Surface Water Monitoring and Classification Methodology

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1. Introduction

This document describes the developments in surface water monitoring and classification through the first cycle and what is currently planned for the second. It follows on from *Rationale for Water Framework Directive Freshwater Classification*[1] published for the first River Basin Plans in 2009.

Over the six years of the first cycle a lot of refinement of methods has occurred. There have been significant developments in the biological classification tools and revisions to some chemical Environmental Quality Standards (EQSs). A good example is eutrophication[2] in rivers where the classification tools for biological eutrophic indicators (macrophytes and diatoms) have been aligned with revised soluble reactive phosphorus (SRP) standards to give a more scientifically robust assessment. For fish inter-calibrated[3] classification tools were developed during the first cycle. Resource constraints have led to targeted reductions in monitoring programmes such as inorganic chemistry. Complete rivers macrophyte and diatom monitoring coverage has been achieved throughout Northern Ireland, which was set as a six-year plan in 2009. Lake water bodies have been monitored for all biological elements. This provides a very solid baseline for objective setting for the second cycle and beyond.

Moving into the second cycle, for rivers, biological monitoring will be much more targeted than previously, i.e. there will not be universal coverage of operational monitoring stations. Lake monitoring in the second cycle will also be reduced with monitoring focusing on lakes that have been assessed during the first cycle as being at less than good status. One of the biggest monitoring challenges will be for Priority Substances which will require considerable analytical method development for new substances and lower EQSs for some existing ones. Added to this is a greater range of substances with biota standards. The process for combining the monitoring data within water bodies to produce overall river quality classification is

[1] link
[2] Defined in the EC Urban Water Treatment Directive (91/271/EEC) thus: '*means the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned*.'
[3] An exercise required by the EC to ensure that national classifications of good ecological status are harmonised.

predominantly the same, although the revised river water body set (doc[4]) has led to far fewer water bodies with more than one monitoring station.

As for the previous *Rationale for Water Framework Directive Freshwater Classification,* this document will deal with rivers and lakes separately except for the last section on Chemical Status. It is considered that this format makes it clearer for the reader. This document does not deal with Heavily Modified and Artificial Water Bodies (HMWBs & AWBs). Developments and revisions on these are described in doc[5].

2. River Monitoring Programmes

2.1. River Water Body revision

During the first cycle we became aware of the limitations of the 575 water body set. This included water bodies <10km^2 (the minimum size threshold as defined by the Directive) and those where changing water quality meant that their delineation made less sense. The revision was also necessary for cross-border areas as the Republic of Ireland's Environmental Protection Agency was redefining theirs as well. This has resulted in a 450 water body set for the second cycle. As per above the details are provided in the water body revision document.

2.2. Surveillance Monitoring

As described in *Rationale for Water Framework Directive Freshwater Classification*, the original rationale for the designation for Surveillance Monitoring (SM) stations remains unchanged for the second cycle:

'these were assigned on the basis of water body type (which includes geology, slope and alkalinity) and the pressure status from the 2004 Article 5 Pressures and Impacts report. Also included were stations in the Intercalibration exercise and those also monitored under other schemes such as the UK Environmental Change and Acid Waters Monitoring Networks. SM stations are intended to provide long-term record so ideally shouldn't be changed if possible. As required by the Directive, the complete range of quality elements are monitored for at SM stations which has lead to a significant increase in the range of quality elements monitored. For example, the WFD introduces the requirement for freshwater fish monitoring and classification for the first time.'

The list of river surveillance stations is presented in Annex 1.

[4] <link to water body revision doc>
[5] Link(s) to HMWB doc(s) or presented in an annex

With the exception of some trace organic Priority Substances and Specific Pollutants all quality elements were monitored at each river surveillance monitoring station during the first cycle.

River Mourne

Biological elements

Macro-invertebrates

Invertebrates have a long history in the context of river biological assessment across the world. Invertebrates are the range of snails, insect nymphs, leeches and crustaceans that are ubiquitous in water, whether fresh or saline. Different organismic groups respond differently to different water quality conditions. For example, stonefly nymphs are very sensitive to fluctuations in dissolved oxygen as might occur as the result of pollution by biodegradable organic material.

Invertebrates were monitored at each surveillance station each year during the first cycle but it is likely that this frequency will not be sustained during the second. Any reductions will be targeted in order to continue to meet WFD requirements.

Macrophytes and diatoms

Macrophytes are aquatic plants and diatoms are algae with a distinctive cell wall made from Silicon Dioxide. Both are good indicators of eutrophication.

For the first cycle we put in place a 6-year programme to complete our monitoring coverage throughout the whole monitoring network for macrophytes and diatoms. For macrophytes, each surveillance station was monitored twice. Diatoms were sampled at each site for at least 3 replicates over a 2 year period, which has been considered the minimum for WFD classification. Complete coverage was also necessary as they are essential elements for water quality assessments under the Nitrates and Urban Waste Water Treatment Directives which are focussed on nutrients and eutrophication. Research work for UKTAG[6] during the first cycle has identified that, depending on the alkalinity of the water, either one or the other would give a more robust indication of eutrophic pressures, with both still considered necessary at other alkalinity ranges[7]. In practical terms this means that the diatom assessment method can be used on its own if mean alkalinity is < 75 mg l^{-1} $CaCO_3$ and the macrophyte method can be used on its own if mean alkalinity is >200 mg l^{-1} $CaCO_3$. In between these alkalinity values both should continue to be used.

For the second cycle, therefore, we will, at the least, monitor macrophytes and/or diatoms to the minimum frequencies required by the Directive at surveillance stations and to provide sufficient coverage for reporting under the Nitrates and Urban Waste Water Treatment Directives. We will continue to monitor both at a limited number of sites as deemed necessary.

Fish

Freshwater fish are the one element that are not sampled by NIEA. The sampling and analysis has been and will be done by the Loughs Agency and AFBI[8], the latter in the area under the Department of Culture Arts and Leisure (DCAL) Inland Fisheries Division[9] jurisdiction. The aim during the first cycle was to monitor each surveillance site once every 3 years, which is twice the Directive minimum of once in every 6-year plan period. This was considered necessary as salmonids, which would be our most numerous native species, have relatively short lifespans and complete age classes could be missed if monitoring was only undertaken once in six years. For some larger river sites, however, it was only possible to monitor them once.

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[6] United Kingdom Technical Advisory Group – group which provides the technical lead on WFD implementation in the UK in relation to classification. See website http://www.wfduk.org/

[7] Details in http://www.wfduk.org/sites/default/files/Media/UKTAG%20Final%20recommendations%20on%20biological%20stds_20131030.PDF in particular pages 14-15

[8] Agri-Food and Biosciences Institute

[9] DCAL Inland Fisheries Division will transfer to the new Department of Agriculture, Environment and Rural Affairs (DAERA) in 2016, along with NIEA.

For the second cycle we will endeavour to monitor surveillance stations every 3 years in a targeted way. Due to resource limitations this may not happen at every surveillance station but the minimum of once during the 6-year cycle will be achieved.

General Physico-Chemistry

During the first cycle, each surveillance station was monitored monthly each year which we plan to continue (except where indicated) as per the table below:

Determinand	Used for WFD Classification?
Ammonia	Yes as a specific pollutant-see below
BOD	No-see below
Dissolved Oxygen % Saturation	Yes
Soluble Reactive Phosphorus (SRP)	Yes-also used for Nitrates Directive and UWWTD reporting
Nitrate	No-used for Nitrates Directive and UWWTD reporting
Nitrite	No
pH	Yes
Suspended Solids*	No
Temperature	No-see below
Alkalinity	No but used for assessing typology for standards
Conductivity	No but used for investigational and regulatory work
Hardness	No but required for Cadmium assessments
Dissolved Organic Carbon (DOC)	No but used in connection with pH and some metals standards

Table 1: – Inorganic chemistry elements monitored at surveillance monitoring stations
** Suspended solids will be monitored quarterly unless station is in a recognised Pearl Mussel river or an OSPAR[10] station*

For BOD and Temperature, the situation is the same as for the first cycle. BOD is not used for overall classification because its levels in clean rivers can be misleading and the link between BOD and Dissolved Oxygen is a complex and uncertain issue if dealt with on a site by site basis. It is, however, a very important element for regulatory and other purposes. For temperature, with relatively few thermal discharges to freshwaters in Northern Ireland, temperature classification has been assessed but not used for overall status. However, as temperature classification could become increasingly important with climate change, it will likely play a more prominent role in the years to come. Along with BOD full details are available.

[10] http://www.ospar.org/

Hydromorphology

For Rivers Hydromorphology we will continue to monitor surveillance stations at least once during the second cycle. This will include hydrology and morphology. Our progress with river continuity (i.e. fish passage) is described in River Continuity Classification 2015, located on our website.

Hydromorphology survey on the Burntollet River

Hydrology

Representative continuous surveillance monitoring of river flow will continue, provided by the current permanent river flow gauging station network operated by Rivers Agency (Department of Agriculture and Rural Devlopment). An additional 16 gauging sites were established in the period 2009 to 2010 to offer the required monitoring of all river typologies, hydro-morphology class and regional representation as required under Annex V of the WFD.

Specific Pollutants

For Specific Pollutants, the Directive in Annex V paragraph 1.3.1 requires that

we need to monitor 'other pollutants discharged in significant quantities...'. A risk assessment was undertaken to determine which substances should be monitored for and where. The assessment was largely on the basis of altitude, knowledge of how and where such substances are likely to be used and previous monitoring data for similar substances or those likely to have been used for the same purpose. For example, Diazinon, an organophosphorus insecticide, has historically been used in sheep husbandry and in domestic pest control products. On the basis of usage practices, sites deemed at risk included upland sites and lowland sites downstream of wastewater treatment works. A risk assessment resulted in the monitoring of 52 sites of a total of 117 surveillance sites over 12 months during the first cycle of monitoring. Clearly this also means some substances were not monitored where they would not have been expected to have been found.

The complete range of trace organic Specific Pollutants was, however, monitored for across the surveillance network as a whole. Specific Pollutant metal elements and ammonia were monitored at each surveillance station. A similar programme is expected to be followed during the second cycle.

Chemical Status – Priority Substances

For Priority Substances, the Directive in Annex V paragraph 1.3.1 requires that we need to monitor 'priority list pollutants which are discharged into the river basin or sub-basin...'. With limited resources, a risk assessment was undertaken in the same way as for specific pollutants. For example, in the case of the flame retardant compounds, polybrominated diphenyl ethers, it was noted that despite bans on usage due to their toxicity, persistence and bio-accumulative properties, there would be legacy issues from their historical use in commercial and household products. Additionally, sources of pollution would include landfill leachates, wastewater treatment works discharges and potentially from land spreading of sewage waste. There was also a risk of atmospheric deposition from combustion sources. The risk assessment resulted in 86 of the 117 surveillance sites being used in 12 months of monitoring. The complete range of trace organic Priority Substances was, however, monitored for across the network as a whole. Priority Substances metal elements were monitored at each surveillance station. A similar programme is expected to be followed during the second cycle. The outcomes of the first cycle will be used to inform the second cycle risk assessment.

With a greater range of substances now included by the 2013 EQS Directive[11] and ever-tightening Environmental Quality Standards there will be the need for considerable analytical method development.

[11] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:226:0001:0017:EN:PDF

Biota monitoring is discussed in paragraph 2.4 below.

2.3 Operational Monitoring

Operational Monitoring is essentially defined by the Directive as the assessment of pressures and how water bodies have changed due to Programmes of Measures. The elements required to be monitored are those that specifically identify with the pressures, such as macrophytes, diatoms and phosphorus for eutrophic pressures. Operational monitoring data is also used in classification.

Biological elements

Macro-invertebrates

During the first cycle invertebrates were monitored at each station on a rolling programme of two years in six. This has helped ensure a robust baseline of classification going into the second cycle. Due to more limited resources monitoring will largely targeted in the second cycle to water bodies that are Moderate or worse. We have undertaken invertebrate monitoring before and after river restoration schemes when possible and will continue to do so as resources permit.

Macrophytes and Diatoms

Similarly for surveillance monitoring we will monitor macrophytes and/or diatoms to provide sufficient coverage for the Nitrates and Urban Waste Water Treatment Directives. Over and above this, WFD operational monitoring will be targeted at those areas which are showing or considered to be at risk of eutrophic pressures.

Fish

Resources have dictated that WFD Fish monitoring has been focussed almost exclusively at surveillance stations, and this will continue to be the case. A few operational stations have been, and should continue to be monitored by the Fishery Agencies under their NASCO[12] fishing programmes using methodologies that are compliant with WFD protocols.

In addition, however, we have been able to adapt fish data collected annually for the SMP (Salmon Management Plan) Index Rivers by the Fishery Agencies. This focuses mainly on salmonid habitat and utilises semi-quantitative methodologies (i.e. brief surveys which do not provide complete datasets), but it was possible to develop a set of rules in order to provide an

[12] NASCO – North Atlantic Salmon Conservation Organisation. NASCO is an international organization, established by an inter-governmental **Convention** in 1984.

indicative classification of Good or Better, Moderate or Poor or worse. For each water body a minimum of 3 sites must be used with at least 66% in agreement. We have been able to use this semi-quantitative indicative classification in overall water body assessments thereby maximising the use of available fish data for WFD purposes.

General Physico-chemistry

During the first cycle monitoring frequency was reduced at operational monitoring stations due to budgetary restrictions. In 2009 each operational station was monitored monthly. Following this, from 2010-2014 a rolling monitoring programme was initiated. Approximately half (258) of the monitoring stations were still monitored monthly each year and these included surveillance and stations considered to be core to the Freshwater Fish Directive[13] assessment programme. The rest (270) were monitored on a rolling programme of 2 years out of six. All stations were monitored monthly in each monitoring year.

For the second cycle each operational monitoring station will be sampled quarterly each year with the exception of those in the two [sub-] catchments (Ballinderry and Strangford) where the concentration of derogated farms has been highest under the Nitrates Directive. For these catchments monitoring will continue monthly each year. This programme aims to have scope to increase the frequency of monitoring at a limited range of stations if necessary. Although a specific pollutant, total ammonia is part of the general physico-chemistry monitoring suite and so is monitored at the same frequencies.

Specific Pollutants and Priority Substances

We were able to monitor metals at many operational stations during the first cycle in order to provide a sound evidence base. For the second cycle we hope to maintain broad coverage. Trace organics will be monitored only where it is considered there is a specific need to do so.

Hydromorphology

During the first cycle we were able to complete surveying of whole catchments (for example, the Lagan and Moyola. We also undertook surveys before and after river restoration schemes.

For the second cycle surveying operational water bodies will be much reduced but will be targeted catchments where improvement projects are undertaken. This will include before and after monitoring of river restoration schemes.

[13] Link to FFD supplementary doc

Hydrology
Representative continuous operational monitoring of river flow will continue, provided by the current permanent river flow gauging station network operated by Rivers Agency (Department of Agriculture and Rural Development). River flow monitoring from 37 of these monitoring sites are incorporated into the hydrological model that affords estimation and assessment of long term flow indices in monitored and un-monitored rivers.

Table of Quality Elements used in river operational monitoring

Impact	Quality Elements
Nutrient Pollution	Marophytes, diatoms, soluble reactive phosphorus
Organic Pollution	Invertebrates, Dissolved Oxygen, BOD, Ammonia, Fish (if data available)
Chemical contamination of water	Invertebrates, Fish (if data available)
Chemical contamination of sediments	We do not monitor sediments in rivers
Saline pollution	Not monitored, no problems known
Acidification	Invertebrates, pH
Altered habitats as a result of hydrological and hydromorphological alterations	Invertebrates, Fishery Agencies will monitor fish before and after fish habitat improvement schemes
Elevated temperatures	No problems known
Other impacts	Considered on a case-by-case basis

Table 2: Quality Elements used in river operational monitoring

2.4 Biota Monitoring
A pilot survey of biota in freshwaters was undertaken to assess fish for the presence of priority hazardous substances in fulfilment of WFD Directive

requirements in the first cycle. Budgetary constraints required that the survey be limited. A total of 11 sites were included taking into consideration rural and urban settings, (7 river sites, 3 lake sites and 1 dam site).

Fish collected in the survey, (trout for rivers, perch for lake sites and also pollan for Lough Neagh), were pooled to provide a composite for each site to improve statistical robustness. Sites were chosen to allow sampling of appropriate species in sufficient number and size.

Analysis was carried out on homogenised whole fish tissue for mercury, Hexachlorobutadiene (HCBD) and Hexachlorobenzene (HCB), which are the 3 substances for which a biota EQS was established by the 2008 WFD EQS Directive[14]. Analysis was done by the English Environment Agency and also included other substances of concern such as pesticides and PAHs (Polycyclic Aromatic Hydrocarbons).

Detailed plans for biota monitoring during the second cycle have not yet been made. These will, however, include risk assessments as per priority substances water column sampling, along with developing guidance on biota monitoring. NIEA do not propose to do rivers sediment monitoring.

2.5 Grouping of water bodies

The 2009 *Rationale for Water Framework Directive Freshwater Classification* document when detailing the WFD classification process (pages 18-23) describes the agglomeration (grouping) of water bodies thus:

1) Water body with no monitoring station
a) Classified by adjacent water body either upstream or downstream
b) If water body is close to headwaters may be classified by a water body that is more than one 'empty' body away,
c) If agglomeration with others is not considered appropriate, classified from either NI or ROI pressures and impacts information,

The revision (and reduction) of river water bodies has meant that there is less need for agglomeration for classification purposes but it is still required in a number of places. Alongside the above, this can also be due to a water body having no suitable access for monitoring. In total there are currently 34 river water bodies without monitoring stations. Details of the stations used to classify each water body are presented in Annex 2.

[14] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:348:0084:0097:en:PDF

2.6 Incorporation into Drinking Water Protected Area monitoring

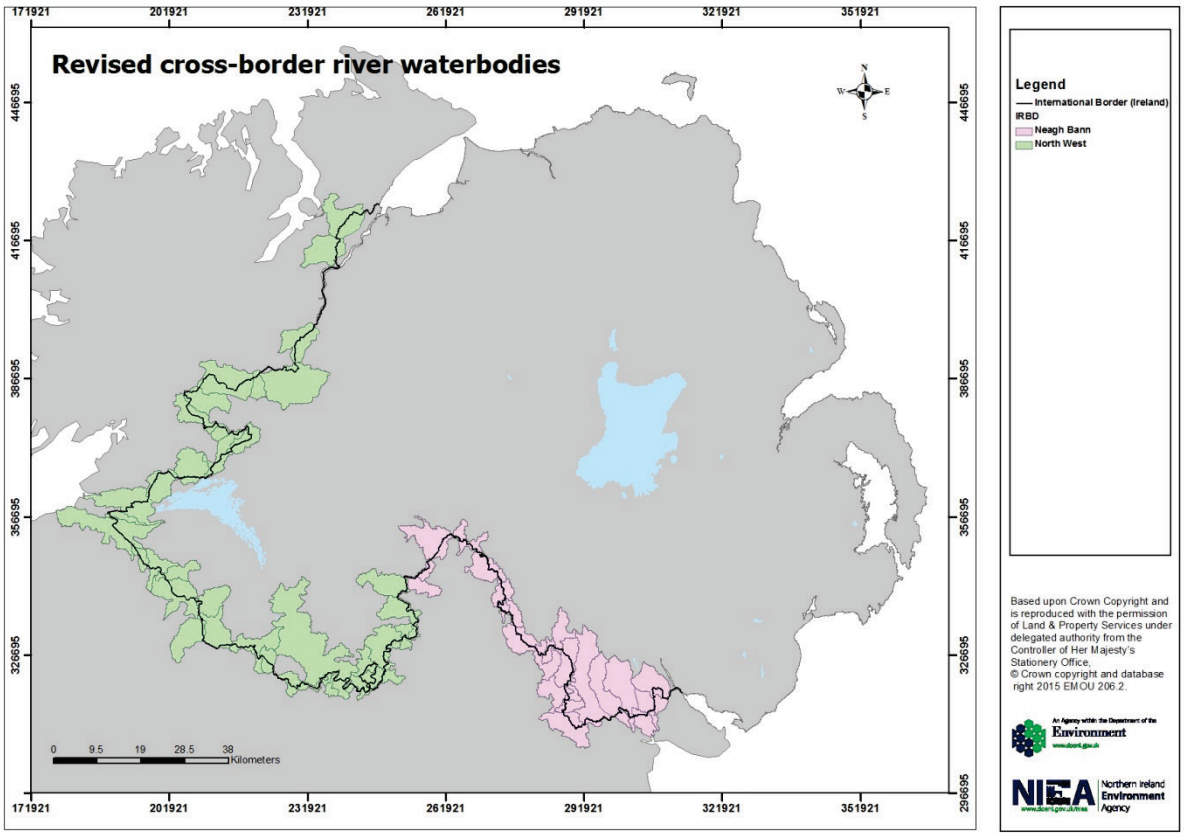
Drinking Water Protected Area monitoring issues are fully described in *'Northern Ireland Drinking Water Protected Area management plan'.*

2.7 Cross-border monitoring and classification

NIEA has always worked closely with our counterparts in the Republic of Ireland. We continue to meet via the North South Rivers and Lakes Group which normally meets twice a year.

With the revision of river water bodies in both jurisdictions this has meant that we have had to update our classification rules for cross-border water bodies. As described in the 2009 *Rationale for Water Framework Directive Freshwater Classification* document (pages 22-23) as our river standards and methodologies for many of the biological and chemical elements are different we can only combine resulting quality classes. The EC Intercalibration exercise has ensured that the classifications produced by different methodologies are comparable with one another. So, for example, what is classified as Good quality for macro-invertebrates in Northern Ireland should reflect the same quality as Good quality for macro-invertebrates in the Republic of Ireland.

Below is a map showing the cross-border water bodies. How they are classified is included in the table in Annex 3.



Map showing revised cross-border water bodies

3. Lake Monitoring Programmes

3.1 Lake Water Body revision

For the first river basin cycle, the WFD minimum threshold of 0.5km^2 (50ha) was used to establish the baseline set of freshwater lake water bodies. Twenty-one lake water bodies were identified as having an area of >50ha. These will remain the lake water body set for the second cycle. One change we have made is that the small river water bodies around Lough Neagh, known as Lough Neagh peripherals, will be classified as part of the Lough Neagh water body. This is because these are small disparate water bodies which are heavily influenced by the Lough.

3.2 Lake Monitoring

The baseline set of 21 lake water bodies form our lakes surveillance network. Surveillance monitoring was used to provide an assessment of the status of each lake water body. A minimum of 4 sites were selected for monitoring each surveillance lake. This number was increased at lakes of a bigger size and greater complexity e.g. 15 sites are monitored on Lough Neagh.

The Directive requires that all quality elements are monitored at surveillance sites. During the first cycle, all quality elements were monitored at each lake water body at frequencies required by the Directive and by classification tool requirements. However, there were some exceptions:

- Fish were not monitored in surveillance lakes that are reservoirs. This is because fish classification in these cases would give no real indication of water quality where migratory fish passage is disrupted. Also, many reservoirs are artificially stocked.
- Invertebrates were monitored but not classified due to a lack of a suitable method.
- Some trace organic Priority Substances and Specific Pollutants were not monitored as this programme was targeted based on pressures and sources..

Details on the quality elements that were assessed are provided below:

Biological elements

Macroinvertebrates
Invertebrates (profundal and littoral) were sampled on a three year rolling basis at all surveillance lakes. To date, the only classification tools available to assess invertebrate status are not suitable for use in NI lakes (see section 6.5). Invertebrates will continue to be sampled at each surveillance lake for the second cycle and preserved for future analysis should a suitable classification tool require this data.

Macrophytes and diatoms (Aquatic flora)
Macrophytes are aquatic plants and diatoms are algae with a cell wall containing silica. They are good indicators of eutrophic pressures and they are therefore also used for water quality assessments under the Nitrates and Urban Waste Water Treatment Directives (UWWTD).

In the first cycle, each surveillance lake was monitored for macrophytes and diatoms on a three year rolling basis. The number of sites surveyed for these elements at each lake varies with lake size and complexity.

For the second cycle a risk based approach will be applied so that monitoring at some lakes will be reduced. Lakes which have shown no change in classification for these elements will have their sample frequency reduced to one year in the 6 year cycle. Ideally, this monitoring will be carried out mid-cycle so that if changes are found, the lake could be resampled a second time in the cycle.

Phytoplankton
Phytoplankton are free floating microscopic plants and algae. They are also eutrophic indicators and are also used in water quality assessments under the requirements of the Nitrates and UWWTD. Algal blooms which can form in lakes are due to the rapid increase in the population of algae in a water system. When these blooms are composed of phytoplankton known as cyanobacteria (or blue-green algae) they can be harmful to plants or animals.

The classification tool requirements for phytoplankton are 3 summer samples from 3 consecutive years i.e. 9 samples in total in a cycle, as well as monthly chlorophyll data. This monitoring frequency will continue at all surveillance lakes for the second cycle.

Fish
As for rivers, NIEA do not undertake fish monitoring. All of the surveillance lakes are

in fishery areas under DCAL jurisdiction. Lake fish monitoring of the cross-border lakes (Melvin, Upper MacNean, Lower MacNean and Upper Lough Erne) has been done in liaison with Inland Fisheries Ireland (IFI). Surveillance lakes which are classified as Heavily Modified Water Bodies and are reservoirs are not monitored.[15]

Other than the cross-border lakes surveyed in conjunction with IFI above, WFD lakes fish monitoring in the first cycle has either been combined with NASCO work or as part of the Interreg funded DOLMANT (Development of Lake Management Tools)[16] project undertaken by AFBI. Unfortunately, it was not possible to include all of the surveillance lakes in the first cycle with the only fish monitoring carried out on three lakes (Castlehume, Clea and Portmore) in 2004-5 as part of the NS-SHARE[17] project. We have not yet been in a position to develop detailed lake fish monitoring plans for the second cycle.

General Physicochemistry

General Physicochemistry elements are sampled monthly at all surveillance lakes (except where indicated) and this will continue at all surveillance lakes throughout the second cycle.

The inorganic elements that are monitored at surveillance lakes are shown in the table below.

Determinand	**Used for WFD Classification?**
Ammonia	Yes as a specific pollutant-see below
BOD	No
Suspended Solids*	No
Total Phosphorus (TP)	Yes and also used for Nitrates Directive and UWWTD reporting
Nitrate	No-used for Nitrates Directive and UWWTD reporting
Nitrite	No
pH	No

[15] See http://www.wfduk.org/sites/default/files/Media/Classification%20of%20ecological%20potential%20for%20HMWBs%20and%20AWBs_Final_310308TAG%20guidance.pdf pages 17-18

[16] http://www.afbini.gov.uk/dolmant

[17] North South Shared Aquatic Resource – an EU Interreg IV sponsored project to develop WFD classification tools etc. which ran from 2004-2008

Soluble Reactive Phosphorus (SRP)	No
Alkalinity	No but used for assessing typology
Conductivity	Used for assessing salinity
Chlorophyll a	Yes
Hardness	No but required for Cadium assessments
Dissolved Organic Carbon	No but used for some metal standards
Colour	No but used for assessing TP standards

Table 3: – Inorganic chemistry elements monitored at surveillance monitoring stations
** Suspended solids will be monitored quarterly*

In addition to these analyses, a Temperature/Dissolved Oxygen (DO) profile is recorded at each surveillance lake in Spring, Summer and Autumn from 2 years in the 6 year cycle. The DO profile is used to produce a classification for DO in surveillance lakes. Temperature is not used in WFD classification but can provide information on natural processes occurring over the seasons in the lake which may impact on fish life.

Hydromorphology

Lake hydromorphology surveys were carried out twice at each surveillance lake in the first cycle. In the second cycle this will be reduced to once in 6 years unless it is considered that a higher level of monitoring is required at individual lakes e.g. if substantial changes are made to the lake shore or restoration schemes are put in place.

Hydrology

Lake level gauging was implemented monthly at 10 greater than 50ha lake sites during the first cycle. This has been replaced with continuous automatic level data logging at most sites. Rivers Agency provides continuous level data at a further 10 lake sites with Northern Ireland Water providing lake level data for 5 heavily modified water bodies (lake type) used as impounded water supply sources. All lakes greater than 50ha will continue to be monitored using the existing protocols for the second river basin cycle. It is intended to complete further bathymetric surveys of some of

the lakes during the 2nd cycle to offer greater confidence in the relationship between lake surface area and lake depth.

Specific Pollutants – See Section 2, Page 9

Chemical Status – Priority Substances – See Section 2, Page 10

Biota Monitoring – see section 2.4, Page 13

3.3 Incorporation into Drinking Water Protected Area monitoring

Drinking Water Protected Area monitoring issues are fully described in *'Northern Ireland Drinking Water Protected Area management plan'.*

3.4 Cross-border monitoring and classification

The cross border lake water bodies are Upper and Lower MacNean, Lough Melvin and Upper Lough Erne. As described in the 2009 *Rationale for Water Framework Directive Freshwater Classification* document (pages 22-23), lake standards and methodologies for many of the biological and chemical elements are different in Northern Ireland (NI) compared to the Republic of Ireland (RoI) so only the resulting quality classes can be combined. The EC Intercalibration exercise has ensured that the classifications produced by different methodologies are comparable with one another, for example, what is classified as Good quality for phytoplankton in Northern Ireland should reflect the same quality as Good quality for phytoplankton in the Republic of Ireland. We continue to liaise with our counterparts in the Republic of Ireland through the North-South Rivers and Lakes group which normally meets twice a year.

4. River Monitoring and Classification methodology

4.1 River Typology

For the first cycle we were required to identify the original water body boundaries and to carry out an initial characterisation of all such bodies (the Article 5 Characterisation report). Northern Ireland adopted System A (as defined in the Directive Annex 2, paragraph 1.2.1) in deriving the basic typology for natural rivers. The typing categories are summarised in Table 4 below and are similar to those used in England and Wales by the Environment Agency (EA) at the time.

Fixed typology	**Descriptor**
Type	Altitude typology:
	High: >800m
	Mid-altitude: 200 to 800m
	Lowland: <200m
	Size typology based on catchment area:
	Small: 10 to 100 km^2
	Medium: >100 to 1000 km^2
	Large: >1000 to 10000 km^2
	Geology:
	Calcareous
	Siliceous
	Organic

Table 4: System A typology attributes

The typology theoretically generates 36 river types, although in practice many of these do not exist or are not significantly populated. This System A typology, when applied to the Northern Ireland river network, produces a typology map with 12 river types . The dominant type of river water body in the Northern Ireland network is NI Type 17, lowland (<200m), small (10-100 km^2) and calcareous. This type is also the dominant type in England and Wales. This typology does not deal with artificial linear

watercourses (canals).

4.2 Reference Conditions

Establishing typology is important because reference conditions are identified in relation to types. At the start of the first river basin cycle, type specific reference condition descriptions were developed as part of the characterisation report[18]. The animals, plants and chemical conditions that would be expected to be found in a river, of a particular type, if it was in an undisturbed or nearly undisturbed condition were described using expert judgement and the data available at the time. As part of the development of classification tools and environmental standards, type-specific, and in some cases, site specific, biological, hydromorphological and physicochemical reference conditions have been established. These represent the values of the biological, hydromorphological and physicochemical quality elements which would be found in each river type at reference condition (equivalent to high status).The quality status classification scheme of five classes ranging from high to bad is then based on deviation from the reference state.

Hydrology

High status hydrology reflects natural or nearly natural flow across the entire flow range, un-impacted by man-made influences such as abstraction, discharge, impoundment or flow diversion. This is defined in the *The Water Framework Directive (Priority Substances and Classification) Regulations (Northern Ireland) 2011* as;

1. No more than 10% abstraction on days when the mean daily flow is greater than the 95 percentile low mean daily flow (long term average).

   or

2. No more than 5% abstraction on days when the mean daily flow is less than the 95 percentile low mean daily flow (long term average).

These standards are unchanged in the amended regulations to be used for classification in the 2nd cycle. The long term average flow is derived from a network of permanent river flow monitoring stations that inform a NI hydrological model (Low Flows Enterprise™) that offers estimation of these flow indices for monitored and un-monitored rivers of known hydrological response. Where a river flow record is known to be influenced by man-made activity then the data has been "naturalised" within the model to afford an estimation of natural conditions. In order to offer sufficient confidence that long term average river flows reflect natural conditions, the period of monitoring data is consistent with the UK Meteorological Office climate representative rainfall period of 30 years. Of the 37 river flow monitoring records incorporated into the NI hydrological model most are more than 30 years long and

[18] http://www.doeni.gov.uk/niea/riverrefcon.pdf

are updated annually to offer the best reflective of natural flow conditions for NI rivers.

Hydromorphology

The River Hydromorphology Assessment Technique (RHAT) separates the river into 8 parts and scores each of these out of a maximum score of 4. To achieve High hydromorphology status the total score should be at least 26 out of 32. The following percentages need to be achieved for high status as outlined in the CEN standard EN 15843 (CEN 2010):

1. *Channel morphology and flow types (OVERVIEW)* >95-100% natural
2. Channel vegetation – habitat and organic matter >95-100% natural
3. Substrate diversity and condition >99-100% natural
4. Barriers to continuity >95-100% natural
5. *Bank structure and stability* >95-100% natural
6. Bank and bank-top vegetation >95-100% natural
7. Riparian land use >95-100% natural
8. Floodplain interactions – channel lateral connectivity >95-100% natural

4.3 Methodology to deal with 'no deterioration' objective'

As with many features of the Water Framework Directive, assessing for 'true' deterioration is not as simple as it sounds. We have undertaken an exercise to assess the number of water bodies that have deteriorated overall at the start of the second cycle compared to that at the start of the first. It considered those water bodies that we can only compare are:

- Water bodies that have not changed in moving from the 575 water body set in the first cycle to 450 in the second,
- Quality elements whose assessment methods and standards are broadly similar at the start of the first and second cycles. This is to maintain consistency so that similar analysis can be done in the future. For example as the standards for rivers phosphorus have completely changed we have not used it in this analysis.
- Quality elements that have been classified at the start and at the end of the first cycle. For example, a particular priority substance could not be included if it was only classified at the start of the second cycle.

From this analysis we found that 9 river water bodies were considered to show a definite deterioration between the first and second cycle.

4.4 Water body classification and methodology

Over the course of the first cycle there was considerable development in biological classification tools, and, for fish, development of one where there was nothing previously. All the biological classification tools have been through the WFD rivers

Intercalibration exercise which was developed to harmonise the differing methodologies used in different member states.

Macro-invertebrates

For the second cycle, WHPT (Whalley, Hawkes, Paisley & Trigg) metrics will replace the Biological Monitoring Working Party (BMWP) metrics used for status classifications in the first cycle. The River Invertebrate Classification Tool (RICT) is used to contextualize WHPT scores, by using a River Invertebrate Prediction And Classification System (RIVPACS) model to predict site specific reference values and provide a WFD compliant probabilistic classification (from http://www.wfduk.org/resources/rivers-invertebrates-general-degradation)

Links to the WHPT are:
http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Invertebrates%20WHPT%20UKTAG%20Method%20Statement%20amendments%20Dec2014.pdf

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Invertebrates%20WHPT%20UKTAG%20Method%20Statement%20Dec2014.pdf

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Invertebrates%20WHPT%20UKTAG%20Method%20Statement.pdf

Macrophytes (aquatic plants) and phytobenthos

Macrophytes provide habitats for fish and smaller animals, they bind sediments, protect banks and absorb nutrients. Macrophytes can indicate the impact of increased nutrients in rivers and are also influenced by other pressures such as channel engineering, water abstraction, flow impoundment or acidification. The types and amount of macrophytes present in a river can tell us how well that river is working.[19]

Phytobenthos are good indicators of nutrient enrichment and other pressures. Diatoms are the main plant groups that we use because their silica shells are easy to identify under the microscope.[20]

Links to the method statements are:
http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Macrophytes%20UKTAG%20Method%20Statement.pdf

[19] http://www.wfduk.org/resources/category/biological-standard-methods-201?page=1
[20] http://www.wfduk.org/resources/category/biological-standard-methods-201

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Phytobenthos%20UKTAG%20Method%20Statement%20amendments%20Dec2014.pdf

Fish

Water Framework Directive Ecoregion 17 – the island of Ireland – has a more impoverished native fish fauna than England, Scotland and Wales, due to separation of the islands following the last ice age and overall river characterisation issues. For this reason, separate classification tools have been developed for Ireland, Scotland and England/Wales.

The river fish classification tool (FCS2 – Fisheries Classification Scheme 2) was developed in 2011 along with a similarly structured one for Scotland. They were based on the FCS tool that has been in use in England and Wales. The method statement for FCS2 is presented in Annex 3.

Given the widespread nature of surveillance stations, it was inevitable that some would be on large, wide and deep rivers (e.g. Lower Bann at the Cutts). Such stations are not suitable for electrofishing which was the preferred, and latterly required method following the introduction of the FCS2 classification tool in 2012. This meant finding alternative sites that could be electrofished for a number of stations and this was achieved in large part by sampling a range of tributaries. However, for others such as the Lower Bann, Upper Bann and the Fermanagh Finn this was not possible and sampling was only possible by netting surveys. Work to identify suitable sites at these locations is ongoing.

Hydromorphology - morphology

The Environmental Protection Agency (EPA) in the Republic of Ireland and the Northern Ireland Environment Agency (NIEA), through the North South Shared Aquatic Resource (NS SHARE) project, agreed a field assessment technique for WFD classification called the Rapid Assessment Technique (RAT). The initial developers in 2005 were Professor Keith Richards and Dr Rachel Horn, who based the technique on the US Environmental Protection Agency Rapid Bio-Assessment Protocols and the Environment Agency (EA) River Habitat Survey (RHS). However, the RAT method and forms have been largely modified from the initial draft by NIEA staff using expert knowledge, guidance from the European Committee for Standardisation (CEN), and practical application. The developed method has been renamed the River Hydromorphology Assessment Technique (RHAT) and located at:

http://www.wfduk.org/resources/river-hydromorphology-assessment-technique-rhat

With rivers hydromorphology, assessments have been very much a developing science, with a continuous process of development. This has resulted in a revised

version of RHAT which was published in 2014. The current RHAT manual can be found at http://www.doeni.gov.uk/niea/rhat_training_manual.pdf
River Hydromorphology Assessment Technique (RHAT) Training Manual – Version 2

Hydromorphology – hydrology
The classification of hydrology has developed throughout the first cycle. The principle was to assess the change to natural river flow due to man-made influences for river stretches within each river water body. The influenced flow was compared to the natural flow at the 95th percentile low mean daily flow (Q_{95}) for each river water body. This reflected that this is the flow condition where ecology is most sensitive to flow changes, as outlined in the UKTAG guidance.

The UKTAG classification standards for river flows can be found at:

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Environmental%20standards%20phase%201_Finalv2_010408.pdf

http://www.wfduk.org/resources%20/amending-poor-and-bad-status-river-flow-standards-medium-and-high-flows

Hydromorphology – river continuity
A separate supporting document has been published on river continuity. It can be found on our website.

Chemistry
Environmental Quality standards for all chemical elements except Priority Substances are developed at member state level. Those for Priority Substances for the second cycle are described in the 2013 EQS Directive.
For inorganic chemistry, the standards, except that for phosphorus are the same as those used previously. They can be found in:
http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Environmental%20standards%20phase%201_Finalv2_010408.pdf

The revised 2013 phosphorus standards for rivers benefit from improvements in understanding of the relationship between phosphorus concentrations and the response of river plant communities. They have been derived using a new approach to setting phosphorus standards that produces site-specific estimates of natural phosphorus concentrations, taking account of a site's alkalinity and altitude. [21]

For Specific Pollutants the proposed standards for the second cycle are at:

[21] http://www.wfduk.org/resources/new-and-revised-phosphorus-and-biological-standards

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

There are several other UKTAG documents that have been published which describe particular aspects of chemical element classification, for example on metals bioavailability. These, and many other documents relating to classification can be found at:
http://www.wfduk.org/resources

4.5 Gaps, inconsistencies and overall assessment methodologies

As has been seen, WFD classification tool and assessment methodologies have undergone more or less continuous development during the first cycle. For some elements, e.g. fish, this has been the development of a tool where there wasn't one before. For others, e.g. diatoms, macrophytes and phosphorus, further development was considered necessary to more accurately reflect the interaction between these elements. It is considered that we now have overall assessment methodologies that are much more robust than for the first cycle.

That does not, of course, mean that further development is not required and it is inevitable that there will be further refinements in many areas over the second cycle and beyond. One area in NI that we are particularly aware of that requires further development is the FCS2 tool for river fish. For example, at the time of development we did not have sufficient information on barriers to migration for it to be input into the tool. We therefore maintain what we call an 'expert judgement over-ride' for freshwater fish classification so that the fish experts undertaking the classification can decide on the status if they consider the tool prediction to be unreasonable. This is included in the method statement in Annex 3.

How we combine the individual quality elements for classification is exactly the same as for the first cycle using the one-out-all-out principle. This is represented in the following diagram:[22]

[22] From http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Recommendations%20on%20surface%20water%20status%20classification_Final_010609.pdf

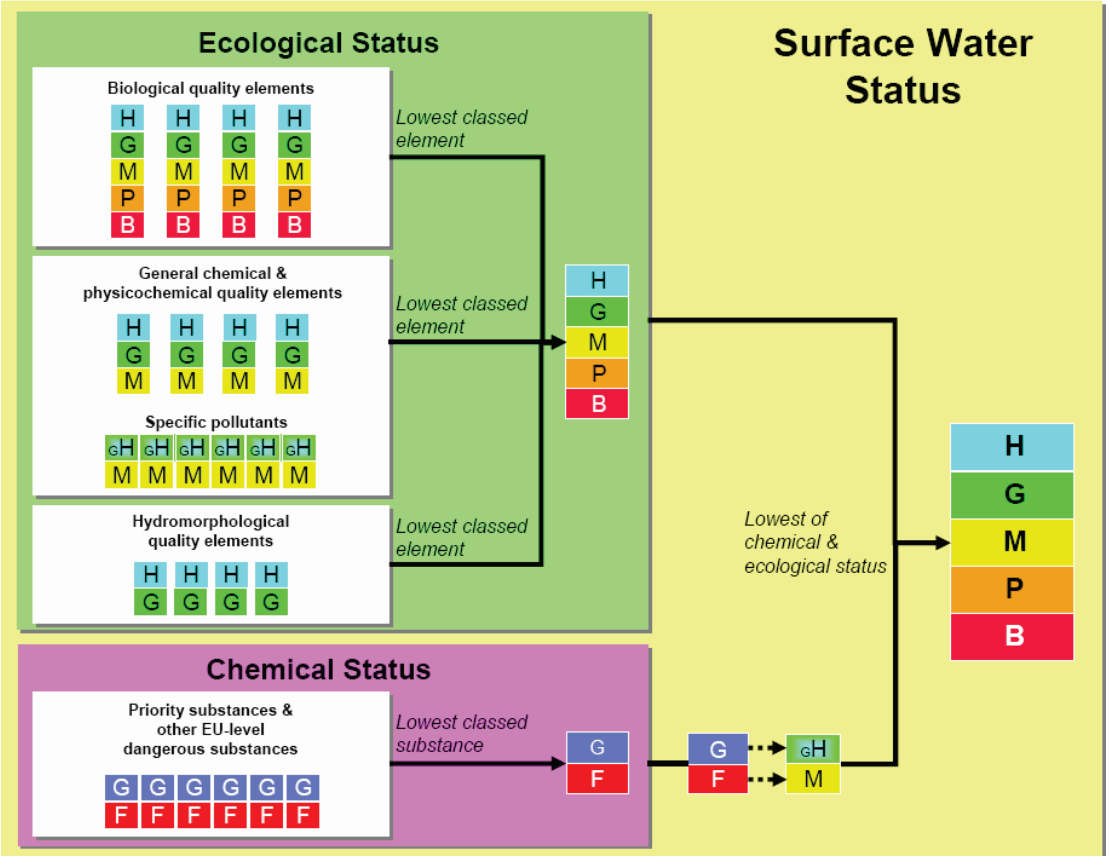


Figure 1 – schematic representation of how results for different quality elements are combined to classify ecological status, chemical status and surface water status.

Key: "H" means high; "G" means good; "gH" means good or better and is normally treated as high for calculating, as relevant, ecological status and surface water status (except for ammonia); "M" means moderate; "P" means poor; "B" means bad; and "F" means failing to achieve good surface water chemical status.

The ecological status is the lowest class of the biological, general chemical and physicochemical and hydromorphological quality elements. This is then combined with chemical status with again the lowest class producing the overall surface water status. Note that chemistry can only downgrade to moderate status overall and that hydromorphology can only downgrade an otherwise high status water body to good.

How each river water body is classified in terms of the monitoring stations considered is presented in Annex 2.

4.6 Confidence and precision

The Water Framework Directive requires that 'Estimates of the level of confidence and precision of the results provided by the monitoring programmes shall be given in the plan.' (Annex V Paragraph 1.3). The proposed UK approach is presented in

Section 4 of the Classification Guidance[23]. Unfortunately, it has not been possible to employ a wholly numeric approach, with one of the main reasons being that for some quality elements the software has not yet been developed to enable numeric confidence to be estimated.

The system used is a simplified alternative based on the differences between classification classes of individual biological and chemical parameters, and has been refined from that used for the first cycle. It is based around the presumption that the major pressures on all water bodies are either from eutrophic and/or organic pressures, which is a reasonable assumption for rivers and lakes in Northern Ireland. This methodology largely relies on the assumption that the individual classifications for each quality element are accurate. Confidence in class will be estimated as high, medium or low as per UKTAG guidance.

The methodology involves assessing the confidence in class for each pressure for each water body using the procedure below and then taking the lowest confidence for the two pressures. However, it is also necessary to give weighting to the number of quality elements that have been combined to produce classification for each pressure.

For eutrophic pressures, macrophytes, diatoms and SRP are considered. However, both UKTAG and EC Eutrophication Guidance essentially require further assessment where only SRP fails and this procedure is aimed at being compliant with the weight of evidence approach for eutrophic pressures should SRP be the only failing element. It was therefore considered that if SRP is the only failing element, eutrophic confidence in class should be low if macrophytes and/or diatoms both pass (an alternative approach may allow a eutrophic pass if a subsequent detailed local study suggested it, but, as c-in-c is done right after classification then the one-out-all-out procedure will be used for the foreseeable future). If either macrophytes or diatoms also fail then the confidence will be higher. The rules for establishing confidence in class for eutrophic pressures are shown in table 5 below:

For organic pressures, invertebrates, DO, ammonia and BOD are considered (even though BOD is not included in overall classification it is considered relevant here). Fish had previously been included but, as they are mostly classified at surveillance stations only it was decided better to leave them out of the rule based system, but that, if available, fish classification could add further weight of evidence to low confidence classifications. The rules for establishing confidence in class for organic pressures are shown in table 6 below:

23 http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Recommendations%20on%20surface%20water%20status%20classification_Final_010609.pdf

The combined overall confidence in class for the water body is then the lowest of eutrophic and organic confidence. Note that each of the chemical elements is considered as it is assessed individually, i.e. from High to Bad (as opposed to overall classification where it cannot downgrade below moderate).

Number of parameters	Parameters and class differences	Eutrophic confidence in class
1	Any	Low
2	Parameters the same class either High, Poor or Bad	High
2	Parameters the same class either Good or Moderate	Medium
2	Both pass, 1 High and 1 Good	High
2	Both fail but different classes	High
2	Biology fails and SRP passes	Medium
2	1 Biology passes and other fails	Low
2	SRP fails and biology passes	Low
3	Parameters the same, pass or fail	High
3	SRP & biology all pass or all fail but cover 2 classes	High
3	SRP & one biology pass or fail but cover 2 classes	Medium
3	SRP fails but biology doesn't	Low
3	Biology fails but SRP passes	Medium
3	SRP and one biological parameter pass or fail and 3 cover 3 classes	Medium
3	SRP and one biological parameter pass or fail and 3 cover 4 or 5 classes	Low

Table 5: rules for establishing eutrophic confidence in class for river water bodies

Number of parameters	Parameters and class differences	Organic confidence in class
1	Any	Low
2	Parameters poor and/or bad	High
2	Parameters both either good or moderate	Medium
2	Parameters both High	High
2	One High, one Good	High

2	Parameters cover more than two classes	Low
3	Parameters the same class	High
3	Parameters cover two or three classes	Medium
3	Parameters cover four or five classes	Low

Table 6: Rules for establishing organic confidence in class for river water bodies

It was also considered that the present system could be adapted and expanded to produce overall confidence of 'Good or better' or 'Moderate or worse' status. Inputting the relevant figures from the eutrophic and organic tables is used to produce the overall confidence. As well as confidence of 'Good or better' or 'Moderate or worse' a possible output is 'Confidence balanced between both'.

For the second cycle we hope to move to more weight of evidence based systems where the individual numerical confidence in classification of each element is taken into account, and developed further with local information particular to each water body. Some work has been done with eutrophic pressure indicators but, as it is only at draft stage at present, confidence in class of WFD classification in 2015 has been estimated according to the systems described above.

4.7 Methodology for the selection of Specific Pollutants

The methodology for the selection of specific pollutants is covered in the UKTAG document on revised standards for the second cycle: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%2004112013.pdf

5. Lake Monitoring and Classification Methodology

5.1 Lake Typology

Typology is the means by which surface water bodies are differentiated according to their physical and physicochemical characteristics. The resulting types will indicate, in very general terms, the sorts of plants and animals that are likely to be present. For example, plants and animals that are expected to be found in shallow lakes are very different from those expected to be found in deep lakes.

As part of the 2005 Article 5 WFD Characterisation Report, Member States were required to identify the location and boundaries of lake water bodies and to carry out an initial characterisation of all such bodies. The lake water bodies identified then

had to be differentiated according to type as defined using either ‘System A’ or ‘System B’ in Annex II of the WFD.

At the start of the first river basin cycle, Northern Ireland defined an initial lake reporting typology based on System A of Section 1.2 of Annex II of the Water Framework Directive using the typology descriptors in Table 7 below. This led to the creation of 24 NI lake types as described in Table 7 above with surveillance lakes (>50ha) falling into 8 of these lake types.

Altitude typology	High: >800m Mid-altitude: 200 to 800m Lowland: <200m
Depth typology based on mean depth	<3m 3 to 15m >15m
Size typology based on surface area	0.5 to 1 km^2 1 to 10 km^2 10 to 100 km^2 > 100 km^2
Geology	Calcareous Siliceous Organic

Table 7: System A Descriptors

Lake typology for Great Britain (Ecoregion 18) followed the System B approach as specified in the Water Framework Directive. As Northern Ireland follows UKTAG guidance and applies assessment tools and standards developed for the UK, NI refined its typology in line with UK typology during the first cycle and this typology will continue to apply for the second cycle.

A “core typology” is still used in NI which uses only mean lake depth and alkalinity

.

A summary of the typology descriptors for these variables is provided in Table 8 below. This generates 9 lake types.

Descriptor	**Bandings**
Depth	Very Shallow< 3m Shallow 3-15m Deep>15m
Alkalinity	Low Alkalinity < 10mg $CaCO_3$ Moderate Alkalinity 10 – 50 mg $CaCO_3$ High Alkalinity > 50mg $CaCO_3$

Table 8: Core typology for lakes in Northern Ireland

For reporting purposes a more detailed typology is used which includes more system B variables. A summary of these descriptors is provided in table 9 below.

Variables	Descriptors
Geological types	Brackish, Organic, Marl, Low Alkalinity, Moderate Alkalinity, High Alkalinity
Depth	Very Shallow, Shallow, Deep
Size	Large (>50ha) Small (<50ha)
Altitude	Upland (>800m) Mid Altitude (200-800m) Lowland (<200m)

Table 9: Reporting typology for lakes in Northern Ireland

5.2 Reference Conditions

Establishing types is important because reference conditions are identified in relation to types. At the start of the first river basin cycle, type specific reference condition descriptions were developed as part of the characterisation report[24]. The animals, plants and chemical conditions that would be expected to be found in a lake, of a particular type, if it was in an undisturbed or nearly undisturbed condition were described using expert judgement and the data available at the time. As part of the development of classification tools and environmental standards, type-specific, and in some cases, site specific, biological, hydromorphological and physicochemical

[24] http://www.doeni.gov.uk/niea/lakerefcon.pdf

reference conditions have been established. These represent the values of the biological, hydromorphological and physicochemical quality elements which would be found in each lake type at reference condition (equivalent to high status).The quality status classification scheme of five classes ranging from high to bad is then based on deviation from the reference state.

5.3 Methodology to deal with the no deterioration objective

The one-out-all-out approach to overall classification (see section 6.6) and the face value approach to status assessments of individual elements can mask underlying trends which show if water quality is actually improving or deteriorating.

We have undertaken an exercise to assess the trends for each individual lake over the first river basin cycle. The status of an individual element may change due to fluctuations around the classification boundary values rather than indicate a real change in water quality. In addition, class changes may be due to changes in tool sampling requirements or methodology rather than indicating a real change in water quality.

For these reasons, we looked at the underlying metrics and/or the raw data for phytoplankton, macrophytes, diatoms, total phosphorus and chlorophyll *a* to identify trends which may be attributed to changes in water quality.

From these analyses we found that 4 of the 21 lake water bodies show a real deterioration from the start of the first cycle to the start of the second cycle.

5.4 Element assessment methodologies

During the first cycle there was considerable development in classification tools and standards. All biological tools have been successfully validated through the EC Intercalibration exercise. This is a process whereby Member States were required to compare WFD class boundary values for their classification methods on a quality element basis to ensure similar levels are set across all countries. A method statement has been produced describing sampling, analysis and classification of each biological element. A link to these method statements is given in the relevant sections below.

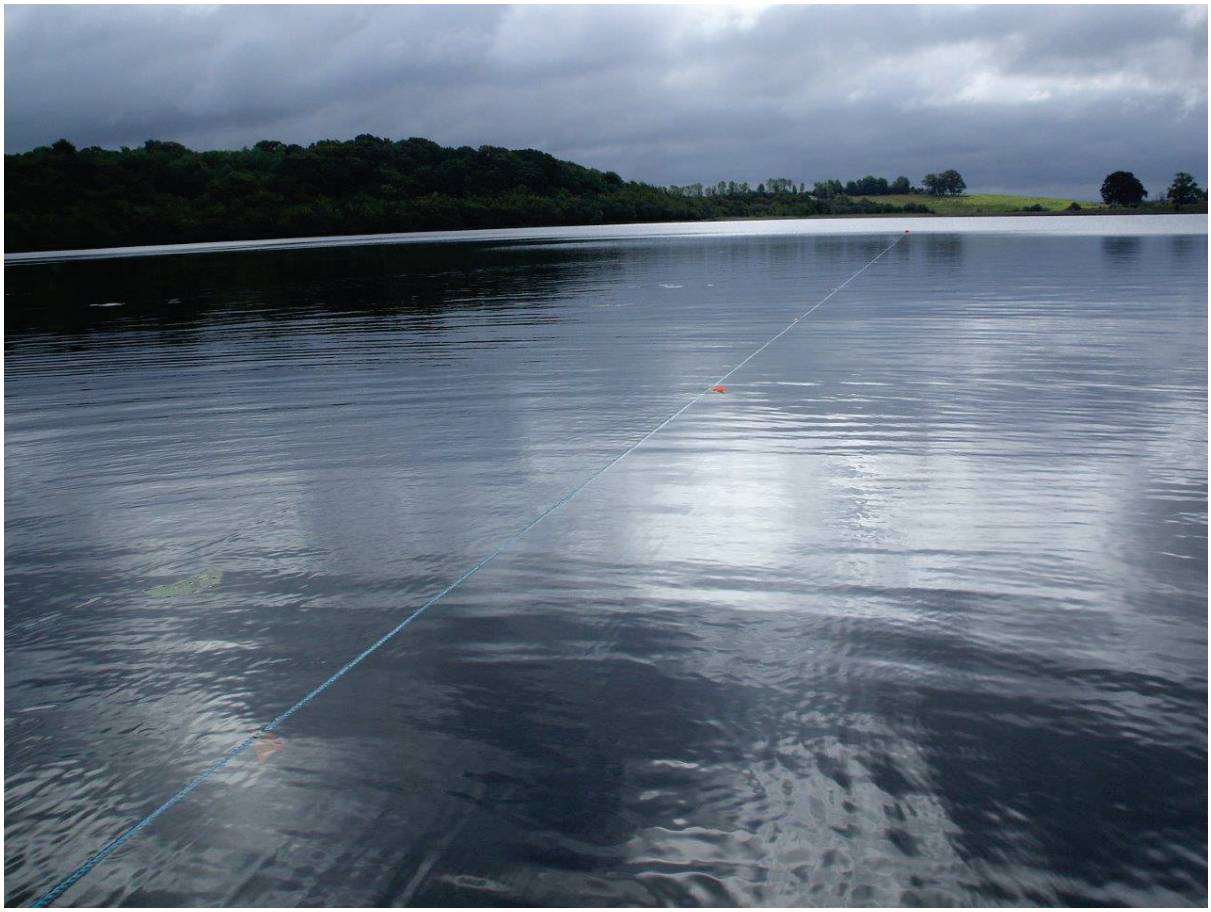
Macrophytes

Water Framework Directive Ecoregion 17 (the whole island of Ireland) has a more impoverished native macrophyte community than England, Scotland and Wales due to a separation of the islands following the last ice age. For this reason NI uses the macrophyte classification tool developed for use in the Republic of Ireland rather than the macrophyte tool used in Ecoregion 18 – the rest of the UK. In addition this

has the benefit of assessing the macrophyte communities at our cross border lakes in the same way.

The link to the macrophyte method statement is:

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/lakes_macrophytes_free_index.pdf



Macrophyte transect line on Upper Lough Erne

Phytobenthos (Diatoms)

Phytobenthos are also good indicators of nutrient enrichment. Diatoms are the group of phytobenthos we use to assess the phytobenthos population.

The links to the phytobenthos method statement are:

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/Lake%20Phytobenthos%20UKTAG%20Method%20Statement%20amendments%20Dec2014.pdf

http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/Lake%20Phytobenthos%20UKTAG%20Method%20Statement%20Dec2014.pdf

Phytoplankton

Phytoplankton are free floating algae and microscopic plants. They can also indicate nutrient enrichment. Excessive growths of algae are known as algal blooms can form in lakes due to high levels of nutrients and natural seasonal processes that occur in the lake. These blooms can be harmful to human and animal life as they contain particular blue-green algae known as cyanobacteria.

The link to the phytoplankton method statement is:
http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/Lake%20Phytoplankton%20UKTAG%20Method%20Statement.pdf

Fish

A Lake Fish classification tool (FiL1, Fish in Lakes version 1) was developed at the start of the first cycle by the NS Share project. It was subsequently refined in 2010 to become FiL2 and has been through the EC Intercalibration process. The method statement for FiL2 is presented in Annex 4.

Hydromorphology – Morphology

To assess the potential impacts on the biological elements from morphological pressures we carry out a lake habitat survey. The data from this is used to produce a morphology classification for the lake.

http://www.sniffer.org.uk/files/4013/4183/7992/WFD49f_Final_Report_web.pdf

Hydromorphology – Hydrology

The assessment of lake hydrological status has developed throughout the 1st cycle. Initially the assessment was based on 2 measures, namely the reduction of freshwater inflow due to abstraction and the change in lake level from natural conditions. It should be noted that 13 of the 25 lakes reported under the WFD are designated as heavily modified water bodies. This is due to the fact that some are impounded reservoirs for public water supply and others have impounded outflows for uses such as hydro-electric power generation, flood defence and navigation. There was a reasonable expectation that these heavily modified water bodies would not achieve the standards for good or high hydrological conditions, particularly as

levels are managed in many of them. The standards applied were developed by UKTAG guidance and are incorporated into regulations found in:

The Water Framework Directive (Priority Substances and Classification) Regulations (Northern Ireland) 2011

It was recognised by the UK administrations that the standards for lake hydrological status needed to be amended to offer an assessment that was more ecologically relevant. New standards have been developed and are incorporated into the amended regulations found in:

The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015

The new standards assessed the impact of abstraction and level management of a lake on the proportion of the lake's surface area available for habitat to rooted aquatic plants. The habitable zone of a lake is deemed to be the area of the lake littoral zone (edge) where the lake is sufficiently shallow and light penetrates sufficiently to support growth of rooted plants. The natural habitable zone or reference zone of any lake is therefore dependant on both the lake basin form (shape) and the turbidity of the water. One of the key determinants of lake turbidity is the "peatiness" of the catchment area with peaty lakes offering less light penetration and less opportunity for plant growth.

Chemistry

Chemistry

Environmental Quality Standards (EQSs) for all chemical elements, except Priority Substances, are developed at member state level. EQSs for Priority Substances for the second cycle are described in the 2013 EQS Directive[25]. Inorganic chemistry standards are the same as those used previously. They can be found in:

http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Environmental%20standards%20phase%201_Finalv2_010408.pdf

Lake phosphorus standards remained unchanged between the first and second river basin planning cycles. They are based on site–specific estimates of reference conditions taking into account the lake typology.

[25] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?urri=OJ:L:2013:226:0001:0017:EN:PDF

The proposed standards for specific pollutants for the second cycle can be found at: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%20041120133.pdf

There are several other UKTAG documents that have been published which describe particular aspects of chemical element classification, for example, metals bioavailability. These, and many other documents relating to classification can be found at:
http://www.wfduk.org/resources

5.5 Gaps, inconsistencies and overall assessment methodologies

As described for rivers, WFD classification tool and assessment methodologies have undergone continuous development during the first cycle. It is considered that the overall assessment methodologies are currently much more robust than they were for the first cycle.

A gap that remains however, for NI lakes, is that there is no suitable classification tool for assessing macroinvertebrates. Two invertebrate classification tools have been developed for use in GB but these cannot be applied in NI lakes. One is used to assess impact from acidification which is not an issue in surveillance lakes here. The other tool sampling methodology has not been successful in NI.

How we combine the individual quality elements for classification is exactly the same as for rivers described in page 25 above.

5.6 Confidence and precision

The Water Framework Directive requires that *'Estimates of the level of confidence and precision of the results provided by the monitoring programmes shall be given in the plan.'* (Annex V, Paragraph 1.3). The proposed UK approach is presented in Section 4 of the Classification Guidance[26]. Unfortunately, it has not been possible to employ a wholly numeric approach. The main reason for this is that the software has not yet been developed for some quality elements to enable numeric confidence to be estimated.

The system used for assessing confidence in class in lakes in Northern Ireland is based on the presumption that the major pressure on NI lakes is from eutrophic pressures. The methodology is a simplified analysis based on the number of failing

26 http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Recommendations%20on%20surface%20water%20status%20classification_Final_010609.pdf

elements. It uses the classification for the main eutrophic indicators i.e. macrophytes, phytobenthos, phytoplankton and Total Phosphorus.

Confidence in class (CiC) is estimated as having a high, medium or low confidence of having or not having an impact from eutrophication and is first assigned based on the biological quality elements alone. The number of eutrophic biological elements used in overall classification of the lake is selected from column 1 in Table 10**.** The number of elements that are at moderate or worse status and number of elements at good or better status are then selected from Columns 2 and 3 respectively. The confidence score of biological impact from eutrophication is then read from column 4.

No. of BQE which respond to eutrophication pressure used in overall classification	**No. elements that fail good status**	**No. Elements that pass good status**	**Confidence of Biological Impact from eutrophication** **1 = Low, 2 = Medium, 3 = High** **Confidence of no biological impact from Eutrophication** **4 = Low 5 = Medium, 6 = High**
1	0	1	**4**
1	1	0	**1**
2	0	2	**5**
2	2	0	**2**
2	1	1	**1**
3	0	3	**6**
3	3	0	**3**
3	1	2	**1**
3	2	1	**2**

Table 10: Lake CiC assigned using biological quality elements only

This confidence in class score is then combined with the TP classification for the lake. Using the matrix in Table 11 the confidence score using biological quality elements only is read across the top row and then the TP class for that lake is located in the first column. The point where these two intersect gives an overall confidence score of the likelihood of impacts from eutrophication.

TP Class	Confidence of impact from eutrophication			Confidence of no impact from eutrophication		
	1	2	3	4	5	6
Bad	2	3	3	2	1	1
Poor	2	3	3	2	1	1
Moderate	1	2	3	2	1	1
Good	1	2	2	5	6	6
High	1	2	2	5	6	6

Table 11: Lake CiC combined with total phosphorus

This overall confidence score equates to the likelihood of impacts from eutrophication as follows:

1	Low confidence of impact from eutrophication
2	Medium confidence of impact from eutrophication
3	High confidence of impact from eutrophication
4	Low confidence of no impact from eutrophication
5	Medium confidence of no impact from eutrophication
6	High confidence of no impact from eutrophication

Table 12: CiC for biological quality elements and TP Class combined

5.7 Methodology for the selection of Specific Pollutants

The methodology for the selection of specific pollutants is covered in the UKTAG document on revised standards for the second cycle: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%20041120133.pdf

6. Chemical status for rivers and lakes

6.1 Changes in methodology

Water Framework Directive priority substances monitoring started at the beginning of the first cycle. The WFD has now subsumed the Dangerous Substances Directive (76/464/EEC) which was repealed at the end of 2013. The environmental quality standards for priority substances for the first cycle were specified by the 2008 EC EQS Directive (2008/105/EEC) and transposed into Northern Ireland legislation by The Water Framework Directive (Priority Substances and Classification) regulations (Northern Ireland) 2011.[27] With a wider range of substances included than before, this meant that a lot of new analytical methods had to be drawn up which, in turn, led to the structure of our monitoring programme. We monitored each surveillance station each year, but for a limited range of substances only, thus allowing for the method development to continue simultaneously.

For the second cycle:

- Further substances have been introduced
- More substances are to be assessed by biota standards, and
- Some water EQSs have been tightened (i.e. become more restrictive)

This means that a similar approach to monitoring will be taken for the second cycle to allow for further method development.

The actual mode of classification assessment remains the same as for the first cycle.

6.2 Water bodies with no monitoring

The monitoring of priority substances is largely confined to surveillance monitoring stations which means that there is a large number of water bodies that have no monitoring data for them. In common with other UK Agencies, it has been decided that, unless there is good evidence to the contrary, water bodies not monitored will be considered to be at Good status. This is considered to be reasonable given the low rate of priority substance failures. It will be kept under review during the second cycle, particularly with the introduction of tighter standards. The approach was agreed by the UK Chemistry Task Team and confirmed by Defra with input from the devolved administrations.

6.3 Data issues

Chemical data for WFD Classification is treated as specified in EC Directive 2009/90/EC:

'laying down, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water

[27] http://www.legislation.gov.uk/nisr/2011/10/pdfs/nisr_20110010_en.pdf

status.'[28]

6.4 Natural background concentrations and other parameters affecting bioavailability of metals

The EQSs for some metals for the second cycle are set according to what is termed the bioavailable fraction. This is the proportion of the substance that would be readily available for biological uptake and may have the potential for adverse effects. Depending on the underlying geology, rivers and lakes will have naturally occurring ambient background concentrations and it is important that environmental quality standards take this into account.

How these ambient background concentrations have been assessed is described in pages 16-17 of the UKTAG Phase 3 standards document: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/UKTAG%20Environmental%20Standards%20Phase%203%20Final%20Report%20041120133.pdf

The classification methodology is described in: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/MBAT%20UKTAG%20Method%20Statement.pdf
Monitoring for dissolved organic carbon (DOC), which is required for the above methodology is now in place.

6.5 Long-term Trend Analysis of Priority Substances in biota and sediments

The frequency on monitoring and timescales over which monitoring has taken place prohibits the long term trend analysis of Priority Substances in biota and sediments in Northern Ireland .

6.6 Mixing zones

Mixing Zones under the EQS Directive (2008/105/EEC) have not been made use of in Northern Ireland.

[28] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0090&from=EN

7. Annex 1 - List of current river surveillance monitoring stations

North Eastern River Basin District

Sitecode	BiolSurv	ChemSurv	Location
F10542	X	X	ANNACLOY R AT ANNACLOY BR
F10639	X	X	ANNALONG R AT ANNALONG BR
F11203	X		BALLYEMON R AT BLACKSMITH COTTAGE LANE
F10458		X	BALLYEMON R AT CLOGHS UPPER
F10574	X	X	BALLYHOLME BAY STREAM/COTTON R AT BALLYHOLME BR
F10465	X	X	BEAGHS BURN AT BEAGHS BR
F10981	X	X	BEN CROM STREAM ABOVE SILENT VALLEY
F10606	X	X	BLACKSTAFF (SOUTH DOWN) R AT TULLYMURRY BR
F10548	X	X	BLACKWATER (ARDS) R AT BALLYMARTIN ROAD BR
F10449	X	X	BUSH R AT BUSHMILLS NEW BR
F10466	X	X	CAREY R AT TORTEIGE
F10533	X	X	DRUMANESS TRIBUTARY U/S OF DRUMANESS
F10550	X	X	ENLER R AT KENNEL BR
F10469	X	X	ESSATHOHAN BURN AT PARKMORE
F10475	X	X	GLENDUN R AT KNOCKNACARRY BR
F10527	X	X	LAGAN R AT BANOGE BR
F10512	X	X	LAGAN R AT SHAWS BR
F10511		X	LAGAN R AT STRANMILLIS
F10555	X		LARNE R AT OWENS BR
F11437		X	LARNE RIVER AT LARNE AND INVER PRIMARY SCHOOL
F10541	X	X	QUOILE R AT QUOILE BR
F10636	X	X	SHIMNA R AT IVY BR, TOLLYMORE FOREST

Neagh Bann International River Basin district (NI stations only)

Sitecode	BiolSurv	ChemSurv	Location
F10416	X	X	ARTICLAVE R AT ARDINA BR
F10361	X	X	BALLINDERRY R AT BALLINDERRY BR
F10328	X	X	BLACKWATER R AT BONDS BR
F10409	X	X	BRECKAGH BURN AT BRECKAGH BR
F10194	X	X	CONNOR BURN AT CONNOR ENCLOSURE
F10918	X	X	CREGGAN RIVER AT COOLDERRY BRIDGE
F10244	X	X	CRUMLIN R AT CIDERCOURT BR
F10441	X	X	DUNDESERT R AT DUNDESERT GOSPEL HALL
F10396	X	X	DUNORE R AT UPPER BR
F10900	X	X	FANE RIVER AT ART HAMILL BRIDGE
F10248	X	X	GLENAVY R AT LEAP BR
F10223	X	X	GREEN BURN AT MILLVALE
F10626	X	X	JERRETTSPASS R AT JERRETTSPASS
F10644	X	X	KILBRONEY R AT NEWTOWN BR
F10649	X	X	KILNASAGGART R AT KILNASAGGART BR
F10427	X	X	LOWER BANN AT THE CUTS
F10212	X	X	MAIN R AT DUNAMORE BR
F10898	X	X	METTICAN RIVER AT METTICAN BRIDGE
F10370	X	X	MILLTOWN BURN (MOYOLA) AT A29 ROAD BR

F10374	X	X	MOYOLA R AT LABBY FORD
F11289	X	X	MOYOLA R AT LISNAMUCK BRIDGE
F11204	X	X	NEWRY R AT DAMOLLY ROW
F10188	X	X	PRIESTS BURN AT BRECKAGH BR
F10250	X	X	ROCKY R AT ROCKY R BR
F10233	X	X	SIX MILE WATER AT CASTLE FARM BR, ANTRIM
F10339	X		TALL R AT REDMONDS BR
F10910		X	TALL RIVER AT CLONMORE
F11450	X	X	TORRENT R AT THE MOOR BRIDGE
F10271	X	X	UPPER BANN AT DYNES BR
F10286	X	X	UPPER BANN AT MC COMBS BR

North Western International River Basin district (NI stations only)

Sitecode	BiolSurv	ChemSurv	Location
F10737	X	X	ARNEY R AT BROCKAGH BR
F10700	X	X	BALLINAMALLARD R AT BALLYCASSIDY BR
F10702	X	X	BALLYCASSIDY R AT TULLYCLEA BR
F10681	X	X	BANNAGH R AT BANNAGH BR
F10743	X	X	BLACK R AT B52 ROAD BR
F10022	X	X	BURNDENNET R AT BURNDENNET BR
F11335	X		CAMOWEN AT CRANNY BRIDGE PICNIC AREA
F10111		X	CAMOWEN R AT DONNELLYS BR
F10089	X	X	CAPPAGH BURN AT TATTYNURE BR
F10744	X	X	CLADAGH R AT GORTEEN
F10707	X	X	CLEEN R AT KILTERMON BR
F10115	X	X	CLOGHFIN R AT LISBOY BR
F10715	X	X	COLEBROOKE R AT BALLINDARRAGH BR
F10076	X	X	CONEYGLEN BURN AT CONEYGLEN BR
F10657	X	X	COUNTY R (FERMANAGH) AT COUNTY BR
F10045	X		DERG R AT CREW BR
F10044		X	DERG R AT MILLBROOK NEW BR
F10128	X	X	DRUMRAGH R AT CAR PARK U/S OF CAMPSIE BR
F10020	X	X	DUNNYBOE BURN AT DUNNYBOE BR
F10693	X	X	EDENCLAW TRIBUTARY AT EDENCLAW
F10669	X	X	ERNE R AT ENNISKILLEN
F10661	X	X	ERNE R AT ROSSCOR VIADUCT
F10101	X		FAIRYWATER R AT MULLANATOOMOG
F10099		X	FAIRYWATER R AT OLD R'WAY BR, NESTLES
F10948		X	FAUGHAN R AT CARMONEY WTW
F10148	X		FAUGHAN R AT MOBUOY BR
F10728	X	X	FINN (ERNE) R AT WATTLE BR
F10025	X	X	FINN (FOYLE) R AT CLADY BR
F10663	X	X	GARVARY R AT LARKHILL
F11467	X		GLENDERGAN R AT MULLYFA
F10049	X	X	GLENDERGAN R AT SRAGHCUMBER
F10079	X	X	GLENELLY R AT CLOGHERNY BR
F10014	X	X	GLENMORNAN R AT CATHERINES BR
F10688	X	X	KESH R AT KESH BR
F10757	X	X	LURGAN R AT BELCOO

F10028		X	MOURNE R AT STRABANE BR
F10029	X		MOURNE R AT VICTORIA BR
F10072	X	X	OWENKILLEW R AT KILLYMORE BR
F10077	X	X	OWENKILLEW R AT MONANAMEAL BR
F10710	X	X	PUBBLE BURN AT PUBBLE BR
F10171	X	X	ROE R AT LIMAVADY
F10170		X	ROE R AT ROE BR
F10654	X	X	ROOGAGH R AT GARRISON
F10748	X	X	SILLEES R AT CARR BR
F10746	X		SILLEES R AT DRUMKEEN NEW BR
F11421		X	SILLEES R AT RIVERSIDE FARM
F10763	X	X	SKEOGE RIVER AT ELAGH ROAD
F10086	X	X	STRULE R AT MOYLE BR
F10735	X	X	SWANLINBAR R AT THOMPSONS BR
F10665	X	X	WATERFOOT R AT LETTER BR

8. Annex 2 - List of how river water bodies are classified. This is based on the 450 water body set as this was used for setting water quality objectives for the second cycle.

North Eastern River Basin District (ra=risk assess)

River Waterbody	Station	Location	Classify by site(s) or by other water body
GBNI1NE040401044		RATHLIN ISLAND	Classify using pressures and impacts information
GBNI1NE040403011	F11211	BALLYGALLY BURN AT CARNCASTLE ROAD BRIDGE	Classify
GBNI1NE040403012	F10479	GLENARM R AT GLENARM	Classify
GBNI1NE040403027	F10477	GLENARIFF R AT CALLISNAGH BR	Classify
GBNI1NE040403033	F11185	TOW R AT 32 MILL STREET	Classify biol
GBNI1NE040403033	F10472	TOW R NEAR OLD GASWORKS	Classify chem
GBNI1NE040403034	F11212	DUNSEVERICK RIVER AT DUNSEVERICK BR	Classify
GBNI1NE040403045	F10470	OWENCLOGHY WATER AT MILL BR	Classify
GBNI1NE040403048	F11310	LINFORD WATER OFF AUGHABOY ROAD	Classify
GBNI1NE040403060	F10463	CARNLOUGH R AT DRUMNAHOE	Classify
GBNI1NE040403061	F10478	GLENCLOY R AT GLENCLOY BR	Classify
GBNI1NE040403062	F10469	ESSATHOHAN BURN AT PARKMORE	Classify
GBNI1NE040403064	F10477	GLENARIFF R AT CALLISNAGH BR	Classify using F10477 downstream
GBNI1NE040404001	F11309	BUSH R AT LANGFIELD BR	Classify
GBNI1NE040404002	F10455	DERVOCK R AT DERVOCK BR	Classify using F10455 downstream
GBNI1NE040404004	F10455	DERVOCK R AT DERVOCK BR	Classify
GBNI1NE040404035	F10442	MOSS-SIDE WATER AT GORTANUEY BR	Classify
GBNI1NE040404036	F10444	LISCOLMAN FEEDER AT BALLYMACFIN	Classify
GBNI1NE040404038	F10448	WELL WATER AT TURNAROBERT	Classify
GBNI1NE040404042	F10449	BUSH R AT BUSHMILLS NEW BR	Classify
GBNI1NE040404050	F10443	FLESK WATER AT FLESK BR	Classify
GBNI1NE040404051	F10453	BUSH R AT BELLISLE BR	Classify chem
GBNI1NE040405046	F10556	GLYNN R AT GLYNN	Classify
GBNI1NE040405047	F10555	LARNE R AT OWENS BR	Classify biol
GBNI1NE040405047	F11437	LARNE RIVER AT LARNE AND INVER PRIMARY SCHOOL	Classify chem
GBNI1NE040405116	F10456	DOUGHERY WATER AT IDEROWN BR	Classify
GBNI1NE040405117	F10451	BURN GUSHET R AT BURN GUSHET BR	Classify
GBNI1NE040405118	F10466	CAREY R AT TORTEIGE	Average all sites
GBNI1NE040405118	F10467	GLENMAKEERAN R AT DRUMNAKEEL BR	Average all sites
GBNI1NE040405118	F10474	CAREY R AT CAREYMILL BR	Average all sites
GBNI1NE040405119	F10473	GLENSHESK R AT B15 ROAD BR	Classify
GBNI1NE040405120	F10475	GLENDUN R AT KNOCKNACARRY BR	Average all sites

GBNI1NE040405120	F10464	GLENDUN R AT CROCKAN	Average all sites
GBNI1NE040405120	F10465	BEAGHS BURN AT BEAGHS BR	Average all sites
GBNI1NE040405121	F10458	BALLYEMON R AT CLOGHS UPPER	Average all sites
GBNI1NE040405121	F10476	GLENAAN R (DALL) AT CUSHENDALL BR	Average all sites
GBNI1NE040405121	F10982	GLENAAN R AT CLOGHS BR	Average all sites
GBNI1NE040405121	F11203	BALLYEMON R AT BLACKSMITH COTTAGE LANE	Average all sites
GBNI1NE040405127	F10454	BUSH R AT BALLYHOE BR	Classify
GBNI1NE040405128	F11453	BUSH R AT ALTNAHINCH WTW	Classify
GBNI1NE050501004		COPELAND WATER	Classify using pressures and impacts information
GBNI1NE050501082	F10557	KILROOT R AT KILROOT	Classify
GBNI1NE050501118	F10560	THREE MILE WATER AT GLENAVNA MANOR	Classify
GBNI1NE050501120	F10559	WOODBURN R AT COURTALDS FACTORY	Classify
GBNI1NE050502083	F10576	CRAWFORDSBURN R AT C'BURN COUNTRY PARK	Classify
GBNI1NE050502084	F10573	BALLYHOLME BAY STREAM/COTTON R AT COTTON BR	Average with 10574 for biol
GBNI1NE050502084	F10574	BALLYHOLME BAY STREAM/COTTON R AT BALLYHOLME BR	Classify
GBNI1NE050503001	F11331	HILLSBOROUGH PARK LAKE STREAM AT GOWDYS	Classify
GBNI1NE050503046	F10530	LAGAN R AT BULLS BROOK	Classify
GBNI1NE050503047	F10532	RAVERNET R AT LEGACURRY BR	Classify biol
GBNI1NE050503047	F10531	RAVERNET R AT SPRUCEFIELD	Classify chem
GBNI1NE050503048	F10488	UPPER LAGAN AT LARCH HILL	Classify
GBNI1NE050503070	F10532	RAVERNET R AT LEGACURRY BR	Classify biol using F10532 downstream
GBNI1NE050503070	F10531	RAVERNET R AT SPRUCEFIELD	Classify chem using F10531 downstream
GBNI1NE050503071	F10532	RAVERNET R AT LEGACURRY BR	Classify biol using F10532 downstream
GBNI1NE050503071	F10531	RAVERNET R AT SPRUCEFIELD	Classify chem using F10531 downstream
GBNI1NE050503087	F10579	CONNSWATER AT CON O'NEILL BRIDGE	Classify
GBNI1NE050503088	F10513	MINNOWBURN AT MINNOWBURN BEECHES	Classify
GBNI1NE050503096	F10486	UPPER LAGAN AT DROMARA	Classify
GBNI1NE050503098	F10487	EEL BURN R (LAGAN) AT GLENLAGAN	Classify
GBNI1NE050503104	F10518	DERRIAGHY RIVER AT KINGSWAY	Classify
GBNI1NE050503105	F10484	EDENORDINARY STREAM AT DRUMSKEE HOUSE	Classify
GBNI1NE050503106	F11298	BROOKMOUNT STREAM AT MOIRA RD BR	Classify chem
GBNI1NE050503108	F10511	LAGAN R AT STRANMILLIS	Average all sites
GBNI1NE050503108	F10512	LAGAN R AT SHAWS BR	Average all sites
GBNI1NE050503108	F10519	LAGAN R AT WOLFENDENS BR	Average all sites
GBNI1NE050503117	F10517	COLIN GLEN RIVER AT STEWARTSTOWN ROAD	Classify
GBNI1NE050504006	F11216	BALLYMORRAN BURN AT	Classify chem

		ISLANDVIEW ROAD BRIDGE	
GBNI1NE050504009	F11179	DIBNEY RIVER AT JERICHO ROAD BRIDGE	Classify
GBNI1NE050504010	F11217	BLACK CAUSEWAY STRANGFORD OFF BLACK CAUSEWAY ROAD	Classify
GBNI1NE050504020	F10550	ENLER R AT KENNEL BR	Classify
GBNI1NE050504021	F10572	MILL BURN (ARDS) AT MILLISLE (B172 ROAD BR)	Classify biol
GBNI1NE050504022	F10575	BLACKSTAFF (ARDS) R AT BLACKSTAFF BR	Classify
GBNI1NE050504023	F10571	COMBER TRIBUTARY AT CAMP HILL	Classify biol
GBNI1NE050504031	F11213	GANAWAY BURN AT GANAWAY BRIDGE	Classify
GBNI1NE050504053	F10537	LOWER McAULEYS LAKE FEEDER AT THOMPSONS BR	Classify biol
GBNI1NE050504057	F10548	BLACKWATER (ARDS) R AT BALLYMARTIN ROAD BR	Classify
GBNI1NE050504058	F10604	BALLYARNET BURN AT MILL QUARTER BAY	Classify
GBNI1NE050504065	F10534	BALLYNAHINCH FEEDER AT LISTOODER	Classify
GBNI1NE050504066	F10533	DRUMANESS TRIBUTARY U/S OF DRUMANESS	Classify
GBNI1NE050504080	F10550	ENLER R AT KENNEL BR	Classify using F10550 downstream
GBNI1NE050504081	F10549	BALLYSTOCKART R AT A22 ROAD BR	Classify
GBNI1NE050504085	F11254	CULLY BURN D/S OF BIRD SANCTUARY PONDS	Classify chem
GBNI1NE050504086	F10577	CUNNING BURN AT BALLYEWRY	Classify
GBNI1NE050505036	F10639	ANNALONG R AT ANNALONG BR	Classify
GBNI1NE050505044	F10633	MULLAGH R AT MULLAGH BR	Classify
GBNI1NE050505059	F10602	MONEYCARRAGH FEEDER AT B175 ROAD BR	Classify
GBNI1NE050505060	F10607	ARDILEA R AT A2 ROAD BR	Classify
GBNI1NE050505062	F10605	RATHMULLAN BURN AT MINERSTOWN	Classify biol
GBNI1NE050505063	F10608	MONEYCARRAGH R AT MONEYLANE	Classify
GBNI1NE050505067	F10608	MONEYCARRAGH R AT MONEYLANE	Classify using F10608 downstream
GBNI1NE050505068	F11438	KILLOUGH RIVER NEAR BALLYBRANNAGH	Classify biol
GBNI1NE050505068	F11214	KILLOUGH RIVER AT LURGAN BRIDGE	Classify chem
GBNI1NE050505097	F10641	AUGHRIM R AT KILKEEL	Classify
GBNI1NE050505111	F10635	BURREN R AT BAILEYS BR	Classify
GBNI1NE050505113	F10609	CARRIGS R AT MAGHERA BR	Classify
GBNI1NE050505114	F10981	BEN CROM STREAM ABOVE SILENT VALLEY	Average with F10640
GBNI1NE050505114	F10640	KILKEEL R AT A2 ROAD BR, KILKEEL	Average with F10981
GBNI1NE050505115	F10542	ANNACLOY R AT ANNACLOY BR	Average with F10541
GBNI1NE050505115	F10541	QUOILE R AT QUOILE BR	Average with F10542
GBNI1NE050505115	F11334	BALLYDUGGAN RIVER BALLYDONETY BR	ra (catchment 11.2%)

GBNI1NE050505122	F10606	BLACKSTAFF (SOUTH DOWN) R AT TULLYMURRY BR	Classify
GBNI1NE050505123	F10636	SHIMNA R AT IVY BR, TOLLYMORE FOREST	Classify
GBNI1NE050505123	F11255	TULLYBRANIGAN RIVER BRIDGE AT RIVERSIDE COTTAGE	ra (catchment 14.7%)
GBNI1NE050505124	F10546	GLASSWATER R AT KILMORE	Classify
GBNI1NE050505125	F10545	BALLYNAHINCH RIVER AT CASEYS BR	Classify
GBNI1NE050505125	F10539	POUND BURN U/S OF BALLYCRUNE LOUGH	ra (catchment 14%)
GBNI1NE050505126	F11287	FORTH RIVER AT BROADWAY	Average with F10494
GBNI1NE050505126	F10494	BLACKSTAFF RIVER (BELFAST) AT B'MORAL STMWASH, BOUCHER	Average with F11287
GBNI1NE050505127	F10522	LAGAN R AT MOORES BR	Average all sites
GBNI1NE050505127	F10523	LAGAN R AT YOUNGS BR	Average all sites
GBNI1NE050505127	F10526	LAGAN R AT FORGE BR, MAGHERALIN	Average all sites
GBNI1NE050505127	F10527	LAGAN R AT BANOGE BR	Average all sites
GBNI1NE050505127	F10529	LAGAN R AT DROMORE	Average all sites
GBNI1NE050505129	F10603	BALLYVIGGIS STREAM AT BRIMSTONE BRAE	Classify

Neagh Bann International River basin District (ra=risk assess)

River Waterbody	Station	Location	Classify by site(s) or by other water body
GBNI1NB030301068	F10406	INVERROE WATER AT THE MEEN (A54 ROAD BR)	Classify
GBNI1NB030301069	F10915	KNOCKONEILL RIVER AT DUNGLADY BRIDGE	Classify
GBNI1NB030301070	F11291	EDEN BURN AT SCOGGY BRIDGE	Classify
GBNI1NB030301071	F11209	BANN BROOK AT BANNBROOK BRIDGE	Classify chem
GBNI1NB030301072	F10419	MAYOGHILL R AT CAHENY BR	Classify
GBNI1NB030301073	F10434	MACOSQUIN R AT REE BR	Classify
GBNI1NB030301075	F10914	AGIVEY RIVER AT ERRIGAL BRIDGE	Classify
GBNI1NB030301076	F10407	SHINNY WATER AT CROSSGARE BR	Classify biol
GBNI1NB030301146	F11302	GREENSHIELDS/GLENLOUGH R AT AT BALLYBOYLAND QUARRY	Classify
GBNI1NB030301147	F10414	DRUMAWHISKEY R AT DRUMAWHISKEY BR	Classify
GBNI1NB030301149	F10430	LOWER BANN AT PORTGLENONE	Average with 10429
GBNI1NB030301149	F10429	LOWER BANN AT KILREA BR	Average with 10430
GBNI1NB030301152	F10421	MULLAGHARDRY POINT STREAM AT MULLAGHARDRY	Classify biol
GBNI1NB030301153	F10420	DOORISH POINT STREAM AT DRUMRAYMOND	Classify
GBNI1NB030301163	F10424	IVY BURN AT ROCK COTTAGE	Classify biol

GBNI1NB030301166	F10417	CULMORE R AT GORTCLANNY	Classify
GBNI1NB030301169	F10431	LOWER BANN AT TOOME BR	Classify
GBNI1NB030301211	F10409	BRECKAGH BURN AT BRECKAGH BR	Classify
GBNI1NB030301213	F10437	AGHADOWEY R AT WHITE BRIDGES	Classify biol
GBNI1NB030301213	F10916	AGHADOWEY RIVER AT AGIVEY BRIDGE	Classify chem
GBNI1NB030301214	F10427	LOWER BANN AT THE CUTS	Classify
GBNI1NB030301215	F10411	AGIVEY R AT GLEN ULLIN	Classify
GBNI1NB030301216	F11333	GLENULLIN WATER AT NEW BROCKAGH BRIDGE	Average with F11332 for biol
GBNI1NB030301216	F11332	BROCKAGH WATER AT NEW BROCKAGH BRIDGE	Average with F11333 for biol
GBNI1NB030301219	F11305	KNOCKANTERN WOOD TRIB AT A26 ROAD BRIDGE	Classify
GBNI1NB030301221	F10416	ARTICLAVE R AT ARDINA BR	Classify
GBNI1NB030301222	F10412	DUNDOOAN FEEDER AT MARINA, PORTSTEWART RD	Classify biol
GBNI1NB030301223	F11210	BALLYVERSAL STREAM AT CIRCULAR ROAD BRIDGE	Classify chem
GBNI1NB030301224	F10898	METTICAN RIVER AT METTICAN BRIDGE	Classify
GBNI1NB030302010	F11303	BRAID R AT ECOS CENTRE	Classify
GBNI1NB030302014	F10215	KELLSWATER R AT CURRYS BR	Classify
GBNI1NB030302016	F10188	PRIESTS BURN AT BRECKAGH BR	Classify
GBNI1NB030302017	F10210	DEERFIN BURN AT HARRYVILLE	Classify
GBNI1NB030302018	F10217	BRAID R AT TULLAGHGARLEY BR	Classify
GBNI1NB030302021	F10197	DEVENAGH BURN AT DEVENAGH BR	Classify
GBNI1NB030302022	F10187	ARTOGES R AT GREEN BR	Classify
GBNI1NB030302150	F10212	MAIN R AT DUNMORE BR	Classify
GBNI1NB030302157	F10207	AGHILL BURN AT CRAIGS BR	Classify
GBNI1NB030302158	F10213	MAIN R AT GRACEHILL BR	Classify
GBNI1NB030302159	F10209	AHOGHILL BURN AT KILLYBEGS BR	Classify
GBNI1NB030302160	F10212	MAIN R AT DUNAMORE BR	Classify using F10212 downstream
GBNI1NB030302161	F10216	KELLSWATER R AT ROCK BR	Classify
GBNI1NB030302164	F10204	SHARVOGUES BURN AT SHARVOGUES	Classify
GBNI1NB030302165	F10198	DUNNSTOWN BURN AT DUNNSTOWN	Classify
GBNI1NB030302168	F10194	CONNOR BURN AT CONNOR ENCLOSURE	Classify
GBNI1NB030302212	F10202	KILLAGAN R AT KILLAGAN BR	Classify
GBNI1NB030302233	F10193	GLENRAVEL R AT CARROWCOWAN BR	Classify
GBNI1NB030302234	F10191	CLOGHMILLS WATER AT CLOGH MILLS	Classify
GBNI1NB030302235	F10195	DOUGLAS BURN (GLENWHIRRY) AT LYNNS BR	Classify
GBNI1NB030302236	F10190	GLEN BURN AT BUCKNA BR	Classify

GBNI1NB030302237	F10192	SKERRY WATER AT CRAIGDUNLOOF	Classify
GBNI1NB030303002	F10373	ALTAGOAN R AT BANTY BR	Classify
GBNI1NB030303004	F10379	KEENAGHT WATER AT DESERTMARTIN	Classify
GBNI1NB030303009	F11292	BLACK BURN AT A29 ROAD BRIDGE	Classify
GBNI1NB030303143	F11311	GRANGE WATER AT LONGFIELD BRIDGE	Classify
GBNI1NB030303144	F10382	MAGHERAFELT BURN AT GRANIAS BR	Classify
GBNI1NB030303154	F10380	MOYOLA R AT MOYOLA NEW BR	Classify
GBNI1NB030303167	F10384	BACK BURN (MOYOLA) AT WIDOW STEELES BR	Classify
GBNI1NB030303210	F10378	GLENGOMNA WATER AT GLENGOMNA BR	Classify
GBNI1NB030303226	F10370	MILLTOWN BURN (MOYOLA) AT A29 ROAD BR	Classify
GBNI1NB030303227	F10377	DOUGLAS R AT BOHERADAILE BR	Classify
GBNI1NB030303228	F11289	MOYOLA R AT LISNAMUCK BRIDGE	Classify
GBNI1NB030303241	F10374	MOYOLA R AT LABBY FORD	Classify
GBNI1NB030304054	F10352	KILDRESS STREAM AT A505 ROAD BR	Classify
GBNI1NB030304056	F10351	DRUMARD STREAM AT A505 ROAD BR	Classify
GBNI1NB030304057	F10353	BALLYMULLY R TRIBUTARY AT THE NOOK	Classify
GBNI1NB030304061	F10368	KILLYMOON R AT PRINCE OF WALES BR	Classify
GBNI1NB030304062	F10359	GORTIN WATER (BALLINDERRY) AT GORTIN BR	Classify
GBNI1NB030304063	F10362	BALLINDERRY R AT DOORLESS NEW BR	Classify
GBNI1NB030304063	F11451	BALLINDERRY R AT ARDREA BRIDGE	Classify from Jan 2015
GBNI1NB030304097	F10356	CLAGGAN R AT LISNANANE BR	Classify
GBNI1NB030304133	F10357	BALLYMULLY R AT A29 ROAD BR	Classify
GBNI1NB030304134	F10367	BALLYMULLY R AT BALLYGONNY BR	Classify
GBNI1NB030304136	F10361	BALLINDERRY R AT BALLINDERRY BR	Classify
GBNI1NB030304137	F11301	BALLYNARGAN STREAM AT AGHAVEAGH	Classify
GBNI1NB030304138	F10350	KINGSMILL STREAM AT KINGSMILL	Classify
GBNI1NB030304176	F10358	TULNACROSS TRIBUTARY AT BEECH GROVE	Classify
GBNI1NB030304177	F10369	ROCK R AT BALLYNAKILLY BR	Classify
GBNI1NB030304177	F10354	ROUGH HILL STREAM AT BALLYNAKILLY	ra (catchment 47.3%)
GBNI1NB030304181	F10355	TULLYARAN TRIBUTARY AT TULNAGALL BR	Classify

GBNI1NB030304240	F10978	BALLINDERRY R AT DUNAMORE BR	Classify
GBNI1NB030305122	F10235	SIX MILE WATER AT SIXMILEWATER BR	Average with F10233
GBNI1NB030305122	F10233	SIX MILE WATER AT CASTLE FARM BR, ANTRIM	Average with F10235
GBNI1NB030305124	F10234	RATHMORE BURN AT RATHMORE BR	Classify
GBNI1NB030305128	F10236	FOUR MILE BURN AT FIFTY ACRES	Classify
GBNI1NB030305162	F10232	HOLYWELL BURN AT DUNSILLY	Average with 10224
GBNI1NB030305162	F10224	PLASKETS FEEDER AT KILBEGS	Average with 10232
GBNI1NB030305202	F10231	SIX MILE WATER AT BALLYBOLEY BR	Classify
GBNI1NB030305203	F10222	CASTLE WATER AT HILLIS BR	Classify
GBNI1NB030305204	F10238	SIX MILE WATER BELOW BALLYCLARE	Average with F10223
GBNI1NB030305204	F10223	GREEN BURN AT MILLVALE	Average with F10238
GBNI1NB030305205	F10230	LISNALINCHY BURN AT BALLYWALTER BR	Classify
GBNI1NB030305206	F10240	BALLYMARTIN WATER AT BALLYMARTIN WATER BR	Classify
GBNI1NB030305207	F10239	CLADY WATER AT DUNADRY ROAD BR	Classify
GBNI1NB030306085	F10393	CREW BURN AT CARROLS BR	Classify biol
GBNI1NB030306085	F11323	ROOGHAN R AT LODGE HILL	Classify chem
GBNI1NB030306085	F10392	ROOGHAN R AT B12 ROAD BR	ra (catchment 49.2%)
GBNI1NB030306087	F10244	CRUMLIN R AT CIDERCOURT BR	Classify
GBNI1NB030306087	F10441	DUNDESERT R AT DUNDESERT GOSPEL HALL	ra (catchment 19.4%) - in u/s rwb
GBNI1NB030306125	F10441	DUNDESERT R AT DUNDESERT GOSPEL HALL	Classify
GBNI1NB030306127	F10396	DUNORE R AT UPPER BR	Classify
GBNI1NB030306131		DOON STREAM	Classified using pressures and impacts information
GBNI1NB030306140	F10385	MOURNEVIEW STREAM AT DOWNSTREAM BR	Classify biol
GBNI1NB030306141	F10386	SALTERSTOWN R AT SALTERSTOWN	Classify
GBNI1NB030306193	F10387	BALLINDERRY (ANTRIM) R AT DRUMART BR	Classify
GBNI1NB030307025	F11321	RIVER RHONE AT MARK STREET ROAD	Classify biol
GBNI1NB030307036	F10342	RHONE R AT CLONTEEVY BR	Classify
GBNI1NB030307041	F10301	BLACKWATER R FEEDER AT AUGHNACLOY	Classify biol
GBNI1NB030307042	F10304	CRILLY FEEDER AT DUNMACMAY	Classify
GBNI1NB030307043	F10330	BLACKWATER R AT BENBURB BR	Classify

GBNI1NB030307044	F10345	CALLAN R AT PAPER MILL BR	Classify
GBNI1NB030307045	F10896	BALLYMARTRIM WATER AT BR ON ARTASOOLY ROAD	Classify
GBNI1NB030307047	F11296	KILMORE TRIB (ANNABOE TRIB) AT FLUSH BRIDGE	Classify
GBNI1NB030307048	F10317	BUTTER WATER AT BALLYNAHONE BR	Classify
GBNI1NB030307049	F11325	CLAY RIVER U/S OF KEADY	Classify biol
GBNI1NB030307050	F10311	TAMNAMORE STREAM AT TAMNAMORE	Classify
GBNI1NB030307096	F10310	COR R TRIB U/S OF MIDDLETOWN STW	Classify biol
GBNI1NB030307109	F10318	KILLEEN WATER AT B77 ROAD	Classify biol
GBNI1NB030307111	F10314	BALLYMACONE R AT CALLAN CONFLUENCE	Classify
GBNI1NB030307112	F10316	CALLAN R AT DUNDRUM	Classify
GBNI1NB030307129	F10910	TALL RIVER AT CLONMORE	Average with F10339
GBNI1NB030307129	F10339	TALL R AT REDMONDS BR	Average with F10910
GBNI1NB030307175	F10348	BALLYGAWLEY WATER AT LISMORE BR	Classify biol
GBNI1NB030307175	F11253	BALLYGAWLEY WATER AT BALLYNAPOTTAGE BR (CHEM ONLY)	Classify chem
GBNI1NB030307180	F10312	BLACKWATER RIVER FEEDER AT FOOTBRIDGE D/S ROUGHAN BRIDGE	Classify
GBNI1NB030307196	F11322	BLACKWATER R AT FINTONA ROAD BRIDGE	Classify
GBNI1NB030307238	F10349	FURY R AT BELALASTERA BR	Classify
GBNI1NB030307239	F10307	BLACKWATER R FEEDER AT LISBOY	Classify
GBNI1NB030307242	F10303	KNOCKMANY BURN (B'WATER) AT ROY	Classify biol
GBNI1NB030307243	F10309	BLACKWATER R TRIBUTARY AT KILLYFADDY	Classify
GBNI1NB030308091	F10267	ANNAGH R AT MAGHON	Classify biol
GBNI1NB030308100	F10286	UPPER BANN AT MC COMBS BR	Classify
GBNI1NB030308101	F10250	ROCKY R AT ROCKY R BR	Classify
GBNI1NB030308102	F10265	LEITRIM R AT LEITRIM BR	Classify
GBNI1NB030308110	F10292	BALLYBAY R AT OBINS STREET, PORTADOWN	Classify
GBNI1NB030308113	F10251	WHITECROSS STREAM AT WHITECROSS	Classify
GBNI1NB030308114	F10300	CUSHER R AT CAPTAINS BR	Average with F10256 downstream
GBNI1NB030308114	F10256	CUSHER R AT McCREEDYS BR	Average with F10300
GBNI1NB030308117	F10278	TULLYORIOR TRIB AT TULLYORIOR RD BR	Classify
GBNI1NB030308118	F10266	LOUGHGILLY R AT BALLYGORMAN	Classify biol

GBNI1NB030308119	F11297	MARKETHILL RIVER/GOSFORD PARK RIVER AT DUNESMULLAN	Classify
GBNI1NB030308120	F10260	MOWHAN R AT DERRYCUGHAN	Classify
GBNI1NB030308186	F10261	EEL BURN (UPPER BANN) U/S OF POLANDS BR	Classify
GBNI1NB030308187	F10262	DRUMADONNELL R AT BALLYRONEY ROAD	Classify
GBNI1NB030308188	F10283	MUDDOCK R AT MUDDOCK BR	Classify
GBNI1NB030308201	F10333	BLACKWATER R AT DERRYMEEN BR	Average with F10332
GBNI1NB030308201	F10332	BLACKWATER R AT BURNS BR	Average with F10333 - in u/s rwb
GBNI1NB030308202	03C010600	NO NI MON - Clontibret Stream at Br in Clontibret	Average IE sites
GBNI1NB030308202	03C011100	NO NI MON - Clontibret Stream Br SW of Clerran	Average IE sites
GBNI1NB030308203	F10329	BLACKWATER R AT MOY	Average with F10328 for chem Classify biol.
GBNI1NB030308203	F10328	BLACKWATER R AT BONDS BR	Average with F10329 for chem
GBNI1NB030308204	F10331	BLACKWATER R AT CALEDON BR	Average with F10330 downstream
GBNI1NB030308204	F10330	BLACKWATER R AT BENBURB BR	Average with F10331
GBNI1NB030308205	F10376	MOYOLA R AT MOYKEERAN	Average with F10375
GBNI1NB030308205	F10375	WHITEWATER (MOYOLA) AT WHITEWATER BR	Average with F10376
GBNI1NB030308206	F10383	GRANGE WATER AT CURRAN	Classify
GBNI1NB030308206	F10371	LUNEY WATER AT LUNEY BR	ra (catchment 26.9%)
GBNI1NB030308207	F10440	CRUMLIN R AT THOMPSONS BR	Average with F10245
GBNI1NB030308207	F10245	CRUMLIN R AT AIRPORT ROAD BR	Average with F10440
GBNI1NB030308208	F10249	GLENAVY R AT BALLYDONAGHY BR	Average with F10247 & F10248
GBNI1NB030308208	F10248	GLENAVY R AT LEAP BR	Average with F10247 & F10249
GBNI1NB030308208	F10247	STONYFORD R AT THE Y BR	Average with F10248 & F10249
GBNI1NB030308208	F10246	RUSHYHILL R AT LEATHEMSTOWN	ra (catchment 26.4%)
GBNI1NB030308209	F11306	CRAIGAVON RIVER AT KESH BRIDGE	Classify
GBNI1NB030308210	F10214	MAIN R AT DUNDERMOT BR	Classify
GBNI1NB030308211	F10220	CLOGH R AT GLARRYFORD BR	Classify
GBNI1NB030308212	F11304	BRAID R AT BROUGHSHANE	Classify
GBNI1NB030308213	F10320	OONA WATER AT CLONTY BR	Classify
GBNI1NB030308214	F10189	BRAID R AT AGHACULLY BR	Classify
GBNI1NB030308215	F10241	DOAGH R AT DOAGH	Average with F10227 & F10242
GBNI1NB030308215	F10242	DOAGH R AT DUNAMOY	Average with F10241 & F10227

GBNI1NB030308215	F10227	DOAGH R TRIBUTARY AT DIXONS CORNER	Average with F10241 & F10242
GBNI1NB030308216	F10256	CUSHER R AT McCREEDYS BR	Classify
GBNI1NB030308216	F10263	CUSHER R TRIBUTARY AT MOUNTNORRIS	ra (catchment 28.7%)
GBNI1NB030308217	F10321	OONA WATER AT PLUCK BR	Average all sites
GBNI1NB030308217	F10346	OONA WATER AT OONA BR	Average all sites
GBNI1NB030308217	F11295	MULLYRODDAN RIVER AT MULLYRODDAN	Average all sites
GBNI1NB030308218	F11327	CUSHER R AT CUSHER BR	Average with F10295
GBNI1NB030308218	F10295	CUSHER R AT KNOCK BR	Average with F11327
GBNI1NB030308219	F11328	UPPER BANN AT LEITRIM ROAD LAND	Average with F10252
GBNI1NB030308219	F10252	KINNAHALLA R U/S OF NEW BR	Average with F11328
GBNI1NB030308220	F11308	MACOSQUIN R AT KILLURE BR	Classify
GBNI1NB030308221	F10433	BALLYMONEY R AT BALLYMENA ROAD BR	Average with F10432
GBNI1NB030308221	F10432	BALLYMONEY R AT GLENSTALL BR	Average with F10433
GBNI1NB030308222	F10336	TORRENT R AT NEWMILLS BR	Average with F10315
GBNI1NB030308222	F10315	TORRENT R AT CASTLECAULFIELD	Average with F10336
GBNI1NB030308222	F11450	TORRENT R AT THE MOOR BRIDGE	replaces F10335 from 2015
GBNI1NB030308223	F10333	BLACKWATER R AT DERRYMEEN BR	Classify
GBNI1NB030308224	F10341	TALL R AT DARBYS BR	Average with F10339
GBNI1NB030308224	F10339	TALL R AT REDMONDS BR	Average with F10341
GBNI1NB030308225	F11326	CALLAN R AT MOY ROAD	Average with F10343
GBNI1NB030308225	F10343	CALLAN R AT DERRYSCOLLOP	Classify biol. Average with F11326 for chem
GBNI1NB030308230	F11181	BALLINDERRY AT AUGHLISH BR	Average with F10363 & F10364
GBNI1NB030308230	F10363	BALLINDERRY R AT KINGS BR	Average with F10363 & F11181
GBNI1NB030308230	F10364	BALLINDERRY AT CORKILL BR	Average with F10363 & F11181
GBNI1NB030308231	F10366	LISSAN WATER AT DRUMGRASS BR	Average with F10904 & F10366
GBNI1NB030308231	F10905	LISSAN WATER AT FLOOD LODGE FOOTBRIDGE	Average with F10904 & F10366
GBNI1NB030308231	F10904	LISSAN WATER AT LITTLE BRIDGE	Average with F10905 & F10366
GBNI1NB030308232	F10360	COOLMAGHRY TRIBUTARY AT TULNAGALL BR	Classify
GBNI1NB030308233	F10438	CLADY R AT GLENONE BR	Classify
GBNI1NB030308234	F10404	GRILLAGH R AT CURDIAN BR	Classify
GBNI1NB030308236	F10347	TYNAN R AT A28 ROAD BR	Average with

			F10319
GBNI1NB030308236	F10319	BALTEAGH STREAM AT BALTEAGH BR	Average with F10347
GBNI1NB030308237	F11456	AGIVEY RIVER AT CULLYCAPPLE BRIDGE	Average for chem with F10436 from Jan 2015
GBNI1NB030308237	F10913	AGIVEY RIVER AT BRICKHILL BRIDGE	Average for chem with F10436. Classify for biol.
GBNI1NB030308237	F10436	AGIVEY R AT MONEYCARRIE BR	Average for chem with F10913
GBNI1NB030308238	F11449	DERRYCAW STREAM AT CLONMACASH	Classify chem
GBNI1NB030308239	tbc	POUND BURN - LOCATION TBC	Classify
GBNI1NB030308241	F10208	GLENWHIRRY R AT PIGTAIL BR	Classify
GBNI1NB030308243		LOUGH NEAGH WATER BODY	Classify using Lake WFD Class
GBNI1NB030308244	F10214	MAIN R AT DUNDERMOT BR	Average with F10199
GBNI1NB030308244	F10199	DAMSTOWN BURN AT DAMSTOWN BR	Average with F10214 downstream
GBNI1NB030308244	F11452	MAIN RIVER AT KILLAGAN ROAD BRIDGE	Classify from Jan 2015
GBNI1NB030308245	F10323	COR R AT LEMNAGORE WOOD	Classify
GBNI1NB030308254	03M010100	MOUNTAIN WATER	Classify using IE site
GBNI1NB030308255	03S020200	SCOTSTOWN R AT BR S OF KNOCKBALLYRONEY	Average IE sites
GBNI1NB030308255	03S020400	SCOTSTOWN R AT MILL S OF DROMSCOR	Average IE sites
GBNI1NB030308256	F10271	UPPER BANN AT DYNES BR	Average with others
GBNI1NB030308256	F10273	UPPER BANN AT LAWRENCETOWN	Average with others
GBNI1NB030308256	F10277	UPPER BANN AT BALLYDOWN	Average with others
GBNI1NB030308256	F10280	UPPER BANN AT KATE MCKAYS BR	Average with others
GBNI1NB060601003	F10617	CLANRYE NORTH R AT HAWKINS BR	Classify
GBNI1NB060601018	F10615	MAYOBRIDGE R AT DOWNSTREAM BR	Classify
GBNI1NB060601020	F11307	DERRYLECKAGH STREAM AT DERRYLECKAGH HOUSE	Classify
GBNI1NB060601021	F11324	CLANRYE RIVER AT CULLION BRIDGE	Classify
GBNI1NB060601025	F10613	LOUGHBRICKLAND STREAM AT KILLYSAVEN VILLAS	Classify
GBNI1NB060602038	F10649	KILNASAGGART R AT KILNASAGGART BR	Classify
GBNI1NB060602038	06B020100	KILNASAGGART/BALLYMASCANLAN R AT JONEBOROUGH BR	xb site - include in final classification
GBNI1NB060603027	F10653	COUNTY WATER (S ARMAGH) AT TRAYNORS BR	Classify

GBNI1NB060603027	06C030050	COUNTY WATER AT COUNTY BRIDGE	xb site - include in final classification
GBNI1NB060603027	06C030170	COUNTY WATER AT BR U/S WALLACES BR	xb site - include in final classification
GBNI1NB060604011	F10643	CASSY WATER AT CASSYWATER BR	Classify
GBNI1NB060604040	F10646	GHANN R AT GREEN PARK BR	Classify
GBNI1NB060604041	F10644	KILBRONEY R AT NEWTOWN BR	Classify
GBNI1NB060604042	F10647	MOYGANNON R AT MOYGANNON FORD	Classify
GBNI1NB060604045	F10642	WHITE WATER R (SOUTH DOWN) AT WHITEWATER BR	Classify
GBNI1NB060604048		NEWRY CANAL	Artifical Waterbody
GBNI1NB060608226	F10626	JERRETTSPASS R AT JERRETTSPASS	Average with F10610
GBNI1NB060608226	F10610	JERRETTSPASS R TRIBUTARY AT GLEN BR	Average with F10626
GBNI1NB060608227	F11204	NEWRY R AT DAMOLLY ROW	Average with F10622
GBNI1NB060608227	F10622	CLANRYE R AT CROWN BR	Average with F11204
GBNI1NB060608228	F10652	FORKILL R AT LOWER BR, FORKILL	Classify
GBNI1NB060608228	06K020200	FORKHILL/KILCURRY RIVER AT MILL NR FALMORE HALL	xb site - include in final classification
GBNI1NB060608229	06F010300	FANE RIVER AT CLAREBANE BR	Classify using IE site
GBNI1NB060608235	F10651	CULLY WATER AT SILVER BR	Classify
GBNI1NB060608235	06C020200	CULLY WATER BR U/S KILCURRY R CONFL	xb site - include in final classification
GBNI1NB060608240	F10625	BESSBROOK R AT MILLVALE BR	Classify
GBNI1NB060608246	F10918	CREGGAN RIVER AT COOLDERRY BRIDGE	Classify
GBNI1NB060608246	06C010050	CASTLETOWN R AT BALLYBINABY BR	xb site - include in final classification
GBNI1NB060608247	F10977	FLURRY R AT LOW ROAD BR	Classify
GBNI1NB060608247	06F020100	FLURRY R AT FLURRY BR	xb site - include in final classification
GBNI1NB060608248	06G040040	NO NI MON - GENTLE OWENS LAKE STREAM AT BR IN CREAGHANROE	Classify using IE site
GBNI1NB060608249	F10900	FANE RIVER AT ART HAMILL BRIDGE	Classify
GBNI1NB060608249	06F010650	FANE RIVER AT BR IN INNISKEEN	xb site - include in final classification
GBNI1NB060608250	F10900	FANE RIVER AT ART HAMILL BRIDGE	Classify using F10900 downstream
GBNI1NB060608250	06F010400	FANE RIVER AT BALLYNACARRY BR	xb site - include in final classification
GBNI1NB060608251	06R020700	NO NI OR IE MON	Classify using IE site
GBNI1NB060608252	06F020300	FLURRY RIVER CURRAHIR BR	Classify using IE site

GBNI1NB060608253	06G040100	GENTLE OWENS LAKE STREAM AT BR 1.5KM D/S MUCKNO MILL LOUGH	Classify using IE site

North Western International River Basin District (ra=risk assess)

RWBID	Sitecode	Location	Classify by site(s) or by other water body
GBNI1NW010101045	F10024	BURNDENNET R AT DUNNAMANAGH	Classify
GBNI1NW010101069	F10023	ALTINAGHREE BURN AT BUNOWEN BR	Classify
GBNI1NW010101070	F10022	BURNDENNET R AT BURNDENNET BR	Classify
GBNI1NW010101071	F10019	BURNDENNET R AT ESSBEG BR	Classify biol
GBNI1NW010101071	F11313	BURN DENNET RIVER AT FOOTBRIDGE NEAR BRYSON HOUSE	Classify chem
GBNI1NW010101072	F10020	DUNNYBOE BURN AT DUNNYBOE BR	Classify
GBNI1NW010101075	F10014	GLENMORNAN R AT CATHERINES BR	Classify
GBNI1NW010101076	F10015	SANDVILLE BURN (BURNGIBBAGH) AT MOUNT PLEASANT	Classify biol
GBNI1NW010102001	F10121	CRANNY BURN AT CRANNY	Classify
GBNI1NW010102006	F10128	DRUMRAGH R AT CAR PARK U/S OF CAMPSIE BR	Classify
GBNI1NW010102008	F10136	ESKRAGH WATER AT SESKINORE MILL BR	Classify
GBNI1NW010102017	F10131	CREEVAN BURN AT MC KINLEY BUNGALOWS	Classify
GBNI1NW010102018	F10129	OWENREAGH (SOUTH) R AT BALLYNAHATTY	Classify
GBNI1NW010102021	F10089	CAPPAGH BURN AT TATTYNURE BR	Classify
GBNI1NW010102023	F10083	GLENSAWISK BURN AT CAMPBELLS BR	Classify
GBNI1NW010102024	F10056	CASHEL BURN (OWENREAGH EAST) AT CASHEL	Classify
GBNI1NW010102025	F10075	GLENLARK R AT GLENLARK BR	Classify
GBNI1NW010102027	F11314	OWENKILLEW R AT TRINAMADDEN BR	Classify
GBNI1NW010102028	F10072	OWENKILLEW R AT KILLYMORE BR	Classify
GBNI1NW010102032	F10104	GRANAGH BURN AT CARRICKMORE	Classify
GBNI1NW010102035	F10115	CLOGHFIN R AT LISBOY BR	Classify
GBNI1NW010102036	F10115	CLOGHFIN R AT LISBOY BR	Classify using F10115 downstream

GBNI1NW010102039	F10109	GLENSCOLLIP (BALLYNAMULLAN) BURN AT OMAGH	Classify
GBNI1NW010102041	F10099	FAIRYWATER R AT OLD R'WAY BR, NESTLES	Average with F10101
GBNI1NW010102041	F10101	FAIRYWATER R AT MULLANATOOMOG	Average with F10099
GBNI1NW010102043	F10073	GLENMACOFFER BURN AT GLENMACOFFER BR	Classify
GBNI1NW010102046	F11320	OWENREAGH (SOUTH) R AT BLACKWATER ROAD BRIDGE	Classify
GBNI1NW010102047	F10043	GLASHAGH/TIEVEMORE BURN AT GLASHAGH BR	Classify
GBNI1NW010102050	F10046	KILLEN BURN AT GLASHAGH BR	Classify biol
GBNI1NW010102050	F11260	KILLEN BURN ATKILLEN BR	Classify chem
GBNI1NW010102051	F10980	DERRYNASEER TRIB AT DERRYNASEER	Classify
GBNI1NW010102053	F10951	OWENREAGH (SOUTH) R AT DRUMLISH	Classify
GBNI1NW010102056	F11317	DERG R AT LEGVIN	Classify
GBNI1NW010102064	F10038	DREENAN BURN AT DREENAN BR	Average with F10048
GBNI1NW010102064	F10048	MOURNE BEG R AT MOURNE BR	Average with F10038
GBNI1NW010102066	F10035	CROAGH BURN AT CROAGH	ra (catchment 21.7%)
GBNI1NW010102066	F10048	MOURNE BEG R AT MOURNE BR	Classify using F10048 downstream
GBNI1NW010102067	F10049	GLENDERGAN R AT SRAGHCUMBER	Classify chem
GBNI1NW010102067	F11467	GLENDERGAN R AT MULLYFA	Classify biol
GBNI1NW010102074	F10028	MOURNE R AT STRABANE BR	Average with others
GBNI1NW010102074	F10029	MOURNE R AT VICTORIA BR	Average with others
GBNI1NW010102074	F10086	STRULE R AT MOYLE BR	Average with others
GBNI1NW010102075	F10030	DOUGLAS BURN (FOYLE) AT DOUGLAS BR	Classify
GBNI1NW010102077	F10026	CAVANALEE R AT MILLTOWN BR	Classify
GBNI1NW010102081	F10058	BROUGHDERG WATER AT BROUGHDERG BR	Classify using F10058 downstream
GBNI1NW010102085	F10076	CONEYGLEN BURN AT CONEYGLEN BR	Classify
GBNI1NW010102086	F10058	BROUGHDERG WATER AT BROUGHDERG BR	Average with F10077
GBNI1NW010102086	F10077	OWENKILLEW R AT MONANAMEAL BR	Average with F10058
GBNI1NW010102089	F10118	RAVEAGH BURN AT RAVEAGH	Average with F10127
GBNI1NW010102089	F10127	ESKRAGH WATER AT ESKRAGH	Average with F10118
GBNI1NW010102090	F10137	ROUTING BURN AT BROWNS BR	Classify
GBNI1NW010102091	F10069	GLASHAGH BURN AT CASHEL WOOD	Average with F11315
GBNI1NW010102091	F11315	OWENREAGH RIVER AT	Average with F10069

		FORMIL BRIDGE	
GBNI1NW010102092	F10114	CAMOWEN R AT RAMACKAN BR	Classify
GBNI1NW010102094	F10047	DERG R AT AGHYARAN BR	Classify
GBNI1NW010102095	F10044	DERG R AT MILLBROOK NEW BR	Average with F10045 for chem
GBNI1NW010102095	F10045	DERG R AT CREW BR	Classify biol
GBNI1NW010102096	F10061	GLENKNOCK BURN AT GLENKNOCK COTTAGES	Classify
GBNI1NW010103062	01C010150	CARRIGANS R AT BRIDGE N. OF GARSHOOEY LOWER	Classify using IE site
GBNI1NW010103062	01C010200	CARRIGANS R BR IN CARRIGANS (U/S STW)	Classify using IE site
GBNI1NW010103062	01G020100	NO NI MON GREENHILL STREAM AT BR AT GREENHILL	Classify using IE site
GBNI1NW010103065	F11317	DERG RIVER AT LEGVIN	Classify using F11317 downstream
GBNI1NW010104040	F10078	GLENELLY R AT CORICK BR	Average with others
GBNI1NW010104040	F10079	GLENELLY R AT CLOGHERNY BR	Average with others
GBNI1NW010104040	F10080	GLENELLY R AT SPERRIN	Average with others
GBNI1NW010104040	F10938	GLENELLY R AT GLASHY BR	Average with others
GBNI1NW010104041	F10081	OWENREAGH (EAST) R AT DRUMLEA BR	Classify
GBNI1NW010104042	F10091	GLENRONE R AT McCREA PARK	Average with others
GBNI1NW010104042	F10092	DRUMQUIN R AT CROOKED BR	Average with others
GBNI1NW010104042	F10103	DRUMQUIN R AT DRUMQUIN	Average with others
GBNI1NW010104043	F10074	OWENKILLEW R AT DRUMLEA	Classify
GBNI1NW010104044	F10090	FAIRYWATER AT B50 ROAD BR	Average with F10102
GBNI1NW010104044	F10102	FAIRYWATER R AT MONAGHANS BR	Average with F10090
GBNI1NW010104046	F10097	BLACK WATER (DRUMQUIN) AT CARRICKANESS BR	Classify
GBNI1NW010104047	F10107	CAMOWEN R AT CARRICKMORE	Classify
GBNI1NW010104047	F10110	ALTANAGH BURN AT POUND BR	ra (catchment 26.1%) biol
GBNI1NW010104047	F11259	ALTANAGH BURN AT ALTANAGH BR	ra (catchment 26.1%) chem
GBNI1NW010104048	F10106	CLOGHFIN R AT BALLYKEEL BR	Average with F10115
GBNI1NW010104048	F10115	CLOGHFIN R AT LISBOY BR	Average with F10106
GBNI1NW010104049	F10133	QUIGGERY WATER AT EDERGOOLE BR	Average with F10134 & F10135
GBNI1NW010104049	F10134	QUIGGERY WATER AT SESSIAGH BR	Average with F10133 & F10135
GBNI1NW010104049	F10135	QUIGGERY WATER AT ECCLESVILLE	Average with F10133 & F10134
GBNI1NW010104050	F10120	MAGHERAGART BURN AT AGHLISK BR	Average with F10121
GBNI1NW010104050	F10121	OWENREAGH (SOUTH) R AT B84 ROAD BR	Average with F10120 upstream

GBNI1NW010104068	F10979	R DERG AT CROCKNACUNNY FOREST	Classify
GBNI1NW010104070	F10108	DRUMNAKILLY BURN AT DRUMNAKILLY	Classify
GBNI1NW010104073	F10042	LOUGH CATHERINE STREAM AT MILLBROOK	Classify
GBNI1NW010104074	F10025	FINN (FOYLE) R AT CLADY BR	Classify
GBNI1NW010108257	F10111	CAMOWEN R AT DONNELLYS BR	Classify chem
GBNI1NW010108257	F11335	CAMOWEN AT CRANNY BRIDGE PICNIC AREA	Classify biol
GBNI1NW010108258	F10086	STRULE R AT MOYLE BR	Average with F10087 & F10088
GBNI1NW010108258	F10087	STRULE R AT STONE BR	Average with F10086 & F10088
GBNI1NW010108258	F10088	STRULE R AT ABBEY BR, OMAGH	Average with F10086 & F10087
GBNI1NW020202005	F10169	OWENALENA R AT OWENALENA BR	Classify
GBNI1NW020202010	F10179	OWENRIGH R AT CARNANBANE	Classify
GBNI1NW020202012	F10160	GELVIN R AT LOWER GELVIN BR	Classify
GBNI1NW020202014	F10161	BOVEVAGH R AT BURNFOOT BR	Classify
GBNI1NW020202015	F11208	ROE R AT TURMEEL BR	Classify
GBNI1NW020202018	F10171	ROE R AT LIMAVADY	Average with F10172
GBNI1NW020202018	F10172	ROE R AT DOG LEAP	Average with F10171
GBNI1NW020202023	F10178	OWENBEG R AT DUNGIVEN	Classify
GBNI1NW020202024	F10170	ROE R AT ROE BR	Classify chem
GBNI1NW020202024	F10171	ROE R AT LIMAVADY	Classify biol using F10171 upstream
GBNI1NW020202032	F10163	WOOD BURN AT KILLIBLEUGHT BR	Classify
GBNI1NW020202039	F10160	GELVIN R AT LOWER GELVIN BR	Classify using F10160 downstream
GBNI1NW020202043	F10175	ROE R AT CORICK BR	Classify
GBNI1NW020203027	F10183	BURNFOOT R AT RUSH HALL	Classify
GBNI1NW020203028	F10180	BALLYKELLY R AT BALLYKELLY BR	Classify
GBNI1NW020203029	F10182	FAUGHANVALE R AT FAUGHANVALE BR	Classify
GBNI1NW020203030	F10181	MUFF R AT MILL BR	Classify
GBNI1NW020204025	F10143	MEENARNET BURN AT SLAGHTMANUS	Classify
GBNI1NW020204026	F10155	FOREGLEN R AT DUNGORKIN BR	Classify
GBNI1NW020204033	F11312	FAUGHAN R AT KILLYCOR BR	Classify
GBNI1NW020204034	F10145	BURNGIBBAGH AT DRUMAHOE	Classify
GBNI1NW020204035	F10157	BURNTOLLET R AT BURNTOLLET BR	Classify
GBNI1NW020204038	F10158	GLENRANDAL R AT CLAUDY	Classify biol
GBNI1NW020204038	F10950	GLENRANDAL R AT LING BR	Classify chem
GBNI1NW020204060	F10177	CURLY R AT ARTIKELLY BR	Classify

GBNI1NW020204061	F10165	CASTLE R TRIBUTARY AT DRENAGH	Average with others
GBNI1NW020204061	F10176	CASTLE R AT DRUMMOND BR	Average with others
GBNI1NW020204061	F10912	CASTLE RIVER AT CASTLE BRIDGE	Average with others
GBNI1NW020204062	F10140	LOUGHERMORE R AT LOUGHERMORE BR	Classify
GBNI1NW020208259	F10148	FAUGHAN R AT MOBUOY BR	Average with others
GBNI1NW020208259	F10151	FAUGHAN R AT ARDMORE	Average with others
GBNI1NW020208259	F10152	FAUGHAN R AT LEGAHORY	Average with others
GBNI1NW020208259	F10948	FAUGHAN R AT CARMONEY WTW	Average with others
GBNI1NW262601001	26S020200	SHANNON RIVER U/S OF TULLYNAFREAVE	Classify using IE site
GBNI1NW353504065	F10654	ROOGAGH R AT GARRISON	Classify
GBNI1NW353504075	F10657	COUNTY R (FERMANAGH) AT COUNTY BR	Classify
GBNI1NW353504076	F10657	COUNTY R (FERMANAGH) AT COUNTY BR	Average with F10899
GBNI1NW353504076	F10899	LATTONE TRIBUTARY AT LATTONE BRIDGE	Average with F10657 downstream
GBNI1NW353504077	35B070060	BRADOGE R AT BR N OF CORNAGLAH	Classify using IE site
GBNI1NW353504082	35D030100	DROWES RIVER AT LENNOXS BR	Classify using IE site
GBNI1NW363601005	F10659	HOLLOW R AT LISNARRICK	Classify biol
GBNI1NW363601007	F10757	LURGAN R AT BELCOO	Classify
GBNI1NW363601010	F10751	BOHO TRIBUTARY AT BOHO	Classify
GBNI1NW363601011	F10694	SALRY R AT SALRY	Classify
GBNI1NW363601032	F11290	ST ANGELO STREAM AT HALLOW HOUSE	Classify chem
GBNI1NW363601036	F10743	BLACK R AT B52 ROAD BR	Classify
GBNI1NW363601041	F10658	BLACKSLEE BURN AT HOLME BAY	Classify biol
GBNI1NW363601042	F10700	BALLINAMALLARD R AT BALLYCASSIDY BR	Classify
GBNI1NW363601044	F11421	SILLEES R AT RIVERSIDE FARM	Classify
GBNI1NW363601046	F10701	BALLINAMALLARD R AT MAGHERACROSS BR	Classify
GBNI1NW363601047	F10693	EDENCLAW TRIBUTARY AT EDENCLAW	Classify
GBNI1NW363601049	F10756	FLORENCECOURT R AT A32 ROAD BR	Classify
GBNI1NW363601053	F10684	MANTLIN R AT MANTLIN BR	Classify
GBNI1NW363601055	F10752	SCREENAGH R AT AGHAKEERAN	Classify
GBNI1NW363601056	F10750	SILLEES R AT DERRYGONNELLY BR	Classify
GBNI1NW363601058	F10681	BANNAGH R AT BANNAGH BR	Classify
GBNI1NW363601059	F10691	DOORAA TRIBUTARY AT LETTERKEEN	Classify
GBNI1NW363601060	F10690	GLENDURRAGH R AT EDENAMOHILL	Classify
GBNI1NW363601073	F10750	SILLEES R AT	Classify using F10750

		DERRYGONNELLY BR	downstream
GBNI1NW363601074	F10750	SILLEES R AT DERRYGONNELLY BR	Classify using F10750 downstream
GBNI1NW363601084	F10744	CLADAGH R AT GORTEEN	Classify
GBNI1NW363602016	F10711	AGHAVEA R AT BOYHILL	Classify
GBNI1NW363602017	F11300	BALLINA TRIB AT DROLES BRIDGE	Classify chem
GBNI1NW363602018	F10715	COLEBROOKE R AT BALLINDARRAGH BR	Classify
GBNI1NW363602020	F10705	RAW R AT RAW BR	Classify
GBNI1NW363602022	F10718	TEMPO R AT A4 ROAD BR	Classify
GBNI1NW363602024	F10672	LOUGH-A-HACHE R BELOW MOORLOUGH	Classify biol
GBNI1NW363602024	F10919	LOUGH-A-HACHE RIVER AT DERRYANY BRIDGE	Classify chem
GBNI1NW363602025	F10714	HOLLYBROOK R AT AGHALURCHER	Classify
GBNI1NW363602026	F10726	DRUMSHANCORICK R AT DEER PARK	Classify
GBNI1NW363602028	F10675	NEWTOWNBUTLER R AT NEWTOWNBUTLER	Classify
GBNI1NW363602029	F10903	DERRYHOOLY TRIBUTARY AT CORRY	Classify chem
GBNI1NW363602029	F10947	DERRYHOOLY TRIBUTARY AT DERRYLANEY	Classify biol
GBNI1NW363602030	F10706	COONEEN WATER AT LEGATILLIDA	Classify biol
GBNI1NW363602030	F10922	COONEEN WATER AT GROGEY BRIDGE	Classify chem
GBNI1NW363602035	F11329	ERNE R AT BELLANALECK JETTY	Classify chem
GBNI1NW363602038	F10901	TAMLAGHT TRIBUTARY AT TAMLAGHT	Classify chem
GBNI1NW363602039	F10669	ERNE R AT ENNISKILLEN	Classify
GBNI1NW363602043	F10720	TEMPO R AT TATTINWEER BR	Classify biol
GBNI1NW363602043	F11330	TEMPO RIVER AT TEMPO	Classify chem
GBNI1NW363602051	F11299	KINGLASS TRIB AT CARRS BRIDGE	Classify chem
GBNI1NW363602054	F10710	PUBBLE BURN AT PUBBLE BR	Classify
GBNI1NW363602063		UPPER LOUGH ERNE	Classify using Lake class
GBNI1NW363602083	F10708	RAMULT BURN AT RAMULT	Classify
GBNI1NW363602085	F10721	MANY BURNS R AT MANYBURNS BR	Classify
GBNI1NW363602088	F11319	TERMON R AT TULLYMALTRA	Classify
GBNI1NW363602092	F10740	BELCOO R AT BELCOO BR	Classify
GBNI1NW363602093	F10760	DRUMHARRIFF BURN AT KNOCKNAFADEELA	Classify
GBNI1NW363602095	F10754	OWENGARR R AT GLASDRUMMAN BR	Classify
GBNI1NW363604039	F10697	BALLINAMALLARD R AT BALLINAPASTE BR	Classify
GBNI1NW363604051	F10707	CLEEN R AT KILTERMON BR	Average with F10722
GBNI1NW363604051	F10722	CLEEN R AT CORRALONGFORD	Average with F10707
GBNI1NW363604052	F11316	COLEBROOKE R AT	Classify chem

		SCARFORD BR	
GBNI1NW363604053	F10717	COLEBROOKE R AT POLLBOY BR	Classify
GBNI1NW363604054	F10735	SWANLINBAR R AT THOMPSONS BR	Average with F10753
GBNI1NW363604054	F10753	MOHER R AT CORRY BR	Average with F10735
GBNI1NW363604055	F10688	KESH R AT KESH BR	Classify
GBNI1NW363604056	F10696	TRILLICK TRIBUTARY AT BOHEE	Average with F10704
GBNI1NW363604056	F10704	TRILLICK TRIBUTARY AT CARRAN BR	Average with F10696
GBNI1NW363604057	F10702	BALLYCASSIDY R AT TULLYCLEA BR	Average with F10703
GBNI1NW363604057	F10703	BALLYCASSIDY R AT NECARNE	Average with F10702
GBNI1NW363604058	F10748	SILLEES R AT CARR BR	Classify
GBNI1NW363604059	F10736	ARNEY R AT DRUMANE BR	Average with F10737
GBNI1NW363604059	F10737	ARNEY R AT BROCKAGH BR	Average with F10736
GBNI1NW363604064	F10679	TERMON R AT TULLYHOMMON	Average with F11318
GBNI1NW363604064	F11318	TERMON R AT LURGANBOY BRIDGE	Average with F10679
GBNI1NW363604066	F10725	KILLYLACKY R ABOVE ROSE LOUGH	Average with others
GBNI1NW363604066	F10732	LACKEY R AT CARRA OLD BR	Average with others
GBNI1NW363604066	F10923	KILLYLACKY RIVER AT LACKY BRIDGE	Average with others
GBNI1NW363604067	F10902	STARRAGHEN TRIBUTARY AT STARRAGHEN BRIDGE	Classify
GBNI1NW363604072	F10663	GARVARY R AT LARKHILL	Classify
GBNI1NW363604078	36W030700	WATERFOOT R AT LETTER BR	xb site - include in final classification
GBNI1NW363604078	F10665	WATERFOOT R AT LETTER BR	Classify
GBNI1NW363604079	36F010010	FINN (MONAGHAN) RIVER AT BR AT MILL NW OF KILCREEN	xb site - include in final classification
GBNI1NW363604079	F10723	CROCKADA R AT DERRYVOLAN	Average all sites
GBNI1NW363604079	F10724	LOUGH TAWY R AT CRINASH	Average all sites
GBNI1NW363604079	F10727	BUNLOUGHER BURN AT BRUSCARNAGH	Average all sites
GBNI1NW363604079	F10731	FINN (ERNE) R AT ROSSLEA	Average all sites. F10731 in downstream rwb
GBNI1NW363604080	36F011000	FINN (ERNE) R AT WATTLE BR	xb site - include in final classification
GBNI1NW363604080	F10728	FINN (ERNE) R AT WATTLE BR	Classify
GBNI1NW363604081	36E011500	ERNE R AT 2.5KM D/S BELTURBET	Classify using IE site
GBNI1NW363604083	F10734	WOODFORD R AT AGHALANE	Classify chem
GBNI1NW363604084	36F010080	FINN (MONAGHAN) R E OF AGHAFIN LOUGH	xb site - include in final classification
GBNI1NW363604084	36F010100	FINN (MONAGHAN) R AT STONE BR	xb site - include in final classification
GBNI1NW363604084	F10731	FINN (ERNE) R AT ROSSLEA	Classify

GBNI1NW363604085	36E011550	ERNE RIVER AT ROSSCOR	xb site - include in final classification
GBNI1NW363604085	F10661	ERNE R AT ROSSCOR VIADUCT	Classify
GBNI1NW393901002	39S010050	SKEOGE RIVER AT BRIDGE S.W. OF MAGHERYARD	xb site - include in final classification
GBNI1NW393901002	39S010300	SKEOGE RIVER AT BR U/S OF LOUGH SWILLY	xb site - include in final classification
GBNI1NW393901002	F10763	SKEOGE RIVER AT ELAGH ROAD	Classify

9. Annex 3 - Method statement for Rivers Fish Classification tool

River Fish- FCS2 Northern Ireland Method Statement

Fisheries classification scheme 2 (FCS2) – Northern Ireland

Introduction

This classification method enables the assessment of fish in rivers according to the requirements of the Water Framework Directive (WFD). It encompasses fish abundance, taxonomic composition and age structure. Previously WFD river fish classification was assessed by the expert judgement of the fisheries experts undertaking the monitoring. This version of the FCS2 model has been developed for use in Ecoregion 17 (the whole island of Ireland) and hereinafter will be referred to as FCS2 Ireland.

Method summary

The FCS2 Ireland classification tool relies on predictive statistical models which are based on the Environment Agency Fisheries Classification Scheme 2 (FCS2) method. The models have been adapted specifically for Irish fish species and sites.

The tool relates the number of salmon, trout and a range of other species caught in a survey to the predicted abundance and prevalence of the species at the specific site. Salmon and trout are separated into age groups (i.e. fry (0+, or young-of the year individuals) and parr (1 year and older individuals)) and comparisons are therefore made for four groups in total.

The expected catch for each group is modelled based on the survey area, a range of site-specific predictive variables and a parameter that describes the shape of the statistical distribution. The EQR is equal to the probability of observing the same or greater number of fish at the site under reference conditions. EQR values are calculated hierarchically for each species and age group for the whole fish survey, then by site (where multiple surveys exist for single site), and finally by water body. A classification result is then provided, based on boundary values derived from EQR values for idealised fish populations confirming with the normative definitions provided by the Water Framework Directive.

The FCS2 model is complex and runs on the freely available R statistical software. It also requires a suite of data files that are used to 'fit' the model, for example, data files for each individual fish species. However, given that, amongst other things some of the input information to this first version of the model is incomplete (e.g. data on barriers for NI), in Northern Ireland we retain the option of using an expert judgement over-ride to the model should fishery experts consider its predictions to be unrealistic.

Environmental pressures to which the method is sensitive

Environmental pressures are intrinsically incorporated within the final EQR outputs from FCS2, because the model uses pressure variables to compare observed results with expected results under reference condition. These are variables which are expected to be related to human activity, and which also have a significant effect on fish populations in the model fitting process. For the final model fit, the following pressure variables were selected: *Artificial impassable barriers where identified (ROI only)*, *Ammonium*, *SRP/MRP*, and *pH*. The response of this assessment method to environmental pressures has also been tested by comparing EQR output with pressure data held in a common database. This showed that the tool responds as expected to changes in water quality and physical habitat.

Geographic application

This assessment method is appropriate for rivers which occur in Northern Ireland and which are assessed in accordance with the Water Framework Directive, although, as stated above, expert judgement may still be required.

Intercalibration

This is a process whereby all European Member States were required to compare WFD class boundary values for each biological quality element (e.g. fish) to ensure similar levels were set across all countries. Intercalibration focussed on the EQRs which define the class boundaries between High and Good and Good and Moderate, the H/G and G/M class boundaries respectively. For this reason the method tends to refer to class *boundary* values rather than EQRs which define a particular class.

FCS2 was intercalibrated in 2013 and is included in the Commission decision of 20th September 2013.[29]

Data collection

Fish survey method

FCS2 relies on an accurate estimate of the number of fish at a survey site, which should be determined by electric fishing. Electric fishing methods should conform to the CEN standard BS EN 14011:2003 Water Quality - Guidance standard on sampling fish with electricity.

The model on which the Irish tool is based was built using data from wadeable and larger river sites (latter in ROI), and included boat-based electric fishing data.

[29] COMMISSION DECISION of 20 September 2013 establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC

FCS2 (Ireland) requires data from area-delimited surveys, because the model assesses observed catches against predicted catches based on numbers per unit area. Time-delimited data cannot therefore be used. Data from single-run, area-delimited sites can be used, although multiple-run data will reduce the level of uncertainty in the model, as catch efficiency can be calculated rather than incorporated as an unknown variable. Where multiple-run data are used, catches must be separated by run.

Sample sites must be representative of the conditions in the water body being classified. A minimum of one site per water body is required for classification.

Procedure for calculating EQRs

The EQRs, along with the corresponding WFD classes are as follows:

EQR Range	Classification
0<= EQR <=0.007	Bad
0.007< EQR <=0.12	Poor
0.12 < EQR <= 0.54	Moderate
0.54 < EQR <= 0.845	Good
0.845 < EQR <= 1.0	High

Confidence in class is supplied by the model assessed from probability density functions of the combined EQR variables and expressed as the probability of each WFD class using the class boundaries above.

It is not possible to provide the detailed model at this stage. This is largely due to the fact that, although it has been intercalibrated, work remains ongoing on the application and interpretation of the model at individual river level. The model is not considered complete and will require updating once further data is available.

References

River Fish Classification Tool: Science Work Phase 2 Report Final, Sniffer Report for Project WFD68c, 2011[30]

[30] http://www.sniffer.org.uk/files/2013/4183/8004/Fisheries_Classification_Phase2v6.0.pdf

10. Annex 4 - Method statement for Lakes Fish Classification tool

Lake Fish - FiL2 Northern Ireland Method Statement

Fish in Lakes 2 (FiL2) – Northern Ireland

Introduction

This classification method enables the assessment of fish in lakes according to the requirements of the Water Framework Directive (WFD). It encompasses fish abundance, taxonomic composition and age structure. Previously in Northern Ireland, WFD lake fish classification was assessed by an earlier version of FiL2 (FiL1) and/or the expert judgement of the fisheries experts undertaking the monitoring. FiL2 has been developed for use in Ecoregion 17 (the whole island of Ireland).

Method summary

FiL2 has been developed from the original Fish in Lakes tool (FiL1) which was developed by the NS Share project[31] in 2005 by the Department of Agriculture for Northern Ireland Science Service (Now the Agri-Food and Bio-Sciences Institute for Northern Ireland, AFBI) and the Central Fisheries Board from the Republic of Ireland (Now part of Inland Fisheries Ireland, IFI) . However, in order to make the tool WFD-compliant it was revised in 2010 to produce FiL2.

FiL2 follows a novel multimetric predictive approach, assigning ecological status to a lake using two independent methods. FiL2 qualitatively defines a lake's ecological status based on fish metrics using discriminant classification rules and, using a generalized linear model, quantitatively derives an Ecological Quality Ratio (EQR, 0 < EQR < 1), along with associated confidence intervals.

FiL2 differs from FiL1 in that it does not require pre-classification into dominant fish species. It has an internal secondary data analysis to create an EQR model which enables confidence of classification estimation and makes it WFD compliant. The scoring system is driven towards lower scores by high numbers of tolerant fish species and poorer water quality.

FiL2 is unique when compared to classification tools across Europe in that it provides two separate methods for assigning ecological status to fish communities in Irish lakes. One major advantage of having these multiple approaches to classifying a lake is the ability to cross-check and highlight potential misclassification. It is recommended that three elements are derived for each lake: a water quality status class based on total phosphorus and chlorophyll a, a qualitative ecological status class based on the discriminant classification rules and a quantitative EQR value

[31] **N**orth **S**outh **Sh**ared Aquatic **Re**source – an EU Interreg IV sponsored project to develop WFD classification tools etc. which ran from 2004-2008

with associated confidence intervals. Applying expert opinion, using specific knowledge of each lake in a local context (e.g. identifying if all type-specific disturbance sensitive species are present in a water body and if the age structure of the dominant fish species is showing any signs of anthropogenic disturbance) is also recommended and will further validate whether or not the models are continuing to perform as expected.

Environmental pressures to which the method is sensitive

FiI2 is based on statistical relationships between a single stressor gradient (nutrient levels) and fish populations over a range of lakes. The scoring system is driven toward lower scores by high numbers and biomass of tolerant fish species.

Total phosphorus (mean) and chlorophyll a (max) are used as the pressure variables and indicators of water quality (eutrophication). A worst case scenario approach was used to ascertain water quality status when the trophic status category derived from mean total phosphorus and max chlorophyll a did not correspond.

Geographic application

This assessment method is appropriate for dimictic clear water and dimictic humic lakes which occur in Ireland and which are assessed in accordance with the Water Framework Directive[32].

Intercalibration

This is a process whereby all European Member States were required to compare WFD class boundary values for each biological quality element (e.g. fish) to ensure similar levels were set across all countries. Once a classification method has been intercalibrated, the method should be adhered to by Member States for the purposes of WFD assessment and reporting.

Intercalibration focussed on the EQRs which define the class boundaries between High and Good and Good and Moderate, the H/G and G/M class boundaries respectively. For this reason the method tends to refer to class *boundary* values rather than EQRs which define a particular class.

FiL2 was successfully intercalibrated in 2013 and is included in the Commission decision of 20th September 2013 (referenced above).

Data collection

Fish data is collected from lake netting surveys to CEN standard methodologies.

Minimum data requirements

This is detailed in the following paper:

[32] COMMISSION DECISION of 20 September 2013 establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC

Fiona L. Kelly, Andrew J. Harrison, Michelle Allen, Lynda Connor, Robert Rosell, *Development and application of an ecological classification tool for fish in lakes in Ireland*, Ecological Indicators 18 (2012) 608–619

Procedure for calculating EQRs

FiL2 is managed and operated by the Agri Food and Biosciences Institute (AFBI) on behalf of NIEA in Northern Ireland. It is not possible to provide the model spreadsheets at this stage. This is largely due to the fact that, although it has been intercalibrated, work remains ongoing on the application and interpretation of the model at individual lake level. A full description of FiL2 can be found in the paper:

Fiona L. Kelly, Andrew J. Harrison, Michelle Allen, Lynda Connor, Robert Rosell, *Development and application of an ecological classification tool for fish in lakes in Ireland*, Ecological Indicators 18 (2012) 608–619