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CAFRE Slurry Management Open Days

January 2024

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Department of Agriculture, Environment and Rural Affairs
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Value of your Slurry

Aveen McMullan, Senior Technologist

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Nutrient content of slurry:

- Slurry a valuable resource not a waste
- Source of Nitrogen, Phosphate, Potash & other nutrients
- Factors affecting nutrient content of slurry

Dry matter – available nutrients

Dry matter	Nitrogen	Phosphate	Potash
%	**kg/m³** (units/1000 gallons)		
2	**0.6** (6)	**0.6** (5)	**1.5** (13)
6	**1.0** (9)	**1.2** (11)	**2.3** (20)
10	**1.4** (12)	**1.8** (16)	**3.0** (26)

Time & method of application

Available Nitrogen

Spring

- Dribble bar/trailing shoe

1.0 kg/m³ (9 units/1000 gallons)

- Splash plate

0.9 kg/m³ (8 units/1000 gallons)

Summer

- Dribble bar/trailing shoe

0.8 kg/m³ (7 units/1000 gallons)

- Splash Plate

0.7 kg/m³ (6 units/1000 gallons)

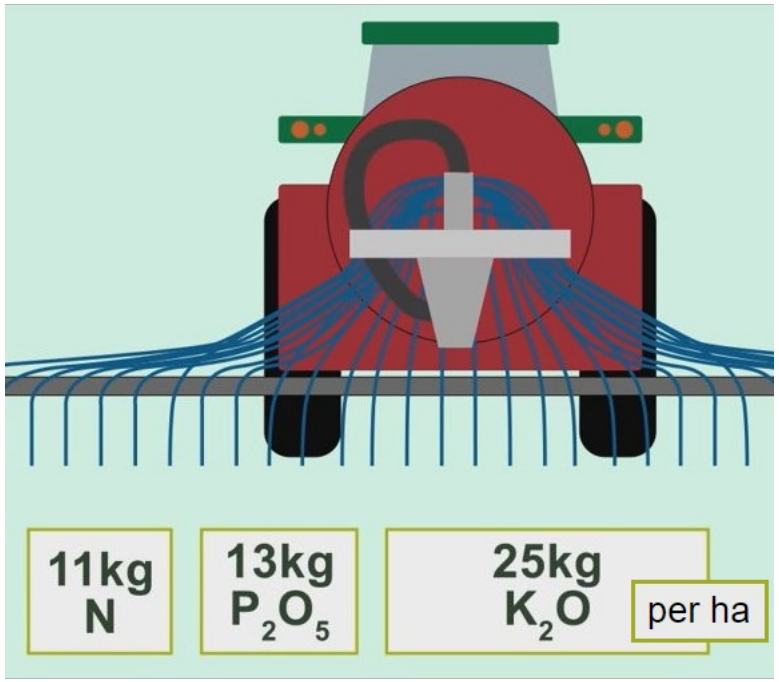
P Index

Available Phosphate

P Index 0 or 1	P Index 2- or above
0.6 kg/m^3 (5 units/1000 gallons)	**1.2 kg/m^3** (10 units/1000 gallons)

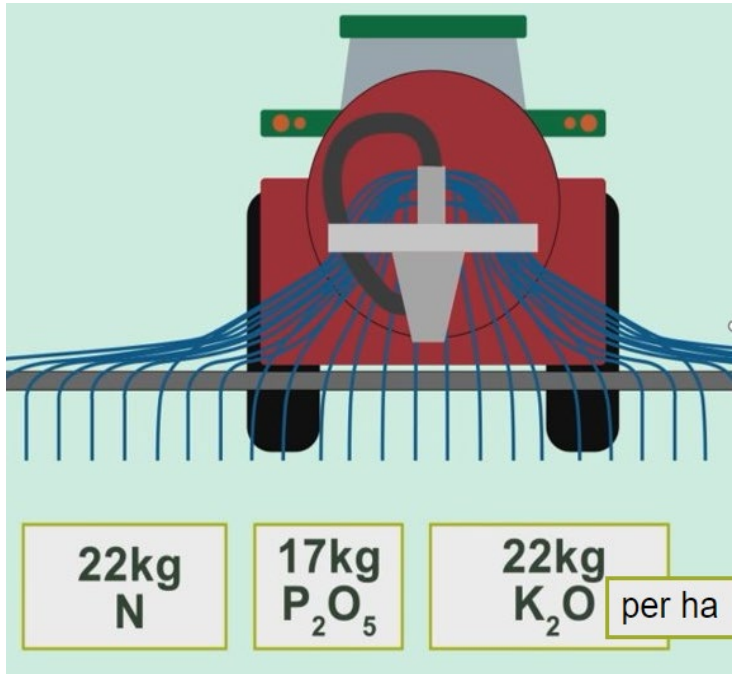
Nutrient Value of Manures

Cattle Slurry 6%DM
*11m3/ha (1000gal/ac)



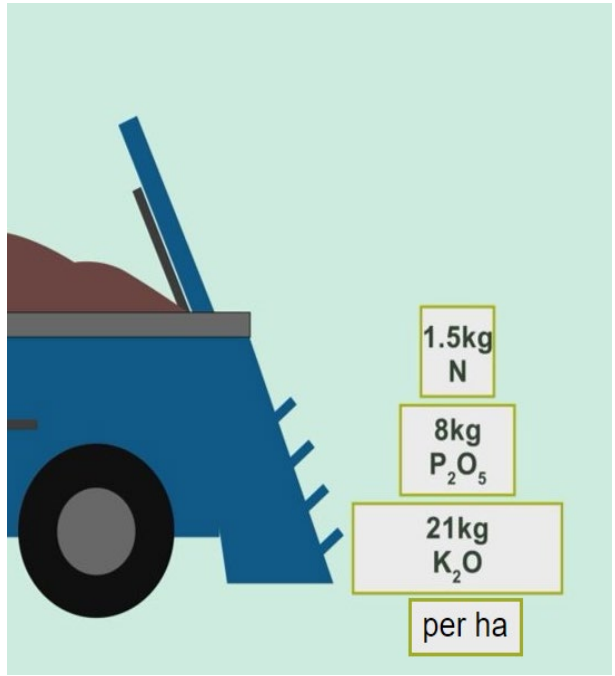
9 : 11 : 20

Pig Slurry 4%DM
*11m3/ha (1000gal/ac)



17 : 13 : 17

Cattle Farmyard Manure 25%DM
2.5t/ha (1t/ac)



1.2 : 6 : 17

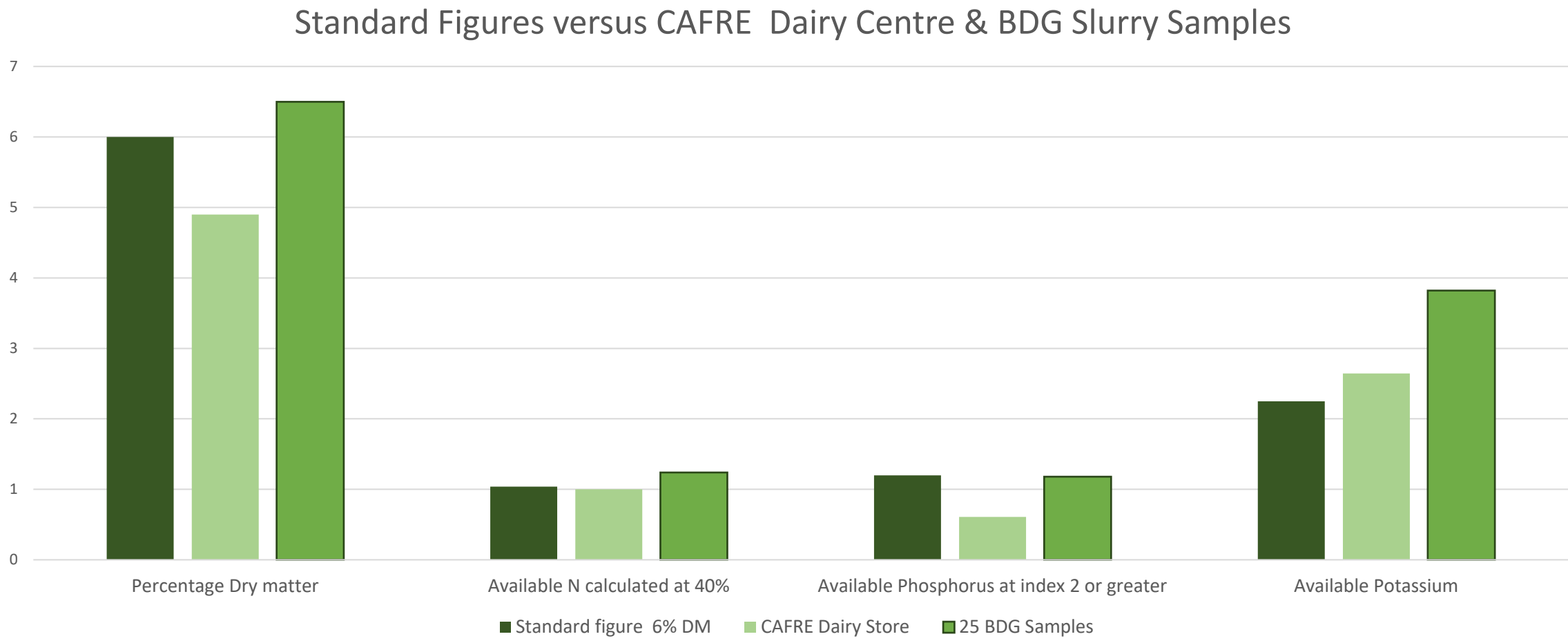
Equivalent bagged fertiliser units/ac

Applied in Spring, to P index 2- soil, *using LESSE

Slurry testing

- Sampling kits available at DAERA Direct offices
- Take samples with care
- Following agitation
- January – March

Slurry Analysis Comparison



How valuable is your slurry?

Example: Cattle slurry, 6% Dry Matter

First cut silage nutrient requirements

Soil Index	Crop Phosphate (P) requirement	3000 gallons/ac supplies	Balance after slurry application	Crop Potash (K) requirement	3000 gallons/ac supplies	Balance after slurry application
	kg/ha					
1	70	20	**50**	110	95	**15**
2-	55	40	**15**	80	95	**0**
2+	40	40	**0**	60	95	**0**
3	20	40	**0**	30	95	**0**

Note: the availability of Phosphorus at Index 1 vs Index 2-

Maintaining soils at the optimum index means that the full requirement of the crop is supplied by slurry and no further chemical fertiliser is required, The above figures assume an optimum pH

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Nutrient management planning
Putting it into practice

Rachel Megarrell, Beef & Sheep Adviser, CAFRE

Joe Casey, Agriculture Technologist, CAFRE

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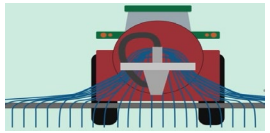
What is nutrient management planning?

Balancing…

Nutrients supplied to the crop *V* *Nutrients Required by the crop*



N P K S Mg, Ca

Nutrients In

Soil reserves

Organic Manure

Chemical Fertiliser

Nutrients out

Yield

Crop Offtake

Soil PH Important

Identify a lime requirement

The steps of nutrient management planning:

Why Nutrient management plan?

-Maximise slurry efficiency.

-Save money on chemical –fertiliser.

-Increase crop yield, and quality.

-Improve soil fertility.

-Improve water quality - less potential for loss from excess nutrients

-Improved air quality .

-Comply with legislation.

Soil Nutrient health scheme (SNHS)

			Measured Concentrations mg/L						%		Indices				
Sample ID	Field ID	MEA	Olsen P	Oxalate P	K	S	Mg	Ca	SOM	pH	P	K	S	Mg	Env Codes
		0.31	41.5		399.0	14.3	218.0	1977.0		6.8	3	3	3	4	G
		0.12	61.6		423.0	10.9	224.0	1531.0		6.5	4	4	3	4	G
		0.38	11.8		223.0	11.4	216.0	1369.0		6.0	1	2+	3	4	G
		2.68	14.4		263.0	8.6	120.0	1358.0		6.5	1	3	2	3	G

- DAERA funded Soil sampling scheme.
- Colour coded soil results and maps - pH, P, K, S. Mg, Ca, SOM including fertiliser recommendations.
- Run off risk maps – LiDAR
- **Soil Nutrient Health Scheme training:** Understanding your soil analysis and how to create a Nutrient Management Plan.
- Decision support tool – informing decisions.

DAERA Online Services | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)

			Measured Concentrations									Indices				
			mg/L						%							
Sample ID	Field ID	MEA	Olsen P	Oxalate P	K	S	Mg	Ca	SOM	pH	P	K	S	Mg	Env Codes
			61.6		423.0	10.9	224.0	1531.0		6.5	4	4	3	4	G

Last Crop:	Grass high input (over 250kg N/ha)
Next Crop:	Silage 68-70D Silage [3 cut(s)]

Silage Cut 1

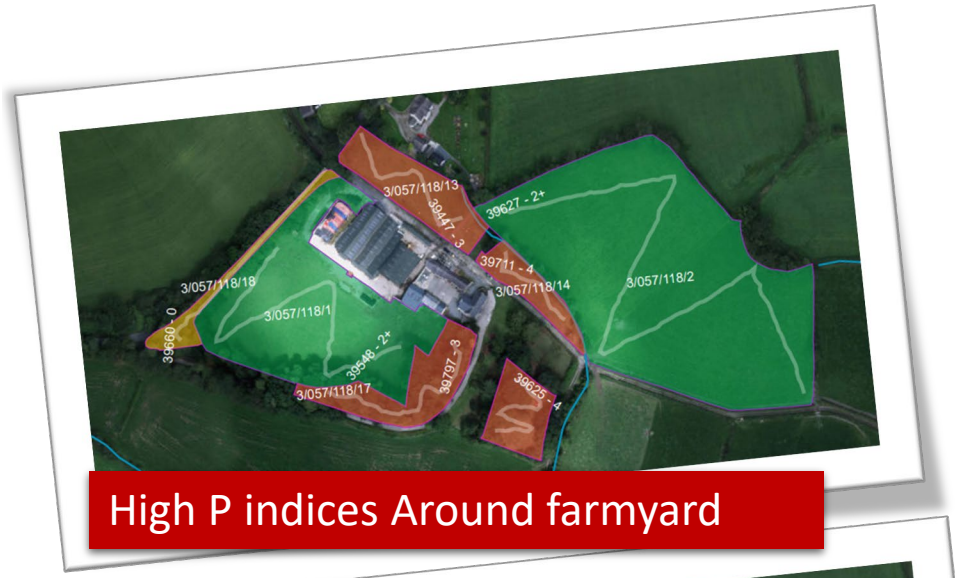
	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_20)
Total Crop Requirement:	120.00 kg/ha *(96.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*
Organic Manure Nutrients:	0.00 kg/ha *(0.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*
Fertiliser Nutrients:	115.00 kg/ha *(92.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*	0.00 kg/ha *(0.00 units/acre)*
Nutrients to be Supplied:	**- 5 kg/ha** ***(- 4 units/acre)*** **(undersupplied)**	0 kg/ha *(0 units/acre)*	0 kg/ha *(0 units/acre)*

Organic Manure to be Applied

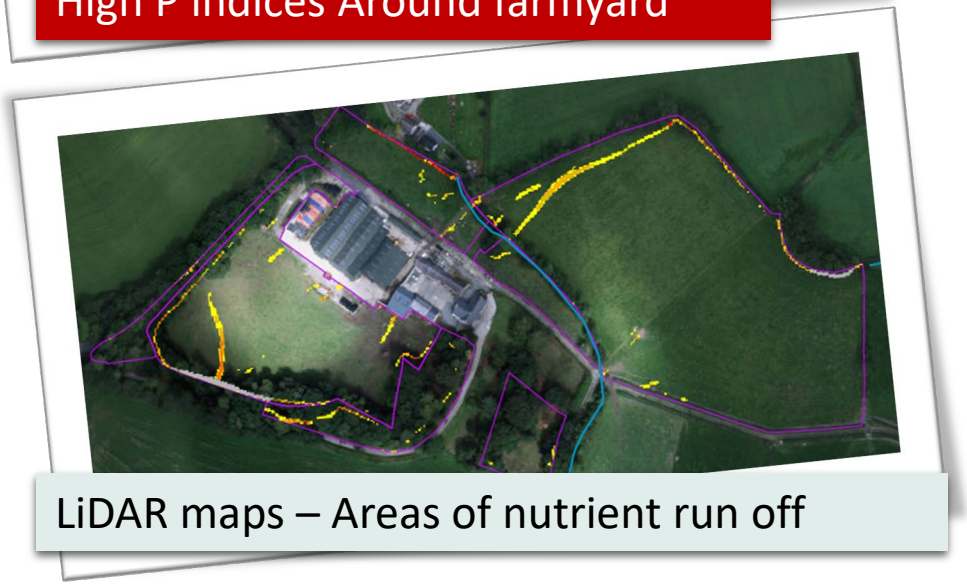
No organic manure specified

Fertiliser to be Applied

Fertiliser Type	Quantity of Product Applied
46 0 0	250 kg/ha



High P indices Around farmyard



LiDAR maps – Areas of nutrient run off

			Measured Concentrations								Indices				
			mg/L						%						
Sample ID	Field ID	MEA	Olsen P	Oxalate P	K	S	Mg	Ca	SOM	pH	P	K	S	Mg	Env Codes
			11.8		223.0	11.4	216.0	1369.0		6.0	1	2+	3	4	G

Last Crop:	Grass high input (over 250kg N/ha)
Next Crop:	Silage 68-70D Silage [3 cut(s)]

Silage Cut 1

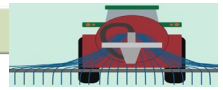
	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_20)
Total Crop Requirement:	120.00 kg/ha *(96.00 units/acre)*	70.00 kg/ha *(56.00 units/acre)*	60.00 kg/ha *(48.00 units/acre)*
Organic Manure Nutrients:	34.32 kg/ha *(27.46 units/acre)*	19.80 kg/ha *(15.84 units/acre)*	74.25 kg/ha *(59.40 units/acre)*
Fertiliser Nutrients:	82.40 kg/ha *(65.92 units/acre)*	46.00 kg/ha *(36.80 units/acre)*	0.00 kg/ha *(0.00 units/acre)*
Nutrients to be Supplied:	**- 3 kg/ha** *(- 2 units/acre)* **(undersupplied)**	**- 4 kg/ha** *(- 3 units/acre)* **(undersupplied)**	**+ 14 kg/ha** *(+ 11 units/acre)* **(oversupplied)**

Organic Manure to be Applied

Manure Type	Volume Applied	Method of Application	When Applied
Dairy Cow Slurry 6% Dry Matter	33 m^3/ha	Slurry - Trailing shoe or Band spread	Spring

Fertiliser to be Applied

9 : 11 : 20



Fertiliser Type	Quantity of Product Applied
46 0 0	140 kg/ha
18 46 0	100 kg/ha

Organic Manure	Total Quantity
Dairy Cow Slurry 6% Dry Matter	264 m^3 *(58080 gallons)*

Chemical Fertiliser	Total Quantity
18 46 0	300 kg
46 0 0	2895 kg

Low P indices further from farmyard

LiDAR maps – Areas of nutrient run off

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Thank you...
Questions?

Soil Nutrient Health Scheme CAFRE Nutrient management training now available

www.cafre.ac.uk/snhs-training

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Realtime Water Quality Monitor

Rachel Cassidy, Catchment Scientist, AFBI

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Nutrient Loss to Water

Around 62% of loads of phosphorus to rivers and lakes in NI come from agricultural sources.

Care in timing and placement of slurry, manure and fertiliser is essential to minimise the potential for loss from land to water.

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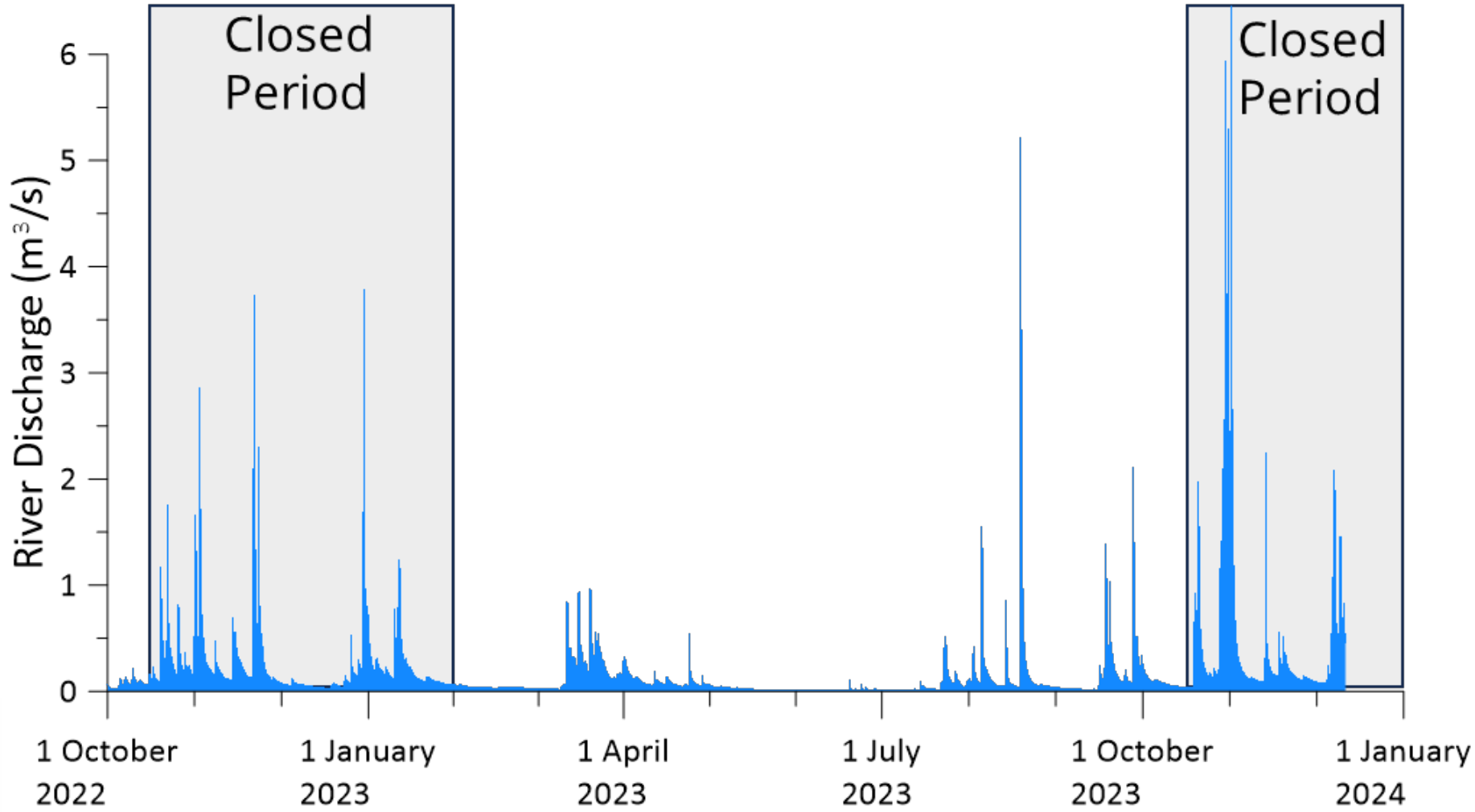
Steep slopes and soils with impeded drainage are vulnerable to runoff.

Most of our rivers show very rapid responses to rainfall – spate rivers.



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A rainfall event lasting only a few hours can deliver a large proportion of the total annual load of phosphorus to rivers and lakes.

- Regular (weekly/monthly) water sampling very rarely captures these events

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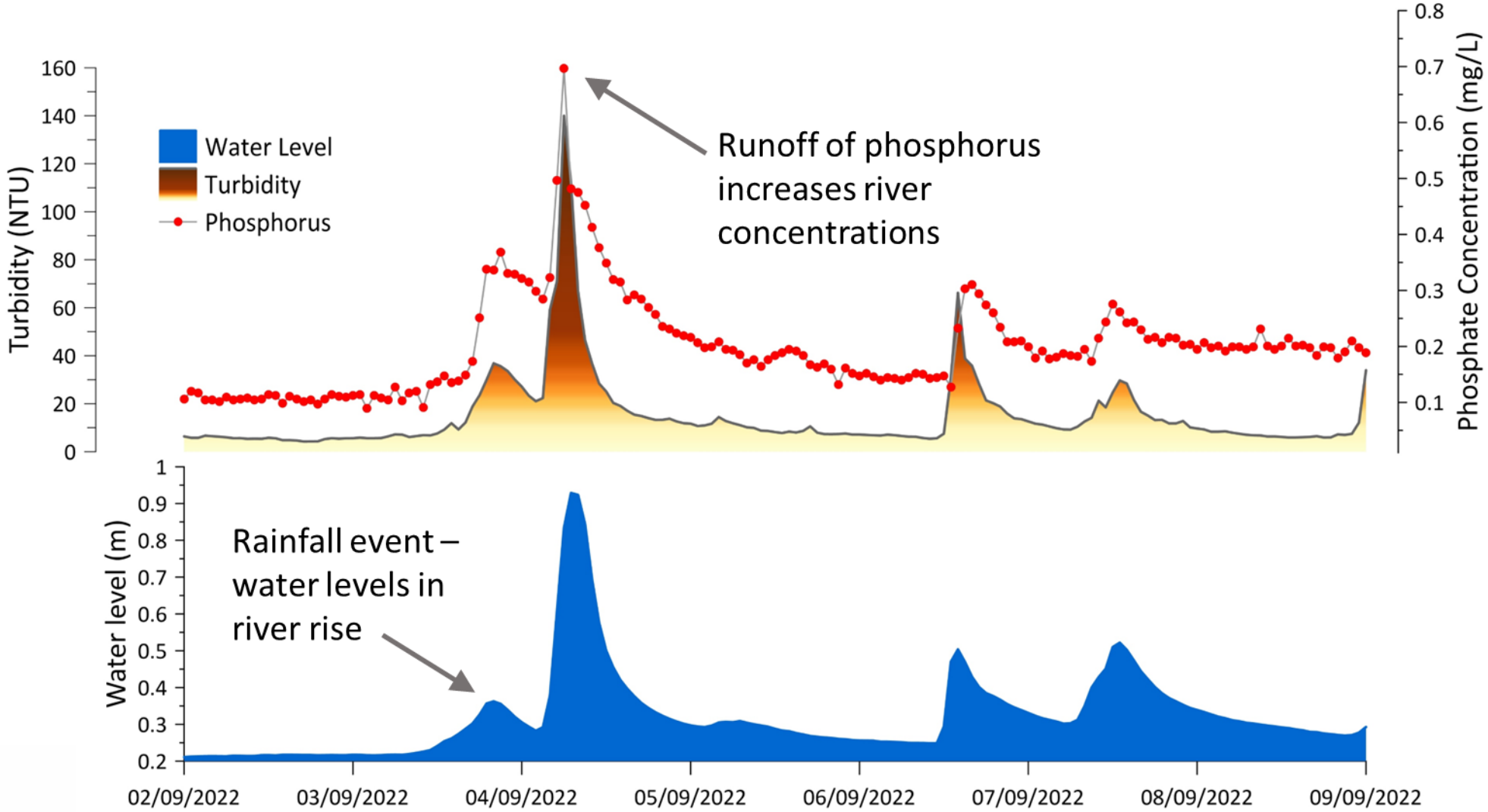
Ulster University

High resolution water quality monitoring shows the link between rainfall and loss of nutrients (particularly phosphorus).

High
Concentrations
+
High Flows
=
Large Loads



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Catchment Platform Bankside Infrastructure

4 stations (4 –12 km^2):

- NAP research since 2016 (UB03, UB15a)
- Evaluation of EFS Group Schemes (Ballinderry BY01, UB22a)

2 stations:
Derg & Finn (~380 km^2)

2 mobile monitoring units

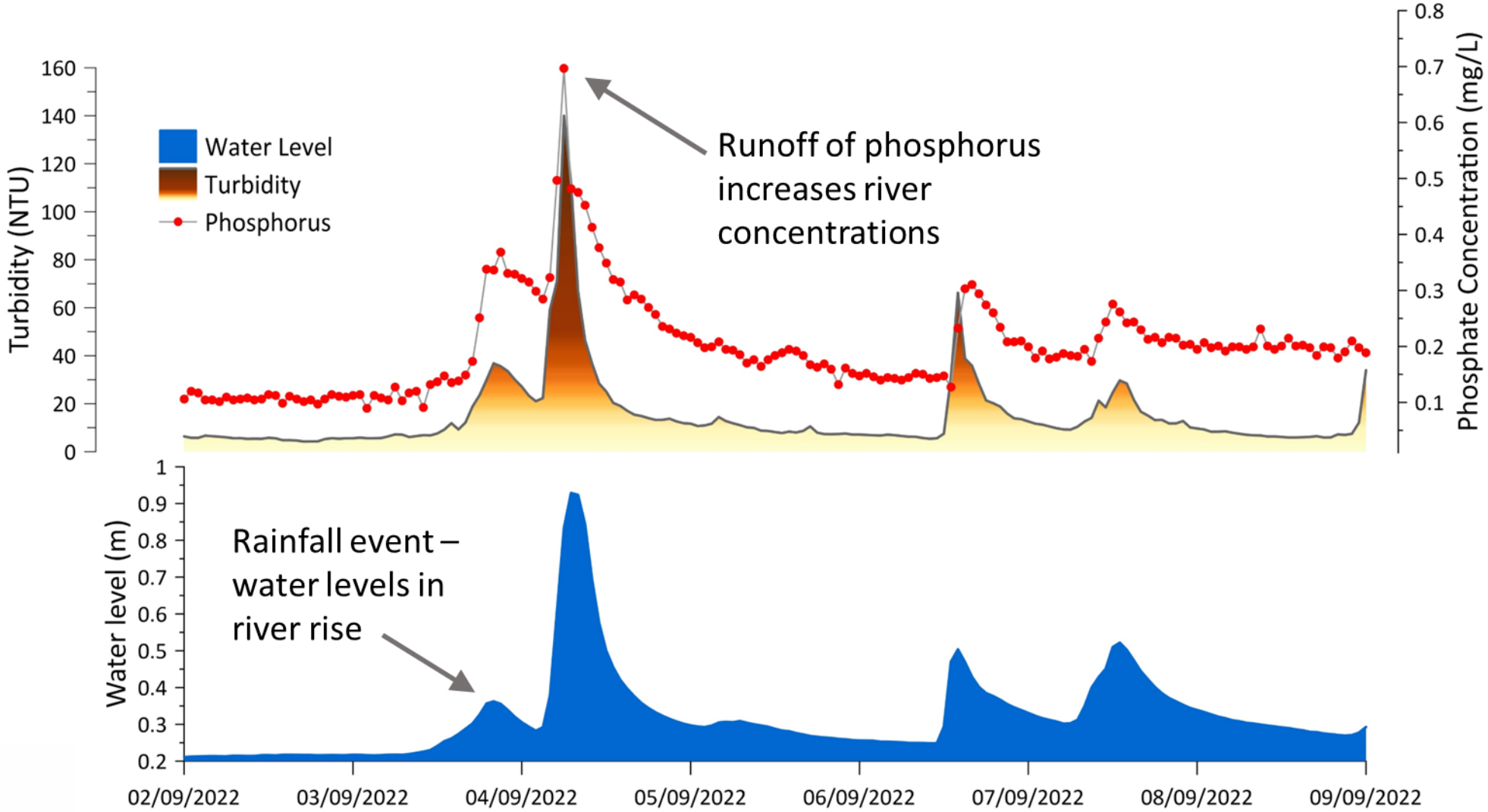
Stilling wells – level

Autosampling (for lab analysis) & in-situ P analyser

Pumping and Telemetry System; Sondes

High resolution water quality monitoring shows the link between rainfall and loss of nutrients (particularly phosphorus).

High
Concentrations
+
High Flows
=
Large Loads



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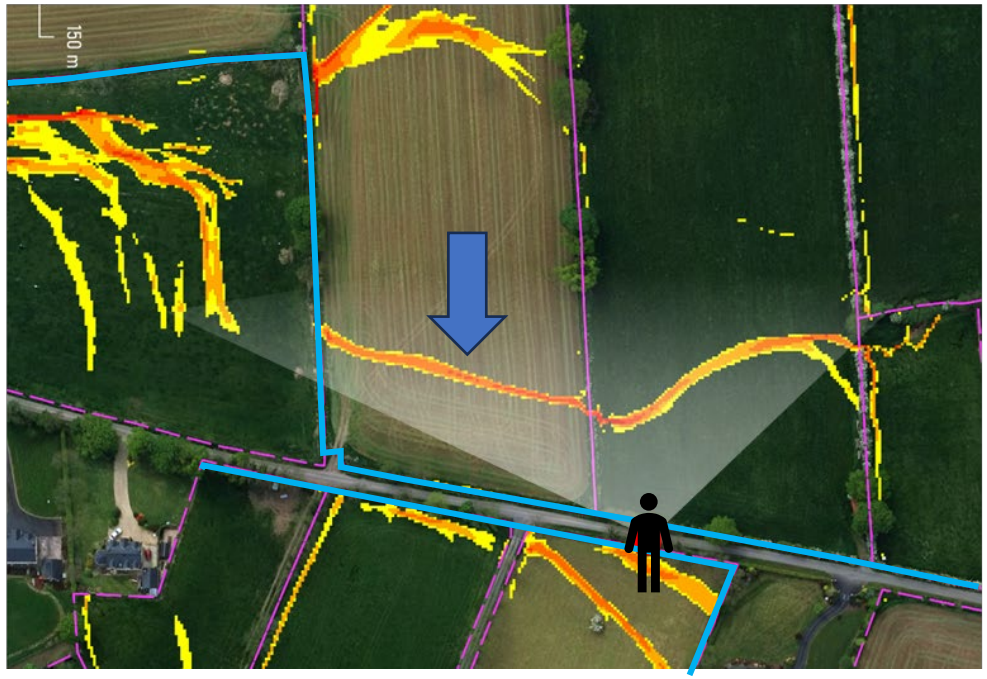
Rainfall on wet soil can lead to overland flow/runoff.

In our landscape these are the main pathways by which nutrients and sediment are transported to streams, rivers and onward to lakes and the sea.

Taking great care when applying nutrients in these areas can reduce the potential for loss and help ensure valuable nutrients remain in the soil for crop uptake.



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Runoff Risk

Modelling using LiDAR can identify these areas in the landscape

All farms will receive these as part of SNHS deliverables

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Water Quality Overview

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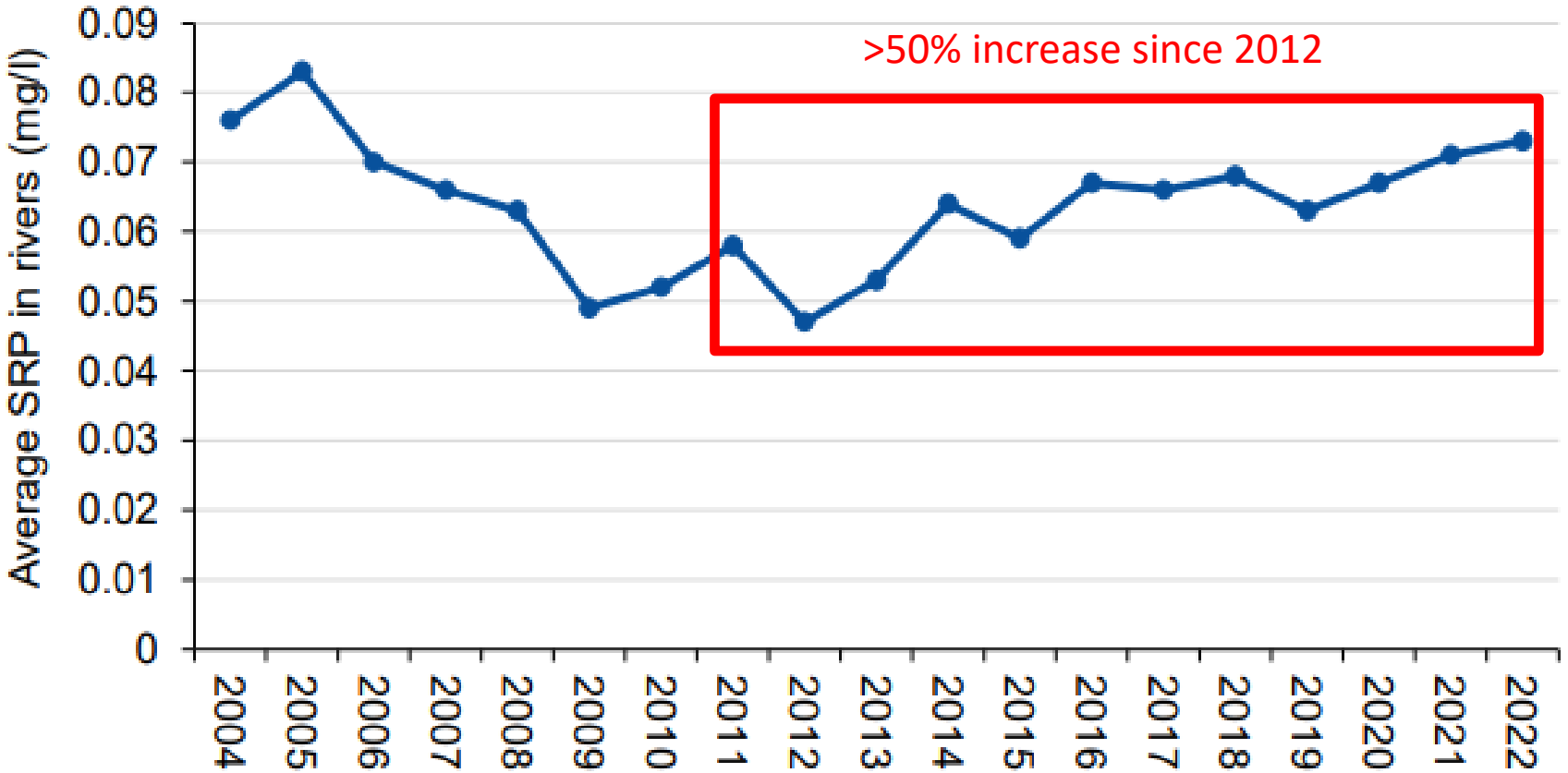
Water Quality Status in NI

Classification	No. of waterbodies
High	2
Good	138
Moderate	254
Poor	49
Bad	3

31% at good or higher

Phosphorus levels in NI Rivers



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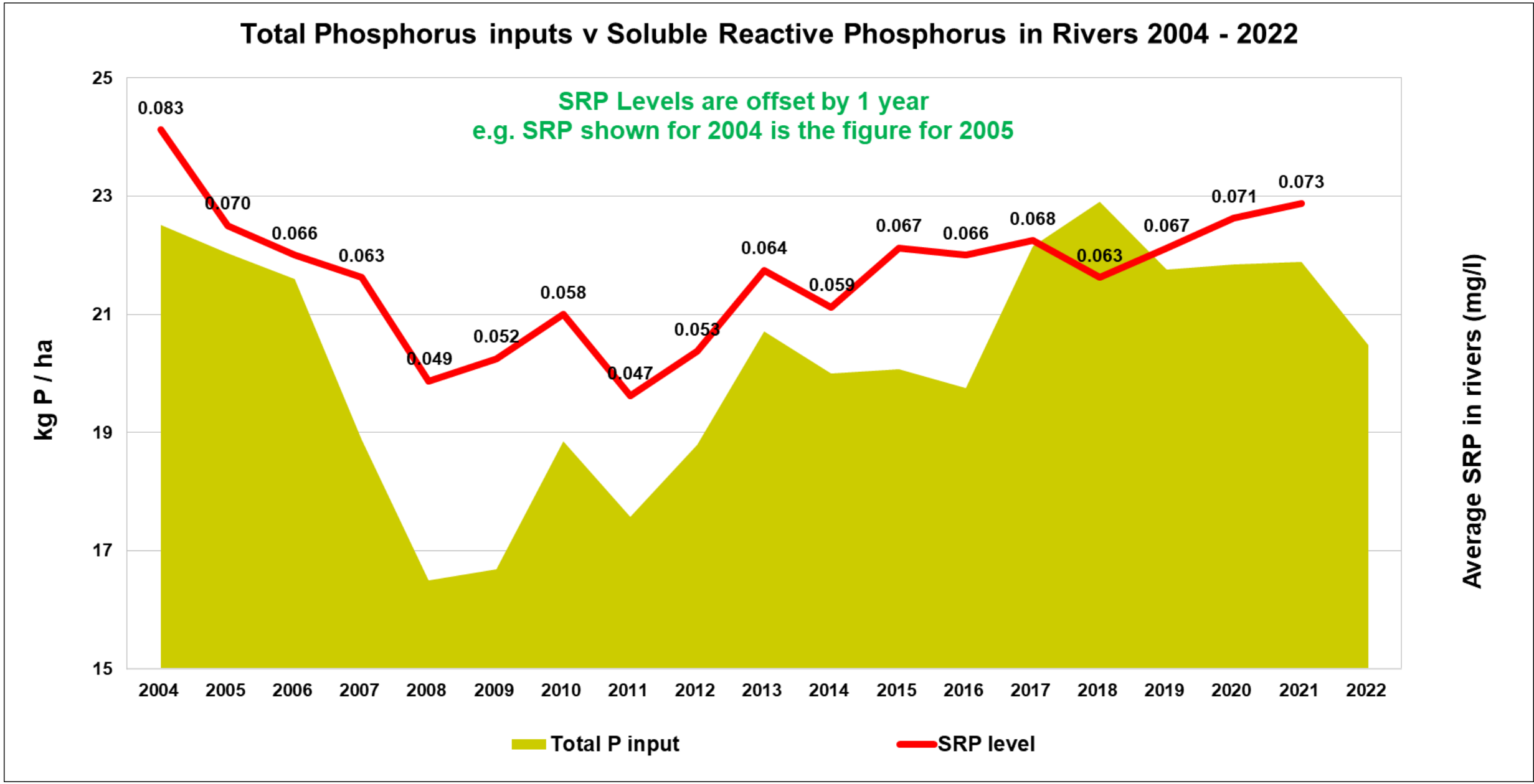
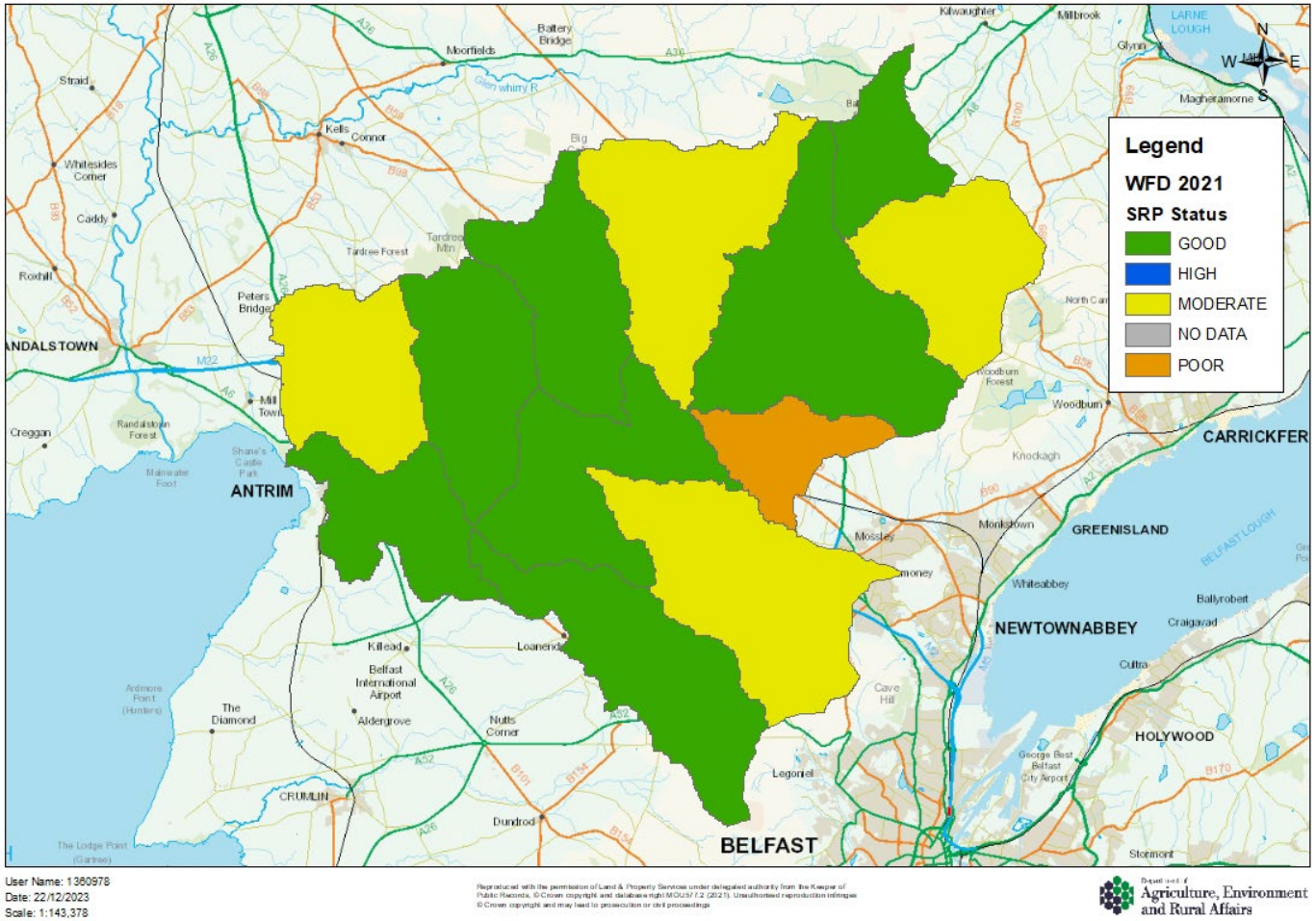
Phosphorus inputs v Phosphorus in Rivers



Phosphorus (SRP) Map (Six Mile Water)

5 out of 11 rivers are failing for SRP

Phosphorus leads to accelerated growth of algae and other plants, which can reduce oxygen levels and negatively change habitats for aquatic species.



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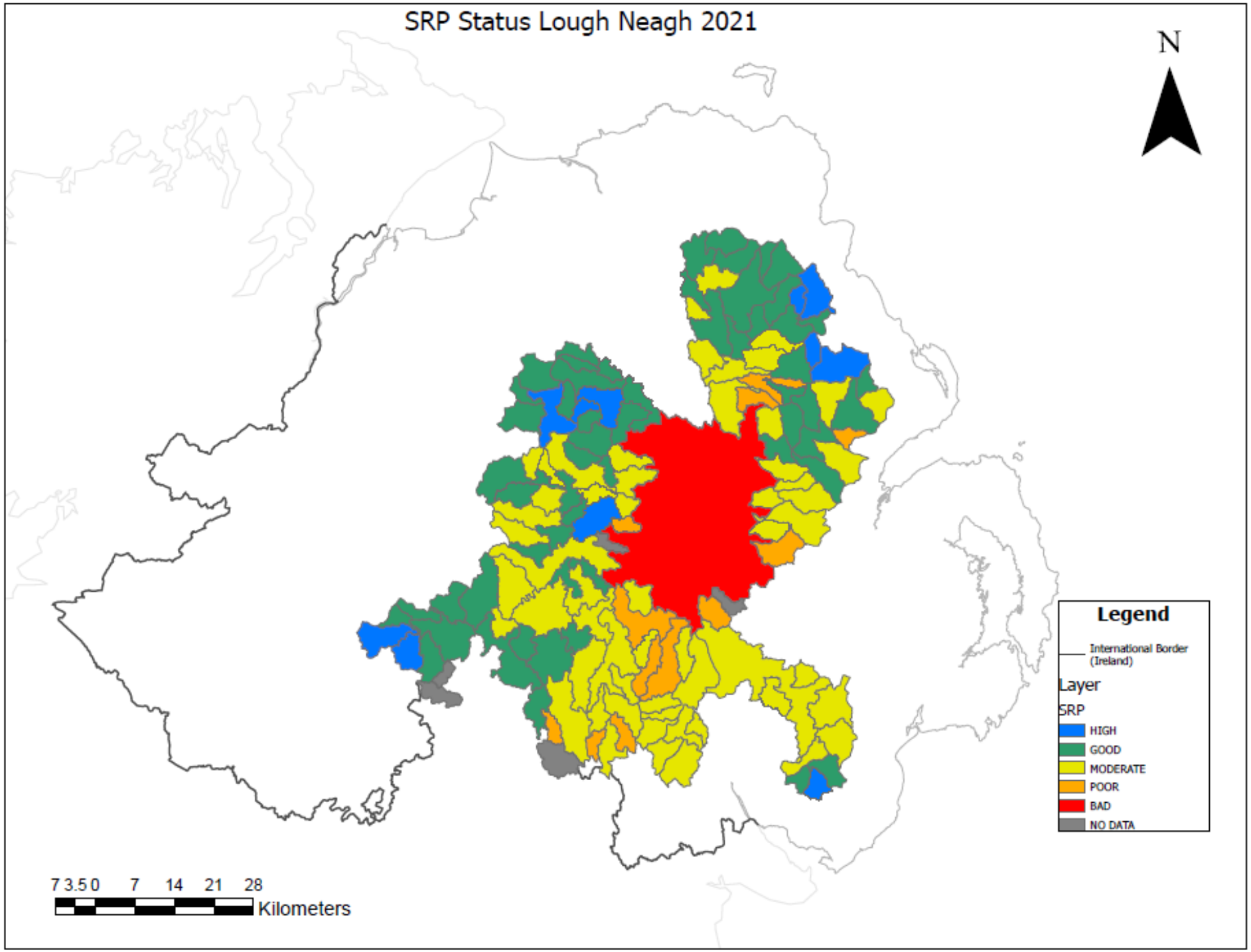
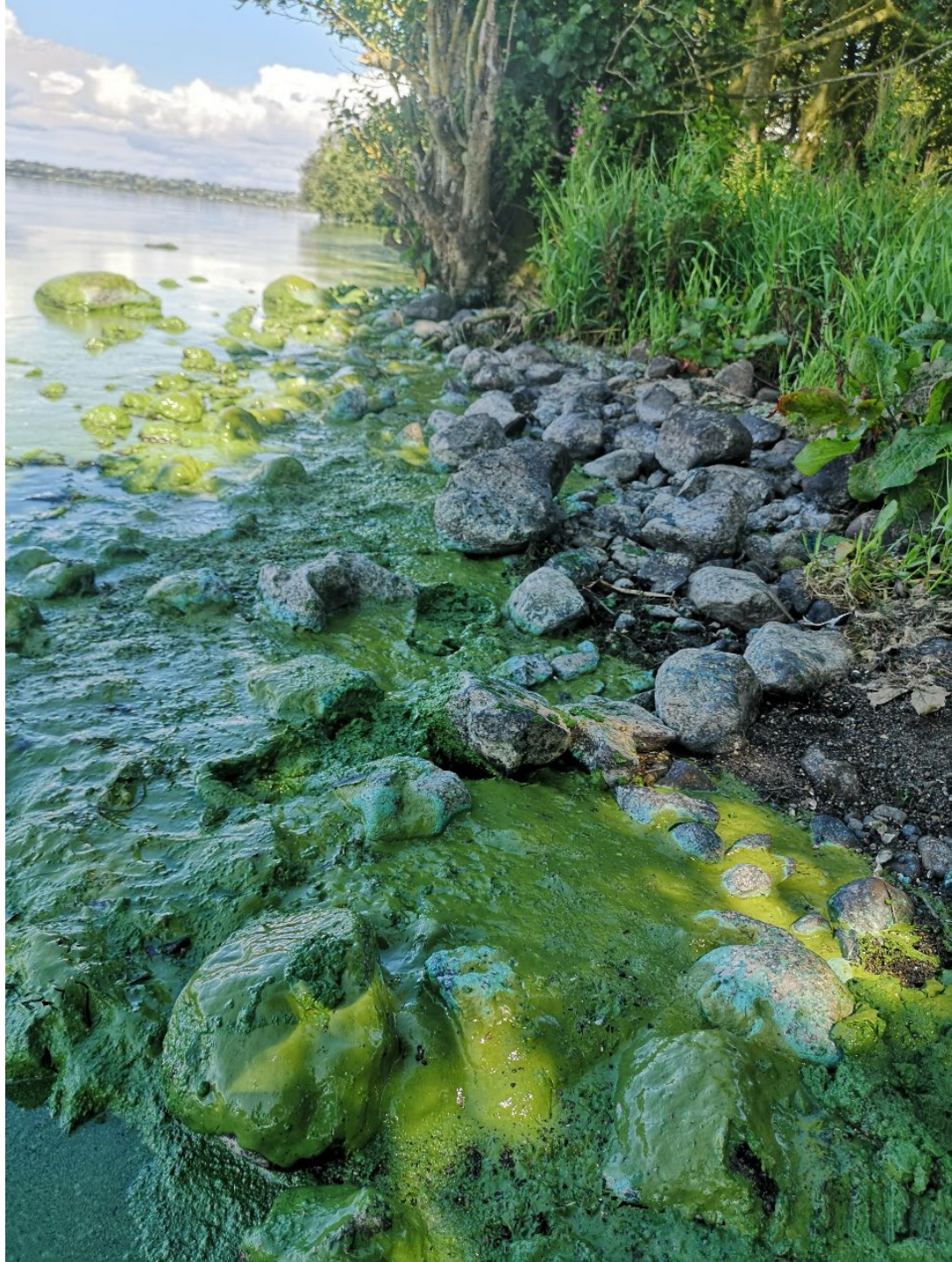
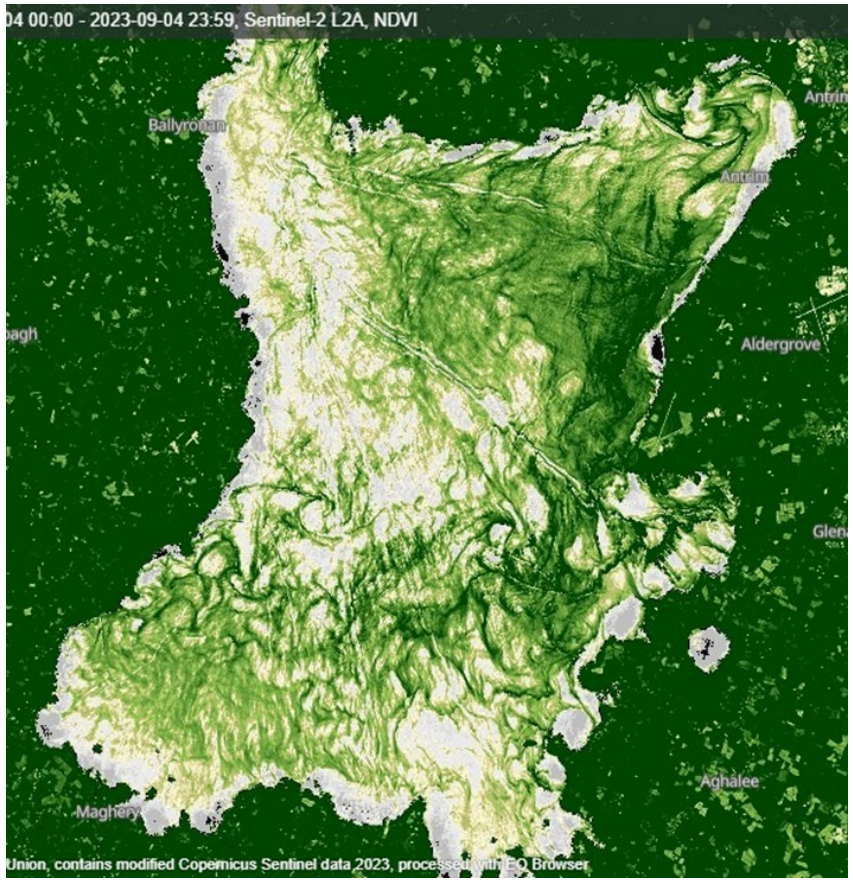

SRP Status Lough Neagh 2021
N
Legend
International Border (Ireland)
Layer
SRP
HIGH
GOOD
MODERATE
POOR
BAD
NO DATA
7 3.5 0 7 14 21 28
Kilometers

Lough Neagh 2023



Lough Neagh September 2023



Credit - European Space Agency - ESA

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Key sources of Nutrient Losses

Yards

Field application

Pollution sources on Farm – how do we tackle?

Source **Pathway** **Receptor**

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Yard and Storm Drainage

- **Storm drains are for clean water**
- **Where do the storm drains go?**
- **Is there a diverter system in place?**
- **Do sheds / roofs have good gutters?**

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Field application

River bank Poaching

Take home Message

- Less than 1/3 of NI waterbodies are meeting WQ standards
- Phosphorus is a key contributor to WQ problems
- Good slurry Management helps improve WQ as well as farm finances
- SNHS will provide every farm with ability to make a difference
- DAERA committed to supporting good slurry management

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Future Developments in Slurry Processing

Jonathan McFerran & Gavin McQuaid

Green Growth, DAERA

Department of Agriculture, Environment and Rural Affairs
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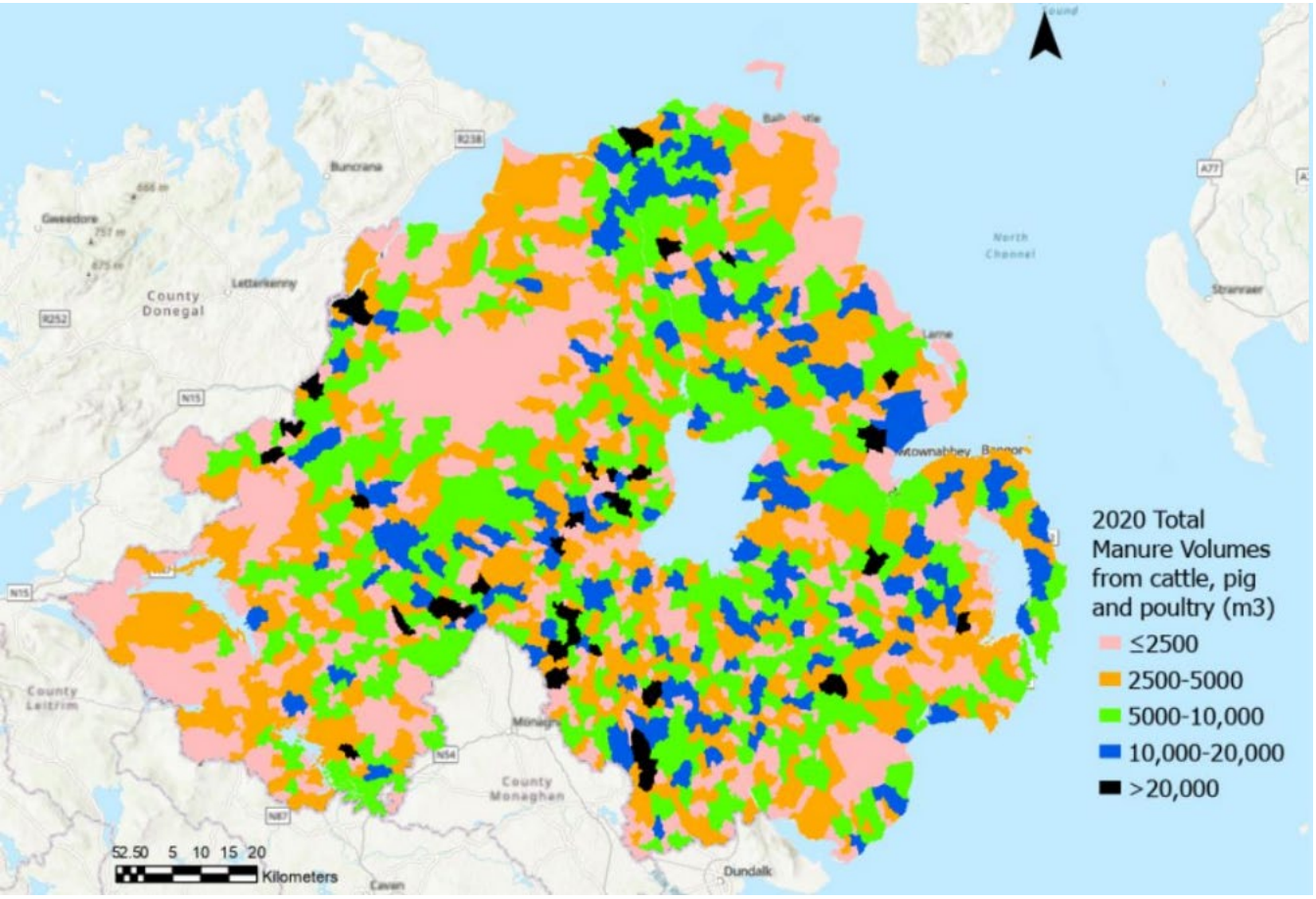
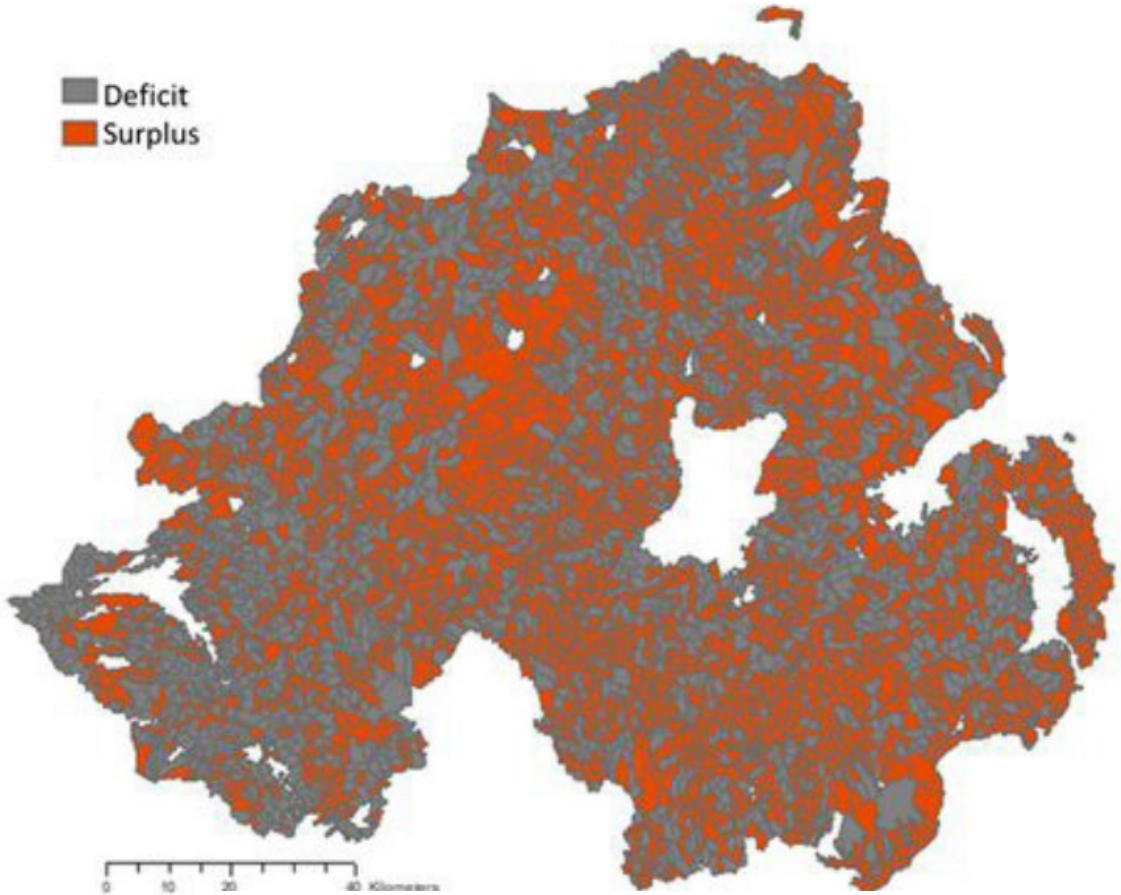
Phosphorus surplus in NI





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Consequences of too much Phosphorus

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Small Business Research Initiative (SBRI)
Sustainable Utilisation of Livestock Slurry (SULS)

Search this site..

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Home Topics

£600,000 awarded to NI companies to fund sustainable solutions for livestock Slurry

Date published: 26 May 2023

Topics: Grants and Funding , Waste

Six Northern Ireland companies have been awarded a total of £600,000 to develop practical and environmentally friendly solutions for livestock slurry.

A key aim of this DAERA led project is to reduce surplus phosphorus and ensure efficient recycling of organic nutrients within Northern Ireland agriculture whilst contributing to climate targets.

Funding is being provided by the Department for the Economy's Small Business Research Initiative

- Focus on developing proof of concepts for management of excess nutrients from slurry, particularly phosphorus.
- Phase 1 - Six successful companies - £100,000 each
- February – August 2023. Focused on dairy and pigs
- DAERA received detailed reports and proposals from each of the suppliers
- Proposals centred around on-farm separation using mobile equipment and centralised processing to produce energy and other products for use in NI and for export.

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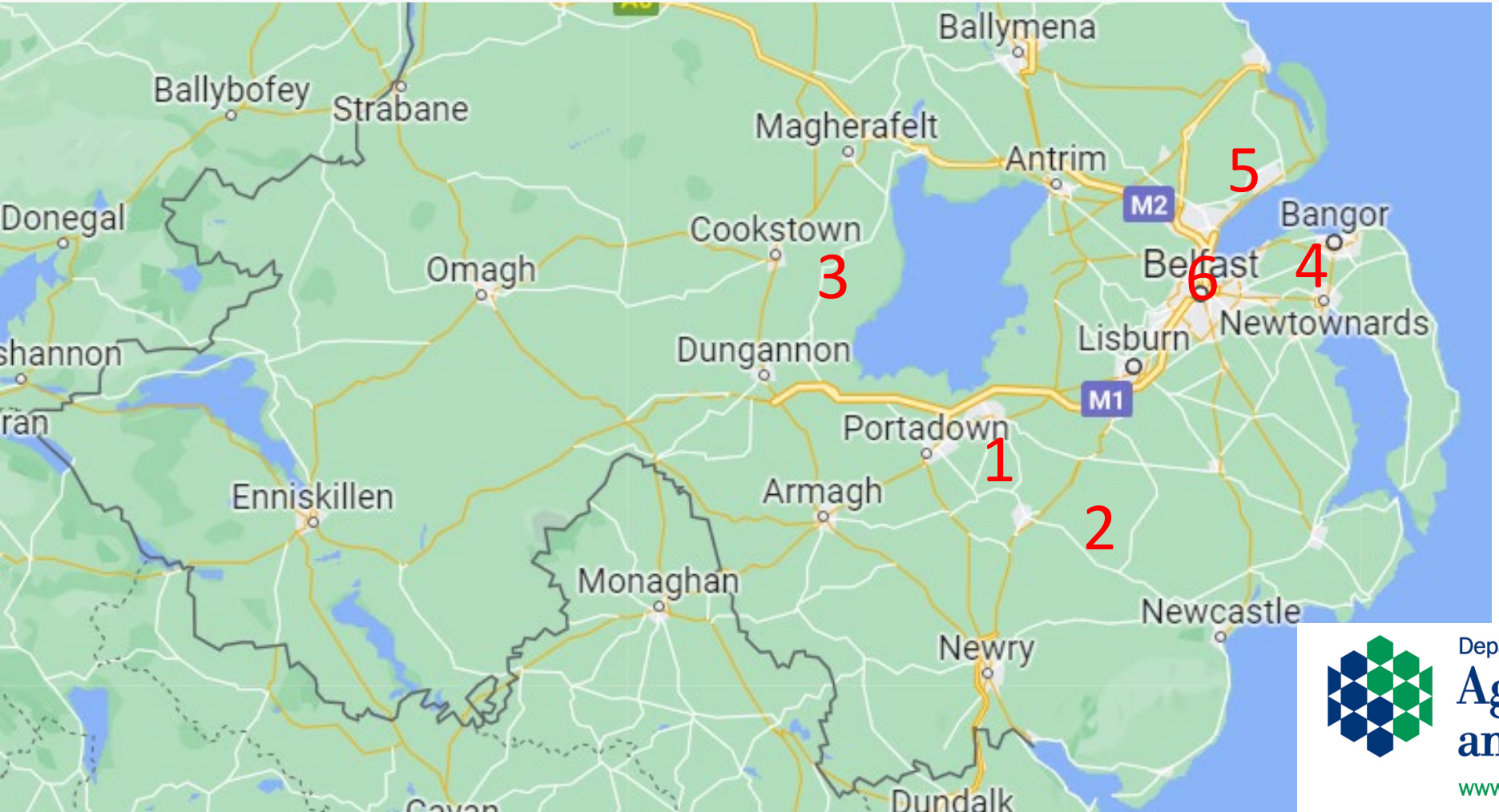
Sustainable Utilisation of Slurry (SULS) SBRI successful project locations

1. **B9**, Portadown (B9 ReCon)
2. **Renewables Utd Ltd**, Banbridge
3. **Centre for Competitiveness**, Mid Ulster Centre for Competitiveness (Dale Farm, Tobermore, CEMCOR, RSC)
4. **Blakiston Houston Estates**, Dundonald
5. **Carbon Technologies Ltd**, Newtownabbey, Organic Power, Helix 8, Circular Values Holland
6. **Natural World Products**, Belfast/Lisburn High solids digestate, compost.



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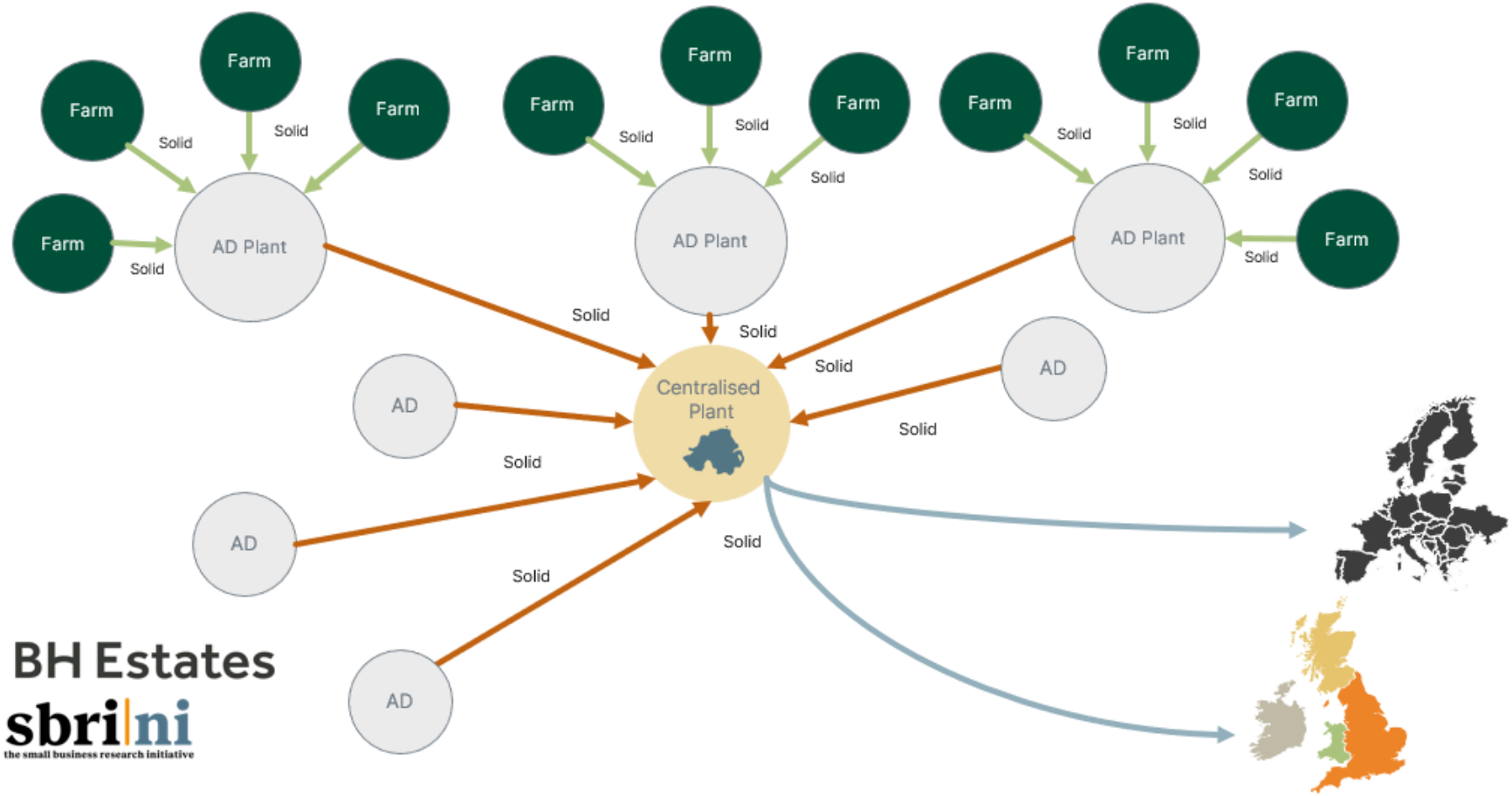
DAERA Small Business Research Initiative – proposed solutions



BH Estates

sbri ni
the small business research initiative

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- On farm separation
- Remove solid fraction
- Feedstock for AD
- Keep liquid fraction

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"Less hassle to spread"

"Less slurry stripes after spreading"

"It's *(separation)* coming down the line"

"Noticed more space"

"Easier to mix"

"No real problems"

"Sustainable tick box"

"We may not need another slurry store"

"Less blockages"

"Easier to spread what was left"

"Fertiliser costs saved"

"Fantastic" (spreading)

"Dispersed well"

"Mixed well and went out well"

"More space"

"Not raking fibre back into the silage clamp"

"Could use remaining liquid in trailing shoe without blockages and so I could use it!"

BH Estates

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Benefits

- More space in your tanks
- Increased flexibility
- Spread when it suits you and when is best
- Slurry more easily spread
- Improve your sustainability

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Next Steps

- We need to do things differently
- DAERA is looking at how to solve slurry issue
- DAERA is moving to next SBRI phase – demonstrator models
- Opportunities for farmers to deal with excess nutrients
- Opportunities for farmers to be part of the solution

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