ANNEX 11 – LAKES – Macrophytes & Phytobenthos – combined BQE

Contents

A1 Description of method

Samples are collected as outlined in Technical Annexes for the two component lake tools: DARLEQ and LEAFPACS, Annexes 8 and 9.

The description of methods and the calculation of the individual EQRs for LEAFPACS and DARLEQ are also outlined in the individual Annexes.

A2 Summary of changes between 1st and 2nd RBMP

For the first River Basin Management Plan, the policy adopted by the UK was to treat each as a separate quality element, reporting the worst of either metric. Options for combining LEAFPACS and DARLEQ were fully evaluated in rivers, and in lakes we will carry out a similar comparison to confirm that this is the most appropriate combination rule. In the interim, the consequences for combined macrophyte and phytobenthos assessments are shown below using the current worst of either combination.

A3 Consequences of changes

England

Table 1. Comparison of classifications of ecological status determined by original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

		Revised				Grand Total
		High	Good	Moderate	Poor	Bad	
Current	High	3	1	2			6
	Good	3	20	22	3		48
	Moderate	1	1	31	15	2	50
	Poor			4	17	5	26
	Bad			1	1	2	4
Grand Total		7	22	60	36	9	134

Table 2. Percentage of water bodies in each class, determined using original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Class	Current Method	Revised Method
High	4.5%	5.2%
Good	35.8%	16.4%
Moderate	37.3%	44.8%
Poor	19.4%	26.9%
Bad	3.0%	6.7%

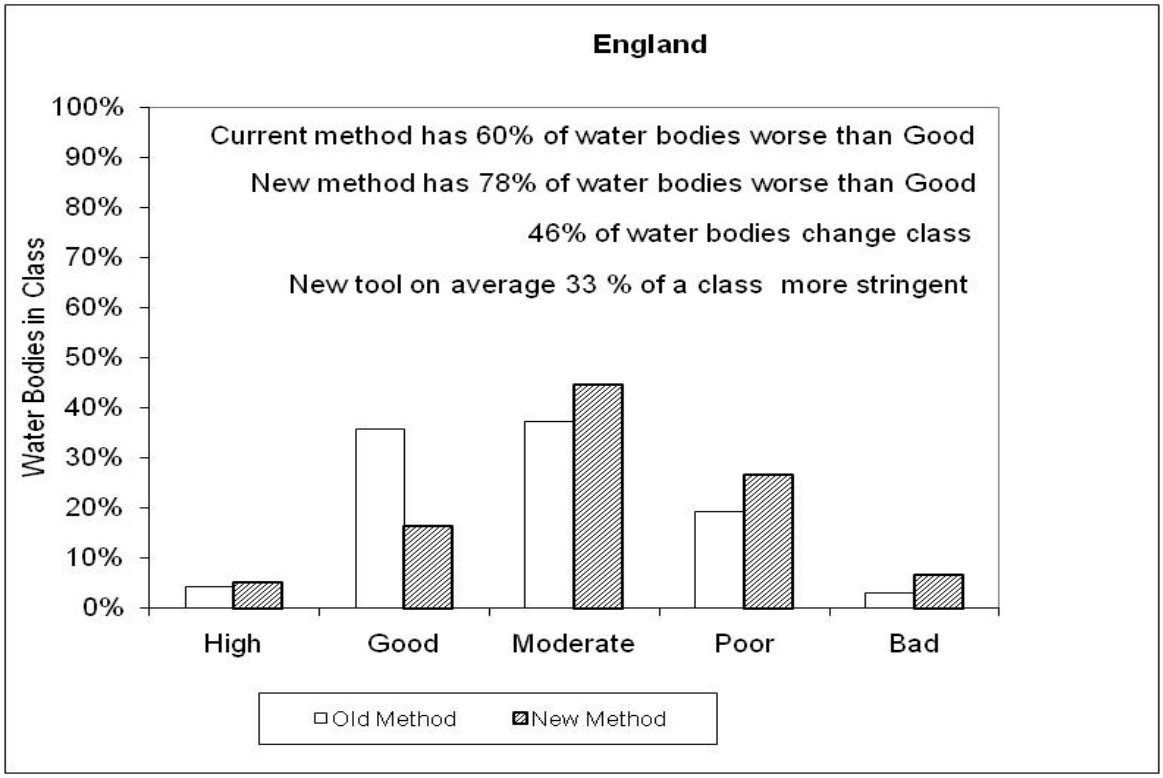

Figure 1. Percentage of water bodies in each WFD class using the current and new combined lake phytobenthos, DARLEQ and lake macrophyte, LEAFPACS assessment methods.

Table 3. Number and percentage of water bodies that change class when using the combined phytopbenthos and macrophyte assessment methods

	Number	Percentage
Current 4 class worse	0	0.0%
Current 3 class worse	0	0.0%
Current 2 class worse	2	1.5%
Current 1 class worse	9	6.7%
Same class	73	54.5%
Revised 1 class worse	43	32.1%
Revised 2 class worse	7	5.2%
Revised 3 class worse	0	0.0%
Revised 4 class worse	0	0.0%

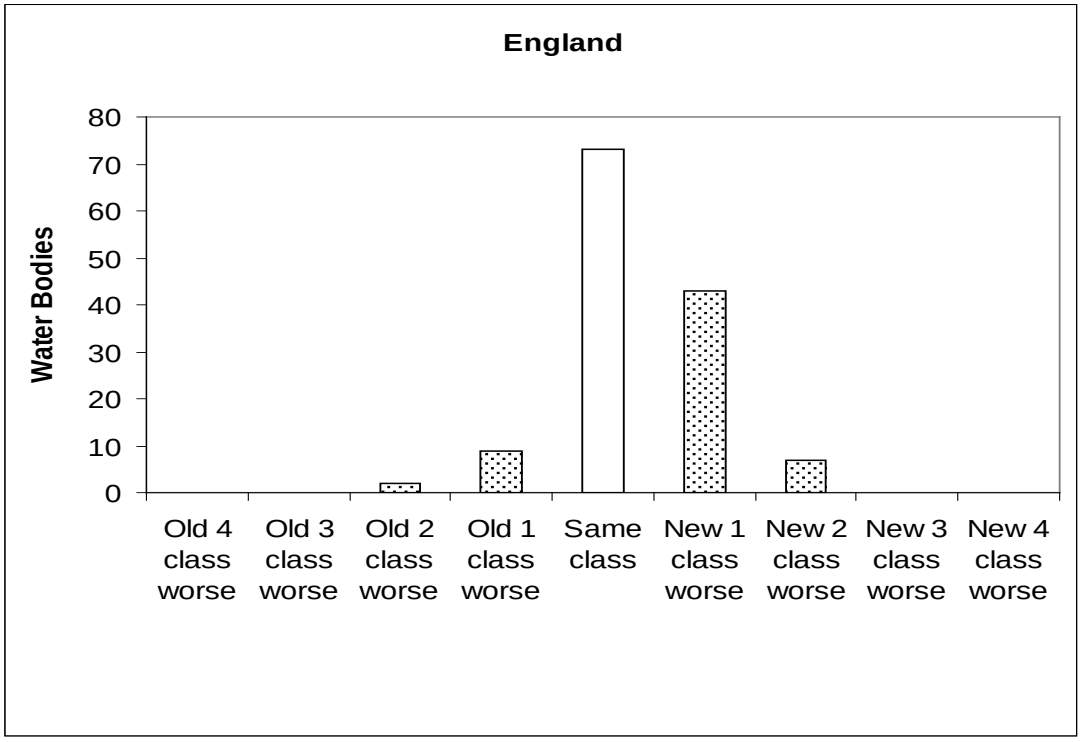

Figure 3. Number of water bodies in England that change class when using the revised version of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Wales

Table 4. Comparison of classifications of ecological status determined by original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

		Revised					Grand Total
		High	Good	Moderate	Poor	Bad	
Current	High	1					1
	Good	9	11	5			25
	Moderate		1	9	5		15
	Poor				5	1	6
	Bad					1	1
Grand Total		10	12	14	10	2	48

Table 5. Percentage of water bodies in each class, determined using original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Class	Current Method	Revised Method
High	2.1%	20.8%
Good	52.1%	25.0%
Moderate	31.3%	29.2%
Poor	12.5%	20.8%
Bad	2.1%	4.1%

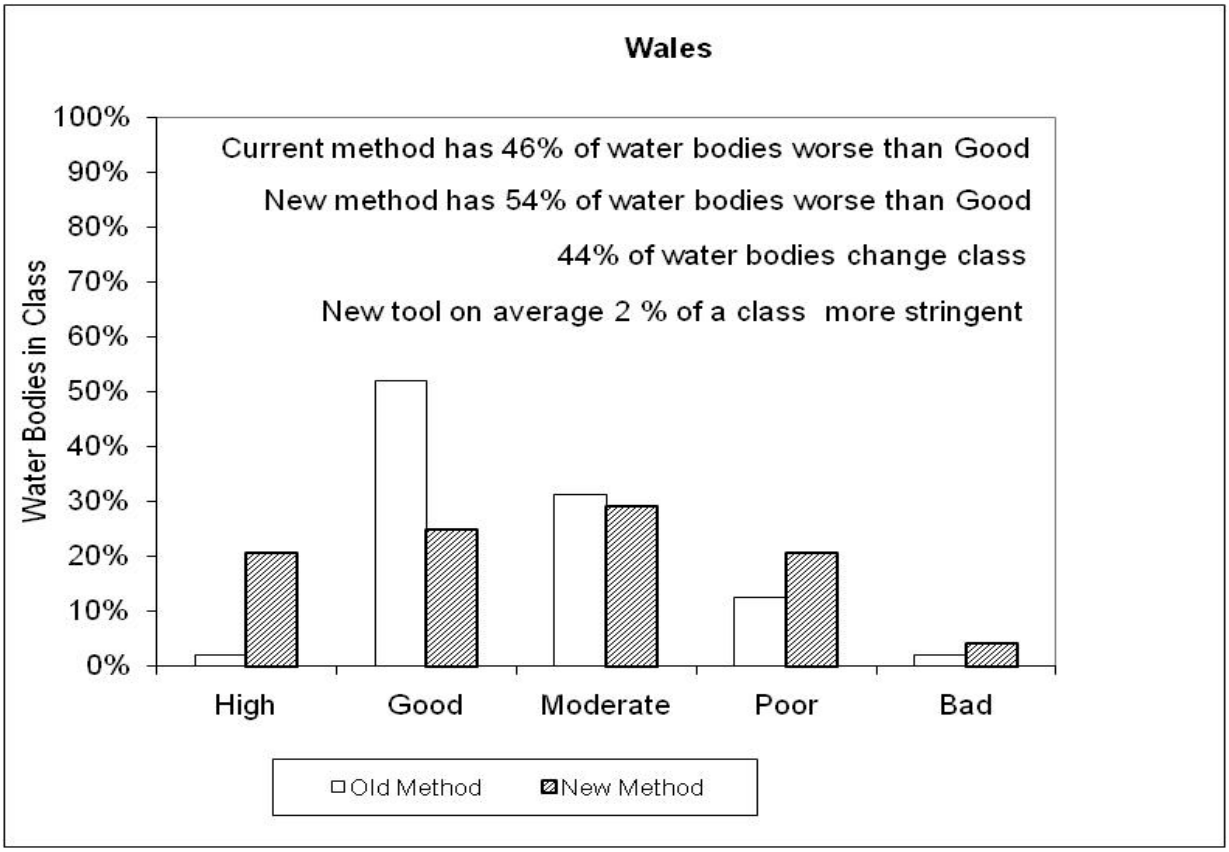

Figure 3. Percentage of water bodies in each WFD class using the current and new combined lake phytobenthos, DARLEQ and lake macrophyte, LEAFPACS assessment methods.

Table 6. Number and percentage of water bodies that change class when using the combined phytopbenthos and macrophyte assessment methods

	Number	Percentage
Current 4 class worse	0	0.0%
Current 3 class worse	0	0.0%
Current 2 class worse	0	0.0%
Current 1 class worse	10	20.8%
Same class	27	56.3%
Revised 1 class worse	11	22.9%
Revised 2 class worse	0	0.0%
Revised 3 class worse	0	0.0%
Revised 4 class worse	0	0.0%

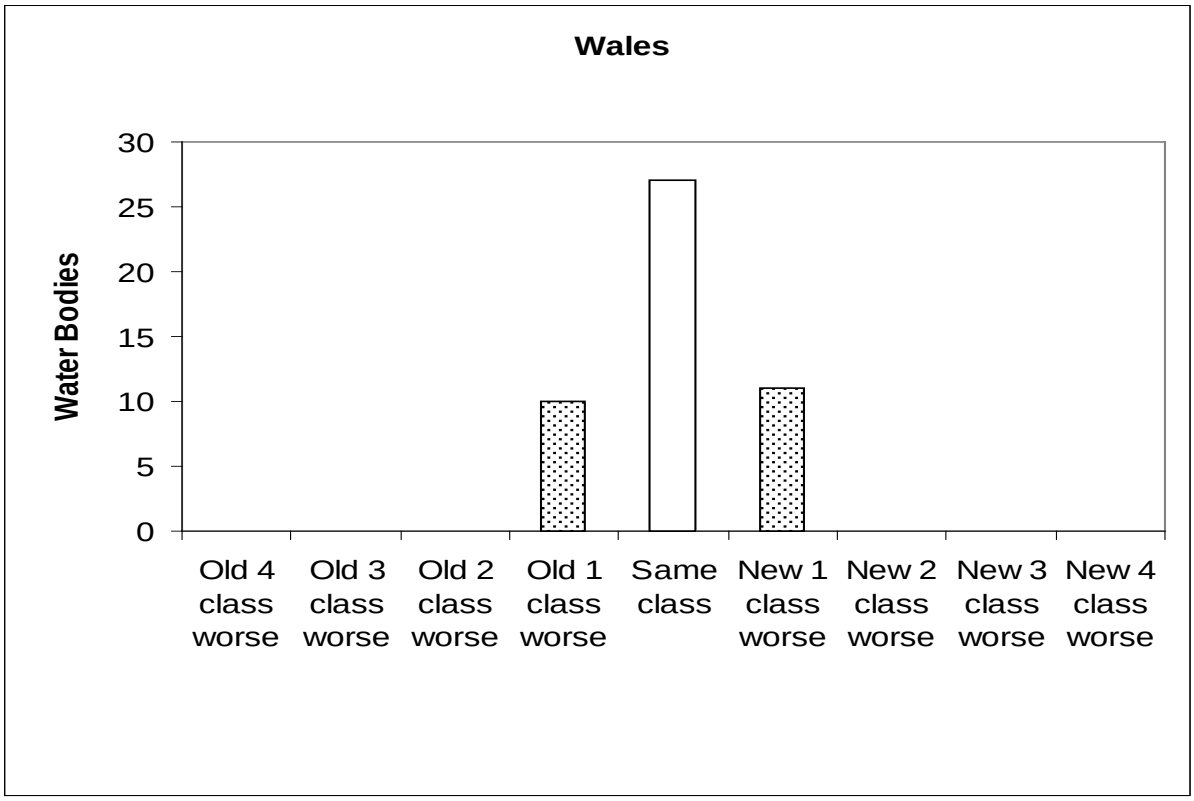

Figure 4. Number of water bodies in Wales that change class when using the revised version of the combined lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Scotland

Table 7. Comparison of classifications of ecological status determined by original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

		Revised					Grand Total
		High	Good	Moderate	Poor	Bad	
Current	High	4	7				11
	Good	1	24	11			36
	Moderate		6	8	1		15
	Poor			1	1		2
	Bad						
Grand Total		5	37	20	2		64

Table 8. Percentage of water bodies in each class, determined using original and revised versions of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Class	Current Method	Revised Method
High	17.2%	7.8%
Good	56.3%	57.8%
Moderate	23.4%	31.3%
Poor	3.1%	3.1%
Bad	0%	0%

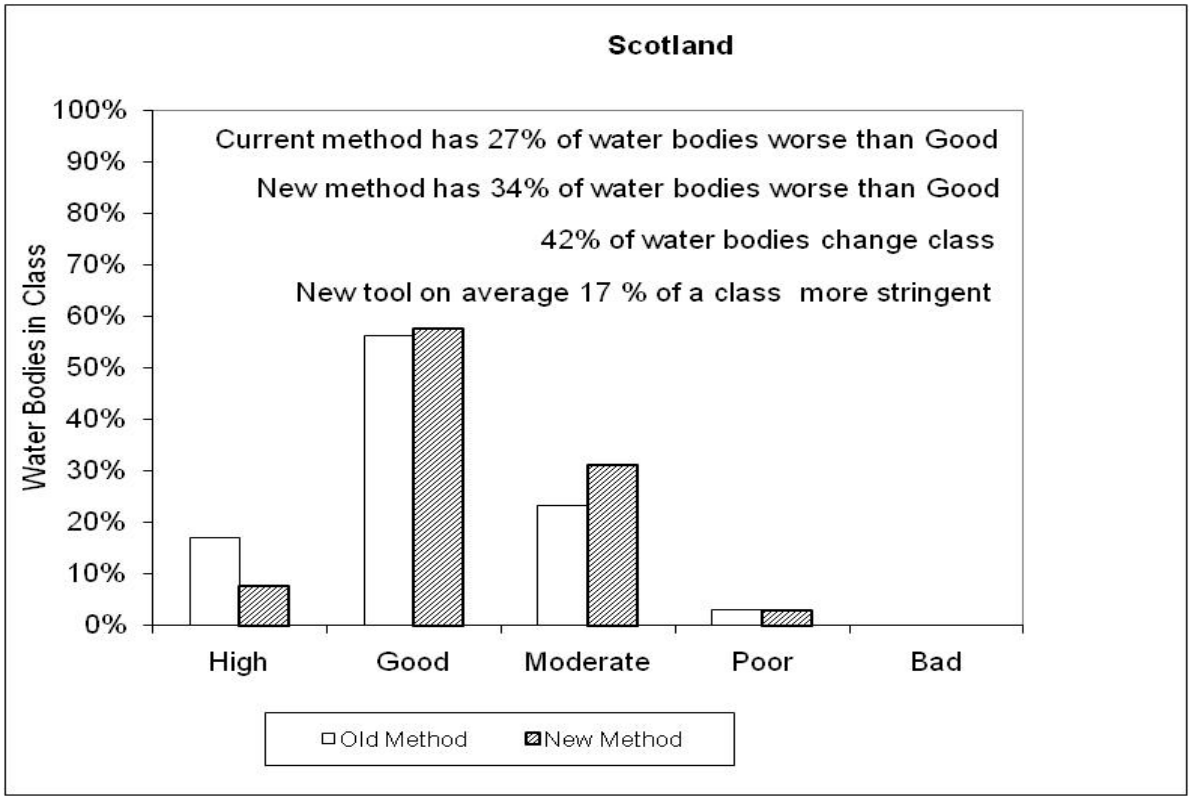

Figure 5. Percentage of water bodies in each WFD class using the current and new combined lake phytobenthos, DARLEQ and lake macrophyte, LEAFPACS assessment methods.

Table 9. Number and percentage of water bodies that change class when using the combined phytopbenthos and macrophyte assessment methods

	Number	Percentage

Current 4 class worse	0	0.0%
Current 3 class worse	0	0.0%
Current 2 class worse	0	0.0%
Current 1 class worse	8	12.5%
Same class	37	57.8%
Revised 1 class worse	19	29.7%
Revised 2 class worse	0	0.0%
Revised 3 class worse	0	0.0%
Revised 4 class worse	0	0.0%

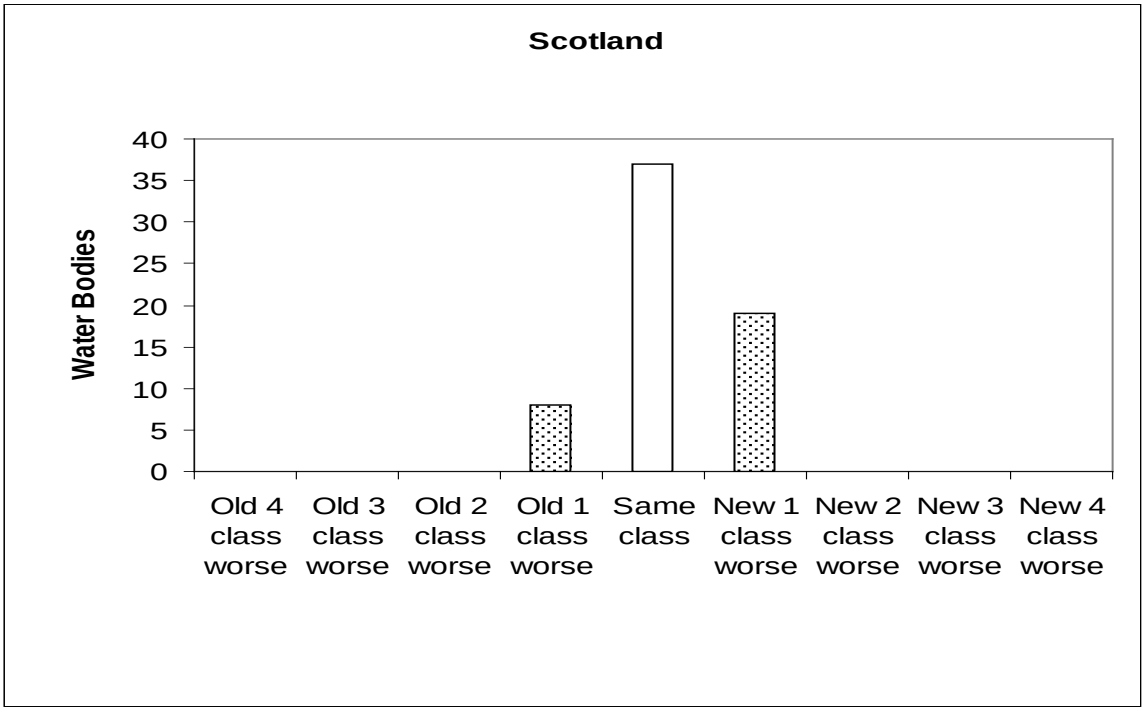

Figure 6. Number of water bodies in Scotland that change class when using the revised version of the combined lake phytobenthos tool, DARLEQ and lake macrophyte tool, LEAFPACS.

Northern Ireland

Table 10. Comparison of classifications of ecological status determined by original and revised versions of the combined lake phytobenthos tool, DARLEQ and the Northern Ireland lake macrophyte tool, FREE index.

		Revised					Grand Total
		High	Good	Moderate	Poor	Bad	
Current	High	2	1				3
	Good		6				6
	Moderate			8			8
	Poor			1	7		8
	Bad				1	1	2
Grand Total		2	7	9	8	1	27

Table 11. Percentage of water bodies in each class, determined using original and revised versions of the combined lake phytobenthos tool, DARLEQ and the Northern Ireland lake macrophyte tool FREE index.

Class	Current Method	Revised Method
High	11.1%	7.4%
Good	22.2%	25.9%
Moderate	29.6%	33.3%
Poor	29.6%	29.6%
Bad	7.4%	3.7%

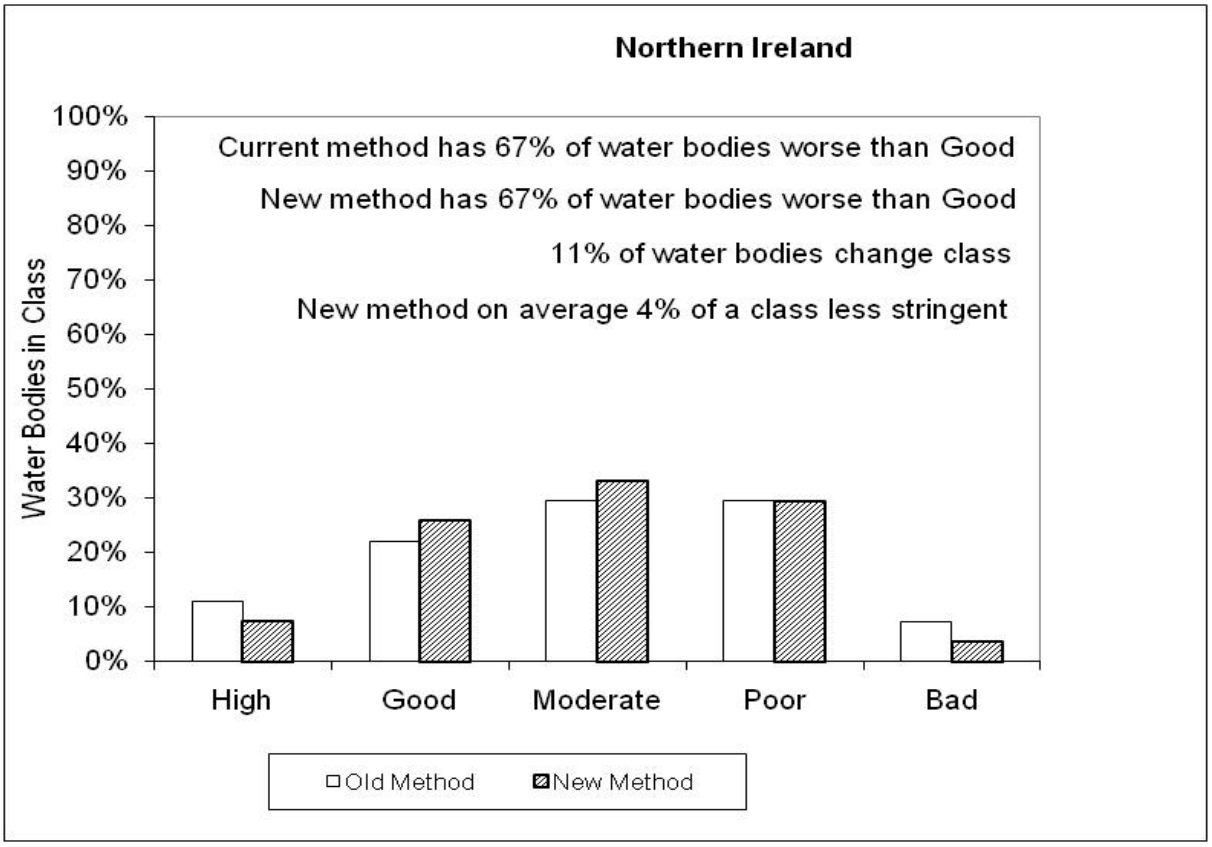

Figure 7. Percentage of water bodies in each WFD class using the current and new combined lake phytobenthos, DARLEQ and lake macrophyte, the FREE Index assessment methods in Northern Ireland.

Table 12. Number and percentage of water bodies that change class when using the combined phytopbenthos and macrophyte assessment methods

	Number	Percentage
Current 4 class worse	0	0.0%
Current 3 class worse	0	0.0%
Current 2 class worse	0	0.0%
Current 1 class worse	2	7.4%
Same class	24	88.9%
Revised 1 class worse	1	3.7%

Revised 2 class worse	0	0.0%
Revised 3 class worse	0	0.0%
Revised 4 class worse	0	0.0%

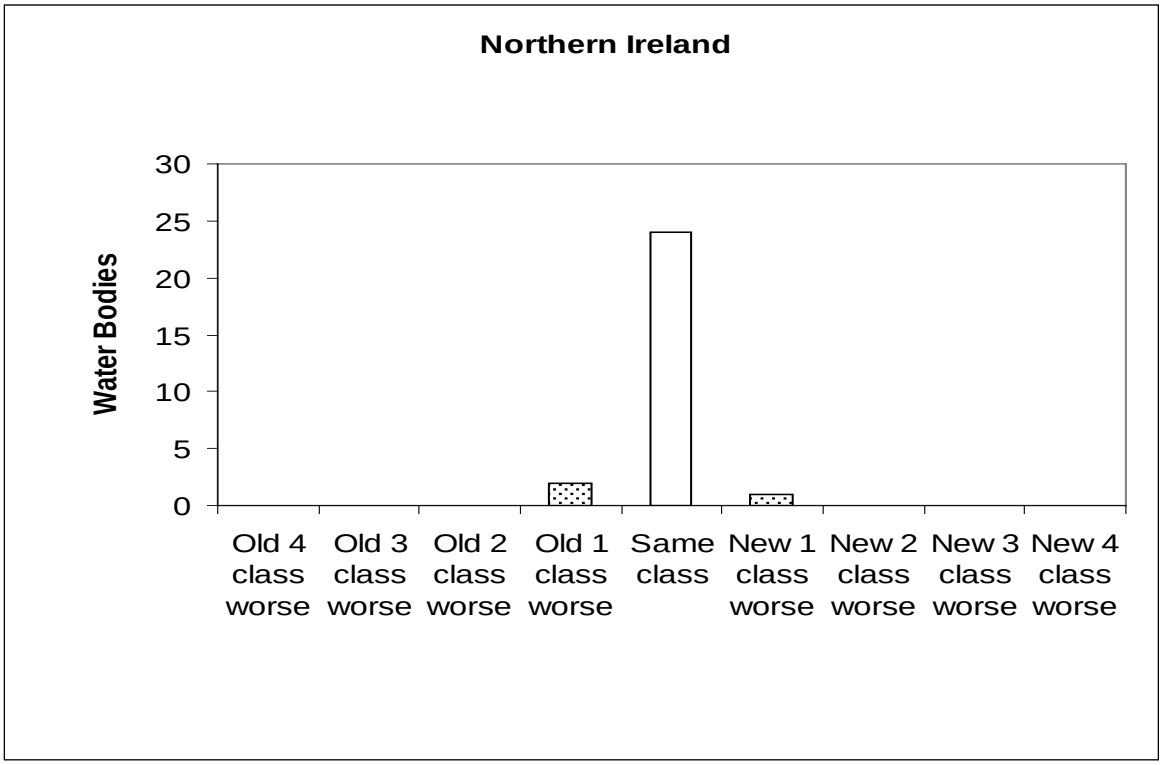

Figure 8. Number of water bodies in Northern Ireland that change class when using the revised version of the lake phytobenthos tool, DARLEQ and lake macrophyte tool, the FREE Index.

A4 Key documents

Annex 8 – LAKES – Macrophytes & Phytobenthos – LEAFPACS

Annex 9 – LAKES – Macrophytes & Phytobenthos – DARLEQ

Bennion, H., Burgess, A., Juggins, S., Kelly, M., Reddihough, G. & Yallop, M. (2012) Assessment of Ecological Status in UK Lakes using Diatoms. Science Report SC070034/TR3, Environment Agency, Bristol. https://brand.environment-agency.gov.uk/mb/DCJHIl

Kelly, M. G, Phillips, G and Willby N (2011). Macrophytes and Phytobenthos: an ecological rationale for the combined quality element, part2. Paper submitted to Freshwater Task Team, UKTAG 2011.