

ANNEX 5 – RIVERS – Invertebrates - WFD–AWIC

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A1 Description of method

Overall Requirements.

In order to perform a WFD- AWIC assessment the following is required:

A “Spring” (01-March – 31-May) Macro-invertebrate sample, which should be analysed to TL5 (Davy – Bowker et al (2010))

Long term average (LTA) pH & Ca data

LTA DOC Data (Scotland)

The method is applicable to sites in Scotland (including Islands) and Wales.

This method has been successfully intercalibrated in Northern GIG.

Site Selection & Screening

Since WFD-AWIC does not produce reliable results at alkaline pH’s sites must be screened for pH and Ca. pH must be <7.0 **AND** Ca <4.0 mg/l. This should be a LTA over the years sampled.

DOC data is required to determine Humic status in Scotland only. Sites are allocated to Humic categories as per Table (1). This should be a LTA as per pH & Ca.

Table 1. Scottish DOC Status Bands

Humic Status	DOC Value
Clear	<10mg/l
Humic	>=10mg/l

Sampling & analysis.

Macro- Invertebrate sampling & analysis is carried out as per EU- STAR (2004). The sample should be analysed to TL5 as described previously, and numerical abundances or log categories as per table (4) recorded.

Calculation

Species / genera found in the sample are allocated sensitivity scores as per Tables 2, 3 & 4 using the equation:

$$\text{WFD- AWIC} = (\text{sum AS}) / n$$

Where **sum AS** is the sum of the WFD -AWIC Sp taxon scores (**AS**) and **n** is the number of taxa used to calculate sum AS.

Table 2 WFD-AWIC Species sensitivity categories & AWICSp Score

CODE	Name	AWICsp score
48120200	Agapetus sp.	9
40510200	Caenis sp.	9
40120105	Baetis muticus	9
48120100	Glossosoma sp.	9
16140301	Potamopyrgus jenkinsi	9
37140206	Gammarus pulex	9
41220201	Perla bipunctata	9
16240101	Ancylus fluviatilis	9
48210101	Philopotamus montanus	8
48350202	Silo pallipes	8
48210200	Wormaldia sp.	8
48250206	Hydropsyche instabilis	8
40130400	Ecdyonurus sp.	8
40130100	Rhithrogena sp.	8
45410202	Hydraena gracilis	8
48370201	Sericostoma personatum	8

40130204	Heptagenia sulphurea	8
50620100	Atherix sp.	8
45630201	Esolus parallelepipedus	8
40120107	Baetis rhodani	8
41210201	Perlodes microcephala	7
48330301	Lepidostoma hirtum	7
48250301	Diplectrona felix	7
40130202	Heptagenia lateralis	7
48250209	Hydropsyche siltalai	6
48250207	Hydropsyche pellucidula	6
40120106	Baetis niger	6
45630101	Elmis aenea	6
41230103	Chloroperla tripunctata	6
45630301	Limnius volckmari	6
05110401	Crenobia alpina	6
42220101	Cordulegaster boltonii	5
41210401	Isoperla grammatica	5
41110302	Brachyptera risi	5
48110101	Rhyacophila dorsalis	5
05110301	Phagocata vitta	4
41230102	Chloroperla torrentium	4
41130104	Leuctra inermis	4
45630600	Oulimnius sp.	4
41120202	Amphinemura sulcicollis	4
41120100	Protonemura sp.	4
41130106	Leuctra nigra	4

41130103	Leuctra hippopus	3
40210101	Leptophlebia marginata	3
46110100	Sialis sp.	3
41210301	Diura bicaudata	3
41120400	Nemoura sp.	2
41120301	Nemurella picteti	1

Table 3 AWIC Sp Score relationship to WFD-AWIC sensitivity class

AWICsp Score	Sensitivity Class
9	Highly Sensitive
8	Sensitive
7	Moderately Sensitive
6	Moderately Sensitive
5	Moderately Tolerant
4	Tolerant
3	Tolerant
2	Highly Tolerant
1	Highly Tolerant

Table 4 Calculation matrix for WFD-AWIC

Log Abundance counts	Highly Tolerant	Tolerant	Moderately Tolerant	Moderately Sensitive	Sensitive	Highly Sensitive
A or 1 (1-9)	3	5	7	8	10	12
B or 2 (10-99)	2	4	6	9	11	13
C+ or 3+ (100-999)	1	3	5	10	12	14

EQR Calculation and assignment of WFD Class.

EQR is calculated by the equation:

$$\text{EQR} = \text{Obs WFD-AWIC} / \text{Expected WFD AWIC}$$

Expected values for WFD AWIC are generated from Table 5 dependent on location & humic status of the waterbody to be assessed.

Once the EQR has been calculated, WFD status bands are allocated as per Table 6.

Where more than one year's data is to be used for the status assessment a mean value of the sample EQRs is to be applied to Table 6.

Table 5 Reference values of WFD-AWIC by typology.

Regional Typology	Humic Typology	WFD-AWIC Ref. Value
Scotland	Clear	8.61
UK	Humic	7.38
England and Wales	Clear	7.65

Table 6 WFD – AWIC Boundary EQR values

Boundary	UK (Humic)	Scotland (Clear)	England & Wales (Clear)
H-G	0.93	0.91	1
G-M	0.83	0.83	0.89
M-P	0.77	0.72	0.78
P-B	0.73	0.66	0.67

A2 Summary of changes between 1st RBMP & 2nd RBMP

The method is entirely new, therefore reference should be made to the method statement for SAWICS and McFarland (2010). The method will be applied to Wales in addition to Scotland for RBMP 2 (There was no method for Wales in RBMP 1).

A3 Consequences of Changes

Scotland (only; no RBMP 1 method for other countries).

Table 7. Comparison of classifications of ecological status determined by original (SAWICS) and revised (WFD-AWIC) versions of the invertebrate acidification tool.

		Revised					Grand Total
		High	Good	Moderate	Poor	Bad	
Current	High	59	5		1		65
	Good	13	10	5			28
	Moderate	2	3	8	6		19
	Poor						
	Bad						
Grand Total		74	18	13	7		112

Table 8. Percentage of water bodies in each class, determined using original (SAWICS) and revised (WFD-AWIC) versions of the invertebrate acidification tool.

Class	Current Method	Revised Method
High	57.0%	64.9%
Good	24.6%	15.8%
Moderate	16.7%	11.4%
Poor	0.9%	6.1%
Bad	0.9%	1.8%

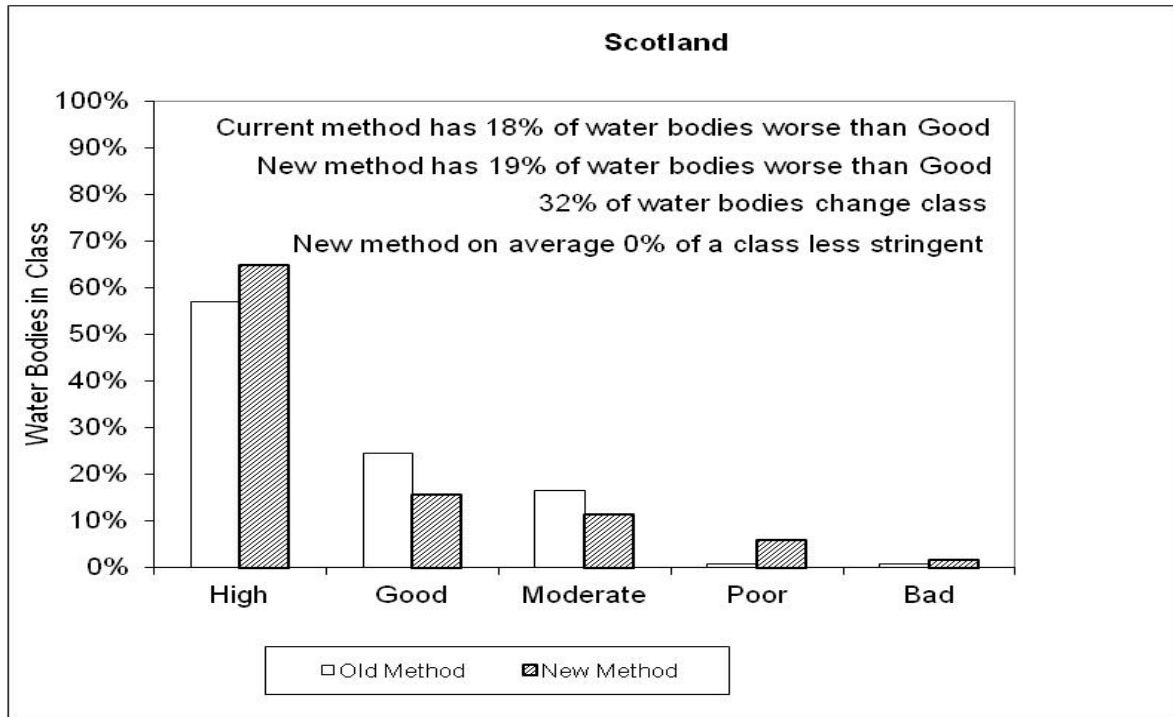


Figure 1. Percentage of water bodies in each class, determined using original (SAWICS) and revised (WFD-AWIC) versions of the invertebrate acidification tool.

Table 9. Number and percentage of water bodies that change class when using the revised version of the invertebrate acidification tool, WFD-AWICS.

	Number	Percentage
Current 4 class worse	0	0.0%
Current 3 class worse	0	0.0%
Current 2 class worse	2	1.8%
Current 1 class worse	16	14.0%
Same class	78	68.4%
Revised 1 class worse	17	14.9%
Revised 2 class worse	0	0.0%
Revised 3 class worse	1	0.9%
Revised 4 class worse	0	0.0%

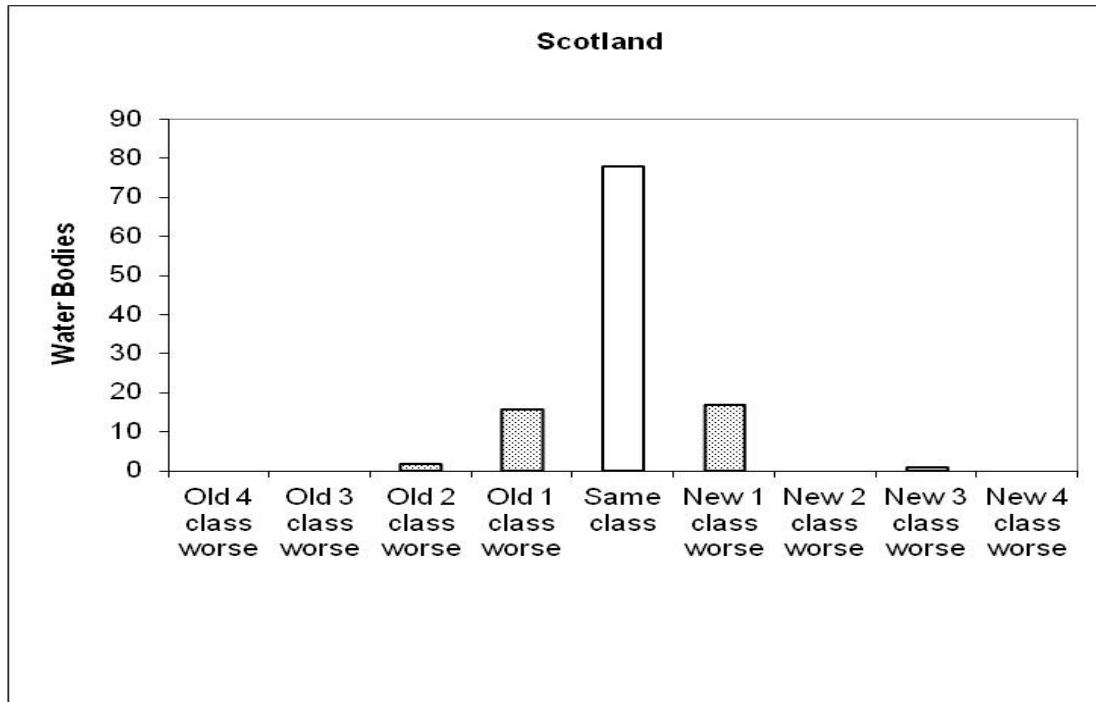


Figure 2. Number of water bodies that change class when using the revised version of the invertebrate acidification tool, WFD-AWIC.

A4 Key documents

[River invertebrates method statement](#)

detailed description of method used for 1st RBMP (sampling and analytical method unchanged, changes to calculations for 2nd RBMP)

[River invertebrates \(acidification, Scotland\) method statement](#)

detailed description of method used for 1st RBMP (sampling and analytical method unchanged, changes to calculations for 2nd RBMP)

McFarland, B. (2010) *Developing typology and class boundaries for WFD-AWICsp to assess acidification in UK rivers using macroinvertebrates.* Report to Freshwater Task team FTT003a.

Murphy, J.F., Davy-Bowker, J., McFarland, B., Ormerod, S.J. (2013) *A diagnostic biotic index for assessing acidity in sensitive streams in Britain.* *Ecological Indicators* **24** pp 562-572.

UK Invertebrate sampling and analysis procedure for STAR project (2004)
<http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf>