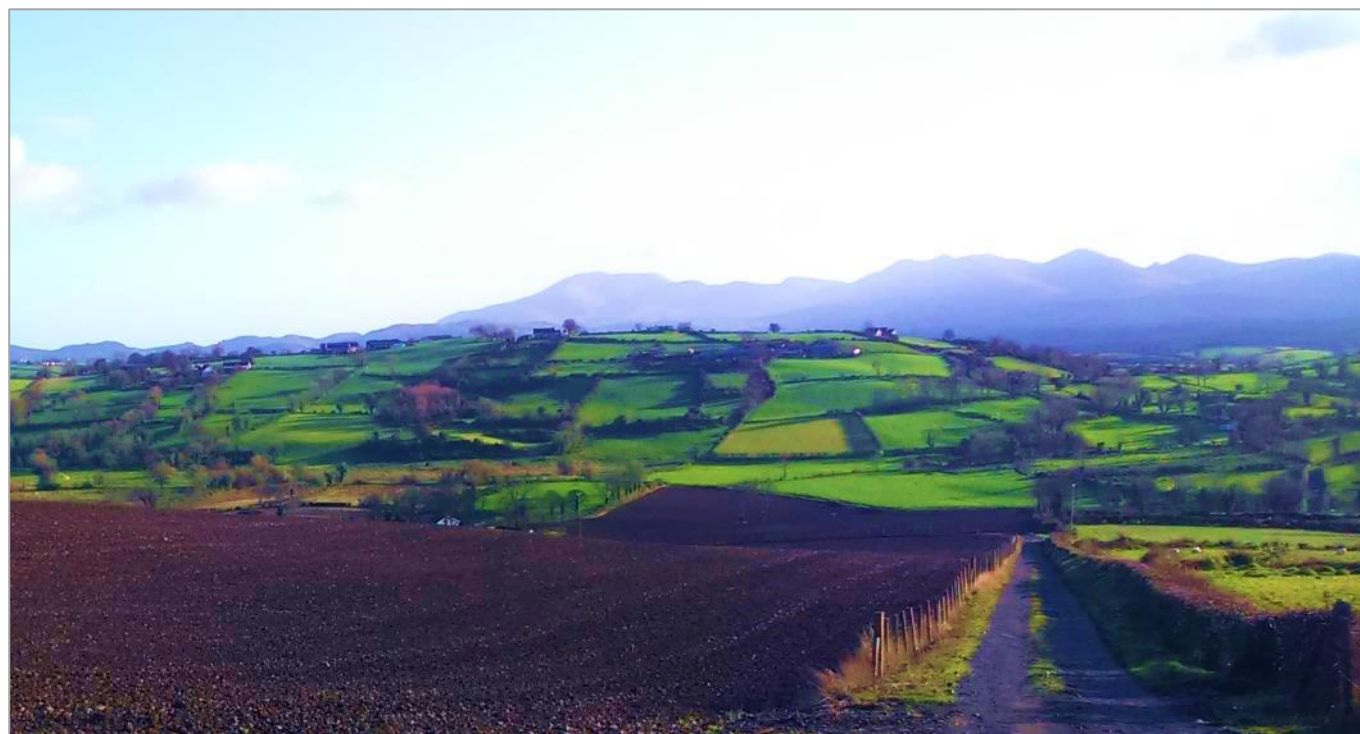


A Source: Pathway Prioritisation Index for diffuse P mitigation in agricultural catchments

SOIL NUTRIENT HEALTH SCHEME

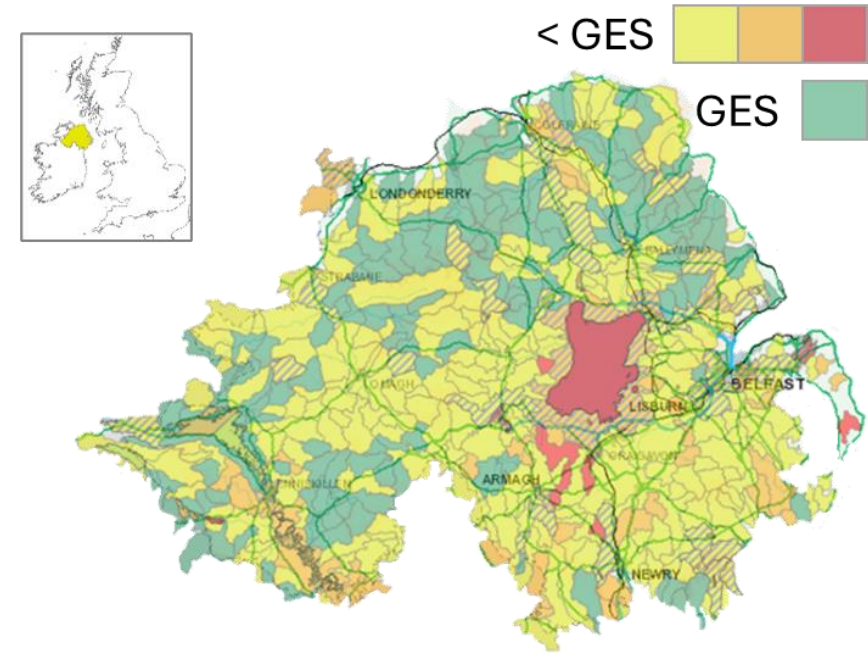


Rachel Cassidy, Thomas Service,
Kevin Atcheson, Luke Farrow, Taylor
Harrison, Alex Higgins, Paddy Jack,
Phil Jordan

Contact: catchments@afbini.gov.uk

Context

- 75% agricultural land cover, 95% grassland/livestock
- National P surplus (~11 kg P /ha/yr) driven by imports of concentrate feed & chemical fertiliser, low levels of soil testing & NMP.
- 70% of rivers at less than good ecological status (GES)
- Strong links between excess soil P and in-stream SRP concentrations
- Losses of P during rainfall events contribute majority of annual loads to rivers (via runoff pathways) – high interannual variability

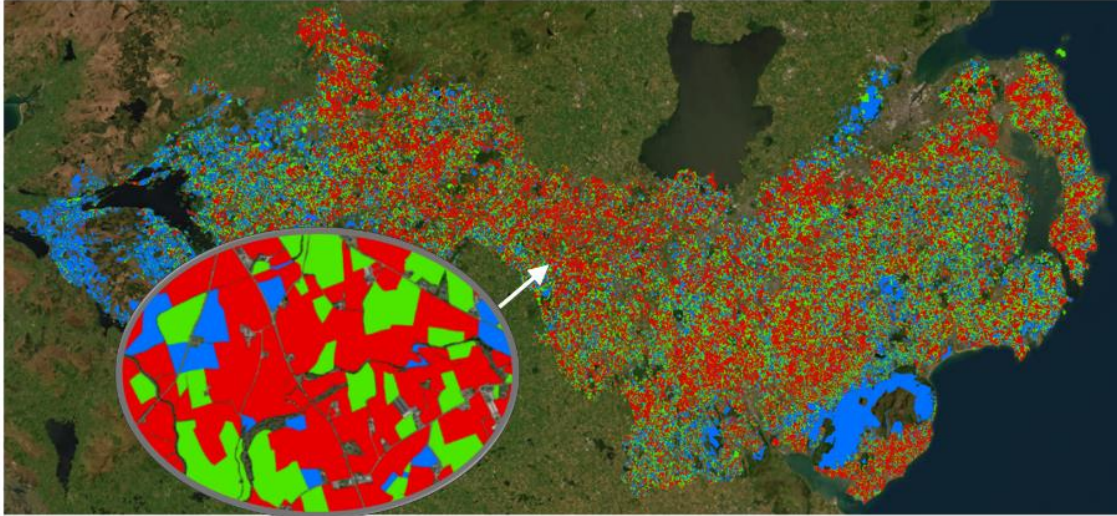


Action – Soil Nutrient Health Scheme – basis of developing BMPs for diffuse P mitigation

- A soil sampling and mapping programme to provide NMP support & focus mitigation across all agricultural land.
- Runoff risk mapped using Hydrologically Sensitive Area (HSA) approach

Source – Soil P

■ Above Optimum ■ Optimum ■ Below Optimum



Excess P in over 40% of fields sampled & susceptible to loss to water.

Pathway

Runoff Risk
■ Runoff most likely
■ Runoff likely
■ Runoff likely
■ Runoff likely
— Drainage Channel



Hydrological pathways – areas of high runoff risk during rainfall events.

Highest resolution data sets on SOURCE & PATHWAY risks **should** make FOCUSED mitigation possible.



High Soil P
surplus
+
Large upslope
runoff potential

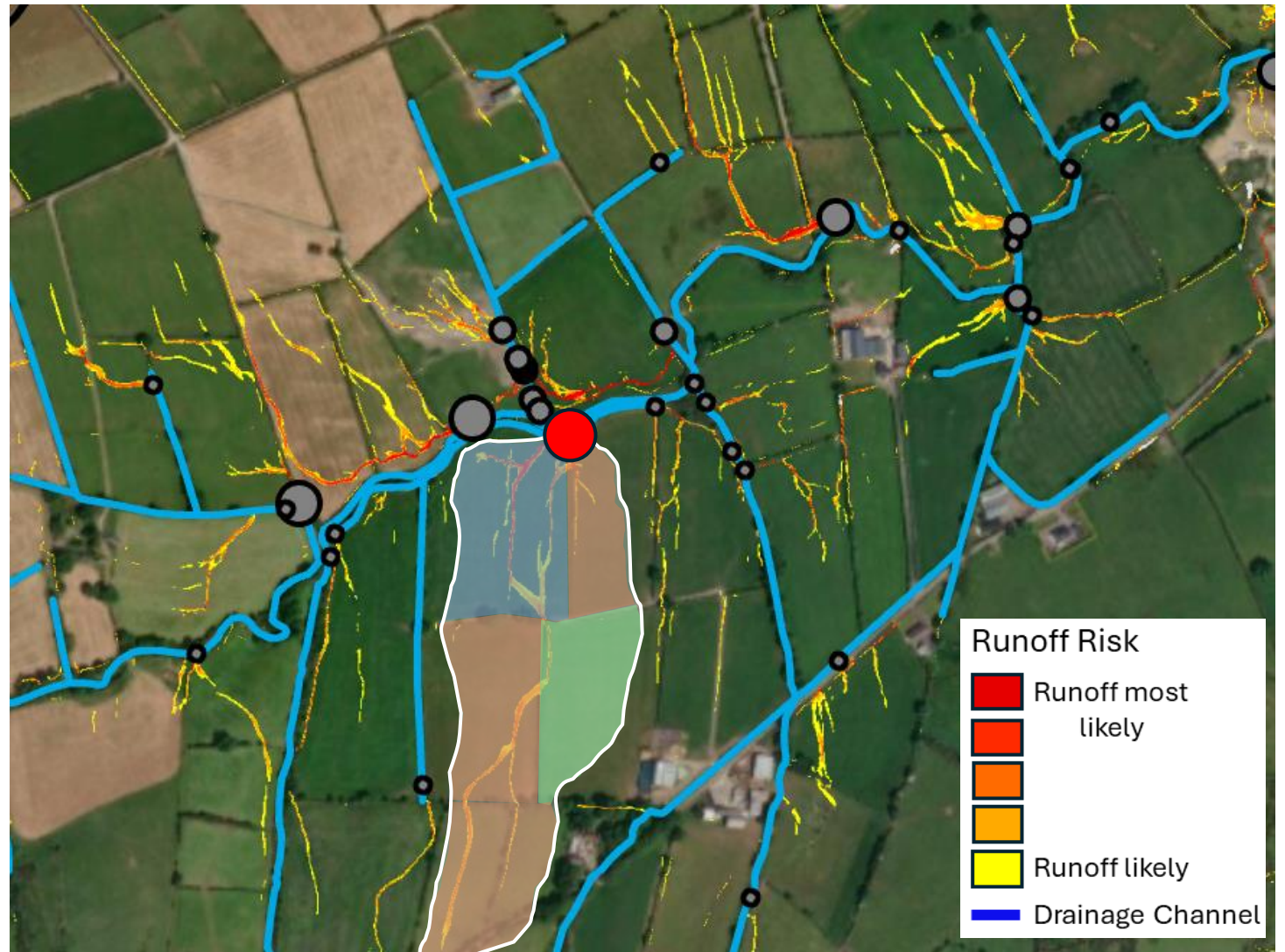
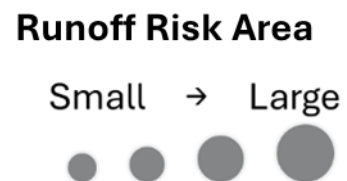
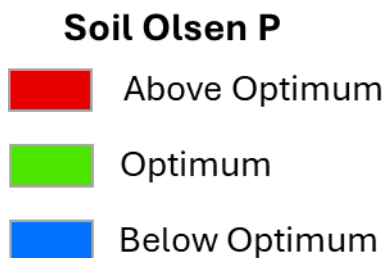
The Challenge:

- Soil and runoff mapping have identified **millions** of CSA for potential mitigation
- Policy makers, catchment managers and farmers need to prioritise €€€ for impact
- Sensitivities around use of SNHS field level data

Micro-catchment Scale

From each runoff interception point define catchment area draining to that point.

Attribute	Value
Contributing Area (m ²)	26,865
Runoff Risk Area (m ²)	6,138
AWMP (mg/L)	35.6
Combine Runoff factors & soil P Source factor to a dimensionless Source/Pathway Pressure Indicator (SPPI)	0-1



Delineate and assess micro-catchments for all runoff interception points in the catchment/region

Note: Soil mapping presented is for demonstration only

Combine runoff factors & soil P source factor to a dimensionless Source:Pathway Priority Indicator (SPPI) scaled between 0-1

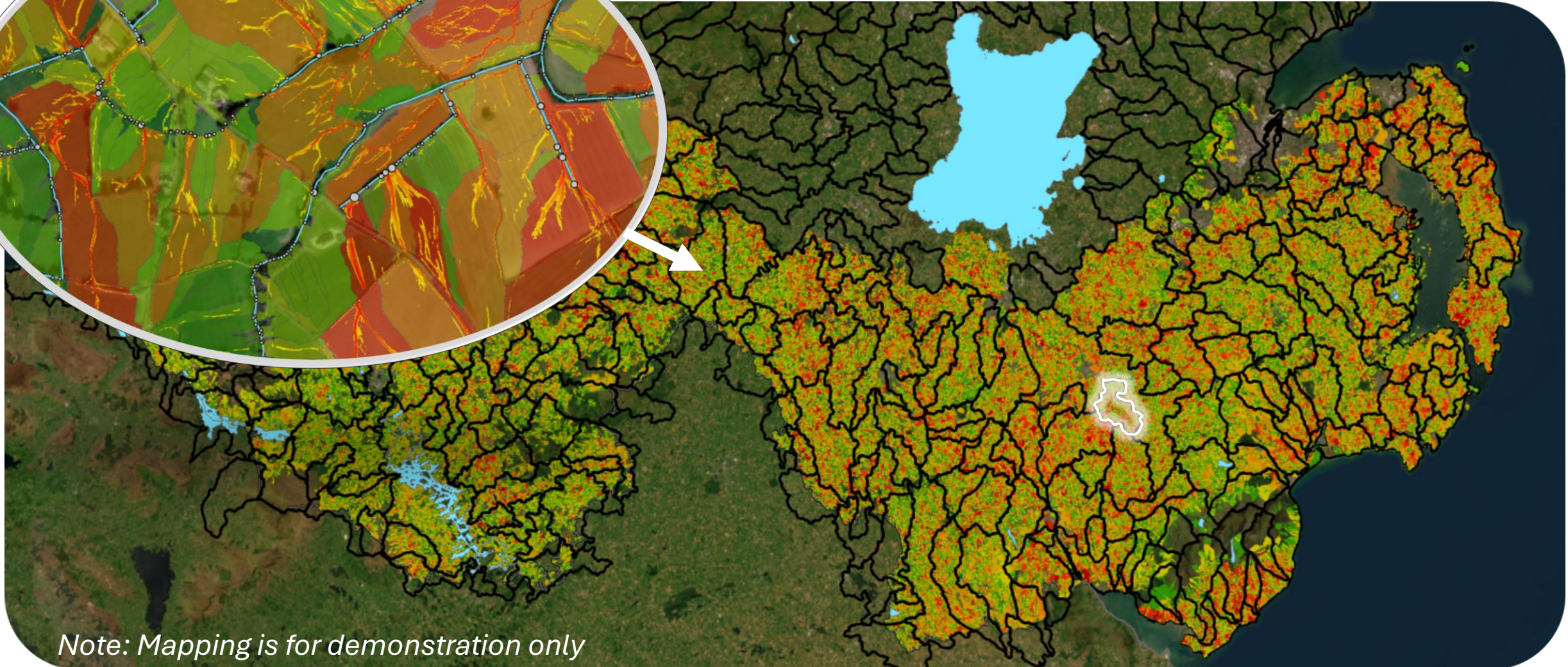
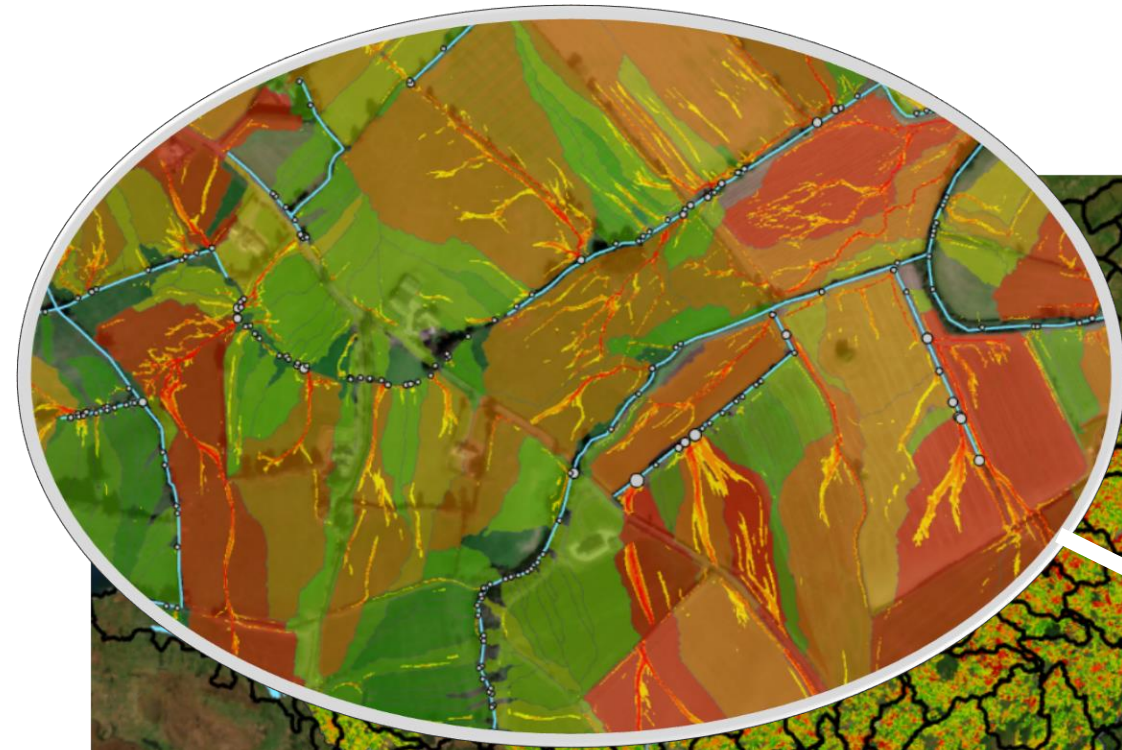
Weighting
0.5 : 0.5

Source

Pathway

$$SPPI = \frac{W_s(AWMP_i - AWMP_{perc5})}{AWMP_{perc95} - AWMP_{perc5}} + \frac{W_p(RR_i - Risk_{perc5})}{Risk_{perc95} - Risk_{perc5}}$$

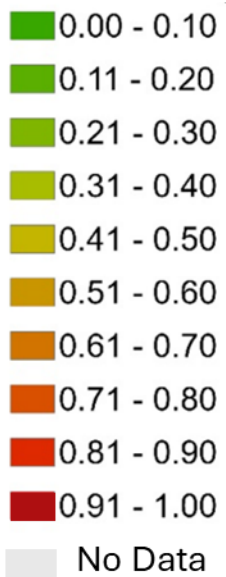
1,897,481 micro-catchments across Zones 1 & 2



Note: Mapping is for demonstration only

	Intensively Farmed Catchment
Catchment Area (km ²)	21.23 km ²
No. of Interception points/micro-catchments	5991 2.5/ha
SPPI >0.9	55 (<5%)

Dimensionless SPPI



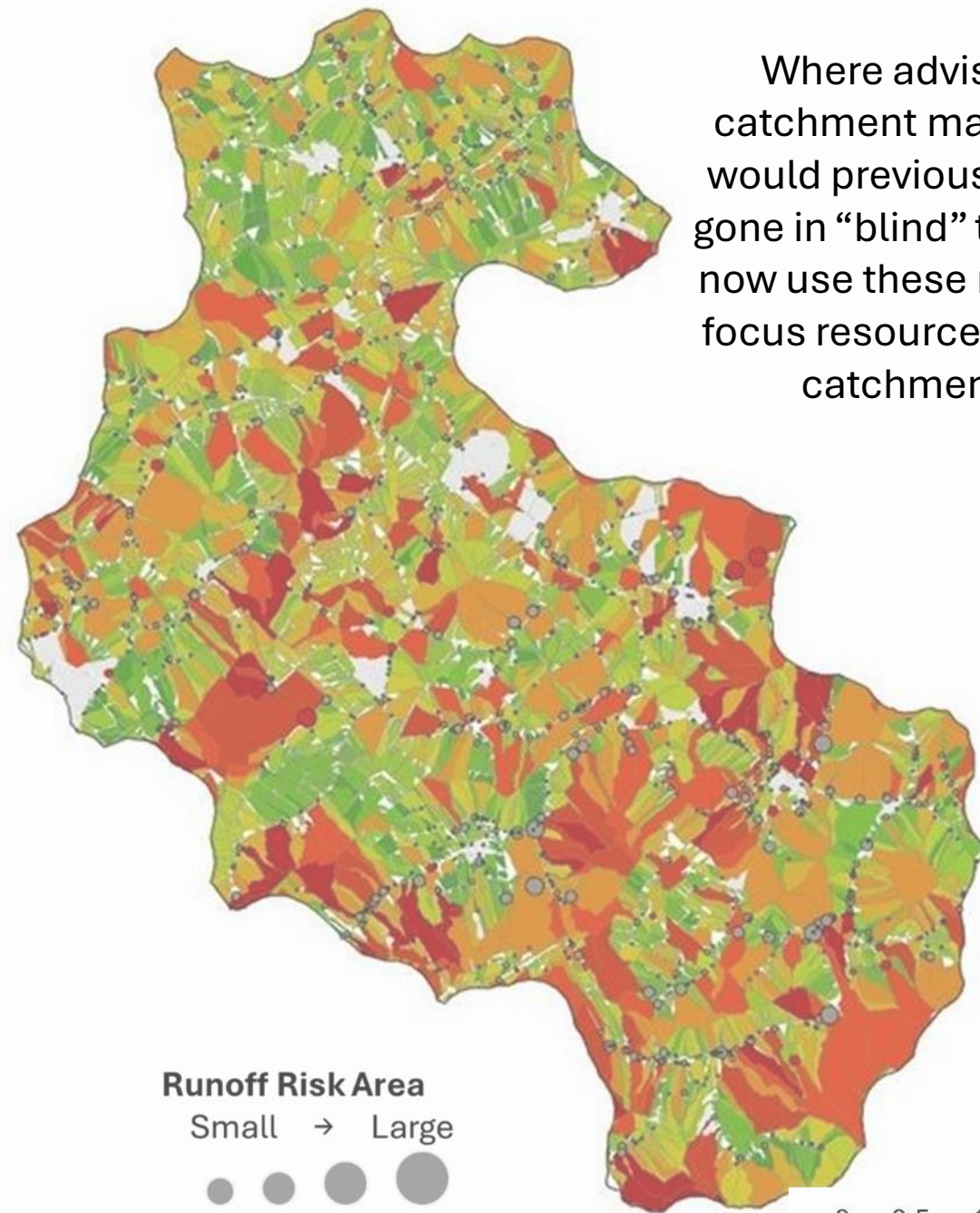
Target interventions in the highest SPPI areas first



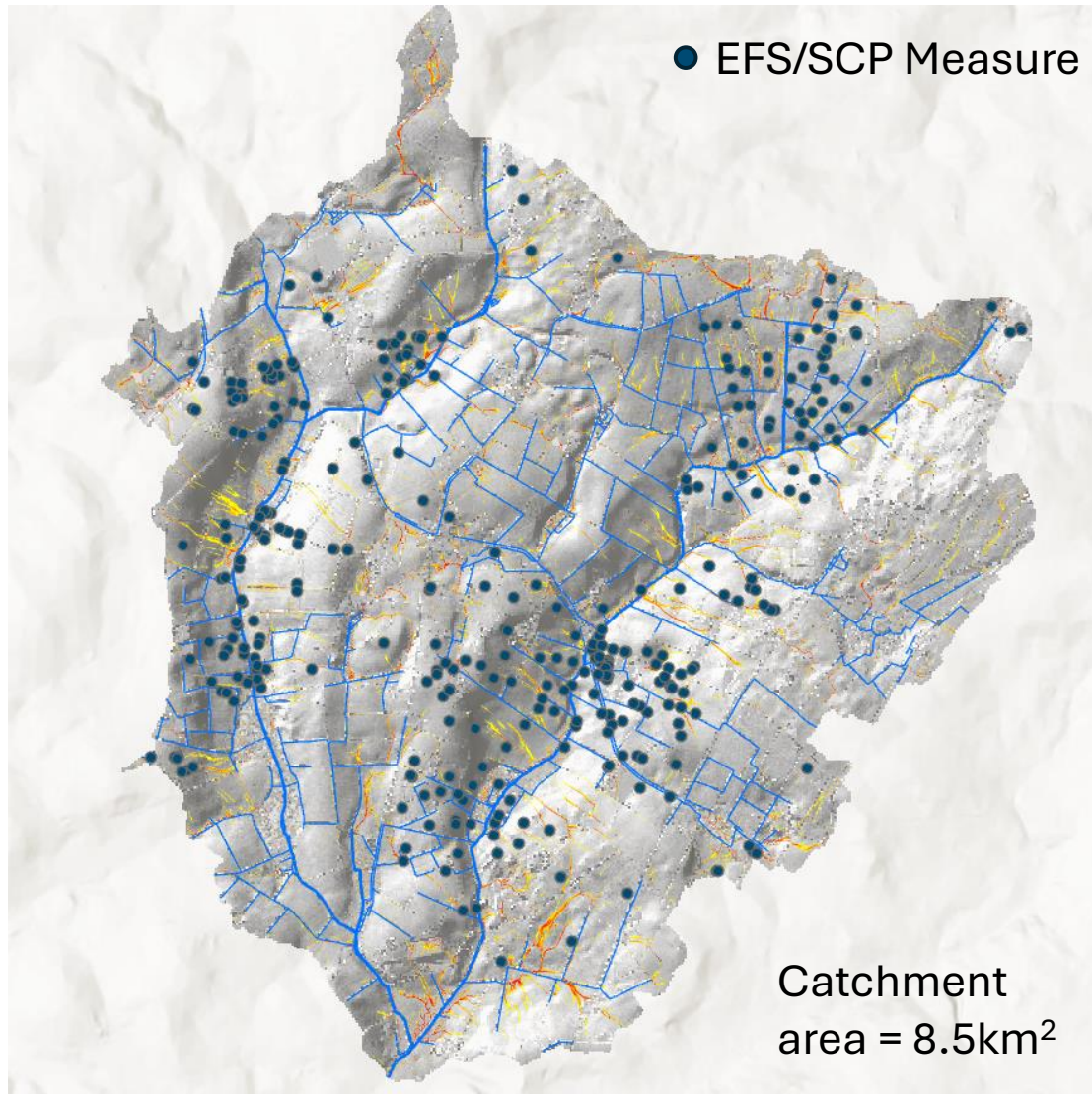
Monitoring/ Assess funding availability



Lower tiers

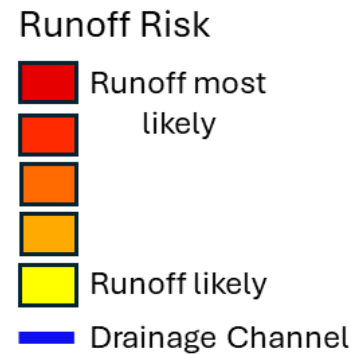


Where advisors/ catchment managers would previously have gone in “blind” they can now use these maps to focus resources within catchments



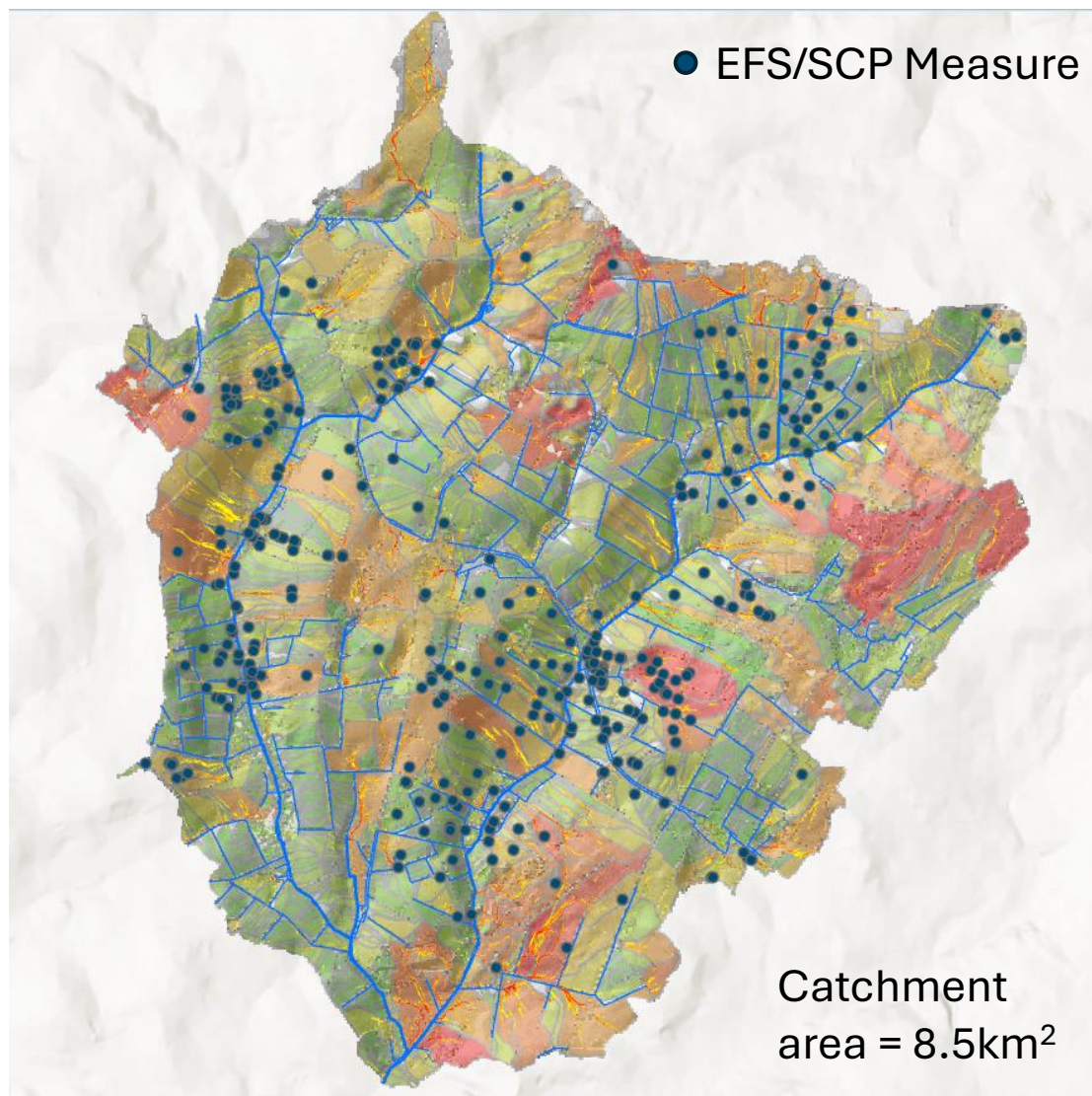
A **retrospective** look at a catchment where measures were installed.

Between 2020 and 2024 a Rivers Trust (eNGO) catchment advisor worked with farmers to install water protection measures associated with NI's Environmental Farming Scheme (EFS) & the Sustainable Catchment Programme.



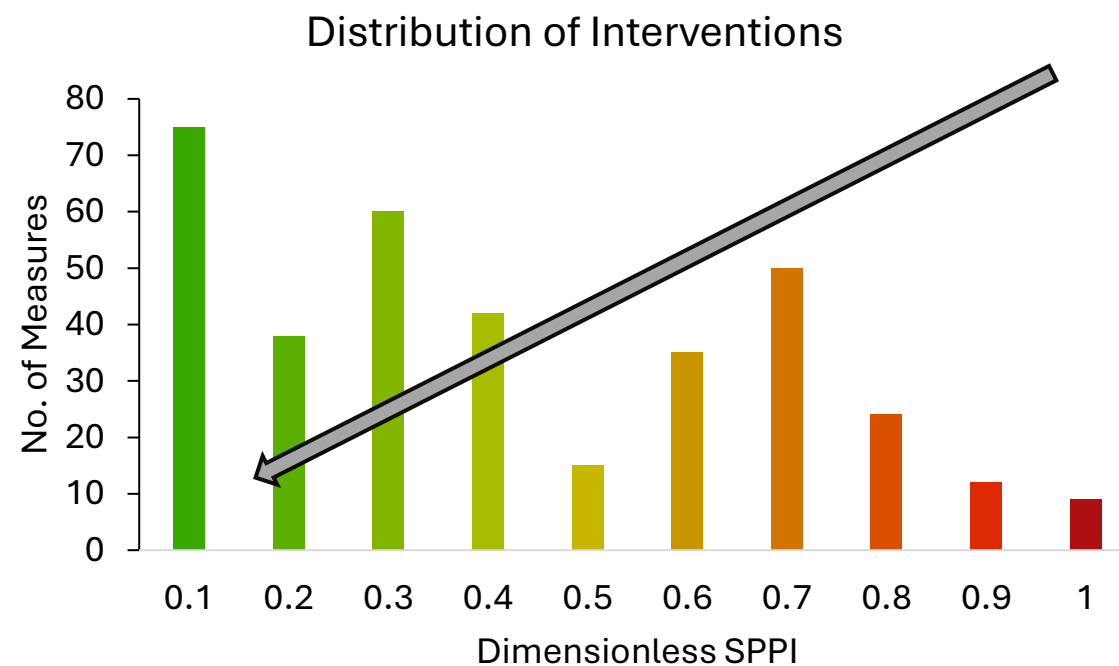
Measures:

- 2m riparian buffers (grass/planted with trees)
- 10 m riparian buffers (grass/planted with trees)
- Hedgerows across slopes

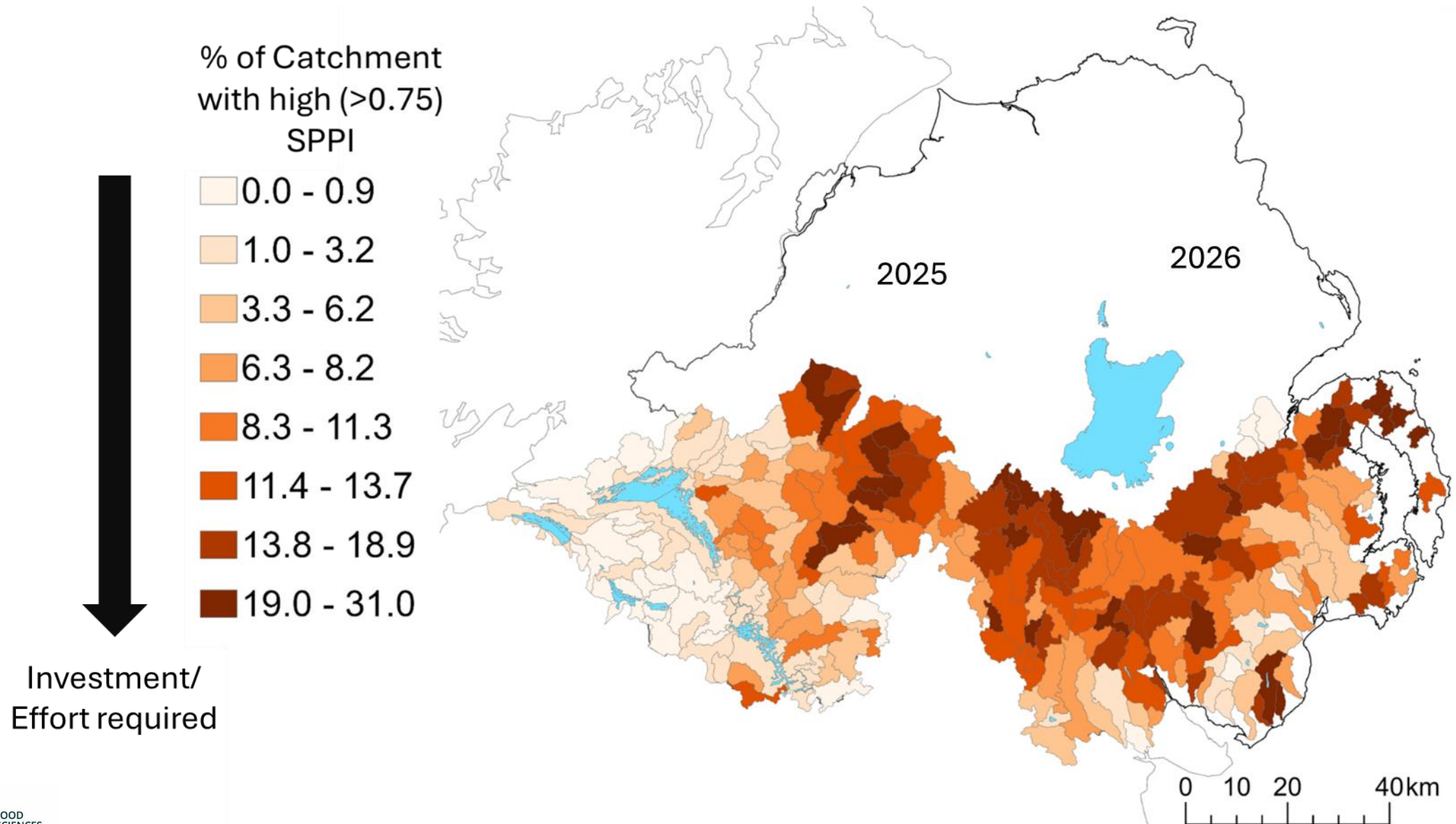


A **retrospective** look at a catchment where measures were installed.

Between 2020 and 2024 a Rivers Trust (eNGO) catchment advisor worked with farmers to install water protection measures associated with NI's Environmental Farming Scheme (EFS) & the Sustainable Catchment Programme.



Regionwide risk ranking of operations WFD monitoring catchments for diffuse P mitigation



SUMMARY

Combination and analysis of “big data” provides a whole-landscape risk ranking method

The Source:Pathway Priority Index (SPPI) can be weighted to highlight advisory priorities or runoff interception priorities as BMPs at all scales.

SPPI is dimensionless (0-1) and does not link directly to field/farm measurements.

Focusing on P SOURCE + PATHWAY ensures mitigations stay resilient in a changing climate.

Next steps – we now know ‘where first’, but ‘what’ needs to be refined.

How to operationalise (data sharing issues, on-the-ground issues) & need to monitor impact

afbi



**SOIL NUTRIENT
HEALTH SCHEME**

Read more here:

<https://doi.org/10.1016/j.watres.2025.123418>

