Rationale for Water Framework Directive (WFD) Freshwater Classification

RIVER AND LAKES CLASSIFICATIONS

Introduction

This text describes how WFD Freshwater Classification has been established. It describes the rationale behind classification, the quality elements monitored and how they have been combined and the monitoring networks. The previously used General Quality Assessment systems are not discussed, full details can be found on our website[1]. This report also includes the designation and classification of Heavily Modified Water Bodies, the confidence in class of freshwater classifications and identifies gaps in initial classification that may be filled in the forthcoming year.

WFD classification is substantially different from previous freshwater classification systems in a number of ways:

- The assessment is now based around water bodies rather than river reaches,
- The quality elements are combined to produce an overall classification,
- The number of quality elements considered is considerably larger than used previously,

The United Kingdom Technical Advisory Group (UKTAG) has produced guidance on surface water classification: *Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive*[2] (hereafter referred to 'Classification Guidance) and this has been followed in Northern Ireland. The methodology for the classification of cross-border water bodies has been agreed by the North/South Rivers and Lakes group which is a sub-group of North/South Technical Advisory Group.

Classification

Overall surface water status is assessed according to the following schematic (Classification Guidance, Paragraph 1.3, page 5):

[1] www.ni-environment.gov.uk
[2] www.wfduk.org

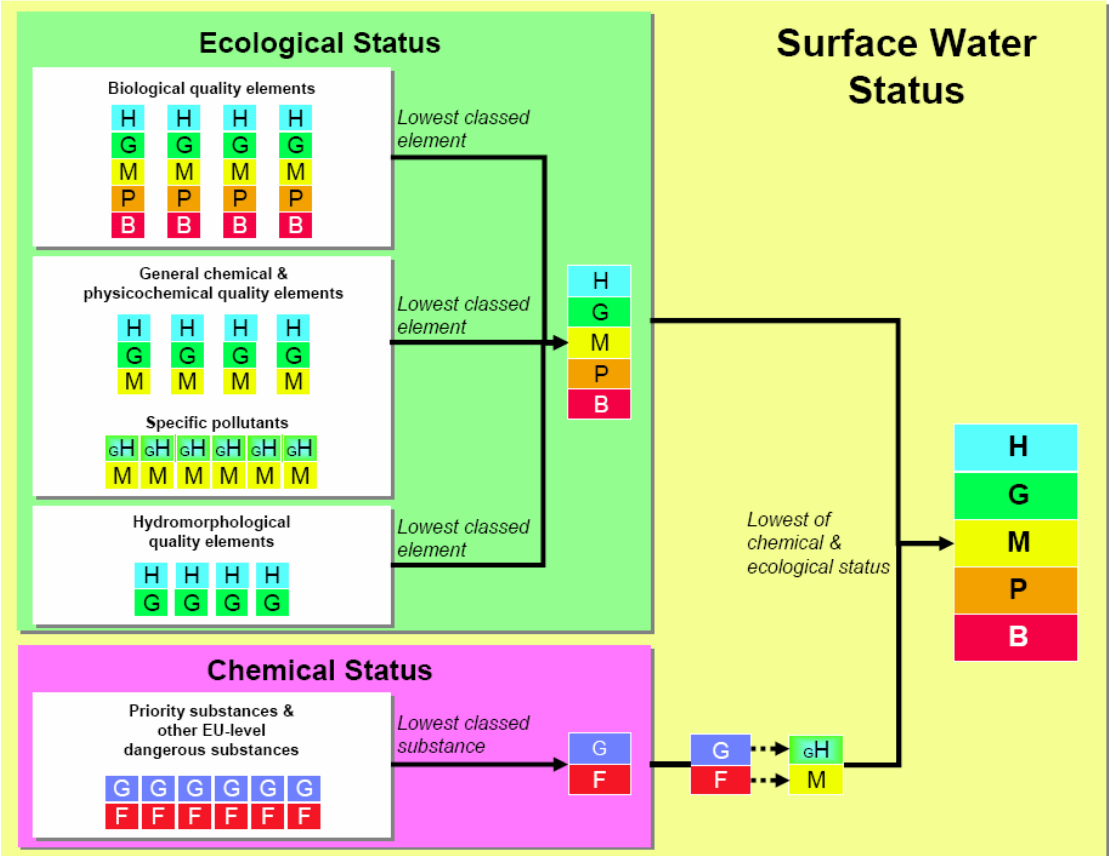


Figure 1 – schematic representation of how results for different quality elements are combined to classify ecological status, chemical status and surface water status.
Key: “H” means high; “G” means good; “gH” means good or better and is normally treated as high for calculating, as relevant, ecological 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/physicochemical and specific pollutants and hydromorphological quality elements. This is then combined with chemical status with again the lowest class producing the overall surface water status. This is known as the one-out-all-out process and, whilst it is still open to debate as to whether it really does give the best indication of overall water quality, it is the process that has been used to date.

Details of the quality elements and how they have been assessed are described separately for rivers and lakes.

Heavily Modified Water Bodies

Designation

A Heavily Modified Water Body (HWMB) is defined by the Directive (Article 2, paragraph 9) as 'a body of surface water which as a result of physical alterations by human activity is substantially changed in character'. An initial designation was undertaken for the Article V report in 2004 and was based around the prevalence of identifiable pressures such as locks, large weirs and straightened sections of rivers and included the examination of land use. This initial designation was refined during 2005 utilising further information such as aerial photography, hydrology, a wider range of water quality data and River Habitat Survey fieldwork.

To finalise the process to ensure that as much information as possible had been considered, a further screening exercise was undertaken. This process, which was undertaken by the NS Share[3] project, utilised the Scottish Environment Protection Agency (SEPA) Rapid Designation Technique[4]. The SEPA methodology covers three areas for freshwaters that should be considered when determining whether a water body should be designated heavily modified, namely:

- Water storage – e.g. impoundments,
- Urban, residential and commercial land use,
- The wider environment.

The output of this process either confirmed or rejected status as HWMB or, in a small number of cases, required further study. An expert stakeholder workshop reviewed the findings of the report and, with some amendments and further fieldwork produced the final lists, which are presented in Annex 1 (note that there may be some minor revisions to this list). HWMB designations will be kept under review, and it is considered that, for example, in some cases HWMB water bodies may require to be split. This will be considered before the start of the next River Basin Plan period in 2010. It is worth noting that in Northern Ireland no water bodies have been designated as artificial water bodies. Some individual portions of water bodies have been highlighted as artificial but the designation process has not yet been extended to consider overall water bodies.

Classification

The classification system for HWMBs is distinct from the standard WFD classification in that it is based around ecological potential rather than ecological classification. This is due to the fact that, because of the modification(s), the

[3] **N**orth **S**outh **Share**d **A**quatic **R**esource – an EU/NI/ROI WFD funded research programme
[4] *Application of the SEPA Rapid Designation Technique on the provisional Heavily Modified Water Bodies (pHWMBs) in Northern Ireland,* NS Share report, 2007

HWMB would not be expected to achieve good ecological status for at least some of the quality elements because of the modifications it contains. One of the simplest examples of this is where migratory fish would not be expected to be present upstream of a barrier such as a dam where a suitable fish pass was not present. Essentially the science behind the more subtle impacts that modifications may have on biological elements is not well understood and will possibly be the subject of supporting research over the next few years. A further difficulty is that monitoring stations in HWMBs are not normally near the modification and so are unlikely, but not proven, to be able to reflect any potential impact of the modification.

For these reasons, the UK decided that initial classification of HWMBs should follow an alternative mitigation measure approach which is, amongst other things, based around whether mitigation measures are/are not in place to counteract potential effects of modifications and whether the potential mitigation measures themselves might cause more harm than good. A full description of HWMB classification ant the mitigation measure approach is given in the UKTAG document '*Guidance on the Classification of Ecological Potential for heavily Modified Water Bodies and Artificial Water Bodies'*[5].

Draft HWMB classification was undertaken by a stakeholder workshop comprising government agencies and NIEA staff and consideration of monitoring data and is reported in more detail in a separate paper. This process is not quite complete but will be for the final plan.

Confidence in class

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. However, at this stage, it is not 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 proposed system for the draft RBP is a simplistic alternative based on the differences between classification classes of individual biological and chemical parameters. 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. No detailed analysis is currently available to be more specific than this. 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

[5] www.wfduk.org

confidence of the two pressures. However, it is also necessary to give some weighting to the number of quality elements (QEs) that have been combined to produce classification for each pressure. The rules are set out in the table below:

Number of QEs	QEs and class differences	Confidence
1	n/a	Low
2	QEs the same class	High
2	QEs cover two classes	Medium
2	QEs cover more than two classes	Low
3 or more	QEs the same or cover two classes	High
3 or more	QEs cover three classes	Medium
3 or more	QEs cover four or five classes	Low

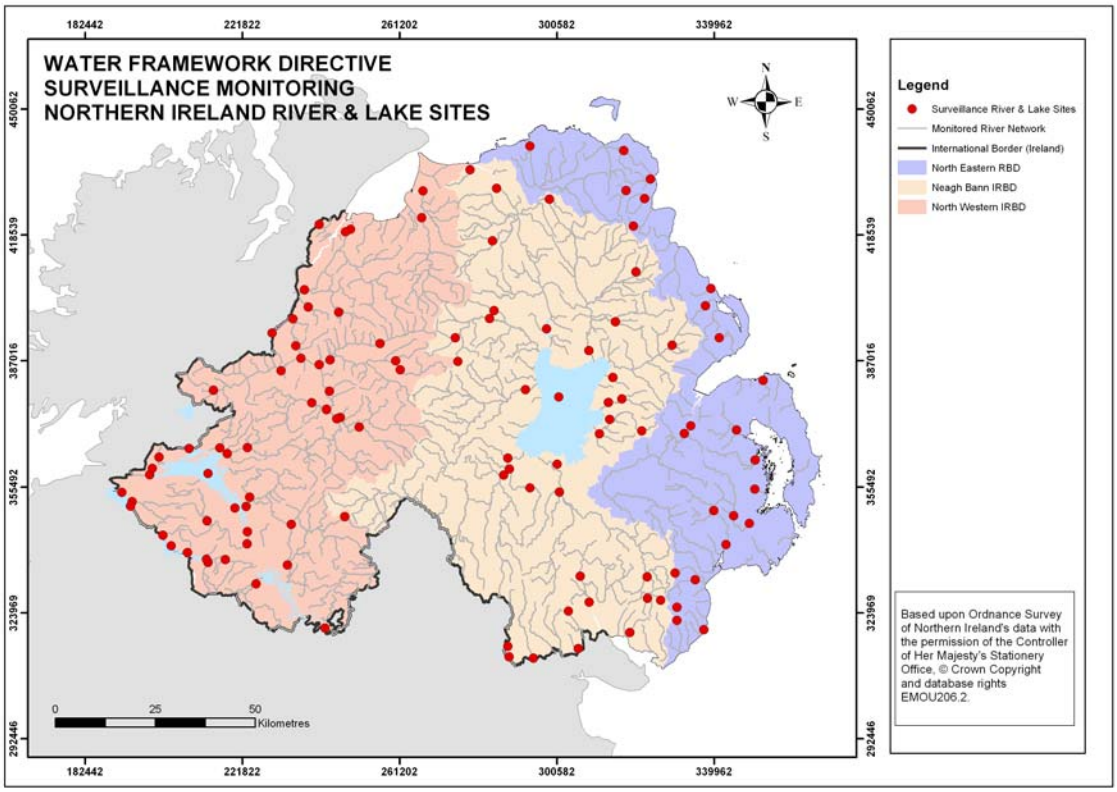
For eutrophication pressures on rivers, macrophytes and soluble reactive phosphorus (SRP) have been considered. Diatoms have been left out as initial classification is based on a limited dataset and therefore could only be considered low confidence. For eutrophication pressures on lakes, macrophytes, diatoms and total phosphorus have been included.

For organic pressures in rivers, fish, invertebrates, Dissolved Oxygen, ammonia and BOD have been considered. For organic pressures in lakes, fish, invertebrates and Dissolved Oxygen have been included. The lower of the confidence classes for either of the impacts is then assigned as the overall confidence in class for a particular water body.

Monitoring networks

The river and lakes monitoring networks have been largely unaltered as yet for WFD purposes other than a few extra stations opened. Normally, a few stations are opened or closed each year because of local issues and health and safety etc. WFD monitoring requirements are detailed in the Common Implementation Strategy Document '*Guidance on Monitoring for the Water Framework Directive Final Version 23 January 2003'*[6]. WFD monitoring networks were reported to the Commission as required under Article 8 in 2007 and documents giving details of the Surveillance, Operational and Investigative networks that were provided in support of the submission are presented in Annex 2. The map below shows the distribution of the rivers and lakes Surveillance Monitoring (SM) stations.

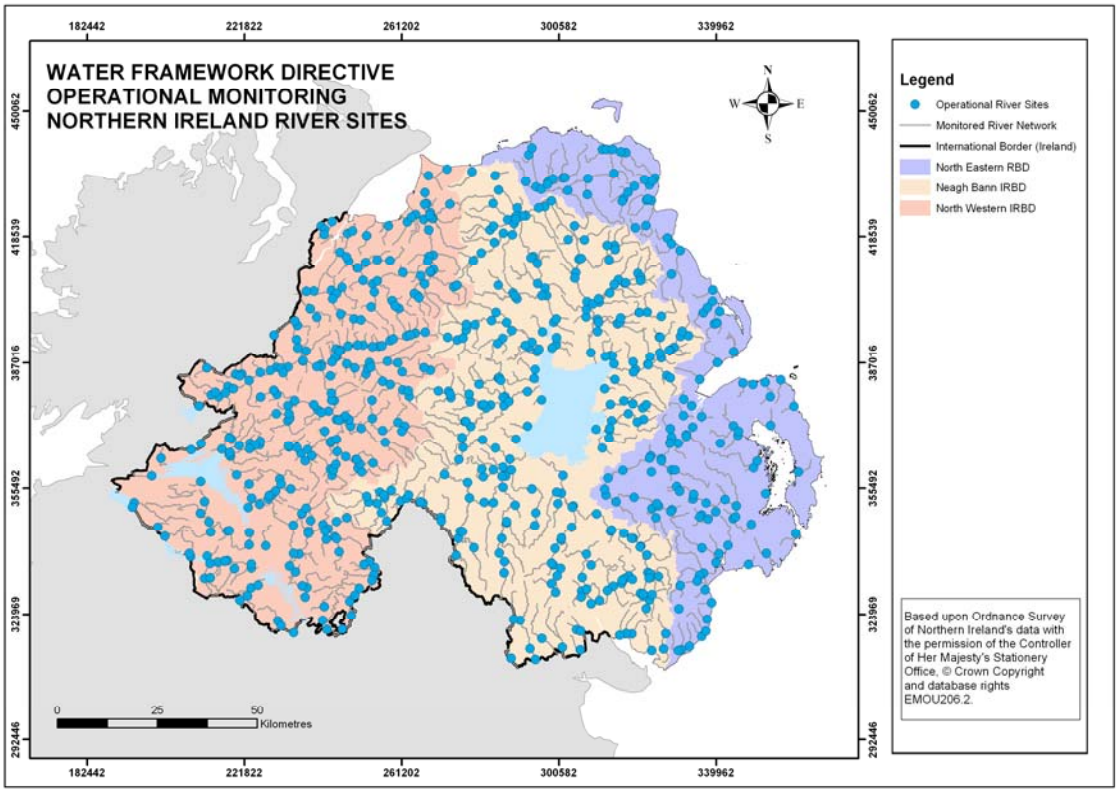
[6] http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos7smonitoring/_EN_1.0_&a=d



Map 1 – Locations of rivers and lakes Surveillance Monitoring (SM) stations

As required by the Directive, the complete range of quality elements are monitored for at SM stations (note that for lakes, some quality elements such as priority and hazardous substances are sampled from the lakes outflows and others are sampled from the lakes edge such as littoral invertebrates). Overall, this has lead to a significant increase in the range of quality elements monitored. Specific details for rivers and lakes are considered separately later in this report.

For rivers, the remainder of the network is designated as Operational Monitoring (OM) and used for classification and pressure assessment purposes, albeit with a smaller range of quality elements than for the SM stations. The map below shows the distribution of the rivers OM stations.



Map 2 – Locations of rivers Operational Monitoring stations

RIVERS

Quality Elements and classification

The quality elements monitored for rivers are listed below along with how they have been classified, including the years of data that have been used.

Ecological Status

Biological quality elements

Elements monitored

All of the biological elements, with the exception of fish were sampled by NIEA staff. Invertebrates and macrophytes were analysed in-house but the diatoms were analysed under contract. Fish were sampled and identified for NIEA under contract by Quercus, a business subsidiary of Queen's University.

Below is a summary of the coverage of biological elements for initial classification.

Quality Element	SM stations	OM Stations
Macro-invertebrates	Yes	Yes
Macrophytes	In most catchments	In most catchments
Phytobenthos (Diatoms)	North West and Neagh-Bann IRBDs	North West andNeagh Bann IRBDs
Fish	Restricted to small wadeable streams	Restricted to a number of small wadeable streams

Classification

Classification tools are progressively being developed under the auspices of UKTAG for all biological elements.

Macro-invertebrates

The General Quality assessment system utilised RIVPACs (**R**iver **I**n**V**ertebrate **P**redcition **A**nd **C**la**S**sification) software for classification. This has been further developed to be WFD compliant and is know known as RICT (**R**ivers **I**nvertebrate **C**lassification **T**ool) which includes measures of invertebrate abundance. River invertebrates are normally sampled in Spring and Autumn in larger rivers with smaller ones done in Spring only. Classification has been assessed from the average of three years data from 2005-2007.

Macrophytes

Previously the 3-band Mean Trophic Ranking system was used for Urban Waste Water Treatment Directive[7] Sensitive Area reviews and other eutrophic water quality assessments. The WFD tool is known as Leafpacs which considers species sensitivity to pollution and the actual abundance of plants represented in a waterbody which are collated into a classification system. Macrophyte surveys are undertaken once between May and September and not normally repeated within three years. For stations that have been sampled more than once since 2002 the most recent data has been used for classification.

Diatoms

The old 3-band Trophic Diatom Assessment has been replaced by DARLEQ (**D**iatoms **A**ssessment for **R**ivers and **L**akes **E**cological **Q**uality) which takes species presence and their relative abundance to produce a classification, weighted by degradation indicator species. As stated previously, only a limited

[7] Concerning urban waster water treatment – 91/271/EEC

dataset has been available for initial classification. Diatom monitoring is relatively new with most sites having been sampled once, or twice in a few cases. The developing WFD classification requires a minimum of four and ideally six replicate samples over several years and this is why initial classification is considered low confidence and not included in overall status assessment. Diatom sampling frequency has been increased to reflect these additional requirements.

Fish

No classification tool is yet available for river fish in Ecoregion 17 (island of Ireland) or Scotland. During the latter part of 2008 it is proposed that work will be undertaken to adapt the Fisheries Classification Scheme Version 2 used by the England and Wales Environment Agency for Scottish and Irish conditions. Initial classification, however, has utilised expert judgement by the contractor who undertook the fish monitoring.

Below is a summary of classification tools and the years of data used for classification:

Quality Element	Classification Tool	Years of data used
Macro-invertebrates	RICT	2005-2007
Macrophytes	LeafPacs	2002-2008
Phytobenthos (Diatoms)	DARLEQ	2005-2006
Fish	None - expert judgement	2005-2007

General chemical and physiochemical quality elements

Elements monitored

General chemical monitoring includes more elements than are actually used for WFD classification. It is undertaken at SM and OM stations monthly. All general chemical monitoring was carried out by NIEA staff with analyses at the NIEA laboratories in Lisburn. The individual determinands are as follows:

Determinand	Used for WFD Compliance?
Ammonia	Yes as a specific pollutant – see next section
BOD	No (see later)
Dissolved Oxygen	No
Dissolved Oxygen % Saturation	Yes
Soluble Reactive Phosphorus (SRP)	Yes

Nitrate	No
Nitrite	No
pH	Yes
Suspended Solids	No
Temperature	No (see below)
Alkalinity	No but used for assessing typology for standards
Conductivity	No
Hardness	No but required for Zinc and Copper assessments

Classification

The general chemical standards for classification are presented in two UKTAG documents:

UK Environmental Standards and Conditions (Phase 1) Final Report April 2008, and

UK Environmental Standards and Conditions (Phase 2) Final March 2008.[8]

These documents describe the process of how the standards were derived, the standards themselves and how compliance with them is assessed. One significant difference from the previous GQA classification system is that BOD is not included, this is explained in the Phase 1 report, page 24: '…the standard for dissolved oxygen is used for assessing and reporting compliance of rivers, and that the standard for BOD is used for deciding action to meet the standard for dissolved oxygen in the river. This is because the levels of BOD can be misleading in clean rivers, and because the link between BOD and dissolved oxygen is a complex and uncertain issue if dealt with on a site-by-site basis.' BOD will therefore be assessed but not included in overall classification.

For temperature, the *Environmental Standards and Conditions Phase 2* report states on page 25 that 'the proposed standards…are intended to supersede the standards in the Directives on Freshwater Fish…when these directives are repealed in 2013.' and 'The UKTAG proposes that these standards are used in the classification of rivers receiving thermal discharges and in calculating the action needed to achieve a target class for rivers.' Given the above and with very few thermal discharges to freshwaters in Northern Ireland, temperature classification has been assessed but not used for overall physico-chemical status.

The importance of phosphorus is recognised by the inclusion SRP in WFD classification. Increasing nutrient concentrations are capable of changing the biomass and composition of biological communities with the most obvious primary impact being enhanced plant and algal production. Secondary impacts

[8] www.wfduk.org

can include reduced dissolved oxygen levels caused by the overnight respiration of macrophytes which can lead to problems for fish. Elevated nutrient levels can also cause toxic blooms of blue-green algae leading to potential problems for livestock and other animals as well as overgrowths of other species.

The other determinands monitored but not included in WFD classification are used for a variety of purposes such as reporting under other EU Directives and general water quality issues. They will also be important is assessing the impact of Programmes of Measures.

WFD classification utilised data over the three year period 2005-2007, similar to the three year assessment periods used by GQA. The percentiles used to classify the Dissolved Oxygen and BOD class boundaries are the same as used previously for GQA.

Specific pollutants

Elements monitored

Member States have been required to identify 'specific pollutants' (i.e. those pollutants being discharged in significant quantities) from the Directive's general list of the main types of pollutants and these are listed in page 9 paragraph 1.3.3(b) of the Classification Guidance.

UKTAG has made recommendations on an initial list of specific pollutants comprising substances known to be being discharged in significant quantities into waters within the UK and on environmental quality standards for these substances. The list of specific pollutants is reproduced in the table below. Further substances may be identified in the future. Substances may also be removed from the list if they cease to be discharged in significant quantities.

Initial list of Specific Pollutants	
1.2,4 D (2,4,Dichlorophenoxyacetic acid)	11. Ammonia
2. Chromium (vi)	12. Chlorine
3. Chromium (iii)	13. Copper
4. Cypermethrin	14. Cyanide
5. Diazinon	15. Permethrin
6. Dimethoate	16. Iron
7. Linuron	17. Zinc
8. Mecoprop	18. 2,4-dichlorophenol
9. Phenol	19. Arsenic
10. Toluene	

Classification

The environmental quality standards for specific pollutants listed 1 to 11 above have been derived or updated in line with the procedure specified by the Directive, including peer review and public consultation. For the pollutants listed in points 12 to 19, UKTAG recommends that the quality standards previously established under the Dangerous Substances Directive[9] should apply. This is because there are insufficient data available at present to recommend revision of these standards.

For good ecological status, the environmental quality standards established for specific pollutants must not be exceeded. With the exception of ammonia, environmental quality standards for the specific pollutants have been set in such a way that, where the standards are met, no adverse effects on aquatic plants and animals should occur. Consequently, UKTAG recommends that in a water body complying with the standards for these specific pollutants, the water quality - as far as these specific pollutants are concerned - is capable of supporting the achievement of high or good ecological status. Ammonia has been included as a specific pollutant because of its toxicity to fish

The initial proposed standards for specific pollutants are presented in the UKTAG report *'Proposals for Environmental Quality Standards for Annex VIII Substances - Final Draft provided to administrations to brief Ministers'*[10] of January 2008. With the exception of ammonia, the standards for specific pollutants are expressed as a long term (annual mean) and as a short-term (maximum admissible concentration). UKTAG recommend that the long-term standards are used for classification and that failure of the maximum admissible concentration (MAC) is used to trigger additional investigation which, in turn, may lead to further monitoring and, where appropriate, action aimed at preventing deterioration of status. It was decided locally that if a substance passes its mean but fails its MAC that it is classified as good.

For initial classification, ammonia was assessed using data from 2005-2007 as per the general chemical elements from surveillance and operational monitoring stations and the more detailed 5-band classification produced with the percentiles used for class boundaries the same as previously for GQA. Zinc and copper have been assessed from around 460 Freshwater Fish Directive[11] monitoring stations for the same time period. Assessment for the other specific pollutants (with the exception of Chromium, Cypermethrin, Chlorine, Cyanide, and Permethrin) was initially done using 2004-2006 data at 11 stations at the

[9] Pollution caused by certain dangerous substances discharged into the aquatic environment of the Community – 76/464/EEC
[10] www.wfduk.org
[11] The quality of fresh waters needing protection or improvement in order to support fish life – 78/659/EEC

downstream limits of major rivers (stations that have been monitored under the Dangerous Substances Directive and OSPAR convention[12]).

In Northern Ireland, like other regions of the UK and Ireland, a specific list of both specific pollutants and priority substances (see later) has been drawn up by an expert group and consists of those substances that available evidence indicates should be monitored at Surveillance Monitoring stations. Taking into account available resources and, in particular, the amount of analytical methodology development required, a 4-year monitoring programme at SM stations was introduced in April 2007 with the aim of monitoring for the complete list by March 2011. The complete list of chemicals and what has been included for the first year is presented in Annex 2. From this, only data for phenol have become available from year 1 monitoring for initial classification.

Specific pollutant monitoring has been done by NIEA staff with analyses at NIEA laboratories in Lisburn and under contract with the Environment Agency for England and Wales.

Hydromorphology

River habitat modification due to management and engineering practices can potentially have major impacts on river ecology. This is a new and developing science and the interrelationships are currently poorly understood but should be investigated through priority research and development over the coming years.

Elements monitored and classification

Essentially, two elements are considered; the hydromorphological element which includes description of river and riparian structure, river continuity and substrate structure and hydrology which includes the quantity and dynamics of water flow.

Within the UK and Ireland, three systems have been used for assessing river hydromorphological quality. These are the River Habitat Survey (RHS) developed by the Environment Agency for England and Wales, Morphological Impact Assessment MIMAS (Scottish Environmental Protection Agency) and the Rapid Assessment Technique (RAT) from NS Share research for the island of Ireland. As RAT only became fully operational in 2008, initial hydromorphological classification has been done using a combination of River Habitat Survey studies done from 2005-2007 and data from NS Share Further Characterisation work which assessed specific risks from intensive land use and channelisation.

The Water Framework Directive requires flow and water level to be protected for its own sake at high status sites as a protection for ecological functioning. A

[12] The **1992 OSPAR Convention** is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic.

number of Sniffer[13] sponsored research studies which concluded in 2007, set out to establish effective water resource standards to protect water body high status in light of abstraction and flow regulation pressures. As a result of these studies, standards have been proposed that define the required protection for flow and water levels. Application of the appropriate water body, type specific water resource standards has allowed the attribution of an 'ecological classification' to all abstraction and flow regulation impacted water bodies. This effectively identifies those river water bodies where the hydrological and hence ecological status may be at risk due to net abstraction from both surface water and groundwater within the surface water catchment. Further information on the water resource standards themselves and how they were derived can be found in the two UKTAG Environmental Standards and Conditions documents referred to earlier.

As for other elements, the lowest class of the hydromorphology and the hydrology has been used to classify overall hydromorphological functioning. Apart from the NS Share Further Characterisation work all classification work has been done by NIEA staff.

Chemical Status

Priority substances and other EU-level dangerous substances

Elements monitored

Chemical status is perhaps confusingly named, given that many other chemicals have already been considered. Chemical status is assessed from what are known as priority substances, defined by the Directive as *'those which present a significant risk to or via the aquatic environment'*. An initial list of 33 substances and standards has been drawn up at a European level and are to be presented in a forthcoming daughter Directive.

Classification

For initial classification, as for specific pollutants (except ammonia), initial assessments were made from 2004-2006 data from 11 stations at downstream locations on major rivers. The substances considered were as follows:

Priority substances	
Mercury (total)	Pentachlorophenol
Cadmium (total)	Chloroform
Lead (sol)	Carbon Tetrachloride
Lead (total)	Trifluralin

[13] **S**cotland and **N**orthern **I**reland **F**orum **F**or **E**nvironmental **R**esearch – a co-funded research organisation

Nickel (sol)	Endosulfan
PCBs (28, 52, 101, 118, 138, 153, 180)	Hexachlorobutadiene
Gamma-HCH	1,2,3 Trichlorobenzene
Hexachlorobenzene	1,2,4 Trichlorobenzene
Aldrin	1,3,5 Trichlorobenzene
Isodrin	1,2 Dichloroethane
Dieldrin	Atrazine
Endrin	Simazine
Para-para-DDT	Chlorvenfinvos
Naphthalene	Benzene
Tri-Butyl Tin	

At this stage no data have become available for classification from year 1 of the 4-year priority substances monitoring programme at SM stations (see Annex 2).

Priority Substance monitoring has been undertaken by NIEA staff with analyses at NIEA laboratories in Lisburn and under contract with the Environment Agency for England and Wales.

How river bodies have been classified

One of the major differences between WFD classification and previous systems is that it is based on water bodies, rather than delineated river reaches. Individual river water bodies can contain more than one river and there are a range of possibilities for the number(s) of monitoring stations they contain. The Classification Guidance Section 5 deals with spatial issues with classification, including the impact of tributaries.

Typical modes of river water body classification would be summarised as follows:

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) Left unclassified if agglomeration with others is not considered appropriate,
2) Water body with one monitoring station:
   a) Classified by that station
   b) If station is towards extremity of water body it may be necessary to consider another station in adjacent water body
3) Water body with more than one station:
   a) Averaged with other(s)
   b) May also need to consider stations in adjacent water bodies
   c) Risk assess the impact of tributary stations (see below)

Not all monitoring stations are monitored for both chemistry and biology. For reasons such as proximity to larger rivers or potential saline intrusion at downstream sites, some, including both SM and OM stations, are monitored for biology or chemistry only. This can mean that different monitoring stations may be used to classify a water body for different quality elements.

Given the distribution of the monitoring network and the delineation of the water bodies, a reasonable number of stations are on tributaries. From the Classification Guidance, the following 'tributary rules' were derived and this required that the area that each tributary catchment occupies within each water body to be calculated.

- If the tributary accounts for less than 10% of the water body area its overall impact can be disregarded,

- If the tributary represents between 10-25% of the water body area then, if the main station(s) are classified as high and the tributary is less than high (doesn't matter what), the overall class falls to good. If the other stations are less than high then the tributary has no impact,

- If the tributary represents more than 25% of the water body area, and if it is a lower class than the main station(s) then the overall class falls by one class.

A simple example of how river monitoring stations are considered for classification is provided by the River Tall.

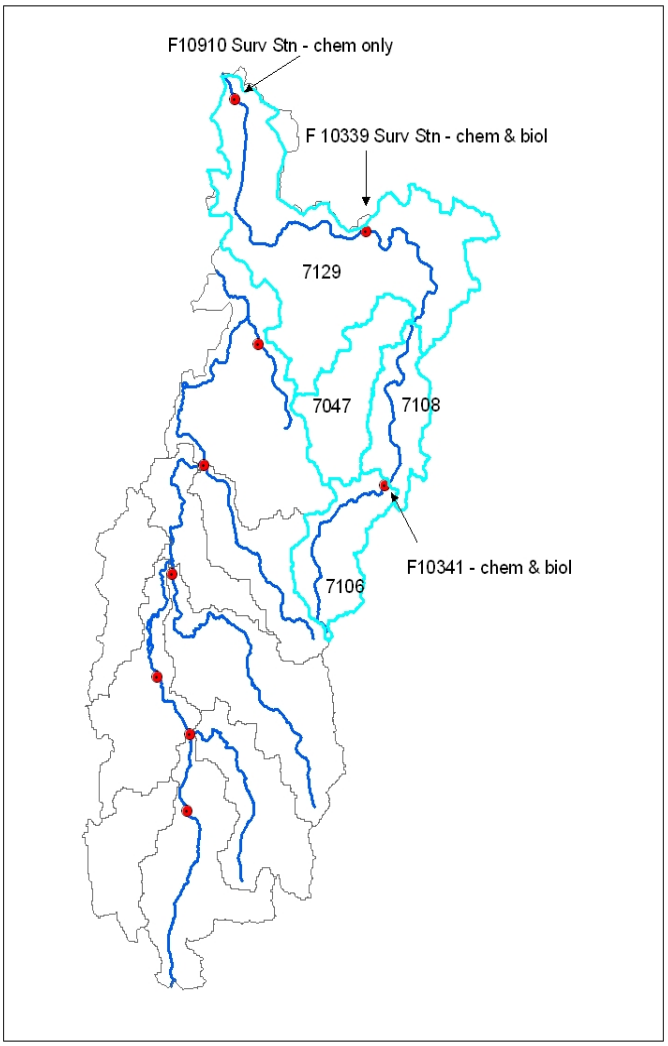


Figure 3 – Water bodies and monitoring stations on the River Tall

The Tall has been classified as follows:

Water body	Station code	Station name	Monitored for	How to classify
GBNI1NB030307129	F10910	Tall at Clonmore	Chemistry only	Average with 10339 for chemistry
	F10339	Tall at Redmonds Br	Chemistry and biology	Classify for biology only
GBNI1NB030307108	none	n/a	nothing	Classify using 10339 for chemistry and biology, but risk assess from 10341*
GBNI1NB030307106	F10341	Tall at Darby's Bridge	Chemistry and biology	Classify for chemistry and biology
GBNI1NB030307047	none	n/a	nothing	Not considered possible

* i.e. check to see if it is significantly different.

The rules above have been followed for most quality elements with the following exceptions:

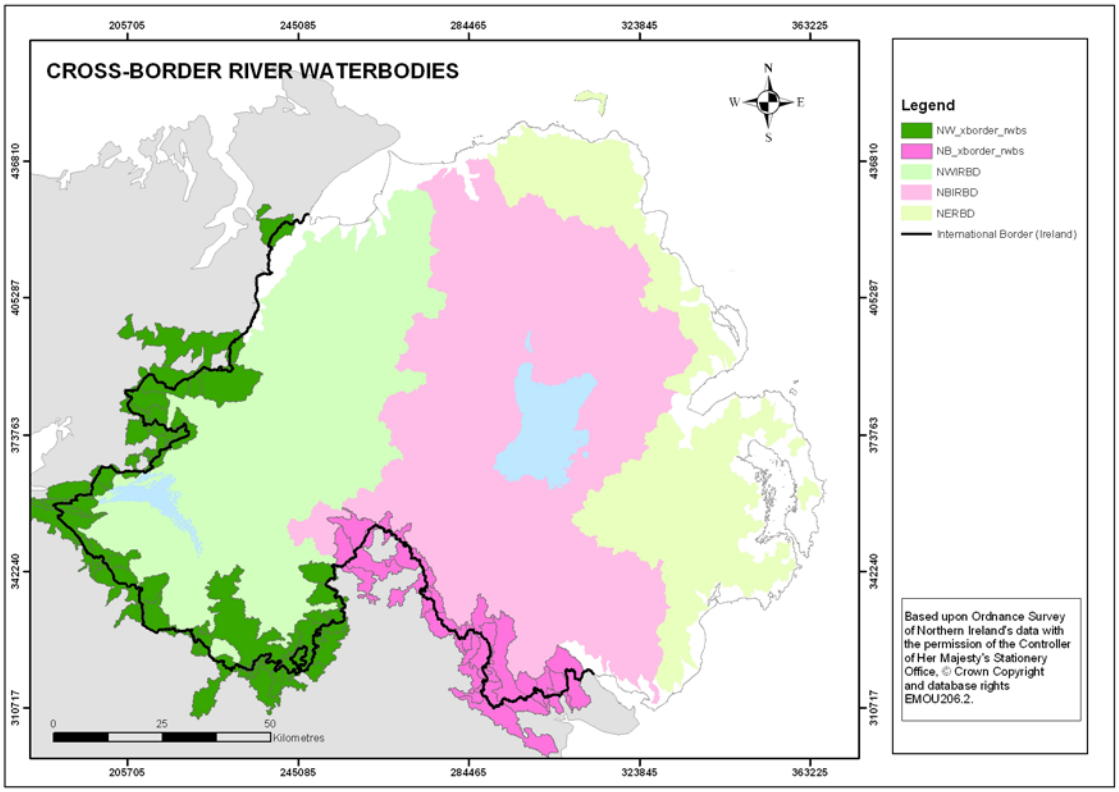
Fish – it is not considered appropriate to classify fish other than in the water body in which they have been assessed as variables such as habitat conditions and patterns of fish movement in adjacent water bodies would be unknown. Often fish monitoring has to be done some distance from published locations of monitoring points due to issues such as representative favourable habitat and access etc.

Hydromorphology – only classified where it has been assessed as it is unique to each individual location. A separate procedure is being developed on water body hydromorphological assessments.

Specific Pollutants and Priority Substances - With ammonia, copper and zinc having been monitored at hundreds of stations they have been considered as per the other general chemical elements. As stated previously, with the exception of phenol, to date it has only been able to assess other specific pollutants and priority substances at the 11 OSPAR/Dangerous Substances stations.

Cross-border classification

As water bodies are based on river catchments it is to be expected that there will be many that lie on both sides of the border with the Republic of Ireland. These are shown below:



Map 3 – Cross-border water bodies

Whilst Northern Ireland and the Republic employ different field assessment and classification methodologies for some biological elements, the introduction of WFD classification has meant that the classifications produced relate to the same classification system (i.e. the same classes, high, good etc). The EU Intercalibration exercise seeks to ensure that the classifications produced by different methodologies are comparable with one another. For example, what is classified as good quality for invertebrates in Northern Ireland should reflect the same quality as good quality for invertebrates in the Republic of Ireland.

The rules for classifying each cross-border water body were agreed with respect to NI and ROI monitoring stations and followed the principles detailed elsewhere in this document. Cross-border classification was undertaken in liaison with the ROI Environmental Protection Agency.

Further classification data that should become available in 2009

At this early stage of WFD implementation initial classification will not include complete coverage for every element. The Water Framework Directive does not require that a full monitoring programme is undertaken before the start of the next River Basin Plan period in 2010. However, NIEA have been working to

achieve as much as possible in the three-year period 2007-2009 (and also utilising older data where appropriate).

Given the above, monitoring in 2008 should produce further classification in the following areas:

Macrophytes – coverage of a wider geographical area than currently exists.

Phytobenthos (diatoms) – coverage of a wider area and higher confidence in class through better temporal sampling.

Fish – inclusion of some larger rivers.

Specific pollutants and priority substances – further substances from years 1&2 of the rolling programme.

2009 data will not be available in time for inclusion in the final RBP.

LAKES

Quality Elements and classification

The quality elements monitored for lakes are described below including the years of data that has been used.

Ecological Status

Biological quality elements

Elements monitored

All of the biological elements, with the exception of fish were sampled and analysed by NIEA staff. Fish were sampled under the NS Share Fish in Lakes project. Invertebrates and macrophytes were analysed in-house but the diatoms were analysed under contract. All surveillance lakes are surveyed on a three year rolling programme for biological quality elements and hydromorphology.

Classification

Classification techniques are progressively being developed under the auspices of UKTAG and through other partnerships for all biological elements.

Macro-invertebrates

Lake morphology divides the open water into littoral (shoreline) and profundal (deep) zones and the two areas support very different invertebrate populations due to differences in substrate, oxygen levels and nutrient availability. Separate classification systems been developed for each zone. Work is ongoing to analyse profundal samples, with a view to including these data in lake classification in 2009.

Littoral invertebrates are sampled twice a year in spring and summer in the selected survey year.

The Northern Ireland Environment Agency initially classified surveillance lakes based on littoral invertebrates using the tool developed by NS Share which responds to nutrient pressures. However it is felt that the tool is currently producing over-generous classifications (i.e. better than expert judgement would consider reasonable) and it is anticipated it will need to undergo further refinement of the class boundaries. Northern Ireland therefore will not be classifying using littoral invertebrates for this draft river basin plan.

Macrophytes

NIEA trialled three macrophyte classification tools (FREE, CBAS and Leafpacs). It was decided to use the FREE Index developed by the ROI Environmental Protection Agency to classify NI lakes as this gives the advantage of using the same method to classify macrophytes throughout Ecoregion 17 and the outputs compare favourably with the opinions of local experts. The FREE index uses the relative frequency of macrophytes found in each quadrant from all sites surveyed. It uses a combination of metrics to produce an overall FREE index for an individual lake. Boundaries are set using points of ecological change along a TP gradient based on reference sites from the IN-SIGHT[14] paleoliminology work. The FREE index is applicable across all lake types.

Macrophyte surveys are carried out once in the maximum growth period generally between June and September and the classification is based on the data from the most recent survey year.

Diatoms

Diatoms have been assessed using the DARLEQ tool as an assessment of the impact of nutrient enrichment on phytobenthos. Species composition and relative abundance of benthic diatoms are assessed and used to calculate an

[14] **I**dentification of refere**N**ce-**S**tatus for **I**rish lake typolo**G**ies using palaeolimnological met**H**ods and **T**echniques

index as nutrient concentrations increase. This is called the Lake Trophic Diatom Index (LTDI). Only 2004 data were available at this time.

Diatoms are sampled twice a year in spring and summer in the selected survey year.

Phytoplankton

NIEA have only been able to produce phytoplankton classifications using the chlorophyll metric assumed to represent phytoplankton biomass. It is not currently possible to classify lakes in NI using composition metrics as no measurements of cell biovolume have been made. Data was averaged over 2005-2007

Phytoplankton are sampled three times a year in spring summer and late summer in the selected survey year corresponding to the natural growth optima of a range of species groups.

Fish

All work on fish classification has been carried out under the NS Share Fish in Lakes project. Only a few lakes have been surveyed to date and the classification tool is undergoing further refinement.

General and physicochemical quality elements

Elements monitored

General chemical monitoring includes more elements than are actually used for WFD classification. It is undertaken at lake Surveillance Monitoring stations on a monthly basis. All general chemical monitoring was carried out by NIEA staff with analyses at the NIEA laboratories in Lisburn. The individual determinands are as follows:

Determinand	Used for WFD Compliance?
Ammonia	Yes as a specific pollutant – see next section
BOD	No
Dissolved Oxygen	Yes
Chlorophyll a	Yes
Soluble Reactive Phosphorus (SRP)	No
Total Phosphorus (TP)	Yes

Nitrate	No
Nitrite	No
pH	Yes
Suspended Solids	No
Temperature	Yes
Alkalinity	No but used for assessing typology for standards
Conductivity	No
Hardness	No, but required for zinc and copper assessments
Colour	No

Classification

The general chemical standards for classification are presented in the two UKTAG Environmental Standards and Conditions documents referred to earlier. These documents describe the process of how the standards were derived, the standards themselves and how compliance with them is assessed.

The importance of phosphorus is recognised by the inclusion of total phosphorus in WFD Classification for lakes. Increasing nutrient concentrations will change the biomass and composition of biological communities with the most obvious primary impact being enhanced plant and algal production. Secondary impacts can include reduced dissolved oxygen levels caused by the overnight respiration of macrophytes which can lead to problems for fish. Elevated nutrient levels can also cause toxic blooms of blue-green algae leading to potential problems for livestock and other animals.

The other determinands monitored but not included in WFD classification are used for a variety of purposes such as reporting under other EU Directives and general water quality issues. They will also be important is assessing the impact of Programmes of Measures.

WFD classification utilised data over the three year period 2005-2007

Specific pollutants

Elements monitored

Member States have been required to identify 'specific pollutants' (i.e. those pollutants being discharged in significant quantities) from the Directive's general list of the main types of pollutants and these are listed in Paragraph 1.3.3(b), page 9 of the Classification Guidance.

UKTAG has made recommendations on an initial list of specific pollutants comprising substances known to be being discharged in significant quantities into waters within the UK and on environmental quality standards for these

substances. The list of specific pollutants is reproduced in the table below. Further substances may be identified in the future. Substances may also be removed from the list if they cease to be discharged in significant quantities.

Initial list of Specific Pollutants	
1. 2,4, Dichlorophenoxyacetic acid	11. Ammonia
2. Chromium (vi)	12. Chlorine
3. Chromium (iii)	13. Copper
4. Cypermethrin	14. Cyanide
5. Diazinon	15. Permethrin
6. Dimethoate	16. Iron
7. Linuron	17. Zinc
8. Mecoprop	18. 2,4-dichlorophenol
9. Phenol	19. Arsenic
10. Toluene	

Classification

The environmental quality standards for pollutants listed 1 to 11 above have been derived or updated in line with the procedure specified by the Directive, including peer review and public consultation. For the pollutants listed in points 12 to 19, UKTAG recommends that the quality standards previously established under the Dangerous Substances Directive should apply. This is because there are insufficient data available at present to recommend the revision of these standards.

For good ecological status, the environmental quality standards established for specific pollutants must not be exceeded. With the exception of ammonia, environmental quality standards for the specific pollutants have been set in such a way that, where the standards are met, no adverse effects on aquatic plants and animals should occur. Consequently, UKTAG recommends that in a water body complying with the standards for these specific pollutants, the water quality - as far as these specific pollutants are concerned - is capable of supporting the achievement of high or good ecological status. Ammonia has been included as a specific pollutant because of its toxicity to fish.

The initial proposed standards for specific pollutants are presented in the UKTAG report *'Proposals for Environmental Quality Standards for Annex VIII Substances - Final Draft provided to administrations to brief Ministers'* of January 2008. With the exception of ammonia, the standards for specific pollutants are expressed as a long term (annual mean) and as a short-term (maximum admissible concentration). UKTAG recommend that the long-term standards are used for classification and that failure of the maximum admissible concentration (MAC) is used to trigger additional investigation which, in turn, may lead to further monitoring and, where appropriate, action aimed at preventing deterioration of

status. It was decided locally that if a substance fails its MAC but passes its mean that it is classified as good.

For initial classification, ammonia was assessed using data from 2005-2007 as per the general chemical elements for river surveillance and operational monitoring stations. Zinc and copper have been assessed for the same period

In Northern Ireland, like other regions of the UK and Ireland, a specific list of both specific pollutants and priority substances (see later) has been drawn up by an expert group and consists of those substances that available evidence indicates should be monitored at Surveillance Monitoring stations. Taking into account available resources and, in particular, the amount of analytical methodology development required, a 4-year monitoring programme at SM stations was introduced in April 2007, with the aim of monitoring for the complete list by March 2011. The complete list of chemicals and what has been included for the first year, is presented in Annex 2. From this, only data for phenol have become available from year 1 monitoring for initial classification.

Specific pollutant monitoring has been done by NIEA staff with analyses at NIEA laboratories in Lisburn and under contract with the Environment Agency for Engand and Wales.

Hydromorphology

Lake Hydromorphology

The condition of the lake hydromorphology plays an important role in determining the overall lake ecology. Lake management and engineering activities can have significant impacts on the availability of habitats and species and therefore, the ability of the lake to support each of the biological elements.

As with rivers, the relationship between lake hydromorphology and ecology is poorly understood and will benefit from focused research over the coming years.

Elements monitored and classified

There are two hydromorphological quality elements; the hydrological regime which includes quantity and dynamics of flow, residence time, connection to groundwater, and morphological condition which includes: lake depth variation, quantity and structure of the substrate on the lake bed and the structure of the lake shore.

The condition of the quality elements can be altered as result of lake management and engineering activities. Lake hydromorphological data is collected by two key survey protocols. The first is a bathymetric survey which

provides information relating to the lake depth variation, including both the maximum and mean depths. From this, calculations can be made to determine the volume and residence time.

The second protocol is the Lake Habitat Survey (LHS). This is a systematic method for characterising the physical habitats in lakes and the presence of pressures within and adjacent to the lake that could result in modification to the hydromorphology.

Lake-MImAS (Morphological Impact Assessment System) was used to determine whether the hydromorphology was at High Status. This tool was developed primarily as a risk assessment tool to inform regulatory decisions but provides a consistent and objective framework for determining the hydromorphological condition of a water body and was therefore used in this round of classification. The method was developed using expert judgement and will need to be refined when empirical data that link hydromorphological alteration to ecological response becomes available.

As for rivers, the application of the appropriate water body, type specific water resource standards for lakes has allowed the attribution of an 'ecological classification' to all abstraction and flow regulation impacted water bodies. However, for lake water bodies two separate hydrological elements were considered. The reduction in lake inflow due to abstraction and the lake level variation due to abstraction and flow regulation pressures were assessed against the developed standards. This identified those lake water bodies where the hydrological and hence ecological status may be at risk due to net abstraction and flow regulation within water body or the surface water catchment. Where a lake water body was deemed to have an un-natural level variation regime due to impoundment or level management, the application of the standards were impractical and it was assumed that standards to protect hydrological high status were not attained. Further information on the water resource standards themselves and how they were derived can be found in the two UKTAG Environmental Standards and Conditions documents.

As for other elements, the lowest of the hydromorphology and the hydrology has been used to classify overall hydromorphology. All classification work has been done by NIEA staff.

Chemical Status

Priority substances and other EU-level dangerous substances

Elements monitored

Chemical status is perhaps confusingly named, given that many other chemicals have already been considered. Chemical status is assessed from what are known as priority substances, defined by the Directive as *'those which present a significant risk to or via the aquatic environment'*. An initial list of 33 substances and standards has been drawn up at a European level are to be presented in a forthcoming daughter Directive.

Classification

For initial classification, as for specific pollutants (except ammonia), initial assessments were made from 2004-2006 data from 11 stations at downstream locations on major rivers. The substances considered were as follows:

Priority substances	
Mercury (total)	Pentachlorophenol
Cadmium (total)	Chloroform
Lead (sol)	Carbon Tetrachloride
Lead (total)	Trifluralin
Nickel (sol)	Endosulfan
PCBs (28, 52, 101, 118, 138, 153, 180)	Hexachlorobutadiene
Gamma-HCH	1,2,3 Trichlorobenzene
Hexachlorobenzene	1,2,4 Trichlorobenzene
Aldrin	1,3,5 Trichlorobenzene
Isodrin	1,2 Dichloroethane
Dieldrin	Atrazine
Endrin	Simazine
Para-para-DDT	Chlorvenfinvos
Naphthalene	Benzene
Tri-Butyl Tin	

At this stage no data have become available for classification from year 1 of the 4-year priority substances monitoring programme at SM stations (see Annex 2).

Priority Substance monitoring has been undertaken by NIEA staff with analyses at NIEA laboratories in Lisburn and under contract with the Environment Agency.

How lake water bodies have been classified

Only lakes greater than 50 hectares have been designated as specific water bodies and therefore classified individually. Guidance on spatial issues of classification can be found in the Classification Guidance section 5. Selected monitoring sites must be representative of the ecological quality of the lake. For macroinvertebrates, macrophytes and diatoms a minimum of 4 sites are surveyed per lake with more sites added with increasing lake size and complexity.

Cross-border classification

Whilst Northern Ireland and the Republic employ different field and assessment methodologies for some biological elements, the introduction of WFD classification has meant that the classifications produced relate to the same classification system (i.e. the same classes, high, good etc). The EU Intercalibration exercise seeks to ensure that the classifications produced by different methodologies are comparable with one another.

The rules for classifiying each cross-border lake were agreed with respect to NI and ROI monitoring stations. Cross-border classification was undertaken in liaison with the ROI Environmental Protection Agency.

Further classification data that should become available in 2009

At this early stage of WFD implementation initial classification will not include complete coverage for every element. The Water Framework Directive does not require that a full monitoring programme is undertaken before the start of the next River Basin Plan period in 2010. However, NIEA have been working to achieve as much as possible in the three-year period 2007-2009 (and also utilising older data where appropriate).

Given the above, monitoring in 2008 should produce further classification in the following areas:

Phytobenthos (diatoms) – The classifications have been based on 2004 data and more recent data will be used

Fish – wider coverage

Specific pollutants and priority substances – further substances from years 1& 2 of the rolling programme.

2009 data will not be available for inclusion in the final RBP.

Annex 1 – Heavily Modified Water Bodies as of 1/10/08

Rivers

Water Body ID	River
GBNI1NB030301071	Ballinrees
GBNI1NB030301149	River Bann (Portglenone)
GBNI1NB030301214	Bann (South of Coleraine)
GBNI1NB030301220	Lower Bann (Ballymoney Trib)
GBNI1NB030302018	Braid River(Ballymena)
GBNI1NB030302022	Artoges River
GBNI1NB030302199	Killylane Reservoir, Glenwhirry River , Donaghy, Crosswater 2 & 3
GBNI1NB030302233	Dungonnell Dam
GBNI1NB030303005	Lough Fea, White Water, Sruhannaclogh, Sruhanpollakeeran
GBNI1NB030303144	Coppies Burn (Magherafelt)
GBNI1NB030304060	Ballinderry River (Cookstown)
GBNI1NB030305122	Six mile Water (Doagh, Antrim)
GBNI1NB030305162	Plaskets Burn (Antrim)
GBNI1NB030305204	Six Mile Water(Ballyclare)
GBNI1NB030306083	Stoneyford Reservoir & Leathemstown
GBNI1NB030307025	River Rhone (Dungannon)
GBNI1NB030307048	Seagahan Reservoir, Butter River
GBNI1NB030307049	Clay Lake
GBNI1NB030307109	Killeen Water (Armagh)
GBNI1NB030307173	Altmore 1 & 2, Torrent River
GBNI1NB030308089	Spelga Dam
GBNI1NB030308103	River Bann (Bannfoot, Craigavon)
GBNI1NB030308188	Lough Island Reavy, Muddock River
GBNI1NB030308197	River Bann (Banbridge)
GBNI1NB060601019	Camlough, Flurry River
GBNI1NE040403064	Collin Burn Lough Garve 1 & 2 Inver River Associated with Dungonnell above
GBNI1NE040404049	Altnahinch
GBNI1NE040404053	Burn Gushet River (North Ballymena)
GBNI1NE040404054	Burn Gushet River (North Ballymena)
GBNI1NE050501004	Lough Mourne Copeland Reservoir Copeland River

GBNI1NE050501120	Woodburn North & South, Woodburn River
GBNI1NE050502083	Ballysallagh Upper & Lower, Crawfordsburn River
GBNI1NE050502084	Ballyholme River (Bangor)
GBNI1NE050503002	Blackstaff River (Belfast)
GBNI1NE050503003	Blackstaff River (Belfast)
GBNI1NE050503087	Connswater (Belfast)
GBNI1NE050503104	River Lagan tributary(Belfast)
GBNI1NE050503119	Clowney water (Belfast)
GBNI1NE050504080	Enler River (Dundonald)
GBNI1NE050504085	Cully's Burn (Newtownards)
GBNI1NE050505036	Annalong
GBNI1NE050505110	Foffany Reservoir, Shimna River
GBNI1NE050505114	Silent Valley, Kilkeel & Annalong River Binnan Tunnel
GBNI1NW010102009	Lough Bradan, The Blackwater
GBNI1NW010102030	Lough Nadarragh Disused, L. Fingrean & L. Macrory
GBNI1NW010102033	Glenhordial
GBNI1NW010102050	Lough Lee, Killen Burn
GBNI1NW010102074	Mourne River (Sion Mills)
GBNI1NW010102093	River Strule (Omagh)
GBNI1NW020202010	Altnaheglish, Owenrigh River
GBNI1NW020204031	River Faughan
GBNI1NW363601072	Erne (Beleek)
GBNI1NW363602039	River Erne (Enniskillen)
GBNI1NW393901001	Skeoge River (Shantallow)

Lakes

Lake
Lough Island Reavy
Silent Valley Reservoir
Cam Lough
Stoneyford Reservoir
Spelga Dam
Lough Fea
Lough Mourne
Lough Beg
Upper Lough Erne
Lough Neagh
Lower Lough Erne Kesh
Lower Lough Erne Devenish
Lough Portmore
Castlehume

Annex 2 – List of substances in 4-year priority substances and specific pollutant monitoring programme

Initial list of WFD surveillance monitoring parameters

Parameter	Justification for inclusion	Year 1 April 07 to March 08	Year 2 April 08 to March 09	Year 3 April 09 to March 10	Year 4 April 10 to March 11	Metals/Inorganic Determinands Years 3?
Alachlor	WFD priority substance				Yes?	
Anthracene	WFD priority hazardous substance			Yes		
Atrazine	WFD priority substance	Yes				
Benzene	WFD priority substance		Yes			
Brominated diphenylether	WFD priority hazardous substance				Yes	
Cadmium and its compounds	WFD priority hazardous substance					Metals
Chloroalkanes (C10-13)	WFD priority hazardous substance				Yes	
Chlorfenvinphos	WFD priority substance	Yes				
Chlorpyrifos	WFD priority substance	Yes				
1,2-dichloroethane	WFD priority substance	Yes				
Dichloromethane	WFD priority substance				Yes	
DEHP	WFD priority substance			Yes		
Diuron	WFD priority substance		Yes			
Endosulphan	WFD priority hazardous substance	Yes				
Fluoranthene	WFD priority substance			Yes		
Hexachlorobenzene	WFD priority hazardous substance	Yes				
Hexachlorobutadiene	WFD priority hazardous substance	Yes				
γ-Hexachlorocyclohexane	WFD priority hazardous substance	Yes				
Isoproturon	WFD priority substance		Yes			
Lead and its compounds	WFD priority substance					Metals
Mercury and its compounds	WFD priority hazardous substance					Metals
Naphthalene	WFD priority substance			Yes		
Nickel and its compounds	WFD priority substance					Metals
Nonylphenol	WFD priority hazardous substance			Yes		
Octylphenol	WFD priority substance			Yes		
Pentachlorobenzene	WFD priority hazardous substance				Yes?	
Pentachlorophenol	WFD priority substance		Yes			
Polyaromatic hydrocarbons	WFD priority hazardous substance			Yes		
Simazine	WFD priority substance	Yes				
Tributyltin compounds	WFD priority hazardous substance				Yes?	
Trichlorobenzenes (all isomers)	WFD priority substance	Yes				
Trichloromethane	WFD priority substance	Yes				
Trifluralin	WFD priority substance	Yes				
DDT total	WFD other pollutant	Yes				
para-para-DDT	WFD other pollutant	Yes				
Aldrin	WFD other pollutant	Yes				
Dieldrin	WFD other pollutant	Yes				
Endrin	WFD other pollutant	Yes				
Isodrin	WFD other pollutant	Yes				

Carbon tetrachloride	WFD other pollutant	Yes				
Tetrachloroethylene	WFD other pollutant	Yes				
Trichloroethylene	WFD other pollutant	Yes				
Aluminium - reactive	UK WFD specific pollutant tranche 1					Metals
Ammonia	UK WFD specific pollutant tranche 1					Inorganic
Arsenic	UK WFD specific pollutant tranche 1					Metals
Bentazone	UK WFD specific pollutant remaining list 2		Yes			
Biphenyl	UK WFD specific pollutant remaining list 2		Yes			
Boron	UK WFD specific pollutant remaining list 2					Metals
Chlorine - total available	UK WFD specific pollutant tranche 1					Inoranic
4-chloro-3-methylphenol	UK WFD specific pollutant remaining list 2		Yes			
Chloronitrotoluenes	UK WFD specific pollutant remaining list 2			Yes		
2-chlorophenol	UK WFD specific pollutant remaining list 2		Yes			
Chromium	UK WFD specific pollutant tranche 1					Metals
Copper	UK WFD specific pollutant tranche 1					Metals
Cyanide - free	UK WFD specific pollutant tranche 1					Inorganic
Cyfluthrin	UK WFD specific pollutant remaining list 2			Yes		
Cypermethrin	UK WFD specific pollutant tranche 1			Yes		
Diazinon	UK WFD specific pollutant tranche 1	Yes				
2,4-Dichlorophenol	UK WFD specific pollutant tranche 2		Yes			
2,4-D (ester and non-ester)	UK WFD specific pollutant tranche 2		Yes			
Dichlorvos	UK WFD specific pollutant remaining list 2				Yes	
Dimethoate	UK WFD specific pollutant tranche 2				Yes	
Fenitrothion	UK WFD specific pollutant remaining list 2	Yes				
Iron	UK WFD specific pollutant tranche 1					Metals
Linuron	UK WFD specific pollutant tranche 2		Yes			
Malathion	UK WFD specific pollutant remaining list 2	Yes				
Manganese	UK WFD specific pollutant tranche 1					Metals
Mecoprop	UK WFD specific pollutant tranche 2		Yes			
Permethrin	UK WFD specific pollutant tranche 1			Yes		
Phenol	UK WFD specific pollutant tranche 1	Yes				
Tetrachloroethane	UK WFD specific pollutant tranche 1	Yes				
Toluene	UK WFD specific pollutant tranche 1		Yes			
1,1,1-trichloroethane	UK WFD specific pollutant remaining list 2	Yes				
1,1,2-trichloroethane	UK WFD specific pollutant remaining list 2	Yes				
Triphenyltin	UK WFD specific pollutant remaining list 2				Yes	
Vanadium	UK WFD specific pollutant remaining list 2					Metals
o,m,p-Xylene	UK WFD specific pollutant remaining list 2		Yes			
Zinc	UK WFD specific pollutant tranche 1					Metals
Glyphosate	N.I. High Concern Substance		Yes			
MCPA	N.I. High Concern Substance		Yes			
Mevinphos	N.I. High Concern Substance	Yes				
Mancozeb (ethylene Bis dithiocarbamate)	N.I. High Concern Substance				Yes?	

17b Oestradiol	N.I. High Concern Substance/tranche 3				Yes	
17ά Ethinyloestradiol	N.I. High Concern Substance/tranche 3				Yes	
Oestrone	Tranche 3				Yes	
Bromoxynil	N.I. Candidate Specific Pollutant				Yes	
Carbendazim (Benzimidazolylcarbamate Fungicide)	N.I. Candidate Specific Pollutant		Yes			
Carbofuran	N.I. Candidate Specific Pollutant		Yes			
Chloropropham (Carbamate)	N.I. Candidate Specific Pollutant				Yes	
Dichlobenil	N.I. Candidate Specific Pollutant				Yes	
Maneb (ethylene Bis dithiocarbamate)	N.I. Candidate Specific Pollutant				Yes?	
Perfluorooctane Sulphonate	N.I. Candidate Specific Pollutant				Yes	
Primicarb	N.I. Candidate Specific Pollutant				Yes	
Propazine	N.I. Candidate Specific Pollutant	Yes				
Triazaphos	N.I. Candidate Specific Pollutant	Yes				
Triclosan	N.I. Candidate Specific Pollutant		Yes			
Butylbenzylphthalate	Detected ROI Screening			Yes		
1,1-dichloroethene	Detected ROI Screening	Yes				
Di-n-butylphthalate	Detected ROI Screening			Yes		
Trichlorophenols	Detected ROI Screening		Yes			
Uranium	Detected ROI Screening					Metals
Dibutyl tin	N.I. Candidate Specific Pollutant				Yes	
acenaphthene	Water Service WWTW monitored substance			Yes		
Fluorene	Water Service WWTW monitored substance			Yes		
PCBs	Water Service WWTW monitored substance	Yes				
Phenanthrene	Water Service WWTW monitored substance			Yes		
Chlormequat	DARD Pesticide Usage Reports		Yes			
Mecoprop-P	DARD Pesticide Usage Reports				Yes?	
Fluroxypyr	DARD Pesticide Usage Reports		Yes			
Triclopyr	DARD Pesticide Usage Reports		Yes			