (Norfolk Rivers Trust)
John Findlay (Environment Agency)
Steve Lane (The Rivers Trust)

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