



# **Integrated Water Quality Report Monaghan & Louth 2011**



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**Integrated Water Quality Report  
Co. Monaghan & Co. Louth**

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Middle. Dromore River in Ballybay (Ray Smith, EPA)  
Left. Bawn Lake in Co. Monaghan (Bryan Deegan, MERC Consultants)

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## EXECUTIVE SUMMARY

### Scope

This report presents a review of water quality in Counties Louth and Monaghan in 2011. These counties lie within three River Basin Districts (RBDs):

- Neagh-Bann IRBD
- North-Western IRBD
- Eastern RBD

It is also a step further along the road of transforming these reports into integrated water quality reports with greater emphasis on the reporting requirements of the Water Framework Directive (WFD). This report therefore also aims to present an assessment of progress towards meeting the objectives of the WFD as set out in the respective River Basin Management Plans.

In 2011, as in previous years, data on river water quality was presented in the form of maximum, minimum and median values for each water quality parameter. Assessments of water quality were made on this basis and any significant changes in quality from previous years were noted.

This year, greater emphasis has been placed on the reporting requirements of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009). Data for several key parameters - Dissolved Oxygen, Ammonia, Nitrate, ortho-Phosphate and Biochemical Oxygen Demand have been presented in map format whereby the annual average values for each parameter have been presented as coloured dots on maps, with each dot representing a sampling station on a river.

As well as a section on river water quality, there are also sections on lakes, groundwaters and transitional & coastal waters, which incorporate biological assessments as well as the physico-chemical assessments. Including these sections is recognition of the importance of these water types in the water cycle and the desire to produce a more integrated WFD-style report. Raw river and lake monitoring data are presented on CD at the end of this report.

The report is based on the biological and physico-chemical sampling and analysis of:

- 79 river stations on 32 rivers
- 16 lakes (in County Monaghan)
- 13 groundwaters
- 16 transitional and coastal waters (in County Louth)
- 4 designated bathing water sites (in County Louth)

Details of the ecological status of Irish waters for the period 2007 – 2009 as required under the Water Framework Directive are found on the EPA website<sup>1</sup>. The review of ecological quality is an on-going process and preparations are underway for assessment of data for the period up to 2012, when the next major report to the EU will be required. This report builds on the information collated to date.

### Pressures

The portions of the three RBD's covered in this report can be sub-divided into 11 water management units (WMU's). These are mapped in the introduction and the key point pressures are identified in the Summary of Pressures chapter. Many of the key pressures are common to all WMUs – waste water treatment plants, surface & groundwater abstraction points for drinking water and industrial discharges. Diffuse pressures such as agricultural discharges and discharges from septic tanks also common to all areas.

<sup>1</sup> [http://www.epa.ie/downloads/pubs/water/waterqua/Final\\_Status\\_Report\\_20110621.pdf](http://www.epa.ie/downloads/pubs/water/waterqua/Final_Status_Report_20110621.pdf)

## Rivers

The River Monitoring Programme covers the following areas:

- Operational Sites
- Surveillance Sites
- Surface Water Abstraction Sites

They are monitored for a range of parameters and at suitable frequency, as required by the relevant legislation. Priority substance monitoring on surveillance sites is also carried out and is co-ordinated by the EPA laboratory in Dublin.

Biological monitoring for rivers generally occurs at least once every three years. The number of high quality sites in the country has reduced by almost half in the period 1987 to 2008. Only five sites in Louth and Monaghan were classified as high quality (Q4-5) in the period 2009 to 2011. In addition, only 35% of river sites in this area are of high or good status compared with 52% nationally. Elevated phosphate and nitrate levels are of particular concern and one of the big challenges will be reducing these nutrient levels to acceptable concentrations in all rivers within the timeframes required by the WFD.

A total of 44 river sites in Counties Louth and Monaghan have been identified as priority polluted sites for tackling the causes of pollution (see Table 2.1). The majority of problems at these sites are caused by diffuse agricultural and point source municipal pollution. Tackling pollution at these sites, will not only improve river quality, it may have knock-on beneficial effects on the lakes and transitional & coastal waters that are fed by these rivers. Targeted local investigations using a variety of methods – for example the Small Stream Risk Score (SSRS) in investigating diffuse pollution – will be the most effective way of identifying and eliminating sources of pollution.

## Lakes

Sixteen lakes, all of which are in County Monaghan were monitored under the Water Framework Directive. Of these lakes, 12.5% are of high or good ecological status with none being classified as high status. This compares very unfavourably with the national picture where 47% of lakes are of high or good status. Rising trends for chlorophyll and phosphorus in some lakes are of particular concern. Diffuse pollution is thought to be the main pressure and a reduction in the amount of nutrients reaching lakes via feeder rivers will be key in improving lake water quality.

## Groundwater

During 2011, 13 groundwater sites were monitored in Louth and Monaghan. Overall 95% of Louth and Monaghan are classified as being at good groundwater status. Nitrate and phosphate levels are relatively low in County Monaghan, but the average values in County Louth are more variable and are more comparable to those seen nationally. There has been a general increase in nitrate and phosphate levels since 2009, which highlights the need to continue with the WFD Programmes of Measures to ensure that nutrient loss to groundwaters is minimised. As with surface water, diffuse pollution is thought to be the main pressure. While agriculture is a potential source of diffuse pollution, on site wastewater treatment systems, including septic tanks, may also be a significant contributor to groundwater pollution.

## Transitional and Coastal Waters

Over 300 km<sup>2</sup> of transitional and coastal waters in 16 water bodies are included in the Louth-Monaghan area. Of these water bodies, five are assessed for ecological status, as defined under the Water Framework Directive; three are classified as being of high or good status with the remaining two being classified as moderate or worse. Bathing waters were also monitored in County Louth during 2011 and all were found to be of good quality.



## Overall Assessment and Conclusions

Water quality in Louth and Monaghan is generally poor when compared with the rest of the country – 35% of rivers, 95% of groundwaters, 60% of transitional and coastal waters, 12.5% of lakes meet the target of good or better status as required under the WFD.

A total of 44 river sites in Louth and Monaghan have been identified as priority polluted sites for tackling the causes of pollution. Reducing pollution at these sites should also result in improved conditions in lakes, groundwaters, and transitional & coastal waters; – refer to table 2.1 which identifies the suspected sources of pollution.

The low percentage of lakes in Monaghan currently at good or higher status is a real cause for concern. Unless significant action is taken, there is likelihood that very few lakes will reach the WFD target of good ecological status by 2015.

Pressures on water bodies in both counties arise from both point and diffuse source pollution. In particular, waters are affected by high levels of nutrients – especially nitrates and ortho-phosphates. Levels of both nutrients need to be reduced to achieve WFD targets.

Addressing the sources of pollution – especially diffuse pollution (from agriculture and septic tanks), and understanding the interactions between the various water bodies – rivers, lakes, groundwater and transitional & coastal waters is vital in retaining and restoring (where appropriate) good status to all water bodies.

Development of the agriculture sector, as detailed in *Food Harvest 2020*, will bring large increases in farm outputs over the coming years. The first of these increases will be in milk production expected in 2016 when the milk quota system is abolished. The challenges of meeting the targets set in the strategy, in an environmentally sustainable way, are significant. It is important that this sector be developed in such a way that Ireland can also meet its targets under the WFD.

## INTRODUCTION

This report is an evolution of the annual reports on river water quality produced in previous years for the local authorities in Louth and Monaghan. It is also a sequel to those issued previously by the Environmental Protection Agency (EPA) and reviews the water quality monitoring carried out in accordance with the National Water Framework Directive Monitoring Programme for the period 2009 – 2011. This programme, which commenced in 2007, covers the principal water body types of rivers, lakes, groundwaters and transitional (Estuarine) & coastal waters. It was set up to address the requirements of Article 10 (1) of the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003). These regulations are the National Regulations implementing the requirements of the Water Framework Directive 2000/60/EC.

While the format of the report has changed somewhat down through the years, it has largely focussed on river water quality. This year it has been decided to revamp the report in an effort to bring it more into line with Water Framework Directive reporting requirements. Therefore in addition to rivers, information on lakes, groundwaters and transitional & coastal waters has also been included. This is the first step along the way to producing a more integrated water quality report and it is anticipated that further changes will be necessary to meet future requirements.

The area covered in this report relates to parts of three RBD's, the Neagh-Bann, the North-Western and the Eastern. The following map shows the boundaries of the relevant RBD's in the Louth-Monaghan area. These two counties cover part of the three RBDs. Each RBD is subdivided into Hydrometric areas and divided again into Water Management Units.

The WFD aims to maintain the high status of surface and groundwaters, to prevent the deterioration of existing status of waters and to achieve high or good status for those waters by 2015.

More information on the EU Water Framework Directive can be obtained at [www.wfdireland.ie](http://www.wfdireland.ie). The WFD specifies three types of monitoring - Operational, Surveillance and Investigative. The EPA carries out surveillance monitoring, but also provides analytical services to Local Authorities in some areas, in respect of Operational and Investigative Monitoring. Coastal waters are assessed by the Marine Institute, while EPA undertakes assessment of Transitional (Estuarine) waters and groundwater. Investigative Monitoring – aimed at identifying possible causes of pollution and steps required to improve conditions is a responsibility of Local Authorities.

The objectives of Surveillance Monitoring are:

- Supplementing and validating the impact assessment procedure detailed in Annex II of the Directive;
- Assisting the efficient and effective design of future monitoring programmes;
- Assessment of long term changes in natural conditions;
- Assessment of long term changes resulting from widespread anthropogenic activity.
- To provide an overall view of surface water status within the river basin district.

Operational Monitoring aims to:

- Establish the status of those bodies identified as being at risk of failing to meet their environmental objectives;
- Assess any changes in the status of such bodies resulting from the Programme of Measures.

The first full period for the assessment of water quality covers 2009 – 2015. This report aims to present an assessment of progress towards meeting the objectives of the WFD as set out in the respective River Basin Management Plans. Details of these are available on the WFD Ireland website<sup>2</sup>.

<sup>2</sup> [http://www.wfdireland.ie/docs/1\\_River%20Basin%20Management%20Plans%202009%20-%202015/](http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/)

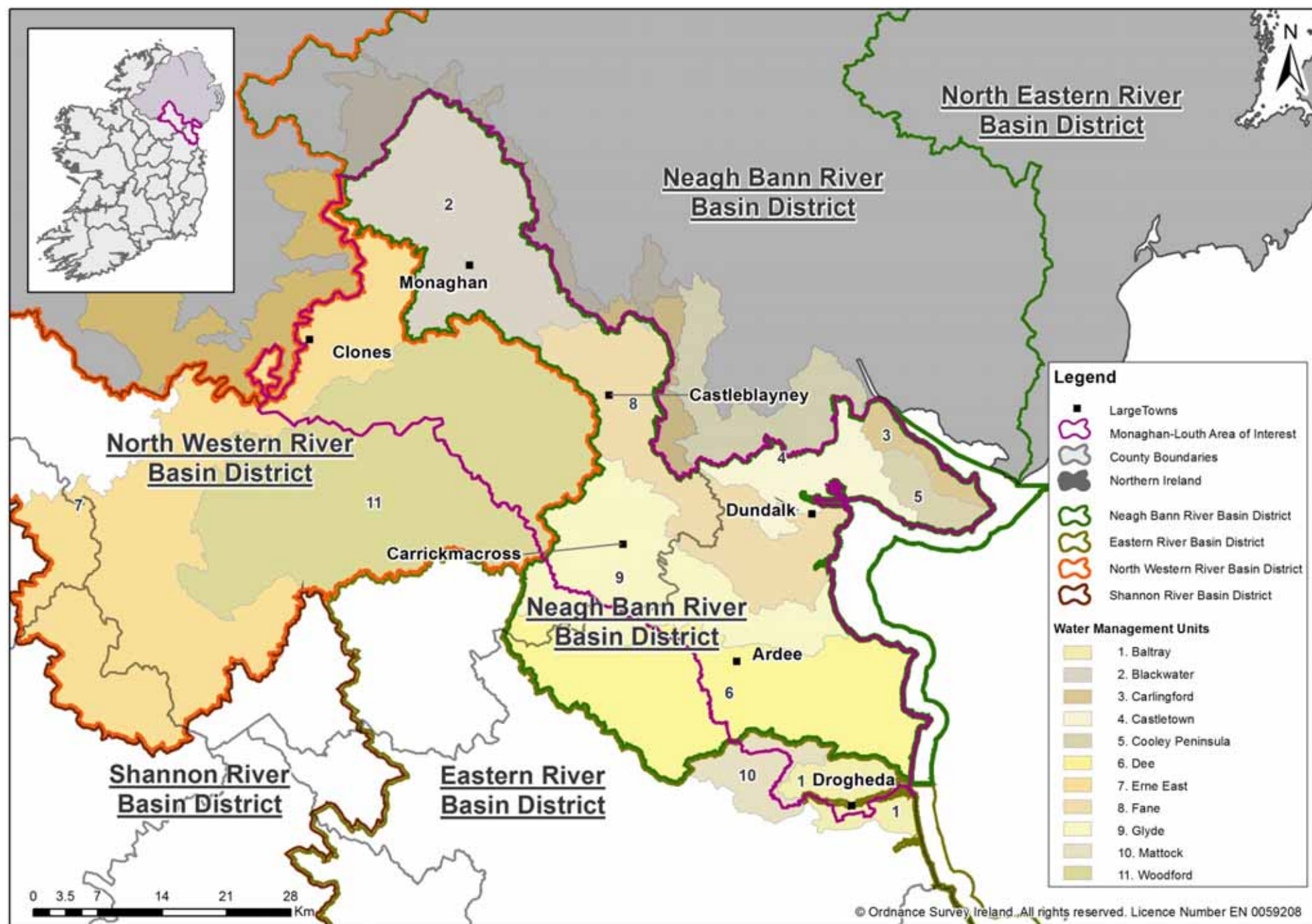


Figure 1.1 River Basin Districts in the North East of Ireland.

## Change in Report Format

The format of this report differs from previous years in respect that it is focussed towards the objectives of the WFD. Changes from previous formats include:

- A greater emphasis on assessing compliance with the WFD, and in particular the reporting requirements of the European Communities (Water Policy) Regulations 2003 (SI 722 of 2003), the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI 272 of 2009), the European Communities Environmental Objectives (Groundwater) Regulations, 2010 (SI 9 of 2010) and other relevant legislation.
- Focus on pressures at Water Management Unit (WMU) level as defined in the WFD River Basin District Management Plans.
- Data for several key parameters are presented in map format whereby the annual average values are presented as coloured dots on maps, with each dot representing a sampling station on a river or lake.
- Graphical presentation of parameter quality and trends with spatial and temporal assessment where sufficient data stations permit.
- Appendices containing the raw monitoring data for rivers and lakes are available on CD at the end of this report.

## SUMMARY OF PRESSURES

Figure 2.1 summarises the key point pressures in the Monaghan and Louth areas. More detailed information may be found on [www.wfdireland.ie](http://www.wfdireland.ie) and in the river basin management plans of the relevant RBD.

Many of the point pressures are common to all WMU's – for example there are waste water treatment plants in almost all WMUs and abstraction points for drinking water in all WMUs. Industrial discharges, landfills and waste facilities are also point source pressures.

Forty four priority polluted river sites have been identified in Louth and Monaghan. Further details of these, including the key pressures, are presented in table 2.1 below. These are the sites that should be the focus of future investigative monitoring.

Louth and Monaghan are predominantly rural counties and diffuse pollution from agriculture and septic tanks are also significant contributory pressures which are expected to grow in the coming years. *Food Harvest 2020*, which was developed as a cohesive road map for the agriculture, fisheries and forestry sector to build capacity, predicts the value of primary output in this sector will increase by 33% from the 2007-2009 average. It should be noted that environmental sustainability is stated as a key underlying principle of *Food Harvest 2020*, and therefore there will be challenges for the agriculture sector to deliver the projected increases in output in a manner that does not prevent Ireland from meeting its objectives under the WFD.

Table 2.1. Priority polluted river sites in counties Louth and Monaghan. The sites are ranked under diffuse and point source headings. This includes all of the currently polluted sites surveyed in Louth and Monaghan in the 2009-2011 period; plus three sites surveyed in 2007-2009 but not surveyed again since.

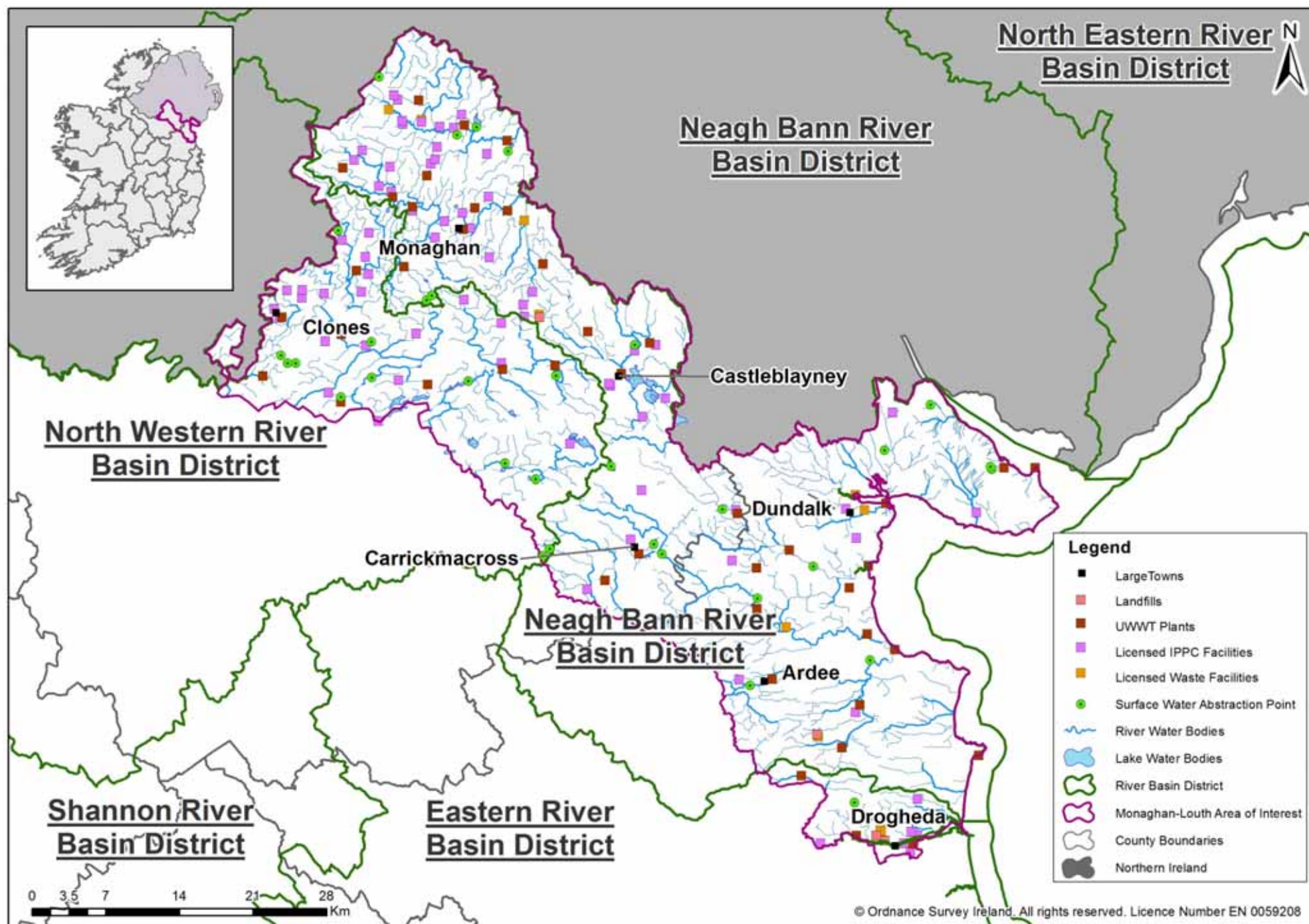
### Louth

River	Status	Station	Key Pressure	Comment
<b>Diffuse Pollution</b>				
Dee	Poor	06D010710	Agriculture	Manure and excess siltation from cattle access
Dee	Poor	06D011000	Agriculture	
Proules	Moderate	06P010600	Agriculture	
Mattock	Moderate	07M010200	Agriculture	Enriched - excessive siltation. Improved pasture & tillage u/s
Castletown	Poor	06C010050	Agriculture	
Termonfeckin	Poor	06T010350	Agriculture	
White (Louth)	Poor	06W010200	Agriculture	New site in 2011
White (Louth)	Poor	06W010500	Agriculture	
Ballymascanlan	Poor (2008)	06B020200	Agriculture	
<b>Other Pollution Sources in Louth:</b>				
Flurry	Moderate	06F020100	Industrial	Oil from transport yard
Ballymascanlan	Moderate	06B020100	Industrial	Suspected illegal waste oil dumping.

**Monaghan**

River	Status	Station	Key Pressure	Comment
<b>Diffuse Pollution</b>				
Fane	Poor	06F010400	Agriculture	Very hypertrophic outflow from Lough Muckno.
Carrickaslane Lough Stream	Poor	06C040115	Agriculture	Mainly agricultural catchment, livestock farming
Clontibret Stream	Poor	03C010600	Agriculture	Cattle access. Rubbish dumping an issue.
County Water	Moderate	06C030170	Agriculture	Suspected slurry problems since 1994.
Gentle Owen's Lake Stream	Moderate	06G040100	Agriculture	Cattle access a problem at u/s site 06G040040.
Finn (Monaghan)	Moderate (2007)	36F011000	Agriculture	
Conawary (Lower)	Poor	03C021300	Agriculture	
Avaghon Lake Stream	Poor	36A070600	Agriculture	
Conawary (Upper)	Poor	36C110500	Agriculture	
Dromore	Poor	36D020300	Agriculture	
Dromore	Poor	36D020500	Agriculture	
Fane	Moderate	06F010200	Agriculture	Tributary of Lough Muckno.
Clontibret Stream	Poor	03C011400	Agriculture	Mushroom composting nearby.
Fane	Poor	06F010155	Agriculture	
Finn (Monaghan)	Moderate	36F010100	Agriculture	
Knappagh	Moderate	36K010200	Agriculture	
Magherarney	Poor	36M010200	Agriculture	
Maghery	Poor	36M031200	Agriculture	
Mountain Water	Moderate	03M010400	Agriculture	
Bunnoe	Moderate	36B050090	Agriculture	P0872-01 just u/s
Bunnoe	Poor	36B050400	Agriculture	
Dromore	Moderate	36D020075	Agriculture	
Finn (Monaghan)	Moderate	36F010200	Agriculture	
Maghery	Poor	36M030600	Agriculture	
Finn (Monaghan)	Moderate	36F010500	Agriculture	
<b>Point Source Pollution in Monaghan</b>				
Shambles	Poor	03S010500	Municipal	D0061-01 WWTP and various urban discharges
Proules	Poor (2006)	06P010300	Municipal	D0062-01 (Inaccessible for biology in 2009)
Mountain Water	Poor	03M010500	Municipal	D0346-01 d/s Emyvale WWTP
Blackwater (Monaghan)	Poor	03B010800	Municipal	D0463-01
Blackwater (Monaghan)	Poor	03B010650	Municipal	D0463-01
DROMORE	Moderate	36D020150	Municipal	D0207-01
Blackwater (Monaghan)	Moderate	03B010510	Municipal	A0032-01
Blackwater (Monaghan)	Moderate	03B010300	Municipal	A0032-01





**Figure 2.1** Environmental pressures in the North East of Ireland

## RIVER WATER QUALITY

### Sampling locations

Physico-chemical and biological monitoring under the WFD is being undertaken at 79 stations in 32 rivers in Counties Monaghan and Louth. These sites were selected as representative of clean waters near the source of the river, or spring, and also at regular locations along the river, where sampling is convenient, safe and representative of the river in general. Sites were also selected downstream of discharges that might impact on the general quality of the river. A full list of the physico-chemical monitoring stations is available in Appendix 1.

Physico-chemical monitoring is carried out on each river site between four and 12 times per year, depending on the legislative requirements. This can take the form of surveillance monitoring which is undertaken by EPA to determine long term variations in water quality; or operational or investigative monitoring which is undertaken by (or on behalf of) Local Authorities for the purposes of assessing the impacts of localised pollution sources.

Biological monitoring is generally carried out once every three years at each site. The map below indicates the locations of the river monitoring sites in Counties Monaghan and Louth.

Further information on the design and operation of National Monitoring programmes is available from the EPA website<sup>3</sup>.

### Physico-Chemical Monitoring of Rivers

The monitoring of rivers in Monaghan & Louth under the WFD is carried out to fulfil the requirements of one of the following programmes:

- Operational Monitoring Programme
- Surveillance Monitoring Programme

Operational Sites are required to be monitored at least four times per annum and require the following monitoring: temperature, dissolved oxygen, pH, conductivity, hardness, colour, alkalinity, ortho-phosphate, TON, nitrate, nitrite, ammonium, chloride and BOD.

Surveillance sites are required to be monitored 12 times per annum for the general physico-chemical parameters listed above. There is also a requirement to monitor for priority substances (including certain metals and organic compounds) as part of the Surveillance Monitoring Programme.

In previous reports water quality had generally been characterised on a broadly defined scale of “Unpolluted”, “Slightly Polluted” “Moderately Polluted” and “Seriously Polluted” depending on the concentrations of nutrients such as ortho-phosphate, ammonium, TON, and reference to the biological Q-value and BOD. This approach has been continued in this report as is reflected in the individual river assessments given in Appendix 2.

The WFD has introduced a new system of ecological status which incorporates supporting general physico-chemical data and hydromorphological criteria. A separate system for assessing ‘chemical status’ for a short list of priority substances and priority hazardous substances as per Annex X of the WFD is also now in place. The latter is applied particularly at surface water surveillance monitoring sites. The general physico-chemical and priority substances are now assessed against their compliance with the criteria set out in the “European Communities Environmental Objectives (Surface Water) Regulations 2009” ([S.I 272 of 2009<sup>4</sup>](#)).

In determining the ecological status of a river water body, a number of general physico-chemical parameters are assessed against annual mean and 95%ile standards which have been set for each. The assessment is based on a statistical approach whereby the pass/fail criterion requires 50% of these parameters, namely, ortho-phosphate, ammonia, BOD and nitrate to exceed the mean and 95%ile standards at a 99% confidence level.

<sup>3</sup> <http://www.epa.ie/downloads/pubs/water/other/wfd/>

<sup>4</sup> <http://www.environ.ie/en/Legislation/Environment/Water/FileDownload,20824,en.pdf>



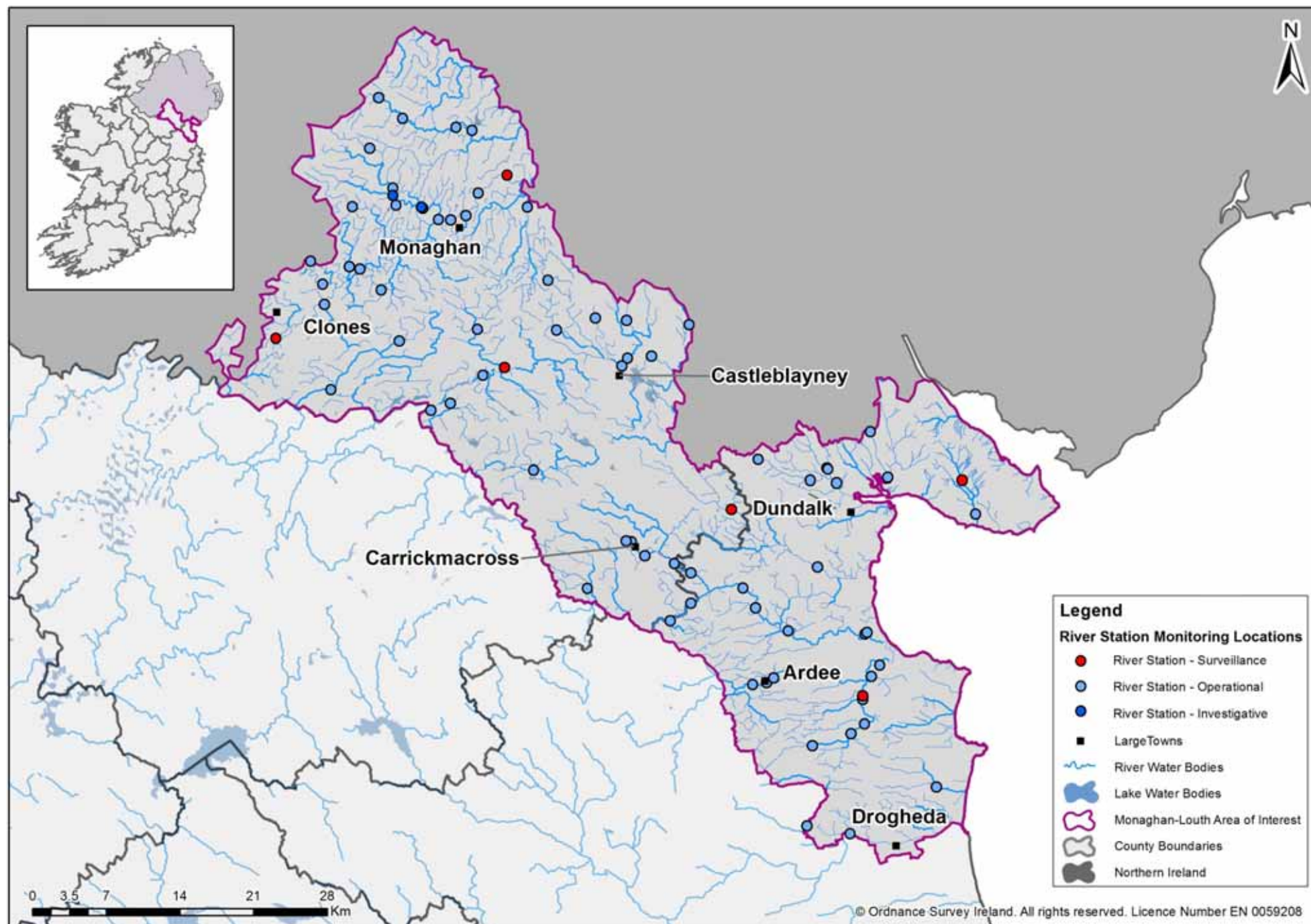


Figure 3.1 River Monitoring Points in Monaghan & Louth 2011

The key parameters are discussed in greater detail in the following sub-sections. It should be noted however that in these sections the maps present the data as face value comparisons against the relevant EQS rather than using the aforementioned statistical approach. This is largely due to the small amount of data available for each site in one year. For future reports, it is anticipated that the assessment period will be extended to three years which will allow for a more appropriate assessment of the data.

Information on the main physico-chemical parameters can be found in Appendix 3, and raw data is available on disk at the back of this report.

### *o-Phosphate in River Waters*

River water quality monitoring has shown increased eutrophication in most Irish rivers since the 1970's. This is caused fundamentally by increased phosphorus run-off from agricultural land and farmyards, as well as from municipal and industrial effluent discharges (McGarrigle *et al.*, 2010).

Eutrophication in surface waters arises from the marked increase in nutrient supply leading to excessive growth of algae or other plants. Phosphorus is usually the limiting nutrient for plant growth in freshwaters. It is an essential element for life and is non-toxic. Plants require phosphorus (along with other nutrients) for growth and a small amount of phosphorus in surface waters is natural.

If natural levels of phosphorus are exceeded, there can be excessive plant growth leading to high levels of photosynthesis (and oxygen production) during the day, followed by excessive respiration (and oxygen consumption) during darkness. This diurnal variation leads to a serious drop in oxygen levels at night which can have detrimental effects on water quality of the river. This in turn can disturb the ecological balance of the river leading to shifts in species composition, food-chain effects, increases in toxic algal blooms and collapse of populations of sensitive fish and other species.

Ortho-phosphate is a very dynamic, biologically active substance and is freely removed from water by aquatic plants and algae, especially during the spring/summer/autumn period. Consequently, increases in eutrophication are not always evident from the analyses of o-Phosphate in river water samples. In many instances increased eutrophication is more evident from the biomass of plant and algae and from the effects of plant respiration and photosynthesis on dissolved oxygen and pH.

Much of the phosphorus added to soil in the form of agricultural fertiliser, or animal slurry, tends to accumulate in the top inch of soil. The surface soil layer can easily become saturated with phosphorus. Water can leach significant amounts of phosphorus from surface soil, especially during the early stages of heavy rainfall events. The higher the soil phosphorus content, the higher the potential for loss of phosphorus to waters (Tunney *et al.*, 2000). Rivers also receive direct discharges of wastes that contain various forms of phosphorus – e.g. sewage, animal slurry, industrial effluents, landfill leachate, etc.

The WFD standards replace the older Phosphorus Regulations and set standards for high and good status waters, which must be achieved when licensing discharges. Compliance with these environmental quality standards (EQS) is based on a statistical approach which requires 99% confidence that the EQS has been exceeded. An outline of the procedure used to incorporate general physico-chemical quality elements, including phosphate, is given in EPA (2011) published in conjunction with Water Quality Status Update 2008-2010.

Figure 3.2 shows the annual average o-phosphate concentration in Monaghan & Louth rivers in 2011. The map is based on a face value comparison of the annual mean against the EQS for High and Good Status.

The o-Phosphate levels in Louth & Monaghan rivers are a cause for concern. In 2011, the annual average for 65% of the rivers monitored was above the EQS for 'Good' status. Worst affected were the Proules (0300), White (0500) and Termonfeckin (0350) rivers. Carrickmacross WWTP is the suspected cause in the case of the Proules while agricultural sources are the suspected causes in the case of the White and Termonfeckin rivers. However there are a large number of other rivers that suffer from significant intermittent inputs of phosphorus and this issue needs to be addressed urgently if WFD targets are to be met.

**EU Directives and ortho-phosphate Standards for Water:** A summary of the relevant ortho-phosphate standards are given below (as mg/l P):

Water Framework Directive Inland Surface Waters SI 272 of 2009		Surface Water Abstraction – A1 SI 294 of 1989
Annual Mean	95%ile	
0.035 good 0.025 high	0.075 good 0.045 high	0.22

### *Nitrate in River Waters*

#### **EU Directives and Nitrate Standards for Water**

In assessing the ecological status of rivers, nitrate is one of a number of supporting physico-chemical determinands that is assessed in combination with biological quality elements. In this assessment, a set of surrogate standards for nitrate (derived in the same manner as those for the standards for phosphate, ammonia and BOD in formal SI 272 of 2009) are also used. For high status, a mean of 0.9 and a 95%ile of 1.4 and for good status a mean of 1.8 and a 95%ile of 2.7 mg/l N are used. The pass/fail criterion for ecological status requires 50% of the quality elements – phosphate, ammonia, BOD and nitrate to exceed the mean and 95%ile standards at a 99% confidence level. The value of 1.8 mg/l N corresponds to the average nitrate value recorded at Irish river sites that are at ‘Good’ ecological status and similarly 0.9 mg/l N at the ‘High’ ecological status sites<sup>5</sup>.

The EU Directive on the quality of water for human consumption (Council Directive 98/83/EC) specifies a maximum admissible concentration of 11.3 mg/l N for nitrate (= 50 mg/l as NO<sub>3</sub>) and also sets out a guide level of 5.65 mg/l N (= 25 mg/l as NO<sub>3</sub>) – the lower guide level is not mandatory but, should nonetheless be aimed for as a quality objective.

Normal treatment processes for drinking water do not reduce the nitrate content and consequently, the limits above are also specified in the EU Directive on the quality of surface water intended for the abstraction of drinking water (Council Directive 75/440/EEC).

The EC Directive regarding the protection of waters from pollution caused by nitrate from agricultural sources was introduced in 1991 because of concern for nitrate concentrations in surface and groundwaters (Council Directive 91/375/EC). Further regulations introduced in 2006 allow for the control of animal stocking rates, farmyard management, and fertilisers and slurry application rates for various crops (S.I. No. 378 of 2006).

While nitrate levels in rivers in Louth and Monaghan are not as high as they are in some other parts of the country, there are nevertheless a number of rivers in this area that have significant nitrate issues. In 2011, the average nitrate concentration in 30% of river stations exceeded the EQS for ‘Good’ status. The worst affected rivers were the Proules (0300), Glyde (1230), White (0400 & 0500), Mattock (0100 & 0300) and Termonfeckin (0350). Agricultural sources are the suspected causes in all cases with the exception of the Glyde and Proules where WWTP point source pollution is suspected.

<sup>5</sup> (See [http://www.epa.ie/downloads/pubs/water/waterqua/Final\\_Status\\_Report\\_20110621.pdf](http://www.epa.ie/downloads/pubs/water/waterqua/Final_Status_Report_20110621.pdf) and [http://www.epa.ie/wfdstatus/rivers/RW\\_Compliance\\_Rules\\_RiverChem\\_20110617.pdf](http://www.epa.ie/wfdstatus/rivers/RW_Compliance_Rules_RiverChem_20110617.pdf) for the details of the statistical method used).

**Ammonia in River Waters****EU Directives and Ammonia Standards for Water**

Ammonia is one of the parameters used to assess ecological status of rivers as set out in the “European Communities Environmental Objectives (Surface Water) Regulations 2009” ([S.I 272 of 2009<sup>6</sup>](#)). A summary of the relevant ammonia standards are given below (as mg/l N):

Water Framework Directive Inland Surface Waters SI 272 of 2009		Surface Water Abstraction – A1 SI 294 of 1989
Annual Mean	95%ile	
0.065 good 0.040 high	0.140 good 0.090 high	0.155

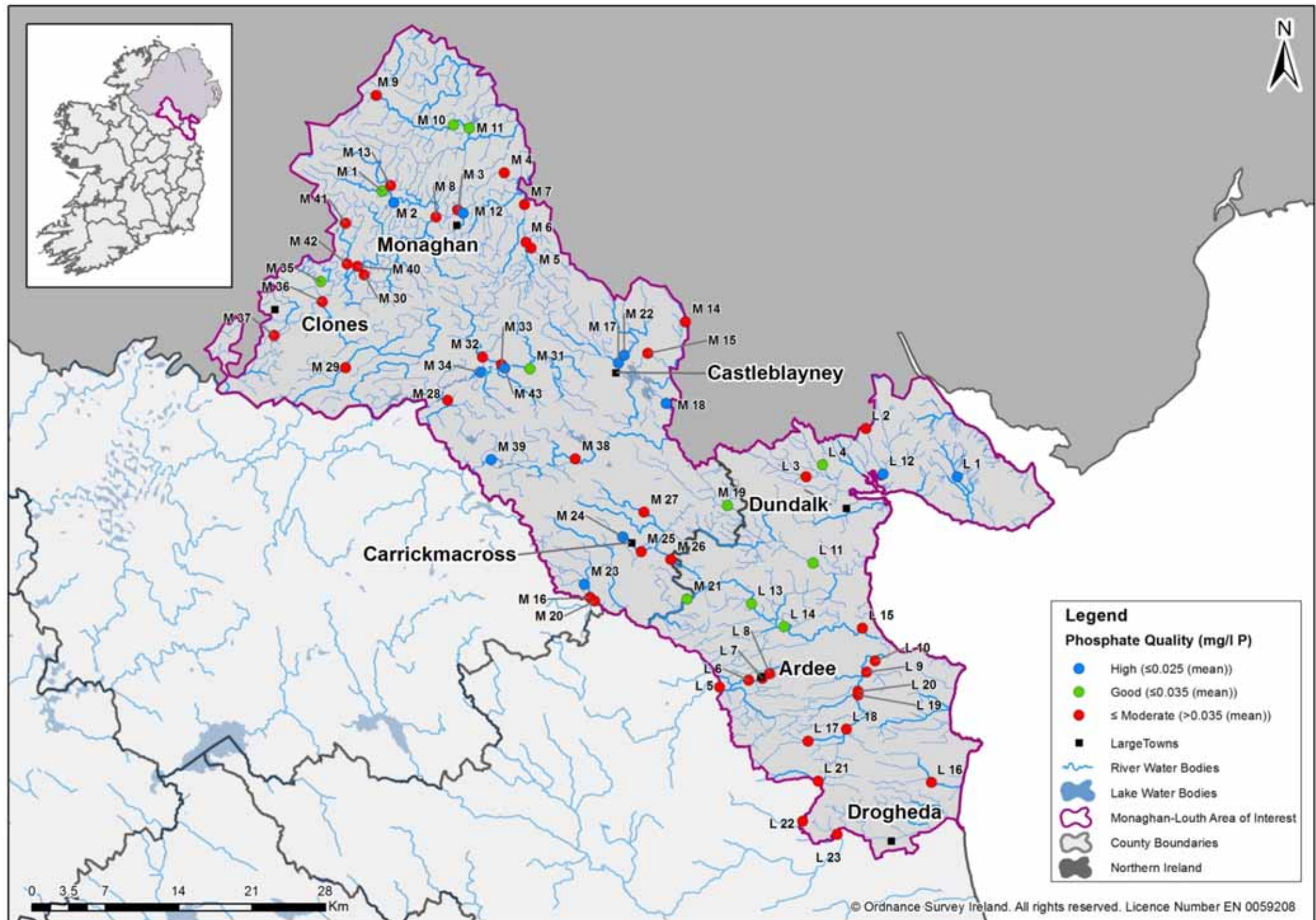
The European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. 293 of 1988) specifies a limit for unionised ammonia of 0.02 mg/l NH<sub>3</sub> (0.016 mg/l N). The European Communities (Drinking Water) (No. 2) Regulations 2007 (S.I. 278 of 2007) specifies a parametric value for ammonia of 0.30 mg/l NH<sub>4</sub> (0.23 mg/l N).

Figure 3.4 shows the annual average ammonia concentration in Monaghan and Louth rivers in 2011. The map is based on a face value comparison of the annual mean against the EQS for High and Good Status.

In 2011, ammonia levels were particularly elevated in the White (station 0040) and Glyde (1230) rivers. Significant levels were also observed from time to time in the Mattock (0300), Ballymascanlon (0100), Dee (0710), Finn (0500) and Maghera (1200) rivers. In the case of the Ballymascanlon and Glyde the suspected causes are illegal waste oil dumping and wastewater treatment plant discharges respectively. Both WWTP discharges and agricultural sources are the primary suspects in relation to the Dee, while agriculture is suspected to be the main cause of elevated ammonia levels in the other rivers.

<sup>6</sup> <http://www.environ.ie/en/Legislation/Environment/Water/FileDownload,20824,en.pdf>





**Figure 3.2** Annual Average o-Phosphate in Monaghan & Louth Rivers in 2011.

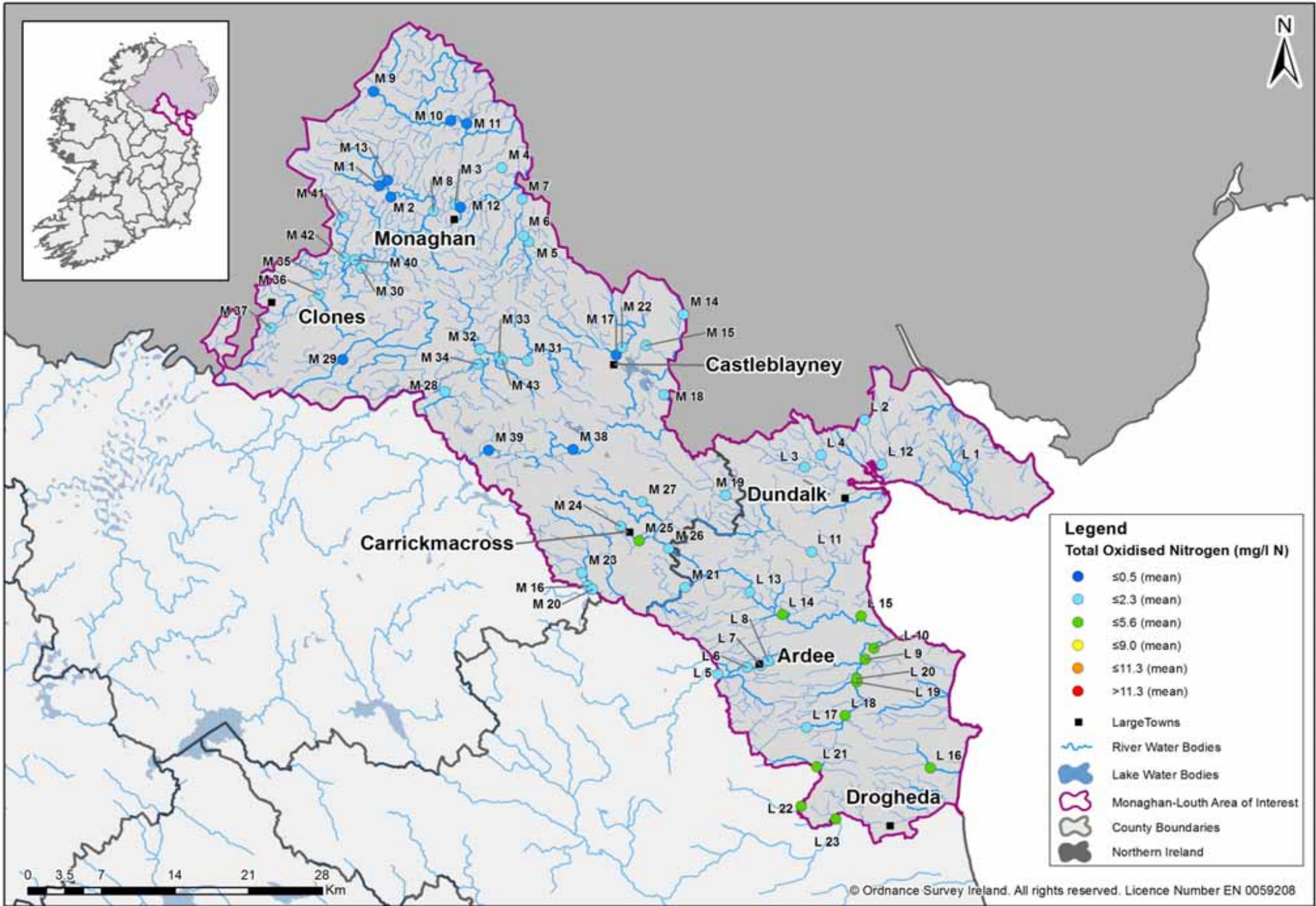
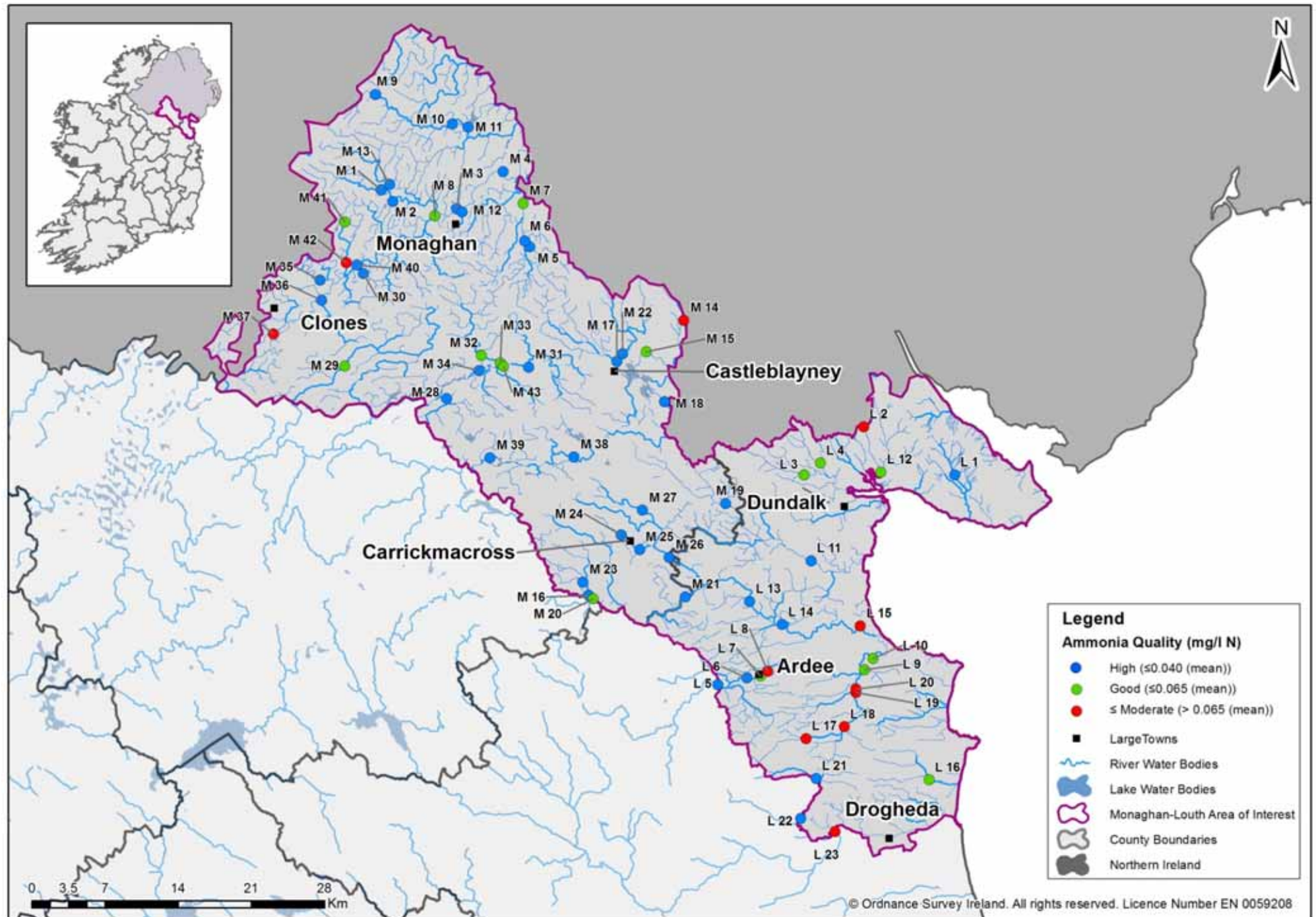


Figure 3.3 Annual Average Nitrate in Monaghan & Louth Rivers in 2011.





**Figure 3.4** Annual Average Ammonia in Monaghan & Louth Rivers in 2011.

### Biochemical Oxygen Demand of River Waters

Biochemical Oxygen Demand (BOD) is a measure of how much dissolved oxygen is being consumed as microbes break down organic matter. A high demand, therefore, can indicate that levels of dissolved oxygen are falling, with potentially dangerous implications for a river's biodiversity.

High biochemical oxygen demand can be caused by:

- high levels of organic pollution, caused by poorly treated wastewater;
- high nutrient levels, which trigger high plant growth

When aquatic plants die, aerobic bacteria feed upon them and nutrients, such as nitrates and phosphates are released into the water body, stimulating plant growth. More plant growth eventually leads to more plant decay. Nutrients can be a prime contributor to high BOD in rivers.

In rivers with high BOD levels, aerobic bacteria consume much of the available dissolved oxygen, robbing other aquatic organisms of the oxygen they require to live. Organisms that are more tolerant of lower dissolved oxygen levels may appear and become numerous, such as carp, midge larvae and sewage worms. Organisms that are intolerant of low oxygen levels, such as caddisfly larvae and mayfly and stonefly nymphs, will not survive. As organic pollution increases, the ecologically stable and complex relationship present in waters containing a high diversity of organisms is replaced by a low diversity of pollution-tolerant organisms with increasing populations.

### EU Directives and BOD Standards for Water

Biochemical Oxygen Demand is one of the parameters used to assess ecological status of rivers as set out in the "European Communities Environmental Objectives (Surface Water) Regulations 2009" ([S.I. 272 of 2009<sup>7</sup>](#)). A summary of the relevant BOD standards are given below (as mg/l O<sub>2</sub>):

Water Framework Directive Inland Surface Waters SI 272 of 2009		Surface Water Abstraction – A1 SI 294 of 1989
Annual Mean	95%ile	
1.50 good	2.60 good	5.0
1.30 high	2.20 high	

The European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. 293 of 1988) specifies a limit for BOD of 5 mg/l O<sub>2</sub>.

Figure 3.5 shows the annual average BOD concentration in Monaghan & Louth rivers in 2011. The map is based on a face value comparison of the annual mean against the EQS for High and Good Status.

In 2011, the annual average BOD for 24% of river stations monitored exceeded the EQS for 'Good' Status. Unsurprisingly, the rivers with the most elevated BODs include some of those with the most elevated nutrient levels e.g. Ballymascanlon (0100), Termonfeckin (0350), Glyde (1230) and White (0040). The suspected sources of pollution have been discussed previously.

### Dissolved Oxygen

Figure 3.6 shows the annual average DO (%Sat) in rivers in Lough and Monaghan in 2011. Over 96% of sites are of high status in relation to DO based on face value comparison of the 2011 annual means against the EQS.

<sup>7</sup> <http://www.environ.ie/en/Legislation/Environment/Water/FileDownload,20824,en.pdf>



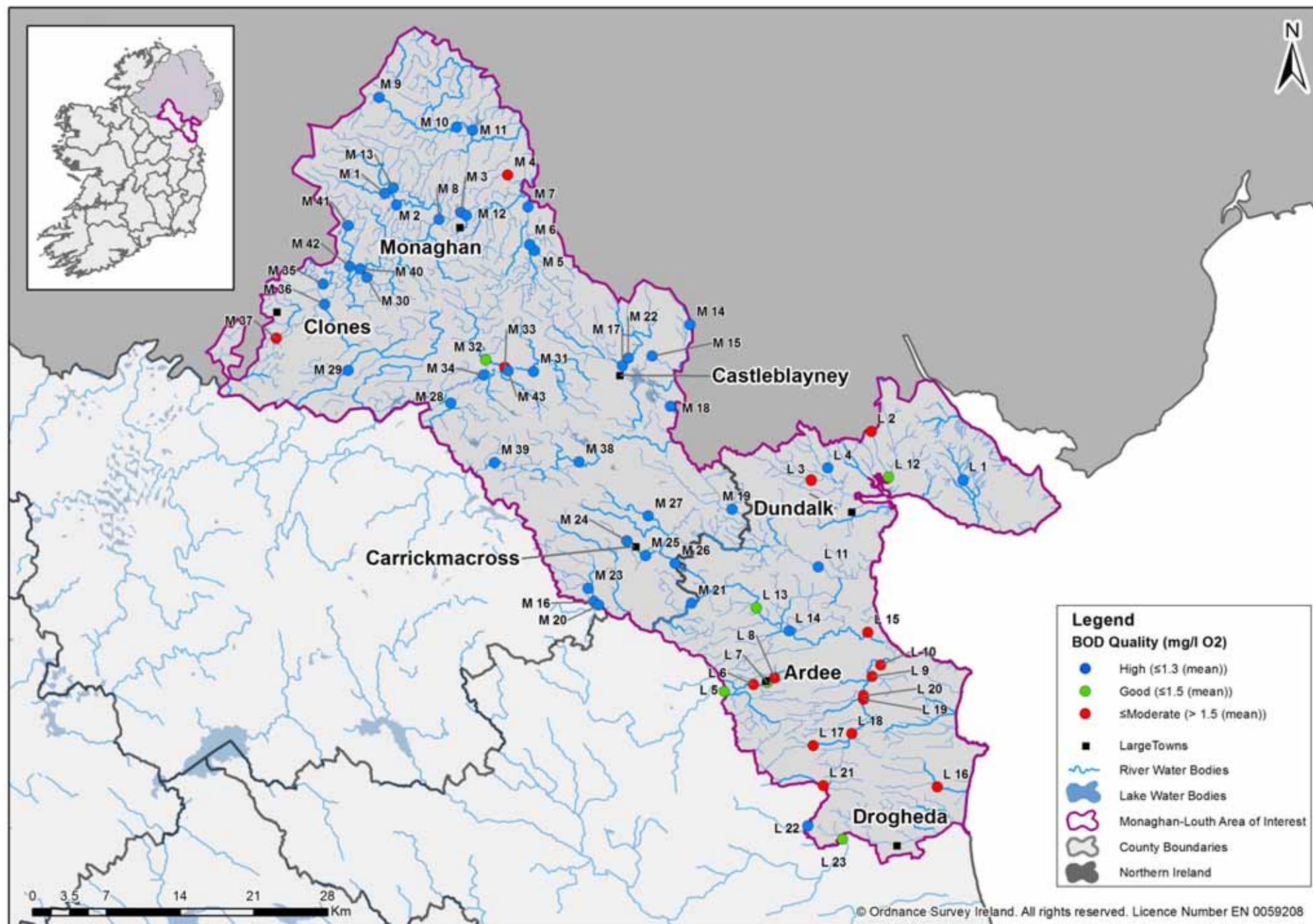
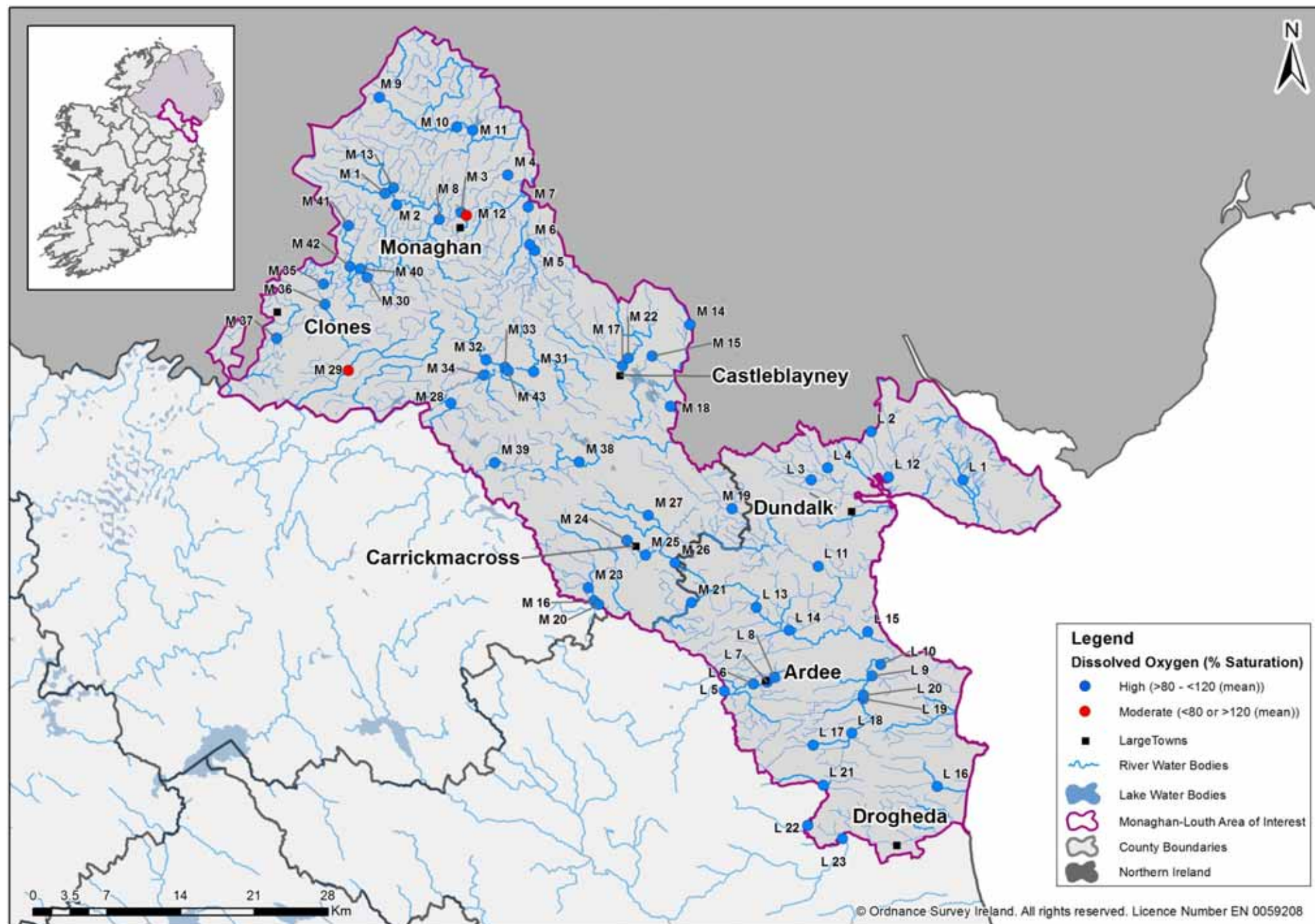


Figure 3.5 Annual Average BOD in Monaghan & Louth Rivers in 2011.



**Figure 3.6** Annual Average DO (% Sat) in Monaghan & Louth Rivers in 2011.



## Biological Monitoring of Rivers

### Biological Monitoring






This is generally carried out on a three year cycle. The freshwater reaches of rivers and streams are surveyed from an upper 'survey limit' to their confluences with other rivers or to their tidal limit. The survey limit is a point in the headwaters above which biological sampling is impracticable, usually because of lack of flow. Sampling sites are typically located at 5 km intervals with extra stations located in some reaches to reflect better the effects of point discharges or other known or potential pollution sources. In order to determine the channel lengths in the various water quality classes it has been necessary to interpolate conditions between the individual sampling points. This procedure has been carried out in a systematic and standardised fashion, having regard to typical or expected patterns of water quality recovery in rivers affected by waste discharges. Where possible, chemical and biological sampling sites coincide.

### Biological Assessment

In the presence of pollution, characteristic and well-documented changes are induced in the flora and fauna of rivers and streams. Particularly well documented are the changes brought about by organic pollution in the macroinvertebrate community i.e., the immature aquatic stages of aerial insects (mayflies, stoneflies etc.) together with Crustacea (e.g. shrimps), Mollusca (e.g. snails and bivalves), Oligochaeta (worms) and Hirudinea (leeches). For the purposes of the EPA assessment procedure benthic macroinvertebrates have been divided into five Indicator Groups.

Relationships between water quality and macroinvertebrate community structure are usually described by means of a numerical scale of values. The EPA scheme of Biotic Indices or Quality (Q) Values and its relationship to WFD status is set out in the table. Where a toxic effect is apparent or suspected the suffix '0' is added to the biotic index (e.g. Q1/0, Q2/0 etc) and attention is sometimes drawn to siltation or atypical effects by appending an asterix to the biotic index (e.g. Q1\*, Q2\* etc). The Q-rating assessment has been adapted to meet the requirements of the WFD and to ensure it is comparable with methods used in other EU countries (Table 3.1).

**Table 3.1.** Reference table for WFD status and Q value.

Q-Value		WFD Status
5, 4-5		High
4		Good
3-4		Moderate
3, 2-3		Poor
2, 1-2, 1		Bad

In the overall assessment for WFD status at surveillance sites, in addition to macroinvertebrates, other biological elements, i.e. plants (macrophytes), algae (including diatoms) and fish, as well as hydromorphological and chemical criteria, are taken into account. In the 2009-2011 period 68 river sites were surveyed in the Monaghan Louth Region with some 79 assessments made at these sites (Table 3.2).

**Table 3.2** Results from 2009-2011 monitoring in the Louth and Monaghan Region.

Ecological Status	No. Sites	%
Bad	0	0%
Poor	26	38%
Moderate	18	27%
Good	19	28%
High	5	7%
No. Stations	68	
Number Assessments	79	

Detailed assessments of the rivers are provided in Appendix 2 and ongoing updates are provided on the EPA website<sup>8</sup>. Figure 3.7 provides the most recent WFD biological classification of rivers in the north east. It shows that 35% of sites monitored are of Good or High status, based on macroinvertebrate assessment, with 60% of moderate or poor status with no seriously polluted sites.

### High Status Sites

Nationally the percentage of high quality (Q5 and Q4-5) sites almost halved in the 21 years between 1987 and 2008 with those attaining Reference Condition (Q5) down to two per cent. The number of high quality sites in the north-east region in the period 2007-2009 are shown below:

County	Sites
<b>Monaghan</b>	3
<b>Louth</b>	2

In the 2009-2011 period, five high quality sites were recorded in the parts of Hydrometric Areas 03, 06 and 36, relevant to the above counties. The current five sites are down from a peak of some 14 sites that achieved high status in Monaghan and Louth in 1987. In the 2007-2009 period the number had dropped to just three sites, so there is a significant danger of losing high status altogether. The remaining five sites are shown in the table below. The EPA has commissioned a study aimed at producing guidance for local authorities in the management and protection of high status sites bearing in mind that not all high status waters are in SACs or other protected areas. This report should be available before the end of 2012, to be published under the STRIVE research programme.

**Table 3.3** Remaining high status river sites in Monaghan and Louth.

River	Station Code
<b>SCOTSTOWN</b>	03S020200
<b>BIG (LOUTH)</b>	06B010100
<b>BIG (LOUTH)</b>	06B010300
<b>DRUMSALLAGH STREAM</b>	06D070070
<b>GLYDE</b>	06G020400

### Poor and Moderate Status

There are no seriously polluted sites currently in the area – this follows the national trend of the virtual elimination of serious pollution (currently some 11 sites are recorded nationally with none of these being in the north-eastern area under consideration here). Some 65% of all river sites examined are polluted, however, and these 44 sites are the target of programmes of measures under the Water Framework Directive River Basin Management Plans.

### Louth

In the 2007-2009 period an analysis of suspected causes of pollution shows that agricultural pressure is the primary cause in Louth with nine of the 11 polluted sites in Louth being attributed to agricultural issues. The Ballymascanlan River had two sites that were polluted due to oil spills thought to be from illegal diesel laundering activities, but this has now improved in the more recent surveys. Two industrial discharges were also suspected of causing river pollution in Louth.

### Monaghan

In Monaghan 25 of the 33 polluted river sites recorded in 2007-2009 were impacted by agricultural activities, the remaining eight sites were impacted by urban wastewater treatment plants. New wastewater standards introduced in SI 272 of 2009 and the licensing of urban wastewater plants by the EPA will require improvements under the WFD programme of measures. In some cases further investment will be required to achieve the necessary water quality improvements.

<sup>8</sup> <http://www.epa.ie/QValue/webusers/>

### Diffuse Agricultural Pollution

It is apparent that diffuse pollution is the main issue in both counties. Tracking down the sources of diffuse pollution is a difficult issue. The use of risk assessments such as the Small Stream Risk Score (SSRS) as an aid to pinpointing, for example, bad practices on farms can be useful in this respect. Blanket measures such as the GAP regulations are essential but it may also be necessary to find local critical source areas or pollution ‘hotspots’ especially where bad practice is occurring such as direct discharges from farmyards to rivers or allowing serious poaching of land surfaces near rivers to develop. Animal access to rivers is an ongoing problem and in many smaller rivers fencing animals out will help. Control of the spreading of wastes produced by intensive animal rearing enterprises such as pigs and poultry operations is particularly important in those areas with gley soils where surface runoff is more likely in wet weather and where the soils have an inherent tendency to release phosphorus into surface runoff. Nutrient management planning is very important in reducing soil phosphorus levels to a more environmentally acceptable level. Research has shown that high soil phosphorus levels in riparian areas close to water can be particularly damaging in wet weather events. Significant programmes to tackle farm pollution undertaken, for example, on the Dromore catchment have produced encouraging results. It is important that resources continue to be made available for programmes of measures that tackle diffuse pollution.

### Summary

In total there are 79 river sites on 32 rivers that are monitored in Louth and Monaghan under the WFD. Of these sites, 68 were monitored for biological parameters (biological programme) during 2009-2011. Not all of the sites were of good or high status – some 65% of these 68 stations have been identified as priority polluted sites for tackling the causes of pollution. The counties and number of priority polluted sites are listed below.

County	No of Priority Polluted Sites
<b>Monaghan</b>	33
<b>Louth</b>	11

A continued focus on investigative monitoring should identify the causes of pollution at these sites and allow for more target measures to be implemented addressing the cause of pollution.

Compared with the national average, the north-east seems to be performing poorly in general. For example in the period 2007-2009, 35% of water bodies in the north-east were of good or high status, compared with 52% nationally. Biological monitoring also indicates the relative lack of high-quality sites, with just five in these north-east counties.

The annual average concentration for o-phosphate alone was less than good for over 65% of the 66 river stations monitored for general physico-chemical parameters in 2011. The projected increase in primary output from the agriculture sector under *Food Harvest 2020*, will prove challenging in the context of meeting the objectives of the WFD within the required timeframes.

As well as having effects on the ecological status of rivers themselves, nutrient levels in rivers also affect the quality of the lakes and transitional and coastal waters they feed. A reduction in the total amount of nutrients delivered to lakes and transitional and coastal waters from river catchments is a key focus of the WFD programme of measures.

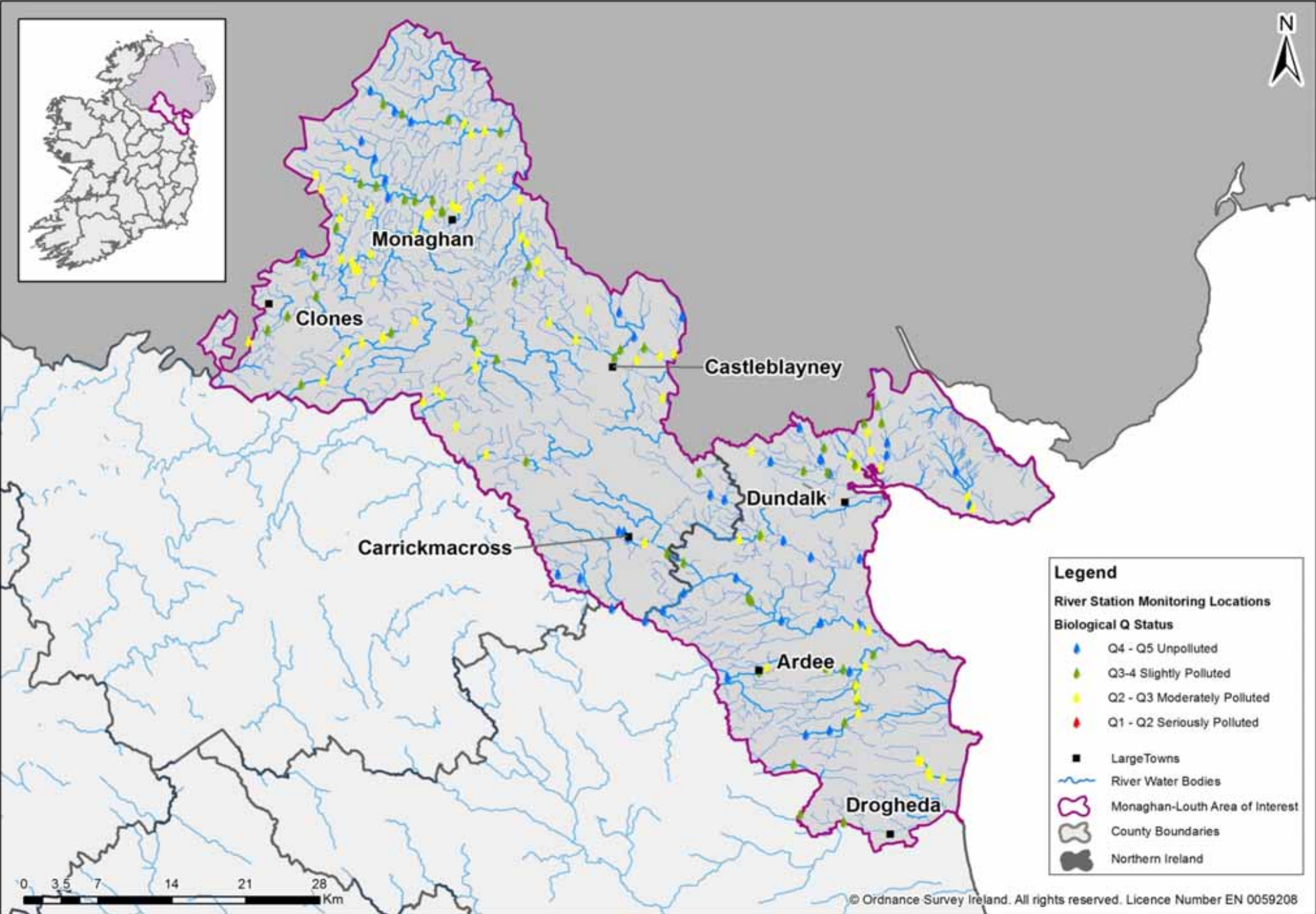


Figure 3.7. Biological Classification of Rivers in Monaghan and Louth



## LAKE WATER QUALITY

### Physico-Chemical & Biological Monitoring

There are no WFD monitored lakes in County Louth. There are three surveillance and 13 operational monitoring lakes in County Monaghan on the 2010-2012 WFD lake monitoring programme.

All lakes are sampled for the biological parameters – macrophytes (except Corconnelly), invertebrates and phytoplankton (chlorophyll) and in the case of surveillance lakes, fish are sampled. They are also monitored for the following general physico-chemical parameters: alkalinity, total ammonia, conductivity, dissolved oxygen, nitrate, nitrite, pH, transparency, silica, temperature, total oxidised nitrogen (TON), total phosphorus (TP) and true colour. The raw data are available in the appendices on the CD at the back of this report. Trends in chlorophyll, total phosphorus and nitrate (using total oxidised nitrogen as a surrogate) are shown in Appendix 4 on the CD.

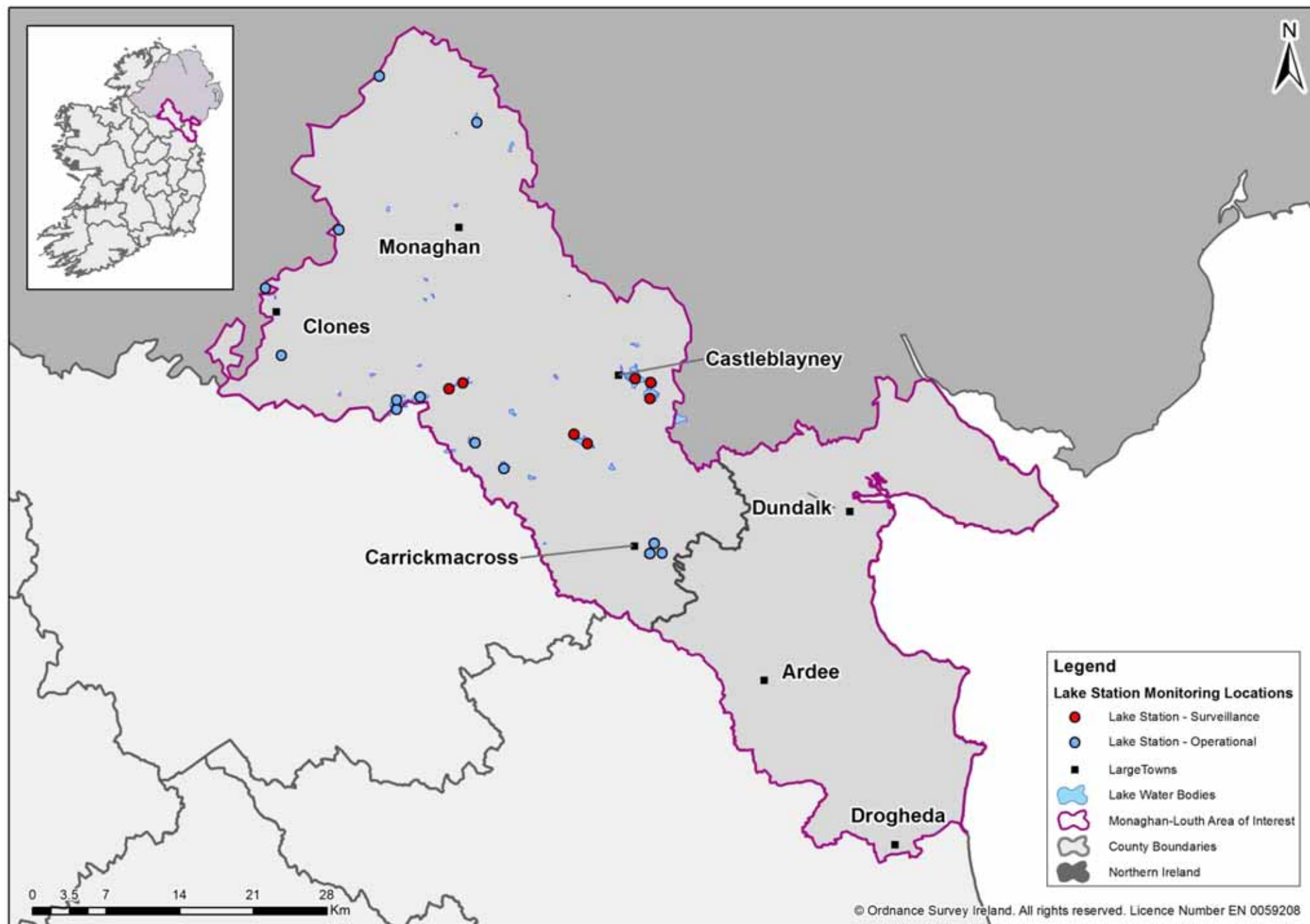
A number of the lakes are also surface water abstraction points, providing water to towns such as Carrickmacross and Emyvale and in addition to the physico-chemical monitoring, they are also monitored for metals, total coliforms, *E. coli* and intestinal enterococci.

### Assessment of Water Quality

The general physico-chemical (GPC), biological (BQE) and ecological status is presented in Table 4.1, for the periods 2007-2009 and 2008-2010. Ecological status remains unchanged for nine of the 11 lakes with continuous data for the period 2007-2010. There were three lakes assigned to each of the ecological status categories, moderate, poor and bad. Two lakes have changed status; Emy lough has deteriorated from poor to bad status and Monalty Lough has improved from poor to moderate status. There were five new lakes added to the programme in 2010. Based on two years of data, two lakes were assigned to each of the ecological status categories, good and moderate, and a single lake is currently assigned to bad status. However, the monitoring cycle has one more sampling year before a full update of status can be given. It is unlikely that status will improve for lakes assigned a moderate or worse status. Lakes currently assigned good or better may be of worse status.

**Table 4.1** Status of WFD monitored lakes in County Monaghan.

LAKE	2007-2009 Status for BQE	2007-2009 Status for GPC	2007-2009 Ecological Status	2008-2010 Rolling Status for BQE	2008-2010 Rolling Status for GPC	2008-2010 Ecological Rolling Status
Avaghon	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Bawn MN				Bad	Moderate	Bad
Corconnelly					Moderate	Moderate
Drumlona	Moderate	Poor	Poor	Poor	Moderate	Poor
Drumore	Moderate	Poor	Poor	Poor	Moderate	Poor
Egish	Moderate	Bad	Bad	Bad	Moderate	Bad
Emy	Moderate	Poor	Poor	Bad	Moderate	Bad
Inner	Moderate	Bad	Bad	Bad	Moderate	Bad
Killcoran				High	Good	Good
Monalty	Moderate	Poor	Poor	Moderate	Moderate	Moderate
More				Moderate	High	Moderate
Muckno or Blayney	Moderate	Bad	Bad	Bad	Moderate	Bad
Naglack	Moderate	Poor	Poor	Poor	Moderate	Poor
Spring				Good	High	Good
Summerhill Lough	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
White	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate



**Figure 4.1** Location of WFD Monitored Lake Stations in County Monaghan



Trends in chlorophyll, total phosphorus and nitrate (using total oxidised nitrogen as a surrogate) for a selection of lakes are shown in Figures 4.2 - 4.4. Analyses of trends in chlorophyll is complicated by the presence of zebra mussel (*Dreissena polymorpha* L.) at a number of lakes which may or may not impact chlorophyll levels and / or total phosphorus levels. This is in addition to normal interannual fluctuations and climatic induced changes (weather).

Lough Inner stands out as having exceptionally high annual average chlorophyll levels ( $>50 \mu\text{g/l}$ ) by comparison to other monitored lakes in Monaghan (Figure 4.2). In general, annual average chlorophyll levels are rarely less than  $10 \mu\text{g/l}$  and are more often greater than  $20 \mu\text{g/l}$ . The highest environmental quality standard for the chlorophyll good/moderate boundary is  $10.94 \mu\text{g/L}$ . Some lakes exhibit a downward trend in chlorophyll, namely, Drumlona and Drumore (both lakes contain zebra mussel), Emy, Muckno or Blayney, Summerhill and White. Other lakes, Avaghon, Egish and Naglack both of which have a population of zebra mussel, exhibit an upward trend in chlorophyll levels. The remaining lakes have no discernible trend.

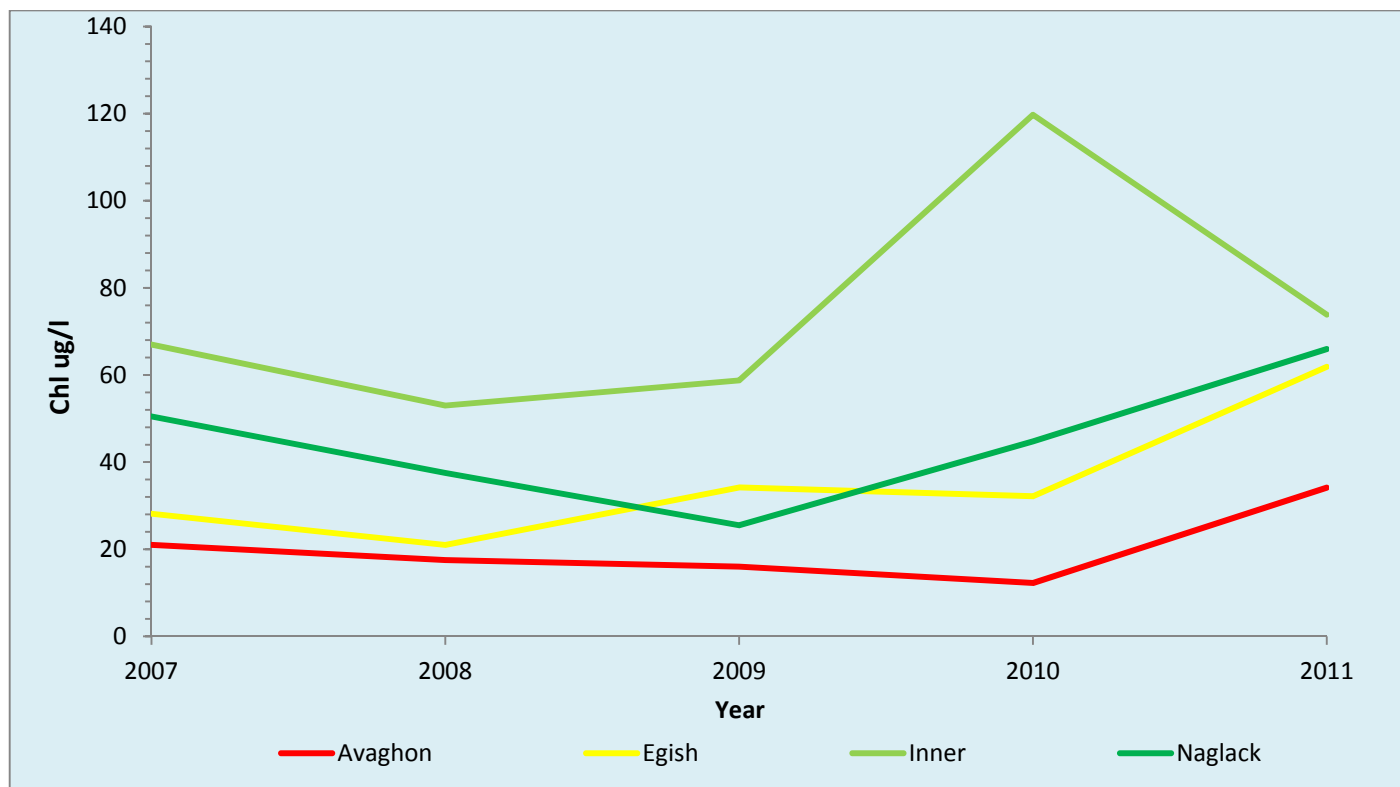
Monalty and Naglack appear to have exceptionally high nitrate levels ( $>4 \text{ mg/l NO}_3$ ) albeit exhibiting a decreasing trend (Figure 4.3). Nitrates appear to be on the increase in Avaghon, Drumlona, Inner, and Spring Lough, but levels are decreasing in Muckno or Blayney and Emy.

Immediately evident from the total phosphorus graph are the exceptionally high annual total phosphorus levels ( $>0.1 \text{ mg/L P}$ ) in Egish, and Inner in particular and to a lesser extent, Naglack by comparison to annual levels in other monitored Monaghan lakes which are usually  $> 0.03 \text{ mg/L P}$ . The interim environmental quality standard for TP good/moderate boundary is  $0.025 \text{ mg/L P}$ . Annual average total phosphorus levels appear to be increasing in Inner, Monalty and Naglack but, decreasing in Avaghon, Drumlona, Drumore, Muckno or Blayney and White (Figure 4.4).

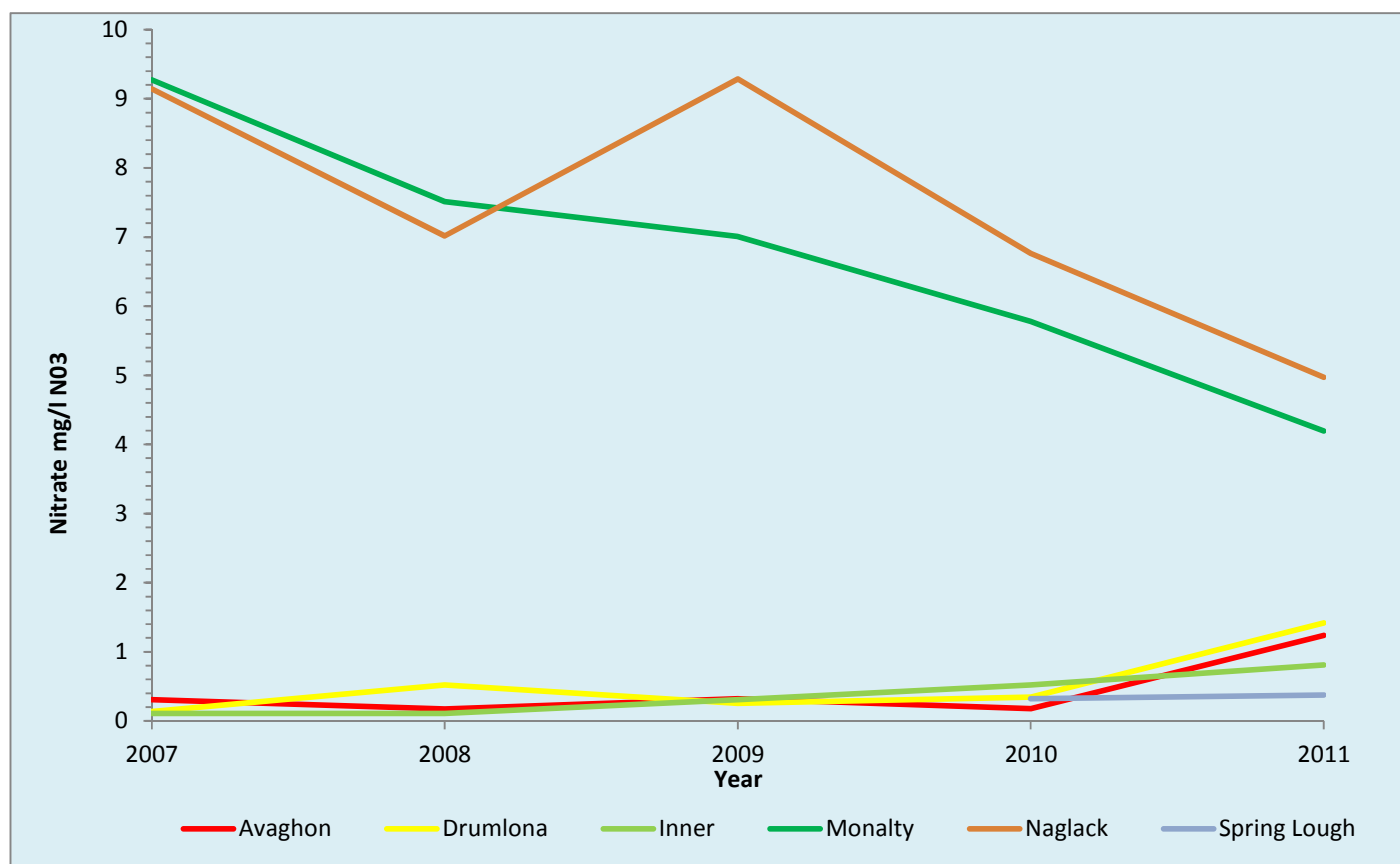
Annual average values for both TP and TON in WFD monitored lakes in County Monaghan 2011 are presented in figures 4.5 and 4.6 respectively.

### Summary

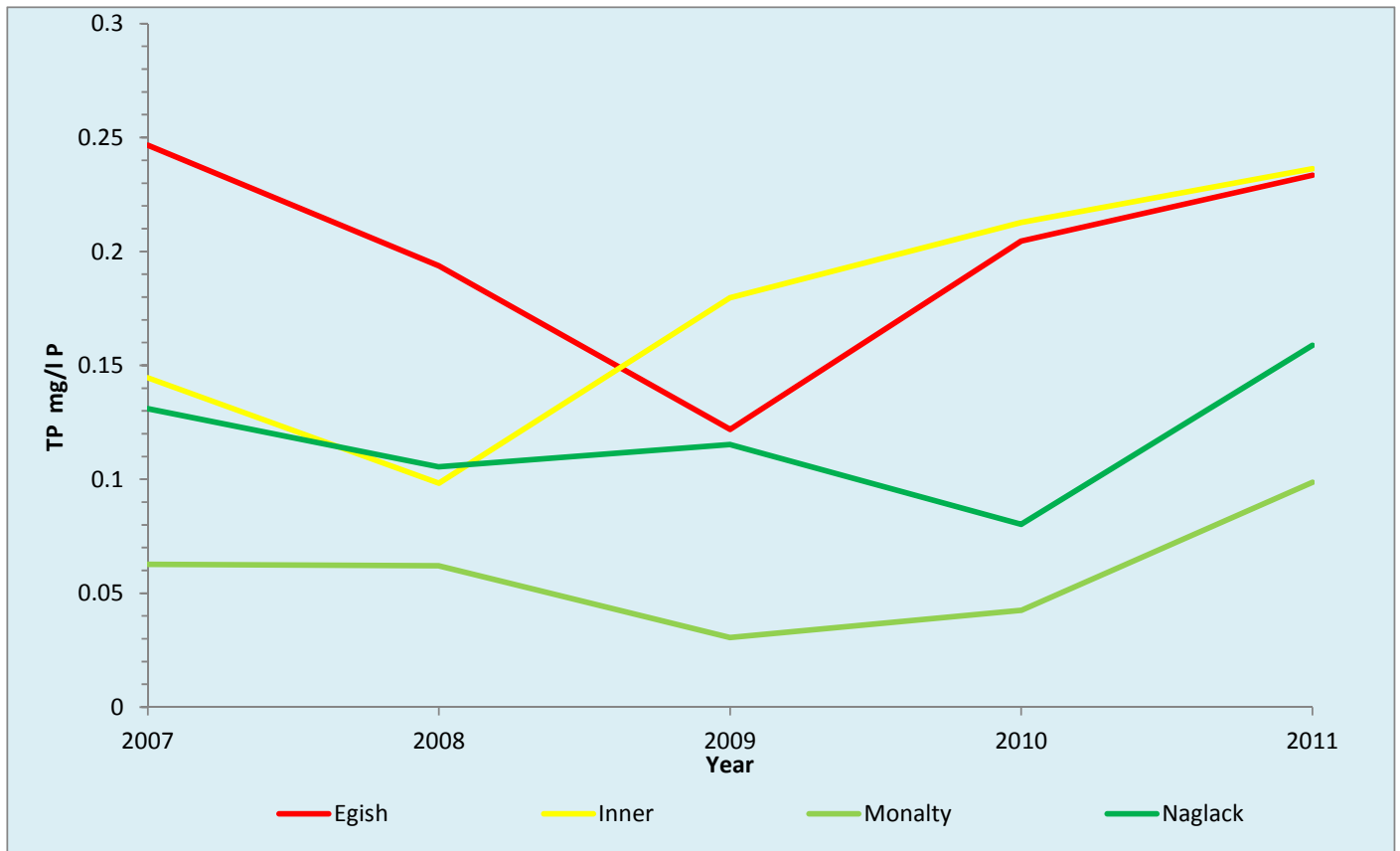
While trends are mixed for the various elements described, it is unlikely that many of lakes in Monaghan will meet the WFD standard of good ecological status which is to be achieved by 2015. The elevated levels and rising trend for both chlorophyll and total phosphorus in some lakes is a cause of concern. The main pressures appear to be diffuse pollution from intensive agriculture and septic tanks, resulting in nutrient enrichment as typified by elevated phosphorus and chlorophyll.



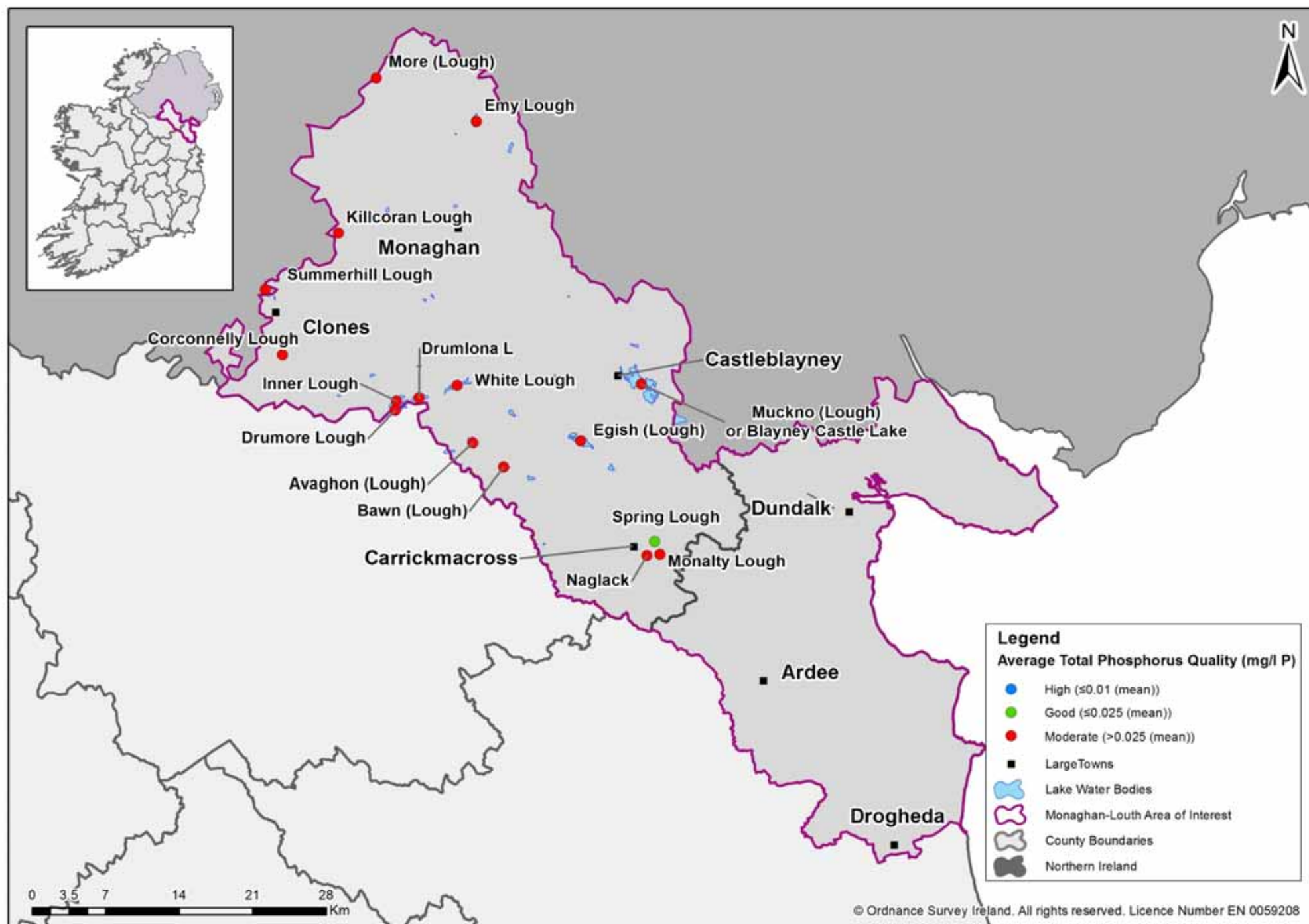
**Figure 4.2** Trends in Annual Average Chlorophyll in Selected WFD Monitored Lakes in County Monaghan 2007-2011 .



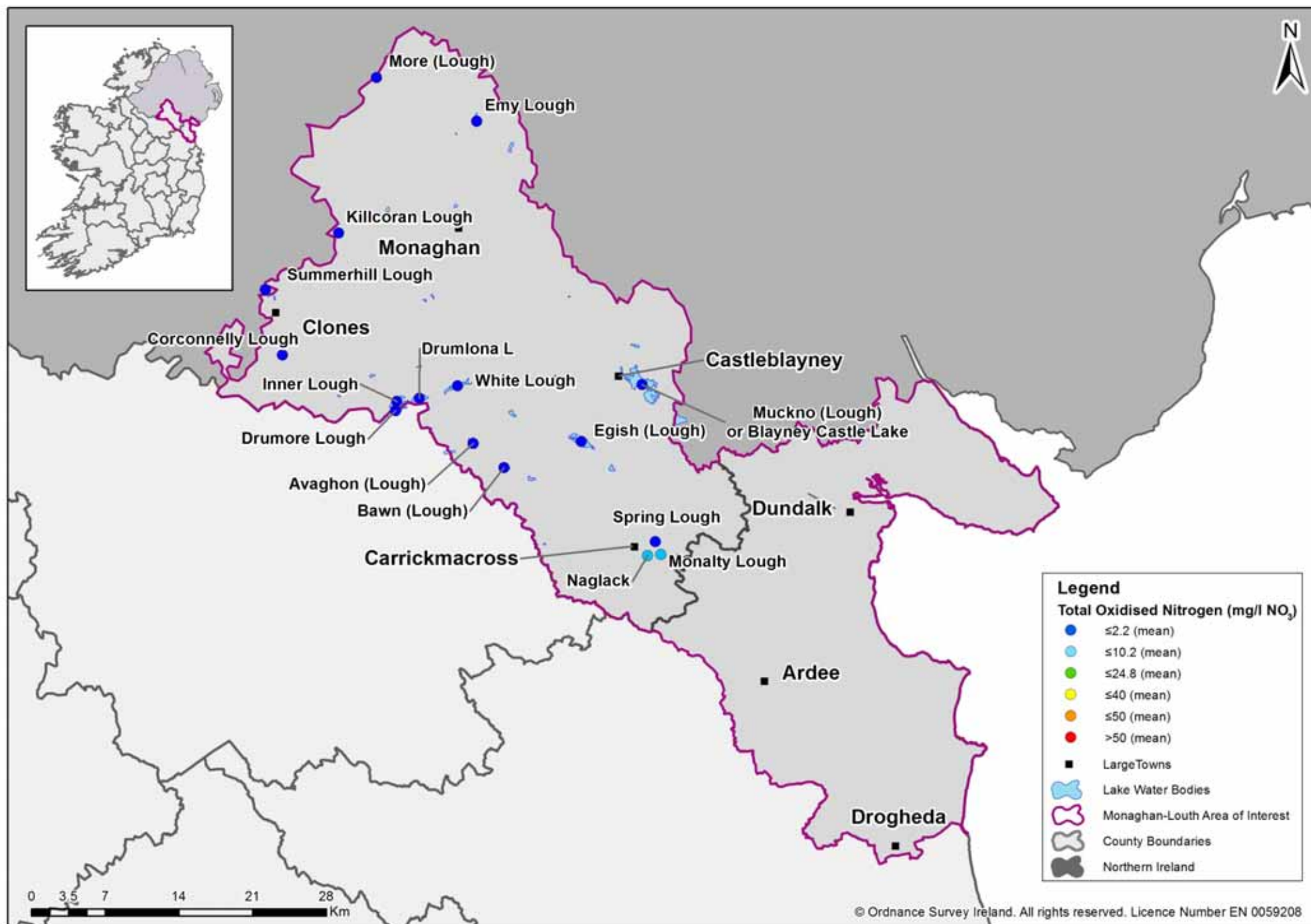
**Figure 4.3** Trends in Annual Average Nitrate (using total oxidised nitrogen as a surrogate) in Selected WFD Monitored Lakes in County Monaghan 2007-2011.



**Figure 4.4** Trends in Annual Average Total Phosphorus in Selected WFD monitored lakes in County Monaghan 2007-2011.



**Figure 4.5** Annual Average Total Phosphorus in Monaghan Lakes in 2011.



**Figure 4.6** Annual Average Total Oxidised Nitrogen in Monaghan Lakes in 2011

## GROUNDWATER QUALITY

Groundwater, which originates from rain that soaks into the ground, is an important natural resource in Ireland. It flows through and is stored in the fractures in bedrock and the pore spaces of sand and gravel deposits. In the past, the focus was on its use as drinking water; however under the WFD there is an increased emphasis on the environmental quality of groundwater, as well as its value as a potable water supply. Groundwater plays an essential role in the hydrological cycle and is critical for maintaining river levels and surface water ecosystems.

In Ireland, approximately 26% of the public and private drinking water supply is from groundwater. Most of the private group schemes and small supplies are reliant on groundwater and many have inadequate or no treatment. Therefore it is critical that groundwater is protected to maintain the quality of drinking water and ensure the water is safe to drink.

### Physico-Chemical Monitoring

In 2011, the EPA's groundwater monitoring programme included 13 monitoring locations in Counties Louth and Monaghan. The breakdown of these groundwater monitoring points is presented in Table 5.1.

**Table 5.1:** Number of groundwater monitoring points in 2011

County	Number of Monitoring Points
Louth	7
Monaghan	6

These sites were monitored for a variety of physico-chemical and microbiological parameters. Nitrate and phosphate, two of the main indicators of anthropogenic pollution, were measured and these are discussed in more detail in Section 5.2.

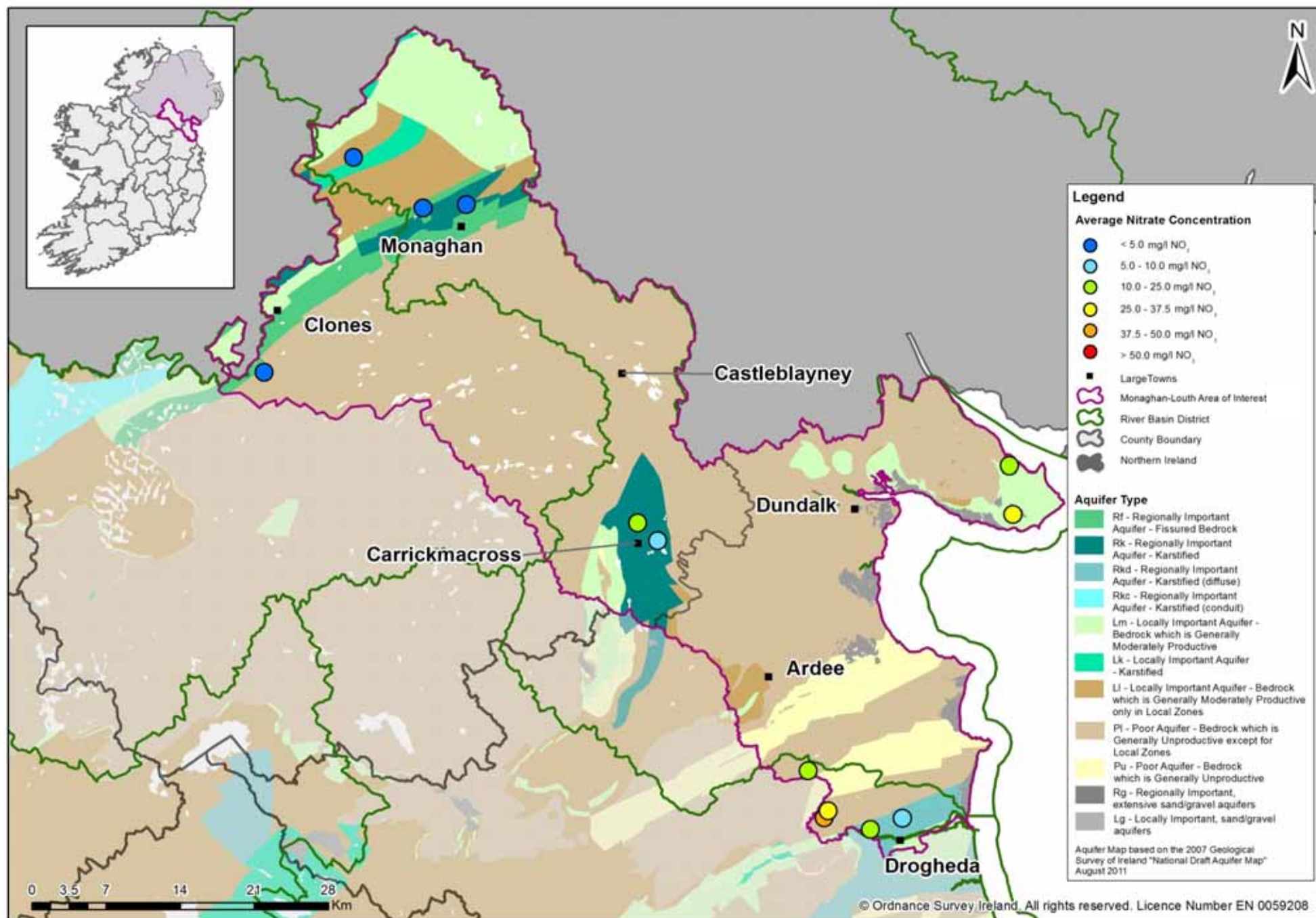
### Assessment of Water Quality

#### Nitrate in Groundwater

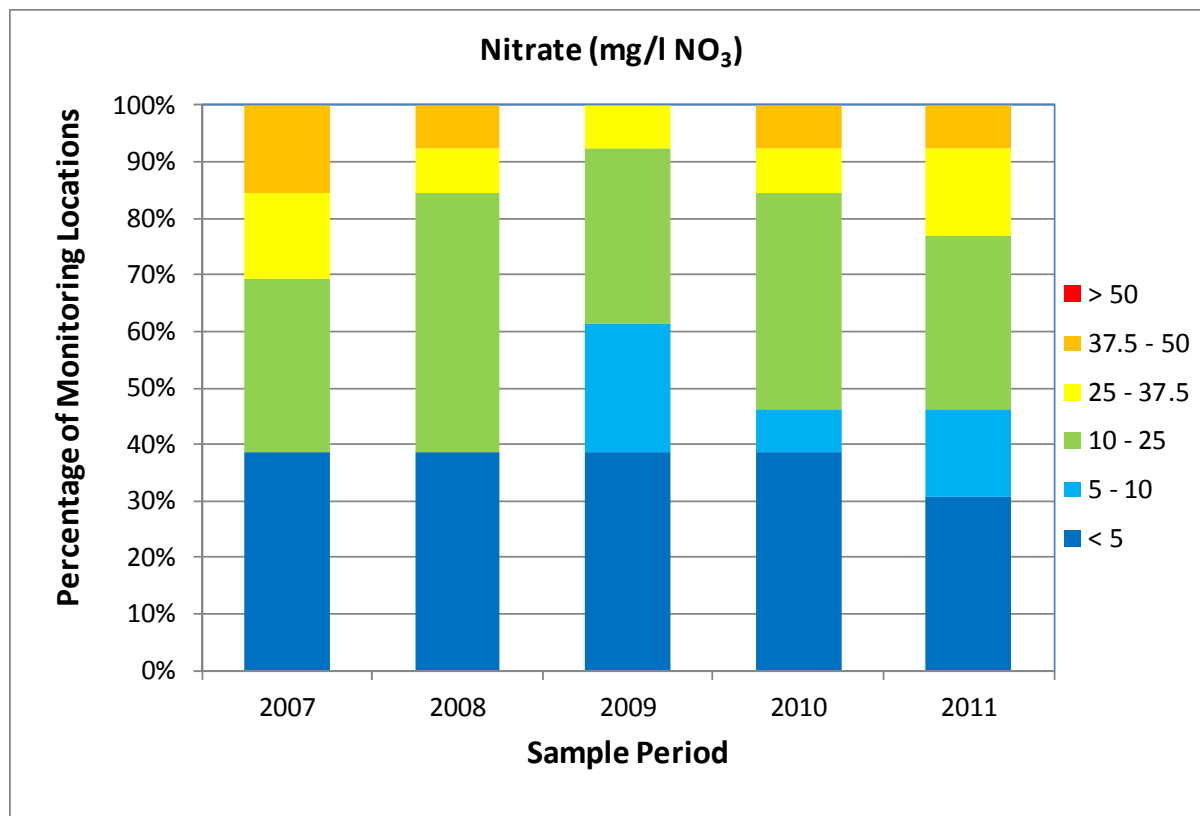
Figure 5.1 shows the locations and the associated average nitrate concentrations in 2011, for the groundwater monitoring points in Counties Louth and Monaghan. Figure 5.2 summarises the average yearly nitrate concentrations from 2007-2011 for the groundwater monitoring programme in Counties Louth and Monaghan.

There was a noticeable decrease in the average nitrate concentration in 2009 which can be attributed to, amongst other factors, dilution caused by the above average levels of rainfall that year. This was followed by an increase in nitrate concentrations in 2010 and 2011. However, the average nitrate concentration at groundwater monitoring locations in Counties Louth and Monaghan has decreased over the period 2007 to 2011. The average nitrate concentration exceeded the Irish WFD Threshold Value concentration of 37.5mg/l NO<sub>3</sub> at one monitoring location in County Louth during 2011; however, the Drinking Water Standard of 50mg/l NO<sub>3</sub> was not exceeded in any samples taken at this location. The average nitrate concentrations were <12mg/l NO<sub>3</sub> at all monitoring locations in County Monaghan during 2011.





**Figure 5.1:** Average Nitrate Concentrations in Counties Louth and Monaghan in 2011. Source: EPA (A. Mannix and M. Craig)



**Figure 5.2:** Average Nitrate Concentrations in Groundwater in Counties Louth and Monaghan. Source: EPA (A. Mannix and M. Craig)

### Phosphate in Groundwater

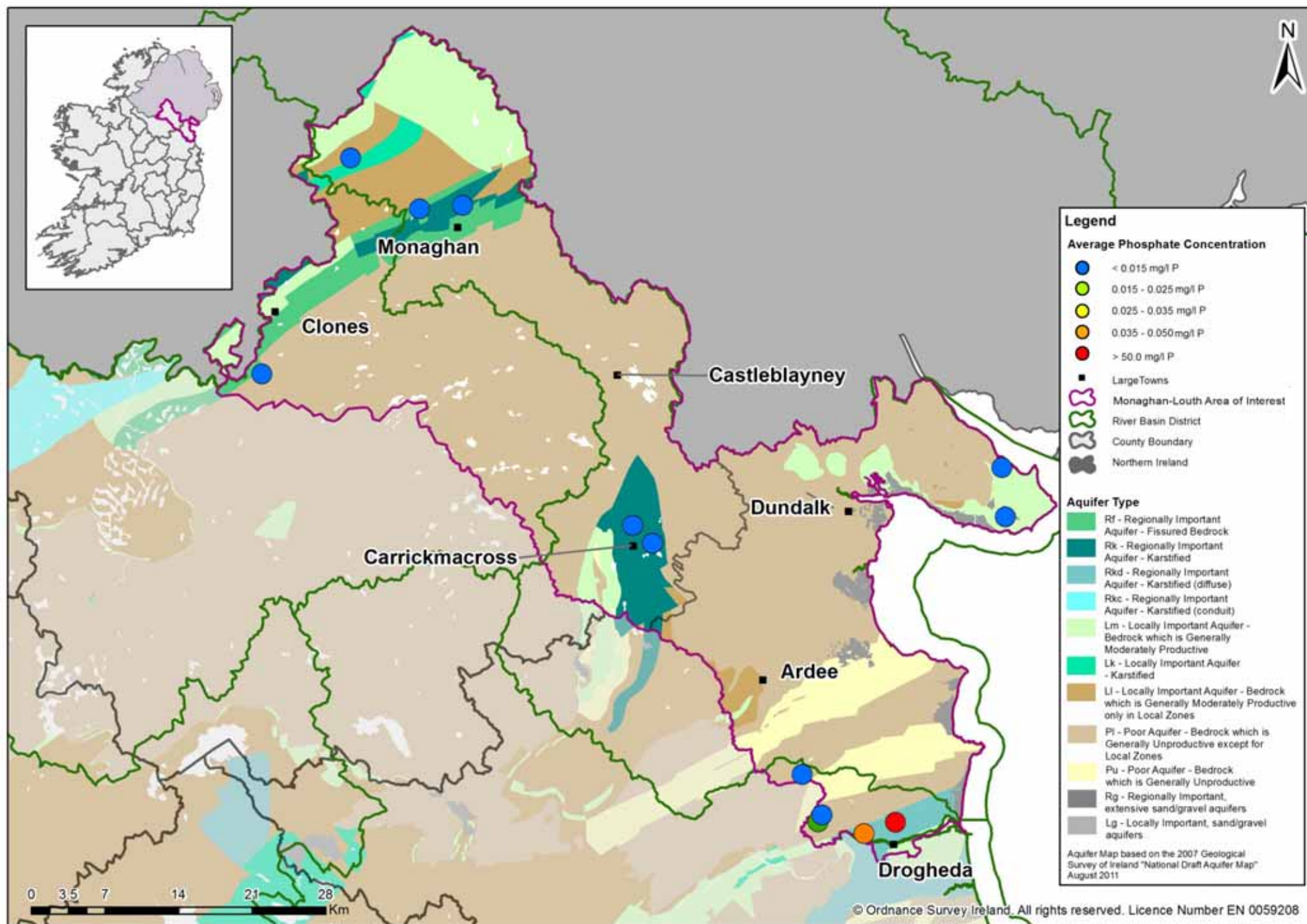
Figure 5.3 shows the locations and the associated average phosphate concentrations in 2011 for the groundwater monitoring points in Counties Louth and Monaghan. Figure 5.4 summarises the average yearly phosphate concentrations from 2007-2011 for the groundwater monitoring programme in Counties Louth and Monaghan.

The Irish WFD phosphate Threshold Value concentration of 0.035mg/l P should be considered when assessing the contribution of phosphorus in groundwater to rivers. Three groundwater bodies in County Louth and two groundwater bodies in County Monaghan are classified at poor chemical status under the WFD because of groundwater contributions of phosphorus to rivers that are less than good status. The proportion of monitoring locations with an average phosphate concentration >0.035mg/l P in Counties Louth and Monaghan did not change in 2010-2011 (two sites). In County Monaghan all monitoring locations had an average concentration <0.015mg/l P in 2011. In County Louth three monitoring locations had an average phosphate concentration greater than 0.025mg/l P and one location had an average concentration >0.050mg/l P in 2011. Overall there has been a general decrease in phosphate concentrations over the period 2007-2011.

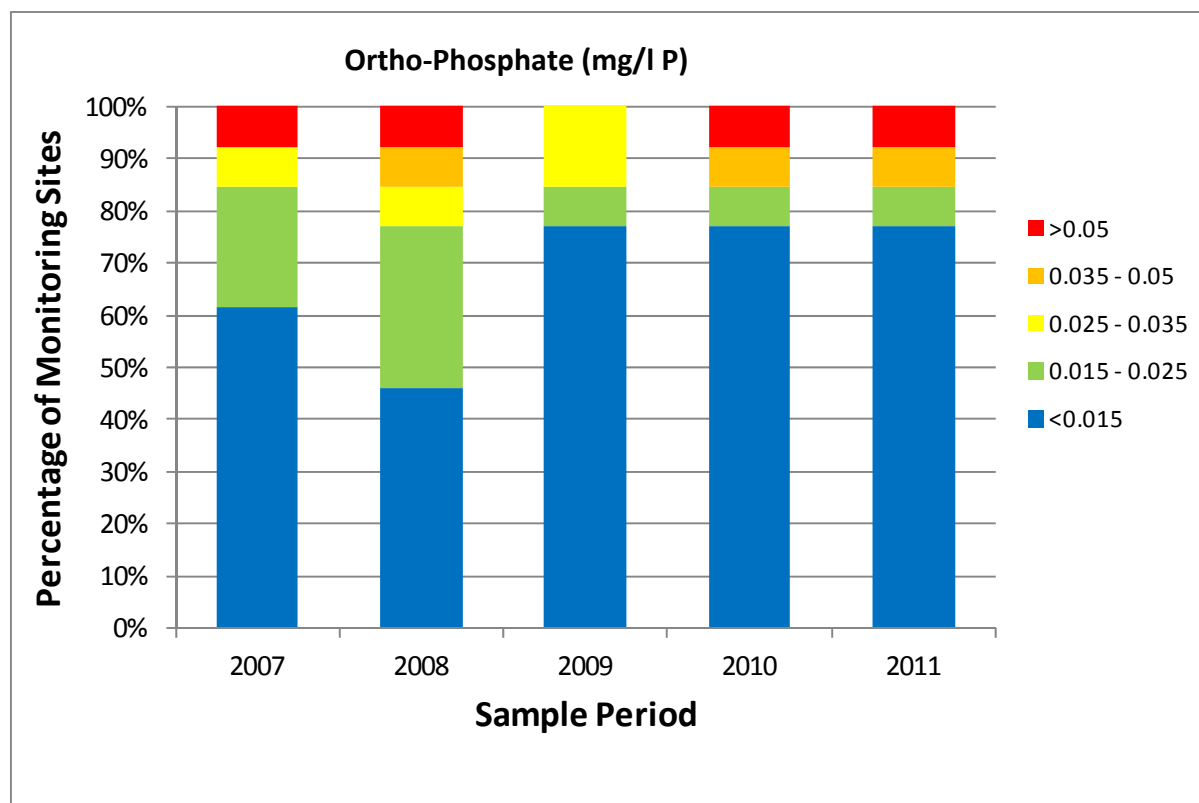
### Other Parameters

In 2011, faecal coliforms were detected at six of the 13 sites monitored in Counties Louth and Monaghan, with 23% of all samples taken in Counties Louth and Monaghan indicating the presence of faecal contamination. Between 2007 and 2010, monitoring was undertaken to assess the impacts of diffuse pollution from pesticides and organic carbon compounds, including hydrocarbons. The Drinking Water Standard for individual pesticides (0.1µg/l) was exceeded in 16 out of 18,722 groundwater samples taken nationally, and there were no organic carbon compound exceedances. In future a less intensive risk based monitoring programme will be put in place for these chemicals (McGarrigle *et al*, 2010).





**Figure 5.3:** Average Phosphate Concentrations in Counties Louth and Monaghan in 2011. Source: EPA (A. Mannix and M. Craig)



**Figure 5.4:** Average Phosphate Concentrations in Groundwater in Counties Louth and Monaghan. Source: EPA (A. Mannix and M. Craig)

#### Sources of Pollutants

It is generally unlikely that the impact from point sources, such as mines, quarries and landfills, will have a significant effect on an entire groundwater body (McGarrigle *et al*, 2010). No groundwater bodies in Counties Louth or Monaghan were classified as being at poor status for the WFD because of point source pressures. Diffuse sources of pollution include nutrient pressures from agricultural activities and domestic wastewater treatment systems (especially nitrates and phosphates), and agrichemicals.

#### Summary

In many Irish rivers, more than 30 per cent of the flow is derived from groundwater, rising to 90 per cent in periods of low flow. Therefore the quality of groundwater can have a major impact on the quality of river water. Nitrate and phosphate concentrations in groundwater in County Monaghan are relatively low. This is likely to be a reflection of the low to moderate groundwater vulnerability in many parts the county because of the natural protection provided by the overlying soils and subsoils. The average nitrate and phosphate concentrations in County Louth are more variable than those in County Monaghan, with the range of average nitrate and phosphate concentrations comparable to those seen nationally. The increase in nitrate and phosphate concentration since 2009 highlights the importance of continuing with programmes of measures to ensure that overall nutrient loss to groundwater of nitrates and phosphates is minimised. Continued improvements in the understanding of the interactions between groundwater and surface water are very important to maximise the effectiveness of any programmes put in place.

## TRANSITIONAL AND COASTAL WATERS

### Physico-chemical & Biological Monitoring

The EPA has been monitoring and assessing the estuarine and coastal status of Irish waters since the early 1990s. Following the introduction of the WFD, the monitoring programme has intensified and the EPA now monitors 120 water bodies up to four times per year, once in the winter and three times during the summer period. In addition to more traditional eutrophic-status monitoring, such as nutrient and oxygen concentrations, the assessment now covers a wide range of biological elements such as seaweeds, phytoplankton and seagrass. This holistic ecological assessment is an essential part of the WFD and in conjunction with the Marine Institute and Inland Fisheries Ireland fisheries programmes, a comprehensive overview of the ecological status of Ireland's tidal waters can now be provided.

The transitional and coastal waters of the Louth area cover an area of just over 300 km<sup>2</sup>. This is broken down into 14 waterbodies in and Neagh Bann RBD and two in the Eastern RBD. These waterbodies comprise partially mixed estuaries (e.g. the Boyne and Castletown Estuaries), transitional lagoons (e.g. Carlingford Lagoons) and tidally mixed coastal waters (e.g. Outer Dundalk Bay and the Louth Coast). A subset of these waterbodies is assessed for WFD ecological status and for trophic status under the EPAs Trophic Status Assessment Scheme (EPA, 2009).

Transitional and coastal water bodies are monitored for the following parameters: salinity, temperature, pH, transparency, DO, BOD, Total Oxidised Nitrogen (TON), ammonia, dissolved inorganic nitrogen (DIN), o-phosphate and chlorophyll a.

The Trophic Status Assessment Scheme (TSAS) has been developed to capture the cause-effect relationship of the eutrophic process and considers the following:

- Enrichment of waters by nutrients (dissolved inorganic nitrogen and phosphorus)
- Accelerated algal growth (chlorophyll and opportunistic macroalgae)
- Undesirable disturbance (oxygen status)

By assessing the results of analysis of DO, BOD, o-phosphate and DIN, in summer and winter, a trophic status is assigned. Priority substances are also monitored and details of this programme, undertaken by the Marine Institute, are available at <http://hdl.handle.net/10793/635>

### Assessment of Water Quality

The 2010 OSPAR Riverine Inputs to the Maritime Area, assesses nitrogen loading to the marine environment for the River Boyne. Compared to National annual figures, the Boyne contributes higher annual loading of nitrogen (4,600 tonnes) than the national average (3,400 tonnes). This represents almost 8% of the national total.

In terms of point sources there are two major waste water treatment plants discharging to tidal waters. Both the Drogheda and Dundalk agglomerations have a treatment plant PE greater than 100,000. The Castletown Estuary is currently classified as Potentially Eutrophic with elevated nutrient in summer and winter and elevated phytoplankton growth. Inner Dundalk Bay was previously classified as eutrophic, but is now indicating Intermediate status. Latest results indicate that the winter DIN levels, chlorophyll concentrations and oxygen conditions have all improved in this waterbody. While there has been an improvement in the status of this waterbody, caution is needed interpreting this change. Both oxygenation and chlorophyll criteria have decreased only marginally below the TSAS assessment thresholds. Additionally, due to sampling difficulties in 2009, the winter data is lacking. So while improvements here have definitely been observed recently, further analyses are required to confirm these changes. The Boyne Estuary is currently Intermediate status due to elevated winter nitrogen concentrations. The coastal waters in this area are all currently unpolluted in relation to trophic status.

Five of the 16 waterbodies are assessed for ecological status, as defined under the WFD. The Castletown Estuary and Inner Dundalk Bay are both classed as moderate or worse exceeding the standards for both general physicochemical elements and biological quality elements. The Boyne Estuary is currently classified as good, although it has elevated nitrogen concentrations currently not covered by an EQS under SI 272 of 2009. Outer Dundalk Bay is classified as Good status based on oxygenation condition and benthic invertebrate fauna. The remaining coastal water is classified as High status.

Trophic Status	Louth (%)	National (%)
<b>Eutrophic</b>	0	10
<b>Potentially Eutrophic</b>	20	5
<b>Intermediate</b>	40	35
<b>Unpolluted</b>	40	50

## Bathing Waters

In 2011, four bathing waters in Co. Louth were monitored during the bathing season, out of a total of 135 locations nationally. The monitoring of bathing waters is the responsibility of the relevant local authority, and sampling must be undertaken at regular intervals during the bathing season which runs from June 1<sup>st</sup> to September 15<sup>th</sup> each year.

A new Bathing Water Directive (2006/7/EC) was transposed into Irish law in 2008 (S.I. 79 of 2008) and will replace the existing regulations (S.I. 155 of 1992) on 31<sup>st</sup> December 2014. This new Directive sets tight microbiological standards for two new parameters – intestinal enterococci (IE) and *E. coli*. Previous assessments were based on total and faecal coliforms and some physico-chemical measurements. In the meantime, transitional arrangements are in place and from 2011 the new microbiological parameters are being monitored. At present bathing waters are classified as good, sufficient or poor. From 2015 microbiological assessments will be used to add a further category of excellent. A classification of sufficient will be required for all bathing waters by 2015.

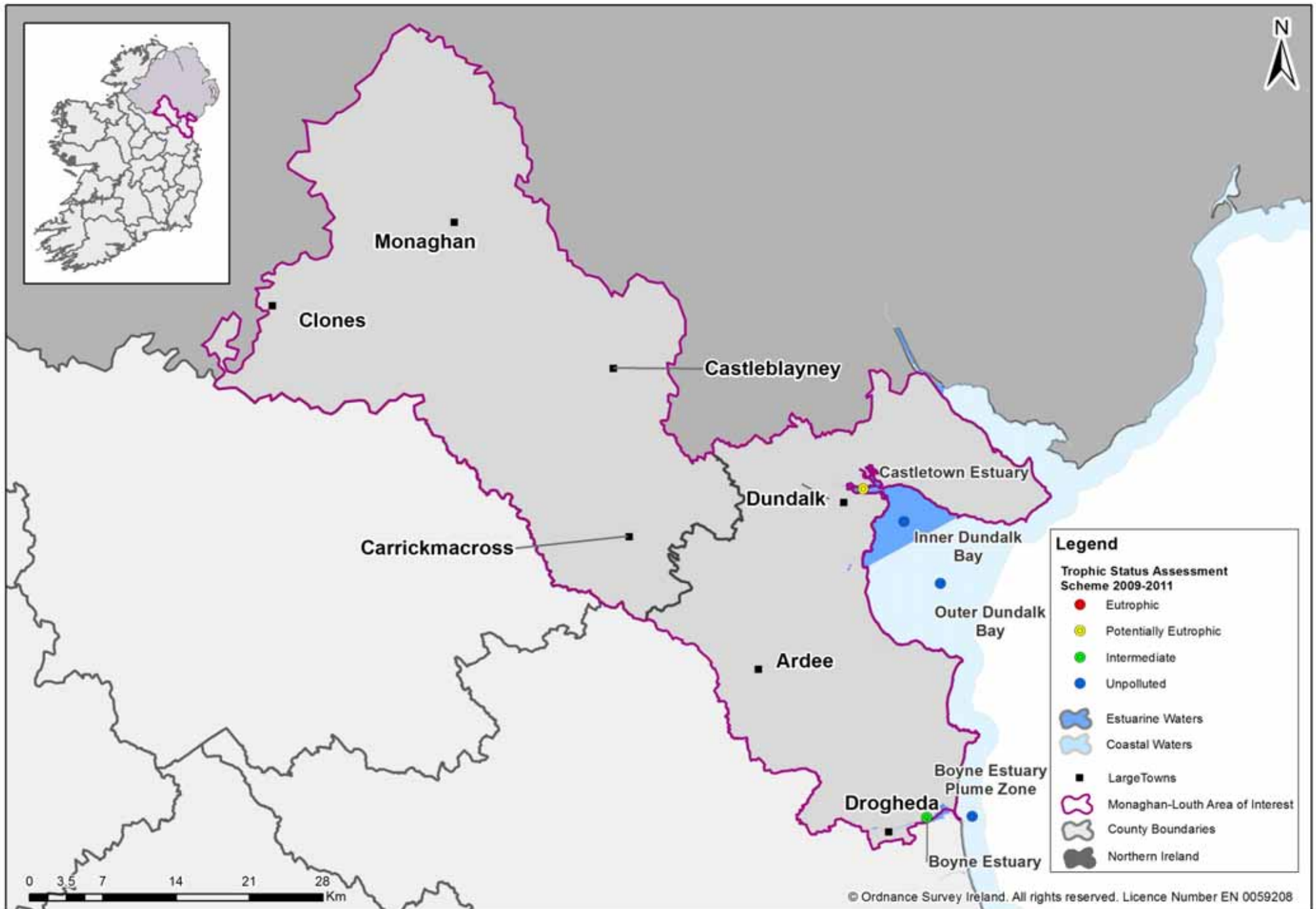
Only Louth County Council has any designated bathing waters. Results for the bathing waters for the 2011 bathing season are provided in Table 6.1 and Figure 6.2. These show that all of the designated bathing areas in the county achieved “good” status compared to the national total of 83%.

Responsible Local Authority	Bathing Area	Water Quality Status 2011	Compliance with mandatory/guide values		
			E. Coli.		IE
			Mandatory	Guide	Guide
<b>Louth County Council</b>	Clogherhead	Good	√	√	√
	Port, Lurganboy	Good	√	√	√
	Seapoint	Good	√	√	√
	Shelling Hill / Templetown	Good	√	√	√

**Table 6.1** Bathing Water Quality in Co. Louth, 2011.

In relation to bathing water, all of the sites in Co. Louth were classified as good for the 2011 bathing season and have shown consistently good status for several years. In 2007 / 2008 Seapoint was classed as being of sufficient status, but has returned to improved quality since. While the bathing waters meet the current guideline standards, the stricter criteria in Directive 2006/7/EC which will be implemented post 2014 will require local authorities to make even greater efforts to improve the water quality and tackle potential sources of pollution.





**Figure 6.1** Trophic Status of Louth Transitional and Coastal waters 2009-2011



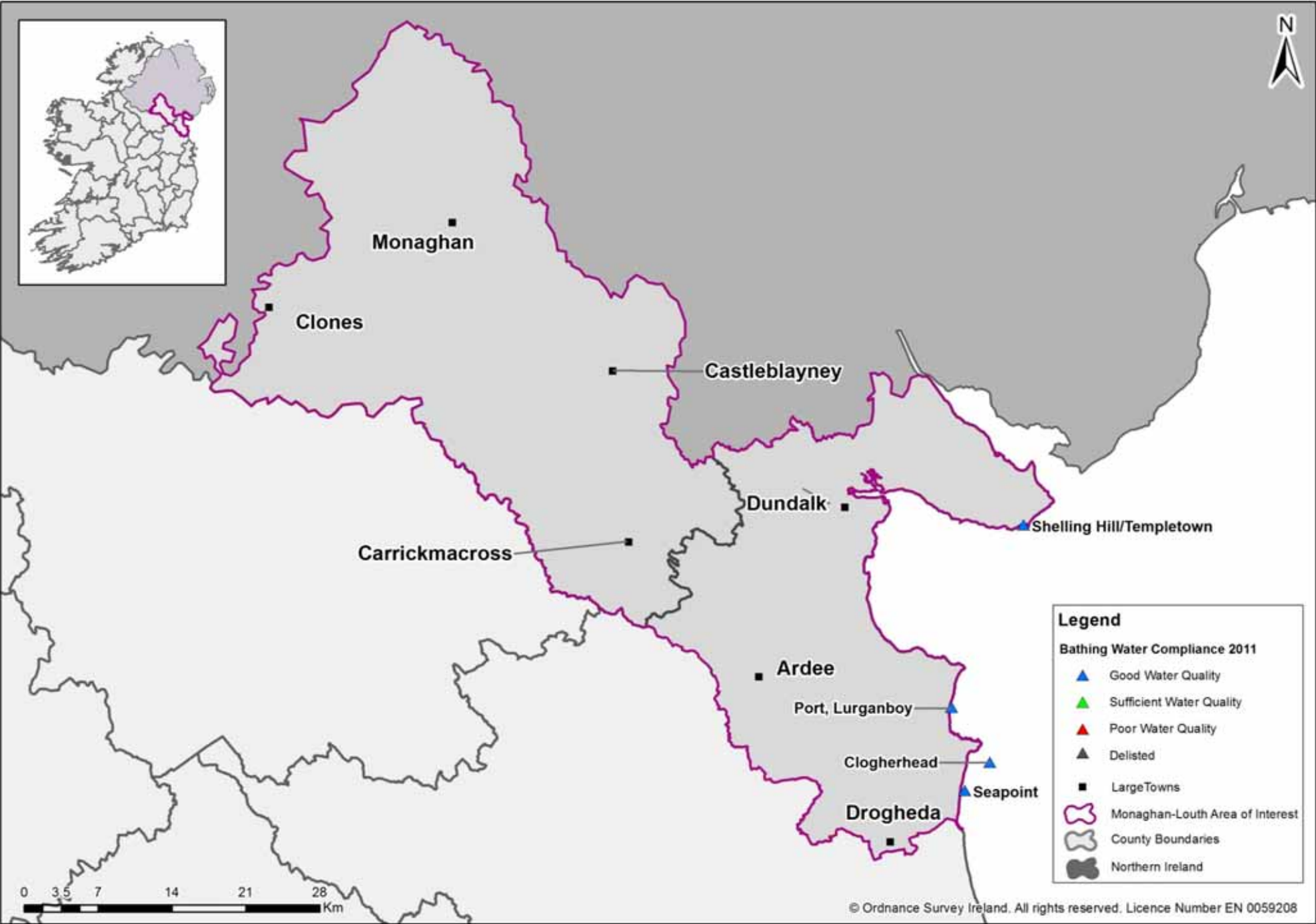


Figure 6.2 Bathing Waters in Co. Louth, 2011.

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## Summary

The Louth coast contains two very large WWTP and as such the estuaries are under increased pressure. However, improvements have been seen. The transitional waters and the coastal waters remain of good environmental status. Recent improvements in inner Dundalk Bay require close analysis to see if the upward trend continues. The Boyne Estuary is currently at Intermediate status compared to potentially eutrophic in the 1990s.

Other pressures are continuing to affect ecological status under the WFD, which is reflected in the conditions of the benthic invertebrate fauna. Both inner and outer Dundalk Bay show deviations from unimpacted status.

The proportion of waterbodies in potentially eutrophic status (20%) appears higher than the national picture, but this is skewed by the low numbers of waterbodies in this assessment area.

## SUMMARY AND ASSESSMENT

The Water Framework Directive requires that by 2015 the following must be achieved:

- Prevent deterioration of water bodies
- Achieve good status for all water bodies
- Reduce chemical pollution
- Achieve water related protected area objectives.

Monitoring of rivers, lakes, groundwaters and transitional & coastal waters in Louth and Monaghan indicates that while there have been welcome improvements in some areas, work remains to be done in others, particularly in addressing point source pollution from Waste Water Treatment Plants and diffuse pollution from agriculture and septic tanks.

One of the aims of this report is to present an assessment of progress towards meeting the objectives of the WFD as set out in the respective River Basin Management Plans. The target is to have 100% of water bodies achieving at least good status by 2021. Given the current status of many water bodies, this will be a significant challenge for all concerned.

### Rivers

On the positive side there are no seriously polluted river sites in Louth and Monaghan, which follows the national trend of virtually eliminating all seriously polluted sites. That aside, the overall picture for river water quality in this area is quite poor. In the period 2007-2009, just 35% of water bodies were of high or good status, compared with 52% nationally. Of equal concern are the relatively few high status sites in Louth and Monaghan. Since 1987 the number of these sites has dropped from 14, to a current level of just five. Should this trend continue, there is a real danger that high status sites will be lost altogether.

Elevated nitrate and o-phosphate levels in particular, arising primarily from diffuse pollution, are the main issues in both counties e.g. the average o-phosphate levels in rivers monitored in 2011 indicates that 65% of river sites are of less than good status with respect to o-phosphate alone.

Tackling pollution at these sites should lead to an improvement in the quality of groundwater, lakes and transitional & coastal waters as well.

### Lakes

All of the lakes monitored under the WFD are in County Monaghan. Overall, lake water quality is poor with only two of the 16 lakes monitored achieving at least good status. Elevated chlorophyll, nitrate and total phosphorus levels are prevalent in a number of lakes with Inner, Monalty, Naglack and Egish particularly badly affected. Diffuse pollution from agriculture and septic tanks seems to be at the heart of the problem.

### Groundwaters

The majority of groundwater in the north-east is meeting its good WFD status objective, with 95% of the counties area at good status compared with 86% nationally. Average nitrate levels are low in Monaghan, but are more elevated in Louth. In the period 2007-2011, there has been an overall decline in nitrate levels even though there has been a slight increase since 2009. Average phosphate levels have also decreased in the same 2007-2011 period. However, five groundwater bodies in the north-east are classified as being of poor chemical status because of groundwater contributions of phosphate to rivers that are less than good status. Faecal contamination of groundwater is an issue, with 23% of samples taken in 2011 containing faecal coliforms, indicating septic tank or agricultural contamination from faecal matter.

The close relationship between groundwater and surface waters needs to be fully appreciated in order to holistically address nutrient levels in all water bodies.

## Transitional and Coastal Waters

Transitional and coastal waters are feeling the effects of high nutrient loadings from rivers in the Louth Monaghan area. The nitrogen loading of the Boyne alone is 35% above the national average and almost 8% of the national total. Diffuse pollution arising mainly from agricultural activities is a significant factor. However, a substantial portion comes from point sources, with two large WWTPs each with a population equivalent greater than 100,000 discharging to tidal waters. In terms of ecological status, as defined under the Water Framework Directive, 40% of the water bodies assessed were found to be 'moderate or worse'.

Bathing water quality in County Louth in 2011 was of good quality. However, the new Bathing Water Directive which places more stringent criteria in terms of water quality will require even greater efforts by local authorities to improve water quality and tackle the sources of pollution.

## Urban Waste Water Discharges

Municipal waste water discharge is one of the main sources of pollution in Irish rivers and the control of these discharges is critical in the protection of water bodies. The main effects of pollution from municipal sources is nutrient enrichment, and to a lesser extent excessive siltation. These two effects lead to decreased biodiversity in our rivers, and excessive weed and algal growth.

While improvements in water quality have been noted in some rivers e.g. the Glyde, where for the first time since sampling began, satisfactory ecological conditions were observed at all stations in 2009, a number of rivers and streams continue to be impacted by urban wastewater discharges. The Blackwater (Monaghan), Dee, Dromore, Glyde, Proules and Shambles rivers in particular all fall into this category with increased nutrient levels observed on occasion downstream of discharge points.

It is anticipated that the licensing of wastewater discharges and the upgrade of treatment plants where appropriate will bring about the necessary reduction of pollution incidents and the corresponding improvement in water quality.

## Diffuse Discharges

Diffuse discharges – mainly from agriculture and septic tanks are more difficult to address than point sources.

Legislation through the Nitrates Directive (SI 101 of 2009) is the main measure for addressing agricultural pollution. These regulations also provide statutory support for good agricultural practice to protect waters against pollution. There have been improvements in agricultural pollution in recent years, but a significant portion of farms nationally may be non-compliant with the Nitrates Regulations. Effective inspection and enforcement regime is needed to ensure full compliance. The risk-based approach adopted by Local Authorities in conjunction with the Department of Agriculture, Fisheries and Food, for farm inspections is welcomed as an efficient way of tackling this problem.

One of the main challenges as regards diffuse agricultural pollution will be the removal of milk quotas at the end of 2015, when it is expected the dairy herd population will increase significantly.

Nutrient from septic tanks are a significant issue. In 2009, the EPA published a new binding Code of Practice to provide guidance on the provision of waste water treatment and disposal systems for new single houses. For existing unsewered properties, improvements are required regarding the operational performance, maintenance and monitoring arrangements of septic tanks and other on-site treatment systems serving such properties. It is hoped that these requirements will ensure environmentally sustainable rural development, protecting vulnerable groundwaters, including drinking water supplies.



## Forestry

Forrestry occupies a relatively low percentage of land in Louth and Monaghan compared to the rest of the country. Figures from 2010 indicate that 4.13% and 4.95% of land is covered by forest in Louth and Monaghan respectively, well below the national average of 10.82%. Pressures exerted by forestry include artificial acidification of waters arising from the presence of coniferous afforestation on acid sensitive soils; nutrient enrichment, siltation and sedimentation impacts from forestry operations. Despite the relatively low level of forestry cover, there needs to be adequate control of forestry operations, particularly in sensitive areas.

## Conclusion

In general, Counties Louth and Monaghan face significant challenges in achieving the targets of the Water Framework Directive. Rivers and lakes in particular compare poorly with national figures as regards number of water bodies achieving good status

Greater focus needs to be placed on the 44 Priority Polluted Sites identified in Table 2.1 of this Report. Tackling the causes of pollution at these sites will not only improve the water quality in these rivers but may also improve the water quality of lakes into which they flow.

The biggest threat to water quality is from excessive nutrients – phosphate in freshwaters and nitrate in transitional and coastal waters. The main sources of these nutrients are waste water treatment plants, run-off from agricultural land and contamination from septic tanks. Improvements in collection systems and reduction of nutrient discharges will bring about an improvement in the status of all water bodies in Louth and Monaghan.

The projected increased output under *Food Harvest 2020*, as well as the removal of the dairy quota at the end of 2015, will provide significant challenges in managing the quality of all water bodies, and achieving the aims of the Water Framework Directive.

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- S.I. No. 48 of 2010 - Urban Waste Water Treatment (Amendment) Regulations, 2010

## APPENDIX 1. RIVER STATION CODES

(with 2011 annual mean values and grid references)

### Louth

Reference	Station ID	2011 annual mean values					Grid Reference (ING)	
		DO % Sat	BOD mg/l O <sub>2</sub>	Ammonia mg/l N	o_PO <sub>4</sub> mg/l P	TON mg/l N	Easting	Northing
L1	RS06B010100	100.8	0.75	0.020	0.01	0.53	315210	309791
L2	RS06B020100	99.3	2.56	0.090	0.05	1.58	306499	314381
L3	RS06C010200	100.0	1.79	0.046	0.07	2.24	300810	309798
L4	RS06C020200	100.0	0.75	0.041	0.04	1.99	302356	310919
L5	RS06D010600	91.2	1.36	0.040	0.04	1.46	292551	289701
L6	RS06D010670	85.8	1.95	0.039	0.05	2.08	295323	290348
L7	RS06D010680	88.8	1.48	0.044	0.05	1.75	296624	290539
L8	RS06D010710	90.8	1.65	0.128	0.05	1.80	297318	290991
L9	RS06D011000	92.8	1.86	0.046	0.06	2.38	306577	291124
L10	RS06D011100	88.0	1.75	0.049	0.07	2.46	307399	292205
L11	RS06F010900	97.3	1.23	0.023	0.04	1.83	301461	301571
L12	RS06F020700	98.3	1.45	0.049	0.02	1.47	308143	310046
L13	RS06G020700	95.8	1.33	0.031	0.03	1.84	295567	297673
L14	RS06G020900	92.5	0.96	0.036	0.03	2.50	298680	295458
L15	RS06G021230	91.5	3.65	0.330	0.06	2.99	306180	295322
L16	RS06T010350	92.5	3.43	0.065	0.16	3.75	312758	280596
L17	RS06W010040	90.5	5.05	0.625	0.05	2.14	300971	284552
L18	RS06W010100	102.0	1.99	0.073	0.08	2.82	304643	285672
L19	RS06W010400	92.0	1.95	0.180	0.06	3.43	305751	288962
L20	RS06W010500	96.8	1.76	0.120	0.13	3.62	305769	289298
L21	RS07M010100	107.0	1.79	0.030	0.09	2.92	301941	280721
L22	RS07M010200	103.0	1.28	0.023	0.04	2.64	300453	276902
L23	RS07M010300	104.3	1.43	0.066	0.04	4.08	303747	275654

### Monaghan

Reference	Station ID	2011 annual mean values					Grid Reference (ING)	
		DO % Sat	BOD mg/l O <sub>2</sub>	Ammonia mg/l N	o_PO <sub>4</sub> mg/l P	TON mg/l N	Easting	Northing
M1	RS03B010100	98.2	0.75	0.012	0.03	0.34	260272	337068
M2	RS03B010130	98.0	0.50	0.018	0.02	0.39	261394	335942
M3	RS03B010600	96.0	1.00	0.031	0.04	0.68	267515	335243
M4	RS03B010800	101.2	2.04	0.039	0.06	1.88	271961	338794
M5	RS03C011100	99.7	0.92	0.040	0.06	0.92	274526	331605
M6	RS03C011200	100.0	0.75	0.036	0.06	1.13	274043	332159
M7	RS03C011400	98.0	0.67	0.043	0.05	1.11	273880	335755
M8	RS03C021300	92.0	1.00	0.061	0.07	0.67	265441	334582
M9	RS03M010100	101.2	0.50	0.006	0.09	0.06	259739	346174
M10	RS03M010400	99.3	0.50	0.013	0.03	0.36	267097	343359
M11	RS03M010500	98.5	0.58	0.011	0.03	0.32	268630	343051
M12	RS03S010500	76.5	0.50	0.004	0.01	0.22	268023	334968
M13	RS03S020500	91.8	1.08	0.033	0.06	0.38	261102	337572
M14	RS06C030050	98.2	0.92	0.078	0.05	1.01	289288	324586
M15	RS06C030170	94.8	1.00	0.060	0.05	1.14	285675	321571
M16	RS06D070070	97.7	0.75	0.020	0.04	1.03	280160	298260

Reference	Station ID	2011 annual mean values					Grid Reference (ING)	
		DO % Sat	BOD mg/l O <sub>2</sub>	Ammonia mg/l N	o_PO <sub>4</sub> mg/l P	TON mg/l N	Easting	Northing
M17	RS06F010200	83.8	0.58	0.014	0.01	0.39	282845	320628
M18	RS06F010300	94.8	0.58	0.035	0.02	0.58	287419	316774
M19	RS06F010650	101.5	1.16	0.019	0.03	0.78	293260	307049
M20	RS06G020100	92.1	1.27	0.053	0.05	1.21	280613	297922
M21	RS06G020500	90.3	0.50	0.015	0.03	0.89	289432	298113
M22	RS06G040100	95.5	1.00	0.032	0.02	0.92	283413	321386
M23	RS06M010096	99.7	0.92	0.012	0.02	1.20	279605	299511
M24	RS06P010100	96.8	0.50	0.011	0.02	1.45	283278	304036
M25	RS06P010300	87.2	0.58	0.035	0.24	3.58	285036	302632
M26	RS06P010500	94.0	0.92	0.037	0.04	1.28	287871	301892
M27	RS06R030400	89.2	0.58	0.017	0.04	2.10	285294	306397
M28	RS36A070600	93.2	0.92	0.028	0.04	0.94	266545	317099
M29	RS36B050300	64.0	1.00	0.065	0.08	0.36	256793	320185
M30	RS36C110700	98.7	0.67	0.011	0.04	1.06	258572	329065
M31	RS36D020036	91.0	0.67	0.017	0.03	0.76	274400	320100
M32	RS36D020100	95.3	1.50	0.049	0.08	0.75	269870	321210
M33	RS36D020150	86.9	2.08	0.063	0.07	0.81	271692	320507
M34	RS36D020300	101.0	0.64	0.024	0.01	0.52	269662	319762
M35	RS36F010100	93.3	0.81	0.035	0.04	0.58	254441	328426
M36	RS36F010200	92.8	0.94	0.036	0.04	0.74	254578	326492
M37	RS36F010500	88.9	1.72	0.088	0.06	0.85	249978	323276
M38	RS36K010100	85.7	0.92	0.028	0.08	0.41	278748	311500
M39	RS36K010400	85.3	0.58	0.037	0.01	0.27	270692	311420
M40	RS36M010200	90.3	0.83	0.038	0.04	1.03	257941	329870
M41	RS36M030900	96.0	0.75	0.048	0.04	0.68	256814	333984
M42	RS36M031200	89.5	0.75	0.086	0.05	0.56	256950	330097
M43	RS36M080200	100.2	0.58	0.044	0.02	0.65	272012	320156