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THE TROPHIC STATUS OF NORTHERN IRELAND RIVERS IN 1996 BASED ON THEIR MACROPHYTE ASSEMBLAGES

TI 96/0236

(Work programme clause 1.2.2.)

CONTENTS

1.0 DISCLAIMER

"Unless otherwise stated in the text the analysis, opinions and comments in this report are beyond the scope of the NAMAS accreditation".

2.0 SUMMARY

In 1994 the Biological River Monitoring Programme was supplemented for the first time by the assessment of macrophytes under a development project supported by IRTU. This was reported on in the Technical Investigation 94/1376 - The potential use of aquatic macrophytes as indicators of long term changes in water quality.

Continuation of this work in 1996 was requested by Environment and Heritage Service in Work Programme 95/7, subversion 1, clause 1.2.2.

The percentage cover of each plant identified at each Biological River Monitoring Programme site was assessed using a standardised methodology in the Summer season 1996. Comparison was made with the Haslam Trophic Banding plant assemblages and each site was assigned the appropriate class(es). For the Holmes classification, macrophyte scores were derived from these data taking into account both the tolerance/sensitivity of the species recorded and their abundance on a 3 tier scale.

The immediate aim of the investigation was to highlight any rivers or catchments which were showing evidence of enrichment. Also, as changes in trophic status are generally the result of slow processes, the investigation forms a base-line against which future macrophyte monitoring data can be compared.

The continuation of both means of classification used in parallel is among the recommendations made. The analysis of the data has shown that Northern Ireland's rivers are for the most part enriched due primarily to agricultural and sewage related sources. The level of enrichment in rivers like the Lagan, parts of the Foyle and the Blackwater is such that there is obviously scope for plant induced variations in chemical water quality with pH and Dissolved Oxygen being obvious indicators of this activity.

The survey has highlighted a number of areas that merit further more detailed studies for a variety of reasons. These include:

(i) In the Foyle River catchment the main priority area for further work is on the upper and mid-sections of the Fairywater River based on both macrophyte and invertebrate data. Subordinate areas that are showing enhanced enrichment include the Cloghfin, Eskragh Water, upper Owenreagh and Mournebeg Rivers all of which are showing signs of enhanced trophication to the extent that chemical and biological quality may also suffer.

(ii) In the Faughan and Roe catchments the most significant change that has occurred is in the Mobuoy stretch of the former from Haslam Class 5 (eutrophic) to oligo-mesotrophic. This change is significant and bearing in mind the highly variable invertebrate data from this river reach further work is recommended.

(iii) In the Lough Neagh catchment the problem areas that are readily recognisable occur on the lower sections of the Upper and Lower River Bann and the Tall River. Given the political sensitivity of the former and the loss of plant biomass at Gilford in

1996 further work in 1997 is recommended as a high priority. The Upper Blackwater appears to exhibit something of a decline in its macrophyte communities in 1996 for whatever reason. This situation should be closely monitored in 1997.

(iv) The most obvious problem in the North Antrim catchment is the highly enriched state of the River Bush. Activity to identify and reduce the nutrient loadings on this river will be necessary if the integrity of the salmonid fishery is to be maintained and enhanced.

(v) The problem rivers in South Antrim/North Down obviously include the River Lagan but the greater priority areas for further work are the Cully's Burn and the Ballynahinch system both of which are consistently subject to high levels of stress on their invertebrate communities.

(vi) In South Down enrichment is a problem on the Newry and Blackstaff River systems which merit further work but a more significant problem involving phytotoxicity may exist in the upper reaches of the Clanrye River.

(vii) In common with (vi) above similar toxicity problems are suspected in the Erne catchment in the upper reaches of the Lackey River and the upper reaches of the Irvinestown tributary. These are recommended for further investigation.

3.0 INTRODUCTION

In 1994 the Biological River Monitoring Programme was supplemented for the first time by assessment of macrophytes under a development project supported by IRTU. This was reported on in the Technical Investigation 94/1376 - The potential use of aquatic macrophytes as indicators of long term changes in water quality.

It was concluded that macrophyte scores derived using the Standing Committee of Analysts (1987) scoring system do not correlate with Biological Monitoring Working Party (BMWP) invertebrate scores. This development work recommended that macrophyte assessment should be carried out annually at the existing Biological River Monitoring Programme sites and that the Haslam Nutrient Status Banding Classification should be employed until such time as a national or European system was adopted.

Continuation of this work was requested by Environment and Heritage Service in Work Programme 95/7, subversion 1, clause 1.2.2.

The subsequent report of this work (see TI 95/0192) included a 1995 classification based on the Haslam system and a comparison with the equivalent classification for 1994.

During this period a national 'trophic ranking' classification was under development by Dr Nigel Holmes on behalf of the Environment Agency which has been subsequently cofunded by the Scottish and Northern Ireland Forum for Environmental Research (SNIFFER). This project was primarily designed for the detection of enhanced trophication in relation to the impact of Sewage Treatment Works (STWs) as defined under the EU Urban Waste Water Treatment Directive.

However, as it was potentially capable of the detection of trophication in rivers impacted by nutrients from other sources its use was adopted in Northern Ireland for the 1995 survey. The results of this method of aquatic macrophyte data collation were included in the report but in the absence of an experience based classification the interpretation of the Mean Trophic Ranking scores was limited.

The percentage cover of each plant identified at each Biological River Monitoring Programme site was assessed using a standardised methodology in the Summer season of 1995 and 1996. Comparison was made with the Haslam Trophic Banding plant assemblages and each site was assigned to the appropriate class(es). For the Holmes classification macrophyte scores were derived from these data taking into account both the tolerance/sensitivity of the species recorded and their abundance on a 3 tier scale.

The immediate aim of the investigation was to highlight any rivers or catchments which were showing evidence of enrichment. Also, as changes in trophic status are generally the result of slow processes, the investigation formed a base-line against which future macrophyte monitoring data can be compared.

The continuation of this work in 1996 was agreed with Environment and Heritage Service (DOE(NI)) as part of the Work Programme (96/7 Sub 1 Clause 1.2.2). This report details the findings of the 1996 survey and examines the macrophyte classifications and undertakes comparisons with the data collected in Summer 1995.

Although a system which is to be nationally adopted has been produced by Holmes (1995) this remains the subject of ongoing R & D. In addition the classification for trophic status based on Mean Trophic Ranking has yet to be formalised although a guide classification is available for the first time. The Haslam system which still appears to be of benefit in the Northern Ireland context continues to be used in this report in order to allow direct comparison with the 1995 data. In addition the Haslam classification provides a baseline against which the proposed classification based on MTR can be assessed.

3.1 The Haslam System

The Haslam Nutrient Status Banding Classification assigns 5 different classes to Irish rivers determined by the presence of predetermined macrophyte assemblages. Each of these classes is represented on a river map by a colour (see Figures 1 and 2) . These colours are listed and the assemblages are described in Appendix 1. The relative abundance of individual species is not taken into account in this classification with the exception that when >50% diatomaceous algal coverage is recorded then the assigned colour banding is downgraded by one band towards the eutrophic end of the spectrum.

3.2 The Holmes Mean Trophic Ranking System

Since the initial report (TI 94/1376) a system was devised by Dr N Holmes, (Alconbury Environmental Consultants, The Almonds, Warboys, Huntingdon, Cambridgeshire) based on Mean Trophic Ranking. This R & D project was initially supported by Anglian NRA, but further phases of the project have been supported by the Environment Agency, latterly with a contribution from the Scottish and Northern Ireland Forum for Environmental Research (SNIFFER). Although the development of this methodology continues to be elaborated and fine tuned it is generally accepted within the United Kingdom as the method of choice for trophication assessment in rivers and supersedes the Standing Committee of Analyst's "blue book" methods.

This system takes the abundance of each species of macrophyte into account. For the purposes of the system, macrophytes are defined as all higher plants, vascular cryptogams and bryophytes, together with groups of algae which can be seen to be composed predominantly of a single species *eg Cladophora* aggregate.

The output of the Holmes system in 1995 was not a classification but a means of ranking sites in terms of their trophic status. Subsequently in 1996, a three band classification was proposed as one of the outputs. This assigned Trophic Ranking Scores to a particular class. These are defined in Table 1 below.

Table 1 Macrophyte Classifications Based on MTR

Class	Class Descriptor	Trophic Ranking Score Range Values
1	Waters that are unlikely to be enriched	>65
2	Waters that are enriched or are showing the potential to become enriched	25 - 65
3	Waters already enriched with a degraded macrophyte flora	<25

A list of the species used in this classification is given in Appendix 2. Note that the Trophic Ranking Scores assigned to each species can be counted up to a maximum of 3 times (in this version of the system) for each site depending on its relative abundance.

3.3 Conservation

In addition to the information which can be derived from macrophytes regarding water and sediment quality there is a peripheral benefit in that this information could be of use in conservation work. It should be emphasised however that the methodology employed does not produce definitive species lists and therefore care should be taken when the data are used for conservation purposes. For example, these data alone would not provide a sound basis for river conservation designation.

The results of this study are not compiled for conservation purposes and thus should not be used for this purpose without appropriate care.

Conservation work in progress on NI rivers (the System for Evaluating Rivers for Conservation, SERCON) is making use of the macrophyte data collected by the field methodology described below to assess the extent of the naturalness of a community of macrophytes. This is done by comparison with predicted macrophyte communities modelled largely from geological information for the reach. In addition macrophyte diversity is relevant as a physical descriptor.

The macrophyte data collated for 1995 and 1996 could be used to help describe the expansion of invasive alien species and the distribution of rare or uncommon species.

4.0 METHODS

This section describes how the river macrophyte data were collected. Subsequently the two separate means used to classify these macrophyte data are described. Comparisons are made between the survey years and the individual sampling methods.

4.1 Macrophyte Data Recording

Macrophytes were assessed at all NI Biological River Monitoring Programme sites using the in-house procedure N1099F between the start of June and the end of August 1996. This involved two members of staff assessing a 100m reach, speciating macrophytes and recording abundance as an estimate of percentage cover for each species.

This methodology was the same as that used to produce data for the 1995 Haslam Nutrient Banding Classification (see Section 5 - TI 95/0192).

The only exception to the recommended Holmes fieldwork methodology was that boats were not used for deep rivers over 10m wide where good visibility from both banks was not possible. This was due to the constraints of time and resources.

4.2 Classifications based on Macrophytes

Two means of determining macrophyte based classifications from the data obtained were used. These are the Haslam Nutrient Banding system and that based on Mean Trophic Ranking scores that is under development by an EA/SNIFFER R & D project. These are described in more detail below.

4.2.1 The Haslam Nutrient Banding Classification

Application of the Haslam Nutrient Status Banding Classification involves determining which of the defined species associated with each of the 5 trophic classes occurred at each site and subsequent assignation to the appropriate class(es). The indicator species for each class are given in Appendix 1. The means of assigning class(es) is described in detail in the 1994 report (TI 94/1376 Section 7.5.3.) and will not be repeated here.

The allocation of Haslam classes to a macrophyte assemblage will always tend to be somewhat subjective and relies on the interpretation of the individual biologist. However, in order to keep subjectivity to a minimum the classification was rule based (see TI 94/1376 - Section 7.5.3). This rule based system was modified slightly in 1995. The rules are reproduced below and these were used in deriving Haslam Classes.

(1) The presence of diatomaceous algae at specific sites reflects a degree of perturbation in trophic status and this needs to be recognised. Where these growths are significant (ie >50% coverage) the colour banding is downgraded by one band towards the eutrophic end of the spectrum.

(2) Where the plant assemblage is indicative of two adjoining bands the overall classification is taken as being indicative of a borderline situation. The classification would then be represented by two colours *eg* blue/purple, red/blue, *etc.*

(3) Where the plant assemblage straddles 3 bands the dominant band(s) based on relative abundance is taken as being the class(es).

The amendment or clarification of rule (3) is that where the plant assemblage straddles 3 or more bands then the band with the most indicator species will be included in the classification (even if it is a joint classification). If another band is to be selected for a joint classification then it would be the next band with the most indicator species represented. In the event of bands having the same number of indicator species then the band adjacent to or closest to the 'dominant' (most indicator species present) band would be assigned. In the event of the 'subordinate' bands being equidistant from the dominant band then the subordinate band with the greater relative abundance of indicator species would be assigned.

Also, for the designation of a joint classification the bands would have to have the same number of indicator species or if one was subordinate (had fewer indicator species) it would have to have over half the number of indicator species present in the dominant band.

Joint classes could be assigned for a reach where the classes are not adjacent in the trophic spectrum *e.g.* Green/Blue.

The limit to the total number of joint classes for each site was taken to be 2. The assumption made in 1994 and 1995 to classify rivers with no plants in the Haslam system as dystrophic was continued.

The difference between the Haslam classifications for the 2 years (1995 and 1996) was calculated as a number derived from examination of the trophic spectrum becoming progressively more eutrophic through Green, Yellow, Blue, Purple and Red. These five trophic bands are allocated a whole number 1 - 5 respectively (Appendix 3). For example, the difference from Green to Yellow is a change of 1 class, from Blue to Red a change of 2, *etc.* Where joint classes had been assigned then the midpoint value is allocated. For example Green/Yellow would be ascribed a numerical band of 1.5, Yellow/Blue would be given numerically as 2.5 and so on (see Appendix 1). Thus a change in class from Green/Yellow to Yellow/Blue would be recorded as a change of 1 band *ie* 2.5 - 1.5 = 1.

Due to the relative insensitivity of the banding system and the relative lack of detail in the descriptions of the species assemblages, a change of 1 unit would not be regarded as being significant.

4.2.2 The Holmes Classification

This system is described in the document submitted to the National Rivers Authority in March 1995 - "Macrophytes for water quality and other river quality assessments". More recent work has attempted to detail how Mean Trophic Ranking scores are allocated to a particular class. However, this classification system is still being evaluated nationally and is perhaps likely to be prone to future modification and amendment as experience is gained. At this moment in time it is the nearest technique available nationally for trophic status classification based on aquatic macrophytes and hence its inclusion in this report.

It must be emphasised that while this system will inevitably require further refinement, its advantages over Haslam classes include the use of abundance, rather than merely presence or absence of indicator species and better discrimination of sites because it is based on a much more comprehensive list of macrophyte species.

A three point scale of abundance is thought to provide adequate definition although there is an option to use a 9 point scale of relative abundance.

The 3 point scoring system involves allocating scoring "Trophic Rank Scores" depending on the percent coverage of the river as follows -

<0.1%	enter once
0.1-5.0%	enter twice
>5.0%	enter three times.

The list of scoring macrophytes and their Species Trophic Index Scores is given in Appendix 2.

The system methodology states that an absolute minimum of at least 5 scoring species "are probably required and high confidence should be reserved for sites with at least 10 species". For simplicity's sake the term "species" throughout this report includes either species *per se* or plant groups defined by Holmes as single scoring entities *e.g.* *Cladophora* aggregate.

As noted, the end product of the ranking system is the Mean Trophic Rank (MTR) which is a biotic score for each reach assessed, reflecting the trophic status of the reach. It is based on the tolerance/sensitivity of each species described as the Species Trophic Rank (STR), and the abundance of each species described as the Cover Value (CV) for each species at each site such that -

$$MTR = [(\text{sum of STR} \times CV)/\text{sum of CV}] \times 10$$

5.0 RESULTS

Figures 1 and 2 show the 1995 and 1996 Haslam Trophic Bandings on a map of Northern Ireland.

A table giving the Haslam Nutrient Status Banding Classifications for 1995 and 1996 and the extent of the change in class between the 2 years is given in Appendix 3.

Figure 3 is cartographical presentation of the nationally proposed classification based on the Holmes Mean Trophic Ranking scores.

The Holmes Mean Trophic Ranking scores derived from the data obtained in the Summers of 1995 and 1996 are given in Appendix 3. The number of species used to derive the score is also given as it is important in terms of the confidence which can be attached to each score. Similarly Percentage Cover Values are included in the same Table. Also recorded here are the alien species encountered at the Biological River Monitoring Programme sites.

Appendix 4 ranks the Biological River Monitoring Programme sites in order of their Mean Trophic Ranking scores.

Figure 4 shows an attempt at correlating the 1995 and 1996 MTR data. It is readily evident from this figure that there is little direct correlation between year on year MTR scores. The reasons for this are considered in more detail in the Discussion Section below.

Appendix 5 is a table of sites assessed giving Irish Grid References and both the Biological River Monitoring Programme and E & H S catchment codes.

Tables 3 to 7 which are included in the Discussion Section summarise changes in Haslam Classification, changes in MTR scores between 1995 and 1996 and year on year variation in relative abundance .

FIGURE 1. HASLAM BANDS FOR 1995.

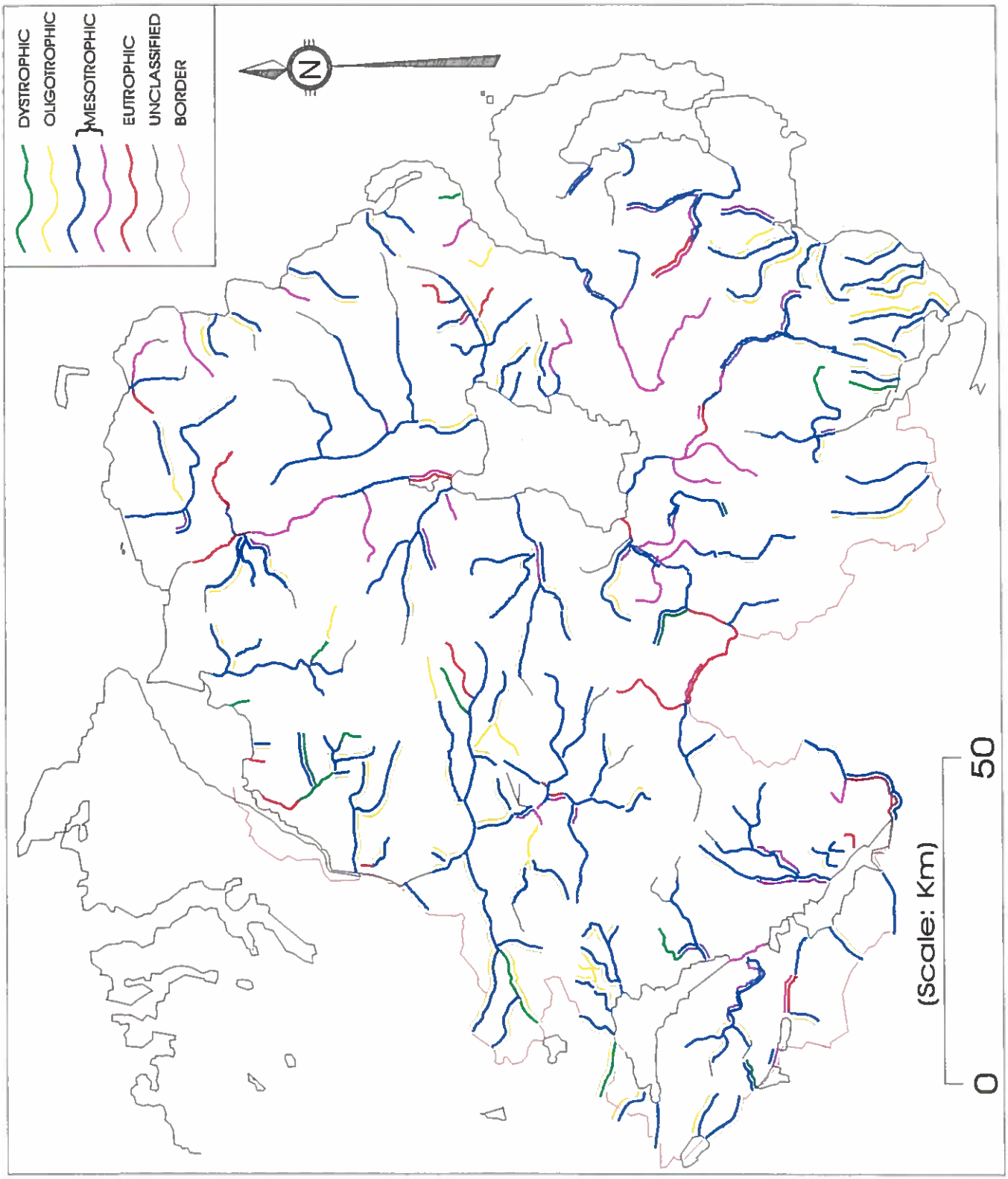


FIGURE 2. HASLAM BANDS FOR 1996.

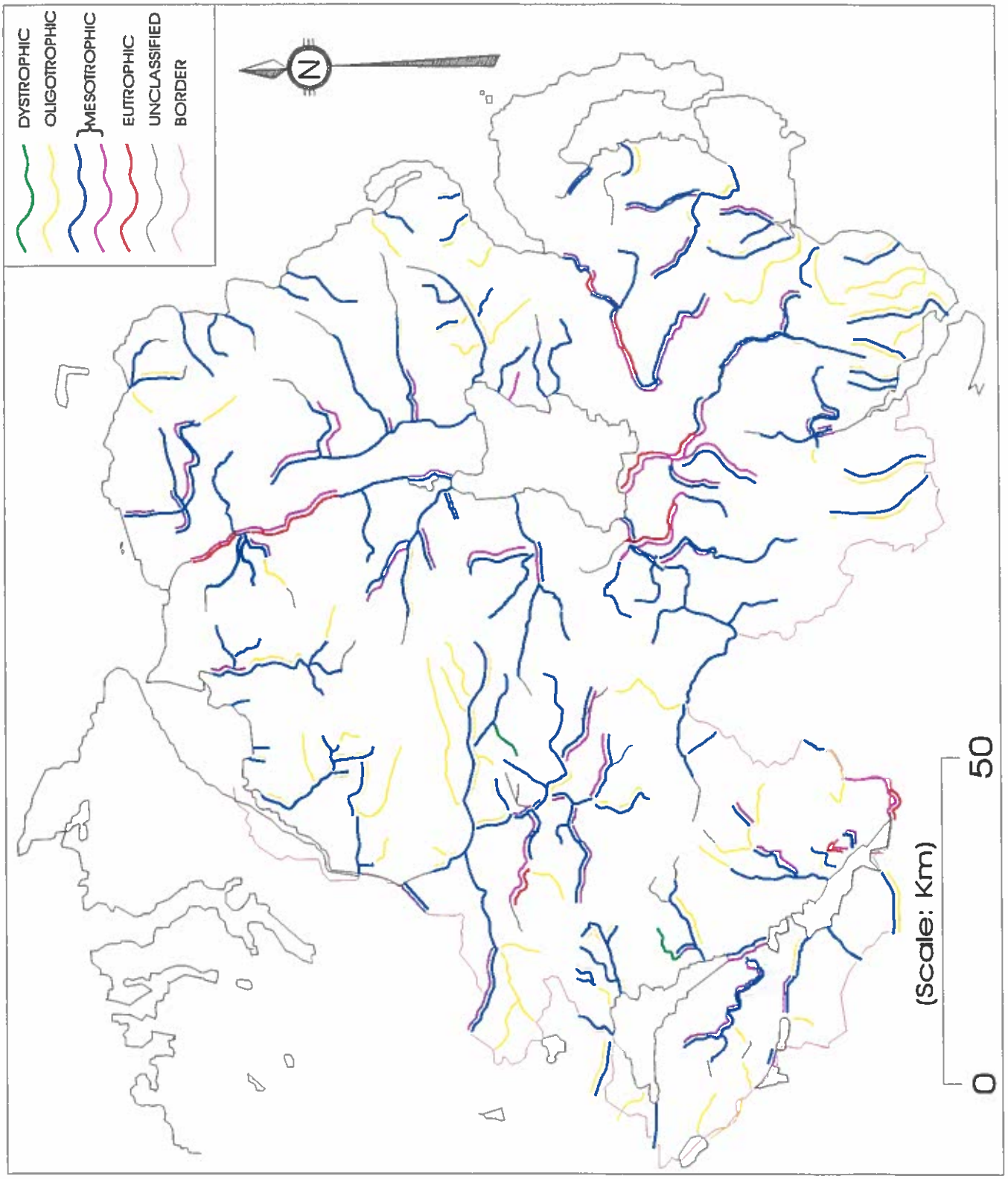
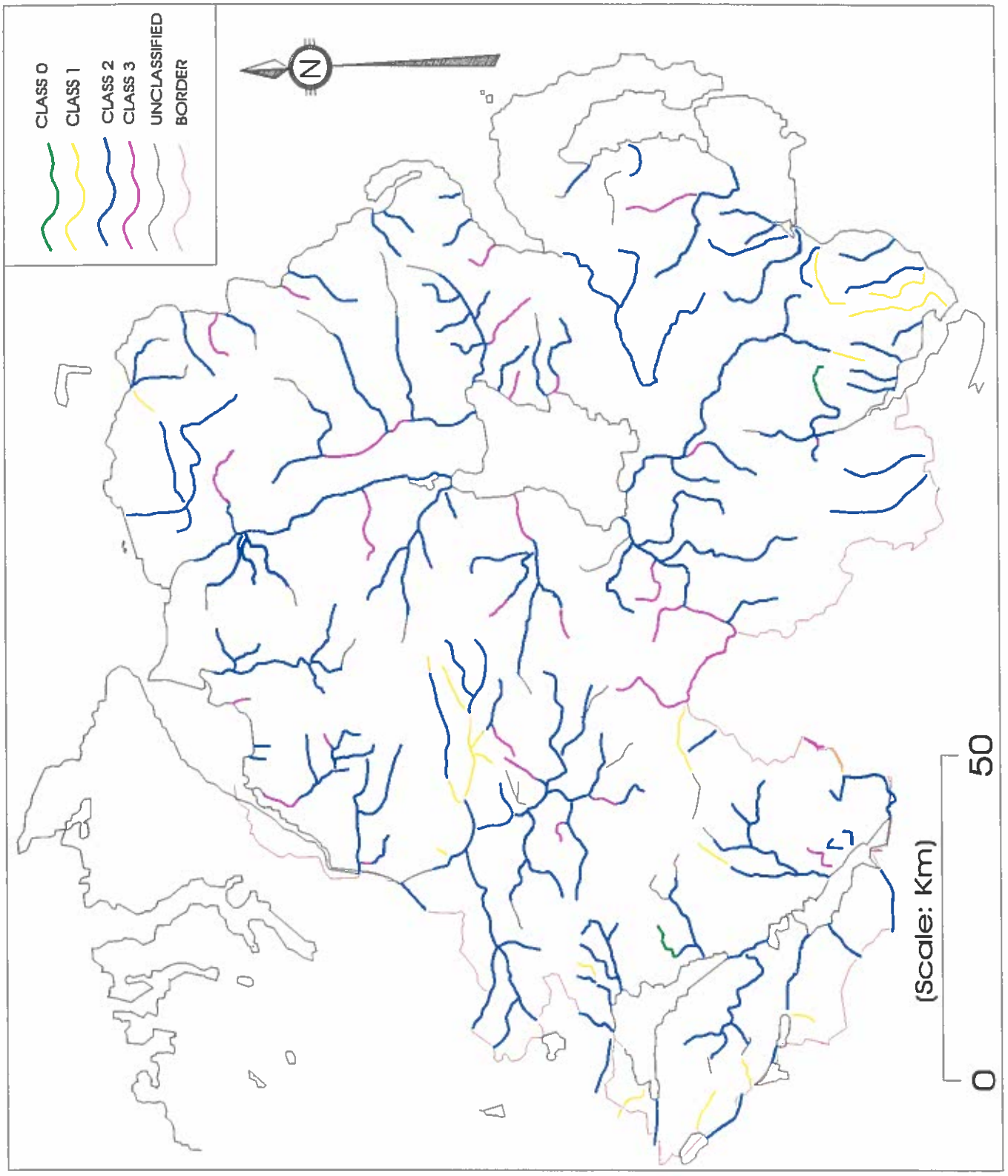


FIGURE 3. MTR BANDS FOR 1996.



6.0 DISCUSSION

For convenience the discussion is divided into sections relevant to the separate means of classification.

6.1 Haslam Classifications 1996

As pointed out in earlier reports there is a measure of subjectivity in allocating Haslam classes to recorded macrophyte assemblages. Whilst this variability can be minimised by the imposition of a rule based decision making process it is still likely that minor fluctuations may occur due to the inherent subjectivity of the classification technique. For these reasons temporal trends will ultimately be more important than fluctuations between one class or another. Where changes of one class or less occur between years at specific sites these are more likely to reflect the limitations of the classification as much as constituting evidence of significant change in trophic status.

Where changes of more than one class occur at individual sites between years then these are more likely to reflect actual changes in trophic status between years.

Reference to Appendix 3 shows that by far the majority of sites have not changed Haslam Class between 1995 and 1996.

The year on year changes in Haslam Class are given in Appendix 3.

6.2 Changes in Haslam classifications 1995 to 1996

6.2.1 Foyle Catchment

In the Foyle River Catchment the overall pattern between 1995-96 has remained relatively stable. The more oligotrophic waters continue to be in the head water sections particularly in the Sperrin Glen Rivers and the upper sections of the Derg and Burndennet systems. This conclusion is supported by the invertebrate data.

Of particular concern is the apparent enhanced degree of trophication in a number of the rivers that were identified as being quite enriched in the 1995 survey. These include the Mourne Beg (1995 oligotrophic/mesotrophic to 1996 upper mesotrophic-Figures 1 and 2) and the mid and lower sections of the Fairywater (going from generally oligotrophic in 1995 to upper mesotrophic in 1996). Similar examples could be cited for the Cloghfin, Eskragh Water and upper Owenreagh Rivers.

Although it might be argued that the enhanced ability of the surveying staff would have contributed to the generation of a more comprehensive species list in 1996 this would ultimately not affect the classifications significantly. Rather the classifications clearly indicate that considerable sections of river within the River Foyle Catchment are showing classic signs of nutrient enrichment.

The net result of this enrichment is the presence of dense macrophytic growths in an appreciable length of rivers in this catchment. Physically these growths will impair water use. For example fly fishing will be constrained, water abstraction will become more difficult and the use for recreational canoeing or bathing would be curtailed. Additionally water quality in reaches where extensive macrophyte growths occur is prone to major fluctuations in pH and Dissolved Oxygen as the direct consequence of respiratory and photosynthetic processes. Not only do these variations in chemical quality have potentially significant implications for the biological quality of these reaches, they are ultimately likely to lead to the downgrading of the classification of these reaches based on General Quality Assessment (GQA) parameters.

6.2.2 Faughan and Roe R Catchments

The changes in classification between 1995 and 1996 for the River Faughan and Roe appear significant. Gone are the sections included in the dystrophic category recorded in 1995 which are largely replaced by their inclusion in the oligotrophic category. In both years these rivers show modest evidence of enrichment but the most significant feature is the removal of the lower River Faughan from the eutrophic category in 1996 which would probably more accurately describe the trophic status of this stretch of river.

The inclusion of the Burnfoot River in the mesotrophic band (*cf* dystrophic in 1995) reflects the increased pressure from agricultural pollution during 1996. The nutrient status of the Muff Burn has apparently improved between years reflecting a decline in the number of recorded agricultural discharges affecting the river during 1996.

6.2.3 Lough Neagh Catchment

In general terms the 1996 Haslam Classifications present a slightly bleaker picture than was evident in 1995. Considerably shorter lengths of river were classified in the oligotrophic and oligo-mesotrophic bands (see Figures 1 and 2). The general indications from the 1996 data are that the rivers in this catchment are showing somewhat more signs of nutrient enrichment. This is evident in the more enriched rivers such as the Lower Bann, the lower sections of the Tall River and the lower sections of the Upper River Bann.

Of particular interest is the fact that the Haslam Classifications for the Sixmilewater remain unchanged despite allegations of reduced macrophyte biomass and species diversity in recent years. In contrast almost all of the tributaries of the Sixmilewater appeared to be more nutrient impoverished in 1996 than was the case in 1995.

In general terms the rivers in this catchment show a highly variable degree of nutrient enrichment based on the Haslam Classifications but by far the dominant classifications lie in the mesotrophic or more nutrient enriched bands.

6.2.4 North Antrim Coast Catchment

With the exception of the Tow and Glenshesk Rivers the remaining water courses in the Antrim Glens catchment were exclusively in the lower mesotrophic Haslam Classes. Given that these rivers flow through the less intensively farmed areas of the Antrim Plateau it is perhaps surprising that these rivers are not oligotrophic. The sources of the nutrient inputs responsible for this enrichment must be assumed as being related to farming practice in the absence of point sources of nutrient enrichment.

The most obvious changes in the trophic status between 1995-96 in the North Antrim rivers occur in the Glencloy, Glendun and Carey Rivers. These were all included in the upper mesotrophic class in 1995 and these are now included in the lower mesotrophic class. In contrast many of the remaining rivers appear to be slightly more enriched but these changes are sufficiently subtle as to be of only academic interest. By far the biggest change between years occurs on the Tow River which was including in the eutrophic class in 1995 and which was upgraded to oligotrophic in 1996.

In contrast the River Bush system appears to be generally more enriched in 1996 than was the case in 1995. Whether these changes are real or illusory is perhaps academic. What is clear is that agricultural enrichment of this river is exerting a significant effect on the flora and remedial action may become necessary if the salmonid fishery is to be maintained and improved.

The MTR based classification confirms that both the Bush and the Antrim Glen rivers are generally showing signs of unexpected nutrient enrichment with only the Tow River being included in Class 1.

6.2.5 South Antrim and North Down Catchments

The changes between years on the Kilroot River and the Cully's Burn are negligible being nutrient poor in both years. In contrast there appears to have been some improvement in the trophic status of the Woodburn River.

The trophic status of the River Lagan appears to have deteriorated somewhat between 1995-96. However, these changes are relatively minor and the classifications still appear valid given the dense macrophyte cover observed on the River Lagan below Moira each summer.

The changes in the trophic status of the Enler and Blackwater Rivers in Co Down are insignificant with the former again showing an enhanced degree of enrichment. The trophic status of the Ballynahinch River shows what appears to be a slight improvement but this is more likely to reflect the insensitivity of the Haslam Classification system. The status of the nearby Blackwater remains unchanged.

6.2.6 South Down Catchment

With the exception of the Clanrye/Newry River system there have been very few changes in the trophic status of the rivers in this catchment between 1995-96. The majority are again either oligotrophic or oligo-mesotrophic which would be regarded as being close to the natural status of these rivers. In contrast the enriched nature of the Blackstaff River was apparent in both years.

The dystrophic status of the upper section of the Clanrye River was evident in both monitoring years despite the fact that inorganic nutrients would not be limiting in this stretch of river. Macrophyte inhibition is suspected.

In contrast the downstream reaches between Crown and Sheep Bridges show an enhanced level of trophication in 1996. Whether this is a deteriorating trend or merely an anomaly in the data set will only become apparent in future years but the situation should continue to be monitored.

6.2.7 Lough Melvin Catchment

The Roogagh and County Rivers were both classified as being oligotrophic in 1996 which indicates a slight improvement in trophic status since 1995. Again this may be a reflection of the relative insensitivity of the classification technique used.

6.2.8 Lough Erne Catchment

The trophic status of the rivers in the north of the catchment including the Garvary, the Waterfoot, the Termon, the Bannagh and the Kesh system has shown very little evidence of change between the two monitoring years. In both cases these rivers tend to be either oligotrophic or bordering on nutrient poor. However there is some indication of enhanced enrichment in both the Glendurragh River and its tributary the Dooraa.

The Haslam classifications for the Ballinamallard River system show a slight measure of improvement in 1996 compared to 1995. Whether this is real or illusory remains to be confirmed by future monitoring. However what appears to be a dystrophic section of river in the Irvinestown Tributary perhaps reflects macrophyte inhibition rather than the absence of trophication (see Section 6.6).

The classifications achieved by the Sillees River in 1996 are similar to those obtained in 1995 whereas there is evidence of a slight improvement in the trophic status of the Arney River. Similarly there appears to have been some slight measure of improvement in the trophic status of the Colebrooke River. The Haslam classifications for the Swanlinbar and Woodford Rivers remain stable.

In contrast there appears to have been a significant improvement in the trophic status of the upper Lackey River at Knockballymore (EHS Reference 36/08/R900) from upper mesotrophic in 1995 to oligotrophic in 1996. Given the very poor invertebrate

biology of this reach there may be grounds to suspect a toxic response in this section of river.

6.2.9 Summary of changes in Haslam Class

As stated elsewhere in this text the Haslam Classification while being a useful assessment technique in monitoring river trophication it has a number of shortcomings. These include the fact that macrophyte abundance is ignored in the classification and additionally that the species lists used are far less comprehensive than those used in the calculation of MTR. For these reasons coupled with the slightly subjective means of allocating classes, the classifications would be expected to inherently vary to some degree.

In interpreting change in the real sense it is probably realistic to assume that changes of one class between years are unlikely to be significant. By the same argument then changes of more than one class, either upwards or downwards, are more likely to evidence real change.

The changes in Haslam Class are given below in Tables 2 and 3. The former gives a list of classes where the classifications have deteriorated between 1995 and 1996 *ie* become more eutrophic. The latter lists sites where the classifications have improved *ie* Show less evidence of trophication.

Table 2 Upward Changes in Haslam Class Between 1995 and 1996

River	Location	Site Reference Code	Haslam 1995	Haslam 1996	Class Change
Fairywater R	Monaghan's Br	01/09/R400 - 180	2.5	4.5	2
Burnfoot R	Rosshalt	02/03/R631 - 268	1	3	2
Fairywater R	Mullanatoomog	01/09/R200 - 182	2	3.5	1.5
R Faughan	Legaghory	02/01/R492 - 173	1	2.5	1.5
R Roe	Dungiven	02/02/R500 - 025	1	2.5	1.5
Upper R Bann	Mt Bridge	03/05/R050 - 045	3	4.5	1.5
Dervock R	Dervock	04/01/R835 - 092	2	3.5	1.5
R Lagan	Lisburn	05/01/R400 - 097	3	4.5	1.5
Kilroot R	Kilroot	05/05/R430 - 216	1	2.5	1.5
Lough-a-Hachie	below Moorlough	36/02/R247 - 277	3	4.5	1.5
R Finn	Clady Bridge	01/03/R300 - 003	2.5	3.5	1
Mourne Beg	Mourne Bridge	01/05/R600 - 006	2.5	3.5	1
Glenlark R	Glenlark Bridge	01/07/R243 - 204	1	2	1
Roulting Burn	Brown's Bridge	01/11/R905 - 207	2.5	3.5	1
R Faughan	Park	02/01/R360 - 272	1	2	1
R Tall	Derby's Bridge	03/06/R520 - 071	2	3	1
Oona Water	Oona Bridge	03/06/R705 - 060	2	3	1
Black Burn	Mount Cottage	03/09/R245 - 210	3	4	1
R Lagan	Drum Bridge	05/01/R250 - 104	3.5	4.5	1
Moygannon	Moygannon Ford	06/02/R755 - 219	1.5	2.5	1
Waterfoot R	Leiter Bridge	36/01/R360 - 265	1.5	2.5	1
Silllees R	Carr Bridge	36/13/R550 - 164	2.5	3.5	1
Silllees R	Drumanure	36/13/R620 - 168	2.5	3.5	1

For completeness Table 2 includes a number of sites which have changed by only one class. It is the sites which have deteriorated by more than one class that are perhaps the more important. It is immediately obvious from the list that all of the river reaches which have declined by more than one class all have a documented pollution history based on the invertebrate monitoring.

The Fairywater is represented in this list by the 2 most upper monitoring sites at Monaghan's and Mullanatoomog Bridges respectively. Intuitively the flora of these sites would be acknowledged as being low grade being abundant in terms of cover but not particularly diverse. The invertebrate data from Monaghan's Bridge particularly has indicated an ongoing pollution problem the source of which has not been fully investigated. The macrophyte data merely serve to support the need for detailed investigation especially as fishery enhancement work is planned for this river.

The Burnfoot R is known to suffer from intermittent farm pollution and this appears to be reflected in the Haslam Class for 1996. Similarly the pollution problems at Legahory on the River Faughan have been documented (see TI 93/7303) as have been the stress problems on the R. Roe and hence the decline in the trophic status of these sites might have been predicted.

Although the classification of the Upper R Bann (03/05/R050) is intuitively accurate and can be corroberated by invertebrate data it does give rise to concern as to whether or not this section of river is deteriorating further. Further detailed study of this section of river in terms of its chemical sediment quality should be considered as a matter of urgency. Below this the remaining river reaches that have deteriorated in terms of their trophic status hold no surprises. These include the Dervock (intermittent agricultural pollution), R Lagan at Lisburn (sewage and industry), and the Kilroot and Lough-a-Hache Rivers both of which receive intermittent agricultural pollution.

This method of analysis clearly indicates that the Fairywater and Upper R Bann should be given priority status for further intensive study.

The sites listed below are those where the trophic status of the reaches appear to have improved between 1995 and 1996 *i.e.* These reaches appear to have improved due to low levels of enrichment. These are considered in more detail in this section. As with the reaches that have shown a decline in Haslam Class it is the reaches showing the greatest degree of change that are the more important in terms of monitoring year on year changes.

Table 3 Downward Changes in Haslam Class Between 1995 and 1996

River	Location	Site Reference Code	Haslam 1995	Haslam 1996	Class Change
Upper R Bann	Gilford	05/05/R281 - 283	5	3.5	-1.5
R Blackwater	Verner's Bridge	03/06/R025 - 055	5	3.5	-1.5
R Blackwater	Moy	03/06/R125 - 056	4	2.5	-1.5
R Blackwater	Burn's Bridge	03/06/R245 - 229	4.5	3	-1.5
Woodburn R	Courtaulds	05/05/R655 - 214	4	2.5	-1.5
Newtownbutler	Newtownbutler	36/02/R405 - 276	5	3.5	-1.5
Glenmornan R	Ballymagorry	01/01/R615 - 199	5	3	-2
Castle R	Drummond	03/02/R720 - 042	5	3	-2
Doagh R	Dunamoy	03/02/R965 - 226	5	3	-2
R Blackwater	Caledon	03/06/R225 - 057	5	3	-2
Ballymoney R	Ballymoney Br	03/10/R550 - 086	5	3	-2
Lackey R	Knockballymore	36/08/R900 - 153	4	2	-2
R Faughan	Mobuoy	02/01/R200 - 019	5	2.5	-2.5
Muff R	Mill Bridge	02/03/R112 - 266	5	2.5	-2.5
Fourmile Burn	Fifty Acres	03/02/R374 - 227	4.5	2	-2.5
Coney Glen	Coney Glen Br	01/07/R305 - 256	5	2	-3
Ballygawley R	Lismore Br	03/06/R927 - 230	5	2	-3
Tow R	Gasworks	04/02/R210 - 194	5	2	-3

As with the sites that have shown a decline in trophic status between 1995 and 1996 (see Table 2) the list of sites which appear to have improved (see Table 3 above) also contains many of the sites where persistent or periodic pollution pressure is either suspected or has been confirmed based on invertebrate biological and chemical data. What is perhaps surprising is the extent of the changes in the Haslam Classes with three sites dropping from eutrophic (Class 5) in 1995 to oligotrophic (Class 2) in 1996.

From examination of the 1995 data set on which the sites recorded in Table 3 were classified obvious trends are evident. In all but three cases the sites were included in the more trophic bands as the result of the occurrence of significant growths of either the blanket weed, *Cladophora* spp or diatomaceous algal films. In both cases these growths are most commonly associated with intermittent enrichment events such as agricultural discharges. By their very nature these growths appear rapidly and can disappear equally rapidly. In addition their extent is strongly related to low flow conditions and prolonged periods of sunshine. Both factors were a major feature of 1995.

In contrast the 1996 flows were higher which would naturally restrict the substantial growths of both blanket weed, *Cladophora* spp or diatomaceous algal films as both are

inherently unstable in higher flow regimes. Their relative absence from these sites in 1996 would be interpreted as being the result of their transitory nature, the availability of only normal levels of axenic radiation and the higher flow levels that were experienced in 1996. The changes in classification between years would appear to be more of a natural phenomenon than evidence of a reduction in nutrient loadings between years.

The three sites that were upgraded on the basis of rooted macrophyte growths rather than on the basis of primary production were the Upper River Bann at Gilford and the River Blackwater at both Verner's and Moy Bridges. The latter appear to be a function of elevated flows affecting the flora of the R Blackwater in 1996. For example, plants such as the burr reeds, *Sparganium emersum* and *S. erectum* which favour shallower waters disappeared from the survey reach between 1995 and 1996.

The former is much more difficult to explain especially as it lies in a stretch of water where theoretically nutrients should not be limiting on the basis that there are several significant STW discharges upstream. Admittedly the main discharge from Banbridge has a phosphate reduction plant in operation but discharges from Lenaderg and Lawrencetown would be expected to maintain plant growths at Gilford but this is not the case. Given the current sensitivities regarding the quality of the Upper R Bann it would be recommended that further more intensive biological surveying should be undertaken in 1997 especially given the modest invertebrate data sets derived from the 1996 monitoring programme.

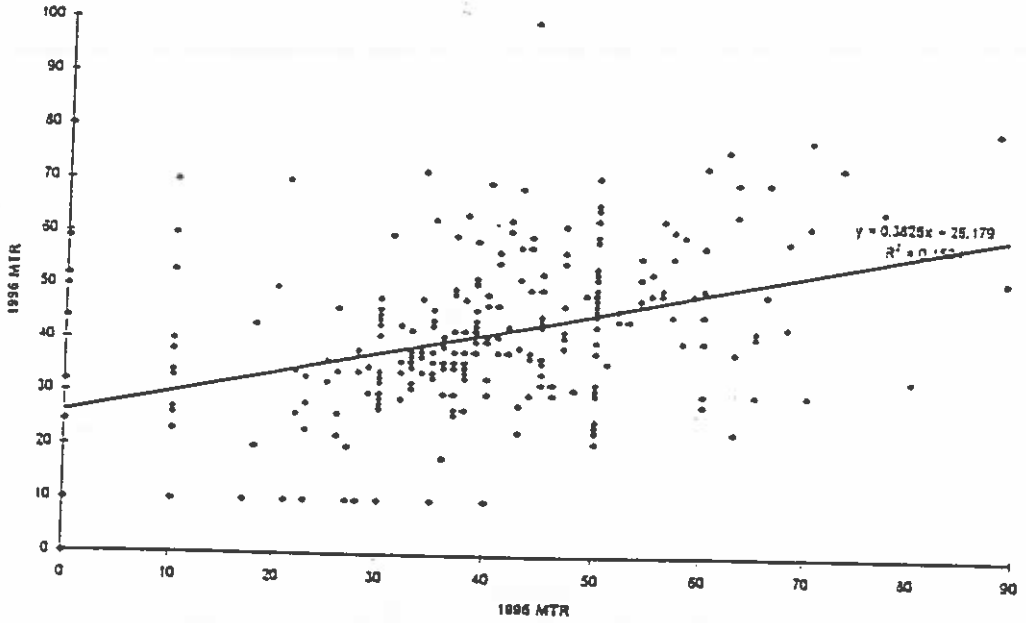
It might be sigificant to note that the relatively short list in Table 3 includes three sites on the River Blackwater. This may be significant and should be carefully monitored in 1997 in order to establish whether there is an ongoing and relatively rapid biological change occurring.

6.3 MTR values 1996

The MTR values recorded in 1996 are generally higher than those derived from the previous sampling year (see Appendices 3 and 4). The reason for this is that the field staff received an advanced training course in the identification of aquatic bryophytes prior to the initiation of the 1996 survey. This important group is recognised as being both difficult to identify and of considerable importance in trophication assessment in rivers. Indeed many are awarded the highest Species Trophic Rankings (STR) that when summed have a disproportionately high effect on the MTR values from specific sites.

The ability to recognise these high STR macrophytes can ultimately have either a positive or negative effect on site MTR values. Reaches that would have been previously classified as dystrophic by virtue of the fact that no macrophytes were recorded would naturally tend to be included in Haslam Class 2 (oligotrophic) but there is very little evidence of this occurring (see Figures 1 and 2).

Figure 4 1995 -1996 Correlation of MTR Value



However it is obvious from a year on year plot of site MTR values that there is little direct correlation between the MTR value obtained from specific sites in the two survey years (see Figure 4). How much of this disparity can be explained in terms of real change and how much relates to improved surveying skills cannot be fully evaluated at this time. It is the further development of the field surveying techniques, development of identification skills and the elaboration of a discriminatory, classification-orientated system which is essential to the more complete and scientifically defensible interpretation of MTR in the context of river or catchment trophication. Only at that time should the use of the Haslam system, with its shortcomings be replaced by a classification/monitoring tool based on MTR.

6.4 Changes in MTR for 1995-96

As MTR is a relatively recent tool developed primarily for the detection of sensitive waters under the EU Urban Waste Water Treatment Directive it is perhaps premature to attempt to measure changes between years for general water quality assessment. This situation is exacerbated by the fact that the tectnique is relatively new in the Northern Ireland context and the expertise continues to develop.

However, in order to critically evaluate MTR it is important to seek trends in the data set and to critically assess whether and more importantly why changes occur. It is inappropriate in this report to attempt to explain all of the changes that occur in the MTR scores and for this reason only the reaches that show the highest year on year changes will be considered. These are listed in Tables 4 (sites where the scores have decreased since 1995) and 5 (sites where the scores have increased since 1995).

It is readily apparent from Table 4 that the list contains two differing types of site *i.e.* those which are known to be subject to pollution stress and those which are naturally low nutrient rivers. Examples of the former include Cully's Burn, Killyclogher Burn, Rhone, Bessbrook *etc.* The latter set includes the Glenaan and Glencloy Rivers in the Antrim Glens. However, the balance is very much in favour of the river reaches which are known to be polluted.

It could be implied that the downward changes in score that are evident in the 1996 data set when compared with 1995 reflect pollution induced biological change which need not necessarily be associated with trophication alone.

As with the analysis of change in Haslam Class it is interesting to note that the R Blackwater system again has a disproportionate representation in what are sites that are showing evidence of biological change, if not decline.

Table 4 - Sites where the scores have decreased since 1995

River	Location	Site Reference	1995 MTR	1996 MTR	% Change
Cully's Burn	Glenavna	05/05/R752 - 213	40	10	-75
Clady R	Dunadry	03/02/R602 - 223	35	10	-71
Killyclogher	Killyclogher	01/10/R133 - 258	30	10	-67
Rhone	Clonteevy	03/06/R530 - 061	30	10	-67
Bessbrook	Glassdrummond	06/01/R720 - 119	30	10	-67
Blackwater	Caledon	03/06/R225 - 057	28	10	-64
Glenavy	Leap Br	03/04/R100 - 044	63	23	-63
Blackwater	Burns Bridge	03/06/R245 - 229	27	10	-63
Burndennet	Burndennet Br	01/02/R100 - 002	80	33	-59
Oona Water	Oona Bridge	03/06/R705 - 060	50	21	-58
Cullywater	Carrive	06/02/R285 - 233	70	30	-57
Glenaan	Cushendall	04/02/R515 - 190	23	10	-57
Glencloy	Carnlough	04/02/R702 - 198	50	23	-54
Drumquin R	Drumquin	01/09/R705 - 181	65	30	-54
Torrent R	Newmills	03/06/R410 - 063	60	28	-53
Finn R	Rossfea	36/08/R525 - 279	21	10	-52
Quiggery Water	Sessiagh Br	01/11/R575 - 205	50	24	-52
Lissan Water	Drumgrass	03/07/R635 - 243	50	24	-52
Castle R	Drummond	02/02/R750 - 026	50	25	-50
R Main	Gracehill	03/01/R200 - 031	36	18	-50
Sixmilewater	Ballycushan	03/02/R350 - 040	60	30	-50
Erne	Belleek	36/01/R205 - 263	50	25	-50

It is readily evident from Table 5 that the sites which have shown any substantial increase in MTR are those which support relatively modest plant communities both in terms of diversity and relative abundance. These vary from sites in nutritionally poor rivers such as the Owenkillew R to sites which support modest plant communities due to being impacted by pollution. The net result is the same, the most difficult macrophytes to speciate (mosses and lichens) assume a much greater importance in

these reaches. The identification skills of the 1996 surveyors had been improved by training prior to the 1996 survey. Hence the recording of mosses and liverworts would have been more compete for the 1996 study. This will probably explain the increases in MTR scores for the sites given in Table 5.

Table 5 - Sites where the scores have increased since 1995

River	Location	Reference Code	1995 MTR	1996 MTR	%Change
Owenkillew	Drumlea	01/07/R205 - 177	40	70	75
Annacloy	Annacloy Br	05/02/R200 - 109	26	46	77
Owenkillew	Monanameal	01/07/R340 - 255	35	63	80
Trillick R	Carran	36/06/R805 - 143	31	60	94
Roogagh	Garrison	35/01/R010 - 171	34	72	112
R Blackwater	Derrymeen	03/06/R300 - 062	44	100	127
Foregien R	Dungorkin	02/01/R717 - 275	10	23	130
Fourmile Burn	Fifty Acres	03/02/R374 - 227	18	43	139
R Strule	Abbey Bridge	01/08/R850 - 012	20	50	150
R Roe	New Bridge	02/02/R400 - 024	10	26	160
R Tall	Drumard Bridge	03/06/R503 - 070	10	27	170
Killyclogher	Lover's Retreat	01/10/R128 - 200	10	33	230
R Finn	below Rosslea	36/08/R505 - 159	21	70	233
R Lagan	Shaws Bridge	05/01/R200 - 095	10	34	240
Muff R	Mill Bridge	02/03/R112 - 266	10	38	280
Moygannon	Moygannon Ford	06/02/R755 - 219	10	38	280
Faughan R	Ardmore	02/01/R390 - 175	10	40	300
Doagh R	Dunamoy	03/02/R965 - 226	10	53	430
Enler	Kennel Bridge	05/04/R200 - 114	10	53	430
Coneyglen	Coneyglen	01/07/R305 - 256	10	60	500
Tow	Gasworks	04/02/R210 - 194	10	70	600

6.5 MTR classification

The MTR based classification has been applied to the 1996 data for the first time. The fact that it is based on a three band system tends to mean that it is relatively insensitive to subtle changes in trophic status that are evident in the Haslam classes. Reference to Figure 3 shows that the majority of river reaches are included in Class 2 ie waters that are enriched or showing the potential to become enriched.

In contrast very few rivers are included in MTR Class 1 and as might be expected these tend to occur in the Lough Erne Catchment, Sperrin Glens and South Down (see Figure 3).

It is perhaps the rivers that are included in Class 3 that produce the most surprises. For example whereas the upper River Blackwater would intuitively be included in the mesotrophic band MTR includes it in Class 3 ie waters that are already enriched and with a degraded macrophyte flora. In contrast the middle and lower sections of the River Lagan which are known to be highly enriched are included in MTR Class 2.

Other surprises in the MTR classifications include the failure to recognise the enrichment of the Drumnagreshial Tributary of the Bannagh River and yet it includes the Creevan Burn which is only slightly enriched in Class 3.

The sensitivity of the river classification could undoubtedly be increased by the inclusion of more bands in the system in much the same way that the number of bands has been increased for GQA chemistry and biology. It is acknowledged that too little experience is available at this time to produce an effective banding system. However, it is apparent that the lack of discrimination in a three band system applied to NI data merely results in most reaches rightly or wrongly being included in the largest band *ie* Class 2. This feature then impinges on the other bands to the extent that very few river reaches in Northern Ireland are included in Class 1 - rivers that are unlikely to be enriched and rivers such as the River Lagan which are known to be highly nutrient enriched are not recognised as such.

6.6 Relative Abundance

The relative abundance of macrophytes in rivers is a critical parameter in the complete interpretation of macrophyte data in the context of trophication assessment. The standing biomass in a river reach is ultimately dependent on the availablity of suitable nitrogen and phosphorus sources in either the water or the sediments of the reach. With the exception of a limited number of nitrogen fixing species these nutrients largely arise from allochthonous (external) sources. In addition particular plant species are susceptible to extreme levels of nutrients. Thus while the standing crop can be high in an enriched reach, the species composition is likely to be reduced due to pollution interferences.

Most plant surveys are reduced to one visit at some point over the Summer period. Invariably the peak relative abundances will be missed in most reaches because of the limitations on the timings of specific surveys frequently not being contemporary with maximum plant growth. In addition the excessive growths of algal species such as diatomaceous algae or *Cladophora* spp can occur and disappear relatively quickly when conditions are transiently favourable. These then are largely encountered by chance when surveys are contemporary with the transient occurrences of these growths.

Despite these limitations relative abundance can yield valuable clues regarding the trophic status of Northern Ireland's rivers. The complete relative abundance records for the Biological River Monitoring Programme sites are recorded in Appendix 3. The high proportion recorded to places of decimals is a feature of the method of surveying employed rather than a highly accurate measurement. For example, species present in very small amounts are recorded as 0.1% whereas others that are merely present within the survey reach would be noted as 0.01%. The net result of summing is a value on occasions to two decimal places giving an appearance of accuracy that is artificial.

Similarly a significant number of sites produced relative abundances >100% cover. This occurs where the growth of higher plants is covered with growths of algal species.

It is not possible within this report to examine each and every site with regard to the trends in biomass. However it is important to understand what is happening in the more extreme cases. For this reason the top 20 sites in terms of relative abundance and the lowest 20 sites in terms of relative abundance will be considered in greater detail below. The features of these more extreme cases are summarised in Tables 6 and 7 below.

6.6.1 Sites with high relative macrophyte abundances

It is readily apparent from Table 6 that the majority of sites with very high relative abundances are dominated by algal species. Of these top 20 sites all but 3 are susceptible to heavy infestations of algal species. The three sites with limited algal cover are the Eskragh Water (01/11/R830) and the R Lagan at Youngs and Lisburn Bridges (05/01/R550 & 05/01/R400 respectively). All three of these sites are known to be highly enriched. The former due to periodic agricultural pollution and the latter two due to a range of nutrient inputs exacerbated by the enrichment of the river sediments.

Table 6 Giving the 20 sites surveyed which supported the highest relative abundances of macrophytes in 1996

Rank	*River*	*Location*	*Dominant macrophytes*
1	Tynan Water	A28 Road Bridge	Cladophora, Vaucheria
2	Ballynahinch	Below B'hinch	Cladophora, diatoms, S. emersum .
3	Fourmileburn	Newmill	Cladophora, diatoms, mosses
4	Blackwater	Caledon	Cladophora, Vaucheria,
5	Annacloy	Annacloy Bridge	Lemanea, Hildenbrandia, filamentous greens
6	Tall	Clonmarn	Cladophora, Lemna spp., Nuphar
7	Muddock	Muddock Bridge	S. emersum, diatoms, mosses
8	Main	Dundermot	diatoms, P. natans, S. emersum
9	Ballycassidy	Ballycassidy Bc	Cladophora, Vaucheria, filamentous greens
10	Ballynahinch	Caseys Bridge	Cladophora, Callitriche
11	Blackburn	Mount Cottage	Cladophora
12	Finn	Ballyboe	Cladophora, S. emersum, S. erectum
13	Braid	Tullaghgarley	Cladophora, Ranunculus penicillatus
14	Lagan	Wolfendens	Cladophora, P. pectinatus, P. crispus
15	Main	Gracehill	Cladophora, diatoms
16	Eskragh Water	Seskinore Mill	S. emersum, P. natans, C. obtusangula
17	Lagan	Young's Bridge	Nuphar, Cladophora, P. natans, Lemna spp.
18	Glenmornan	Ballymagorry	Cladophora, diatoms, A. riparium
19	Lagan	Lisburn	Lemna spp., P. natans, E. canadensis
20	Faughanvale	Faughanvale Br.	Cladophora, diatoms

The remaining 17 sites all have a history of either point or intermittent pollution problems all of which contribute to the high macrophyte relative abundances recorded. What is perhaps perturbing is the extent of the problem and its range of geographical distribution. In this context more detailed catchment surveying in conjunction with nutrient budgets including both water and sediment components might be appropriate

in subcatchments or catchments where remedial action may become necessary. The obvious target areas would be those where catchment management plans exist.

6.6.2 Site with low relative macrophyte abundances

The absence of macrophytes from a reach can be associated with range of environmental conditions. These include, areas of unstable substrate (eg gravel/sand in a high velocity reach), high turbidity waters, acidic waters, waters naturally dystrophic (very poor in terms of nutrients), and waters which contain substances which are inhibitory to the growth of macrophytes, amongst others.

Reference to Table 7 clearly demonstrates the range of rivers that support at best only low macrophyte abundances. Many are clearly the result of being nutrient poor river reaches in upland watercourses. From Table 7 the following sites would be identified in this group (using the coding from the Table): 1, 3, 5, 10, 12, 13, 15, 18, and 19. Two other sites can be removed from the list on the grounds that both the macrophyte and invertebrate data for these stations indicate a degree of acidification. In the case of the former the macrophytes resident in both the Coneyglen Burn and the Glenlark River are restricted to acid tolerant species of mosses typical of acidic upland streams.

This leaves a core of eight sites which are restricted in the abundance of their resident macrophytes for reasons which are less readily apparent than are recorded above. What is common to these eight sites is the fact that the resident invertebrate communities show persistent signs of stress to a greater or lesser degree.

Table 7 listing the 20 sites with the lowest recorded macrophyte relative abundance values recorded during 1996

	River	Location
1	Glenelly	Sperrin
2	Finn	Rosslea
3	Colebrooke	Pollboy
4	Six Mile Water	Ballycashan
5	Moyola	Fortwilliam
6	Irvinestown	Necarne
7	Burntollet	Burntollet Bridge
8	Bessbrook	Millvale Bridge
9	Lower Bann	Toome
10	Owenkillew	Monanamneal
11	Lackey	Knockballymore
12	Manyburns	Many Burns Bridge
13	Tow	Old Gas Works
14	Finn	Below Rosslea
15	Owenreagh	Drumlea
16	Clanrye	Barnmeen
17	Glenlark	Glenlark Bridge
18	Owenkillew	Drumlea
19	Glenmacoffer	Glenmacoffer Bridge
20	Coneyglen	Coneyglen Bridge

The inclusion of the Six Mile Water site at Ballycushan (03/02/R350) is suspicious as this is within the area where local angling interests have suggested that there has been a decline in macrophyte abundances over the last number of years. The neighbouring upstream station below Ballyclare (03/02/R500) at first sight appears to support a much more abundant flora with a total cover recorded as being 19.4% in 1996. However more detailed scrutiny of the data set reveals that the blanket weed, *Cladophora* spp and the canary reed grass *Phalaris arundinacea* account for 3% and 15% respectively. The former could be regarded as an indicator of periodic enrichment whereas the latter is an emergent grass that is not subject to the full rigours of any inhibitory chemicals that may be present in the water column. In addition, the absence of the water crowfoot, *Ranunculus penicillatus var penicillatus* from a river system where it is generally common is suspicious. Taking these factors together the situation does merit further more detailed investigation.

Two sites which form a slightly unique cluster are those on the R Finn above and below Rosslea STW (36/08/R525 and 36/08/R525 respectively). In the case of the latter the impoverished plant community in terms of biomass could be explained in terms of shading and unstable substrate which is primarily sand in this reach. However, neither constraint could be applied to the upstream site which has significant proportions of hard, stable substrates and the relative absence of shading. The fact that there is an obvious absence of macrophytes in a reach which is physically suitable and is known to be prone to nutrient inputs from agricultural sources is suspicious and merits further investigation particularly as the invertebrate fauna of this section of river is also suppressed on most occasions since monitoring began.

Of the remainder the suppression of plant biomass in the Burntollet (02/01/R903) is most likely to be a function of excessive shading and in the case of the Toome Bridge site (03/10/R490) it is more likely to be associated with the fact that most of the available nutrients have been removed by algal metabolism.

This leaves a core of three sites which appear to defy explanation. These are the Irvinestown tributary at Necarne (36/06/R700), the Bessbrook R at Millvale (06/01/R735) and the Lackey R at Knockballymore (36/08/R900). The common thread between all of these sites is the consistently poor quality status of these reaches in terms of their invertebrate biology although the likely sources of the stress observed differ somewhat. The Irvinestown tributary site is below a creamery and a sewage treatment works discharge point and hence nutrients should be anything but limiting (*c.f.* Clanrye below Rathfriland where the flora is restricted to aerial forms of the canary reed grass, *Phalaris arundinacea*). Given the absence of plants from this stretch of river in a location where nutrients should be abundant would tend to imply that there is some phytotoxic agent at work within this reach. A detailed screening of the effluent might be recommended.

Although the Lackey site is not known to be below any established point discharge and shading there may be a problem the site has a long pollution history which it has been postulated as being the result of a toxic agent. If this is the case then further investigative work would be justified. However in this context it is relevant to note that the neighbouring downstream site at Carra Old Bridge (36/08/R810) is covered in

an almost confluent growth of the burr reed, *Sparganium erectum* during the Summer low flow periods. This does not necessarily contradict the phytotoxic agent theory as the growth is virtually monospecific, however, it does clearly demonstrate that nutrients are far from limiting at least in the sediments.

The low plant biomass at the Millvale site on the Bessbrook R cannot be easily explained but the very poor invertebrate biological conditions in the reach may be relevant in terms of demonstrating the presence of an upstream pollution problem. It should also be noted that the neighbouring downstream site at Glassdrummond (06/01/R720) also supported a very poor standing crop of plants (1%) dominated by modest growths of the pollution tolerant moss, *Amblystegium riparium* despite being in a stretch of river where nutrient levels could not be limiting.

6.7 Catchment reports

6.7.1 Hydrometric Area 201 - River Foyle Catchment

The rivers in this catchment are with one exception never worse than mesotrophic. Within the range of river types based on the nutrient classification described by Haslam, river reaches in this catchment vary from a short dystrophic reach (Glensawisk Burn) to strongly mesotrophic reaches. River reaches in this relatively nutrient enriched group include the River Finn, the Mourne Beg, the Fairywater, the Owenreagh, the Eskragh Water and the Cloghfin.

By far the most enriched reach in this catchment is the upper section of the Fairywater River above Monaghan's Bridge. This reach supports a dense and extensive macrophyte community dominated by the water lily, *Nuphar lutea*, the broad-leafed pondweed, *Potamogeton natans* and the burr reed *Sparganium erectum*. This type of assemblage is typical of the more nutrient enriched watercourses of Northern Ireland such as occur in the more polluted stretches of the River Lagan. By implication it is clear that this stretch of river is indeed highly enriched. Somewhat strangely the enriched status of this stretch of river is not detected by the MTR classification system which perhaps gives the first indication that the system may need to be further fine tuned. Corroborative invertebrate data continue to indicate that this reach is subject to quite heavy levels of pollution pressure which are presumed to be related to agricultural discharges. In turn based on this assumption the macrophyte data also indicate a high degree of perturbation in this stretch of river and further remedial work would be fully justified.

Of considerable concern in this catchment are the number of river reaches which are included in the mesotrophic category particularly those towards the upper end of this classification (see Figure 2). Included in this category are the Finn, Mourne Beg, Fairywater, Owenreagh, Eskragh Water, Strule and Cloghfin Rivers. All of these reaches support dense and diverse macrophyte communities indicative of relatively higher levels of nutrient enrichment. The net result of these dense assemblages on the chemical quality of the overlying waters is likely to be evident as fluctuations in both

pH and Dissolved Oxygen. In turn these can potentially influence the resident vertebrate and invertebrate communities of the affected reaches.

The sources of the nutrients responsible are a matter of conjecture. Certainly in the case of the River Finn and the Strule below Omagh the primary sources of nutrients can be related to point discharges from food processing and treated sewage effluent. In other cases the primary sources of nutrients appear to be more diffuse and are probably related to agricultural practices. Obvious examples would include the Cloghfin, Eskragh Water and Fairywater Rivers.

Within this catchment there are still large sections of river which show very little evidence of trophication when classified using the Haslam system. These include many of the rivers in the Sperrin Glens, the upper section of the Derg Catchment and parts of the Burndennet system. In the case of the Sperrin Glen rivers even here there is some evidence of nutrient enrichment in both the Owenreagh and the Owenkillew rivers.

The river classifications based on MTR present a similar overall picture to that generated by the Haslam system. However, as it is a three band system compared to a five band Haslam Classification which can also be extended to include intermediate nutrient water quality types, MTR appears to be much less sensitive in detecting changes in water quality. Having accepted this lack of sensitivity it does throw up a number of potential problem areas that are not easily detectable in the Haslam Classification. These are the Killyclogher Burn, which receives water treatment waste and leachate from a domestic refuse tip, the Quiggery Water, which is prone to non-point agricultural pollution as well as receiving storm overflow waters from Fintona, and the Creevan Burn which will ultimately receive waters from the Gold Mine development but is currently suspected of receiving intermittent farm pollution.

In common with the Haslam Classification MTR identifies many of the river stretches in the middle band *i.e.* those which are showing a degree of existing enrichment. In contrast with the Haslam Classification MTR places relatively few stretches of river in the less enriched category 1. Category 1 rivers in this catchment are reduced to sections of the Glenelly and Owenkillew subcatchments and the Douglas Burn.

It is apparent from both classification systems that there are obvious signs of enrichment in many of the rivers within this catchment and this phenomenon is considered in slightly more detail below.

Given that in terms of the fishery potential this system is perhaps the most important catchment in Northern Ireland it is perhaps sensible to recommend that attention should be paid to nutrient reduction in these rivers. Many sections of river in this catchment are showing signs of degradation through enrichment and ultimately if this is allowed to continue there will be an associated decline in the overall biological quality.

6.7.2 Hydrometric Area 202 - River Roe and Faughan Catchment

Large sections of both the River Roe and Faughan are included in the oligo-mesotrophic classification by Haslam which is probably a defensible classification of these rivers based on the previous knowledge of the biology. The only exception to this nutrient based classification is the section of the River Roe below Limavady which Haslam includes in the mesotrophic category. The downgrading of this lower reach presumably reflects the contribution to the nutrient balance of the river from Limavady STW.

Three smaller watercourses within this subcatchment are tending towards being mesotrophic. These are the Muff Burn, the Faughanvale River and the Burnfoot. The fact that the former is included in the more oligotrophic classification is encouraging as the latter two rivers were both known to have been exposed to farm pollution during 1996 which would have undoubtedly adversely affected their trophic status.

The classification based on MTR again tends to show that the rivers in this catchment are at least showing signs of enrichment by including all sections surveyed in either Classes 2 or 3. Again this classification points up several suspicious areas. These include the Burnfoot River which is known to be subject to periodic agricultural pollution, the Foreglen River which has shown a gradual decline in the quality of its invertebrate biology over this last several years and the lower sections of the River Faughan which has been detailed in earlier longitudinal surveys (see TI 93/7303).

6.7.3 Hydrometric Area 203 - Lough Neagh Catchment

The rivers in the Lough Neagh Catchment cover virtually the full range of nutrient based river classes defined by Haslam. Relatively few areas approach the oligotrophic end of the spectrum with these being confined to sections of the Six Mile Water, upper Aghivey, upper Moyola, upper Lissan Water, Ballygawley Water, upper Kellswater and upper sections of the Upper River Bann.

Sections of this list of apparently low nutrient rivers are to say the least interesting. Throughout 1996 a number of reports were received from the angling community in South East Co. Antrim relating to a variety of pollution problems. For example there appeared to be an indication that the macrophyte community of the upper sections of the Six Mile Water was declining for some unknown reason. In particular the occurrence of the water crowfoot, *Ranunculus penicillatus*, appeared to be rapidly declining in the system. In this respect it is interesting to compare the Haslam based classifications for 1995-96 and from this it is evident that the classification of the main river is unchanged between these years. For this reason there is no obvious evidence that the macrophyte community of this section of river is showing any evidence of decline.

In contrast the classifications of the Rathmore Burn, Fourmile Burn, Doagh River, Ballymartin Water and Clady Burn tend to indicate that these watercourses are showing evidence of a gradual reduction in nutrient loadings reflected in improved Haslam classifications.

The remaining sections of low nutrient class rivers are probably defensible on the grounds that they tend to be in the upper catchments where enhanced trophication would not be expected.

While many of the rivers in the catchment are described as being mesotrophic (blue or purple in Figure 2) there are obviously problem areas where the rivers are bordering on being euthrophic. These include the lower section of the River Tall, the lower sections of the Upper and Lower River Bann. In these situations both the relative density and lack of diversity indicate high levels of nutrient enrichment.

The MTR classification again fails to recognise any Class 1 rivers in this catchment with the exception of the upper section of the River Blackwater. For the large part this would be defensible considering the problems that had been associated with Lough Neagh and its feed rivers.

6.7.4 Hydrometric Area 204 - North Antrim Coast Catchment

Based on the Haslam Classes there has been relatively little movement between classes in the years 1995-96 for the Antrim Glen Rivers. There have been movements from the oligo-mesotrophic bands into the lower mesotrophic and also movements from upper mesotrophic to lower mesotrophic. However, given the relative insensitivity of the classification method these changes are regarded as being insignificant.

By far the most significant change between the years has been the movement of the Tow River site from euthrophic down to oligotrophic. The reasons for this change are something of an enigma but they clearly reflect a high degree of change in the nutrient budget of this river.

It is somewhat surprising given the nature of this catchment that the Antrim Glen rivers are anything other than oligotrophic. Given the absence of known point discharges to these rivers it most also be assumed that the sources relate to agricultural practices.

In clear contrast significant sections of the River Bush System are showing a significant measure of trophication (see Figure 2). In this instance this phenomenon is not surprising given the intensive farming within this subcatchment.

6.7.5 Hydrometric Area 205 - South Antrim and North Down Catchments

The South Antrim Rivers including the Inver, Glynn, Kilroot, Woodburn and Cully's Burn are generally at or bordering oligotrophic based on the Haslam classification system. The only exception is, rather surprisingly the Glynn R by virtue of its unusual if diffuse floral assemblage. No explanation is offered for this phenomenon other than to cite the fact that the flora is very obviously atypical for a river of this type. The MTR based classification of these rivers includes all but the Cully's Burn (Class 3) in Class 2. Invertebrate monitoring of the latter has already established beyond any doubt its highly stressed nature and the situation obviously merits more detailed study than it has received to date.

As anticipated the Haslam Classification for the River Lagan indicates a high level of trophication. At best the waters of the main channel are at the upper end of the mesotrophic band and at their worst, between Moira and Lisburn, the classifications indicate trophic conditions approaching euthrophic. This phenomenon is not unexpected given the knowledge of the catchment usage and the significant point discharges made to the river. If anything the MTR classification confirms that the nutrient based classification of the river indicates a degree of enrichment but as it is based on a three band system it perhaps gives an impression of underestimating the actual trophic status of the river. Both classification systems clearly indicate that the Ravernet River is classified as being mesotrophic.

The Enler River is described as being mesotrophic by both classification systems whereas in contrast the River Blackwater in Co Down verges on oligotrophic according to Haslam whereas the MTR classification indicates more enriched conditions.

The upper sections of the Ballynahinch River and the Glasswater River are both classified as being in the upper mesotrophic band according to Haslam. Invertebrate data for the upper Ballynahinch River have indicated a high degree of environmental stress, the source of which has yet to be determined. However it is interesting to speculate as to whether or not the macrophyte and invertebrate problems are inter-related. Indeed both techniques used together might offer a better methodology for tracing the source of this problem. The problems in the Glasswater River are perhaps better documented in terms of nutrient enrichment with the major problems being associated with point sewage effluent discharges and intensive agriculture. Somewhat unusually the trophic status of the Ballynahinch River appears to improve in the lower reaches. The MTR based classification presents a similar picture but fails to discriminate changes in trophic status in the Ballynahinch River. However it clearly detects the level of enrichment in the Glasswater River.

6.7.6 Hydrometric Area 206 - South Down Catchment

Excluding the Blackstaff River and the Clanrye System the rivers in this catchment are either oligotrophic or bordering on oligotrophic based on the Haslam Classifications (see Figure 2). Given the physical nature of these rivers, the solid geology and the agricultural usage these classifications would be fully anticipated. However the MTR based classification presents a somewhat less rosy picture with only the Shimna, Aughrim and Whitewater Rivers being included in Class 1. This may again be the result of the inherent insensitivity of a three band system.

The inclusion of the Blackstaff and most of the Newry System in the more trophic Haslam bands is not unexpected given previous knowledge of these watercourses. The Blackstaff supports a dense but low grade macrophytic flora which would fully support its inclusion in the upper mesotrophic class. The reasons for this phenomenon are obscure but presumably relate to agricultural practices in this subcatchment and the susceptibility of this small watercourse. What is perhaps disappointing is the failure of the MTR Classification to recognise what is obviously a highly enriched watercourse.

A wide variety of Haslam Classifications are allocated to different sections of the Clanrye/Newry River systems reflecting a range of river types and associated pollution problems. For example the Jerretspass River has been prone to intermittent organic pollution which contributes to the inclusion of this river in the mestrophic Haslam class. In contrast Haslam recognises the upper section of the Clanrye River as being dystrophic despite the readily available supply of nitrogen and phosphorus compounds from Rathfriland STW in the upper reaches. This unusual phenomenon might suggest that the growth of macrophytes is being suppressed by some mechanism in these upper reaches. Further consideration of this hypothesis has been undertaken when considering the relative abundance data (see Section 6.6 above).

6.7.7 Hydrometric Area 235 - Lough Melvin Catchment

The Roogagh and County Rivers are both described as being oligotrophic by the Haslam classification which would be in total agreement with that expected given the catchment use and the underlying solid geology. However it is interesting to note that the latter is included in Class 2 by the MTR Classification. No explanation can be put forward to explain this phenomenon other than the fact that this nutrient poor river does not naturally support either a dense or diverse flora. This in turn would give rise to a low MTR score which ultimately defines its classification.

6.7.8 Hydrometric Area 236 - Lough Erne Catchment

The Haslam classification defines many of the Lough Erne Rivers as being either oligotrophic or bordering on oligotrophic. Included in this group are many of the rivers in the north of the catchment including the Garvary, the Waterfoot, the Termon, the upper sections of the Kesh River system and sections of the Bannagh River. It is interesting to note that the Drumnagreshial Tributary of the Bannagh River is included in the mesotrophic band despite the low intensity land use and absence of known point discharges in the subcatchment. This classification is fully justified as the resident flora of this stream is heavily dominated by a growth of the moss, *Amblystegium riparium*, which is a particularly good indicator of polluted conditions.

Similarly the less polluted stretches of the Ballinamallard, Tempo, Colebrooke, Sillees, Finn, Woodford and Arney Rivers are included in the less nutrient enriched categories as might be predicted.

In contrast the higher trophic ratings from Haslam are ascribed to rivers that are known to be enriched such as the Sillees (middle and lower sections), the Cleen, the lower Irvinestown and the middle sections of the Colebrooke. These all occur as the result of either non-point discharges or diffuse enrichment from semi-intensive agriculture. By far the most enriched reaches in the catchment are in the lower sections of the Finn River and in the Lough-A-Hache River. The former is influenced by domestic and industrial discharges from across the international border and the latter rises from an enriched lake.

Within this catchment only one short reach is described as being dystrophic. This is the upper section of the Irvinestown Tributary of the Ballinamallard River. This section of river has been shown to be in a highly stressed state due to commercial and treated sewage discharges from the Irvinestown area. It might be postulated that given the high levels of available nutrient that this reach should be bordering on eutrophic but this is clearly not the case. It might be implied that this phenomenon reflects some form of plant inhibition. This is discussed in Section 6.6 above.

Similarly there might be a suspicion of macrophyte inhibition in the upper section of the Lackey River based on shortcomings in the invertebrate data for the site at Knockballymore (EHS Code 36/08/R900).

7.0 CONCLUSIONS

Macrophyte monitoring is an integral part of any river programme for the detection of environmental disturbance due to nutrient enrichment. In addition it also produces corroberative evidence for sites stressed by pollution which have been detected chemically or biologically. It is therefore a cost effective means of monitoring river water quality and the changes that occur with time and should therefore be continued in future years.

The analysis of the data has shown that Northern Ireland's rivers are for the most part enriched due primarily to agricultural and sewage related sources. The level of enrichment in rivers like the Lagan, parts of the Foyle and the Blackwater is such that there is obviously scope for plant induced variations in chemical water quality with pH and Dissolved Oxygen being obvious indicators of this activity.

The survey has highlighted a number of areas that merit further more detailed studies for a variety of reasons. These include:

(i) In the Foyle River catchment the main priority area for further work is on the upper and mid-sections of the Fairywater River based on both macrophyte and invertebrate data. Subordinate areas that are showing enhanced enrichment include the Cloghfinn Eskragh Water, upper Owenreagh and Mournebeg Rivers all of which are showing signs of enhanced trophication to the extent that chemical and biological quality may also suffer.

(ii) In the Faughan and Roe catchments the most significant change that has occurred is in the Mobuoy stretch of the former from Haslam Class 5 (eutrophic) to oligo-mesotrophic. This change is significant and bearing in mind the highly variable invertebrate data from this river reach further work is recommended.

(iii) In the Lough Neagh catchment the problem areas that are readily recognisable occur on the lower sections of the Upper and Lower River Bann and the Tall River. Given the political sensitivity of the former and the loss of plant biomass at Gilford in 1996 further work in 1997 is recommended as a high priority. The Upper Blackwater appears to exhibit something of a decline in its macrophyte communities in 1996 for whatever reason. This situation should be closely monitored in 1997.

(iv) The most obvious problem in the North Antrim catchment is the highly enriched state of the River Bush. Activity to identify and reduce the nutrient loadings on this river will be necessary if the integrity of the salmonid fishery is to be maintained and enhanced.

(v) The problem rivers in South Antrim/North Down obviously include the River Lagan but the greater priority areas for further work are the Cully's Burn and The Ballynahinch system both of which are consistently subject to high levels of stress on their invertebrate communities.

(vi) In South Down enrichment is a problem on the Newry and Blackstaff River systems which merit further work but a more significant problem involving phytotoxicity may exist in the upper reaches of the Clanrye River.

(vii) In common with (vi) above similar toxicity problems are suspected in the Erne catchment in the upper reaches of the Lackey River and the upper reaches of the Irvinestown tributary. These are recommended for further investigation.

8.0 RECOMMENDATIONS

1. Annual assessment of macrophytes should continue as part of the Biological River Monitoring Programme using the most up-dated and refined methodology based on the Holmes (1995) system ie the nationally adopted system. This should facilitate the identification of trends in the trophic status of rivers.

2. The use of the Haslam Nutrient Status Banding Classification should be continued in tandem with the Holmes Trophic Ranking system. This is because there is concern at the high proportion of Northern Ireland sites which are not classified with reasonable confidence. Also it is only interpretation of the data which requires additional resources as the raw data collation for both methods is the same.

3. Northern Ireland data should be reviewed with data from the rest of the UK in order to refine the Holmes methodology and establish class defining ranges of scores.

4. A procedure for the prompt investigation of major discrepancies between Holmes macrophyte scores for subsequent Summers should be considered - initially with declines of 25% or more warranting investigation with this percentage to be reviewed.

5. As a priority additional surveys would be recommended for the following rivers:

(i) In the Foyle River catchment the upper and mid-sections of the Fairywater River;

(ii) In the Faughan and Roe catchments the Mobuoy stretch;

(iii) In the Lough Neagh catchment the problem areas that are readily recognisable occur on the lower sections of the Upper and Lower River Bann and the Tall River;

(iv) The most obvious problem in the North Antrim catchment is the highly enriched state of the River Bush;

(v) The problem rivers in South Antrim/North Down obviously include the Cully's Burn and the Ballynahinch system;

(vi) In South Down a significant problem involving phytotoxicity may exist in the upper reaches of the Clanrye River;

(vii) In common with (vi) above similar toxicity problems are suspected in the Erne catchment in the upper reaches of the Lackey River and the upper reaches of the Irvinestown tributary

The need for these surveys is discussed in detail in the body of this report and is also summarised in the Conclusions Section.

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9.0 REFERENCES

Haslam SM (1987) River Plants of Western Europe. Cambridge University Press.

Holmes NTH (1995) unpublished report to the National Rivers Authority, Anglian Region.

Standing Committee of Analysts (1987) Methods for the use of aquatic macrophytes for assessing water quality 1985-86 HMSO.

APPENDIX 1

DETAILS OF THE HASLAM CLASSIFICATION

THE HASLAM NUTRIENT STATUS BANDING CLASSIFICATION

Colour Band	Trophic Status	Example
Orange	Dystrophic	Moorland streams - size ii
Yellow	Oligotrophic	Acid sands streams size ii
Blue	Mesotrophic	Limestone streams size i, ii and iii
Purple	Mesotrophic	Clay streams, size iii
Red	Eutrophic	Nutrient rich clay streams size iv

These assemblages are as follows:

Orange	Blue	Red
Ranunculus flammula	Ranunculus spp	Epilobium hirsutum
Ranunculus omiophyilus	Phalaris arundinacea	Potamogeton spp (Broad Leaves)
Potamogeton polygonifolius	Iris pseudoacorus	
Myriophyllum alterniflora	Hippuris vulgaris	Blanket weed
Veronica beccabunga	Myriopyllum spicatum	
Potomageton natans	Potamogeton crispus	
Yellow	Mosses	Rorippa amphibia
Mentha aquatica	Potamogeton pectinatus	
Callitriche hamulata	Berula erecta	Butomus umbellatus
Juncus bulbosus	Phalaris arundinacea	Sagittaria sagittifolia
Eleocharis acicularis	Apium nodiflorum	Scirpus lacustris
Caltha palustris	Callitriche spp	Nuphar lutea
Glyceria fluitans (long leaves)	Rorippa nasturtium-aquaticum agg.	
Juncus effusus	Veronica anagallis-aquatica agg.	
Mosses (hills)	Myosotis scorpioides	
Equisetum spp.		
Oenanthe crocata	Purple	
Blanket weed (sparse on hills)	Small grasses	
Polygonum hydropiper	Sparganium erectum	
Mimulus guttatus	Alisma plantago-aquatica	
Lemna minor agg.		
Iris pseudoacorus		
Phragmites communis		
Elodea canadensis		
Glyceria maxima		
Sparganium emersum		

APPENDIX 2

DETAILS OF THE HOLMES MEAN TROPHIC RANKING SYSTEM INCLUDING THE SPECIES TROPHIC RANK SCORES

THE HOLMES MEAN TROPHIC RANKING SYSTEM

The scores are applied dependent on the abundance of each scoring plant recorded as outlined below in the 3 point scoring system -

Three Point Scoring System

When plants recorded in <.1% enter once

When plants recorded in .1-5% enter twice

When plants recorded in >5% enter three times

The list of scoring taxa for this system is provided.

LIST OF MACROPHYTE SCORING TAXA FROM HOLMES (1995)

Species Name	Common Name	STR
Batrachospermum sp(p)		6
Hildenbrandia rivularis		6
Lemanea fluviatilis	Wire alga	7
Vaucheria sp(p)	Mole-pelt alga	1
Enteromorpha sp(p)	Tubeweed	1
Stigeoclonium tenue		1
Hydrodictyum reticulatum	Netweed	3
Cladophora agg	Cott/Blanketweed	1
Filamentous green algae		
Thick Diatom scum		
Blue-green algal scum		
Charaphyte		
Chiloscyphos polyanthos	liverwort	8
Marsupella emarginata	liverwort	10
Nardia compressa	liverwort	10
Pellia endiviifolia	liverwort	6
Pellia epiphylla	liverwort	7
Scapania undulata	liverwort	9
Solenostoma triste	liverwort	8
Amblystegium fluviatile	moss	5
Amblystegium riparium	moss	1
Blindia acuta	moss	10
Brachythecium plumosum	moss	9
Brachythecium rivulare	moss	8
Brachythecium rutabulum	moss	3
Bryum pseudotriquetrum	moss	9
Calliergon cuspidatum	moss	8
Cinclidotus fontinaloides	moss	5
Dichodontium flavescens	moss	9
Dichodontium palustre	moss	9
Dicranella palustris	moss	10
Fontinalis antipyretica	Willowmoss	5
Fontinalis squamosa	moss	8
Hygrohypnum ochraceum	moss	9
Hygrohypnum luridum	moss	9
Hyocomium armoricum	moss	10
Philonotis fontana	moss	9
Polytrichum commune	moss	10
Racomitrium aciculare	moss	10
Rhynchostegium riparioides	moss	5
Sphagnum	bog moss	10
Thamnobryum alopecurum	moss	7
Azolla filiculoides	Water-fern	3
Equisetum fluviatile	Water Horsetail	5
Equisetum palustre	Marsh Horsetail	5

Species Name	Common Name	STR
Apium inundatum	Lesser Marshwort	9
Apium nodiflorum	Fool's water-cress	4
Berula erecta	Lesser Water-parsnip	5
Callitriche hamulata	Intermediate Water-starwort	9
Callitriche obtusangula	Blunt-fruited Water starwort	5
Callitriche	NOT ABOVE Starwort agg	
Ceratophyllum demersum	Common Hornwort	2
Hippurus vulgaris	Mare's tail	4
Littorella uniflora	Shoreweed	8
Lotus uliginosum	Great Bird's foot-trefoil	8
Menyathes trifoliatus	Bogbean	9
Montia fontana	Blinks	8
Myriophyllum alterniflorum	Alternate-flowered Milfoil	8
Myriophyllum spicatum	Spiked Water-milfoil	3
Nuphar lutea	Yellow Water-lily	3
Nyphaea alba	White Water-lily	6
Nymphoides peltata	Fringed Water-lily	2
Nasturtium officinalis	Water-cress	5
Oenanthe crocata	Hemlock Water-dropwort	7
Oenanthe fluviatilis	River Water-dropwort	5
Polygonum amphibium	Amphibious Bistort	4
Potentilla erecta	Tormentil	9
Ranunculus aquatilis	Common Water-crowfoot	5
Ran penic sub pseudofluitans	Brook Water-crowfoot	5
Ran penic subsp peniciliatus	Brook Water-crowfoot	6
Ran penic subsp vertumnus		5
Ranunculus circinatus	Fan-leaved Water-crowfoot	4
Ranunculus flammula	Lesser Spearwort	7
Ranunculus fluitans	River Water-crowfoot	7
Ranunculus hederaceus	Ivy-leaved Crowfoot	6
Ranunculus omiophyllus	Round-leaved Crowfoot	8
Ranunculus peltatus	Pond Water-crowfoot	6
Ranunculus trichophyllus	Fine-leaved Water-crowfoot	6
Ranunculus sceleratus	Celery-leaved Crowfoot	2
Ranunculus	Crowfoot (spp NOT KNOWN)	
Rorippa amphibia	Great Yellow-cress	3
Rumex hydrolopathum	Great Water-dock	3
Veronica anagallis-aquatica	Blue Water-speedwell	4
Veronica catenata	Pink Water-speedwell	5
Veronica scutellata	Marsh Speedwell	7
Viola palustris	Marsh Violet	9
Acorus calamus	Sweet-flag	2
Alisma plantago aquatica	Common Water-plantain	3
Alisma lanceolatum	Narrow-leaved Water-plantain	3
Butomus umbellatus	Flowering Rush	5
Carex acuta	Lesser-tussock Sedge	5
Carex acutiformis	Lesser Pond-sedge	3

Species Name	Common Name	STR
Carex riparia	Greater Pond-sedge	4
Carex rostrata	Bottle Sedge	7
Carex vesicaria	Bladder Sedge	6
Catabrosa aquatica	Whorl-grass	5
Eleocharis palustris	Common Spiked-rush	6
Elodea canadensis ++	Canadian Pondweed	5
Elodea nuttallii ++	Nuttall's Pondweed	5
Glyceria maxima	Reed Sweet-grass	5
Groenlandia densa	Opposite-leaved Pondweed	5
Hydrocharis morsus-ranae	Frogbit	6
Iris pseudacorus	Yellow-flag	5
Juncus bulbosus	Bulbous Rush	10
Lemna gibba	Fat Duckweed	2
Lemna minor	Common Duckweed	4
Lemna (Spirodela) polyrhiza	Great Duckweed	2
Lemna trisulca	Ivy-leaved Duck-weed	4
Phragmites australis	Common Reed	4
Potamogeton alpinus	Reddish Pondweed	7
Potamogeton berchtoldii	Small Pondweed	4
Potamogeton crispus	Curled Pondweed	3
Potamogeton friesii	Flat-stalked Pondweed	3
Potamogeton gramineus	Various-leaved Pondweed	7
Potamogeton lucens	Shining Pondweed	3
Potamogeton natans	Broad-leaved Pondweed	5
Potamogeton obtusifolius	Blunt-leaved Pondweed	5
Potamogeton pectinatus	Fennel Pondweed	1
Potamogeton perfoliatus	Perfoliate Pondweed	4
Potamogeton polygonifolius	Bog Pondweed	10
Potamogeton praelongus	Hooded Pondweed	6
Potamogeton pusillus	Lesser Pondweed	4
Potamogeton trichoides	Stiff Pondweed	2
Potamogeton sp(p)	Unidentified Pondweed	
Sagittaria sagittifolia	Arrowhead	3
Scirpus fluitans	Floating Club-rush	10
Scirpus lacustris agg	Clubrush/bulrush	3
Scirpus maritimus	Sea Club-rush	3
Sparganium emersum	Unbranched Bur-reed	3
Sparganium erectum	Branched Bur-reed	3
Typha latifolia	Common Reedmace	2
Typha angustifolia	Lesser Reedmace	2
Zannichellia palustris	Horned Pondweed	2

APPENDIX 3

GIVING THE SUMMARY DATA FOR THE 1995 AND 1996 MACROPHYTE

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
01/01/R615 - 199	74	10	5	96.5	10	3	3	0.00	-2	3	j knot
01/01/R635 - 292	36.2	33	2.5	7.32	35	2	2	-6.06	NC	6	j knot,bals
01/02/R100 - 002	39	80	2.5	11.3	33	3	2	58.75	NC	6	j knot + bals
01/02/R455 - 197	3	50	2.5	4.31	45	2.5	2	10.00	NC	4	
01/02/R525 - 198	2.1	50	2.5	4.52	49	2	2	2.00	NC	7	
01/03/R300 - 003	15.3	30	2.5	12.61	45	3.5	2	-50.00	1	6	bals
01/04/R640 - 269	1.18	50	2.5	1.32	60	2.5	2	-20.00	NC	3	hog +j knot+bals
01/04/R755 - 281	5.44	60	2.5	5.34	73	2	1	-21.67	NC	5	
01/05/R050 - 004	4.24	56	2.5	34.11	49	3	2	12.50	NC	5	bals
01/05/R155 - 179	47.21	54	2.5	21.32	52	3	2	3.70	NC	7	bals
01/05/R365 - 203	6.4	50	2.5	3.031	54	2	2	-8.00	NC	5	
01/05/R420 - 005	0.53	56	1.5	4.12	63	2	2	-12.50	NC	5	
01/05/R600 - 006	27.3	58	2.5	67.51	60	3.5	2	-3.45	1	15	
01/05/R855 - 202	6.32	89	2.5	4.04	52	2	2	41.57	NC	5	
01/06/R700 - 007	5.73	42	3	3.63	61	3	2	-45.24	NC	9	j knot
01/07/R050 - 008	1.25	57	2.5	61.22	45	2.5	2	21.05	NC	7	bals
01/07/R175 - 252	0.04	73	2.5	0.003	73	2	1	0.00	NC	3	
01/07/R205 - 177	3.3	40	3	0.004	70	2.5	1	-75.00	NC	4	
01/07/R243 - 204	0	0	1	0.006	80	2	1	-	1	2	
01/07/R305 - 256	12	10	5	0.002	60	2	2	-500.00	-3	2	
01/07/R340 - 255	5.5	35	3	0.111	63	2.5	2	-80.00	NC	2	
01/07/R430 - 009	0.22	50	2.5	0.76	71	2.5	1	-42.00	NC	7	bals
01/07/R650 - 176	0.4	50	2.5	20.003	32	2	2	36.00	NC	4	
01/07/R750 - 257	0.71	63	2	0.7	70	2	1	-11.11	NC	3	
01/07/R810 - 178	10.74	50	2	0.013	65	2.5	1	-30.00	NC	4	
01/07/R879 - 254	7.63	58	2.5	70.151	40	3	2	31.03	NC	3	
01/07/R960 - 253	1.41	0	2	50	10	1	3	-	-1	1	
01/06/R050 - 010	8.13	54	2.5	3.32	56	2.5	2	-3.70	NC	7	bals
01/08/R450 - 011	32.31	41	3.5	34.44	38	3.5	2	7.32	NC	12	bals

Site Reference Number	1995 % Cover	1995 MTR	1995 HASLAM Class	1996 % Cover	1996 MTR	1996 HASLAM Class	1996 MTR Class	1996 % Change in MTR	1996 Change in Class	1996 No. of Species	1996 Aliens
01/08/R850 - 012	91.4	20	4	4.12	50	3.5	2	-150.00	NC	5	bals
01/08/R952 - 201	6.63	50	2.5	5.71	48	2.5	2	4.00	NC	7	
01/09/R050 - 013	5.06	50	4	15.43	31	3.5	2	38.00	NC	8	bals
01/09/R200 - 182	58.13	29	2	9.51	30	3.5	2	-3.45	1.5	3	bals
01/09/R400 - 180	41.21	38	2.5	48.6	34	4.5	2	10.53	2	7	
01/09/R705 - 181	10.41	65	2.5	2.01	30	2	2	53.85	NC	3	
01/10/R100 - 014	5.01	40	3	5.12	19	2.5	2	-22.50	NC	5	
01/10/R128 - 200	1	10	5	1.141	33	3	2	-230.00	-2	5	
01/10/R133 - 258	1.1	30	2.5	15.011	10	3	3	66.67	NC	2	
01/10/R430 - 259	5.41	43	3	18.201	32	3	2	-20.93	NC	5	
01/10/R605 - 208	14.3	50	3	20.011	53	3.5	2	-6.00	NC	7	
01/11/R050 - 015	154.1	32	4.5	5	43	3.5	2	-34.38	-1	3	
01/11/R250 - 017	7.41	42	3.5	46.11	38	3.5	2	9.52	NC	9	bals
01/11/R262 - 293	-	-	-	13.9	23	2.5	3	-	-	5	
01/11/R355 - 261	25.8	44	3	50	37	3.5	2	15.91	NC	9	
01/11/R420 - 016	14.05	53	3	10.15	53	3	2	3.64	NC	7	
01/11/R575 - 205	18	50	3	67.15	24	2.5	3	52.00	NC	10	
01/11/R705 - 260	0.36	30	2.5	3.15	32	2.5	2	-6.67	NC	5	bals
01/11/R830 - 206	42.51	36	3	99.4	35	3.5	2	2.78	NC	11	
01/11/R905 - 207	5.43	46	2.5	2.22	30	3.5	2	34.78	1	5	
02/01/R200 - 019	96.1	10	5	93.6	10	2.5	3	0.00	-2.5	2	bals
02/01/R390 - 175	21.1	10	3	3.2	40	2.5	2	-300.00	NC	2	
02/01/R492 - 173	1	0	1	1.22	44	2.5	2	-	1.5	4	
02/01/R547 - 274	3.1	50	2.5	45.93	43	2.5	2	14.00	NC	5	
02/01/R700 - 020	50.4	30	2.5	40.11	27	2.5	2	10.00	NC	6	
02/01/R717 - 275	87.3	10	3	70.52	23	2.5	3	-130.00	NC	4	
02/01/R860 - 272	3.2	50	1	18.3	39	2	2	-18.00	1	8	
02/01/R903 - 174	3.2	0	2	0.2	50	2	2	-	NC	1	
02/01/R953 - 273	5.5	68	2.5	14.61	43	2.5	2	36.76	NC	9	
02/02/R200 - 022	25.1	60	3	45.8	40	3.5	2	33.33	NC	8	bals

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
02/02/R300 - 023	5.3	65	3	26.7	42	2.5	2	35.38	NC	10	bals, j.knot
02/02/R400 - 024	23.1	10	3	51.41	26	2.5	2	-160.00	NC	4	j.knot, bals
02/02/R500 - 025	1	0	1	2.02	59	2.5	2	-	1.5	6	
02/02/R650 - 027	4.1	37	2	20.71	60	2	2	-62.16	NC	10	
02/02/R720 - 282	17.8	45	2.5	48.1	37	2.5	2	17.78	NC	6	hog,j.knot
02/02/R750 - 026	5.2	50	2.5	45.8	25	3	2	50.00	NC	7	
02/02/R805 - 029	11.2	0	3	54.62	32	3	2	-	NC	7	
02/02/R930 - 028	7.3	50	3	28.52	63	3	2	-26.00	NC	9	
02/03/R112 - 266	60.1	10	5	8.71	38	2.5	2	-280.00	-2.5	8	
02/03/R422 - 267	98.4	22	2.5	95.53	26	3	2	-18.18	NC	5	bals,
02/03/R831 - 268	7	0	1	86.5	24.5	3	3	-	2	5	bals,j.knot
03/01/R050 - 030	12.2	40	2.5	54.22	47	3	2	-17.50	NC	6	
03/01/R200 - 031	13.3	36	3	100.12	18	3	3	50.00	NC	3	
03/01/R400 - 032	42.5	36	3	120.82	30	3.5	2	16.67	NC	9	
03/01/R510 - 033	54	26	3	55.01	34	3.5	2	-30.77	NC	4	
03/01/R555 - 038	28.2	36	3	51.21	39	2.5	2	-8.33	NC	7	
03/01/R620 - 034	140.7	43	4	102.22	39	3.5	2	9.30	NC	3	bals
03/01/R700 - 037	72.7	39	3	14.371	44	3	2	-12.82	NC	10	bals
03/01/R800 - 035	10.1	53	3	30	44	3	2	16.98	NC	4	
03/01/R910 - 036	10.2	44	3	11.51	30	3.5	2	31.82	NC	5	
03/02/R050 - 039	37.5	39	3	38	38	3	2	2.56	NC	6	
03/02/R185 - 224	46.02	48	3	93	31	2	2	35.42	-1	4	
03/02/R350 - 040	17.3	60	2.5	0.41	30	2.5	2	50.00	NC	2	
03/02/R374 - 227	82.5	18	4.5	40.7	43	2	2	-138.89	-2.5	4	
03/02/R385 - 290	71.1	50	2.5	149.83	38	2.5	2	24.00	NC	9	
03/02/R500 - 041	11.3	33	3	19.4	36	3	2	-9.09	NC	5	
03/02/R602 - 223	70.21	35	3	15.2	10	2	3	71.43	-1	1	
03/02/R720 - 042	17.3	41	5	81.14	41	3	2	0.00	-2	4	
03/02/R915 - 225	55.4	0	3	41.5	52	2.5	2	-	NC	6	
03/02/R965 - 226	125	10	5	4.22	53	3	2	-430.00	-2	4	

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
03/03/R100 - 043	103	39	3	78.52	40	3	2	-2.56	NC	5	
03/03/R300 - 185	96.81	30	2.5	34	30	3	2	0.00	NC	4	
03/04/R100 - 044	5.32	63	3	54.01	23	3	3	63.49	NC	4	
03/04/R400 - 209	85.4	33	4	20.22	42	3	2	-27.27	-1	6	
03/05/R050 - 045	18.4	33	3	34.3	35	4.5	2	-6.06	1.5	8	
03/05/R150 - 046	18.4	33	4	40.3	32	4.5	2	3.03	NC	10	
03/05/R250 - 047	134.6	39	4	24.1	40	3.5	2	-2.56	NC	7	hog
05/05/R281 - 283	9.2	44	5	15.1	50	3.5	2	-13.64	-1.5	5	hog
03/05/R350 - 048	77.3	37	4.5	35	42	3.5	2	-13.51	-1	4	
03/05/R366 - 284	105.3	49	3	76.22	49	3.5	2	0.00	NC	9	
03/05/R465 - 286	6.11	35	3	16.11	33	3.5	2	5.71	NC	3	
03/05/R500 - 050	82.3	44	4	26.31	58	3	2	-31.82	-1	6	
03/05/R560 - 287	49.8	39	3.5	85.021	38	3.5	2	2.56	NC	9	
03/05/R658 - 289	15.31	45	3.5	121	34	3.5	2	24.44	NC	7	
03/05/R680 - 288	13.12	50	2.5	16.03	52	2.5	2	-4.00	NC	10	
03/05/R700 - 051	23.12	38	3	12.03	64	2.5	2	-68.42	NC	6	
03/05/R755 - 054	16.5	29	4	41.1	35	3.5	2	-20.69	NC	5	bals
03/05/R820 - 052	19.1	27	4	9.02	20	3.5	3	25.93	NC	4	bals
03/05/R880 - 053	72.1	38	4	81.53	42	3.5	2	-10.53	NC	8	bals
03/06/R025 - 035	2.5	30	5	3.22	33	3.5	2	-10.00	-1.5	4	
03/06/R075 - 065	9.3	37	3.5	6.01	38	3.5	2	-2.70	NC	3	
03/06/R125 - 056	8.2	37	4	13.05	50	2.5	2	-35.14	-1.5	2	
03/06/R181 - 249	63.3	30	3	37	27	3	2	10.00	NC	3	
03/06/R225 - 057	91.91	28	5	143	10	3	3	64.29	-2	3	
03/06/R245 - 229	99	27	4.5	11.1	10	3	3	62.96	-1.5	2	
03/06/R300 - 062	22.6	44	3	2.16	100	3	1	-127.27	NC	1	bals
03/06/R380 - 280	29.2	30	3.5	15.12	34	4	2	-13.33	NC	4	
03/06/R410 - 063	17.3	60	2.5	83.22	28	3	2	53.33	NC	7	
03/06/R451 - 067	86.1	34	4	43.3	37	4.5	2	-8.82	NC	6	
03/06/R465 - 068	47	33	4	127.1	31	4.5	2	6.06	NC	8	

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
03/06/R491 - 069	16.6	30	3.5	73	28	4	2	6.67	NC	5	
03/06/R303 - 070	12	10	3	10.21	27	3	2	-170.00	NC	4	
03/06/R520 - 071	5	40	2	10.1	30	3	2	25.00	1	2	
03/06/R330 - 061	67.4	30	4	18	10	3	3	66.67	-1	1	
03/06/R605 - 059	25.3	30	4	21.01	33	3.5	2	-10.00	NC	4	
03/06/R620 - 072	115.2	38	3	78.05	38	3.5	2	0.00	NC	8	hog,bals
03/06/R675 - 064	0.03	37	2.5	3.14	49	3	2	-32.43	NC	5	
03/06/R705 - 060	14.01	50	2	36	21	3	3	58.00	1	3	hog
03/06/R752 - 231	125.61	35	3	186.21	36	3	2	-2.86	NC	6	
03/06/R927 - 230	171.2	10	5	60	10	2	3	0.00	-3	2	
03/06/R974 - 228	20.5	33	2.5	80.15	36	3	2	-9.09	NC	7	
03/07/R100 - 073	11.2	43	3	85	23	3	3	46.51	NC	3	bals
03/07/R300 - 074	16.3	30	3.5	3	30	3.5	2	0.00	NC	1	hog
03/07/R400 - 075	11.4	37	3	41.21	27	3	2	27.03	NC	5	hog
03/07/R543 - 242	71	57	2.5	55.01	61	2.5	2	-7.02	NC	4	
03/07/R620 - 077	8.1	50	2.5	1.15	30	3	2	40.00	NC	2	hog, j.knot
03/07/R635 - 243	4.1	50	2.5	55.1	24	2.5	3	52.00	NC	5	
03/07/R653 - 244	21.2	50	3	24.11	43	3.5	2	14.00	NC	4	
03/07/R720 - 076	45.6	38	2.5	41.1	27	3	2	28.95	NC	3	
03/07/R912 - 241	2.3	17	2.5	50.61	10	3	3	41.18	NC	2	
03/08/R050 - 078	22.21	36	3	7.13	41	3	2	-13.89	NC	6	bals
03/08/R335 - 184	10.01	32	2.5	0.401	34	2.5	2	-6.25	NC	5	bals
03/08/R612 - 251	63.11	30	4	15.11	27	3.5	2	10.00	NC	6	bals
03/08/R707 - 270	16.7	33	3.5	23.62	36	3.5	2	-9.09	NC	11	
03/08/R805 - 250	19.6	50	3	17.21	50	3.5	2	0.00	NC	6	bals
03/09/R218 - 211	68.52	28	2.5	49.7	34	3	2	-21.43	NC	5	
03/09/R245 - 210	102.21	26	3	103	22	4	3	15.38	1	2	bals + hog
03/10/R100 - 085	4.1	45	5	1.151	45	4.5	2	0.00	NC	4	
03/10/R300 - 079	7.3	40	4	3.71	40	4.5	2	0.00	NC	6	hog
03/10/R400 - 080	0.02	40	3	1.012	30	3	2	25.00	NC	3	

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Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
03/10/R490 - 081	0.11	45	4.5	0.121	50	3.5	2	-11.11	-1	2	
03/10/R510 - 082	56.3	26	3	45.011	26	3	2	0.00	NC	3	
03/10/R550 - 086	27	10	5	41.501	10	3	3	0.00	-2	3	
03/10/R608 - 186	6.61	39	2.5	1.013	42	3	2	-7.69	NC	5	
03/10/R710 - 083	7.7	45	3.5	4.31	32	3.5	2	28.89	NC	3	bals
03/10/R745 - 188	51.51	36	2.5	6.502	40	2	2	-11.11	NC	6	
03/10/R815 - 187	57.2	37	3	26.012	36	3	2	2.70	NC	6	bals
03/10/R910 - 084	90.2	40	4	13.01	33	3	3	17.50	-1	5	
04/01/Q370 - 090	105.4	35	3.5	15.677	46	3.5	2	-31.43	NC	10	
04/01/R100 - 089	24.6	44	3	60.226	38	3.5	2	13.64	NC	7	
04/01/R300 - 087	37.5	50	2.5	5.206	46	3	2	8.00	NC	13	
04/01/R460 - 091	73.1	30	3	72.031	43	3.5	2	-43.33	NC	4	
04/01/R500 - 088	29.1	55	3	16.222	49	3.5	2	10.91	NC	8	bals
04/01/R682 - 264	16.4	41	2.5	3.002	57	2	2	-39.02	NC	4	j.kuoi
04/01/R835 - 092	168.5	37	2	75.531	26	3.5	2	29.73	1.5	7	
04/01/R955 - 093	33.2	39	2.5	12.322	46	2.5	2	-17.95	NC	6	
04/02/R210 - 194	63	10	5	0.02	70	2	1	-600.00	-3	1	
04/02/R245 - 193	96.11	63	3	1.212	38	2.5	2	39.68	NC	3	bals
04/02/R305 - 192	68	30	4	14.313	41	3	2	-36.67	-1	5	bals j.kuoi
04/02/R412 - 191	64.52	47	4	5.231	39	3	2	17.02	-1	6	bals
04/02/R515 - 190	2.1	23	2.5	39.111	10	3	3	56.52	NC	3	
04/02/R625 - 189	0.11	60	2.5	2.01	50	3	2	16.67	NC	2	
04/02/R702 - 196	76.1	50	4	69.012	23	3	3	54.00	-1	5	
04/02/R773 - 195	10.31	54	2.5	5.01	48	3	2	11.11	NC	4	
05/01/R200 - 095	85	10	3	88.331	34	3.5	2	-240.00	NC	7	
05/01/R250 - 104	66.5	30	3.5	13.01	29	4.5	2	3.33	1	4	bals
05/01/R288 - 285	90.6	28	4	101.022	38	3.5	2	-35.71	NC	10	bals
05/01/R400 - 097	42.2	33	3	96.28	37	4.5	2	-12.12	1.5	11	bals
05/01/R550 - 106	52.5	33	4	96.61	32	4.5	2	3.03	NC	10	
05/01/R600 - 098	19.2	30	4	12.8	46	4.5	2	-53.33	NC	7	

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
05/01/R655 - 103	10.3	53	4	27.9	44	3.5	2	16.98	NC	12	hog
05/01/R700 - 102	103.2	34	4	48.5	38	3.5	2	-11.76	NC	12	
05/01/R750 - 107	44	32	4	69.2	36	3.5	2	-12.50	NC	10	
05/01/R850 - 100	98	35	4	48	38	3.5	2	-8.57	NC	8	
05/01/R910 - 101	90.1	22	4	55.2	34	3	2	-54.55	-1	2	
05/01/R945 - 212	13.3	30	3	67.8	44	3	2	-46.67	NC	10	
05/02/R200 - 109	66	26	3	130.011	46	2.5	2	-76.92	NC	8	
05/02/R300 - 110	65.1	25	3.5	32.02	36	2.5	2	-44.00	-1	7	
05/02/R500 - 111	71.1	23	3.5	151.012	28	3	2	-21.74	NC	6	
05/02/R700 - 112	28.3	25	4.5	104.001	32	3.5	2	-28.00	-1	8	
05/02/R805 - 248	96	18	3.5	89	20	3.5	3	-11.11	NC	2	
05/03/R040 - 113	10	40	3	59.021	41	2.5	2	-2.50	NC	7	
05/04/R200 - 114	55	10	3.5	3.021	53	3.5	2	-430.00	NC	3	
05/05/R070 - 218	71	44	2.5	11.601	60	2	2	-36.36	NC	5	
05/05/R127 - 217	1.2	60	3	3.143	58	3	2	3.33	NC	6	
05/05/R480 - 216	0.3	60	1	81.223	45	2.5	2	25.00	1.5	6	
05/05/R655 - 214	104.1	34	4	15.013	34	2.5	2	0.00	-1.5	2	
05/05/R752 - 213	10.1	40	2	75	10	2	3	75.00	NC	2	
05/07/R610 - 235	34.33	36	3.5	78.21	36	3.5	2	0.00	NC	8	
05/07/R655 - 236	2.21	57	2	3.621	56	2.5	2	1.75	NC	9	
05/07/R710 - 237	18.21	66	2.5	49.13	49	2.5	2	25.76	NC	6	bals
05/07/R875 - 238	17	56	2.5	16.5	50	2	2	10.71	NC	5	
06/01/R100 - 115	57.2	41	3.5	29.23	41	3.5	2	0.00	NC	12	
06/01/R300 - 116	10.01	33	4	12.031	42	3	2	-27.27	-1	8	
06/01/R400 - 117	31.11	52	3	49.22	45	3.5	2	15.38	NC	8	
06/01/R500 - 118	42.2	38	3	25.24	48	3.5	2	-26.32	NC	10	
06/01/R650 - 120	15.02	0	3	0.01	0	3	0	-	NC	0	
06/01/R720 - 119	9.11	30	2.5	1.01	10	3	3	66.67	NC	2	bals
06/01/R735 - 183	8.1	37	2.5	0.2	30	2	2	18.92	NC	2	
06/01/R807 - 245	25.91	41	3	87.021	47	3	2	-14.63	NC	6	

	1995			1996							
Site Reference Number	% Cover	MTR	HASLAM Class	% Cover	MTR	HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
06/01/R905 - 170	31.2	39	3.5	12.74	44	4	2	-25.71	NC	12	
06/02/R015 - 239	11.2	70	2.5	13.2	62	3	2	11.43	NC	5	
06/02/R060 - 240	2.1	50	2.5	3.4	65	2	1	-30.00	NC	6	
06/02/R155 - 234	7.31	63	2.5	78.81	64	2.5	2	-1.59	NC	9	
06/02/R285 - 233	86.1	70	2.5	92.32	30	2	2	57.14	NC	3	
06/02/R335 - 232	20.41	77	2.5	19.12	65	2	1	15.58	NC	6	
06/02/R438 - 222	39.1	43	2.5	31.51	69	2.5	1	-60.47	NC	8	
06/02/R560 - 221	2.1	50	2.5	88.241	48	2	2	4.00	NC	8	
06/02/R665 - 121	2.1	65	2.5	55.91	41	2.5	2	36.92	NC	8	bals
06/02/R704 - 220	22.3	50	2.5	4.34	47	2.5	2	6.00	NC	6	
06/02/R755 - 219	7.3	10	1.5	10.5	38	2.5	2	-280.00	1	6	hog, bals
06/04/R705 - 247	56	39	2.5	19.3	52	2.5	2	-33.33	NC	6	
06/04/R881 - 246	63.12	59	3	40.06	49	2.5	2	16.95	NC	8	
35/01/R010 - 171	6.11	34	2.5	0.704	72	2	1	-111.76	NC	8	j knot
35/03/R010 - 172	60.26	41	2.5	4.42	55	2	2	-34.15	NC	8	
36/01/R205 - 263	0.43	50	3	5.22	25	3	2	50.00	NC	2	
36/01/R300 - 122	5.76	45	3	12.32	43	2.5	2	4.44	NC	5	
36/01/R315 - 134	3.01	70	2.5	10.01	78	2	1	-11.43	NC	2	
36/01/R320 - 135	13.3	88	2.5	2.5	80	2	1	9.09	NC	1	
36/01/R360 - 265	6.31	68	1.5	6.22	59	2.5	2	13.24	1	4	
36/02/R020 - 123	6.63	32	4	3.65	29	3.5	2	9.38	NC	7	
36/02/R247 - 277	12.42	51	3	6.52	36	4.5	2	29.41	1.5	6	
36/02/R405 - 276	102.2	45	5	15.21	36	3.5	2	20.00	-1.5	4	
36/03/R100 - 128	82.56	39	2.5	6.76	59	2.5	2	-51.28	NC	6	
36/04/R050 - 136	7.31	47	2.5	4.22	35	2	2	-17.02	NC	5	
36/04/R600 - 137	7.11	66	2	3.7	70	2.5	1	-6.06	NC	4	
36/04/R800 - 138	10.7	47	2.5	15.4	41	3	2	12.77	NC	3	
36/05/R060 - 139	0.25	43	3	12.61	28	2.5	2	34.88	NC	6	bals
36/05/R310 - 140	4.42	47	3	11	42	3	2	10.64	NC	5	bals
36/05/R400 - 141	2.34	23	2.5	4.42	33	2.5	2	-43.48	NC	4	bals

Site Reference Number	1995 % Cover	1995 MTR	1995 HASLAM Class	1996 % Cover	1996 MTR	1996 HASLAM Class	MTR Class	% Change in MTR	1996 Change in Class	No. of Species	Aliens
36/05/R710 - 144	8.42	44	2.5	20.12	37	3	2	15.91	NC	9	
36/05/R800 - 142	6.11	50	2.5	7.11	47	3	2	6.00	NC	5	
36/05/R910 - 143	41.45	33	2.5	15.04	35	2.5	2	-6.06	NC	7	
36/06/R050 - 129	181.42	46	3.5	105.51	32	3	2	30.43	NC	10	bals, hog
36/06/R200 - 145	29.66	52	3	5.45	46	2.5	2	11.54	NC	7	
36/06/R620 - 146	44.62	34	3.5	29.01	39	3.5	2	-14.71	NC	4	
36/06/R700 - 147	1	0	1	0.3	0	1	0	-	NC	0	bals
36/06/R805 - 148	26.81	31	3	3	60	3	2	-93.55	NC	2	hog, j.knot
36/07/R010 - 278	92.5	23	2.5	4.51	23	2.5	3	0.00	NC	3	
36/07/R100 - 130	94.02	30	3.5	19.1	48	3	2	-60.00	NC	5	bals
36/07/R300 - 149	104.67	39	3.5	32.36	51	3.5	2	-30.77	NC	6	bals
36/07/R400 - 150	81.52	47	3	0.542	62	2	2	-31.91	-1	5	
36/07/R520 - 151	23.31	43	3.5	10.11	58	3	2	-34.88	NC	3	
36/07/R610 - 152	39.15	44	3	11.01	50	3	2	-13.64	NC	8	
36/07/R640 - 271	6.12	50	2.5	1.03	66	2	1	-32.00	NC	5	
36/07/R755 - 154	1.11	42	3	0.033	63	2	2	-50.00	-1	4	
36/07/R810 - 153	131.5	33	3	35	38	3.5	2	-15.15	NC	13	
36/08/R010 - 155	71.53	40	4	77.82	40	4.5	2	0.00	NC	18	
36/08/R100 - 156	117.61	35	4	102.61	34	4	2	2.86	NC	9	
36/08/R305 - 159	131.12	21	2.5	0.02	70	2	1	-233.33	NC	2	bals
36/08/R325 - 279	68.42	21	3	0.611	10	3	3	52.38	NC	3	
36/08/R810 - 157	108.45	37	4	93.2	35	4	2	5.41	NC	8	
36/08/R900 - 158	0.1	50	4	0.04	40	2	2	20.00	-2	4	
36/10/R050 - 160	8.22	35	3	3.42	43	2.5	2	-22.86	NC	2	
36/11/R100 - 131	34.95	47	2.5	10.18	47	3	2	0.00	NC	16	
36/12/R050 - 132	3.44	47	3	4.52	57	2.5	2	-21.28	NC	6	
36/12/R150 - 161	5.16	42	4.5	5.481	43	3.5	2	-2.38	-1	10	
36/12/R247 - 291	54.01	39	3.5	22.32	43	3.5	2	-10.26	NC	14	
36/12/R425 - 169	41.1	62	2	5.24	76	2	1	-22.58	NC	10	
36/12/R825 - 162	0.14	50	2.5	2.44	65	2	1	-30.00	NC	6	

Site Reference Number	1995 % Cover	1995 MTR	1995 HASLAM Class	1996 % Cover	1996 MTR	1996 HASLAM Class	1996 MTR Class	1996 % Change in MTR	1996 Change in Class	1996 No. of Species	1996 Aliens
36/13/R050 - 163	29.45	38	3.5	25.77	36	3.5	2	5.26	NC	12	
36/13/R350 - 163	3.54	38	3.5	6.63	33	3.5	2	13.16	NC	4	
36/13/R550 - 164	24.53	38	2.5	11.47	35	3.5	2	7.89	1	9	
36/13/R620 - 168	34.62	45	2.5	27.45	44	3.5	2	2.22	1	10	
36/13/R700 - 165	146.22	45	3	32.442	53	3.5	2	-17.78	NC	15	
36/13/R830 - 166	20.9	60	2.5	9.61	50	2	2	16.67	NC	5	
36/13/R920 - 167	23.82	34	2.5	13.12	48	2.5	2	-41.18	NC	4	

APPENDIX 4

RIVER REACHES SORTED BY MTR 1996 SCORES (ASCENDING)

Location		Site Reference No.	MTR95	MTR96	MTR Class
R Blackwater	Derrymeen	03/06/R300 - 062	44	100	1
Glenlark R	Glenlark Bridge	01/07/R243 - 204	0	80	1
Garvary R	Larkhill	36/01/R320 - 135	88	80	1
Garvary R	A47 Road Bridge	36/01/R315 - 134	70	78	1
Black R	Drumkeenagh	36/12/R425 - 169	62	76	1
Douglas Burn	Douglas Bridge	01/04/R755 - 281	60	73	1
Glenmacoffer R	Glenmacoffer Bridge	01/07/R175 - 252	73	73	1
Roogagh R	Garrison	35/01/R010 - 171	34	72	1
Glenelly R	Corrick Bridge	01/07/R430 - 009	50	71	1
Owenkillew R	Drumlea	01/07/R205 - 177	40	70	1
Glenelly R	Sperrin	01/07/R750 - 257	63	70	1
Tow	Gasworks	04/02/R210 - 194	10	70	1
Bannagh R	Drumnagalliagh	36/04/R600 - 137	66	70	1
R. Finn	Rosslea	36/08/R505 - 159	21	70	1
Whitewater R	Whitewater Bridge	06/02/R438 - 222	43	69	1
Tempo R	Tattinweer Bridge	36/07/R640 - 271	50	66	1
Owenreagh R	Drumlea Bridge	01/07/R810 - 178	50	65	1
Shimna R	Tollymore Forest	06/02/R060 - 240	50	65	1
Aughrim R	Kilkeel	06/02/R335 - 232	77	65	1
Cladagh R	Gorteen	36/12/R825 - 162	50	65	1
Upper Bann R	Hilltown	03/05/R700 - 051	38	64	2
Annalong R	Annalong Bridge	06/02/R155 - 234	63	64	2
R Derg	Aghyaran	01/05/R420 - 005	56	63	2
Owenkillew R	Monanameal	01/07/R340 - 255	35	63	2
Owenrigh R	Camanbane	02/02/R930 - 028	50	63	2
Manyburns R	Manyburns Bridge	36/07/R755 - 154	42	63	2
R Burren	Bailey's Bridge	06/02/R015 - 239	70	62	2
Colebrooke R	Pollboy Bridge	36/07/R400 - 150	47	62	2
R Strule	Abercorn Bridge	01/06/R700 - 007	42	61	2
Ballinderry R	Corkhill	03/07/R543 - 242	57	61	2
Mourne R	Victoria Bridge	01/04/R640 - 269	50	60	2
Mourne Beg R	Mourne Bridge	01/05/R600 - 006	58	60	2
Coney Glen R	Coneyglen Bridge	01/07/R305 - 256	10	60	2
R Roe	Corick Bridge	02/02/R650 - 027	37	60	2
Lame R	Owen's Bridge	05/05/R070 - 218	44	60	2
Trillick R	Carran	36/06/R805 - 148	31	60	2
Faughan R	Park Bridge	02/01/R860 - 272	50	59	2
R Roe	Dungiven	02/02/R500 - 025	0	59	2
Waterfoot R	Letter Bridge	36/01/R360 - 265	68	59	2
Termon R	Killynoogan	36/03/R100 - 128	39	59	2
Upper Bann R	Ballydown	03/05/R500 - 050	44	58	2
Glynn R	Glynn	05/05/R127 - 217	60	58	2
Tempo R	Killashanbally	36/07/R520 - 151	43	58	2
R Bush	Ballyhoe	04/01/R682 - 264	41	57	2
R Arney	Drumane Bridge	36/12/R050 - 132	47	57	2
R Strule	Moyle Bridge	01/06/R050 - 010	54	56	2
Ardilea R	A2 Road Bridge	05/07/R655 - 236	57	56	2
County R	County Bridge	35/03/R010 - 172	41	55	2
Bannagh R	Bannagh Bridge	36/04/R050 - 136	47	55	2
Killen Burn	Glashagh	01/05/R365 - 203	50	54	2
Cloghfin R	Blackhill	01/10/R605 - 208	50	53	2
Quiggery	Edergoole	01/11/R520 - 016	55	53	2

	Location	Site Reference No.	MTR95	MTR96	MTR
Doagh R	Dunamoy	03/02/R965 - 226	10	53	2
Enler R	Kennel Bridge	05/04/R200 - 114	10	53	2
Sillees R	Derrygonelly	36/13/R700 - 165	45	53	2
Derg R	Crewe Bridge	01/05/R155 - 179	54	52	2
Glendergan R	Sraghcumber	01/05/R355 - 202	89	52	2
Camowen	Ramakan	01/10/R430 - 259	43	52	2
Doagh R	Doagh	03/02/R915 - 225	0	52	2
Upper Bann R	McComb's Bridge	03/05/R680 - 283	50	52	2
Cullywater R	Carrive	06/04/R705 - 247	39	52	2
Colebrooke R	Tullyreagh Bridge	36/07/R300 - 149	39	51	2
Strule R	Abbey Bridge	01/08/R850 - 012	20	50	2
Burntollet R	Burntollet Bridge	02/01/R903 - 174	0	50	2
Upper Bann R	Gilford Bridge	05/05/R281 - 283	44	50	2
Blackwater R	Moy	03/06/R125 - 056	37	50	2
Back Burn	Widow Steele's Bridge	03/08/R805 - 250	50	50	2
Lower Bann R	Toome Bridge	03/10/R490 - 081	45	50	2
Glenariff R	Callisnagh Bridge	04/02/R625 - 189	60	50	2
Carrigs R	Maghera Bridge	05/07/R375 - 233	56	50	2
Tempo R	Tempo Bridge	36/07/R610 - 152	44	50	2
Boho R	Boho	36/13/R830 - 166	60	50	2
Burndennet R	Dunnaghmanagh	01/02/R525 - 198	50	49	2
Derg R	Millbrook Bridge	01/05/R050 - 004	56	49	2
Camowen R	Donnelly's Bridge	01/10/R100 - 014	40	49	2
Upper R Bann	Milltown	03/05/R366 - 284	49	49	2
Callen R	Papermill Bridge	03/06/R675 - 064	37	49	2
R Bush	Bellisle Bridge	04/01/R500 - 088	55	49	2
Moneycarragh	Moneylane	05/07/R710 - 237	66	49	2
Forkhill R	Forkhill Lower	06/04/R881 - 246	59	49	2
Cappagh Burn	Tattynure	01/08/R952 - 201	50	48	2
Glenarm R	Glenarm	04/02/R773 - 195	54	48	2
Clanrye	Crown Bridge	06/01/R500 - 118	38	48	2
Cassy Water R	Cassy Water Bridge	06/02/R560 - 221	50	48	2
Colebrooke R	Ballindarragh	36/07/R100 - 130	30	48	2
Screenagh R	Aghakeeran	36/13/R920 - 167	34	48	2
Main R	Dunmore Bridge	03/01/R050 - 030	40	47	2
Jerretspass R	Jerretspass	06/01/R807 - 245	41	47	2
Ghann R	Green Park Bridge	06/02/R704 - 220	50	47	2
Dooraa R	Killygarry	36/05/R800 - 142	50	47	2
Swanlinbar R	Thompson's Bridge	36/11/R100 - 131	47	47	2
Burngushet R	Burngushet Bridge	04/01/Q370 - 090	35	46	2
R Bush	Seneirl Bridge	04/01/R300 - 087	50	46	2
Dervock R	Iderowen	04/01/R955 - 093	39	46	2
R Lagan	Spencer's Bridge	05/01/R600 - 098	30	46	2
Annacloy R	Annacloy Bridge	05/02/R200 - 109	26	46	2
Ballinamallard R	Magheracross	36/06/R200 - 145	52	46	2
Altinaghree R	Bunowen	01/02/R455 - 197	50	45	2
R Finn	Clady	01/03/R300 - 003	30	45	2
Owenkillew R	Killymore	01/07/R050 - 008	57	45	2
Lower R Bann	The Cutts	03/10/R100 - 085	45	45	2
Kilroot R	Kilroot	05/05/R480 - 216	60	45	2
R Faughan	Legaghory	02/01/R492 - 173	0	44	2
R Braid	Harryville	03/01/R700 - 037	39	44	2
R Braid	Knockan	03/01/R800 - 035	53	44	2
R Lagan	Magheralin	05/01/R655 - 103	53	44	2

	Location	Site Reference No.	MTR95	MTR96	MTR
Ravernet R	Legacurry	05/01/R945 - 212	30	44	2
Newry R	Sheep Bridge	06/01/R400 - 117	52	44	2
Newry Canal	Cammeen	06/01/R905 - 170	35	44	2
Silees R	Drumanure	36/13/R620 - 168	45	44	2
Drumragh R	Campsie Bridge	01/11/R050 - 015	32	43	2
Bond's Glen	Ardground	02/01/R547 - 274	50	43	2
Glenrandall R	Claudy	02/01/R953 - 273	68	43	2
Fourmile Burn	Fifty Acres	03/02/R374 - 227	18	43	2
Ballymully R	Ballygonny Bridge	03/07/R653 - 244	50	43	2
R Bush	Conagher Bridge	04/01/R460 - 091	30	43	2
R Erne	Rosscor	36/01/R300 - 122	45	43	2
Woodford R	Aghalane	36/10/R050 - 160	35	43	2
R Arney	Brockagh	36/12/R150 - 161	42	43	2
Lough MacNean R	Belcoo	36/12/R247 - 291	39	43	2
R Roe	Dog's Leap	02/02/R300 - 023	65	42	2
Glenavy R	Ballydonaghy Bridge	03/04/R400 - 209	33	42	2
Upper R Bann	Lawrencetown	03/05/R350 - 048	37	42	2
R Cusher	Clare	03/05/R880 - 053	38	42	2
Macosquin R	Ree	03/10/R608 - 186	39	42	2
Newry R	Cammeen	06/01/R300 - 116	33	42	2
Glendurragh	Edemey	36/05/R310 - 140	47	42	2
Ballymartin Water	Ballymartin Bridge	03/02/R720 - 042	41	41	2
Moyola R	New Bridge	03/08/R050 - 078	36	41	2
Carey R	Carey Mill Bridge	04/02/R305 - 192	30	41	2
Blackwater R	Ballymartin Bridge	05/03/R040 - 113	40	41	2
Newry R	Newry	06/01/R100 - 115	41	41	2
Kilbroney R	Newtown Road Bridge	06/02/R665 - 121	65	41	2
Bannagh	Drumnagreshial	36/04/R800 - 138	47	41	2
Owenreagh R	Cashel	01/07/R879 - 254	58	40	2
R Faughan	Ardmore	02/01/R390 - 175	10	40	2
R Roe	Limavady	02/02/R200 - 022	60	40	2
Crumlin R	Cidercourt	03/03/R100 - 043	39	40	2
Upper R Bann	Dyne's Bridge	03/05/R250 - 047	39	40	2
Lower R Bann	Kilrea	03/10/R300 - 079	40	40	2
Aghivey R	Moneycarrie	03/10/R745 - 188	36	40	2
R Finn	Wattle Bridge	36/08/R010 - 155	40	40	2
R Lackey	Knockballymore	36/08/R900 - 158	50	40	2
Kellswater R	Rock Bridge	03/01/R555 - 038	36	39	2
R Braid	Tullaghgarley	03/01/R620 - 034	43	39	2
Glendun R	Knocknacarry	04/02/R412 - 191	47	39	2
Irvinestown R	Tullyclea	36/06/R620 - 146	34	39	2
R Strule	Stone Bridge	01/08/R450 - 011	41	38	2
Owenreagh R	Ballynahatty	01/11/R250 - 017	42	38	2
Mutl R	Mill Bridge	02/03/R112 - 266	10	38	2
Six Mile Water	Castle Farm Bridge	03/02/R050 - 039	39	38	2
Fourmile Burn	New Mill Bridge	03/02/R385 - 290	50	38	2
Upper R Bann	Katesbridge	03/05/R560 - 287	39	38	2
R Blackwater	Bond's Bridge	03/06/R075 - 065	37	38	2
R Callen	Allistragh	03/06/R620 - 072	38	38	2
R Bush	Bushmills	04/01/R100 - 089	44	38	2
Glenshesk R	B15 Road Bridge	04/02/R245 - 193	63	38	2
R Lagan	Wolfenden's Bridge	05/01/R288 - 285	28	38	2
R Lagan	Banoge Bridge	05/01/R700 - 102	34	38	2
R Lagan	Bull's Bridge	05/01/R850 - 100	35	38	2

	Location	Site Reference No.	MTR95	MTR96	MTR
Moygannon	Moygannon Ford	06/02/R755 - 219	10	38	2
Cleen R	Corralongford	36/07/R810 - 153	33	38	2
Owenreagh R	Shannaragh	01/11/R355 - 251	44	37	2
Castle R	Drummond Bridge	02/02/R720 - 282	45	37	2
R Tall	Clonmore	03/06/R451 - 067	34	37	2
R Lagan	Lisburn	05/01/R400 - 097	33	37	2
Dooraa R	Letterkeen	36/05/R710 - 144	44	37	2
Six Mile Water	Below Ballyclare	03/02/R500 - 041	33	36	2
R Tynan	A 28 Road Bridge	03/06/R752 - 231	35	36	2
Fury R	Belalastera	03/06/R974 - 228	33	36	2
Grange Water	Curran Bridge	03/08/R707 - 270	33	36	2
Aghadowey R	White Bridges	03/10/R815 - 187	37	36	2
R Lagan	Below Dromore	05/01/R750 - 107	32	36	2
Ballynahinch R	Legacurry	05/02/R300 - 110	25	36	2
R Blackstaff	Tullymurry	05/07/R610 - 235	36	36	2
Lough-a-hache R	Below Moorlough	36/02/R247 - 277	51	36	2
Newtownbutler R	Newtownbutler Bridge	36/02/R405 - 276	45	36	2
Sillees R	Drumkeen New Bridge	36/13/R050 - 133	38	36	2
Glenmornan R	Catherine's Bridge	01/01/R635 - 292	33	35	2
Eskragh Water	Seskinore Mill Bridge	01/11/R830 - 206	36	35	2
Upper R Bann	M1 Bridge	03/05/R050 - 045	33	35	2
Ballybay R	Oban Street	03/05/R755 - 054	29	35	2
Edenclaw R	Edenclaw	36/05/R910 - 143	33	35	2
R Lackey	Carra Old Bridge	36/08/R810 - 157	37	35	2
Sillees R	Carr Bridge	36/13/R550 - 164	38	35	2
Fairy Water R	Monaghan's Bridge	01/09/R400 - 180	38	34	2
Kellswater R	Curry's Bridge	03/01/R510 - 033	26	34	2
Muddock R	Muddock Bridge	03/05/R658 - 289	45	34	2
Coalisland Canal	Annaghbeg	03/06/R380 - 280	30	34	2
Moyola R	Fortwilliam Bridge	03/08/R335 - 184	32	34	2
Dunore R	Upper Bridge	03/09/R218 - 211	28	34	2
R Lagan	Shaw's Bridge	05/01/R200 - 095	10	34	2
Ravernet R	Sprucefield	05/01/R910 - 101	22	34	2
Woodburn R	Courtauld's	05/05/R655 - 214	34	34	2
R Finn	Ballyhoe	36/08/R100 - 156	35	34	2
Burndennet	Burndennet Bridge	01/02/R100 - 002	80	33	2
Kilfyclogher Burn	Lover's Retreat	01/10/R128 - 200	10	33	2
Upper R Bann	Solitude Park	03/05/R465 - 286	35	33	2
R Blackwater	Verner's Bridge	03/06/R025 - 055	30	33	2
R Callan	Derryscollop	03/06/R605 - 059	30	33	2
Glendurragh R	Edenamohill	36/05/R400 - 141	23	33	2
Sillees R	Thompson's Bridge	36/13/R350 - 163	38	33	2
Clady R	Portglenone	03/10/R910 - 084	40	33	3
Glenelly R	Clougherny	01/07/R650 - 176	50	32	2
Quiggery R	Ecclesville	01/11/R705 - 260	30	32	2
Owenbeg R	Dungiven	02/02/R805 - 029	0	32	2
Upper R Bann	Shillington's Bridge	03/05/R150 - 046	33	32	2
Aghivey R	Glasgort	03/10/R710 - 083	45	32	2
R Lagan	Young's Bridge	05/01/R550 - 106	33	32	2
Ballynahinch R	Casey's Bridge	05/02/R700 - 112	25	32	2
Ballinamallard R	Ballycassidy Bridge	36/06/R050 - 129	46	32	2
Fairy Water R	Fairy Water Bridge	01/09/R050 - 013	50	31	2
Rathmore Bridge	Rathmore Bridge	03/02/R185 - 224	48	31	2
R Tall	Clonmain	03/06/R465 - 063	33	31	2

	Location	Site Reference No.	MTR95	MTR96	MTR
Fairy Water R	Mullanatoomog	01/09/R200 - 182	29	30	2
Drumquin R	Drumquin	01/09/R705 - 181	65	30	2
Routing Burn	Brown's Bridge	01/11/R905 - 207	46	30	2
R Main	Dundermot	03/01/R400 - 032	36	30	2
R Clogh	Glarryford	03/01/R910 - 035	44	30	2
Six Mile Water	Ballycushan	03/02/R350 - 040	60	30	2
Crumlin R	Airport Road	03/03/R500 - 185	30	30	2
R Tall	Darby's Bridge	03/06/R520 - 071	40	30	2
Ballinderry R	Doorless Bridge	03/07/R300 - 074	30	30	2
Lissan Water R	Lismoney	03/07/R620 - 077	50	30	2
Lower R Bann	Portglenone	03/10/R400 - 080	40	30	2
Bessbrook R	Millvale Bridge	06/01/R735 - 183	37	30	2
Kilkeel R	A 2 Road Bridge	06/02/R285 - 233	70	30	2
R Lagan	Drum Bridge	05/01/R250 - 104	30	29	2
R Erne	Enniskillen	36/02/R020 - 123	32	29	2
R Torrent	Newmills	03/06/R410 - 063	60	28	2
R Tall	Redmond's Bridge	03/06/R491 - 069	30	28	2
Ballinahinch R	below Ballinahinch STW	05/02/R500 - 111	23	28	2
Glendurragh R	Kesh	36/05/R060 - 139	43	28	2
R Faughan	Ballynameen	02/01/R700 - 020	30	27	2
R Blackwater	Benburb	03/06/R181 - 249	30	27	2
R Tall	Drumard	03/06/R503 - 070	10	27	2
Ballinderry R	King's Bridge	03/07/R400 - 075	37	27	2
Killymoon R	Prince of Wales Bridge	03/07/R720 - 076	38	27	2
Magherafelt Burn	Granias Bridge	03/08/R612 - 251	30	27	2
R Roe	Bonnanaboigh New Bridge	02/02/R400 - 024	10	26	2
Faughanvale R	Faughanvale Bridge	02/03/R422 - 267	22	26	2
Ballymoney R	Glenstall	03/10/R510 - 082	26	26	2
Dervock R	Dervock Bridge	04/01/R835 - 092	37	26	2
Curley R	Artikelly	02/02/R750 - 026	50	25	2
R Erne	Belleek	36/01/R205 - 263	50	25	2
Burnfoot R	Rush Hall	02/03/R831 - 268	0	24.5	3
Quiggery R	Sessiagh Bridge	01/11/R575 - 205	50	24	3
Lissan Water	Drumgrass Bridge	03/07/R635 - 243	50	24	3
Creevan Burn	Creevan Cottage	01/11/R262 - 293	-	23	3
Foregien R	Dungorkin	02/01/R717 - 275	10	23	3
Glenavy R	Leap Bridge	03/04/R100 - 044	63	23	3
Ballinderry R	Ballinderry Bridge	03/07/R100 - 073	43	23	3
Glencloy R	Carnlough	04/02/R702 - 196	50	23	3
Hollybrook R	Aghalurcher	36/07/R010 - 278	23	23	3
Black Burn	Mount Cottage	03/09/R245 - 210	26	22	3
Oona Water R	Oona Bridge	03/06/R705 - 060	50	21	3
Cusher R	Knock Bridge	03/05/R820 - 052	27	20	3
Glasswater R	Kilmore	05/02/R805 - 248	18	20	3
R Main	Gracehill	03/01/R200 - 031	36	18	3
Glenmornan R	Ballymagorry	01/01/R615 - 199	10	10	3
Glensawhisk R	Campbell's Bridge	01/07/R960 - 253	0	10	3
Killyclogher Burn	Killyclogher	01/10/R133 - 258	30	10	3
R Faughan	Mobuoy Bridge	02/01/R200 - 019	10	10	3
Clady Burn	Dunadry	03/02/R602 - 223	35	10	3
R Blackwater	Caledon Bridge	03/06/R225 - 057	28	10	3
R Blackwater	Burn's Bridge	03/06/R245 - 229	27	10	3
R Rhone	Clonteevy	03/06/R530 - 061	30	10	3

	Location	Site Reference No.	MTR95	MTR96	MTR
Ballygawley Water	Lismore Bridge	03/06/R927 - 230	10	10	3
Rock River	Ballynakilly	03/07/R912 - 241	17	10	3
Ballymully R	Ballymully Bridge	03/10/R550 - 086	10	10	3
Glenaan R	Cushendall	04/02/R515 - 190	23	10	3
Cully's Burn	Glenavna	05/05/R752 - 213	40	10	3
Bessbrook	Glassdrummond	06/01/R720 - 119	30	10	3
R Finn	Below Rossiea	36/08/R525 - 279	21	10	3
Clanrye R	Barnmeen	06/01/R650 - 120	0	0	0
Irvinestown R	Necarne	36/06/R700 - 147	0	0	0

APPENDIX 5

SITE LOCATION DETAILS FOR THE 279 SITES SURVEYED FOR MACROPHYTES IN 1996

THE ENVIRONMENT & HERITAGE SERVICE CODE, RIVPACS SITE NUMBER, RIVER, LOCATION AND IRISH GRID REFERENCE FOR THE SITES IN THIS REPORT

ES CODE	RIV PAC	RIVER	LOCATION	IGR
01/01/R615	199	GLENMORNAN	BALLYMAGORRY	C 3680 0160
01/01/R635	292	GLENMORNAN	CATHERINES	C 3840 0050
01/02/R100	2	BURNDENNET	BDENNET BR	C 3740 0480
01/02/R455	197	ALTINAGHREE	BUNOWEN BR	C 4490 0430
01/02/R525	198	BURNDENNET	DUNNAMANAGH	C 4390 0300
01/03/R300	3	FINN	CLADY BR	H 2930 9400
01/04/R640	269	MOURNE	VICTORIA BR	H 3530 9070
01/04/R755	281	DOUGLAS	DOUGLAS BR	H 3730 9000
01/05/R050	4	DERG	MILLBROOK BR	H 3650 8770
01/05/R155	179	DERG	CREWE BR	H 3150 8450
01/05/R365	203	KILLEN BURN	GLASHAGH	H 2310 8270
01/05/R420	5	DERG	AGHYARAN BR	H 1910 8060
01/05/R600	6	MOURNE BEG	MOURNE BR	H 2070 8380
01/05/R855	202	GLENDERGAN	SRAGHCUMBER	H 1450 7960
01/06/R700	7	STRULE	ABERCORN BR	H 4040 8600
01/07/R050	8	OWENKILLEW	KILLYMORE BR	H 4380 8730
01/07/R175	252	GLENMACOFFER	G'MACOFFER BR	H 5270 8550
01/07/R205	177	OWENKILLEW	DRUMLEA	H 5320 8710
01/07/R245	204	GLENLARK	GLENLARK BR	H 5760 8750
01/07/R305	256	CONEYGLEN	C'GLEN BR	H 6030 8700
01/07/R340	255	OWENKILLEW	M'AMEAL BR	H 6130 8470
01/07/R430	9	GLENELLY	CORICK BR	H 4500 8860
01/07/R650	176	GLENELLY	CLOGHERNY BR	H 5630 9130
01/07/R750	257	GLENELLY	SPERRIN	H 6340 9410
01/07/R810	178	OWENREAGH	DRUMLEA BR	H 5350 8590
01/07/R879	254	OWENREAGH	CASHEL BR	H 5820 8220
01/07/R960	253	GLENSAWISK	C'BELLS BR	H 5650 8250
01/08/R050	10	STRULE	MOYLE BR	H 4110 8610
01/08/R450	11	STRULE	STONE BR	H 4370 7760
01/08/R850	12	STRULE	ABBEY BR	H 4490 7290
01/08/R952	201	CAPPAGH BURN	TATTYNURE BR	H 4360 7940
01/09/R050	13	FAIRYWATER	F'WATER BR	H 4310 7490
01/09/R200	182	FAIRYWATER	M'TOOMOG	H 3920 7660
01/09/R400	180	FAIRYWATER	M'AGHANS BR	H 3450 7760
01/09/R705	181	DRUMQUIN	DRUMQUIN	H 3290 7430
01/10/R100	14	CAMOWEN	DONELLYS BR	H 4640 7300
01/10/R128	200	K'CLOUGHER	LOVERS RET	H 4670 7290
01/10/R133	258	K'CLOUGHER	K'CLOUGHER	H 4720 7370
01/10/R430	259	CAMOWEN	RAMACKAN BR	H 3650 7010
01/10/R605	208	CLOGHFIN	BLACK HILL	H 5120 7060
01/11/R050	15	DRUMRAGH	CAMPSIE BR	H 4580 7240
01/11/R250	17	OWENREAGH	BALLYNAHATTY	H 4370 6730
01/11/R355	261	OWENREAGH	SHANNARAGH	H 3790 6480
01/11/R520	16	QUIGGERY	EDERGOOLE BR	H 4490 6780
01/11/R575	205	QUIGGERY	SESSIAGH BR	H 4510 6470
01/11/R705	260	QUIGGERY	ECCLESVILLE	H 4420 6020
01/11/R830	206	ESKRAGH	S'NORE MILL	H 4720 6350
01/11/R905	207	ROUTING BURN	BROWNS BR	H 5070 6170
02/01/R200	19	FAUGHAN	MOBUOY BR	C 4770 1930

ES CODE	RIV PAC	RIVER	LOCATION	IGR
02/01/R390	175	FAUGHAN	ARDMORE	C 4740 1340
02/01/R492	173	FAUGHAN	LEGAGHORY	C 5010 1060
02/01/R547	274	BONDS GLEN	ARDGROUND	C 5160 0770
02/01/R700	20	FAUGHAN	B'MEEN BR	C 5450 0710
02/01/R717	275	FOREGLEN	DUNGORKIN	C 5520 0740
02/01/R860	272	FAUGHAN	PARK	C 5940 0200
02/01/R903	174	BURNTOLLET	B'TOLLET BR	C 5030 1070
02/01/R953	273	GRANDALL	CLAUDY	C 5390 0660
02/02/R200	22	ROE	LIMAVADY	C 6680 2290
02/02/R300	23	ROE	DOGS LEAP	C 6790 2030
02/02/R400	24	ROE	NEW BR	C 6820 1530
02/02/R500	25	ROE	DUNGIVEN	C 6850 0950
02/02/R650	27	ROE	CORICK BR	C 7510 0630
02/02/R720	282	CASTLE	DRUMMOND BRID	C 6390 2280
02/02/R750	26	CURLY	ARTIKELLY BR	C 6840 2460
02/02/R805	29	OWENBEG	DUNGIVEN	C 6830 0980
02/02/R930	28	OWENRIGH	CARNABANE	C 6690 0670
02/03/R112	266	MUFF	MILL BR	C 5240 1880
02/03/R422	267	F'YARE	F'VALE BR	C 5780 2140
02/03/R831	268	BURNFOOT	RUSH HALL	C 6460 2420
03/01/R050	30	MAIN	DUNMORE BR	J 0870 8960
03/01/R200	31	MAIN	GRACEHILL BR	D 0770 0230
03/01/R400	32	MAIN	DUNDERMOT BR	D 0570 1300
03/01/R510	33	KELLSWATER	CURRYS BR	J 1050 9710
03/01/R555	38	KELLSWATER	ROCK BR	J 1600 9830
03/01/R620	34	BRAID	T'GARLEY BR	D 0910 0170
03/01/R700	37	BRAID	H'VILLE BR	D 1050 0300
03/01/R800	35	BRAID	KNOCKAN BR	D 1440 0650
03/01/R910	36	SLOGH	G'FORD BR	D 0620 1310
03/02/R050	39	SIX MILE WAT	CASTLE F BR	J 1450 8670
03/02/R185	224	RATHMORE	RATHMORE BR	J 1970 8540
03/02/R350	40	SIX MILE WAT	BALLYCUSHAN	J 2290 8690
03/02/R374	227	FOURMILE	FIFTY ACRES	J 2340 8860
03/02/R385	290	FOUR MILE BU	NEW MILL	J 2300 8970
03/02/R500	41	SIX MILE WAT	BELOW B'CLARE	J 2850 9030
03/02/R602	223	SLADY	DUNADRY	J 1940 8460
03/02/R720	42	B'MARTIN WA	B'MARTIN BR	J 2300 8660
03/02/R915	225	DOAGH	DOAGH	J 2580 8960
03/02/R965	226	DOAGH	DUNAMOY	J 2600 9350
03/03/R100	43	CRUMLIN	CIDERCOURT	J 1350 7660
03/03/R500	185	CRUMLIN	AIRPORT BR	J 1920 7670
03/04/R100	44	GLENAVY	LEAP BR	J 1400 7260
03/04/R400	209	GLENAVY	B'DONNAGHY BR	J 1790 7430
03/05/R050	45	UPPER BANN	M1 BR	J 0170 5920
03/06/R181	249	BLACKWATER	BENBURB	H 8190 5200
03/06/R520	71	TALL	DARBYS BR	H 9460 4620
03/06/R530	61	RHONE	C'TEEVY BR	H 8640 3850
03/06/R605	59	CALLAN	D'SCOLLOP	H 8670 5580
03/06/R620	72	CALLAN	ALLISTRAGH	H 8660 4920
03/06/R675	64	CALLAN	P'MILL BR	H 8570 3920
03/06/R705	60	OONA WATER	OONA BRIDGE	H 7820 5310
03/06/R752	231	TYNAN RIVER	A28 RD BR	H 7640 4460
03/06/R927	230	B'GAWLEY R	LISMORE BR	H 6300 5380
03/06/R974	228	FURY RIVER	B'LASTERA BR	H 5520 5170
03/07/R100	73	BALLINDERRY	B'DERRY BR	H 9270 7980

ES CODE	RIV PAC	RIVER	LOCATION	IGR
03/07/R300	74	BALLINDERRY	DOORLESS	H 8350 7640
03/07/R400	75	BALLINDERRY	KINGS BR	H 8130 7650
03/07/R543	242	BALLINDERRY	CORKHILL BR	H 7340 7930
03/07/R620	77	LISSAN WATER	L'MONEY	H 8510 7950
03/05/R130	46	UPPER BANN	SH'TONS BR	J 0130 5420
03/05/R250	47	UPPER BANN	DYNES BR	J 0420 5120
03/06/R225	57	BLACKWATER	CALEDON BR	H 7590 4460
03/06/R245	229	BLACKWATER	BURNS BR	H 7120 4740
03/06/R300	62	BLACKWATER	D'MEEN BR	H 6250 5300
03/06/R380	280	C'LISLAND CAN	ANNAGHBEG	H 8830 6280
03/06/R410	63	TORRENT	N'MILLS BR	H 8160 6770
03/06/R451	67	TALL	C'MORE BR	H 8840 6070
03/06/R465	68	TALL	CLONMAIN	H 8930 5540
03/06/R491	69	TALL	REDMONDS BR	H 9380 5540
03/06/R503	70	TALL	DRUMARD BR	H 9610 5290
03/05/R281	283	UPPER BANN	GILFORD BR	J 0660 4830
03/05/R366	284	UPPER BANN	MILLTOWN	J 1130 4860
03/05/R465	286	UPPER BANN	SOLITUDE PARK	J 1270 4580
03/05/R500	50	UPPER BANN	BALLYDOWN	J 1380 4500
03/05/R560	287	UPPER BANN	KATESBRIDGE	J 2090 4030
03/05/R658	289	MUDDOCK	MUDDOCK	J 2350 3410
03/05/R680	288	UPPER BANN	McCOMBS BR	J 2320 3310
03/05/R700	51	UPPER BANN	HILLTOWN	J 2180 2910
03/05/R755	54	BALLYBAY	OBINS ST	J 0810 5460
03/05/R820	52	CUSHER	KNOCK BR	J 0390 5080
03/05/R880	53	CUSHER	CLARE BRIDGE	J 0120 4300
03/06/R025	55	BLACKWATER	VERNERS BR	H 8820 6110
03/06/R075	65	BLACKWATER	BONDS BRIDGE	H 8730 5860
03/06/R125	56	BLACKWATER	MOY	H 8520 5590
03/07/R635	243	LISSAN WATER	DRUMGRASS BR	H 8060 8160
03/07/R633	244	BALLYMULLY	B'GONY BR	H 8720 7850
03/07/R720	76	KILLYMOON	POW BR	H 8240 7570
03/07/R912	241	ROCK RIVER	B'KILLY BR	H 7730 7240
03/08/R030	78	MOYOLA	NEW BR	H 9560 9050
03/08/R335	184	MOYOLA	F'WILLIAM BR	H 8570 9270
03/08/R612	251	MAGHERAFELT	GRANIAS BR	H 9310 9110
03/08/R707	270	GRANGE WAT	CURRAN	H 8880 9520
03/08/R805	250	BACKBURN	W'STEELES BR	H 8750 9710
03/09/R218	211	DUNORE R.	UPPER BRIDGE	J 1470 8290
03/09/R245	210	BLACK BURN	MOUNT COTT	J 1210 8060
03/10/R100	85	LOWER BANN	THE CUTS	C 8630 3000
03/10/R300	79	LOWER BANN	KILREA BR	C 9360 1330
03/10/R400	80	LOWER BANN	PORTGLENONE	C 9750 0380
03/10/R490	81	LOWER BANN	TOOME BRIDGE	H 9890 9080
03/10/R510	82	BALLYMONEY	GLENSTALL BR	C 9140 2580
03/10/R550	86	BALLYMONEY	B'MONEY BR	C 9550 2580
03/10/R608	186	MACOSQUIN	REE BRIDGE	C 8980 2370
03/10/R710	83	AGIVEY	GLASGORT	C 9070 2250
03/10/R745	188	AGIVEY	M'CARRIE BR	C 8670 1950
03/10/R815	187	AGHADOWEY	WHITE BR	C 8790 2280
03/10/R910	84	CLADY	GLENONE BR	C 9630 0380
04/01/Q370	90	BURNGUSHET	BURNGUSHET	C 9490 3110
04/01/R100	89	BUSH	BUSHMILLS	C 9390 4090
04/01/R300	87	BUSH	SENEIRL BR	C 9420 3600
04/01/R460	91	BUSH	CONAGHER BR	C 9620 3060

ES CODE	RIV PAC	RIVER	LOCATION	IGR
04/01/R500	88	BUSH	BELLISLE BR	C 9660 3040
04/01/R682	264	BUSH	BALLYHOE	D 0770 2910
04/01/R835	92	DERVOCK	DERVOCK BR	C 9770 3170
04/01/R955	93	DERVOCK	IDEROWN BR	D 0210 3340
04/02/R210	194	TOW	GASWORKS	D 1140 4060
04/02/R245	193	GLENSHESK	B15 RD BR	D 1260 4060
04/02/R305	192	CAREY	CAREYMILL BR	D 1410 4060
04/02/R412	191	GLENDUN	K'NACARRY BR	D 2400 3260
04/02/R515	190	GLENAAN	CUSHENDALL	D 2370 2750
04/02/R625	189	GLENARIFF	C'LISNAGH BR	D 2240 2140
04/02/R702	196	GLENCLOY	CARNLOUGH	D 2880 1650
04/02/R773	195	GLENARM	GLENARM	D 3100 1490
05/01/R200	95	LAGAN	SHAWS BR	J 3270 6940
05/01/R250	104	LAGAN	DRUM BR	J 3060 6710
05/01/R288	285	LAGAN	WOLFENDENS BR	J 2840 6650
05/01/R400	97	LAGAN	LISBURN	J 2710 6420
05/01/R550	106	LAGAN	YOUNGS BR	J 2330 6300
05/01/R600	98	LAGAN	SPENCERS BR	J 1830 6030
05/01/R655	103	LAGAN	FORGE BRIDGE	J 1290 5810
05/01/R700	102	LAGAN	BANOGE	J 1230 5380
05/01/R750	107	LAGAN	BELOW D'MORE	J 1770 5350
05/01/R850	100	LAGAN	BULLS BROOK	J 2520 5160
05/01/R910	101	RAVERNET	SPRUCEFIELD	J 2620 6240
05/01/R945	212	RAVERNET	LEGACURRY	J 2970 6010
05/02/R200	109	ANNACLOY	ANNACLOY BR	J 4480 4840
05/02/R300	110	BALLYNAHINCH	L'CURRY BR	J 4220 5260
05/02/R500	111	BALLYNAHINCH	BELOW B'HINCH	J 3780 5150
05/02/R700	112	BALLYNAHINCH	CASEYS BR	J 3430 5400
05/02/R805	248	GLASSWATER	KILMORE	J 4500 5110
05/03/R040	113	BLACKWATER	B'MARTIN BR	J 5030 6240
05/04/R200	114	ENLER	KENNEL BR	J 2560 6990
05/05/R070	218	LARNE	OWEN'S BR	D 3780 0080
05/05/R127	217	GLYNN	GLYNN	J 4080 9990
05/05/R480	216	KILROOT	KILROOT	J 4430 8980
05/05/R655	214	WOODBURN	COURTALDS	J 4030 8720
05/05/R752	213	CULLY'S BURN	GLENAVNA	J 3580 8290
05/07/R610	235	BLACKSTAFF	T'MURRY BR	J 4290 4120
05/07/R635	236	ARDILEA	A2 RD BR	J 4070 3910
05/07/R710	237	MONEYCARRA	MONEYLANE	J 3990 3690
05/07/R875	238	CARRIGS	MAGHERA BR	J 3680 3430
06/01/R100	115	NEWRY	NEWRY	J 0850 4820
06/01/R300	116	NEWRY	CARNMEEN	J 0750 3030
06/01/R400	117	NEWRY	SHEEP BR	J 0970 3150
06/01/R500	118	CLANRYE	CROWN BR	J 1080 2750
06/01/R650	120	CLANRYE	BARNMEEN	J 1640 3260
06/01/R720	119	BESSBROOK	G'DRUMMOND	J 0720 2830
06/01/R735	183	BESSBROOK	MILLVALE BR	J 0620 2830
06/01/R807	245	JERRETTSPASS	JERRETTSPASS	J 0640 3330
06/01/R905	170	NEWRY CANAL	CARNMEEN	J 0740 3030
06/02/R015	239	BURREN	BAILEYS BR	J 3580 3370
06/02/R060	240	SHIMNA RIVER	T'MORE FRST	J 3530 3230
06/02/R135	234	ANNALONG	ANNALONG BR	J 3740 1980
06/02/R285	233	KILKEEL	A2 RD BR	J 3140 1510
06/02/R335	232	AUGHRIM	KILKEEL	J 3050 1490
06/02/R438	222	WHITEWATER	WH'WATER BR	J 2670 1530

ES CODE	RIV PAC	RIVER	LOCATION	IGR
06/02/R560	221	CASSY WATER	CASSY WTR BR	J 2380 1490
06/02/R665	121	KILBRONEY	NEWTOWN BR	J 1890 1910
06/02/R704	220	GHANN	GREEN PK BR	J 1750 1920
06/02/R755	219	MOYGANNON	M'GANNON FD	J 1590 1870
06/04/R705	247	CULLYWATER	CARRIVE	H 9760 1700
06/04/R881	246	FORKHILL	F'HILL LOWER	H 0150 1570
35/01/R010	171	ROOGAGH R	GARRISON	G 9410 5180
35/03/R010	172	COONEY	COUNTY BR	G 9370 5070
36/01/R205	263	ERNE	BELLEEK	G 9390 5900
36/01/R300	122	ERNE	R'CORR	G 9870 5860
36/01/R315	134	GARVARY	A47 RD BR	H 0190 6150
36/01/R320	135	GARVARY	L'HILL	H 0090 6300
36/01/R360	265	WATERFOOT	LETTER BR	H 0850 6520
36/02/R020	123	ERNE	ENNISKILLEN	H 2310 4430
36/02/R247	277	L. HACHER	MOORLOUGH	H 3740 3070
36/02/R405	276	N'BUTLER	N'BUTLER	H 4180 2590
36/03/R100	128	TERMON	KILLYNOOGAN	H 1110 6590
36/04/R050	136	BANNAGH	B'NAGH BR	H 1620 6540
36/04/R600	137	BANNAGH	D'GALLIAGH	H 2050 6870
36/04/R800	138	BANNAGH	D'GRESHIAL	H 1870 6920
36/05/R060	139	GLENDURRAGH	KESH	H 1800 6390
36/05/R310	140	GLENDURRAGH	EDERNY	H 2220 6520
36/05/R400	141	GLENDURRAGH	E'MOHILL	H 2440 6640
36/05/R710	144	DOORAA	LETTERKEEN	H 1820 6450
36/05/R800	142	DOORAA	K'GARRY	H 2050 6630
36/05/R910	143	EDENCLAW	EDENCLAW	H 2320 6540
36/06/R050	129	B'MALLARD	B'CASSIDY BR	H 2280 5070
36/06/R200	145	B'MALLARD	M'CROSS	H 2810 5370
36/06/R620	146	IRVINESTOWN	TULLYCLEA	H 2360 5300
36/06/R700	147	IRVINESTOWN	NECARNE	H 2300 5650
36/06/R805	148	TRILLICK	CARRAN	H 3100 5660
36/07/R010	278	HOLLYBROOK	AG'LURCHER	H 3630 3110
36/07/R100	130	CBROOKE	B'DARRAGH	H 3310 3600
36/07/R300	149	COLEBROOKE	T'REAGH BR	H 3780 4410
36/07/R400	150	COLEBROOKE	POLLBOY BR	H 4450 4340
36/07/R520	151	TEMPO	K'BALLY	H 3420 3920
36/07/R610	152	TEMPO	TEMPO	H 3470 4690
36/07/R640	271	TEMPO	TATTINWEER	H 3630 4920
36/07/R755	154	MANYBURNS	MANYBURNS	H 3848 4730
36/07/R810	153	CLEEN	C'LONGFORD	H 4280 4530
36/08/R010	155	FINN	WATTLE BR	H 4258 2080
36/08/R100	156	FINN	B'HOE FR	H 4648 2080
36/08/R505	159	FINN	ROSSLEA	H 5328 3090
36/08/R525	279	FINN	ROSSLEA BR	H 5378 3258
36/08/R810	157	LACKEY	CARRA BR	H 4850 2378
36/08/R900	158	LACKEY	K'BALLYMORE	H 4820 2720
36/10/R050	160	WOODFORD	AGHALANE	H 3420 1940
36/11/R100	131	SWANLINBA	THOMP'BR	H 2530 3130
36/12/R050	132	ARNEY	D'MANE BR	H 2360 3670
36/12/R150	161	ARNEY	BROCKAGH	H 1750 3750
36/12/R247	291	L MACNEAN	BELCOO	H 0830 3840
36/12/R425	169	BLACK	D'KEENAGH	H 0180 4350
36/12/R825	162	CLADAGH	GORTEEN	H 1320 3670
36/13/R050	133	SILLEES	D'KEEN BR	H 2300 4130
36/13/R350	163	SILLEES	THOM'SONS BR	H 1810 4480

ES CODE	RIV PAC	RIVER	LOCATION	IGR
36/13/R550	164	SILEES	CARR BR	H 1300 4710
36/13/R620	168	SILEES	D'NURE	H 1200 4970
36/13/R700	165	SILEES	D'GONNELLY	H 1180 5210
36/13/R830	166	BOHO	BOHO	H 1340 4450
36/13/R920	167	SCREENAGH	A'KEERAN	H 1080 4920