

Lough Forbes

**Challenges providing drinking water
untainted by pesticides**

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rish Water



General Info Relating to Pesticides from an IW Perspective

- Prior to the establishment of IW, LAs held combined responsibility for Drinking Water & Catchment through Water Services.
- IW does not have statutory powers in the catchment.
- Drinking Water tested for Pesticides more often and more comprehensively than catchment (APHA Monitoring of 4 Priority Catchments started in 2018).
- The regulatory standards for Pesticides in Drinking Water (**not health based**):
 Pesticides (Individual) 0.10 µg/l
 Pesticides (Total) 0.50 µg/l
 Aldrin, dieldrin, heptachlor and heptachlor epoxide¹ 0.030 µg /l (Banned since 1981)
- The treatment option for Pesticides is very expensive to install & maintain. Issue can be ephemeral in many cases. Where possible UK Water Utilities trying to move away from treatment as the panacea for Pesticides & focusing efforts in the catchment through partnership.
Proactive Prevention vs Reactive Intervention.
- IW wish to reduce risk posed by Pesticides by raising awareness and through engagement & collaboration. Primarily through involvement with the NPDWAG
- **Many ways Pesticides can enter catchment not just Agriculture!
 However, it's fair to say that MCPA is directly related to Agriculture.**

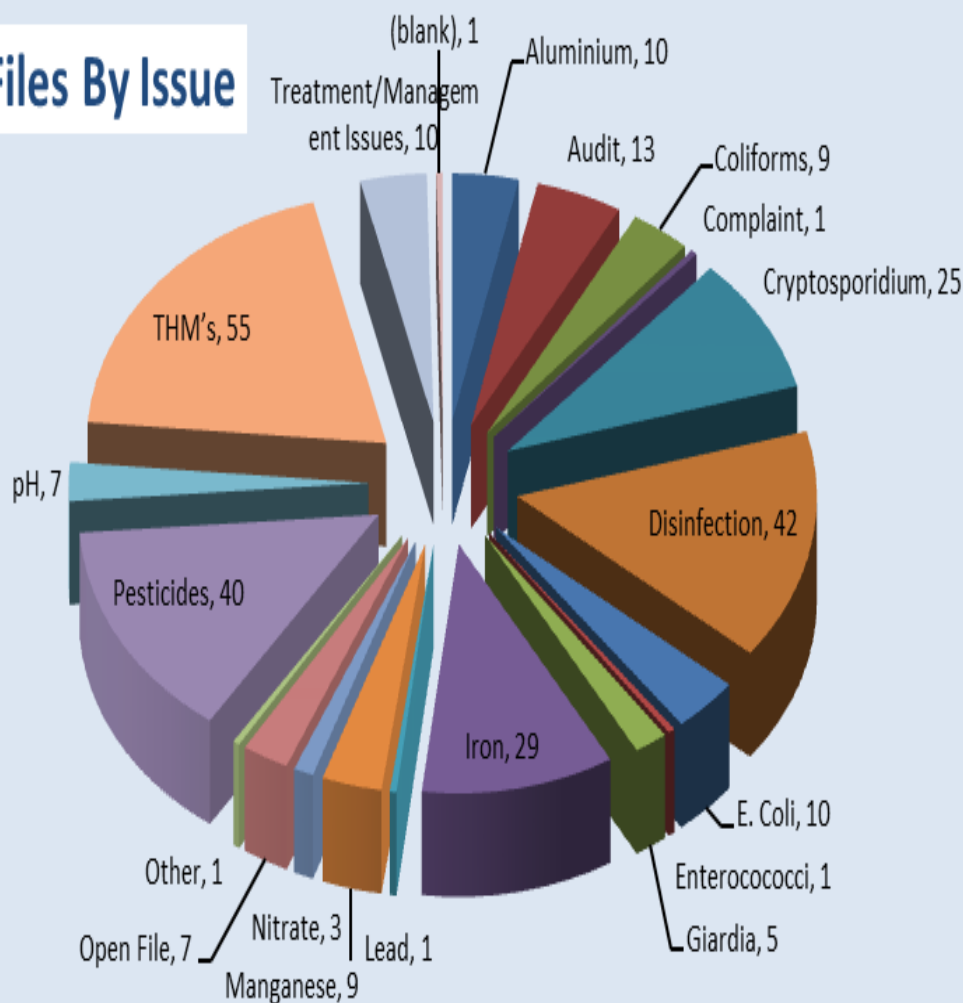
Factors Influencing Pesticide Failures in DW



- It doesn't take a lot of pesticide to exceed the MAC for drinking water.
- The chemistry of MCPA lends itself to detection.
- Rushes and the efforts to curtail! MCPA is an issue unique to Ireland.
- Also Ireland has large no. of WTP abstractions relative to European counterparts.

Scale of Issue: EPA Files Open (Q1 2019)

EPA Files By Issue

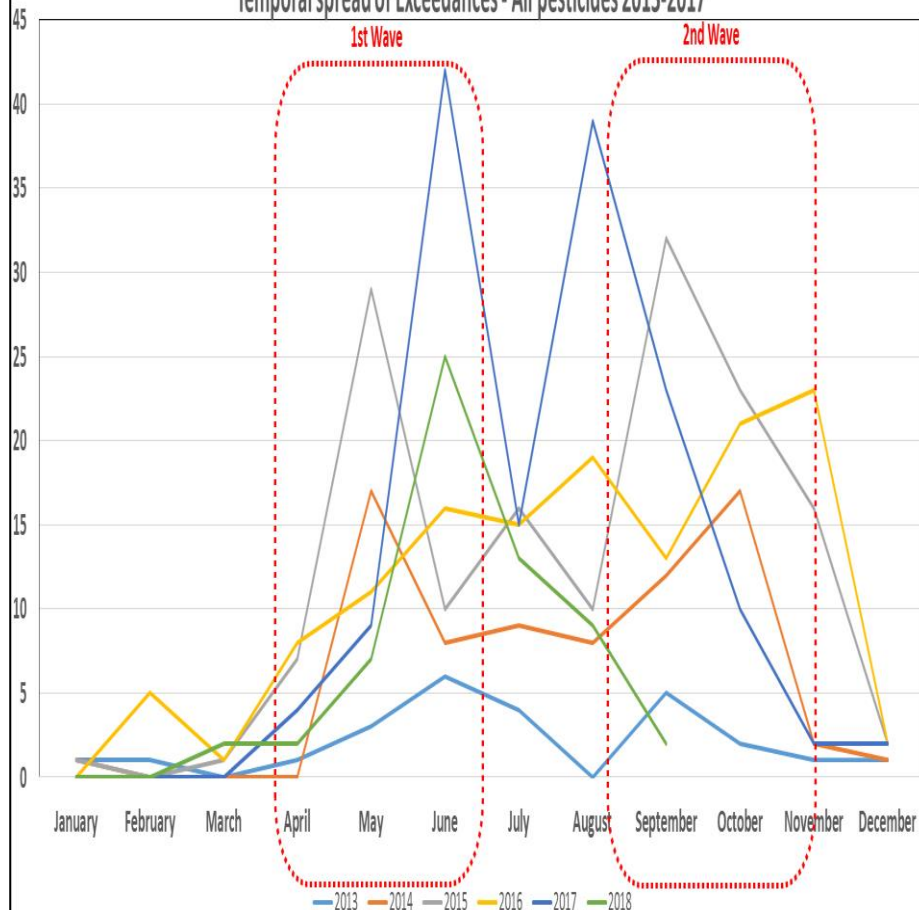


Row Labels	Count of EPA Open File Number
Aluminium	10
Audit	13
Coliforms	9
Complaint	1
Cryptosporidium	25
Disinfection	42
E. Coli	10
Enterococci	1
Giardia	5
Iron	29
Lead	1
Manganese	9
Nitrate	3
Open File	7
Other	1
Pesticides	40
pH	7
THM's	55
Treatment/Management Issues	10
(blank)	1
Grand Total	279

IW Introduced a Standardised Risk Based Pesticide Monitoring Programme Nationally:

IW monitor for 33 different Pesticides. Baseline (21) and Additional (12)
Typical spraying season and meteorological factors considered.

Temporal spread of Exceedances - All pesticides 2013-2017



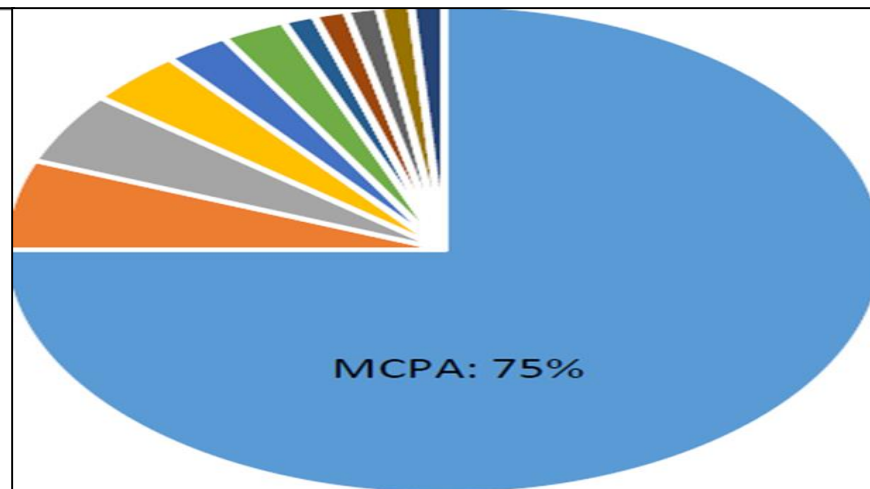
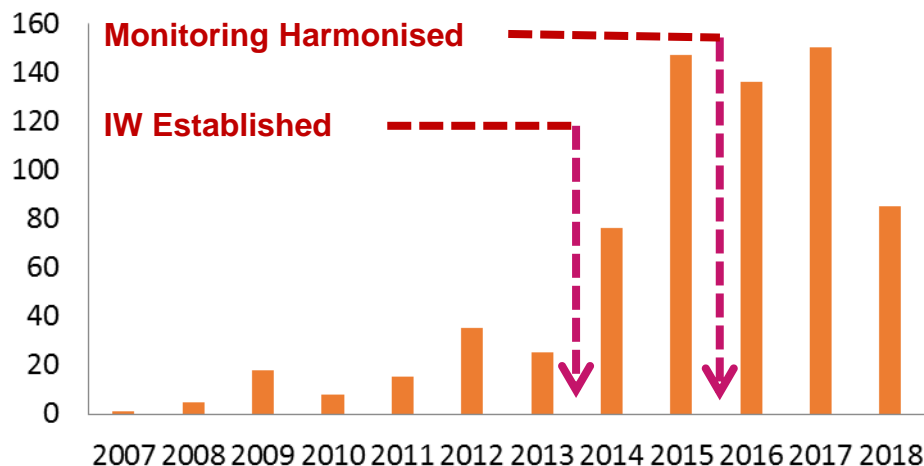
Irish Water

Eastern Midlands Region: 2016 Pesticide Sampling Programme

Level of Risk	Low	Med	Med to High	High	High	High	Med	Med to High	High	High	High	Low	Comments:
No. of Audit Samples	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
1													Sole Audit sample is collected either in March, April, June or July – with preference for the months with the highest risk.
2													1 st Audit sample is collected either in March, April, June or July and the 2 nd Audit sample collected in August, September or October – with preference for the months with the highest risk.
3				X		X				X			The three Audit samples required collected during months marked by an X.
4				X		X			X		X		The four Audit samples required collected during months marked by an X.
5													1 st Audit sample collected either in February, March or April and the 4 th Audit sample collected either in July, August or September. The remaining three Audit samples collected during months marked by an X.
6													1 st Audit sample collected either in February, March or April and the 4 th Audit sample collected either in July, August or September. The remaining four Audit samples collected during months marked by an X.
7				X	X	X	X		X	X	X		The seven Audit samples required collected during months marked by an X.
8				X	X	X	X		X	X	X	X	The eight Audit samples required collected during months marked by an X.
9				X	X	X	X	X	X	X	X	X	The nine Audit samples required collected during months marked by an X.
10				X	X	X	X	X	X	X	X	X	The ten Audit samples required collected during months marked by an X.
11				X	X	X	X	X	X	X	X	X	The eleven Audit samples required collected during months marked by an X.

What Happened?

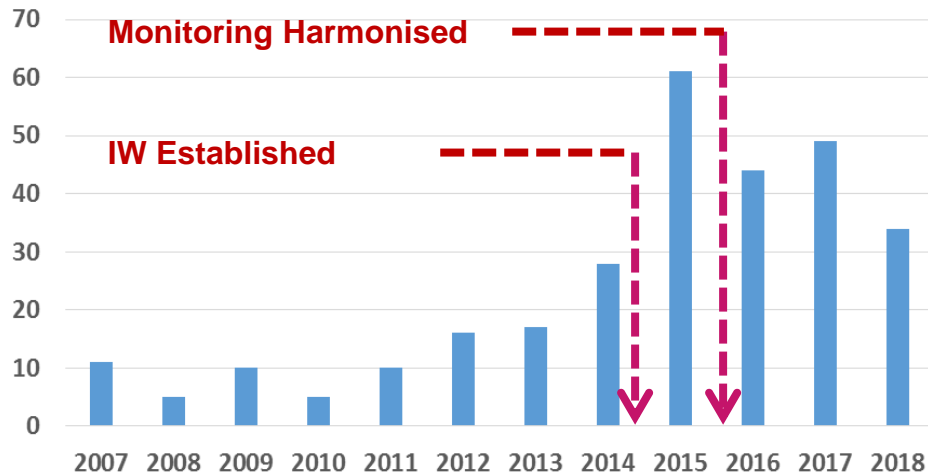
No. of Pesticide Exceedances 2007-2018



2018 % Breakdown of Pesticides

Pesticide	No. of Exceedances	
MCPA	63	
2,4-D	5	
Bentazone	4	
Glyphosate	3	
Fluroxypyr	2	
Mecoprop	2	
Clopyralid	1	
Metaldehyde	1	
Picloram	1	
Triclopyr	1	
Pesticides Total	1	

No. of Public Supplies with Reported Pesticide Failures



What is a persistent/serious Pesticide failure?

Serious: Agreed following consultation with HSE
Persistent: EPA Pesticide File Classification System

EPA adopt a two tier classification system that separates DW investigation files for pesticides into **Watching** (30) or **Action** (7) category.

Classification	Classification Criteria	File Update Requirements
Watching	Supplies with pesticide failures in 1, 2 or 3 calendar months during the spraying season.	As a minimum, Irish Water to undertake monthly monitoring from April to November .
Action	Supplies with pesticide failures in 4 or more calendar months during the spraying season.	IW to monitor as above <u>and</u> undertake actions towards returning supply to compliance.

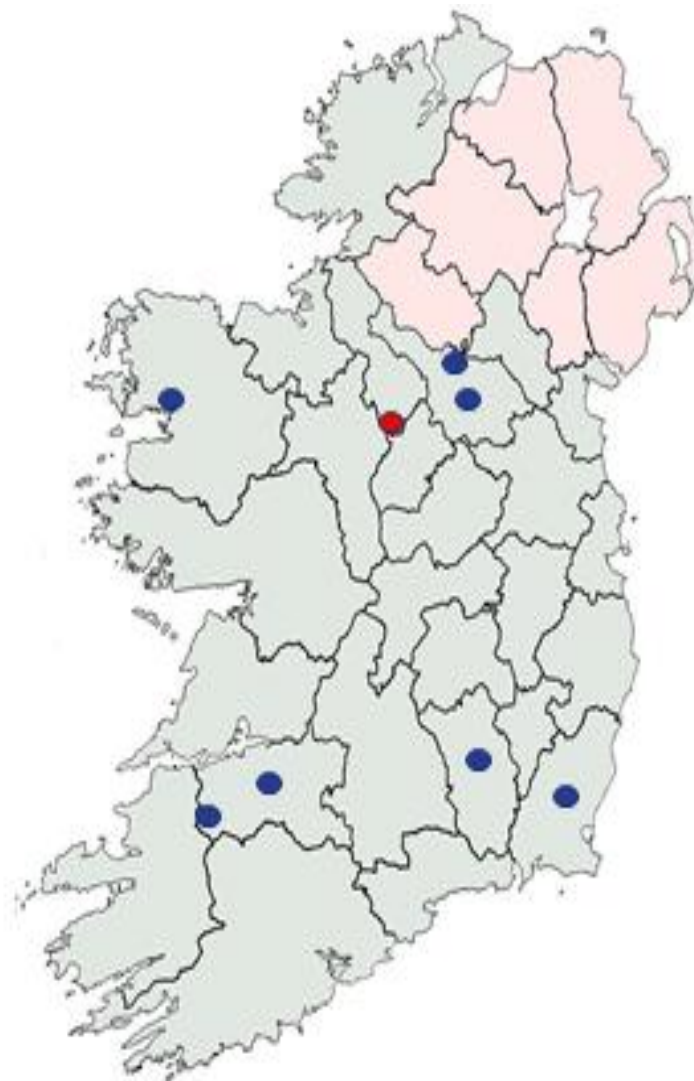
Intervene to
prevent escalation

The National Pesticide and Drinking Water Action Group

- The National Pesticide and Drinking Water Action Group (NPDWAG) is chaired by the Department of Agriculture, Food and the Marine (DAFM) and was formed to provide a coordinated and collaborative approach to prevent the ongoing prevalence of pesticides in catchments used for the abstraction of drinking water.
- DAFM directed producers of MCPA products to fund/undertake monitoring programmes across 4 catchments in order to maintain license to supply their products in ROI.

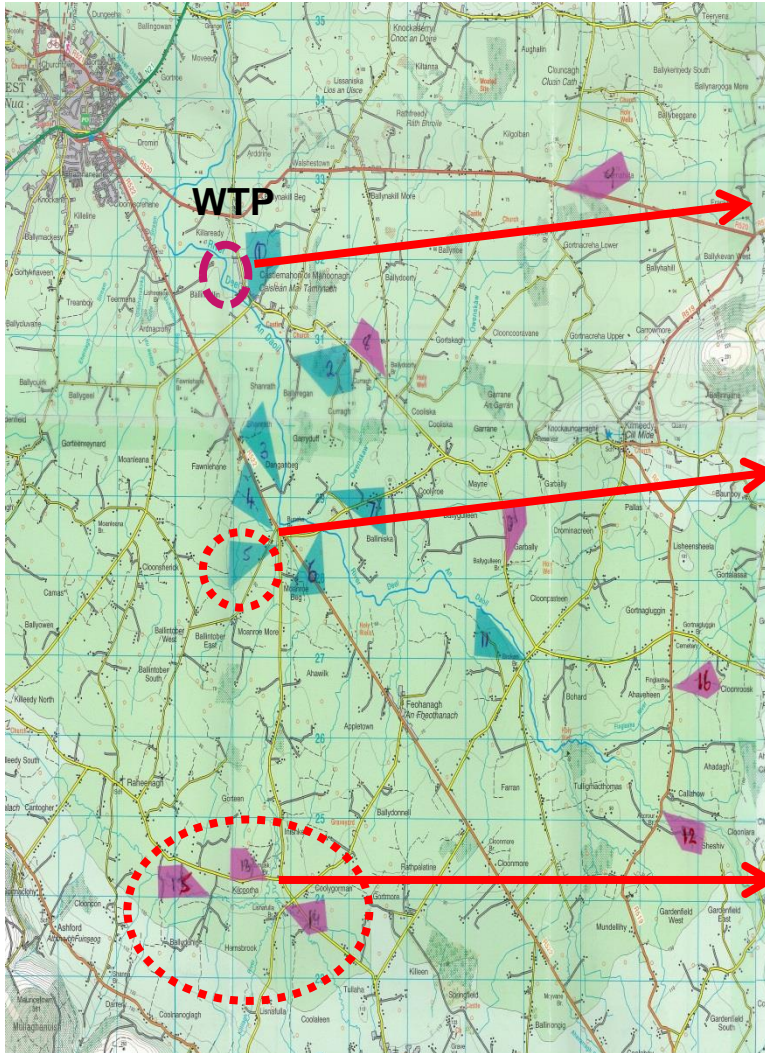
PWS Classified as “Action” based on four or more failing months in a year

Local Authority	Water Supply Zone	Number of Compliant Months	Number of Failing Months	Year
Longford County Council	Longford Central	2	6	2017
Longford County Council	Longford Central	7	1	2018
Longford County Council	Longford Central	3	2	2019
Kilkenny County Council	Kilkenny City (Troyswood) PWS	7	4	2017
Kilkenny County Council	Kilkenny City (Troyswood) PWS	11	0	2018
Kilkenny County Council	Kilkenny City (Troyswood) PWS	7	0	2019
Limerick County Council	Abbeyfeale PWS	7	5	2017
Limerick County Council	Abbeyfeale PWS	6	5	2018
Limerick County Council	Abbeyfeale PWS	8	0	2019
Limerick County Council	Newcastle West PWS	8	4	2017
Limerick County Council	Newcastle West PWS	10	1	2018
Limerick County Council	Newcastle West PWS	7	1	2019
Wexford County Council	Clonroche	1	0	2017
Wexford County Council	Clonroche	5	4	2018
Wexford County Council	Clonroche	5	2	2019
Cavan County Council	Belturbet PWS	7	3	2017
Cavan County Council	Belturbet PWS	7	4	2018
Cavan County Council	Belturbet PWS	1	4	2019
Cavan County Council	Cavan RWSS	9	3	2017
Cavan County Council	Cavan RWSS	6	5	2018
Cavan County Council	Cavan RWSS	5	0	2019
Mayo County Council	Newport PWS	8	3	2017
Mayo County Council	Newport PWS	11	1	2018
Mayo County Council	Newport PWS	2	4	2019



APHA Catchment Monitoring Programme

River Deel – Newcastle West PWS



River Nore Catchment

Reference

	Name	Location	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W</
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APHA Catchment Monitoring Programmes

R.Nore (Kilkenny PWS) & – R.Feale (Listowel)

River Nore Catchment

			01/04/2019	08/04/2019	15/04/2019	22/04/2019	29/04/2019	06/05/2019	13/05/2019	27/05/2019	10/06/2019	24/06/2019	08/07/2019	22/07/2019	05/08/2019	19/08/2019	02/09/2019	09/09/2019	16/09/2019	23/09/2019	30/09/2019	14/10/2019
			WK 14	WK 15	WK 16	WK 17	WK 18	WK 19	WK 20	WK 22	WK 24	WK 26	WK 28	WK 30	WK 32	WK 34	WK 36	WK 37	WK 38	WK 39	WK 40	WK 42
Reference	Name	Location																				
NO 001	River Nore	Threecastles Bridge (River Nore)																				
NO 002	Dinin River	Dinin Bridge Jenkinstown																				
NO 003	Nuenna River	Bishopsmeadow (Nuenna River)																				
NO 004	River Nore	Lismaine Bridge (River Nore)																				
NO 005	River Nore	Ballyraggert Bridge (River Nore)																				
NO 006	Owenbeg River	Attanagh Bridge (I)																				
NO 007	River Nore	Tallyho Bridge (Nore)																				
NO 009	River Nore	U/S Troyswood WTP (River Nore)																				
NO 010	Douglas River	Douglas River (Douglas River)																				
NO 011	Dinin River	Dysart Bridge (Dinin River)																				
NO 012	Dinin River	Castlecomer (Dinin River)																				
NO 015	River Gloshia	Kilcollan (River Gloshia)																				
NO 020	Dinin River	Massford Bridge (Dinin River)																				

River Feale Catchment

			WK 14	WK 15	WK 16	WK 17	WK 18	WK 19	WK 20	WK 22	WK 24	WK 26	WK 28	WK 30	WK 32	WK 34	WK 36	WK 37	WK 38	WK 39	WK 40	WK 42
Reference	Name	Location																				
FE 001	River Feale	Directly U/S of WTP																				
FE 002	River Feale	Wellesley Bridge																				
FE 003	Feeder Stream No. 1	Meenscovane																				
FE 004	Feeder Stream No. 2	Caherlane Bridge																				
FE 005	River Feale	Inchinapoagh																				
FE 006	Clydagh River	Clydagh Bridge																				
FE 008	Clydagh River	Scalp Bridge																				
FE 009	Caher River	Mountcollins																				
FE 010																						
FE 011	Breanagh River	Breanagh Bridge																				
FE 012	River Feale	Glencarney Bridge																				
FE 013	River Feale	Rock Chapel																				
FE 014	Owveg River	Bateman's Bridge																				
FE 015	Owveg River	Heailly Bridge																				

APHA Catchment Monitoring Programme

Lough Forbes (Longford Central PWS) – pop. 15,427

Reference	Name	Location	WK 14	WK 15	WK 16	WK 17	WK 18	WK 19	WK 20	WK 22	WK 24	WK 26	WK 28	WK 30	WK 32	WK 34	WK 36	WK 37	WK 38	WK 39	WK 40	WK 42
LF 001	Lough Forbes	Water Extraction Plant																				
LF 002	Shannon	Roosky																				
LF 003	Eislin River	Dromod																				
LF 004	Rinn River	Cloonart Bridge																				
LF 005	Rinn River	Annaveagh Bridge																				
LF 006	Black River	Clooncamber																				
LF 007	Black River	Bealantra Bridge																				
LF 008	Feeder Stream No	Scry Bridge																				
LF 011	Feeder Stream No	Kilbarry																				
LF 012	Black River	Breannskullew																				
LF 014	Lough Rinn	Feeder Stream From Lough Errew																				
LF 015	Lough Rinn	Feeder From West - Tawnagh More																				
LF 016	Lough Rinn	Feeder From North - Creenagh Lough																				
LF 017	Lough Rinn	Centre of Lough																				
LF 018	Eislin River	Lough Erril Bridge																				
LF 019	Eislin River	Breandrum Bridge																				
LF 020	Lough Forbes	Centre of Lough																				

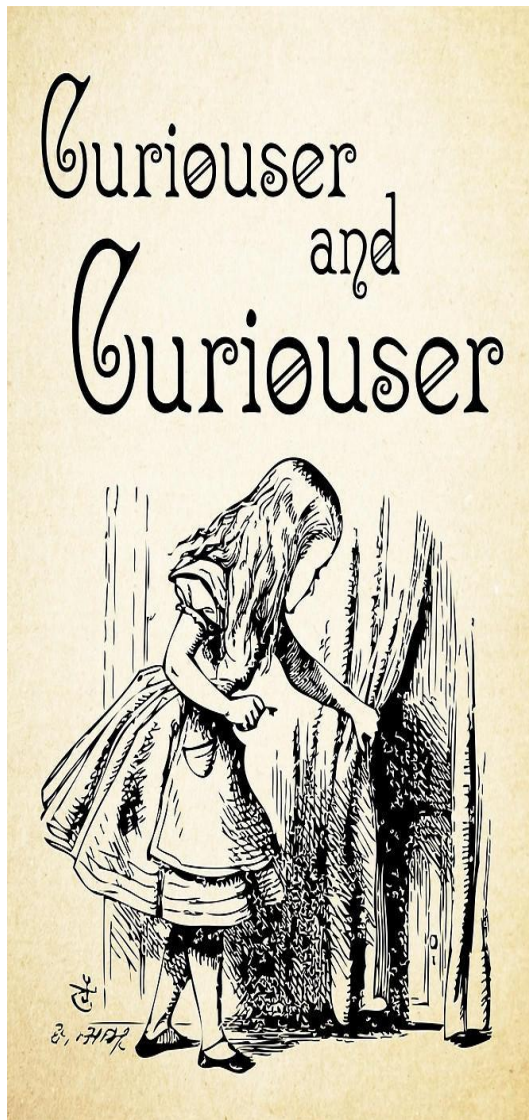
Second year of monitoring – visible presence on the ground.

Huge efforts through NPDWAG to raise awareness (media campaigns) & engage on the ground

MCPA cause of N/C in DW, however, MCPP & 2,4 D detected at high levels in catchment

Significant improvements to DW compliance but still widespread issue in catchment

What is going on????



- Lough Forbes Catchment Unique & Defies Conventional expectations.
- Widespread detections across entire catchment
- 2018 V. high levels of MCPA detected in advance of spraying season? Additionally, conditions were very wet under foot.
- DT_{50} (half life) of approximately 25 days in soil (depending on conditions...can be as low as 10 days) but can remain in environment for a significant duration (negligible breakdown in anaerobic conditions)
- Catchment complex with feeder lakes (lough Rinn) feeding into Lough Forbes, are these acting as pesticide reservoirs?
- Centre of Lake samples for Lough Rinn and Lough Forbes detected elevated levels of MCPA.
- Are we looking a historical and current contamination? Lag between cause and effect.

It's complicated!

- APHA monitoring to continue over Winter period to determine if pesticides are still detectable in catchment outside of the spraying season – this should answer the legacy issue. Old and new water – possible complicated GW and SW interactions.
- Unlike Rivers difficult to identify troublesome areas because they're all troublesome! Need to determine loadings and their impact on the abstraction point.
- Is a low flow/volume input with high concentrations having a more pronounced impact on abstraction than a high flow/volume input with low concentrations?
- Call in the catchment scientists!!

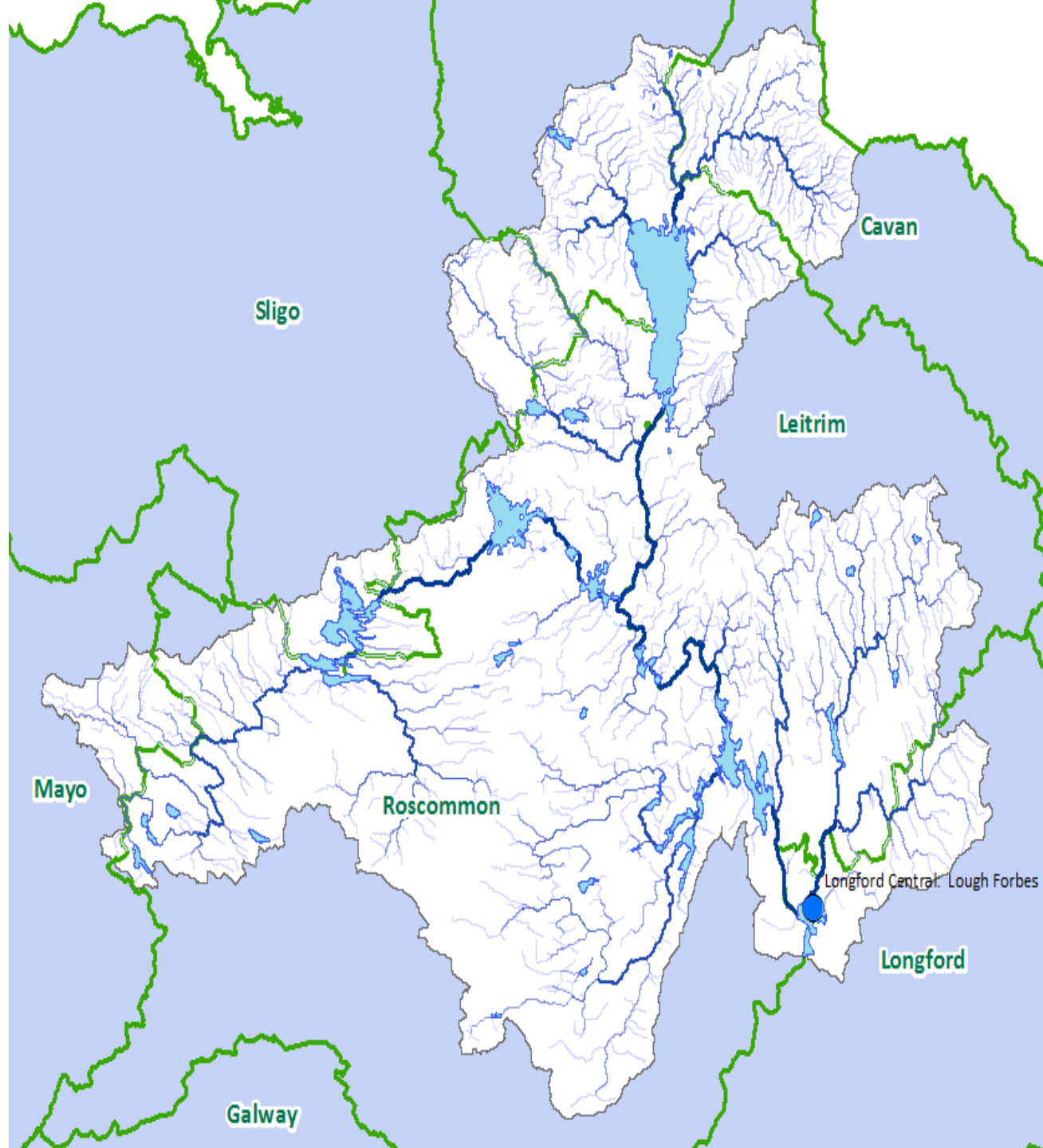
SW abstraction catchment:

Delineation and characterisation

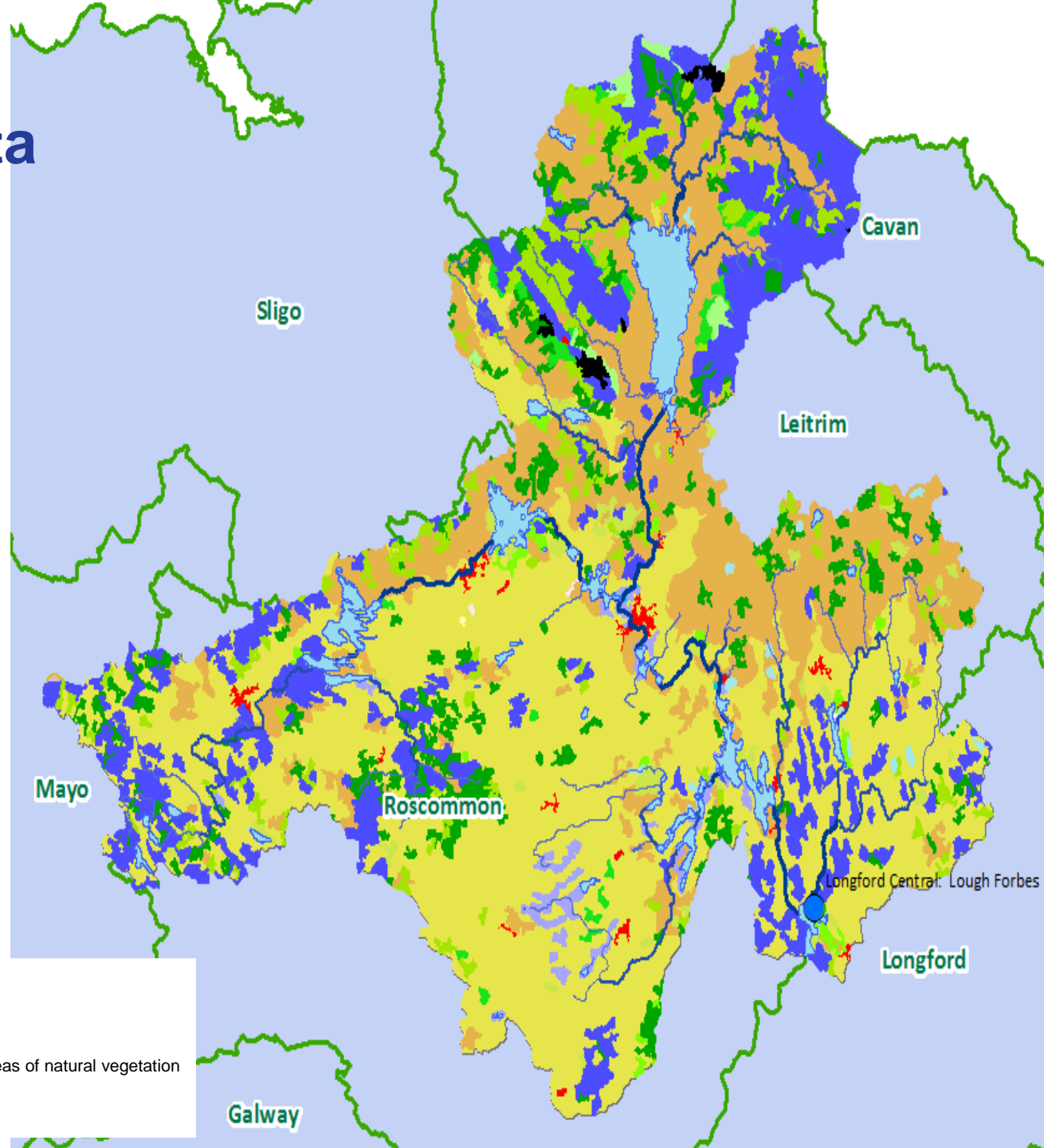
**Lorraine Gaston ,
Catchment Scientist,
Irish Water**

Lough Forbes Surface water abstraction catchment

Size:
2,257 km²



Corine 2018 Landcover data

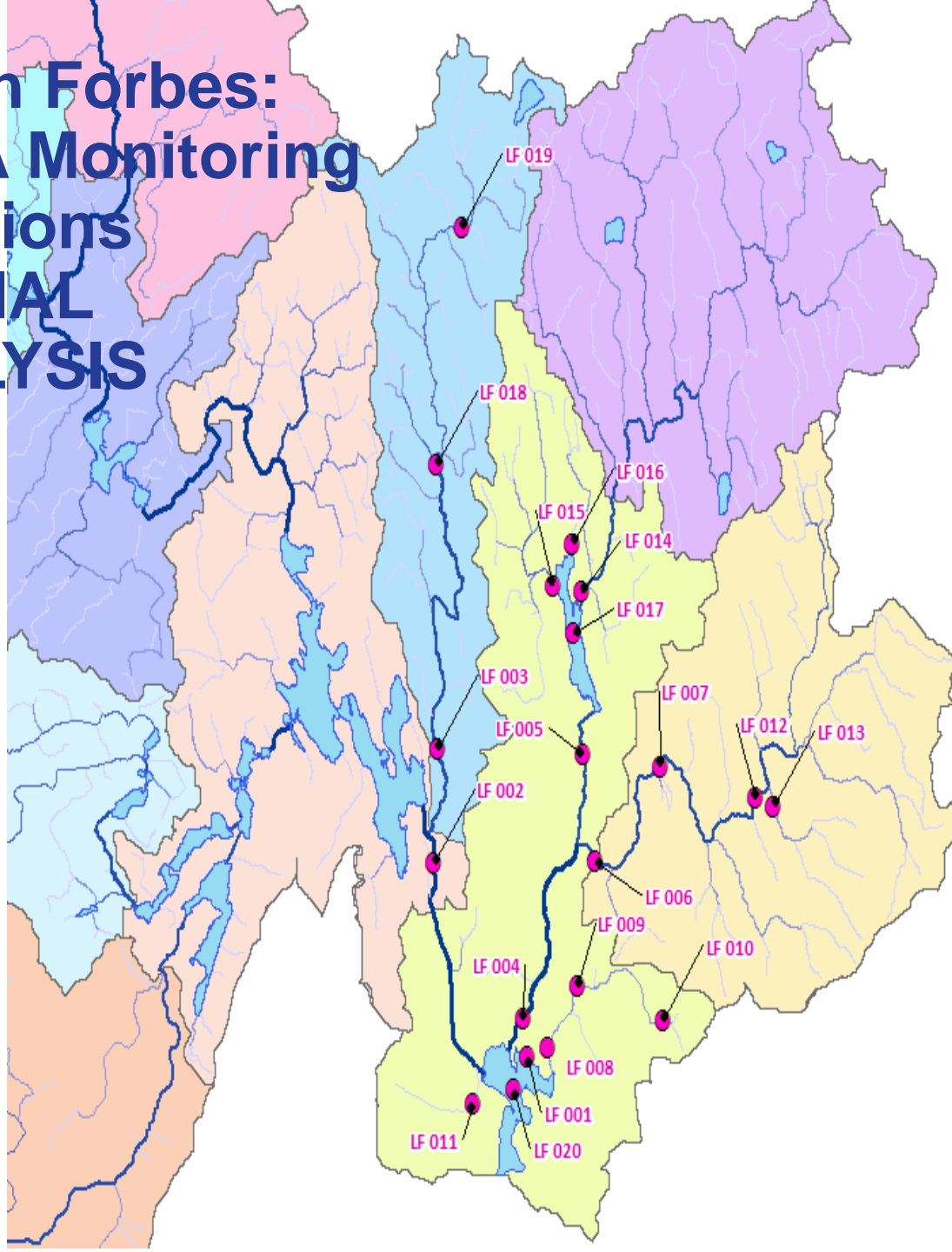


Legend

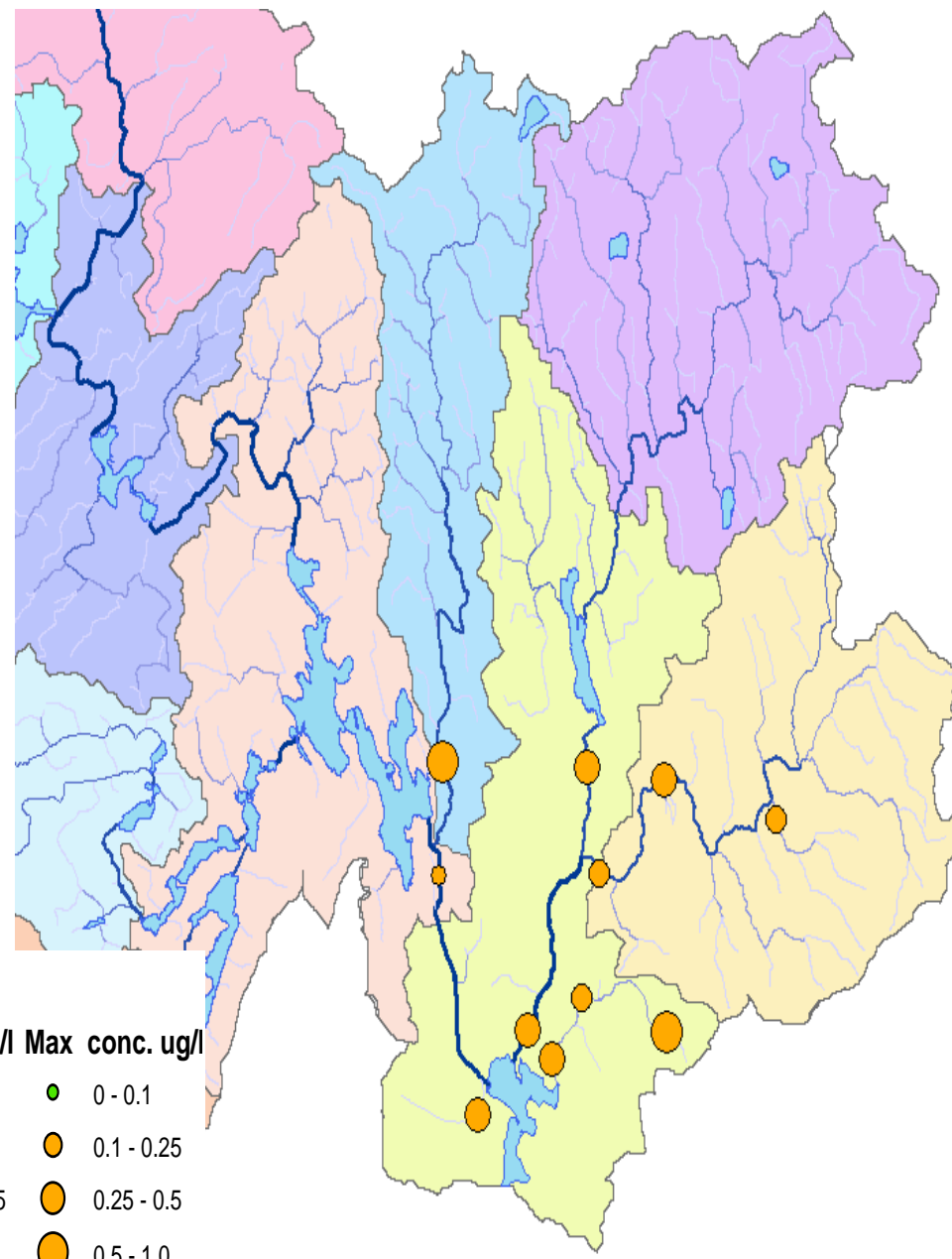
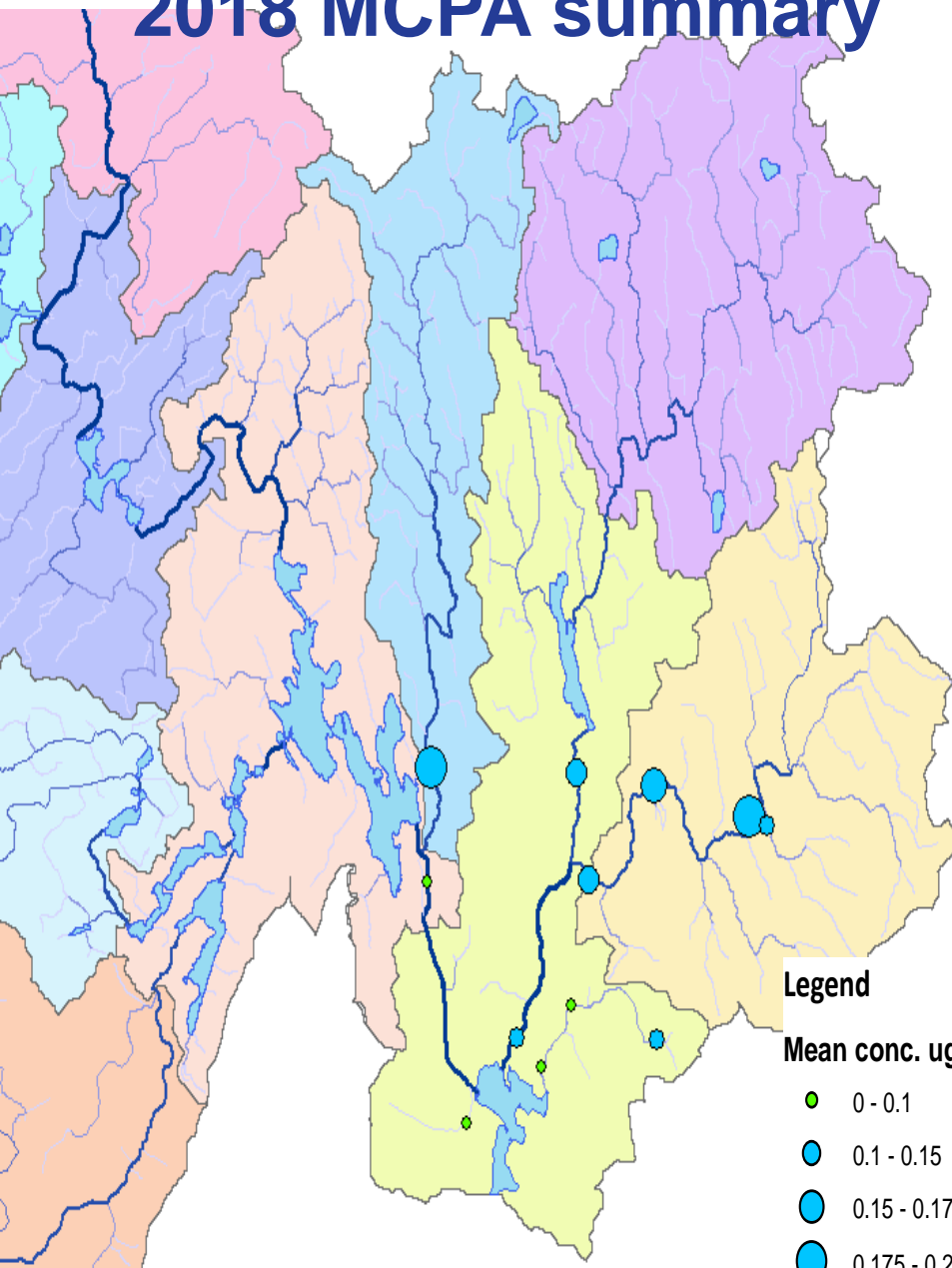
- 231 Pastures
- 243 Land principally occupied by agriculture with areas of natural vegetation
- 412 Peat bogs

Data analysis: Spatial

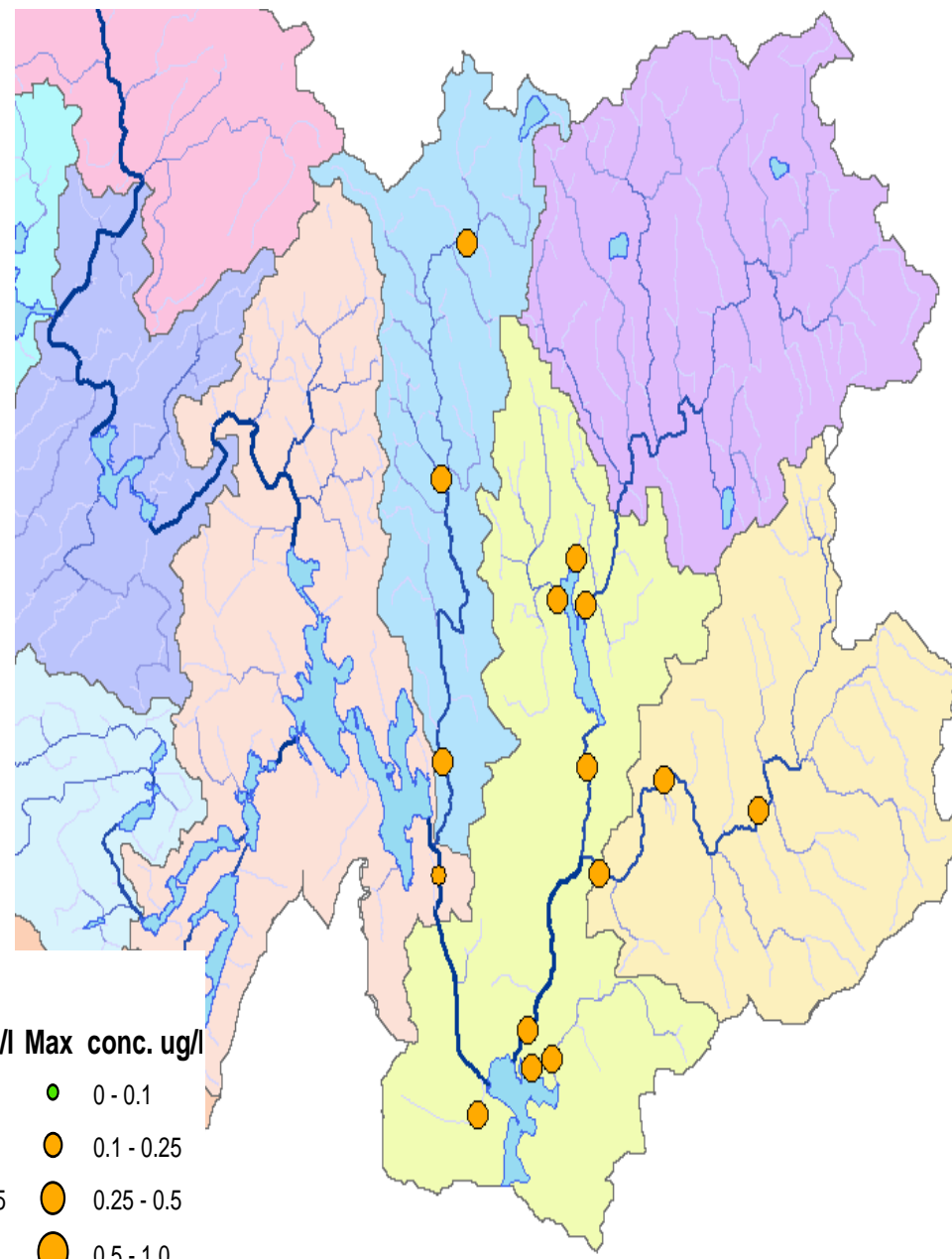
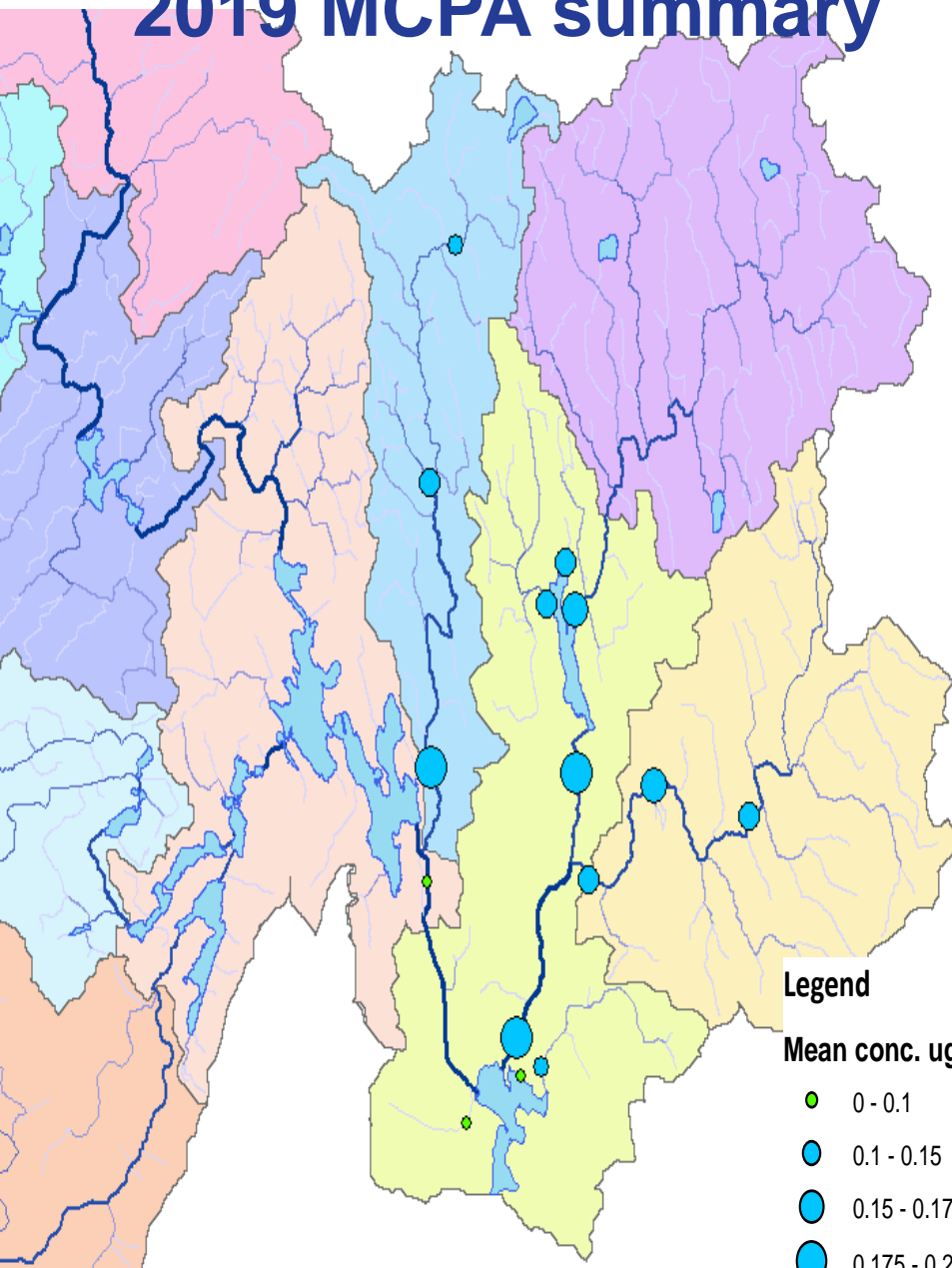
Lough Forbes: APHA Monitoring Locations SPATIAL ANALYSIS



2018 MCPA summary

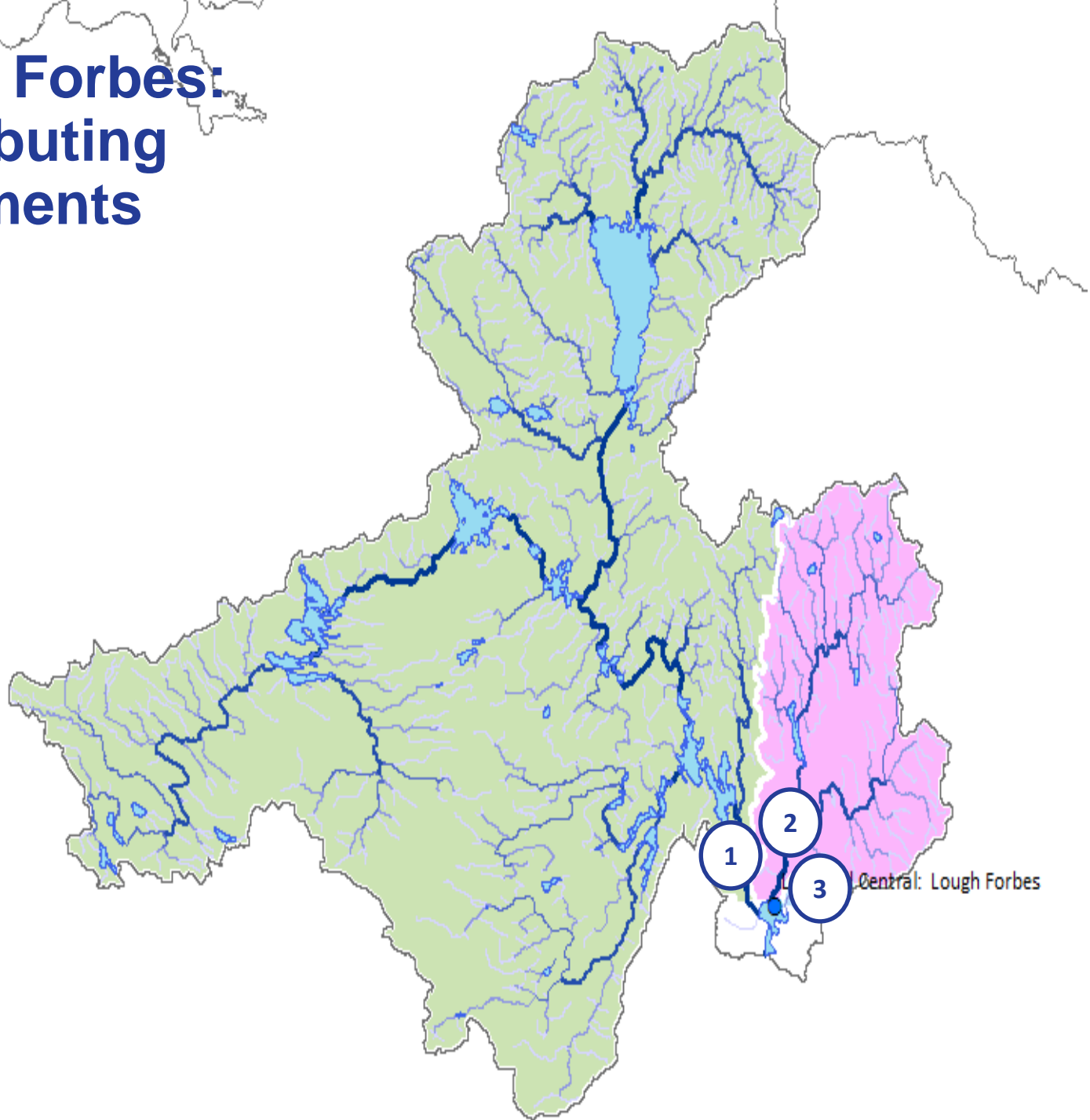


2019 MCPA summary



Data analysis: Flows

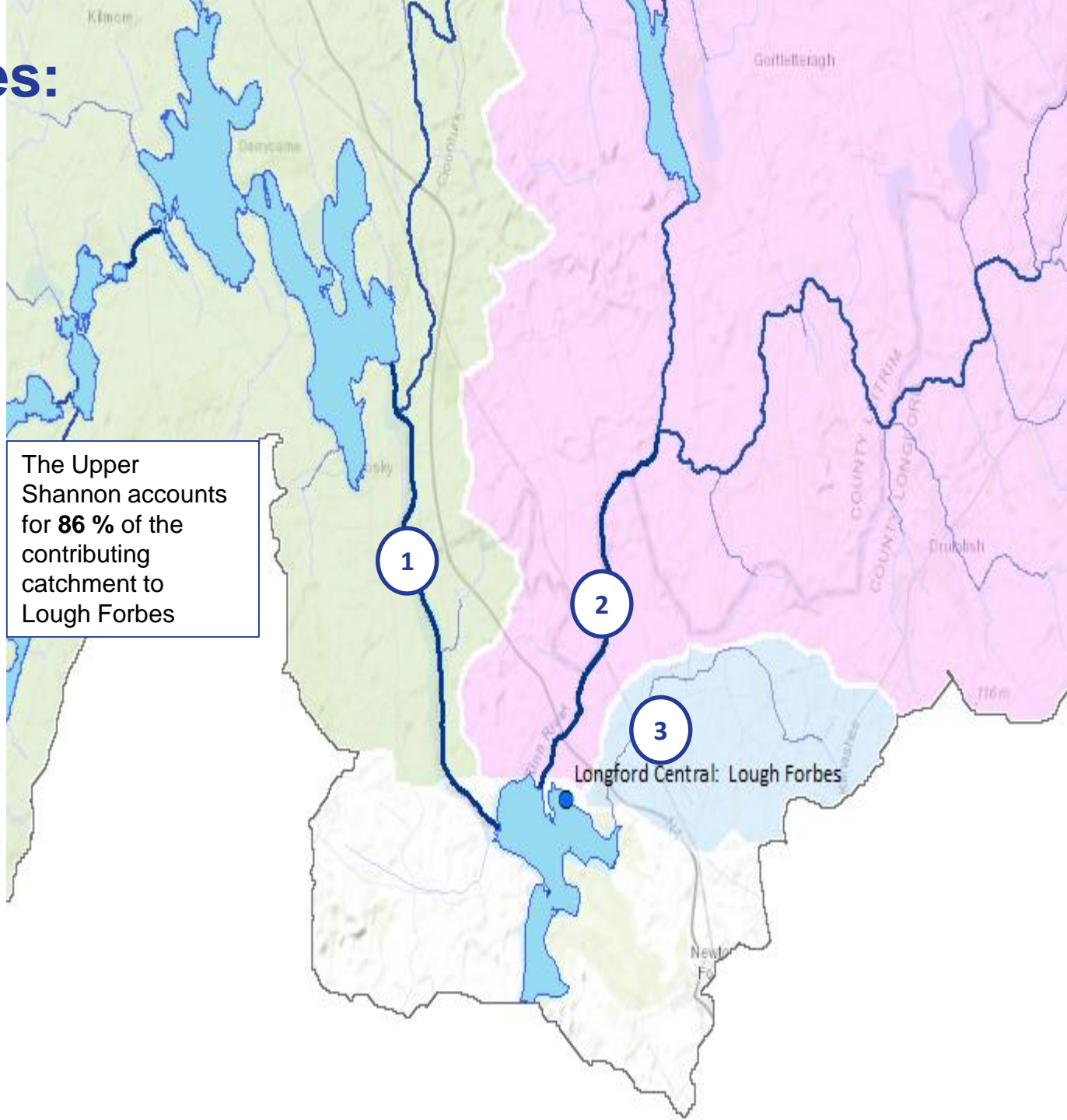
Lough Forbes: Contributing catchments



Lough Forbes: Contributing catchments

- 1 Upper Shannon
1,918 km²
- 2 Rinn
299 km²
- 3 Annaghcoolen
12 km²

The Upper
Shannon accounts
for **86 %** of the
contributing
catchment to
Lough Forbes



Lough Forbes inflows

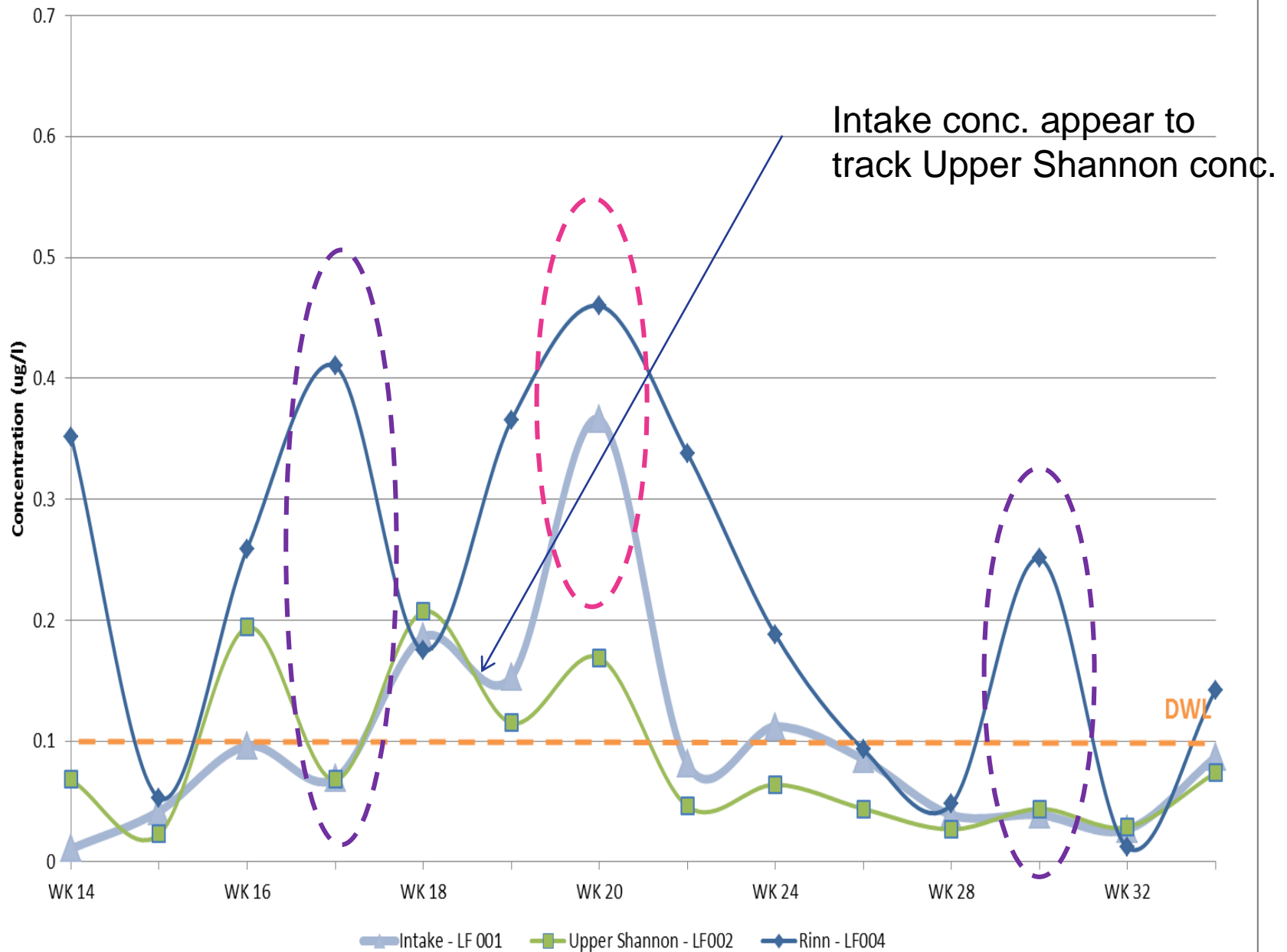
- Difficult to assess hydrology for this large catchment with a series of large lakes
- Only the upper reaches or small tributaries are gauged
- No gauges on the Shannon immediately upstream and downstream
- The Shannon, is very controlled (for navigation and hydropower)
- There is no EPA estimate of the flow for the Shannon

Approximate Q50 flows

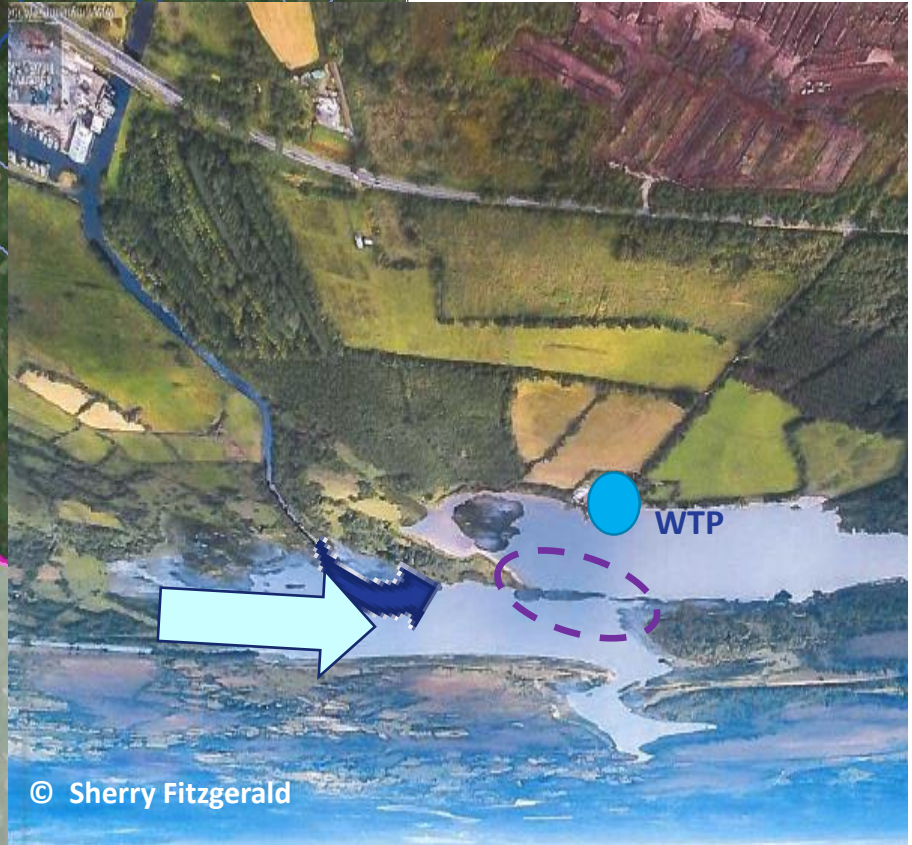
- Upper Shannon ~34 m³/s
- Rinn ~5 m³/s
- Annaghcoolien ~0.2 m³/s

Data analysis: Time-series concentrations

Comparison of MCPA concentrations with the L Forbes abstraction intake (2019)







Summary of initial findings

- No correlation between effective rainfall and pesticide detection in 2019 (LAWPRO presentation – Kate Tynan)
- Catchment is predominately a mix of poorly draining and peaty lands
- The Upper Shannon provides approx. 86% of the flow to L Forbes and is therefore a major contributor of MCPA loads to the lake:
 - *Diluting inputs from the Rinn River and the Feeder stream*
 - *Perhaps during times of lower flow, allowing the other rivers to have a greater impact (due to lake levels, wind, sand bar etc)?*
- This approach can aid in:
 - *understanding MCPA exceedances and the importance of considering river flows and lake dynamics; and*
 - *narrowing down (or expanding) the areas to focus NPDWAG efforts and the type of messaging*

- Further analysis for Lough Forbes
 - *Try to get a better understanding of flows in the Upper Shannon and the Rinn sub-catchments*
 - *Find out more about the lakes bathymetry and flow dynamics*
 - *Analyse other pesticides (2,4, D) and correlations*
 - *Estimate pesticide loads to Lough Forbes*

Thank you for you attention

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Any Questions

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ervia

Aurora
TELECOM



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ÉIREANN : IRISH
WATER