

UKILN Conference

**Lakes – protecting,
enhancing and restoring.**

**Westport
16th and 17th October 2019**

Hotel Westport Leisure, Spa & Conference Hotel

<http://www.ukandirelandlakes.org>

United Kingdom Ireland Lake Network



Lake Water Quality and the Water Framework Directive Maths and Facts.



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October 16th 2019

Lake Water Quality and the Water Framework Directive Maths and Facts.

- **Water Quality in Ireland Report**
- What is the quality of our lakes?
- How are lakes doing compared to the last assessment?



What are we monitoring?

- 224 monitored Water Framework Directive lakes
 - 20 largest lakes ($> 10\text{km}^2$) including the HMWB Pollaphuca Reservoir and lakes such as Lough Owel and Corrib Lower
 - 90 small lakes
 - 113 large lakes
 - 6 high altitude lakes
- 812 Water Framework Directive lakes
 - 1 artificial waterbody – Seven Churches or Turlough Hill
 - 16 heavily modified waterbodies
 - 795 small and large lakes
 - 206 large lakes
 - 90 high altitude lakes
- $> 12,000$ lakes

What are we monitoring?

■ Four biological elements

- Macrophytes
- Phytobenthos
- Phytoplankton
- Invertebrates
- Fish

■ 24 General Physical Chemical Elements

- Conservative parameters e.g. alkalinity
- Nutrients

■ Specific Pollutants and Priority Action Substances

WFD Lake Assessment Tools and Environmental Quality Standards – Nutrient Focus

■ Four intercalibrated biological assessment tools

- Free Macrophyte Index
- Lake Trophic Diatom Index
- IE Phytoplankton Index
- Fish in Lakes 2

■ Four environmental quality standards

- Total phosphorus
- Ammonium
- pH
- Oxygen

Who is monitoring and assessing - Collaborative Effort

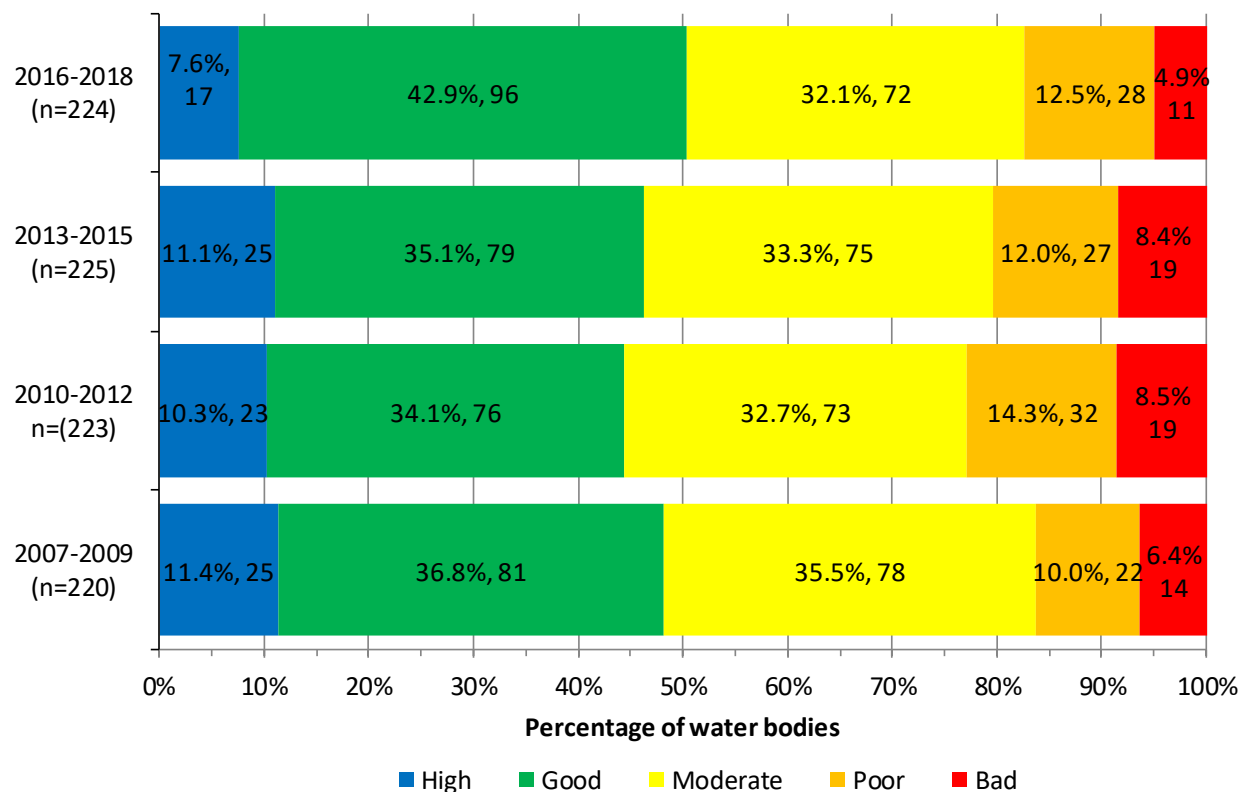
- Environmental Protection Agency
- Inland Fisheries Ireland
- Northern Ireland Environment Agency
- National Parks and Wildlife Service
- Local Authorities
- People
- Sampling
- Laboratory Analysis
- Data compilation and Quality Control
- Analysis and Assessment
- Designated Body
- Competent Authorities

What have we assessed- Monitoring Programme

- Data from 2007 to 2018
- 205 lakes assessed 4 times
- 17 assessed 3 times
- 2 new lakes in 2016-2018

Water Quality Report – Current Status and Trends

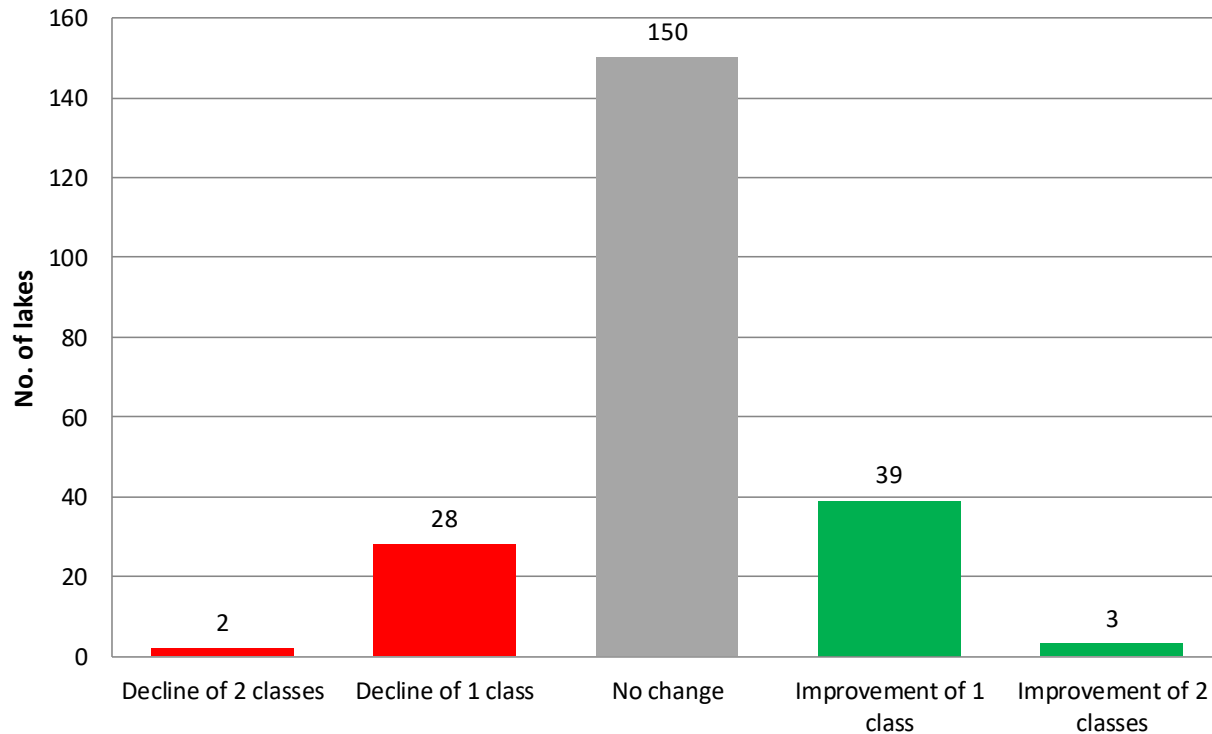
Lake Ecological Status



- What do you see?
- What does this mean?
- What do you think?

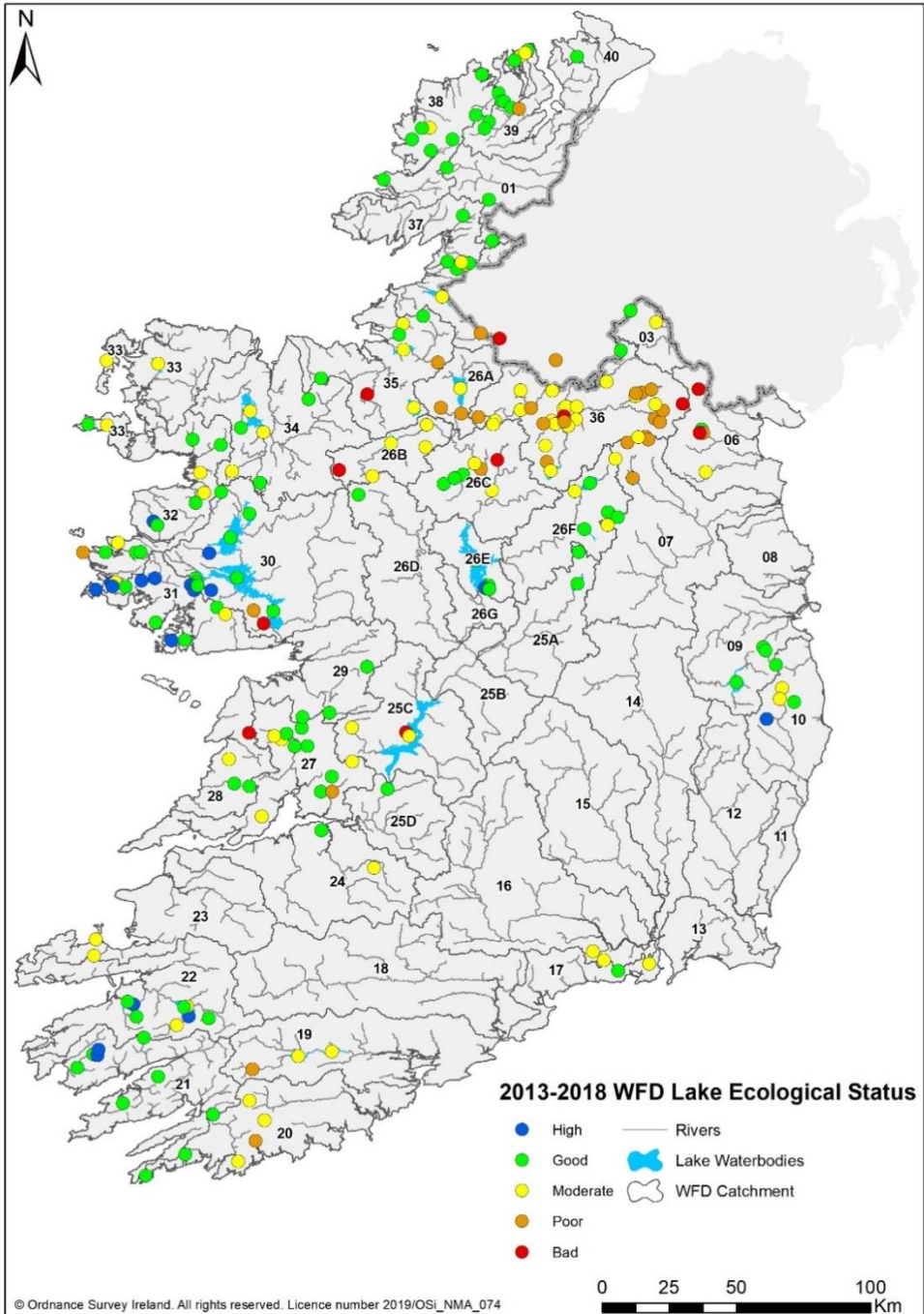
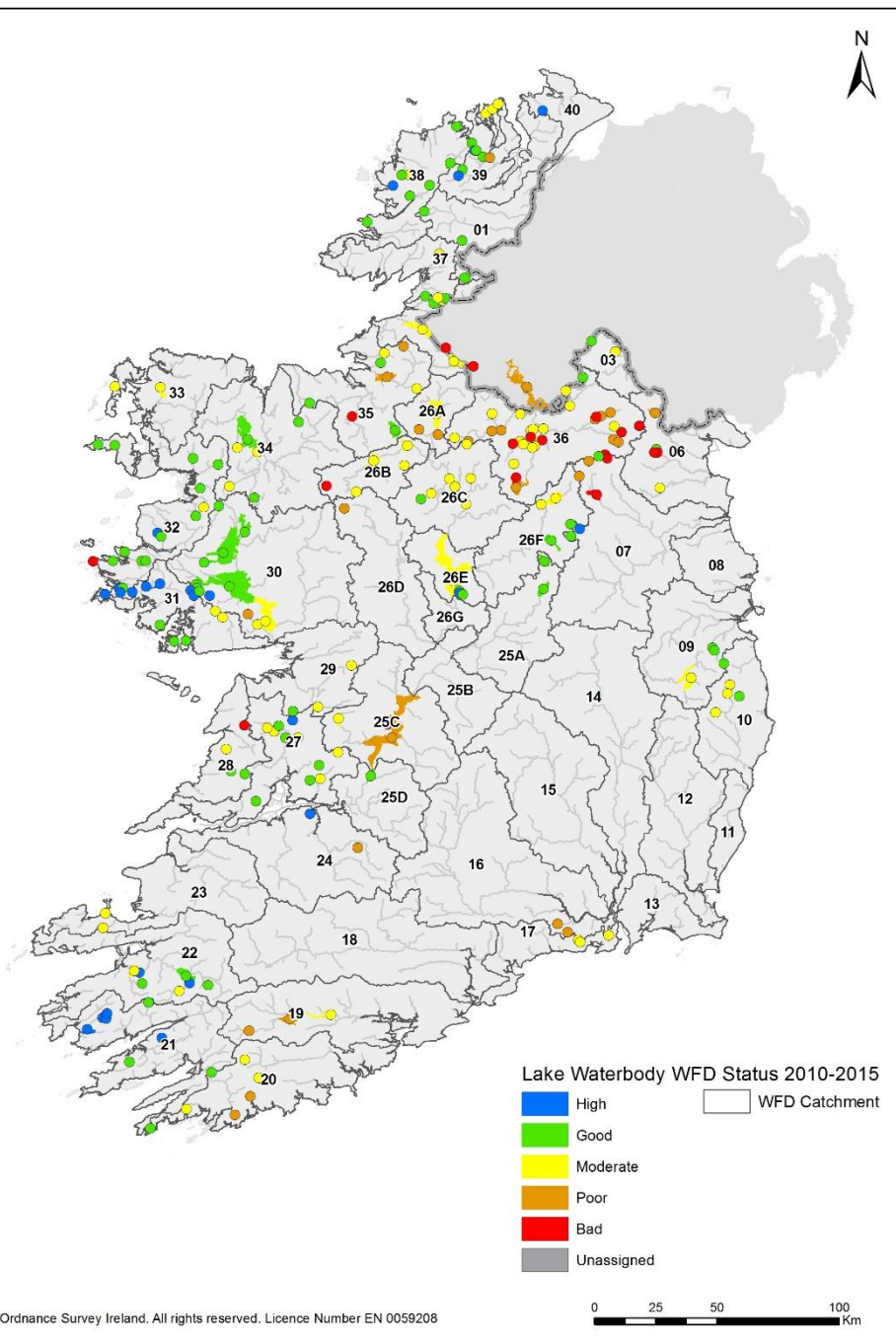
- Less High but more Good
- Increase in H/G
- Net Improvement
- Less Bad
- Moderate about the same

Change in Status Class compared to previous assessment



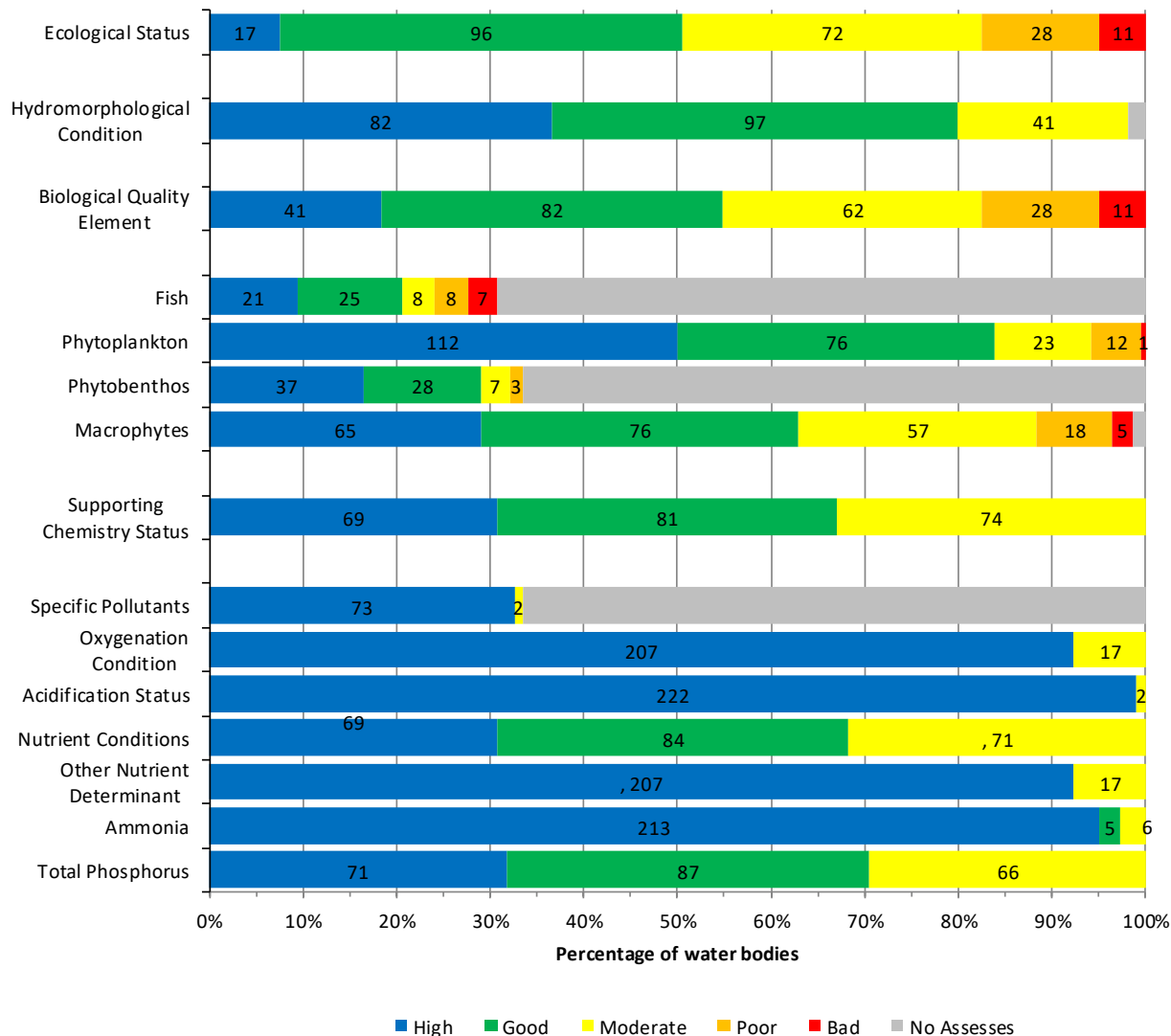
- What do you see?
- What does this mean?

Recent Net improvement - 12 lakes



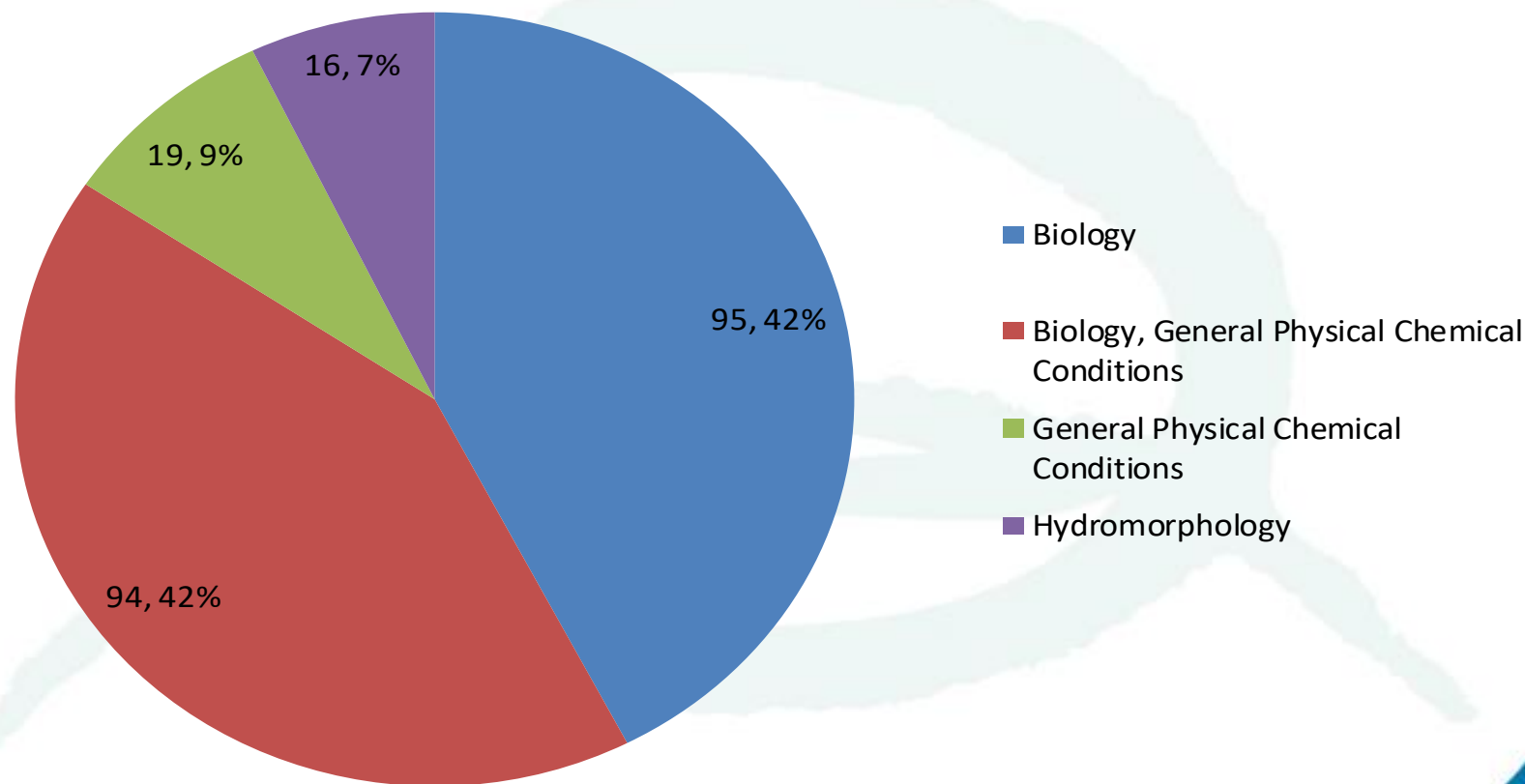
Water Quality Report – Status Assessment

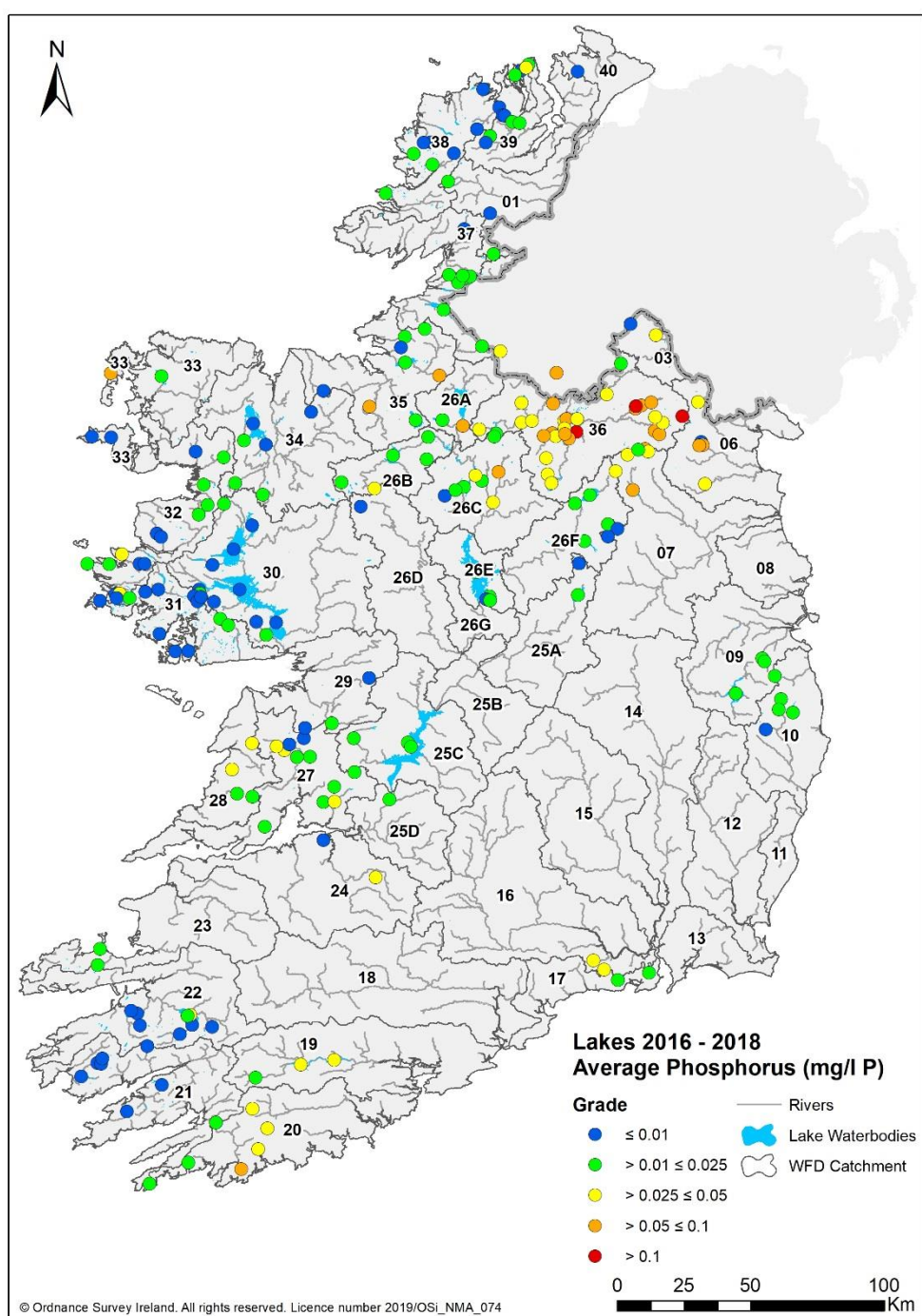
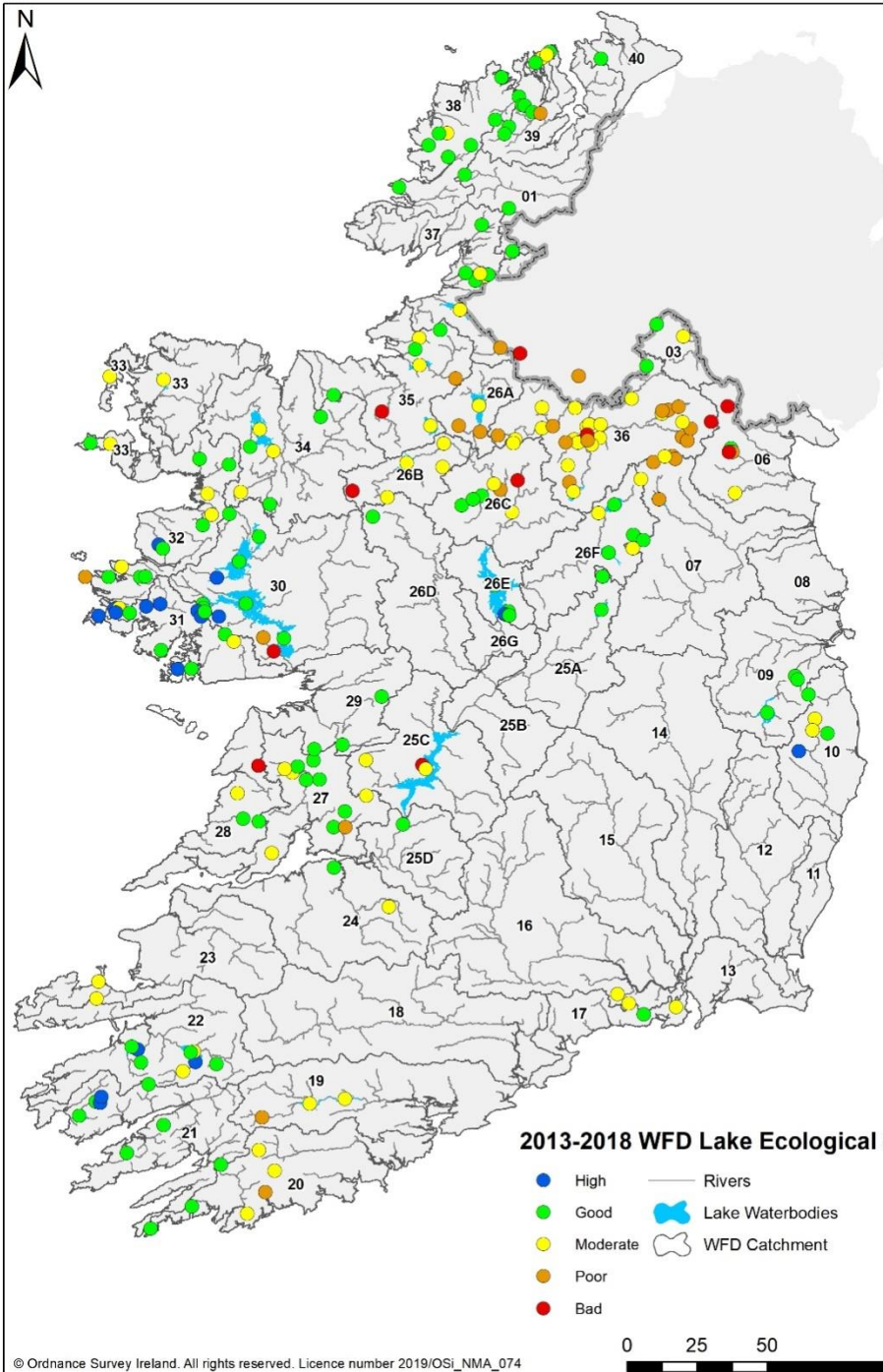
Lake Ecological Status



What do you see?
What does this mean?

Water Quality Report – Status Assessment





Under the Bonnet!



Under the Bonnet! - Loss of High Status Lakes

- 17 lake currently in high status. 25 lakes in high status in 2007-2009 - what has happened?
- 2 lakes dropped from programme, leaves 23 lakes
- **8 lakes are always high status to date**, leaves 15 lakes
- 14 lakes either high or good – **2 currently high status** leaves 1 lake
- 1 lake now good status but had also been moderate
- Hydromorphology not a particular factor in 'loss'
- **7 different lakes** are now high status but.....
- **1 lake new** to programme in 2013-2015 – have to find **6 lakes**.....

Under the Bonnet! - Loss of High Status Lakes

■ Finding 6 lakes

LAKE	LA	Classes
Anaserd	GY	HGHH
Ballynahinch	GY	GHHH
Coosan	WH	HGHH
Illauntrasna	GY	GGGH
Mask Upper	MO	GGH
Salt	DL	GHGG
Shindilla	GY	GHHH
Cummernamuck	KY	MGHH
Upper Lake Glendalough	WW	GGMH

Under the Bonnet! – Increase in High/Good lakes

■ Focus on:

- Increase in high/good – 104 to 113 lakes, Net increase = 9 lakes
- Improvements only into high/good
- Recently good status

	Improvement to:	Decline to:
High	3	
Good	17*	11
Moderate	13	10
Poor	9	6
Bad		3
	42	30

*1 came from poor
1 high status lake from moderate

■ 17 lakes moved into H/G

■ 10 lakes moved out of H/G

■ Net in of 7 lakes

■ 1 new lake with good status

- Where did they come from?
- What do they look like?
- Who are they?
- What does the improvement mean?
- So what?

Under the Bonnet! – Increase in High/Good lakes

- 14 lakes improved from moderate to good
- 1 lake improved from poor to good
- 2 lakes improved from moderate to good
- 1 lake improved from moderate to high

Status classes	Total
GGMG	5
GMMG	3
MGMG	1
MMMMG	3
	12
GMG	1
MMG	1
	2
	14

LAKE	LA	Classes
Glenade	LM	BMPG
Caragh	KY	HMMG
Corrib Lower	GY	PMMG
Upper Lake Glendalough	WW	GGMH

Caragh – high status ‘loss’ and High/Good gain

- Moderate to Good
- SM lake
- Specific Pollutant
- ? Improvement
- but.....Macrophytes

						Assessment			
						2007-2009	2010-2012	2013-2015	2015-2018
Ecological Status						1	3	3	2
Supporting Chemistry Status						1	3	3	1
Nutrient Conditions Status						1	2	1	1
Oxygenation Status						1	1	1	1
Acidification Status						1	1	1	1
Specific Pollutants							3	3	1
Biological Status						1	2	2	2
Macrophyte Status						1	2	2	2
Phytobenthos Status						1	2	1	1
Chlorophyll Status						1	1	1	1
Phytoplankton Composition Status						1	1	1	1
Phytoplankton Status						1	1	1	1
Fish Status						1	1	1	1
Status Determinants						BQE, GPC	GPC	GPC	BQE
Status Years						Mp, Phb, Pp, Fish			Mp
Macrophyte nEQR						DO, Nutrients, pH, Thermal	SP	SP	
Phytobenthos nEQR									
Chlorophyll nEQR									
Taxonomic Metric nEQR									
Mean TP as mg/L									
2007-2009	0.82		0.84	0.87	0.0098				
2010-2012	0.74		0.84	0.952	0.0101				
2013-2015	0.78		0.85	0.84	0.0089				
2016-2018	0.69	0.81	0.84	0.92	0.0093				
High/Good	0.80	0.80	0.80	0.80	0.0100				

Upper Lake Glendalough – high/ good gain and high gain

- OM lake
- Moderate to High
- Macrophytes determining
- Low taxa numbers
- Low plant counts
- Low nutrients
- Low chlorophyll
- High colour
- Steep shore
- Improvement – maybe



Upper Lake Glendalough – High/Good gain

	2007-2009	2010-2012	2013-2015	2015-2018
Ecological Status	2	2	3	1
Supporting Chemistry Status	1	1	1	1
Nutrient Conditions Status	1	1	1	1
Oxygenation Status	1	1	1	1
Acidification Status	1	1	1	1
Specific Pollutants				
Biological Status	2	2	3	1
Macrophyte Status	2	2	3	1
Phytobenthos Status				
Chlorophyll Status	1	1	1	1
Phytoplankton Composition Status				
Phytoplankton Status	1	1	1	1
Fish Status				
Status Determinants	BQE	BQE	BQE	BQE, GPC
	Mp	Mp	Mp	Mp, Chl
				DO, Nutrients, pH, Thermal

Upper Lake Glendalough - – High/Good gain

	2009	2012	2015	2018	2009	2012	2015	2018
% RF Chara spp.					0.0	0.0	n/a	n/a
% RF Elodeids	52	57	41	12	0.6	0.5	0.7	1.0
% RF Tolerant	56.5	50.0	41.2	5.9	0.7	0.8	0.8	1.0
Trophic Score	25.0	22.3	31.8	21.0	1.0	1.0	0.7	1.0
Max Depth	2.1	2.7	1.2	2.0	0.5	0.6	0.2	0.4
Average Depth of EQR	0.61	0.62	0.54	0.83	0.2	0.2	0.2	0.3
					0.66	0.69	0.58	0.81
Status					Good	Good	Moderate	High

				Count				%RF			
Trophic	Tolerant	Elodeid	Taxa	2009	2012	2015	2018	2009	2012	2015	2018
39	Yes	Yes	Filamentous Algae	12	7	4		52.2	50.0	23.5	
15	No		<i>Juncus bulbosus</i> var. <i>fluitans</i>	7	3	6	5	30.4	21.4	35.3	29.4
12	No		<i>Isoetes lacustris</i>	3	3	3	7	13.0	21.4	17.7	41.2
34	Yes		<i>Potamogeton natans</i>	1		1		4.3		5.9	
68	Yes	Yes	<i>Callitriche</i> spp			2				11.8	
	No		<i>Eleoqiton fluitans</i>				2				11.8
34	Yes		<i>Littorella uniflora</i>				1				5.9
23	No	Yes	Mosses		1	1	2		7.1	5.9	11.8
			Total positions sampled	36	36	39	37				
			No. of Taxa	4	4	6	5				
			Sum of counts	23	14	17	17				

The '14'

- Prevalence of drinking water abstractions
- Zebra Mussel present in some cases
- Is there ecological change?
- Previous decline/moderate a blip or not nutrient related
- Near boundary
- 10 probably not any different ecologically
- 2 undecided
- 2 yes butZebra Mussel

Conclusions

- The Numbers are right –synopsis tool of a continuum and multiple element outcomes – necessary for communication
- Broad overview – Individual Story
- Numerically different vs Ecologically different
- Focus– improved, declined, stable interrogation
- Simple to complex and analytically light to analytically heavy
- Answer questions – More questions to answer
- Look (deeper) before you act

Acknowledgements

- Colleagues in the EPA – Ecological Monitoring and Assessment Unit, Laboratory Services, Analytics
- External Colleagues – Inland Fisheries Ireland and National Parks and Wildlife Service, Northern Ireland Environment Agency



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