Integrated Water Quality Report 2012

GALWAY & MAYO

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Community and Local Government.

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- Office of Environmental Enforcement
- Office of Environmental Assessment
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

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The collation and summation of data for this report was undertaken with the assistance of Mr. Peter Webster (Senior Scientist, Reporting & Assessment) under the direction of Dr. Micheál Lehane, (Programme Manager, Environmental Monitoring & Assessment) within the Office of Environmental Assessment.

ENVIRONMENTAL PROTECTION AGENCY

An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle Estate, Co. Wexford, Ireland
Telephone: +353 53 9160600 Fax: +353 53 9160699
Email: info@epa.ie Website: www.epa.ie
LoCall 1890 33 55 99

Regional Inspectorate, John Moore Road, Castlebar, Co. Mayo.

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Executive Summary

Scope

This report summarises water quality in the counties of Galway and Mayo in 2012. These counties lie within two river basin districts (RBDs): the Western RBD and a small part of the Shannon RBD. The Western RBD has a land area of 12,193 km^2 with some 2,700 km of coastline. This area is mainly rural with many high quality waters. The principal urban areas include Galway City, Castlebar and Ballina. The main rivers are the Corrib, the Moy and the Owenmore. The main lakes are the Corrib (165 km^2), Conn (107 km^2), Mask (82 km^2) and Carra (15 km^2).

This is an integrated water quality report, and reviews the quality of rivers, lakes, groundwaters, transitional and coastal waters, and bathing waters in Mayo and Galway during 2012. Inclusion of all of these water bodies is recognition of the importance of different water types in the water cycle and how their interactions affect each other. With an emphasis on the reporting requirements of the Water Framework Directive (WFD), 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. The inclusion of biological assessments of rivers, lakes, and transitional and coastal waters, as well as physico-chemical assessments, gives a more complete picture of the ecological status of these water bodies.

Data for several key parameters in rivers – Ammonia, Nitrate and ortho-Phosphate, Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) are presented in map format whereby the mean values are presented as coloured dots on maps, with each dot representing a sampling station on a river. Raw data, as well as summary reports and trend graphs of river quality, are also presented on CD inside the back cover of the report.

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

- Over 190 river stations on over 90 rivers
- 49 lakes
- 27 groundwater sites
- 20 transitional and coastal waters
- 31 bathing water sites

Details of the ecological status of Irish waters for the period 2007–2009 as required under the WFD are available at: Water Quality Status Report 2007–2009[1]. The review of ecological quality is an on-going process and preparations are underway for assessment of data for the period up to 2012 covering the first six-year cycle of monitoring for the next major report to the EU. This report builds on the information collated to date.

The portions of the RDBs covered in this report can be sub-divided into 16 water management units (WMUs). These are mapped in Figure 1.1 and the key point pressures are identified in Figure 2.12.

1 http://www.epa.ie/pubs/reports/water/waterqua/waterframeworkstatusupdate.html

Pressures

In Galway and Mayo, 85 river sites have been identified by the EPA as WFD priority polluted sites for tackling pollution. These sites are subject to one or more of the key pressures that are common to all WMUs – waste water treatment plants, surface water abstraction points for drinking water, landfills, industrial effluents (point sources), agricultural discharges, forestry and discharges from septic tanks (diffuse sources). Eutrophication, the over enrichment of surface waters with nutrients, specifically phosphorus and nitrogen, is the most common manifestation of these pressures and is a threat to water quality in both Galway and Mayo.

Management of these pressures is important because large areas of the Western RBD have been designated as Special Areas of Conservation (SAC) under the European Union (Natural Habitats) Regulations, 1997 and Natural Heritage Areas (NHA) under the Wildlife (Amendment) Act 2000. Also Freshwater Pearl Mussel catchments in the Western RBD include the Newport, Bundorragha, Dawros and Owenriff rivers and Shellfish Waters with designated Pollution Reduction Programmes include the Clarinbridge River, Kinvara, Clifden and Killala bays. There are also many drinking water sources and designated bathing waters in both counties. Special attention needs to be paid to all of these areas due to their sensitivity to pollution.

Rivers

The river monitoring programme covers the following areas:

- Operational sites
- Surveillance sites
- Designated salmonid sites

They are monitored for a range of parameters and at a 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.

Trend graphs, showing the annual median for both ortho-phosphate and nitrate at 44 key river locations, are presented in the appendices and show that while nitrate levels have remained relatively stable, ortho-phosphate levels have increased somewhat in the last ten years. One of the big challenges will be reducing ortho-phosphate levels to acceptable concentrations in all rivers, although some progress towards this can be seen from the noticeable decrease in ortho-phosphate concentrations in some rivers in 2012.

Biological monitoring for rivers generally occurs at least once every three years. The Western RBD continues to be ranked as one of the most unpolluted RBDs in Ireland. When compared to national statistics, there are more unpolluted sites in Galway and Mayo, 73% of river channel nationally is unpolluted, compared with over 80% of river channel in Galway and Mayo. However, the number of high quality sites in the country has reduced by almost half in the period 1987–2012. The Western RBD is one of the districts that has seen the greatest decline in high quality river sites. In Galway and Mayo 102 sites were classified as high status (Q4–5 or better) in the period 2010–2012.

In Galway and Mayo, 85 sites have been identified as WFD priority polluted river sites for tackling pollution. 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 lakes and transitional and coastal waters that are fed by these rivers. Targeted local investigations using a variety of methods such as the Small Stream Risk Score (SSRS) in investigating diffuse pollution will be the most effective way of identifying and eliminating sources of pollution.

Lakes

In total, 49 lakes were monitored in counties Galway and Mayo by the EPA as part of the national lake monitoring programme in 2012. Water samples were collected between four and 12 times per year and tested for a wide range of physico-chemical parameters. As the biological communities typically exhibit longer response times to gradual changes in their environment, the biological sampling is completed once every three years. The physico-chemical, hydromorphological and biological results combine to produce overall ecological status and lakes are classified as high, good, moderate, poor or bad status. During the 2007–2009 reporting period, 86% of lakes in Galway and 62% of lakes in Mayo were either high or good status. The good/high categories do compare very favourably with the national statistics where 47% of the lakes were either high or good status.

The challenge is to maintain high and good status lakes, prevent the spread of alien species and improve the lakes assigned moderate or less status. The main threats to lake water quality are diffuse pollution from agricultural activities and forestry, and municipal waste water treatment plants and septic tanks. But for some lakes, the cause(s) of failing to reach at least good status are unknown and further investigations are required.

Groundwater

Twenty-seven groundwater sites were monitored in Galway and Mayo during 2012. Contamination from phosphate and faecal coliforms is the main threat to groundwater quality in Galway and Mayo. There has been a general reduction in nitrate levels in the period 2007–2012 and current levels remain low. Elevated ortho-phosphate levels have been found in three groundwater sites in Galway and Mayo in 2012, although overall ortho-phosphate levels have decreased in the period 2007–2012. However, microbial pollution was found at the majority of monitoring locations in 2012. While agriculture is a potential source of diffuse pollution, domestic waste water treatment systems, including septic tanks may also be a contributor to groundwater pollution.

Transitional and Coastal Waters

Over 4700 km^2 of transitional and coastal waters in 20 water bodies were monitored in the West in 2012. All but one of the 20 estuarine and coastal waters bodies were classified as unpolluted. Thirty-one designated bathing water sites were monitored in Galway and Mayo in 2012 and all but one (Clifden, Co. Galway) were found to be of sufficient or good quality.

Overall Assessment and Conclusions

Overall, water quality in Galway and Mayo continues to be very good especially when compared with the rest of the country. Over 70% of rivers, lakes and transitional and coastal waters meet the target of good or better status as required under the WFD.

Pressures on water bodies in Galway and Mayo arise from both point and diffuse source pollution. Dealing with diffuse pollution and pollution from small point sources can be a lot more difficult to manage than pollution arising from point sources. Waters in Galway and Mayo are affected by high levels of nutrients – especially ortho-phosphate, and levels need to be reduced to achieve WFD targets.

Addressing the sources of pollution – especially diffuse pollution and understanding the interactions between the various water bodies, e.g. rivers, lakes, groundwaters and transitional and coastal waters is vital in retaining and restoring (where appropriate) good status to all water bodies.

Approximately 17% of river sites in counties Galway and Mayo have been identified as WFD priority polluted river sites for tackling pollution (see Fig 2.12 and Appendix 2). Addressing pollution at these sites may also result in improved conditions in lakes, groundwaters, and transitional and coastal waters. These sites should be the focus of future local authority investigative work especially with regard to eliminating bad practices.

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.

1. Introduction

This report is the second in a series of integrated water quality reports for the west of Ireland. It deals with the quality of rivers, lakes, groundwaters, and transitional and coastal waters (including bathing waters) in counties Galway and Mayo. (The Castlebar laboratory no longer undertakes work on behalf of Sligo County Council).

This report is also a sequel to those issued previously by the EPA and reviews the water quality monitoring carried out in accordance with the National Water Framework Directive Monitoring Programme for the period 2010–2012. This programme, which commenced in 2007, covers the principal water body types of Rivers, Lakes, Groundwaters and Transitional (Estuarine) waters. It was set up to address the requirements of Article 10 (1) of the European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003). These regulations are the national regulations implementing the requirements of the Water Framework Directive (WFD) 2000/60/EC.

The following map (Fig. 1.1) shows the boundaries of the relevant RBDs in Galway and Mayo along with the WMUs. The area covered by the Castlebar Regional Inspectorate includes counties Galway and Mayo.

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 WFD can be obtained at www.wfdireland.ie.

The WFD specifies three types of monitoring – operational, surveillance and investigative. The EPA carries out surveillance monitoring of rivers and lakes, and also provides analytical services to Galway and Mayo local authorities in respect of operational and some investigative monitoring. Surveillance and operational groundwater sampling and analyses are undertaken by the EPA. Coastal waters are assessed by the Marine Institute, while the EPA undertakes assessment of transitional (estuarine) waters. 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

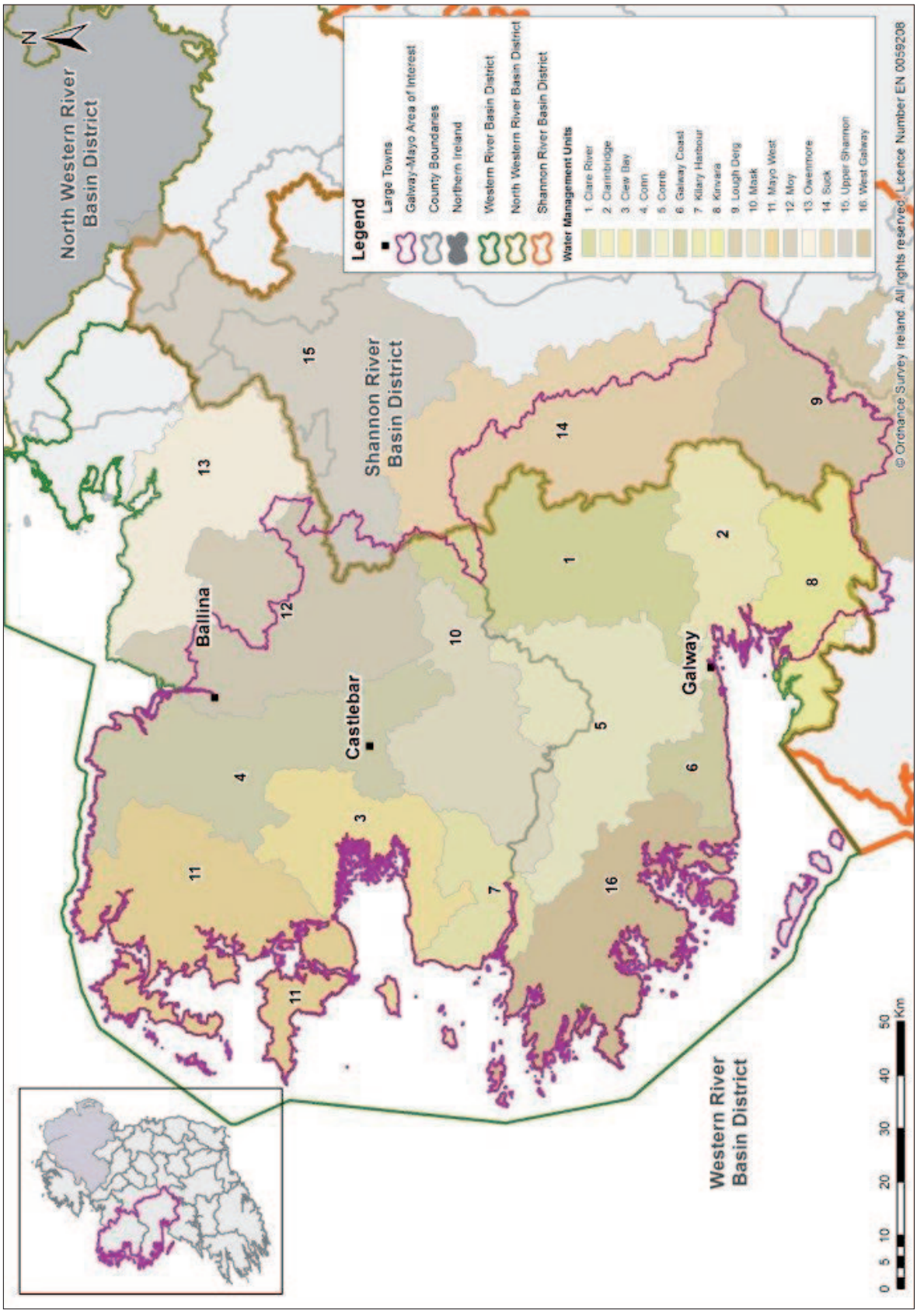
Operational monitoring aims to:

- 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[2].

2 http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/

Figure 1.1 *River basin districts in Galway and Mayo*



2. River Water Quality

2.1 Sampling Locations

Physico-chemical monitoring under the WFD is being undertaken at 197 stations in 91 rivers in the Galway and Mayo. 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 these 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 the 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 in Figure 2.1 indicates the locations of the physico-chemical river monitoring sites in Galway and Mayo.

Further information on the design and operation of national monitoring programmes is available from the EPA website at: National Monitoring Programme[3].

2.2 Physico-Chemical Monitoring of Rivers

The rivers monitored by the EPA Castlebar laboratory are monitored for one or more of the following reasons:

- Operational monitoring under the WFD
- Surveillance monitoring under WFD
- Designated salmonid monitoring
- Investigative monitoring for local authorities

Operational sites require the following monitoring: temperature, DO, pH, conductivity, hardness, colour, alkalinity, ortho-phosphate, TON, nitrite, ammonium, chloride and BOD.

Surveillance sites require these parameters as well as priority substances (including certain metals and organic compounds). Designated salmonid sites require the operational suite, as well as suspended solids, free ammonia, copper and zinc. The frequency of monitoring investigative sites and the parameters monitored varies depending on specific needs.

Physico-chemical data is assessed against its compliance with the criteria set out in the "European Communities Environmental Objectives (Surface Water) Regulations 2009" S.I. 272 of 2009[4]. 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.

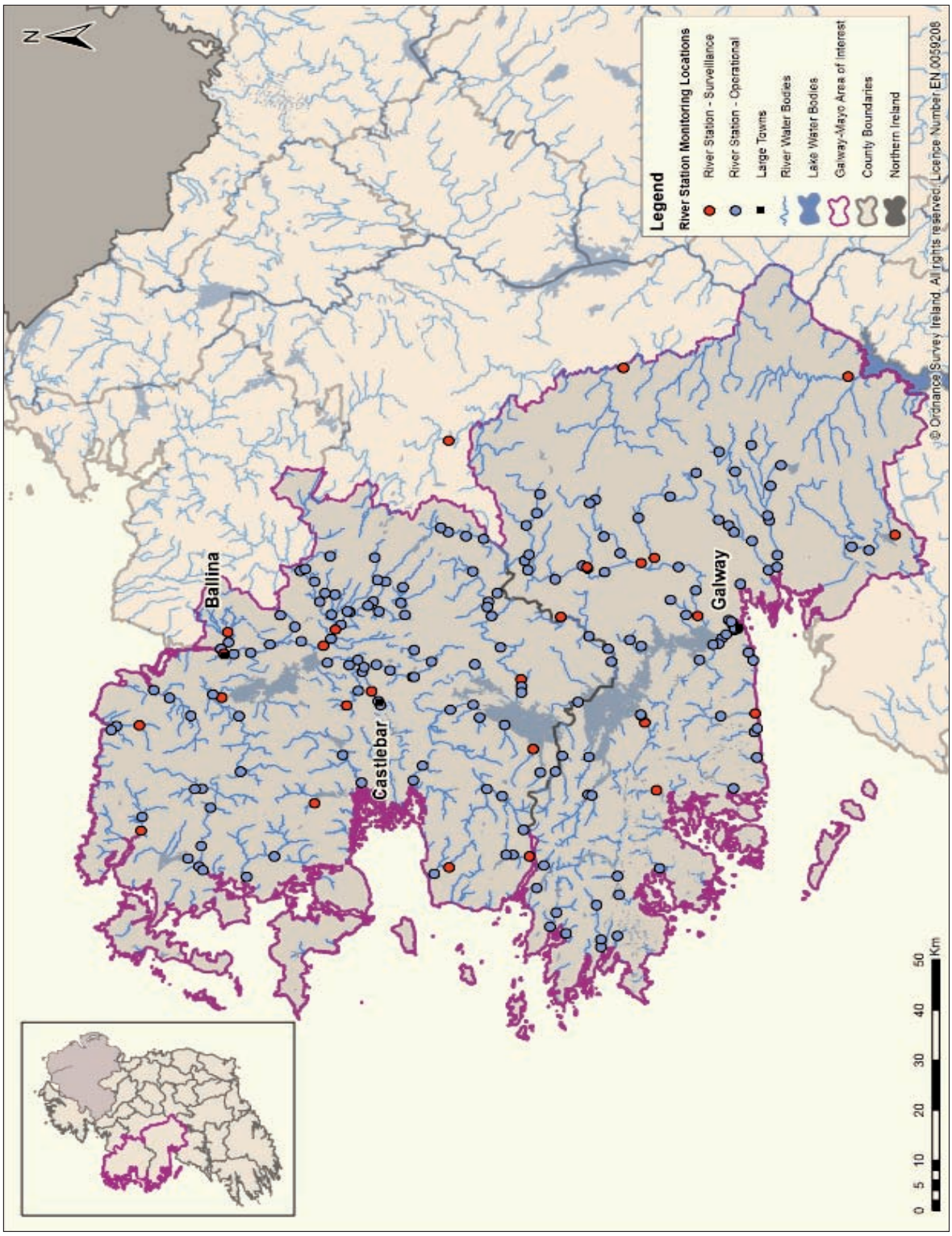
3 http://www.epa.ie/pubs/reports/water/other/wfd/

4 http://www.environ.ie/en/Legislation/Environment/Water/FileDownLoad,20824,en.pdf

The area covered in this report relates to the Western RBD and some of the Shannon RBD. Each RBD is subdivided into hydrometric areas and divided again into WMUs.

Figure 2.12 summarises the key point pressures in each RBD. More detailed information may be found on www.wfdireland.ie.

Figure 2.1 *Physico-chemical river monitoring points in counties Galway and Mayo in 2012*



In determining the ecological status of a river water body, a number of general physico-chemical parameters are assessed against annual mean and 95th percentile 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 95th percentile standards at a 99% confidence level.

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 Environmental Quality Standard (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 4.

2.2.1 Phosphate in River Waters in Galway and Mayo

River water quality monitoring has shown increased eutrophication in most Irish rivers since the 1970s and this is caused fundamentally by increased phosphorus run-off from agricultural land and farmyards, from municipal and industrial effluent discharges (McGarrigle et al., 2010), from septic tanks discharges and/or from forestry operations.

Eutrophication in surface waters arises from the marked increase in nutrient supply leading to excessive growth of algae or other plants. Phosphorus (P) is usually the limiting nutrient for plant growth in freshwaters. Phosphorus 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.

However, 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 can lead to a significant 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.

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 and the surface soil layer can easily become saturated with P. 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 P, for example, sewage, industrial effluents, landfill leachate, etc.

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 ortho-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.

Figure 2.2 shows the annual average ortho-phosphate concentration in rivers in Galway and Mayo in 2012. The map is based on a face value comparison of the annual mean against the EQS for high and good status – see Table 2.1. In 2012, only 7% of the rivers monitored in Galway and Mayo had annual averages above the EQS for "Good" status. This compares favourably with the 2011 data where almost 25% of river sites in Galway, Mayo (and Sligo) had an average concentration >0.035 mg/l P. The worst affected sites are listed in Table 2.2. Ortho-phosphate concentrations are lowest along the western seaboard of Galway and Mayo with mean levels recorded as <0.02 mg/l P.

EU Directive and ortho-phosphate standards for water: A summary of the relevant ortho-phosphate standards (as mg/l P) for rivers is given below. These replace the older Phosphorus Regulations.

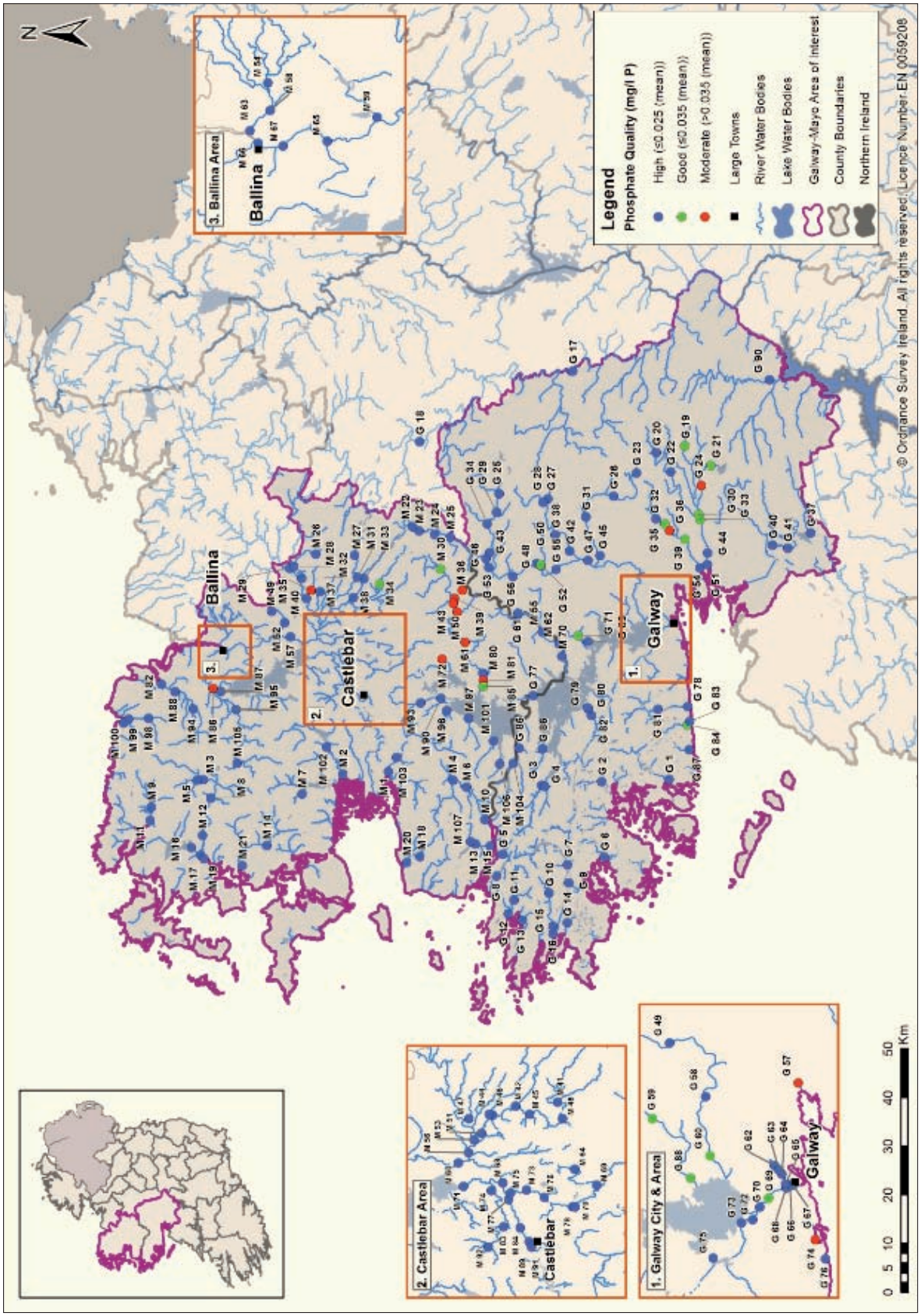
Table 2.1 *EU Directive and ortho-phosphate standards for water*

Water Framework Directive Inland Surface Waters S.I. 272 of 2009	
Annual Mean	**95%ile**
0.035 good	0.075 good
0.025 high	0.045 high

Table 2.2 *Five highest annual average ortho-phosphate concentrations in rivers in Galway and Mayo in 2012*

River	Station	Ortho-Phosphate Conc. (mg/l P)
Ballindine	0200	0.068
Carrowmoneash	0400	0.054
Slieveclaur	0400	0.053
Swinford	0200	0.046
Robe	0200	0.045

Figure 2.2 *Annual average ortho-phosphate in rivers in Galway and Mayo in 2012 (see Appendix 1 for details of station codes)*



Annual median ortho-phosphate concentrations at 44 river stations in Galway and Mayo are presented in graphical form in Appendix 5. Ortho-phosphate trends from eight of these rivers are presented in Figure 2.3. The data covers the period 1979–2012 (except in some cases where the data was unavailable).

These graphs indicate that while there have been fluctuations, the overall levels of ortho-phosphate recorded in river water samples have remained relatively constant over the 30-year period. However, some rivers in Galway and Mayo show an increase in ortho-phosphate levels in the last ten years, e.g. the Corroy (0200), Cregg (0100) and the Black (Shrule) (0400). In 2012 there was a noticeable reduction in median ortho-phosphate levels in some rivers; these include the Castlebar 0200 and the Glore 0200. Ortho-phosphate levels in the Clarinbridge (0300) have continued to have median concentrations of ≥0.050 mg/l P over the past 30 years; however, in 2012 this figure has reduced to 0.039 mg/l P. In some rivers the levels of ortho-phosphate have reduced due to improvements in municipal waste water treatment (e.g. the Castlebar, Owenmore and Swinford), while restrictions on the usage of phosphorus in agriculture together with improvements in farming practice may also have contributed to the decreases in ortho-phosphate concentrations seen in some rivers in 2012.

Over the period 1979 to the present, the laboratory reporting limit for ortho-phosphate has changed for a number of reasons. The current reporting limit is <0.012 mg/l P (i.e. values less than 0.012 mg/l P are reported as <0.012 mg/l P). For the purpose of this report, all values <0.012 mg/l P appear on the graphs as 0.012 mg/l P.

In relation to these graphs it is important to point out the following:

- The median values displayed on the graphs are simply the median ortho-phosphate values for each year in question and can only be taken at face value.
- The number of samples taken from each station from year to year varied and some stations (e.g. salmonid stations) were sampled at a much higher frequency than other river stations due to legislative requirements.
- Samples were obviously taken at different times of the year but no account is taken of seasonal factors (e.g. rainfall) in preparing these graphs.

Figure 2.3 *Long-term trends for ortho-phosphate in a selection of river waters in Galway and Mayo*

2.2.2 Nitrate in River Waters in Galway and Mayo

The EC Directive regarding the protection of waters from pollution caused by nitrate from agricultural sources (Council Directive 91/375/EC) was introduced in 1991 because of concern for nitrate concentrations in surface and ground waters. Supporting regulations (most recently S.I. 610 of 2010) control inter alia farmyard and nutrient management, and establishment and maintenance of buffer zones. 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. 378 of 2006).

The second review of Ireland's Nitrates Action Programme is currently under review, and the retention of derogations already received from the commission will be critical to the success of *Food Harvest 2020*. However, any derogation received will depend on Ireland's ability to show that water quality will not be adversely affected by any increase in agricultural outputs.

No WFD limits have been set for nitrate to date. 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_3) and also sets out a guide level of 5.65 mg/l N (=25 mg/l as NO_3) – 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). It is considered that all river waters in the West of Ireland should meet these standards, therefore, these are the criteria that are used here to assess river nitrate levels.

Figure 2.4 shows the annual average nitrate concentration in the rivers in Galway and Mayo in 2012 (based on the Nitrates Directive classification of water quality).

Of the 197 stations monitored, all were high or good, (based on face value comparisons with the nitrates directive (Council Directive 91/375/EC) classification of water quality). This is an improvement on 2011 data where 2.5% of stations were of moderate status. Over 86% meet the ecological target value of 0.9 mg/l N for high ecological status. Again, restrictions on the usage of nitrogen in agriculture together with improvements in farming practices could have contributed to the improvements in nitrate concentrations. This also compares favourably with the south-east of Ireland in which only 41% were high or good, and 56% were moderate.

The worst affected sites in Galway and Mayo are listed in Table 2.3.

Table 2.3 *Six highest annual average nitrate concentrations in rivers in Galway and Mayo in 2012*

River	Station	Nitrate Conc. (mg/l N)
Cregg	0100	2.0
Cregg	0300	1.7
Headford Stream	0200	1.7
Nanny (Tuam)	0300	1.6
Swinford	0200	1.6
Bearna Stream	0300	1.6

Long Term Trends for Nitrates in River Waters in Galway and Mayo: The graphs in Appendix 6 show the annual median nitrate concentrations at 44 river stations in Galway and Mayo. Nitrate trends from eight of these rivers are presented in Figure 2.5. The data covers the period 1979–2012 (except in some cases where data was unavailable). In order to facilitate easier comparison of median levels between different river stations, the scales on each graph are the same. The graphs show the long-term trends and indicate that the nitrate concentrations in some rivers have slightly increased since 1980, e.g. the Dalgan and the Swinford both of which previously suffered from intense organic pollution with a resultant high degree of denitrification. These graphs also indicate that while there have been fluctuations in the levels in some rivers, in the majority of the rivers with low nitrate levels, i.e. <0.5 mg/l N, the levels of nitrate have remained constant (e.g. Cannahowna, Corrib, Owenriff, Ballinglen, Clydagh, Owenmore). Loughnaminoo Stream and Robe have seen a reduction in nitrate levels in 2012.

Figure 2.4 *Annual mean nitrate in Galway and Mayo Rivers in 2012 (see Appendix 1 for details of station codes)*

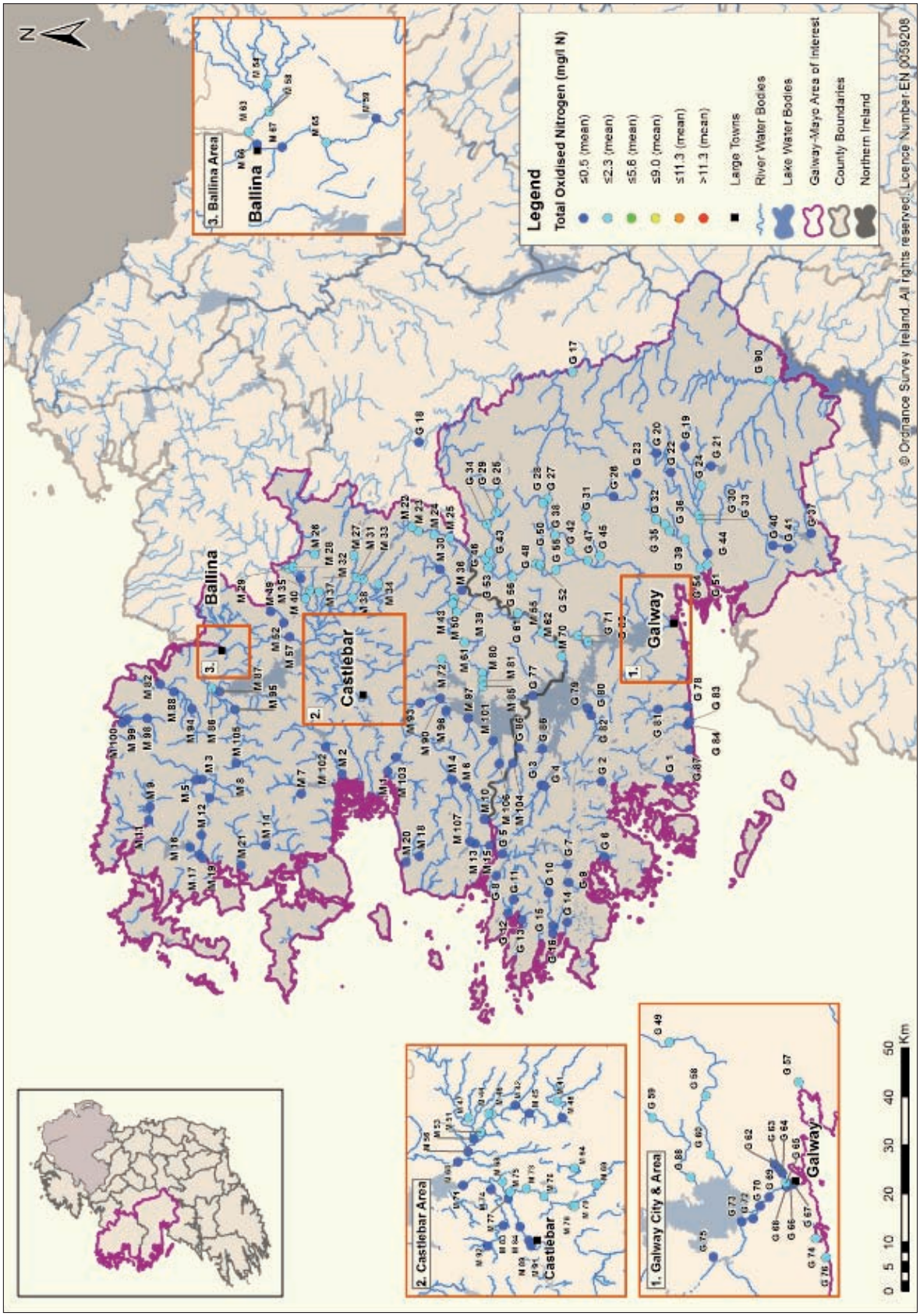


Figure 2.5 *Long-term trends for nitrate in a selection of river waters in Galway and Mayo*

Over the period 1980 to the present, the laboratory reporting limit for nitrate has changed for a number of reasons. The current reporting limit is <0.4 mg/l N (i.e. values less than 0.4 mg/l N are reported as <0.4 mg/l N). For the purpose of this report, all values <0.4 mg/l N appear on the graphs as 0.4 mg/l N.

In relation to these graphs is important to point out the following:

- The median values displayed on the graphs are simply the median nitrate values for each year in question and can only be taken at face value.
- The number of samples taken from each station from year to year varied and some stations (e.g. salmonid stations) were sampled at a much higher frequency than other river stations due to legislative requirements.
- Samples were obviously taken at different times of the year but no account is taken of seasonal factors (e.g. rainfall) in preparing these graphs.

2.2.3 Other Physico-Chemical Monitoring

Dissolved Oxygen

Dissolved oxygen (DO) is essential for the survival of fish and other aquatic life and is an important indicator of pollution. The solubility of oxygen in river water depends mainly on the temperature and salinity of the water. Water in equilibrium with air is saturated with oxygen (i.e. 100% saturation). Water body characterisations and pollution can cause deviations in DO.

Figure 2.6 shows the annual mean DO in rivers in Galway and Mayo in 2012. Ninety-eight per cent of sites in Galway and Mayo are of high status in relation to DO based on face value comparison of the 2012 annual means against the EQS. Table 2.4 lists the 4 DO exceedances in 2012.

Table 2.4 *DO exceedances in rivers in Galway and Mayo in 2012*

River	Station	DO (% Sat)
Cloondaver Stream	0100	79.2
Loughnaminoo Stream	0200	73.0
Cregg	0100	69.3
Carrowmoneash	0400	63.2

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 BOD can be caused by:

- high levels of organic pollution, caused by poorly treated waste water
- 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. Eventually, more plant growth leads to more plant decay. Nutrients can be a prime contributor to high BOD demand 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 need 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

BOD 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).
A summary of the relevant BOD standards are given below (as mg/l O_2):

Water Framework Directive Inland Surface Waters S.I. 272 of 2009	
Annual Mean	**95%ile**
1.50 good	2.60 good
1.30 high	2.20 high

Figure 2.7 shows the annual mean BOD in rivers in Galway and Mayo in 2012. Ninety-nine per cent of sites in Galway and Mayo are of good or high status in relation to BOD, based on a face value comparison of the 2012 annual means against the EQS (as compared with 96% in 2011). The worst affected sites in Galway and Mayo are listed in Table 2.5. As expected, rivers with elevated BODs also include some of those with elevated nutrient levels, e.g. the Carrowmoneash.

Table 2.5 *Five highest annual average BOD results in rivers in Galway and Mayo in 2012*

River	Station	BOD (mg/l O_2)
Carrowmoneash	0400	6.8
Clarinbridge	0300	1.9
Dalgan	0300	1.4
Sinking	0400	1.3
Robe	0400	1.2

Ammonia in River Waters

Ammonia is very important to plant, animal and human life. It is a source of nitrogen, a nutrient to plants, and when deposited from the atmosphere onto land it can enrich the nitrogen content of habitats. It occurs naturally in the environment at low levels.

The most widespread environmental problems arise when ammonia is deposited from the atmosphere onto plants, soil and water. Though not normally the limiting factor, it can cause eutrophication of surface waters. When deposited in large quantities, ammonia can cause soil, streams and lakes to become acidic, affecting plants and aquatic biodiversity. High concentrations of ammonia in the air can also damage plants such as lichen, moss and heather, important components of balanced habitats. Ammonia can also contribute to poor air quality by reacting with the atmosphere to form fine particles.

Forms of Ammonia

Ammonia exists in water as either unionised ammonia (NH_3) or as ionised ammonia (NH_4+) according to the following equilibrium:

$$NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$$

The balance between the two depends on temperature and, more critically, on pH. As the pH increases, the amount of NH_3 (unionised ammonia) also increases. At low pH the amount of unionised ammonia also is generally very low. Unionised ammonia is highly toxic to fish even at relatively low levels.

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). A summary of the relevant ammonia standards are given below (as mg/l N):

Water Framework Directive Inland Surface Waters S.I. 272 of 2009	
Annual Mean	**95%ile**
0.065 good	0.140 good
0.040 high	0.090 high

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_3 (0.016 mg/l N).

Sources of Ammonia in River Water

Ammonia levels above 0.1 mg/l N generally indicate that contamination has occurred. In Irish rivers, the main sources of ammonia contamination include agricultural sources, mainly from the production and management of manure and slurry in livestock farming and following the spreading of nitrogen fertiliser, sewage effluent, industrial effluent.

Figure 2.8 shows the annual mean ammonia in rivers in Galway and Mayo in 2012. Ninety-six per cent of sites in Galway and Mayo are of good or high status for ammonia, based on face value comparison of the annual means against the EQS (as compared with 90% in 2011). The worst affected sites in Galway and Mayo are listed in Table 2.6. More detailed individual biological and chemical assessments are given for each river in Appendix 3.

Table 2.6 *Five highest annual average ammonia results in rivers in Galway and Mayo in 2012*

River	Station	Ammonia (mg/l N)
Carrowmoneash	0400	0.505
Clarinbridge	0300	0.260
Kilcolgan	0200	0.114
Kilcolgan	0100	0.104
Clarinbridge	0200	0.099

Figure 2.6 *Annual mean DO (%Sat) in Galway and Mayo rivers in 2012 (see Appendix 1 for details of station codes)*

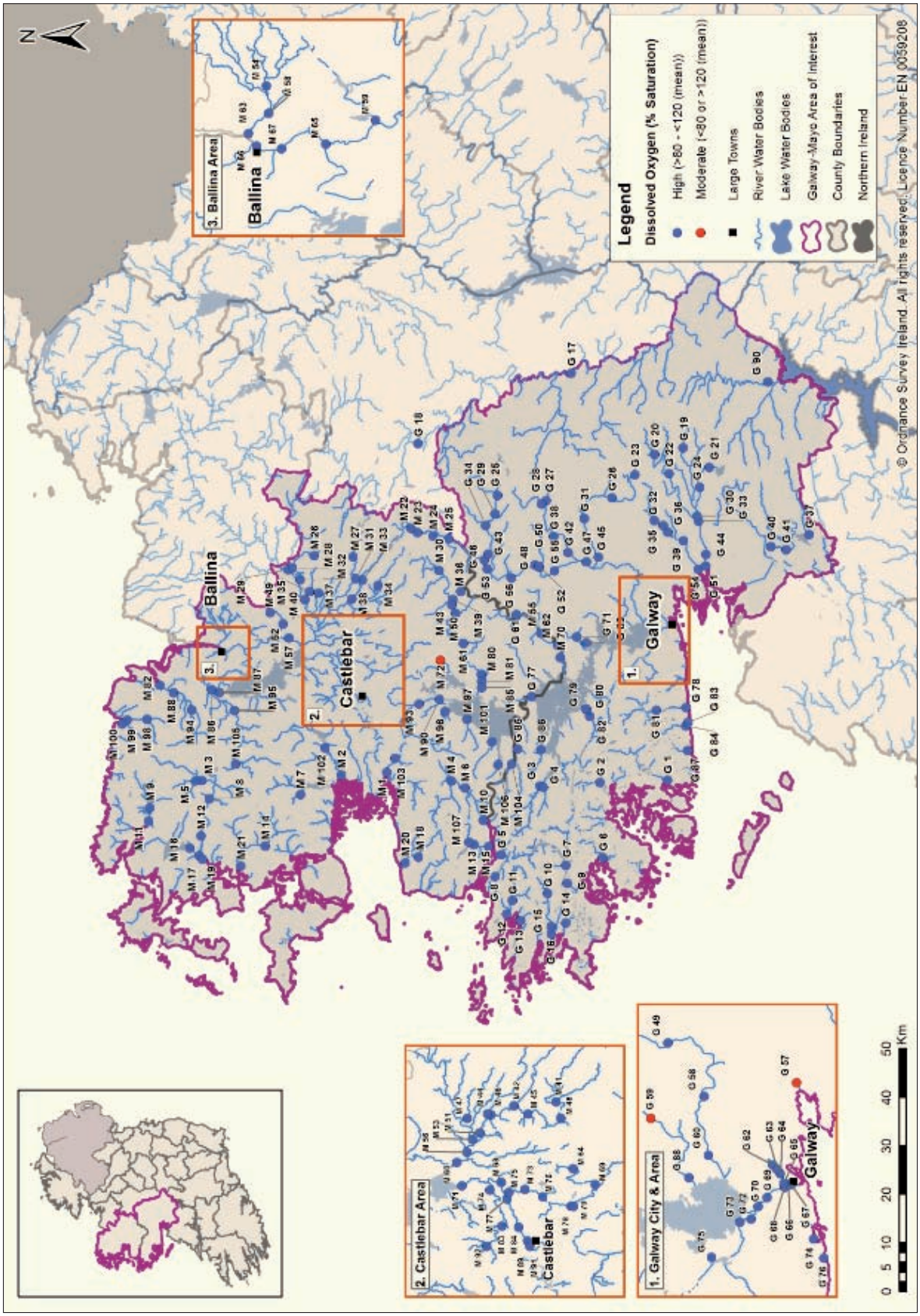


Figure 2.7 *Annual mean BOD (mg/l O_2) in Galway and Mayo Rivers in 2012 (see Appendix 1 for details of station codes)*

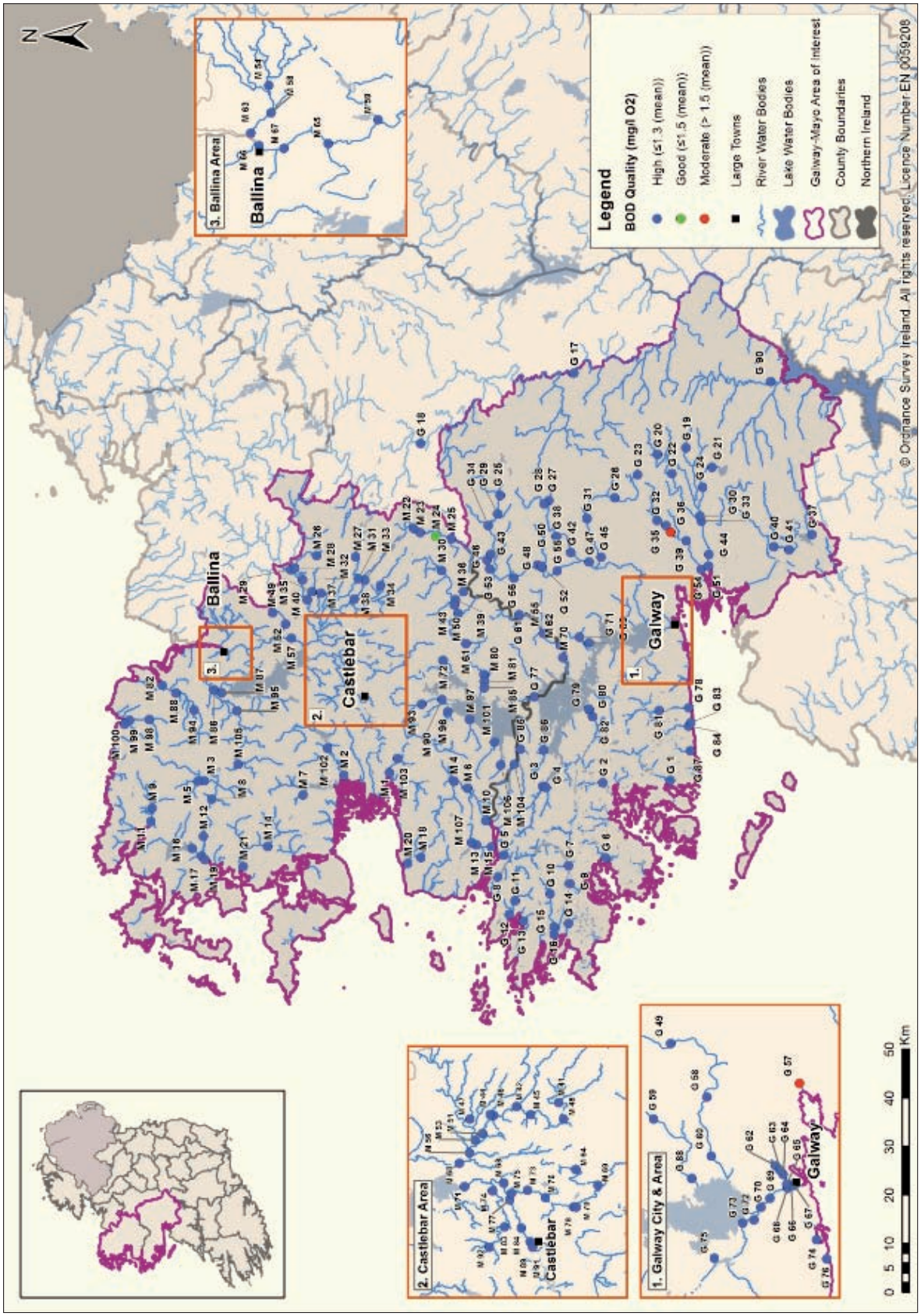
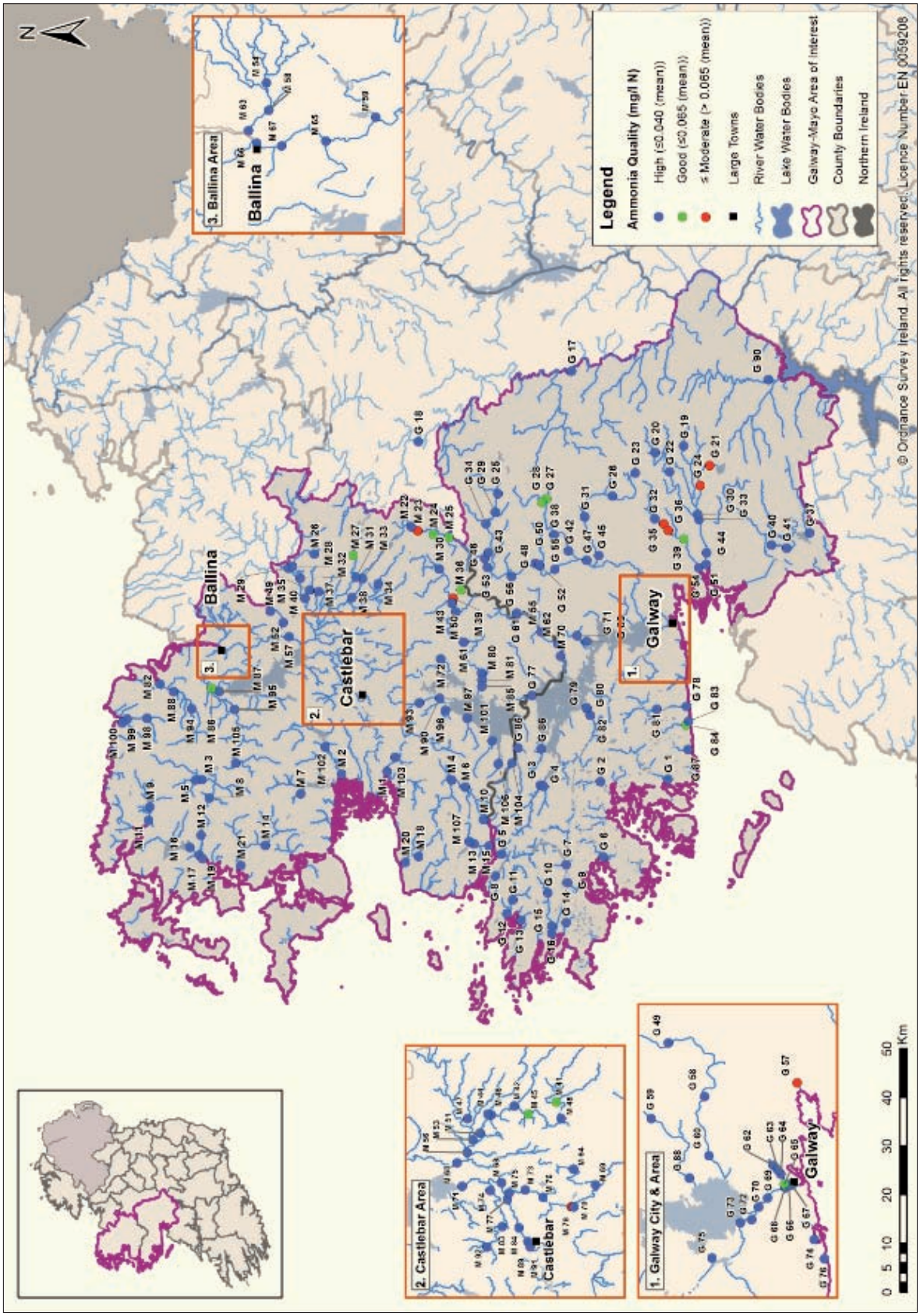


Figure 2.8 *Annual mean ammonia (mg/l N) in Galway and Mayo Rivers in 2012 (see Appendix 1 for details of station codes)*



2.2.4 Salmonid Rivers in the Region

The objective of this designation type is the maintenance of water quality for salmon and trout freshwater species and is legally backed by the European Communities (Quality of Salmonid Waters) Regulations, S.I. 293 of 1988.

The 1988 directive defines freshwaters as being waters capable of supporting salmon, trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*) and are to be designated as Salmonid waters.

The local authorities in Galway and Mayo are responsible for the monitoring of salmonid rivers, and EPA Castlebar carries out this work on their behalf. The river that is designated as salmonid in Galway is the Corrib (stations 0100, 0200, 0300, 0400 and 0500) and these stations require monitoring on a monthly basis. In Mayo, the Castlebar 0500, Corroy 0200, Deel 0300, Glore 0200, Gweestion 0200, Manulla 0500, Moy stations 0500, 0700 and 1100, Mullaghanoe 0300, Spaddagh 0200, Trimoge 0500 and the Yellow (Foxford) 0200 are all designated salmonid river stations.

Compliance

In total, 216 samples were taken in 2012 and analysed to assess compliance with the salmonid regulations. There was 100% compliance with the following parameters: temperature, pH, ammonia, non-ionised ammonia, copper and zinc. The only exceedence was in relation to nitrite in the Manulla at station 0500. The exceedance was a relatively minor one with 92% of samples having a nitrite concentration of ≤0.05 mg/l NO_2 (95% required for compliance). In 2011 there were three exceedences of nitrite, one on the Corrrib at station 0400 and two on the Mullaghanoe at station 0300, however, in 2012 these all fully complied with the regulations. Refer to Appendix 7 for further details of individual salmonid river station assessments.

2.3 Biological Monitoring of Rivers

Biological Monitoring

This is generally carried out on a three-year cycle. In the 2010–2012 period, 395 sites were surveyed on some 2300 km of river channel in Galway and Mayo. 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. Many of the chemical and biological sites coincide, but generally there are more biology sites than chemistry sites.

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 2.7. 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 asterisk 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 (2008/915/EC).

Table 2.7 *WFD Status and corresponding Q-value*

Q-Value	WFD Status
Q5, Q4–5	High
Q4	Good
Q3–4	Moderate
Q3, Q2–3	Poor
Q2, Q1–2, Q1	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 although the results reported here rely largely on the macroinvertebrate biological survey using Q-Values.

Tables 2.8–2.10 and Figures 2.9 and 2.10 show the most recent WFD biological classification of rivers in the Galway and Mayo region based on the biological surveys (primarily macroinvertebrates, with most assessments carried out in the period 2010–2012). This shows that 74% of Galway and 87% of Mayo river channel surveyed was in a satisfactory condition. Galway is close to the national average while Mayo is above average (Table 2.11). The 19% of river channel that was recorded as polluted breaks down primarily into moderate (14%) and poor (5%) status with just one stretch of serious pollution (bad ecological status). This was recorded on the Laurencetown Stream – a small stream impacted by an industrial discharge. An improvement from historically bad status was recorded in 2012 on the Clarinbridge River downstream of the Athenry WWTP in comparison with the 2011 and previous reports. In general, this picture compares well with the rest of the country but nonetheless significant problems remain to be tackled.

Trends

The EPA and its predecessor organisations have been monitoring rivers in the West of Ireland using biological methods since the early 1970s, using essentially the same methodology. This allows for a long timeline for analysis of trends and changes in water quality over time. The results are available online at: River Water Quality Reports and Maps :: Environmental Protection Agency, Ireland in a variety of ways from maps to reports on individual stations. The results are broken down on a hydrometric area basis at http://www.epa.ie/QValue/webusers/. The Galway/Mayo region is covered by hydrometric areas 25, 26, 27, 29, and 30–34. The online reports are available within a short time after the biological surveys have been carried out during the summer months.

Table 2.8 *Galway river channel (1163.5 km) for 2010–2012 based on macroinvertebrate surveys*

	High	Good	Moderate	Poor	Bad
Galway	A	A	B	C	D
Galway rivers surveyed 2010–2012 (km)	255.9	604.6	219.5	79.7	3.9
% of the 1163.5 km surveyed	22.0%	52.0%	18.9%	6.9%	0.3%
% of the 1163.5 km surveyed	74.0%		18.9%	6.9%	0.3%

Table 2.9 *Mayo river channel (1178 km) for 2010–2012 based on macroinvertebrate surveys*

	High	Good	Moderate	Poor	Bad
Mayo	A	A	B	C	D
Mayo rivers surveyed 2010–2012 (km)	401.9	626.1	111.9	38.1	0.0
% of the 1178.0 km surveyed	34.1%	53.2%	9.5%	3.2%	0.0%
% of the 1178.0 km surveyed	87.3%		9.5%	3.2%	0.0%

Table 2.10 *Galway and Mayo river channel combined (2341.5 km) for 2010–2012 based on macroinvertebrate surveys*

	High	Good	Moderate	Poor	Bad
Mayo+Galway	A	A	B	C	D
Galway/Mayo rivers surveyed 2010–2012 (km)	657.8	1230.7	331.3	117.8	3.9
% of the 2341.5 km surveyed	28.1%	52.6%	14.2%	5.0%	0.2%
% of the 2341.5 km surveyed	80.7%		14.2%	5.0%	0.2%

Figure 2.9 *Breakdown of water quality for Mayo based on 218 river monitoring sites surveyed in 2010–2012*

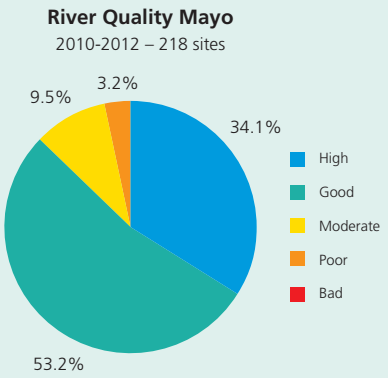


Figure 2.10 *Breakdown of water quality for Galway based on 177 river monitoring sites surveyed in 2010–2012*

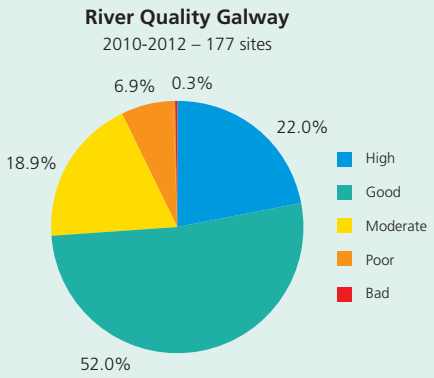


Table 2.11 *Comparison of channel distances with national breakdown for 2010–2012 monitoring*

	National	Galway	Mayo	Galway+Mayo
% Channel length surveyed	**2010–2012**	**2010–2012**	**2010–2012**	**2010–2012**
Class A: unpolluted	73	74	87	81
Class B: slight pollution	18	19	10	14
Class C: moderate pollution	10	7	3	5
Class D: serious pollution	0.1	0.3	0	0.2

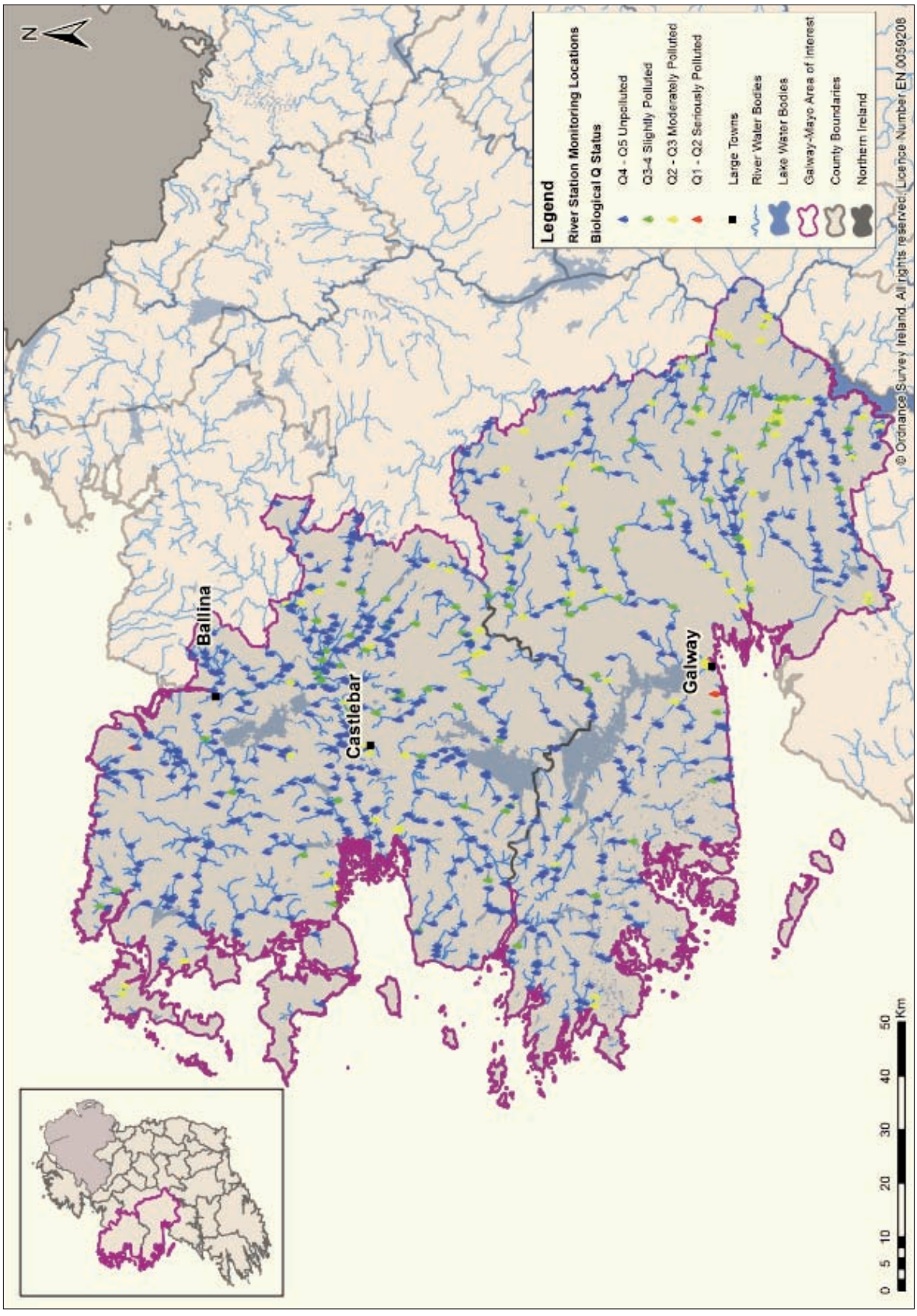
High Quality Sites

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 2%. The number of high quality sites in Galway and Mayo in the period 2010–2012 are shown below:

Number of high status sites recorded		
County	**2007–2009**	**2010–2012**
Galway	37	38
Mayo	58	64
Total surveyed	386	395

In the 2010–2012 period, 102 high quality sites were recorded in the parts of Hydrometric Areas 25, 26, 27, 29, 30, 31, 32, 33, 34, relevant to the above counties – this represents an improvement from the period 2007–2009 when 95 high quality sites were recorded. In part this may reflect the addition of sites that had historically been at high status but were not included in the monitoring programme for 2007–2009 when the new WFD monitoring cycle began. As noted above, high status accounts for some 28% of the channel length surveyed in 2010–2012 in the Galway/Mayo region – amounting to 258 km – and representing some of the best river channel in the country ideally suited for many beneficial uses and providing invaluable 'ecosystem services'. It is vital to implement programmes of measures to provide on-going protection for such rivers.

Figure 2.11 *Biological classification of rivers in Galway and Mayo*



2.4 Priority Polluted Sites and Summary of Key Pressures

The key pressures affecting river water quality are well known. These can be broken down into point and diffuse sources.

Figure 2.12 summarises the key pressures on river waters in counties Galway and Mayo. More detailed information may be found on www.wfdirelend.ie.

Many of the point pressures are common across the country, for example waste water treatment plants and associated sewer networks, abstraction points for drinking water, industrial effluents, landfills and Section 4 licences (small scale private trade and sewage discharges) (not displayed on Figure 2.12). The west of Ireland is predominantly rural and therefore diffuse pollution from agriculture and septic tanks are significant pressures.

Pressures and Suspected Causes of Pollution

The cause of pollution at the individual sites monitored was assessed with the results tabulated in Appendix 2. As in previous surveys, agriculture and municipal (urban waste water) sources remain the primary causes of pollution. Table 2.12 shows the primary suspected cause in each case – bearing in mind that multiple pressures may impact on any given site. Note that further work is required also in order to better distinguish between the impacts of septic tanks and diffuse agricultural sources. The pathways by which pollutants reach water are similar for those emanating from septic tanks and from agricultural sources whether farmyard or field. A new catchment index which will provide a relative risk weighting for individual catchments is currently under development.

Table 2.12 *Suspected causes of pollution (number of river sites surveyed)*

Suspected cause of pollution	Galway	Mayo	Totals	%
Agriculture	17	17	34	42.0%
Municipal and urban	14	6	20	24.7%
Industrial	7	5	12	14.8%
Forestry	3	7	10	12.3%
Engineering works	0	2	2	2.5%
Aquaculture	3		3	3.7%
Total	**44**	**37**	**81**	**100%**

Priority Polluted Sites

Figure 2.12 and Appendix 2 provide details of the WFD priority polluted river sites in each of the two counties. Overall a total of 85 sites have been identified as priority polluted sites (40 in Co. Mayo, 45 in Co. Galway). These represent the sites whose ecological status is currently to be reported as less than good in Galway and Mayo. In Mayo, some of the sites in which monitoring has continued to highlight issues include the Ballindine, the Dalgan at station 0200 and Loughnaminoo Stream. In Galway, the Clarinbridge and the Kilcolgan all have water quality issues at some locations. These are mainly caused by diffuse agricultural or municipal pollution or point source pollution from waste water treatment plants.

Mitigation Measures

Since 2007, with the introduction of the Waste Water Discharge (Authorisation) Regulations (S.I. 684 of 2007) the EPA is responsible for the authorisation and regulation of waste water discharges from waste water works owned by, vested in, controlled or used by water service authorities (local authorities). To date ten waste water discharges in Galway city and county have been authorised by the EPA and 22 applications are under assessment. In the case of Mayo 23 waste water discharges have been authorised and 21 applications are under assessment. Authorisations for Athenry, Leenane, Moycullen, Achill Sound, and Bellullet have been issued since the beginning of 2012. Each individual authorisation sets conditions on the operation of the discharge and emission limit values for the discharges to allow the receiving water to achieve at least a good WFD status.

Under the Water Services Investment Programme (WISP) 2010–1012 Mayo County Council completed upgrades on the Ballina, Castlebar, Achill Sound and Kiltimagh waste water works during 2012. Galway County Council has completed upgrades at Tuam waste water works during 2012.

The advent of Irish Water, which will take over responsibility from the water services authorities for the waste water works over the next few years, should result in improved strategic investment in infrastructure, improved operational standards at and improved emissions from these facilities.

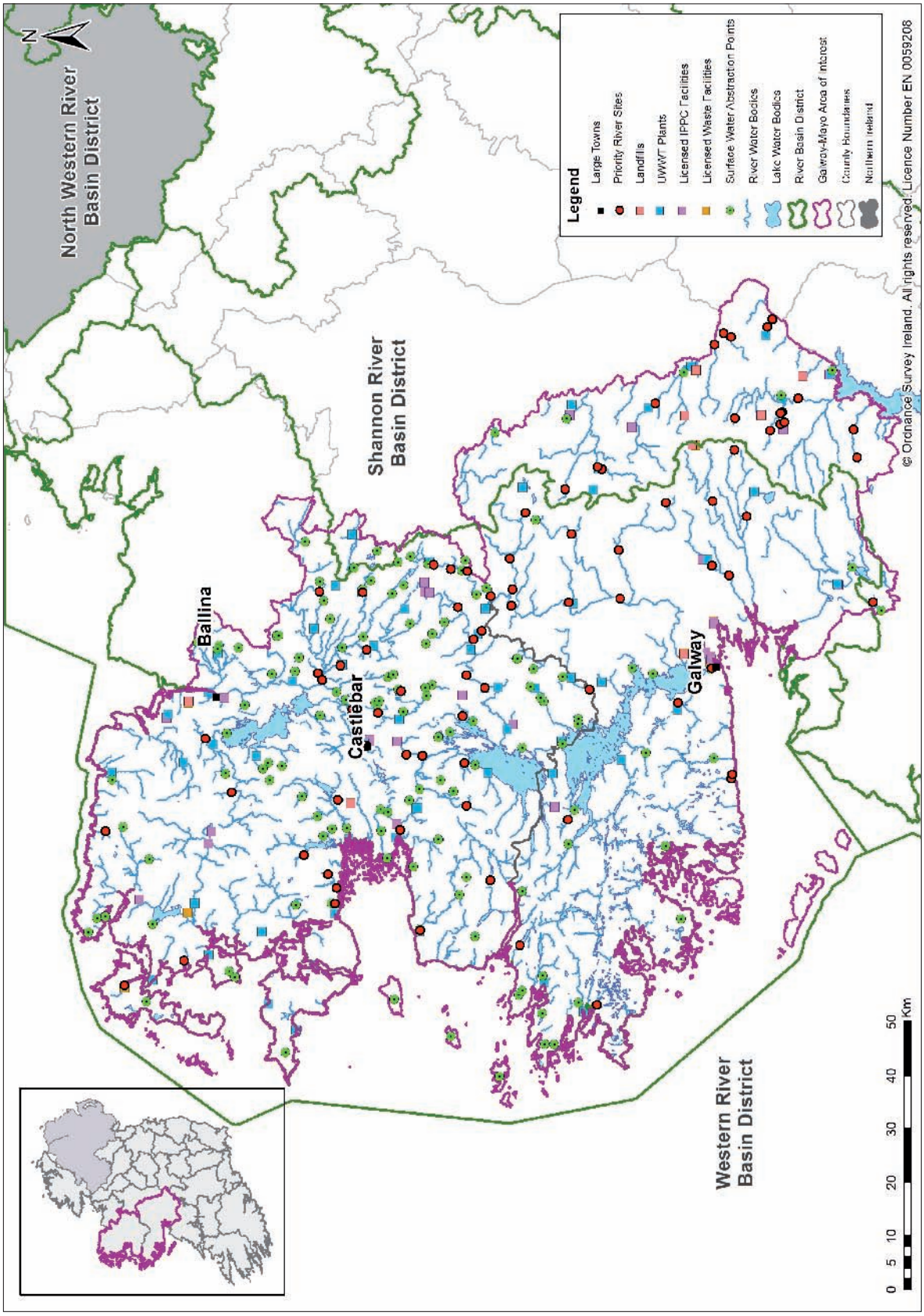
The *National Inspection Plan for Domestic Waste Water Treatment Systems 2013* outlines how septic tanks and waste water treatment systems will be inspected in coming years, while making people aware of the risks to their health and to the environment if treatment systems are not working properly. The EPA has identified areas of priority and set minimum inspection levels for each local authority. Inspections will be concentrated in areas where waste water discharges present a high risk to human health or the environment. Priority areas are based on levels of risk to sensitive water receptors, for example, drinking water sources, bathing waters, or pearl mussel beds.

The second review of Ireland's Nitrates Action Programme is currently under review in relation to addressing diffuse agricultural pollution.

Tackling the major point sources requires investment, but on-going care and attention to the operation and maintenance of waste water treatment plants is also required. Diffuse pollution may be due to a range of pressures including, for example, septic tanks, agricultural bad practice, over-fertilisation of fields close to water, cattle accessing streams, nutrient losses from forestry on peat soils in addition to urban diffuse pollutants. Tackling these diffuse sources is a difficult challenge, but raising public awareness and a risk-based inspection and enforcement system in respect of domestic waste water treatment systems and farm inspections under the Nitrates regulations are key to success.

If the pollution problems noted at the priority sites (the 45 sites located on 31 rivers in Galway and 40 monitoring sites on 31 rivers in Mayo) can be solved then the WFD objective of good ecological status can be achieved. This requires examination of the catchments immediately upstream of the monitoring points in order to detect the precise source of pollution problems and introduce measures to address the pollution. In this respect an integrated approach to catchment management is required taking into account pathways for pollutants – both surface and subsurface pathways.

Figure 2.12 *Key environmental pressures and priority polluted sites in Galway and Mayo*



2.5 Summary

Eighty-five river sites in Galway and Mayo have been identified as priority sites for tackling pollution. The counties and number of priority polluted sites are listed below (Table 2.13). More details of these priority polluted sites can be found in Appendix 2. A continued focus on investigative monitoring is required to confirm the causes of pollution at these sites and to allow for more targeted measures to be implemented in order to address the underlying cause of pollution.

Table 2.13 *Counties and number of priority polluted sites*

County	No of Priority Polluted Sites
Galway	45
Mayo	40

Compared with the national average, Galway and Mayo would appear to be performing satisfactorily in general. For example, in the period 2007–2009, over 80% of river channel in the West of Ireland was of good or high status, compared with 71% nationally. As expected, the less densely populated areas of the country have a higher number of unpolluted sites. However, serious pollution continues on the Carrowmoneash, the Clarinbridge, the Kilcolgan, and the Ballindine, etc. Compliance with the requirements of EPA licences along with investment in updating these waste water treatment plants should lead to improvements in water quality at these sites in the future. More detailed individual biological and chemical assessments are given for each river in Appendix 3.

As discussed earlier, there was an improvement in 2012 in ortho-phosphate levels – average annual ortho-phosphate in 7% of river sites exceeded the threshold for good status, compared with 25% in 2011 (O'Sullivan, 2012). Nitrate levels in all rivers were below the EQS for good status. While this compares favourably with the rest of the country, there are still a number of WFD priority polluted river sites in Galway and Mayo which need to be addressed in order to meet the aims of the WFD of achieving good status in waters by 2015 and ensuring that water quality does not decline in any waters. The projected increase in primary output from the agriculture sector under *Food Harvest 2020*, will prove challenging in the context of meeting these objectives.

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 rivers is a key focus of the WFD programme of measures.

3. Lake Water Quality

3.1 Physico-Chemical & Biological Monitoring

Physico-chemical monitoring to meet the requirements of the WFD is being undertaken at 28 lakes in County Galway and 21 lakes in County Mayo (Figure 3.1). Lakes are designated either as surveillance (SM) or operational monitoring (OM) sites; the objective of the surveillance monitoring programme is to assess long-term changes within lakes, while the objective of the operational monitoring programme is to assign status to lakes identified as being at risk of failing to meet their environmental objectives. The surveillance monitoring programme is undertaken by the EPA, whilst the operational monitoring programme is undertaken by (or on behalf of) the local authorities. Lakes are sampled for physico-chemical parameters between four and 12 times per year, depending on the legislative requirements.

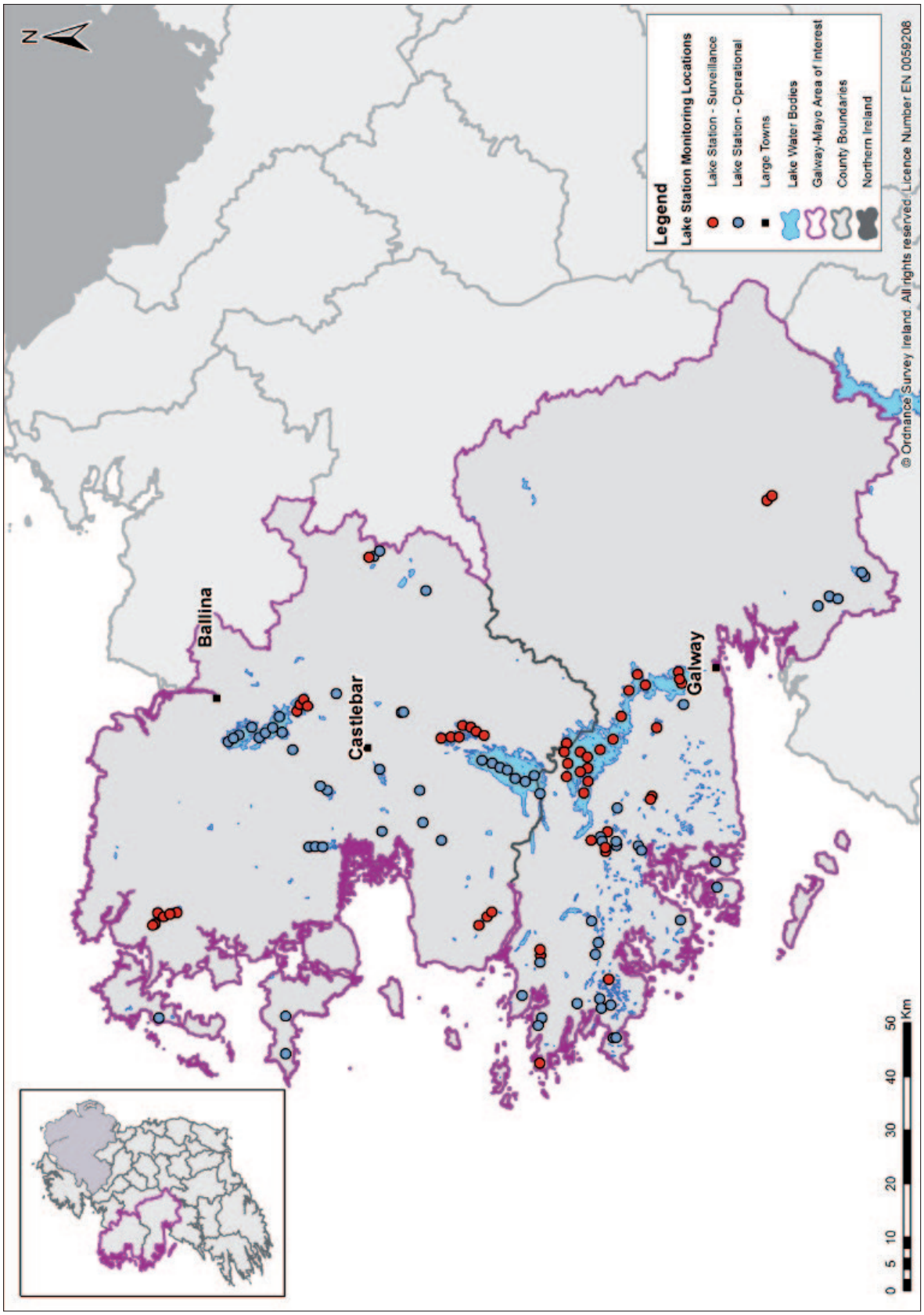
The general physico-chemical parameters (GPC) measured at the operational monitoring sites include alkalinity, conductivity, pH, transparency, temperature, DO, total phosphorus (TP), total ammonia, TON, nitrate, nitrite, silica and true colour. Surveillance monitoring sites require these parameters as well as specific priority substances, including certain metals and organic compounds.

Additional parameters including calcium, chloride, sodium, potassium and magnesium are monitored at selected lakes in poorly buffered catchments as part of the acid lake network.

General physico-chemical status was assigned to the lakes using the EQS for total ammonia, DO and pH as published in S.I. 272 of 2009 Surface Water Regulations. There is currently no formal EQS for total phosphorus, however, given that it is often the key nutrient driving enrichment, it is important that phosphorus is included in any assessment of lake quality. The phosphorus regulations (S.I. 258 of 1998) set the annual mean target value for total phosphorus at 25 µg/l and this value was used for GPC status assessment. A formal EQS for phosphorus in lakes will be set in the next phase of the standard setting for the WFD.

The biological monitoring programme for both the surveillance and operational monitoring lakes is undertaken by the EPA. Given that biological communities typically exhibit longer response times to gradual changes in their environment, the biological sampling is completed once every three years, apart from the phytoplankton, which are sampled annually in surveillance monitoring lakes. Aquatic plants (macrophytes), phytoplankton, benthic diatoms and fish are currently used to assign biological status in the surveillance monitoring lakes, while macrophytes and chlorophyll a are used to assign biological status in the operational monitoring lakes.

Figure 3.1 *WFD surveillance and operational monitored physico-chemical sites in counties Galway and Mayo*



A number of biological tools have been developed specifically to meet the requirements of the WFD and enable each lake to be assigned high, good, moderate, poor or bad status. The macrophyte index combines a number of different aspects of the plant community present in each lake, for example, the average depth at which plants can be found growing, the maximum depth of colonisation and the relative frequency of pollution-tolerant and pollution-sensitive taxa. The phytobenthos metric scores diatom species based on their sensitivity or tolerance to nutrient pollution and these scores are averaged to provide an overall score for each lake. The phytoplankton index is a similar composition based metric, which uses chlorophyll a and nine groups of indicator taxa, which are scored based on their abundance and sensitivity to pollution; these scores are combined with the chlorophyll a score to give an overall lake score. Inland Fisheries Ireland (IFI) has developed a multi-metric tool for status assessment using fish communities. This tool incorporates a number of different fish metrics, including total biomass per unit effort of all fish, of native fish and the relative abundance of perch.

Each biological quality element is assigned status separately and the results are combined using the "one-out-all-out" approach to produce biological status. In the "one-out-all-out" approach, status is determined by the element with the lowest status. The same approach is adopted for assigning GPC status. Biological status is combined with GPC status using "one-out-all-out" to produce ecological status. High ecological status is dependent upon agreement between the biological and physico-chemical status. Additionally, a lake is not considered to be at high status if it contains the invasive alien species zebra mussel or roach; or if it has significant morphological alterations to its shoreline or a regulating structure on its outflow.

3.2 Assessment of Water Quality

Co. Galway

The general GPC, biological (BQE) and ecological status of WFD Lakes in Galway are presented in Table 3.1 for the periods 2007–2012. Ecological status remains unchanged for 17 of the 27 lakes with continuous data for the period 2010–2012. Six lakes were assigned high status and 15 lakes were assigned good status for 2010–2012. Three lakes are at moderate status, three are at poor status and one lake is classified as being at bad status. Nine lakes; Anaserd, Anillaun, Aughrusbeg, Ballyquirke, Beaghcauneen, Corrib Upper, Nahasleam, Ross and Tully have deteriorated in status and one lake; Ballynahinch has improved from good to high status. One additional lake, Cutra was added to the programme in 2010. Based on three years of data, it was assigned good status. Loughs Nahasleam and Pollacappul, were downgraded to an overall ecological classification of good status owing to hydromorphological impacts; a causeway has been built through Lough Nahasleam to support a regional road, and Lough Pollacappul has significant alterations and hard engineering structures along its shoreline.

Lough Aughrusbeg was the only lake in County Galway classified as being at bad ecological status. Chlorophyll concentrations and the phytoplankton community in the lake are exhibiting signs of slight impact, returning only good status in what is a relatively isolated and rural location. Given the absence of any known point sources of pollution in the catchment, any impacts are likely the result of diffuse agricultural pollution and effluents from septic tanks. The lake is exhibiting a substantial departure from reference condition in its fish community in terms of species composition and consequently it is classified as being at bad ecological status. Loughs Corrib Upper and Lower and Ross Lake returned high status for phosphorus, chlorophyll and phytoplankton, however, all lakes are infested with the zebra mussel (Dreissena polymorpha), an invasive alien species whose establishment has previously been associated with a reduction in these water quality parameters in the pelagic zone. Lough Corrib Upper is classified as being at poor status in terms of its fish community. Lough Corrib Lower is classified as being at moderate status in terms of its fish community. Ross Lake fails to meet good ecological status in terms of both its macrophyte and fish communities. Loughs Tully and Beaghcauneen were both assessed as being at moderate status on the basis of their phosphorus and chlorophyll a concentrations. Ballyquirke Lake also fails to meet the requirements of the WFD and returned an overall ecological classification of poor status on the basis of its macrophyte community.

Trends in chlorophyll a, TP and nitrate (using TON as a surrogate) are shown in Figures 3.2–3.4 for selected lakes. Analyses of trends in chlorophyll are complicated by the presence of zebra mussel (Dreissena polymorpha L.) on Loughs Corrib and Ross which may or may not impact chlorophyll levels and/or TP levels. This is in addition to normal interannual fluctuations and climatic induced changes.

Annual average chlorophyll levels were usually <10 µg/l but many lakes recorded values <5 µg/l. Lakes with chlorophyll levels <5 µg/l exhibited the least interannual variation and tended to be the high status lakes. Nearly all lakes exhibited a dip in the annual average values in 2008. The highest chlorophyll a values were recorded in Beaghcauneen in 2012. Average annual chlorophyll a values in Ballyquirke have decreased from 14 µg/l in 2007 to 2.2 and 2.5 µg/l in 2011 and 2012, respectively.

Table 3.1 *Status of WFD monitored lakes in County Galway for the period 2007–2012*

Lake Code	Lake	SM OM	2007–2009 Ecological Status	2008–2010 Ecological Rolling Status	2010–2012 Rolling Status for BQE	2010–2012 Rolling Status for GPC	2010–2012 Ecological Rolling Status
WE_31_211	Anaserd	OM	High	High	Good	High	Good
WE_30_348	Anillaun	OM	High	High	Good	High	Good
WE_31_76	Ardderry	SM	Good	Good	Good	High	Good
WE_32_436	Aughrusbeg	SM	Good	Poor/Bad	Bad	Moderate	Bad
WE_31_120	Aunwillan	OM	Good	Good	Good	High	Good
WE_31_228	Ballynahinch	OM	Good	High	High	High	High
WE_32_479	Ballynakill	OM	Good	Good	Good	Good	Good
WE_30_340	Ballyquirke	OM	Moderate	Poor	Poor	Good	Poor
WE_32_402	Beaghcauneen	OM	Good	Good	Moderate	Moderate	Moderate
WE_30_335	Bofin GY	OM	High	High	High	High	High
WE_30_666a	Corrib Lower	SM	Moderate	Poor/Bad	Moderate	High	Moderate
WE_30_666b	Corrib Upper	SM	Moderate	Good	Poor	High	Poor
WE_29_37	Cutra	OM		Good	Good	Good	Good
WE_31_227	Derryclare	OM	High	High	High	High	High
WE_32_333	Enask	OM	High	High	High	High	High
WE_32_501	Fadda	OM	High	High	High	High	High
WE_31_1126	Illauntrasna	OM	Good	Good	Good	High	Good
WE_32_509b	Kylemore	SM	Good	Good	Good	High	Good
WE_30_344	Lettercraffoe	SM	Good	Good	Good	Good	Good
WE_31_177	Loughaunore	OM	Good	Good	Good	High	Good
WE_30_343	Maumwee	SM	High	High	High	High	High
WE_31_208	Nahasleam	OM	High	High	High	High	Good
WE_32_500	Nambrackmore	SM	Good	Good	High	Good	Good
WE_32_509a	Pollacappul Note 1	OM	Good	Good	High	High	Good
WE_29_194	Rea	SM	Good	Good	Good	High	Good
WE_30_345	Ross	SM	Moderate	Poor/Bad	Poor	High	Poor
WE_31_171	Shindilla Note 1	SM	Good	Good	Good	High	Good
WE_32_474	Tully	OM	Good	Moderate	Moderate	Moderate	Moderate

Note 1: Downgraded from high status to good by hydromorphology.

Annual average nitrate levels are generally low (<2.5 mg/l NO_3) in WFD monitored lakes in Galway (Figure 3.3). A perceived dip in annual nitrate concentrations was observed in most lakes in 2008 but this was most likely associated with a change in the level of detection with some exceptions; Lough Corrib Upper has the highest average annual nitrate concentration of all the WFD monitored lakes in Galway. There is currently no EQS for TON/nitrates.

Trends in annual average TP were highly variable (Figure 3.4). Loughs Beaghcauneen, Ballyquirke and Tully, were notable for their highly variable trends in mean annual TP in addition to having relatively higher values compared to other Galway lakes (Figure 3.4). Many lakes exhibited a rise in average annual values in 2008 and most lakes subsequently experienced a dip in annual average values in 2009. In general, most lakes in Galway have a relatively stable annual mean TP. Annual values exceeding the interim good/moderate boundary (0.025 mg/l P) put a lake at risk of not achieving good status for GPC status.

Figure 3.2 *Selected WFD monitored lakes in County Galway illustrating trends in annual average chlorophyll a for the period 2007–2012*

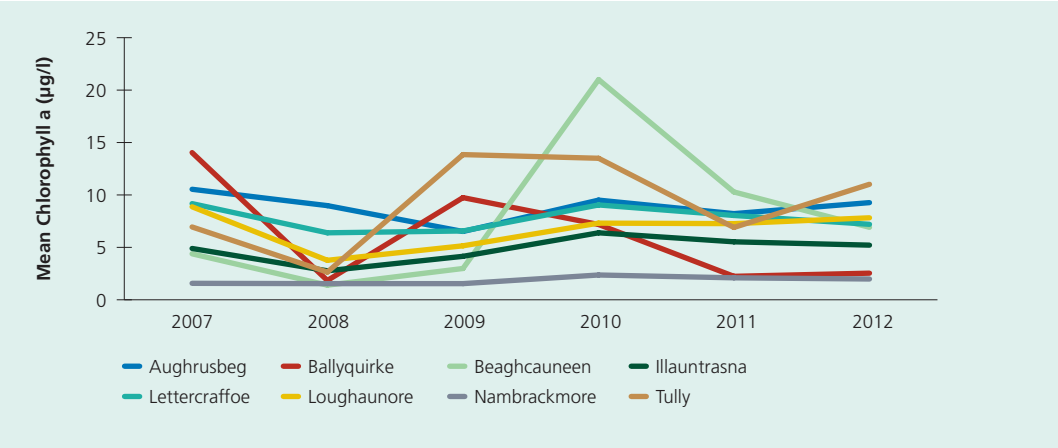


Figure 3.3 *Trends in annual average nitrate (using TON as a surrogate) in selected WFD monitored lakes in County Galway 2007–2012*

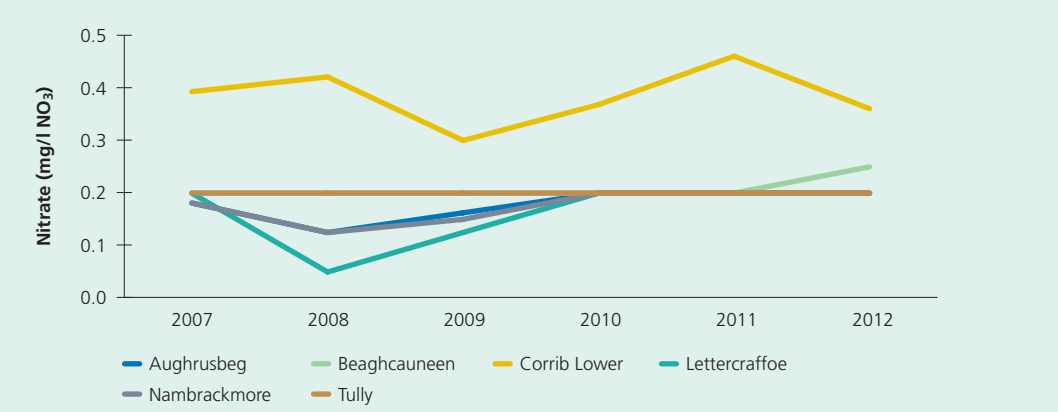
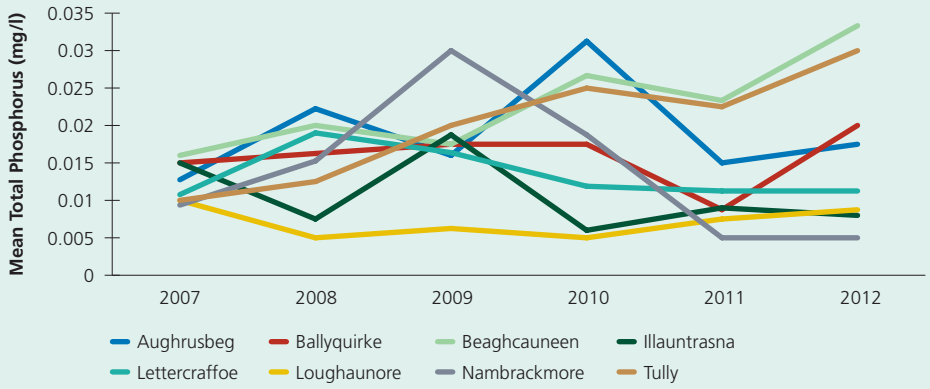


Figure 3.4 *Trends in annual average TP concentrations in selected WFD monitored lakes in County Galway 2007–2012*



Co. Mayo

The GPC, BQE and ecological status is presented in Table 3.2 for the period 2007–2012. Three lakes, Carra, Glencullin and Washpool, were assigned high ecological status. Eleven lakes were assigned good ecological status and four were assigned moderate ecological status. Two lakes were assigned poor ecological status and one lake was at bad ecological status (Table 3.2).

Ecological status remains unchanged for eight of the 18 lakes with continuous data for the period 2007–2012. Aille, Carrowmore, Conn, Doo, Feeagh and Mask were at good status in the 2007–2009 sampling period and remain in good status in 2010–2012. Ballin and Knappabeg were at moderate status for both monitoring periods.

Ten lakes have changed in status during the period under review, with six lakes improving in status and four lakes deteriorating in status. Loughs Carra, Glencullin and Washpool have improved in status from good to high; Keel and Levally have improved from moderate to good status and Cross Lough has improved from poor to moderate status. Acorrymore has deteriorated from good to moderate status and Moher has deteriorated from high to good status. Three new lakes were added to the programme in 2010 and based on the first round of monitoring; both Beltra and Mask Upper are good status and Urlaur is poor status based on its fish community.

Mayo has a relatively high proportion of good status lakes. Two high status lakes, Doo and Mask, were downgraded to good based on hydromorphology and due to the presence of alien species. The biological status and GPC status is in agreement for six lakes categorised at good ecological status. Physico-chemical status determined the status of one good status lake (Mask Upper). Biological status determined the status of the remaining three lakes.

The status of three of the moderate status lakes Acorrymore, Ballin and Knappabeg is driven by macrophytes, while the status of the fourth moderate status lake, Cross, is driven by TP and chlorophyll a. Given the absence of any known point sources of pollution in this catchment, any impacts are likely caused by direct livestock access to the lake, diffuse agricultural pollution and effluents from septic tanks.

Fish determine the status of the two poor/bad status lakes; Cullin and Urlaur. In terms of its fish population, Lough Cullin, which was once regarded as one of the premier brown trout fisheries in Ireland, is now dominated by roach; these became established in the lake in the 1990s and are highly prolific. Perch have also become established and are present in relatively large quantities. It is difficult to ascertain what measures can be adopted to improve the fish status of these two lakes. The status of the remaining poor status lake, Lough Lannagh, is driven by the macrophyte community. The lake is frequently choked with aquatic plants during the summer months and is categorised as being at poor status on the basis of the aquatic macrophyte community.

Table 3.2 *Status of WFD monitored lakes in County Mayo for the period 2007–2012*

Lake Code	Lake	SM OM	2007–2009 Ecological Status	2008–2010 Ecological Rolling Status	2010–2012 Rolling Status for BQE	2010–2012 Rolling Status for GPC	2010–2012 Ecological Rolling Status
WE_33_1892	Acorrymore	OM	Good	Good	Moderate	**High**	Moderate
WE_30_532	Aille	OM	Good	Good	Good	Good	Good
WE_32_364	Ballin	OM	Moderate	Moderate	Moderate	Good	Moderate
WE_32_452	Beltra	SM		**High**	Good	Good	Good
WE_30_347	Carra	SM	Good	Good	**High**	**High**	**High**
WE_33_1914	Carrowmore	SM	Good	Moderate	Good	Good	Good
WE_34_406b	Conn	OM	Good	Good	Good	**High**	Good
WE_33_1889	Cross	OM	Poor	Moderate	Moderate	Moderate	Moderate
WE_34_406a	Cullin	SM	Moderate	**Poor/Bad**	Poor	**High**	Poor
WE_32_490	Doo Note 1	SM	Good	Good	**High**	**High**	Good
WE_32_510	Feeagh	OM	Good	Good	Good	**High**	Good
WE_32_487	Glencullin	SM	Good	Good	**High**	**High**	**High**
WE_33_1895	Keel	OM	Moderate	Moderate	Good	Good	Good
WE_32_483	Knappabeg	OM	Moderate	Moderate	Moderate	Good	Moderate
WE_34_403	Lannagh	OM	Moderate	Moderate	Poor	Good	Poor
WE_34_368	Levally	OM	Moderate	Good	Good	Good	Good
WE_30_665	Mask Note 2	OM	Good	Good	Good	**High**	Good
WE_30_665b	Mask Upper	OM		**High**	**High**	Good	Good
WE_32_406	Moher	OM	**High**	Good	Good	Good	Good
SH_26_689	Washpool	SM	Good	Good	**High**	**High**	**High**
WE_34_402	Urlaur	OM		**Poor/Bad**	Good	**Bad**	**Bad**

Note 1: Rolling status downgraded due to hydromorphology/weir located on its outflow.
Note 2: Rolling status downgraded due to alien species.

Trends in chlorophyll a, nitrate (using TON as a surrogate) and TP are shown in Figures 3.5–3.7. Analysis of trends in chlorophyll is complicated by the presence of zebra mussel (Dreissena polymorpha L.) at Loughs Conn, Cross, Cullin, Lannagh and Mask which, may or may not impact chlorophyll levels and/or TP levels. This is in addition to normal interannual fluctuations and climatic induced changes (weather).

In general, annual average chlorophyll levels are rarely >5 µg/l in Mayo lakes. Five lakes, Ballin, Cross, Carrowmore, Lannagh and Knappabeg, have recorded annual average chlorophyll levels >10 µg/l over the past five years (Figure 3.5). The highest chlorophyll good/moderate boundary is 10.94 µg/l. It is notable that several lakes experienced a peak in annual average chlorophyll levels in 2009 followed by a declining trend. Of particular note are Cross and Knappabeg which show an increasing trend in the 2012 years' data.

Annual average nitrate levels are low (<2.0 mg/l NO_3) in WFD monitored Mayo lakes (Figure 3.6). A peak in annual concentrations was observed in some lakes in 2009 and again in 2011 with nearly all lakes exhibiting a decline in 2012. Overall trends are difficult to discern due to the high interannual variation and low concentrations.

Figure 3.5 *Selected WFD monitored lakes in County Mayo illustrating trends in annual average chlorophyll a concentrations for the period 2007–2012*

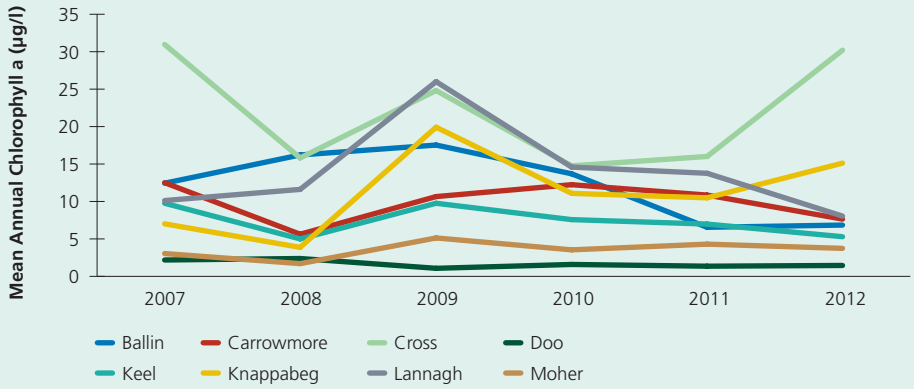
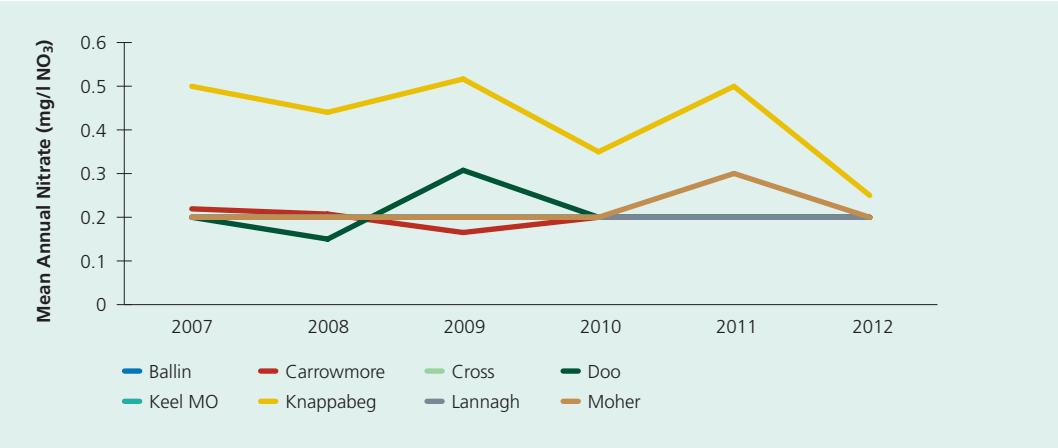
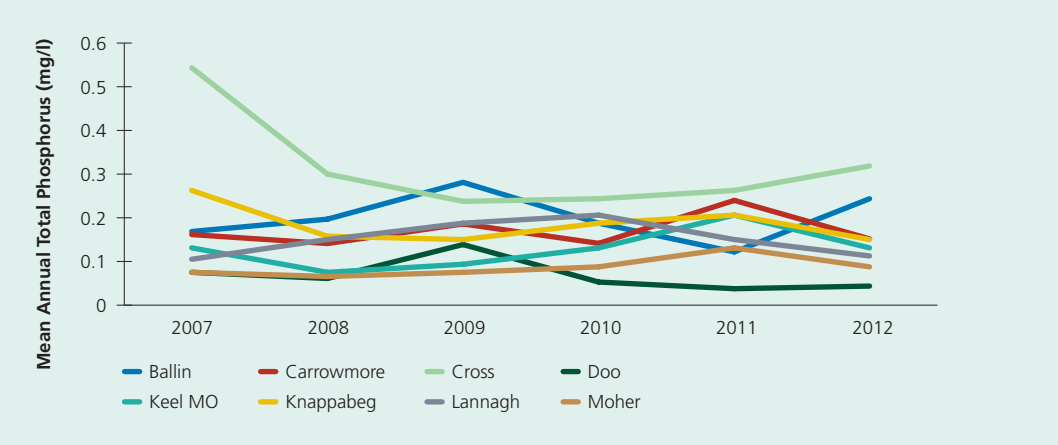


Figure 3.6 *Trends in annual mean nitrate (using TON as a surrogate) in selected WFD monitored lakes in County Mayo 2007–2012*



Annual TP levels rarely exceed 0.02 mg/l P (Figure 3.7). There were notable peaks in annual TP levels in 2008 in some lakes (Ballin, Carrowmore and Doo). TP concentrations in Cross lake declined between 2007 and 2009 but have been increasing in recent years. Ballin, Cross, Knappabeg and Lannagh are notable for their relatively high levels of TP compared with other lakes in Mayo.

Figure 3.7 *Trends in annual mean TP for a selection of WFD monitored lakes in County Mayo 2007–2012*



3.3 Summary

Overall, the ecological status of lakes in counties Galway and Mayo compares favourably with the national overview, where 42% of lakes are classified as being at least good status. Currently 75% of the lakes in Co. Galway and 67% of lakes in Co. Mayo are classified as being at least good status. However, there is little room for complacency. The 28 lakes sampled in Co. Galway, only six lakes (21%) were at the highest status, and over half of the Galway lakes (54%) were at good status, indicating they were exhibiting signs of slight impacts, which was reflected by their measured water quality parameters or their biological communities. A similar situation was seen in the Mayo lakes where of the 21 lakes sampled, only three lakes (14%) were at the highest status and again over half of the lakes (52%) were at good status, implying slight impacts in terms of water quality or their biological communities.

One-quarter and one-third of lakes sampled in Galway and Mayo, respectively, currently fail to meet the requirements of the WFD. While water quality in Galway and Mayo is better than average compared with other counties, there are still significant challenges in achieving the targets of the WFD. Investigative monitoring programmes will have to be put in place to identify suspected causes of pollution followed by a programme of measures to restore these impacted sites. The biggest threat to water quality in Galway and Mayo are excessive nutrients from agricultural activities, malfunctioning on-site waste water treatment systems (septic tanks) and municipal waste water treatment plants. Improvements in collection systems and a reduction in nutrient discharges should lead to an improvement in the status of all water bodies over time.

Co. Galway

Long-term trends in the data set are difficult to ascertain due to large interannual variability, however, overall trends appear to be relatively steady. The exceptions are Loughs Aughrusbeg, Tully and Beaghcauneen, which continue to stand out as lakes to be concerned about because of high and/or increasing levels of TP and/or chlorophyll. Most of the lakes in Galway are of good or high status and the challenge is to maintain this status. There are few pressures in Galway, but diffuse pollution from agriculture and septic tanks, and in some instances point sources pose a threat.

Co. Mayo

Ballin, Cross, Knappabeg and Carrowmore are notable for their relatively high levels of TP compared with other lakes in Mayo. These lakes also tend to have the highest chlorophyll levels. The challenge is to maintain good or high status lakes and to improve the moderate and poor/bad status lakes to good ecological status by 2015. The elevated levels and rising trend for TP and chlorophyll in some lakes is a cause of concern. The main pressures appear to be diffuse pollution from agriculture and septic tanks resulting in nutrient enrichment.

Figure 3.8 *Average annual total phosphorus concentrations in WFD monitored lakes in counties Mayo and Galway in 2012*

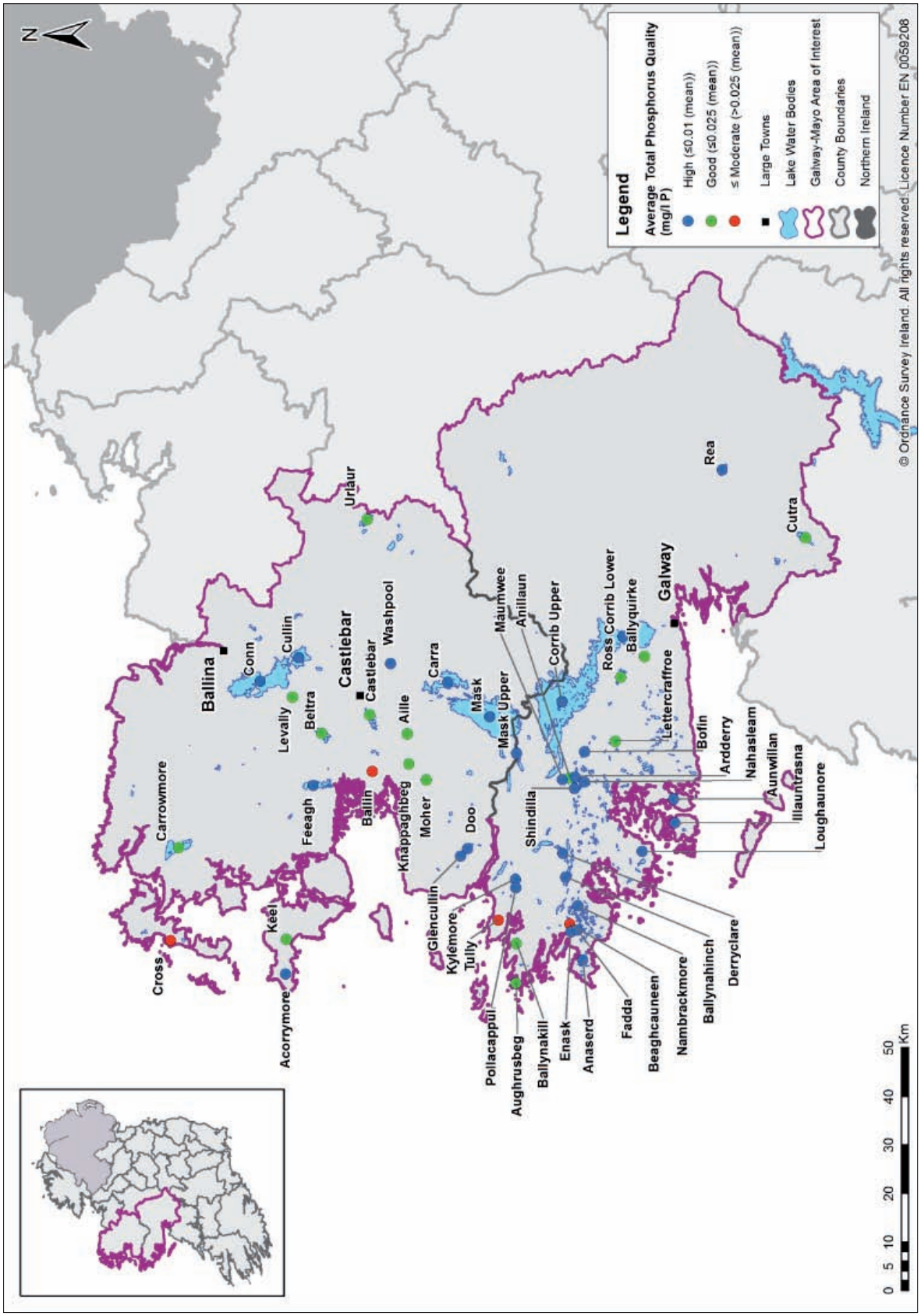
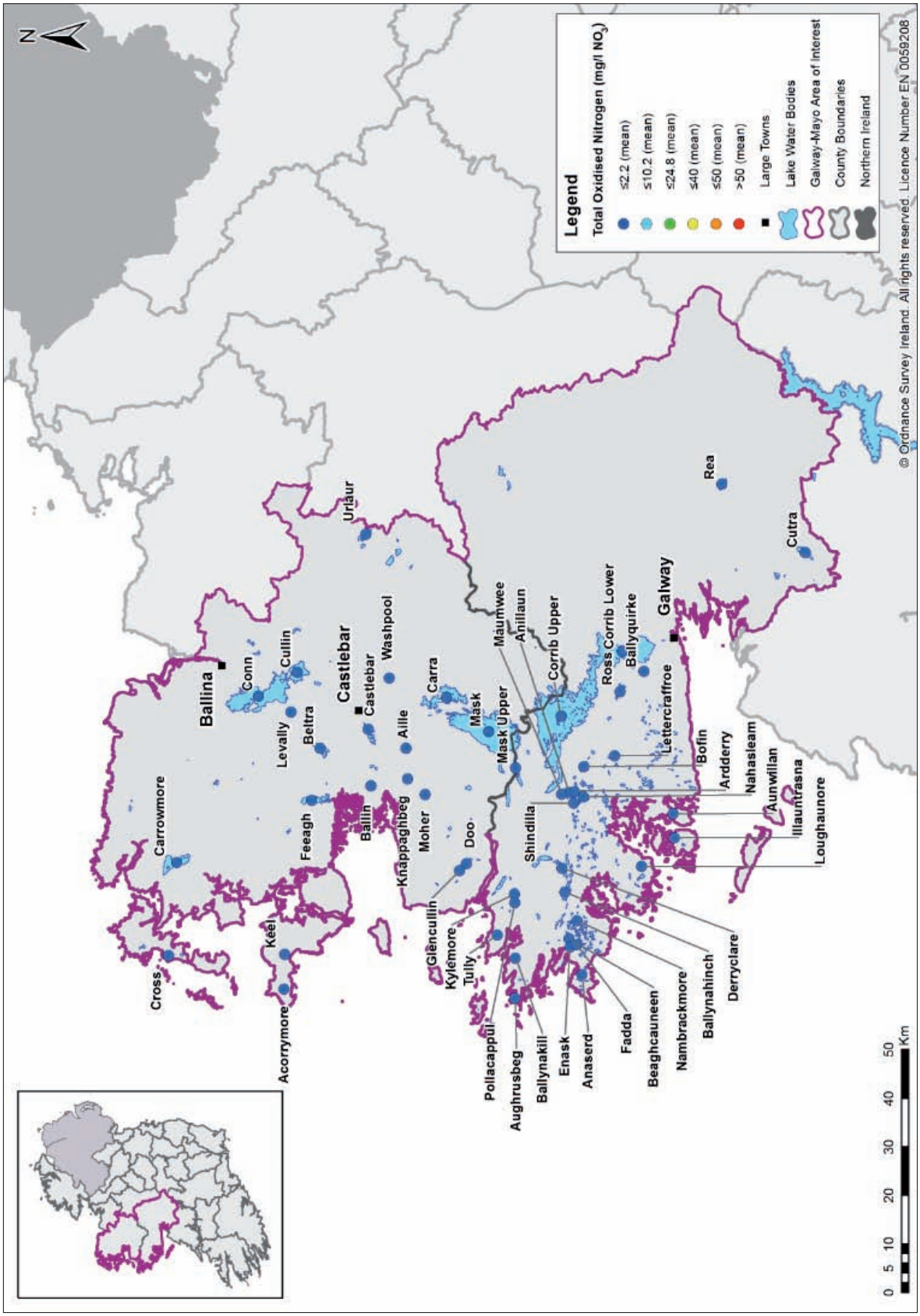


Figure 3.9 *Average annual TON concentrations in WFD monitored lakes in counties Mayo and Galway in 2012*



4. 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 many Irish rivers, more than 30% of the flow is derived from groundwater, rising to 90% in periods of low flow. Therefore, the quality of groundwater can have a major impact on the quality of river water.

In Ireland approximately a quarter 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 treatment. Therefore, it is critical that groundwater is protected to maintain the quality of drinking water and ensure the water is safe to drink without the requirement for excessive levels of treatment.

4.1 Physico-Chemical Monitoring

In 2012 the EPA`s groundwater monitoring programme included 27 monitoring locations in counties Galway and Mayo. The breakdown of these groundwater monitoring points is presented in Table 4.1.

Table 4.1 *Number of groundwater monitoring points in 2012*

County	Number of Groundwater Monitoring Points
Galway	15
Mayo	12

These sites were monitored for a variety of physico-chemical and microbiological parameters. Nitrate and ortho-phosphate, two of the main indicators of anthropogenic pollution from diffuse and small point sources, were measured and these are discussed in more detail in Section 4.2.

4.2 Assessment of Water Quality

Nitrate in Groundwater

In general, the average nitrate concentration at groundwater monitoring locations in counties Galway and Mayo is relatively low when compared to the national average nitrate concentration. Figure 4.1 shows the locations and the associated average nitrate concentrations in 2012 for groundwater monitoring points in counties Galway and Mayo.

Figure 4.1 *Average nitrate concentrations in counties Galway and Mayo in 2012*

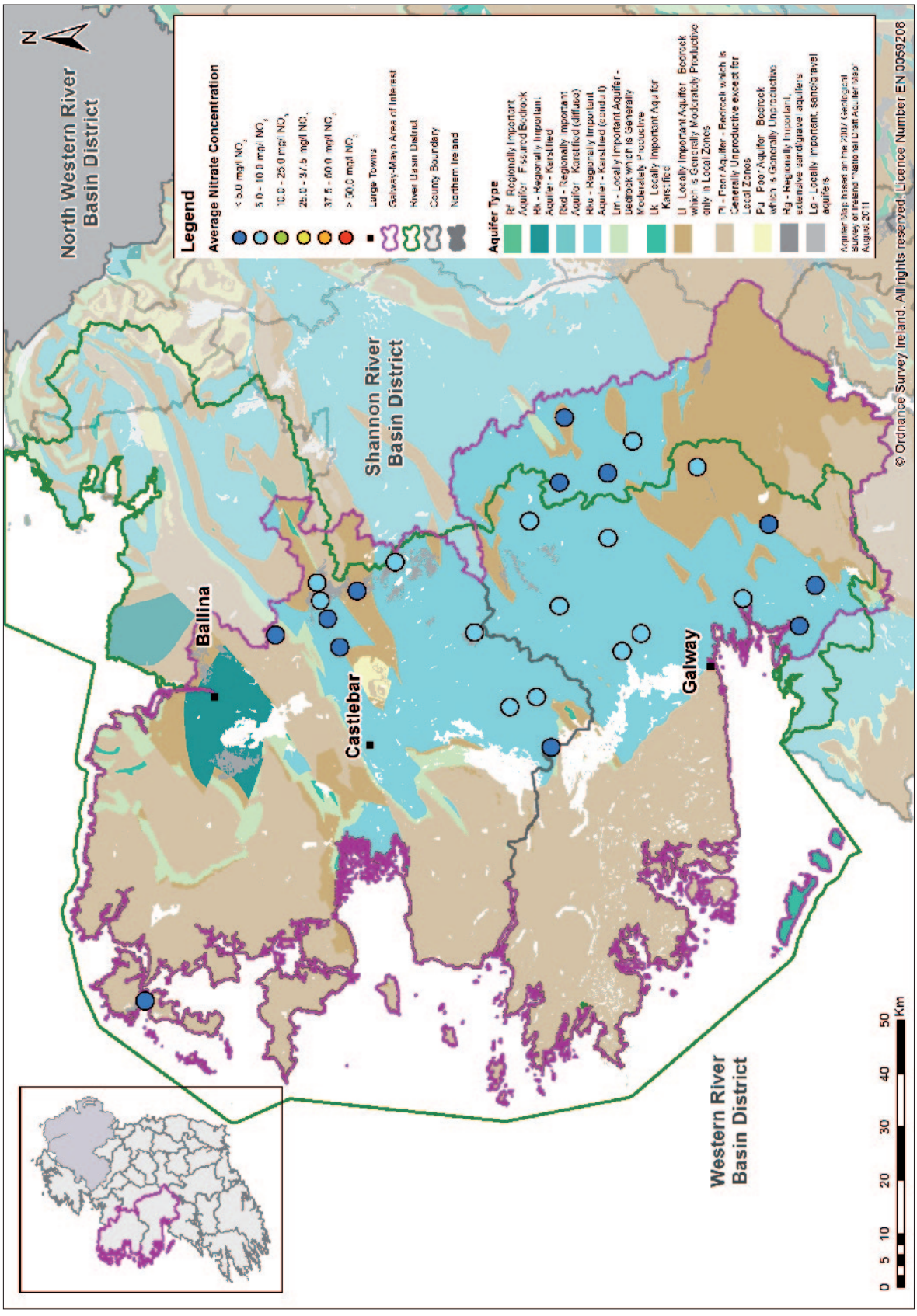
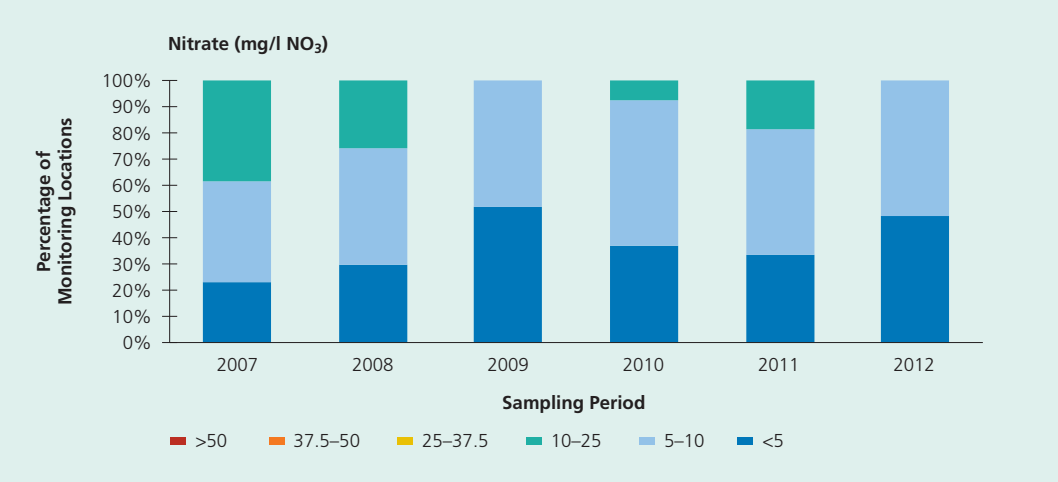


Figure 4.2 summarises the average yearly nitrate concentrations from 2007 to 2012 for the groundwater monitoring programme in counties Galway and Mayo.

Figure 4.2 *Average yearly nitrate concentrations in groundwater in counties Galway and Mayo*



The average nitrate concentration at groundwater monitoring locations in counties Galway and Mayo has decreased over the period 2007–2012. There was a noticeable decrease in average nitrate concentrations in 2012. A number of factors may have influenced the reduction in average nitrate concentration including: reductions in inorganic fertiliser applications, improvements in storage for organic fertiliser and the implementation of landspreading restrictions as part of the Good Agricultural Practice Regulations. Above average rainfall in 2008–2009 and the resultant increase in dilution (particularly in 2009) also contributed to a noticeable decrease in the average nitrate concentration. In 2012 the average nitrate concentration at any monitoring location did not exceed the Irish WFD threshold value concentration of 37.5 mg/l NO_3 and the concentration in any individual sample did not exceed the drinking water standard of 50 mg/l NO_3. The average nitrate concentrations were <9 mg/l NO_3 at all monitoring locations in counties Galway and Mayo during 2012.

Ortho-Phosphate in Groundwater

Figure 4.3 shows the locations and the associated average ortho-phosphate concentrations in 2012 for groundwater monitoring points in counties Galway and Mayo.

Figure 4.3 *Average ortho-phosphate concentrations in counties Galway and Mayo in 2012*

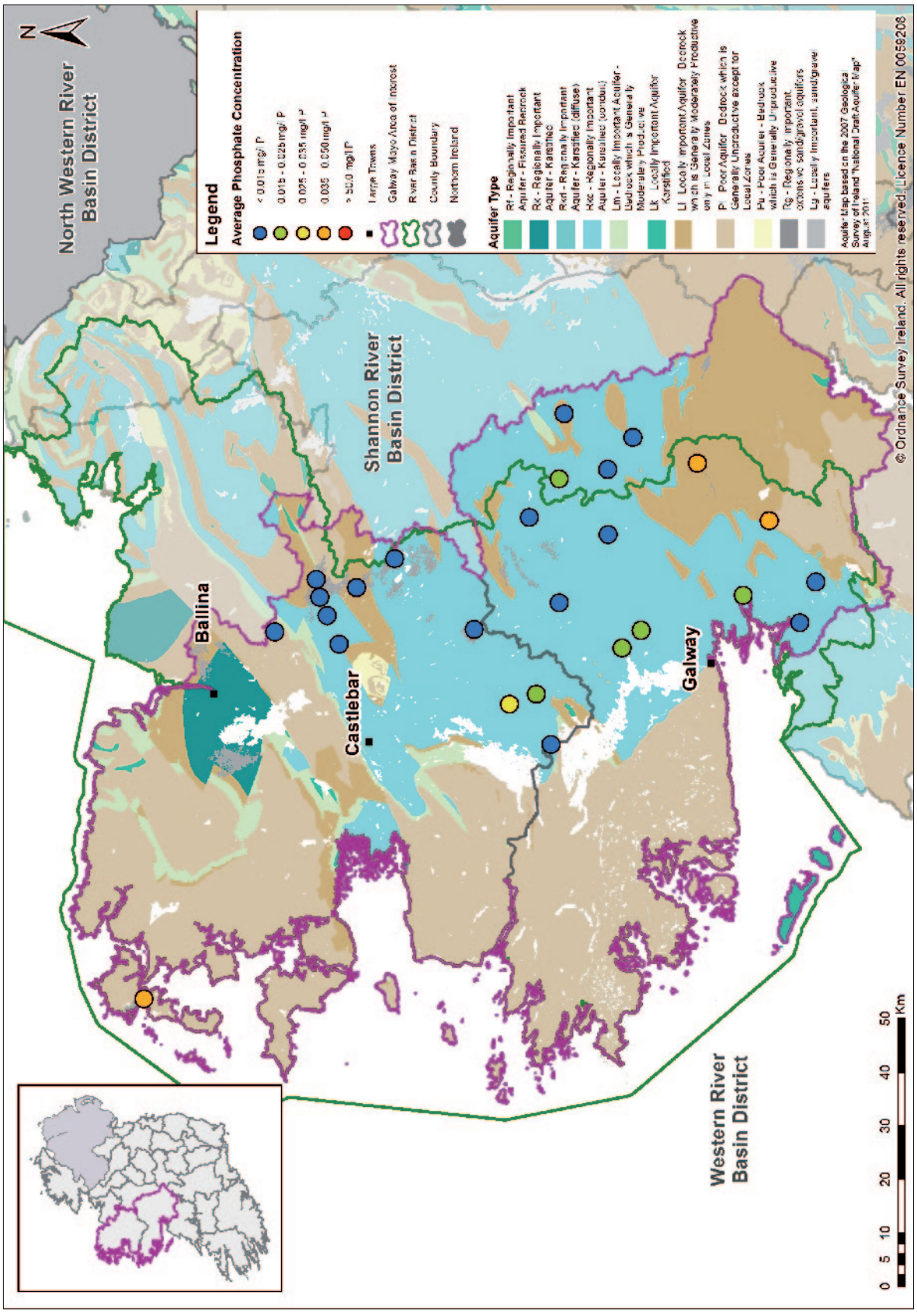
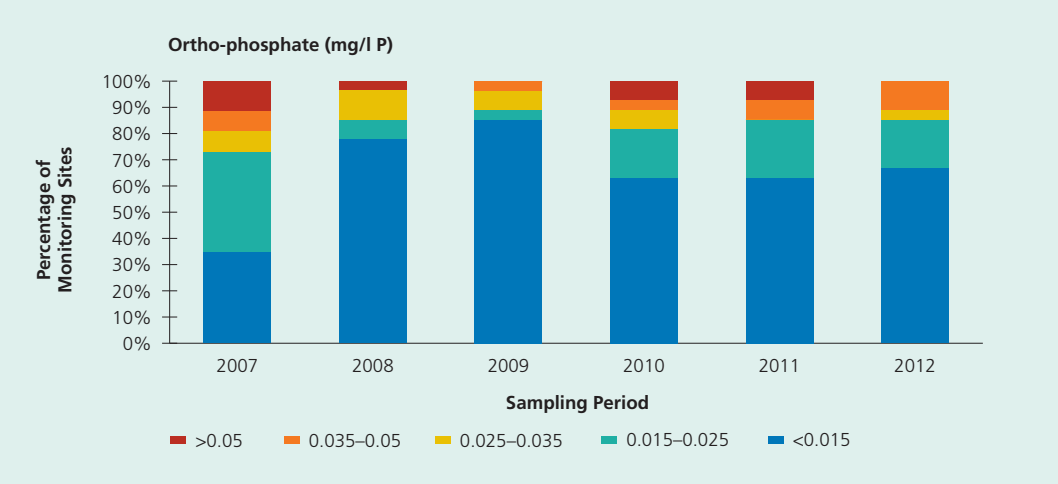


Figure 4.4 summarises the average yearly ortho-phosphate concentrations from 2007 to 2012 for the groundwater monitoring programme in counties Galway and Mayo.

Figure 4.4 *Average yearly ortho-phosphate concentrations in groundwater in counties Galway and Mayo*



Overall there has been a general decrease in ortho-phosphate concentrations over the period 2007–2012. A number of factors may have influenced the reduction in average ortho-phosphate concentration including: reductions in inorganic fertiliser applications, improvements in storage for organic fertiliser and the implementation of landspreading restrictions as part of the Good Agricultural Practice Regulations. Above average rainfall in 2008–2009 and the resultant increase in dilution (particularly in 2009) also contributed to a noticeable decrease in the average ortho-phosphate concentration. The Irish WFD threshold value concentration of 0.035 mg/l P should be considered when assessing the contribution of ortho-phosphate in groundwater to rivers. The majority of the regionally important karst groundwater bodies in counties Galway and Mayo were classified at poor chemical status during the first WFD reporting cycle because of groundwater contributions of ortho-phosphate to rivers that are less than good status. The number of monitoring locations with an average ortho-phosphate concentration >0.035 mg/l P in counties Galway and Mayo has reduced from four sites in 2011 to three in 2012. Also, in 2012 there were no longer any sites with an average concentration >0.05 mg/l P. In 2012 the average concentration was <0.015 mg/l P at nine of the 15 monitoring locations in County Galway and at nine of the 12 monitoring locations in County Mayo.

Other Parameters

In 2012 faecal coliforms were detected at 26 of the 27 sites monitored in counties Galway and Mayo. Many of these were not one off detections at sites with 78% of the individual samples taken indicating faecal contamination. This relates to the vulnerable nature of the groundwater in these counties, with shallow subsoils and exposed rock in many areas. 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 pesticides (0.01 µg/l) was exceeded in 16 out of 18,722 groundwater samples taken nationally, and there were no organic carbon compound exceedences. In response to this, a less intensive risk-based monitoring programme has been put in place for these chemicals.

Sources of Pollutants

While in general it is 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), there is one groundwater body in County Galway classified at poor chemical status for the first WFD reporting cycle because of contamination from historic mining activities. It is likely that other groundwater body scale water quality issues are due to diffuse sources of pollution including nutrient pressures from agricultural activities and small point sources such as domestic waste water treatment systems and farmyards.

4.3 Summary

It is important that groundwater is protected to maintain the quality of drinking water and so that the groundwater contribution to ecosystems, including rivers, is of good quality. Nitrate concentrations in groundwater in counties Galway and Mayo are relatively low. While large areas of counties Galway and Mayo were classified as being at poor status in the first WFD reporting cycle due to contribution of ortho-phosphate from groundwater to surface water bodies, there has been a general decrease in ortho-phosphate concentrations over the period 2007–2012.

The progress made in improvement of nitrate and ortho-phosphate concentration in counties Galway and Mayo 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. Nitrate concentrations in groundwater were below the drinking water quality standard. However, as microbial pollution was evident at the majority of monitoring locations and, therefore, may also be present in other private group schemes and small supplies, groundwater protection measures need to be maintained to ensure the water is safe to drink without the need for increased levels of treatment.

5. Transitional and Coastal Waters

5.1 Physico-Chemical & Biological Monitoring

The EPA has been monitoring and assessing the water quality of estuaries and coastal waters since the early 1990s. Following the introduction of the WFD, the monitoring programme has intensified and the EPA now monitors 122 water bodies up to four times per year; once in winter and three times in summer. In addition to more traditional trophic-status monitoring, which involves the measurement of nutrient and oxygen concentration, 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 programmes, a comprehensive overview of the ecological status of Ireland's tidal water environment can now be provided.

The transitional and coastal waters of the Western RBD cover an area of just over 4,700 km^2 representing the largest tidal waters area of any RBD in Ireland. This is broken down into 96 water bodies comprising partially mixed estuaries (e.g. the Moy Estuary), transitional lagoons (e.g. the Loch an tSaile, Kinvarra Bay Lagoons), tidally mixed and seasonally stratified coastal waters (e.g. Inner Clew Bay and the Western Atlantic Seaboard, respectively). A representative subset of these water bodies are assessed for WFD ecological status and for trophic status.

Transitional and coastal water bodies are monitored for the following parameters: salinity, temperature, pH, turbidity, Secchi depth, dissolved oxygen, BOD, TON, total ammonia, dissolved inorganic nitrogen (DIN), ortho-phosphate and chlorophyll a.

The trophic status of these waters is assessed using the EPA's Trophic Status Assessment Scheme (TSAS) which captures the cause-effect relationship of the eutrophication process and considers the following:

- Enrichment of waters by nutrients (DIN and phosphorus)
- Accelerated algal growth (phytoplankton and opportunistic macroalgae)
- Undesirable disturbance (oxygen content)

Trophic status assessments are based on the analysis of data collected over a period of three years, and each water body assessed is categorised as either eutrophic, potentially eutrophic, intermediate or unpolluted with respect to nutrient enrichment.

Priority substances are also monitored and details of this programme, undertaken by the Marine Institute, are available at http://hdl.handle.net/10793/635.

5.2 Assessment of Water Quality

The rivers in the Western RBD contribute relatively low loadings of nitrogen and phosphorus to the marine environment. Data from the 2011 OSPAR Riverine Inputs to the Maritime Area assessment show that the combined loading from the Corrib and Moy rivers, of nitrogen, as total nitrogen, and phosphorus, as total phosphorus, was 6,551 and 128 tonnes, respectively. This represents around 6% of the national total loading for the two rivers, which account for 7.4% of the national total catchment area.

In terms of point sources, four of the ten largest waste water treatment plants in the Western RBD discharge directly to tidal waters, the largest discharges being from Sligo UWWTP and the Galway City agglomeration. Improvement in the trophic status of both these receiving waters has been seen since the implementation of these facilities. The improvements seen in previous reports have been confirmed in this assessment with both the Garavogue Estuary and the Corrib Estuary classed as unpolluted.

A number of boundary changes have been made to some water bodies in the Western RBD. Based on a reassessment of the salinity conditions of the Ballysadare and Sligo areas, the two water bodies Ballysadare Bay and Ballysadare Estuary have been combined into a single transitional water body – Ballysadare Estuary. Similarly in Sligo, the Garavogue Estuary and Sligo Harbour have been combined into a single transitional water body. In addition to the amalgamation of these water bodies, a number of additional water bodies have been assessed in the 2010–2012 period, including outer Clew Bay and outer Galway Bay. This assessment now covers 20 coastal and transitional water bodies with a surface area of 872 km^2.

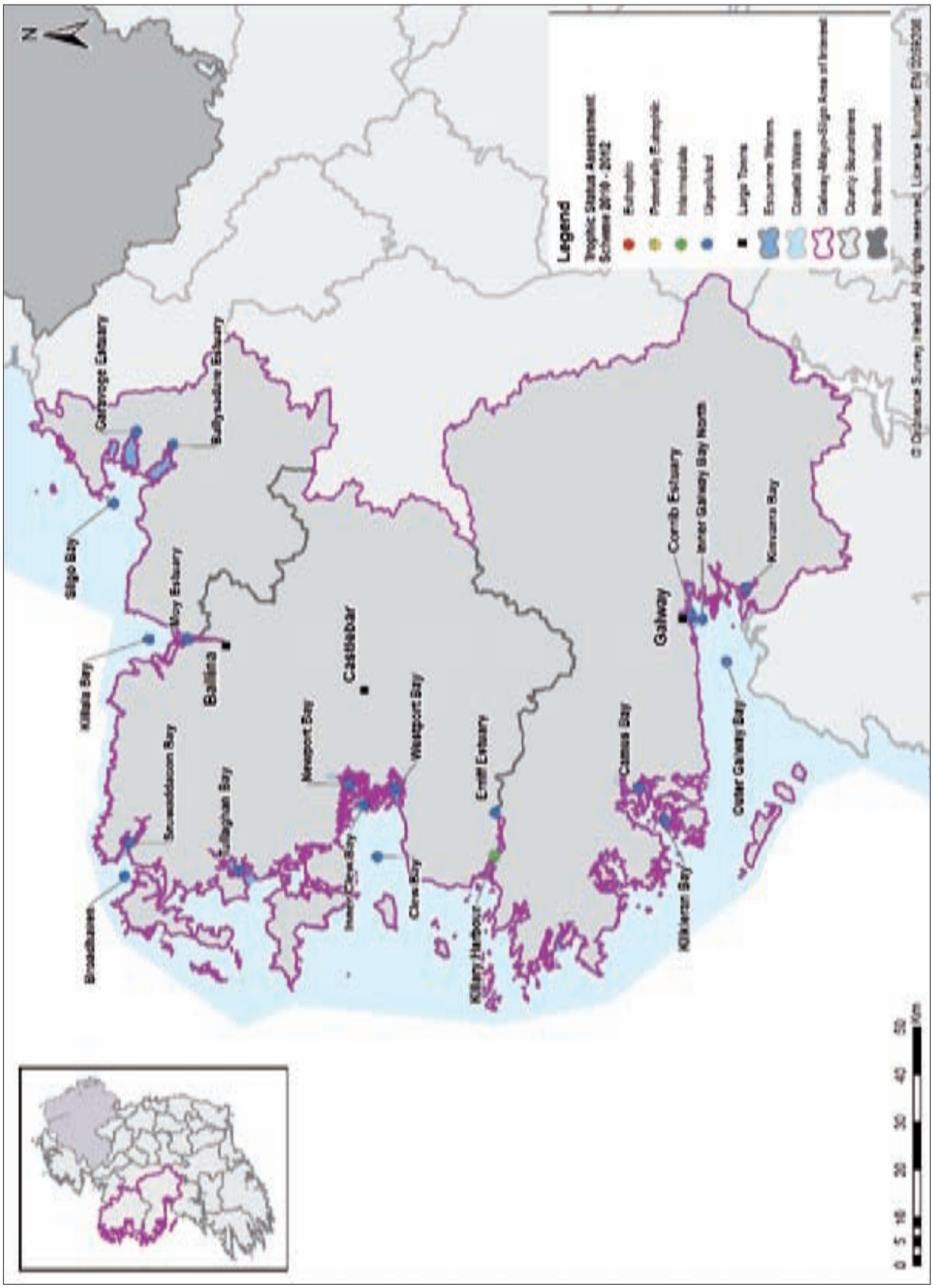
With the exception of one water body all of the areas assessed in this period were found to be unpolluted with respect to nutrient enrichment. This compares favourably with the national average and shows the highest percentage of unpolluted water bodies for any RBD (Table 5.1). The only water body classified as intermediate status was Killary Harbour. This assessment is based on reduced oxygen concentrations in the inner harbour. This is possibly due to natural hydrographic conditions, which can cause stratification of the water column, but it may also be an indication of an anthropogenic impact on oxygen conditions. Further investigation is needed to identify the cause of the deviation in oxygenation status here. In relation to the Moy Estuary, although currently classified as unpolluted, elevated growth of green macroalgae is still of concern and will be the subject of more intensive investigations in 2013.

Table 5.1 *Trophic status of western and national waterbodies*

Trophic Status	Western (%)	National (%)
Eutrophic	0	7
Potentially Eutrophic	0	8
Intermediate	5	28
Unpolluted	95	57

Of the 28 water bodies assessed for the last WFD status assessment, six were found to be 'moderate or worse', 13 were 'good', and nine were 'high'. The areas at less than good WFD status included two Lagoons (Kinvarra Bay Lagoons and Lough Muree), two transitional waters (Moy Estuary and Ballysadare Estuary) and one coastal water (Killary Harbour). Moderate status in Killary Harbour is based on the status of the benthic invertebrate community which was affected by a large phytoplankton bloom in 2005. The classification indicates that this biological element has not fully recovered from the event.

Figure 5.1 *Trophic status of Western RBD 2012*



5.3 Bathing Waters

During 2012, 31 bathing waters were monitored in Galway City, Co. Galway and Co. Mayo, just under a quarter of the 136 bathing areas monitored nationally. Monitoring of bathing waters is the responsibility of the relevant local authority, and sampling is undertaken at regular intervals during the bathing season, which runs from June 1st to September 15th each year with a pre-season sample at the end on May each year.

The revised Bathing Water Directive (2006/7/EC) was transposed into Irish law in 2008 (S.I. 79 of 2008) and fully replaces the existing regulations (S.I. 155 of 1992) on 31st December 2014. This directive sets tighter 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. Since 2011 transitional arrangements are in place and the new microbiological parameters have been monitored. At present bathing waters are classified as Good, Sufficient or Poor depending on their compliance with existing EU guide or mandatory standards. From 2015, however, 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.

Results for the bathing waters for the two counties and Galway City for the 2012 bathing season are provided in Table 5.2 and Figure 5.2. These show that 30 of the 31 designated bathing areas (96.8%) achieved at least "sufficient" status similar to 2011 and comparable to the national picture. Twenty-three of the 31 sites (74.2%) achieved "good" status compared to just 66.9% nationally. In 2011 Galway City added two new urban beaches; Ballyloughane and Grattan Road, while Mayo County Council added Carrowniskey beach and Louisburgh, but delisted Silver Strand Louisburgh due to its isolation and limited bathing numbers.

Overall bathing water quality in the area continues to be of a very high standard but at times was affected by extreme rainfall events. This was particularly so for beaches on Achill where short-term restrictions on bathing were imposed, in the interests of public health, at the request of the Health Services Executive. Clifden was the only beach to remain closed to bathing for the season (but continued to be monitored). The principal source of impact on this beach remains the municipal waste water treatment facility. This was licenced by EPA (Discharge Licence No. D0198-01). Upgrade work in on-going and when fully operational is expected to yield a marked improvement in water quality. In Galway City the urban beaches remain prone to periodic pollution from both surface drainage and waste water treatment plant overflows.

Table 5.2 *Bathing water quality in Galway City, Co. Galway and Co. Mayo in 2012*

Responsible Local Authority	Bathing Area	Water Quality Status 2012	Compliance with Mandatory/ Guide Values		
			E. coli.		IE
			Mandatory	Guide	Guide
Galway County Council	An Trá Mór, Coill Rua, Indreabhán	Good	✔	✔	✔
	Loughrea Lake	Good	✔	✔	✔
	Bathing Place at Portumna	Good	✔	✔	✔
	Céibh an Spidéil	Sufficient	✔	✔	✘
	Cill Mhuirbhigh, Inis Mór	Good	✔	✔	✔
	Clifden Beach	Poor	✔	✘	✘
	Goirtín, Cloch Na Rón	Good	✔	✔	✔
	Trá na bhForbacha, Na Forbacha	Good	✔	✔	✔
	Trá na mBan, An Spidéal	Sufficient	✔	✘	✔
	Trá an Dóilín, An Ceathrú Rua	Good	✔	✔	✔
	Trá Chaladh Fínis, Carna	Good	✔	✔	✔
	Traught, Kinvara	Good	✔	✔	✔
Galway City Council	Ballyloughane Beach	Sufficient	✔	✘	✘
	Grattan Road Beach	Sufficient	✔	✘	✔
	Salthill Beach	Good	✔	✔	✔
	Silverstrand Beach	Good	✔	✔	✔
Mayo County Council	Bertra Beach, Murrisk	Good	✔	✔	✔
	Carrowmore Beach, Louisburgh	Good	✔	✔	✔
	Carrowniskey, Louisburgh	Sufficient	✔	✘	✔
	Dugort Beach, Achill Island	Good	✔	✔	✔
	Dooega Beach, Achill Island	Good	✔	✔	✔
	Elly Bay, Belmullet	Good	✔	✔	✔
	Golden Strand, Achill Island	Good	✔	✔	✔
	Keel Beach, Achill Island	Good	✔	✔	✔
	Keem Beach, Achill Island	Good	✔	✔	✔
	Ross Beach, Killala	Sufficient	✔	✔	✘
	Louisburgh, Old Head Beach	Good	✔	✔	✔
	Mullaghroe Beach, Belmullet	Good	✔	✔	✔
	Mulranny Beach	Good	✔	✔	✔
	Rinroe Beach, Carrowtigue	Sufficient	✔	✔	✘
	Clare Island, Louisburgh	Good	✔	✔	✔

In 2015 assessment of bathing waters will be undertaken using a statistical approach based on evaluating four years of bathing water data. This should minimise the variability observed in the present annual assessments. The following forecast is based on examination of data covering 2009–2012 inclusive and shows that 24 of the 31 waters (77.4%) are predicted to achieve Excellent status (E), 3 Good (G), 1 Sufficient (S) and 3 Poor (P) – refer to Table 5.3.

Assessments for Ballyloughane (Galway City) and Grattan Road (Galway City) are based on only two years' data. The post-2014 status of these bathing waters, together with Clifden, will be dependent on any water quality improvements over the next two years.

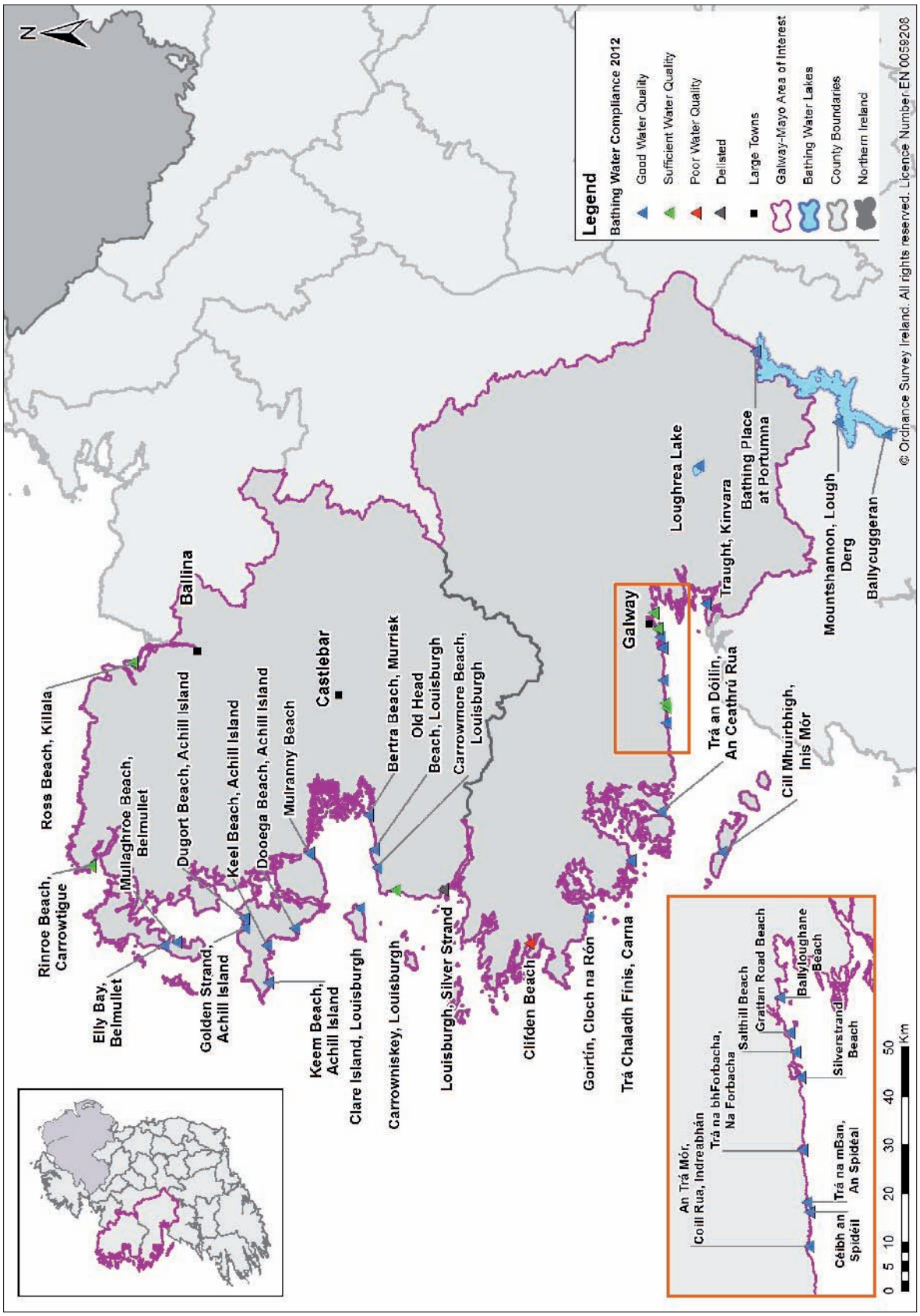
In the cases of the three beaches projected to be of Sufficient/Poor status efforts are required to determine the actual sources of bacterial pollution with a view to minimising their future impact on bathing water quality. These should include, where practicable, increased monitoring of actual bathing water quality and assessment of probable pollution sources as defined in the respective bathing water profiles.

Table 5.3 *Predicted bathing water quality in Galway City, Co. Galway and Co. Mayo (based on 2009–2012 data using a four-year statistical approach)*

Local Authority	Bathing water	Projected status
Galway Co. Co.	An Trá Mór, Coill Rua, Indreabhán	E
	Céibh an Spidéil	G
	Clifden	P
	Cill Mhuirbhigh, Inis Mór	E
	Goirtín, Cloch Na Rón	E
	Trá an Dóilín, An Ceathrú Rua	E
	Traught, Kinvara	E
	Trá Chaladh Fínis, Carna	E
	Trá na mBan, An Spidéal	G
	Trá na bhForbacha, Na Forbacha	S
	Bathing place at Portumna	E
	Loughrea Lake	E
Galway City Co.	Ballyloughane Beach	P
	Grattan Road	P
	Salthill	E
	Silverstrand	E
	Ballyloughane Beach	E
Mayo Co. Co.	Carrowmore Beach, Louisburgh	E
	Carrowniskey, Louisburgh	E
	Rinroe Beach, Carrowtigue	E
	Dugort Beach, Achill Island	E
	Dooega Beach, Achill Island	E
	Elly Bay, Belmullet	E
	Golden Strand, Achill Island	E
	Keel Beach, Achill Island	E
	Keem Beach, Achill Island	E
	Ross Beach, Killala	E
	Old Head Beach, Louisburgh	E
	Mulranny Beach	E
	Mullaghroe Beach, Belmullet	E
	Clare Island, Louisburgh	E

Key: E: Excellent; G: Good, S: Sufficient and P: Poor

Figure 5.2 *Bathing water status in Galway City, Co. Galway and Co. Mayo in 2012*



6. Summary and Assessment

The WFD requires that by 2015 the following 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 and coastal waters in Galway and Mayo 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 WWTPs 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. In the period 2010–2012, 81% of river channel in Galway and Mayo achieved at least good status, compared with 82% in the period 2007–2009. The target for 2021 is to have 100% of river bodies in the Western RBD achieving at least good status. This will be a significant challenge for all concerned. The Western RBD continues to be ranked as one of the most unpolluted districts, however, serious pollution continues on the Clarinbridge River, Loughnaminoo Stream and Kilcolgan River amongst others.

Rivers

In the period 1998–2012 in the West, the percentage of unpolluted river channel has remained stable at over 80% and those classed as moderately polluted have decreased from 7 to 5%. While this reduction is a welcome improvement, approximately 20% of river channel remains of less than good status.

Phosphate levels in rivers appear to have stabilised in recent years, but in a few cases are still at a level that is above the EQS for "good status" as classified by the WFD. In 2012, the average concentrations of ortho-phosphate in rivers in Galway and Mayo decreased, with just 7% of rivers having an average concentration of >0.035 mg/l P compared with 25% in 2011 (O'Sullivan, 2012). Improvements in municipal waste water treatment and use and storage of fertiliser and landspreading activities may also have contributed to the decreases.

The EPA has identified 85 priority polluted river sites (sites were status is less than "good") in counties Galway and Mayo (45 Galway and 40 Mayo). Identifying and targeting the causes of pollution at these sites and in their upstream catchments will lead to continued improvement in river water quality in both counties. This should also lead to improvements in the quality of associated groundwater, lakes and transitional and coastal waters.

Lakes

While water quality in Galway and Mayo is better than in most counties, it is unlikely that those sites which are currently classified as moderate, poor or bad will meet the required standards by 2015. There has been no sign of improvement in status in Ballyquirke, Corrib or Ross lakes, while Beaghcauneen and Tully Lough are currently failing as a result of increasing concentrations of total phosphorus and chlorophyll. Aughrusbeg lake has been downgraded from good to bad status on the basis of results of fish surveys. In Mayo, seven lakes were classified as being at less than good status in 2010–2012 Five of these lakes (Ballin, Cross, Cullin, Knappabeg, Lannagh) currently show no signs of improvement and are still classified as being at less than good status. Urlaur Lough is currently the only lake in Mayo classified at bad ecological status, driven by the fish community. It is difficult to ascertain what measures can or should be adopted to improve the fish status of lakes.

Another challenge will be to maintain existing high and good status sites and preventing any deterioration. Increasing chlorophyll and total phosphorus levels are a cause for concern in some lakes and it is thought that diffuse pollution from agriculture and septic tanks seems to be at the heart of the problem. Investigative monitoring programmes will have to be implemented in order to identify suspected causes of pollution followed by a programme of measures to restore these impacted sites.

Groundwaters

Groundwaters in Galway and Mayo have low levels of nitrate, and ortho-phosphate levels have decreased overall in the period 2007–2012. In 2012, 66% of samples taken in Galway and Mayo contained <0.015 mg/l ortho-phosphate. The vulnerable nature of the karst limestone aquifers in Galway and Mayo may explain the elevated ortho-phosphate concentrations found in groundwater. However, faecal contamination of groundwaters is an issue, with 78% of samples taken in 2012 containing faecal coliforms.

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

Transitional and Coastal Waters

Transitional and coastal waters in the West of Ireland have the lowest levels of nutrient loadings from rivers nationally. Despite the fact that four of the ten largest WWTPs in the Western RBD discharge directly into tidal waters, 95% of water bodies remain unpolluted. This compares favourably with the national figure of 57%. In terms of ecological status, as defined under the WFD, of the 28 water bodies assessed, only six were found to be 'moderate or worse'.

Overall, bathing water quality in Galway and Mayo in 2012 is high with 96.8% achieving at least "sufficient" status in 2012. However, from 2015, more stringent criteria will be in place, which will require even greater efforts by local authorities to improve water quality and tackle sources of pollution.

Pressures

The principal suspected causes of less than satisfactory water bodies in Galway and Mayo are discharges, principally of nutrients, from agricultural activities and municipal waste water works. Industrial discharges and waste water from unsewered properties also contribute to water quality issues. Abstraction of water for domestic use and for agriculture are a potential risk to rivers and lakes through reduction of flow in springs and rivers and lowering of water levels in lakes.

In Galway and Mayo, 85 sites have been identified as WFD priority polluted river sites for tackling pollution. The majority of problems at these sites are caused by diffuse agricultural and point source municipal waste water pollution. Tackling pollution at these sites, will not only improve river quality, it may have knock-on beneficial effects on lakes and transitional and coastal waters that are fed by these rivers. Targeted local investigations and actions to address the causes of pollution at these sites will be the most effective way of improving water quality.

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.

In 2011, nine urban areas in Galway with secondary treatment did not meet the BOD, COD and Total Suspended Solids (TSS) quality standards for effluent discharged as per the Urban Waste Water Treatment Directive (Focus on Urban Waste Water Discharges in Ireland (Reports for years 2008–2011) EPA, 2012). These nine urban areas included Ballygar, Clonbur, Gort, Letterfrack, Loughrea, Mountbellew, Moylough, Oughterard and Tuam (all failed on quality except for Clonbur & Letterfrack which failed on not having a sufficient number of samples collected, analysed and reported to the EPA).

In Mayo, 10 urban areas with secondary treatment did not meet the required quality standards for BOD, COD and TSS. These included Bangor Erris, Belcarra, Castlebar, Charlestown, Doogort, Foxford, Gweesalia, Kiltimagh, Lahardane and Louisbourgh. These all failed on quality. D0047-1 (Castlebar) did meet the requirements of the Directive in relation to total phosphorus in waste water discharged to sensitive areas from an urban area with a population equivalent of >10,000.

Since 2007, with the introduction of the Waste Water Discharge (Authorisation) Regulations (S.I. 684 of 2007) the EPA is responsible for the authorisation and regulation of waste water discharges from waste water works owned by, vested in, controlled or used by water service authorities (local authorities). To date 10 waste water discharges in Galway city and county have been authorised by the EPA and 22 applications are under assessment. In the case of Mayo 23 waste water discharges have been authorised and 21 applications are under assessment. Authorisations for Athenry, Leenane, Moycullen, Achill Sound, and Bellullet have been issued since the beginning of 2012. Each individual authorisation sets conditions on the operation of the discharge and emission limit values for the discharges to allow the receiving water to achieve at least a good WFD status.

The 2010–2012 Water Services Investment Programme (WISP) aimed to prioritise projects that target environmental compliance issues. While there have been some improvements in the quality of rivers affected by municipal waste water pollution, there are still problem areas. Investments in waste water treatment plants should have a marked beneficial effect on the quality of the rivers they discharge to as they come on-stream. The priority for investment in waste water infrastructure under the 2010–2012 WSIP was to ensure compliance with the WFD and to meet projected increases in demand. The programme included investment for a number of WWTP upgrades such as the Clifden and Galway (Mutton Island) sewerage schemes. As part of the 2010–2012 WISP, Mayo County Council completed upgrades on the Ballina, Castlebar, Achill Sound and Kiltimagh waste water works and Galway County Council completed upgrades at Tuam waste water works during 2012.

The advent of Irish Water, which will take over responsibility from the water services authorities for the waste water works over the next few years, should result in improved investment in infrastructure, improved operations at and emissions from these facilities.

Agricultural and Food Harvest 2020

Diffuse discharges – mainly from agriculture are more difficult to address than point sources. Nutrient enrichment is the most widespread threat to water quality in Galway and Mayo. Legislation through the Nitrates Directive (S.I. 610 of 2010) 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. A review of Ireland's Nitrate Action Plan is currently under way. An 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 tacking this problem. The targets set by *Food Harvest 2020* will provide welcome economic development, but will also pose significant challenges in meeting the requirements of the WFD. It is predicted that there will be a 33% increase in primary output across the country, based on 2007–2009 averages.

Domestic Waste Water Treatment Systems (DWWTS)

Nutrients from DWWTS can have an impact not just on human health but also on water quality. In the Western RBD, unsewered properties account for 3% of the nitrate and 7% of the phosphorus load going to surface waters. It is estimated that there are almost 500,000 DWWTS in Ireland, which if not properly maintained may contaminate water supplies, groundwaters and surface waters causing harm to human health and the environment. While it is difficult to differentiate between nutrient loadings arising from agriculture and DWWTS, it is likely that agriculture is a far greater contributor than DWWTS overall. However, in areas where there is either inadequate percolation or groundwater vulnerability, along with a high density of DWWTS, then DWWTS can be a significant source of pollution. 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 help to ensure environmentally sustainable rural development, protecting vulnerable groundwaters, including drinking water supplies. The national inspection plan for DWWTS will commence in 2013 and inspections will target those areas deemed most vulnerable following risk assessments.

Forestry

In both Galway and Mayo, over 56,000 hectares are covered by forestry (approximately 10% of the land area). Pressures exerted by forestry include artificial acidification of waters arising from the presence of coniferous afforestation on acid-sensitive soils; and nutrient enrichment and siltation and sedimentation impacts from forestry operations. Many of these afforested areas are located in sensitive salmon and trout spawning catchments, such as the Owenriff, underpinning the need for adequate control of forestry operations in sensitive areas. The impact of forestry on water quality continues to be an issue of concern in Galway and Mayo.

Conclusion

While water quality in Galway and Mayo compares favourably with many other counties in Ireland, it still faces significant challenges in achieving the targets of the WFD. The biggest threat to water quality in Galway and Mayo is from excessive nutrients in particular from agricultural activities and from municipal waste water treatment plants. Other activities identified as contributing to poor water quality include industrial discharges and waste water from unsewered properties. Improvements in collection systems and reduction of nutrient discharges should lead to an improvement in the status of all water bodies in these two counties.

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 WFD in Galway and Mayo. The second review of Ireland's Nitrates Action Programme is currently underway, and the retention of derogations already received from the commission will be critical to the success of *Food Harvest 2020*. However, any derogation received will depend on Ireland's ability to show that water quality will not be adversely affected by any increase in agricultural outputs.

An integrated catchment management based approach to implementing the WFD would help us develop a clear understanding of the issues at a catchment level. Investigative monitoring is key to enable detailed analysis and identification of the causes of pollution and enable tailor made management plans to be implemented.

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8. Abbreviations & Acronyms

BOD	Biochemical Oxygen Demand
BQE	Biological Quality Element
Br	Bridge
CEC	Council of the European Communities
DIN	Dissolved Inorganic Nitrogen
DO	Dissolved Oxygen
d/s	Downstream
DWWTP	Domestic Water Water Treatment Plant (Septic Tank)
EC	European Commission
EEA	European Environment Agency
EPA	Environmental Protection Agency
EQS	Environmental Quality Standard
EU	European Union
GAP	Good Agricultural Practice
GPC	General Physico-Chemical
GSI	Geological Survey of Ireland
IFI	Inland Fisheries Ireland
IPPC	Integrated Pollution Prevention and Control
mg/l	Milligrams Per Litre
N	Nitrogen
NHA	Natural Heritage Areas
NH_3	Ammonia
NH_4+	Ammonium Ion
NO_2	Nitrite Ion
NO_3	Nitrate Ion
OEE	Office of Environmental Enforcement (EPA)
o-PO_4	ortho-Phosphate
P	Phosphorus
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PE	Population Equivalent
PO_4	Phosphate
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SERBD	South Eastern River Basin District
SI	Statutory Instrument
SSRS	Small Stream Risk Score
T	Tonne
TSAS	Trophic Status Assessment Scheme
TON	Total Oxidised Nitrogen
TP	Total Phosphorus
u/s	Upstream
WRBD	Western River Basin District
WFD	Water Framework Directive
WMU	Water Management Unit
WSIP	Water Services Investment Programme
WWTP	Waste Water Treatment Plant
µg/l	Micrograms Per Litre

9. Glossary

Acidification: Continuing loss of capacity to neutralise acid inputs indicated by declining alkalinity and increasing hydrogen ion concentration (i.e. the decrease in pH of water or soil resulting from increases in acidic anion inputs such as sulphate)

Ammonia (NH_3): A simple compound of nitrogen primarily originating in waste discharges. It can be toxic to fish under certain circumstances and is a source of nitrogen for plants and algae.

Ammonium (NH_4+): The ionised form of ammonia, which is more commonly found in water.

Anthropogenic: Produced as a result of human activities.

Benthic zone: The ecological region at the lowest level of a body of water such as a lake, including the sediment surface and some sub-surface layers.

Biochemical Oxygen Demand (BOD): A measure of the potential oxygen consumption of decaying organic matter in water. It is a widely used measure of organic pollution in rivers and in effluents discharged to water.

Biodiversity: Word commonly used for biological diversity and defined as an assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and biological complexes of which they are part.

Calcareous: Being composed partly or mostly of calcium carbonate (limestone).

Diatoms: A major group of algae.

Diffuse source pollution: Pollution that arises from diffuse areas in a catchment such as septic tanks from rural housing or fields adjacent to a river or stream during heavy rainfall when surface runoff occurs.

Ecology: The study of the relationship among organisms and between those organisms and their non-living environment.

Ecosystem: A community of interdependent organisms together with the environment they inhabit and with which they interact and, which is distinct from adjacent communities and environments.

Effluent: Liquid wastes.

Erosion: Wearing away of earth or rock by the effects of rain, wind, sea or rivers or by the action of toxic substances.

Eutrophication: The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.

Food Harvest 2020: A strategic plan to develop Ireland's agricultural sector in an environmentally sustainable way

Groundwater: Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material.

Hydromorphological pressures: Physical disturbances of water such as impoundments and other water regulation structures.

Invasive alien species: Species that have been introduced to Ireland (deliberately or accidently) by humans and have a negative impact on its economy, wildlife or habitats.

Invertebrate: An animal that does not possess a backbone.

Limit value: A level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained.

Macroinvertebrates: An invertebrate that is large enough to be seen without a microscope.

Macrophytes: An aquatic plant that grows in or near water and is either emergent, submergent, or floating.

Nitrate (NO_3): An ion of nitric acid (HNO_3).

Nitrite (NO_2): An ion of nitrous acid (HNO_2).

Nutrient: Element or chemical essential for growth, e.g. phosphorus, nitrogen, silica, oxygen, carbon.

ortho-Phosphate (PO_4): The simplest in a series of phosphates and an ion of phosphoric acid (H_3PO_4). It is commonly occurring form of phosphorus taken up by plants in the aquatic environment and is essential for their growth.

Phosphate: A general term to include ortho-phosphate, condensed phosphates and organically bound phosphates.

Point source pollution: Pollution that arises from a well-defined point, typically the end of a discharge pipe, but may include farmyard sources.

Pressures: Activities that may have a negative impact on water quality such as agricultural activities, forestry etc.

Priority Substances: Substances found in water that are harmful to health and the environment

River Basin District: A river basin/catchment is an area of land from which all surface run-off flows through a series of streams, rivers and possibly lakes in the sea at a single river mouth or estuary. A River Basin District comprises one or more neighbouring river basins together with their associated wetlands, groundwaters and coastal waters.

Taxonomic: Referring to 'taxon' (plural taxa) or taxonomic unit; a name designating an organism or a group of organisms.

Water Framework Directive: An EU-wide law introduced in 2000 to bring a common approach to safeguarding all Community waterbodies and water dependent ecosystems.

Appendix 1. River Station Codes *(with grid references)*

Galway

			Grid References	
Reference	**Station ID**	**River**	**Easting**	**Northing**
G1	RS31C010100	Casla	97815.17	226412.12
G2	RS31S010570	Screeb	97337.29	240359.06
G3	RS30B010200	Bealanabrack	96578.20	252767.68
G4	RS30F010100	Failmore	96324.15	252131.11
G5	RS32B040100	Bunowen (Killary Harbour)	82395.05	260764.72
G6	RS31O020300	Owengowla	81853.65	239789.17
G7	RS31R010500	Recess	80235.85	247474.82
G8	RS32C040040	Culfin	77916.71	262073.27
G9	RS31R010600	Recess	76517.89	247166.36
G10	RS32O030100	Owenglin	74473.13	251197.72
G11	RS32D010100	Dawros	72966.50	258492.37
G12	RS32D010200	Dawros	70205.66	259697.00
G13	RS32T010100	Traheen	68800.33	256785.22
G14	RS32B070100	Ballinaboy	68353.65	247464.42
G15	RS32O030200	Owenglin	67625.09	250460.06
G16	RS32O030300	Owenglin	66085.87	250412.79
G17	RS26S071100	Suck	181610.43	246363.84
G18	RS26S070300	Suck	167100.49	278032.93
G19	RS29C031000	Carra Stream	166233.52	223160.99
G20	RS29R010100	Raford	164864.15	229011.53
G21	RS29K010100	Kilcolgan	162238.98	217795.88
G22	RS29R010200	Raford	160925.73	226086.04
G23	RS30A010028	Abbert	160706.96	233170.87
G24	RS29K010200	Kilcolgan	158089.19	219706.37
G25	RS30S010025	Sinking	156427.72	261489.60
G26	RS30A010100	Abbert	155933.22	237913.17
G27	RS30G020200	Grange (Galway)	155338.12	251455.08
G28	RS30L070100	Levally Stream	154647.67	252475.31

			Grid References	
Reference	Station ID	River	Easting	Northing
G29	RS30S010100	Sinking	152609.83	262060.71
G30	RS29R010500	Raford	152165.69	220239.93
G31	RS30A010300	Abbert	151670.92	243628.02
G32	RS29C020050	Clarinbridge	151293.08	229121.03
G33	RS29K010400	Kilcolgan	151124.40	219933.48
G34	RS30S010300	Sinking	150223.35	263996.51
G35	RS29C020200	Clarinbridge	150211.10	227295.22
G36	RS29C020300	Clarinbridge	148849.69	226319.32
G37	RS29O011000	Owendalulleegh	148355.13	197130.40
G38	RS30G020400	Grange (Galway)	147980.62	249906.79
G39	RS29C020400	Clarinbridge	147057.84	223078.00
G40	RS29C010200	Cannahowna	145894.17	204952.67
G41	RS29C010100	Cannahowna	145258.29	201868.79
G42	RS30G020600	Grange (Galway)	144647.05	246957.18
G43	RS30S010400	Sinking	144381.97	263466.54
G44	RS29K010600	Kilcolgan	144266.15	218437.76
G45	RS30A010500	Abbert	143694.66	240726.30
G46	RS30D010600	Dalgan	143159.70	264250.25
G47	RS30C010800	Clare (Galway)	142725.50	243149.70
G48	RS30C010500	Clare (Galway)	142093.21	253778.96
G49	RS30C011000	Clare (Galway)	141916.57	236354.17
G50	RS30N010300	Nanny (Tuam)	141893.35	252974.62
G51	RS29K010700	Kilcolgan	141882.53	218518.29
G52	RS30C010650	Clare (Galway)	141617.24	252833.46
G53	RS30C010100	Clare (Galway)	141288.30	263693.26
G54	RS29C020500	Clarinbridge	141251.77	220046.79
G55	RS30C010700	Clare (Galway)	140891.48	249785.25
G56	RS30C010300	Clare (Galway)	139430.70	258746.32
G57	RS29C050400	Carrowmoneash	138463.09	225155.42
G58	RS30C011200	Clare (Galway)	137261.91	233237.21
G59	RS30C030100	Cregg	135389.94	237858.59
G60	RS30C011300	Clare (Galway)	132172.79	232847.29

			Grid References	
Reference	Station ID	River	Easting	Northing
G61	RS30B020100	Black (Shrule)	131914.85	257707.34
G62	RS30T010100	Terryland	131330.71	227241.25
G63	RS30T010200	Terryland	130952.97	226844.62
G64	RS30T010300	Terryland	130574.86	226581.73
G65	RS30T010500	Terryland	129728.83	226269.80
G66	RS30C020500	Corrib	129645.70	225872.80
G67	RS30C020600	Corrib	129625.12	225636.00
G68	RS30C020460	Corrib	129372.24	226210.73
G69	RS30C020400	Corrib	128509.64	227732.43
G70	RS30C020300	Corrib	127726.36	228521.24
G71	RS30H010200	Headford Stream	127336.99	245218.74
G72	RS30C020200	Corrib	126631.11	229115.10
G73	RS30C020100	Corrib	126372.30	230092.31
G74	RS31B010300	Bearna Stream	124903.48	223675.95
G75	RS30B140100	Ballyquirke	123324.82	232574.73
G76	RS31B020600	Bearna House Stream	123251.24	222795.96
G77	RS30C060300	Cong Canal	114966.87	254562.25
G78	RS31O010200	Owenboliska	112733.00	222482.57
G79	RS30O020200	Owenriff (Corrib)	112517.22	243231.01
G80	RS30O020190	Owenriff (Corrib)	112247.72	243140.27
G81	RS31O010100	Owenboliska	112142.31	228709.30
G82	RS30O020100	Owenriff (Corrib)	110854.78	242471.14
G83	RS31P010100	Polleen	109717.89	222082.79
G84	RS31O040300	Owenriff (South Galway)	108975.62	222622.34
G85	RS30C050100	Cloghbrack Stream	104235.38	257442.39
G86	RS30D020200	Dooghta	104046.38	252587.09
G87	RS31C020100	Crumlin (Galway Bay)	103908.86	222198.88
G88	RS30C030300	Cregg	130237.00	234557.00
G89	RS30H010300	Headford Stream	126103.00	243184.00
G90	RS29K010700	Kilcrow	179792.00	205702.00

Mayo

			Grid References	
Reference	Station ID	River	Easting	Northing
M1	RS32C050300	Carrowbeg	99417.68	284466.11
M2	RS32N010190	Newport	98862.22	293855.70
M3	RS33O040050	Owenmore	97699.47	322764.74
M4	RS32E010100	Erriff	97648.28	271119.68
M5	RS33S030150	Sheskin Stream	97619.71	324018.80
M6	RS32E010200	Erriff	96146.95	268314.80
M7	RS32G030100	Glenamong	94802.35	302324.64
M8	RS33O040200	Owenmore	93942.60	321178.24
M9	RS33G010050	Glenamoy	92083.94	333551.96
M10	RS32E010300	Erriff	89473.81	264501.26
M11	RS33G010100	Glenamoy	89358.91	333789.97
M12	RS33O040300	Owenmore	86307.82	322900.98
M13	RS32B010100	Bundorragha	84523.68	266405.72
M14	RS33O010020	Owenduff	84146.51	309619.68
M15	RS32B010200	Bundorragha	84139.05	263380.52
M16	RS33M030100	Munhin	83778.88	325260.85
M17	RS33M030200	Munhin	82157.97	323259.13
M18	RS32B030100	Bunowen (Louisburgh)	81962.81	277952.08
M19	RS33O040500	Owenmore	81460.78	322572.70
M20	RS32B030150	Bunowen (Louisburgh)	80757.72	280663.66
M21	RS33O010100	Owenduff (Blacksod)	80107.53	314685.80
M22	RS30D010100	Deel Crossmolina	149684.97	279479.42
M23	RS30D010200	Dalgan	148811.09	278093.15
M24	RS30D010300	Dalgan	148045.55	274902.08
M25	RS30D010400	Dalgan	147532.16	271672.99
M26	RS34S020060	Sonnagh (Moy)	143997.84	299531.97
M27	RS34T010200	Trimoge	143788.89	291449.39
M28	RS34S020100	Sonnagh (Moy)	141481.40	303995.78
M29	RS34M030300	Mullaghanoe	141132.15	304868.27
M30	RS30R010030	Robe	141014.68	273662.93
M31	RS34T010300	Trimoge	139265.50	290925.89

			Grid References	
Reference	Station ID	River	Easting	Northing
M32	RS34M020500	Moy	139018.95	302368.92
M33	RS34G020100	Glore (Mayo)	138996.51	289493.10
M34	RS34Y020250	Yellow (Knock)	137928.38	286291.22
M35	RS34S050200	Swinford	136654.81	300471.68
M36	RS30B030100	Ballindine	136639.94	269183.61
M37	RS34S030100	Spaddagh	136343.75	298631.71
M38	RS34G020200	Glore (Mayo)	135070.94	291732.11
M39	RS30B030200	Ballindine	134977.27	270789.97
M40	RS34S050300	Swinford	134971.29	301405.82
M41	RS34Y020300	Yellow (Knock)	134729.14	286717.87
M42	RS34P010300	Pollagh	134201.25	292657.10
M43	RS30R010200	Robe	133936.43	271033.42
M44	RS34T010500	Trimoge	133024.70	296389.33
M45	RS34P010260	Pollagh	133004.27	290679.45
M46	RS34G030100	Gweestion	132911.50	295935.89
M47	RS34S030200	Spaddagh	132430.53	299299.28
M48	RS34P010100	Pollagh	132393.41	285983.32
M49	RS34Y010100	Yellow (Foxford)	132307.35	308563.31
M50	RS30R010250	Robe	132144.01	270221.82
M51	RS34G030200	Gweestion	130399.95	297538.22
M52	RS34Y010200	Yellow (Foxford)	129967.59	305902.96
M53	RS34M020650	Moy	129464.06	298558.87
M54	RS34B080400	Behy (North Mayo)	128854.46	318078.46
M55	RS30B020200	Black Shrule	128048.32	252616.41
M56	RS34M020700	Moy	127620.99	299329.69
M57	RS34M020800	Moy	127033.00	304729.04
M58	RS34G010100	Glenree	126940.32	317918.73
M59	RS34C070600	Carrowkeribly Lough Stream	126452.78	310464.32
M60	RS34M020750	Moy	126207.28	300770.66
M61	RS30R010400	Robe	125922.90	268623.40
M62	RS30B020300	Black (Shrule)	125601.24	249105.18
M63	RS34G010200	Glenree	125555.89	319333.20

			Grid References	
Reference	Station ID	River	Easting	Northing
M64	RS34L040200	Loughnaminoo Str.	125297.47	284320.21
M65	RS34C060200	Corroy	124804.31	313939.16
M66	RS34M021100	Moy	124676.14	318772.63
M67	RS34M021000	Moy	124475.27	317019.33
M68	RS34C010400	Castlebar	123360.34	294477.97
M69	RS34M010100	Manulla	123074.87	281168.26
M70	RS30B020400	Black (Shrule)	123022.74	248542.64
M71	RS34C010500	Castlebar	122863.74	300050.53
M72	RS30C090100	Cloondaver Str. Nth.	122455.09	273325.16
M73	RS34M010400	Manulla	122368.29	291103.77
M74	RS34C050200	Clydagh (Castlebar)	122286.68	296091.66
M75	RS34M010500	Manulla	121936.84	293360.16
M76	RS34M010300	Manulla	121323.29	288623.34
M77	RS34C010300	Castlebar	120995.17	293680.15
M78	RS34M010225	Manulla	120024.79	284572.71
M79	RS34M010200	Manulla	119971.73	284262.38
M80	RS30R010600	Robe	119542.70	264943.01
M81	RS30R010700	Robe	118121.16	264822.46
M82	RS34C030300	Cloonaghmore	117358.59	331448.60
M83	RS34C050100	Clydagh (Castlebar)	117214.93	294388.64
M84	RS34C010200	Castlebar	117072.94	292025.42
M85	RS30R010950	Robe	116851.40	264835.76
M86	RS34S060400	Slieveclaur	116478.95	320754.23
M87	RS34D010300	Deel Crossmolina	115808.01	319151.54
M88	RS34C030200	Cloonaghmore	115774.44	328606.43
M89	RS34C010180	Castlebar	115130.22	290738.99
M90	RS30A020300	Aille (Mayo)	114432.26	273591.85
M91	RS34C010100	Castlebar	114349.13	290406.87
M92	RS34C050030	Clydagh (Castlebar)	114329.33	296524.53
M93	RS30A020200	Aille (Mayo)	113461.73	277749.47
M94	RS34C030100	Cloonaghmore	112226.18	324804.65
M95	RS34D010100	Deel Crossmolina	112095.44	316017.92

			Grid References	
Reference	Station ID	River	Easting	Northing
M96	RS30S020400	Srah Stream	111921.82	272397.33
M97	RS30G010300	Glensaul	110344.03	267904.87
M98	RS33B010100	Ballinglen	110314.68	334110.84
M99	RS33B010200	Ballinglen	110140.55	338213.85
M100	RS33G020200	Glencullin (N Mayo)	109331.34	339229.40
M101	RS30O010200	Owenbrin	105629.23	262758.90
M102	RS32N010020	Newport	104385.39	297280.37
M103	RS32C050100	Carrowbeg	102282.97	282744.91
M104	RS30F030100	Finny	101101.53	258636.15
M105	RS34D010010	Deel Crossmolina	101084.21	315758.72
M106	RS30S030100	Srahnalong	100933.56	261427.38
M107	RS32G050080	Glenummera	84959.76	267494.42

Appendix 2. WFD Key Priority Polluted River Sites in Each County

Prioritisation of polluted sites is based on a metric which takes into account the severity of pollution, the certainty as to the causes and the number and impact of each of the individual pressures noted upstream of the site. They are also subdivided broadly into point or diffuse sources however it should be noted that issues such as bathing water or drinking water were not taken into account when selecting these priority sites.

Mayo

River	Station	Key pressures: point vs. diffuse	Comments
Aille (Mayo)	30A020010	Forestry	
Claureen (Mayo)	30C120400/0700	Diffuse: Agriculture	Agriculture – possible pig & poultry nutrient impacts
Bunowen (Louisburgh)	32B030150	Diffuse: Agricultural	Nutrient losses to water (also peat harvesting impacts)
Shanvolahan	34S010400	Diffuse: Forestry, peat harvesting, quarrying	
Carrowbeg (Westport)	32C050300	Point: Urban diffuse	CSOs – storm overflows
Clooneen (Mayo)	33C030050	Diffuse: Peat harvesting	Engineering works – Minor drainage works
Glaishwy	32G120100	Diffuse: Forestry	Forestry – clear-felling, siltation (landfill u/s)
Castlebar	34C010180/0200	Point: Municipal waste water	CSOs – storm overflows/diffuse urban
Bunnahowna	32B020100	Diffuse: Agriculture	Overgrazing effects
Glennamong	32G030100	Diffuse: Forestry	Eutrophication effects/acidification
Owengarve (Mayo)	32O020100/0200	Diffuse: Agricultural	Overgrazing effects
Lough Muck Stream	34L050600	Diffuse: Agricultural	Diffuse nutrient losses to water
Pollagh	34P010260	Point: Municipal waste water	Large municipal – EPA licensed
Manulla	34M010300 34M010500	Point: Municipal waste water Diffuse: Agricultural	Belcarra: but also agriculture likely Nutrient losses to water

River	Station	Key pressures: point vs. diffuse	Comments
Slieveclaur	34S060400	Diffuse: Agricultural	Diffuse nutrient losses to water
Dalgan	30D010200/0300/0400/0500	Point: Industrial	IPPC EPA licensed discharge & WWTP & agriculture
Cloondaver North Stream	30C090200	Diffuse: Engineering works	Diffuse agriculture plus possible DWWTs
Srah Stream	30S020400	Diffuse: Agricultural	Diffuse nutrient losses to water
Trimoge	34T010200	Point: Municipal waste water	Small municipal – EPA certified
Ballindine	30B030200 30B030100	Point: Municipal waste water Diffuse: Agricultural	Smaller municipal – EPA certified Diffuse u/s Ballindine
Robe	30R010030 30R010310/0400	Diffuse: Agricultural Point: Municipal waste water	Nutrient losses to water
Black Shrule	30B020300	Diffuse: Agricultural	Nutrient losses to water
Loughnaminoo Stream	34L040200	Point: Municipal waste water	Balla WWTP
Sonnagh (Moy)	34S020060	Point: Industrial	Quarrying
Glendavock	32G010100	Diffuse: Forestry	Clear-felling
Doolough Stream	33D020100	Forestry	
Belderg	33B020200	Diffuse: Forestry	Nutrient losses to water
Oughtagh	34O050400	Diffuse: Agricultural	Nutrient losses to water
Carroward	34C090300	Diffuse: Agricultural	Nutrient losses to water
Cloondaver North Stream 30	30D740200	Diffuse: Agricultural	Engineering works – land clearance & drainage

Galway

River	Station	Key pressure: point vs. diffuse	Comments
Woodford (Galway)	25W010040/0200	Point: Municipal waste water	Municipal waste water – Sub 500pe Cert of Authorisation (Forestry – 0040)
Ahascragh	26A010400	Point: Municipal waste water	Municipal sewage
Laurencetown Stream	26L070300/0500	Industrial	Industrial – Section 4
Shiven (South)	26S030040	Diffuse: Agricultural	
Clarinbridge	29C020300/0400	Point: Municipal waste water	Large municipal – EPA Athenry
Carra Stream	29C030900	Diffuse: Agricultural	
Kilcolgan	29K010200	Point: Municipal waste water	Municipal sewage
Eyrecourt Stream	25E010100/0200	Point: Municipal waste water	Smaller municipal – EPA certified
Abbert	30A010300	Diffuse: Agricultural	
Ballycuirke	30B140100	Point: Municipal waste water	Smaller municipal – EPA certified
Clare (Galway)	30C010800/0110 30C010100	Diffuse: Agricultural/ septic tanks/waste Point: Industrial	Investigative monitoring for 30C010800 long-term moderate status. IPPC
Invermore	30I010080/0500	Diffuse: Forestry	Forestry – eutrophication effects
Glennamucka Stream	30G040015	Diffuse: Agricultural	Diffuse nutrient losses to water
Kilcrow	25K010020-0500	Diffuse: Agricultural	Agriculture – intensive land use
Gortgarrow Stream	30G050025	Diffuse: Agricultural	Diffuse nutrient losses to water
Nanny (Tuam)	30N010300	Diffuse: Urban	CSOs – storm overflows
Terryland	30T010500	Diffuse: Urban	Urban diffuse – distributary of Corrib to swallow hole industrial estate & car parks, etc.
Owenriff (South Galway)	31O040300	Point: Industrial	Industrial – petrol station leak
Ballinaboy	32B070100/0300	Point: Aquaculture	Fish farming in u/s lake
Lisduff & Lisduff Stream (Kilcrow)	25L060100/0400 25L070050/0200	Diffuse: Agricultural & old mine waste	Agricultural – diffuse & heavy metals
Castlegar	26C030200 26C030100	Point: Municipal D0219-01 Diffuse: Agricultural	Municipal sewage

River	Station	Key pressure: point vs. diffuse	Comments
Sinking	30S010300/0400	Point: Municipal waste water	Smaller municipal – EPA certified
Culfin	32C040040	Point: Aquaculture	Fish farming in u/s lake
Suck	26S071500	Industrial IPPC	IPPC & Ballinasloe town discharges
Raford	29R010200	Diffuse: Agricultural	Diffuse nutrient
Lisduff Stream (Shannon)	25L070200	Diffuse: Agricultural	Agricultural – diffuse (metals also possible)
Dooghta	30D020100	Diffuse: Agricultural	Land-clearing and/or slurry spreading. Diffuse losses to water
Castlelodge	27C010700	Diffuse: Engineering & agriculture	Construction – Gort bypass N17 & ongoing agricultural impacts
Polleen	31P010100	Diffuse: Septic tanks	Extensive rubbish dumping noted in river
Levally Stream	30L070100	Diffuse: Agricultural	Diffuse nutrient losses to water
Barnacullia Stream	25B140100	Point Industrial	Old Tynagh mines

Source: EPA

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil, Pobal agus Rialtais Áitiúil.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail.
- scardadh dramhuisce
- dumpáil mara

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 1200 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil – aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe, Taighde agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.


CD

ENVIRONMENTAL PROTECTION AGENCY

An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle Estate, Co. Wexford, Ireland

Telephone: +353 53 9160600 Fax: +353 53 9160699
Email: info@epa.ie Website: www.epa.ie
LoCall 1890 33 55 99

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil