

2010 - 2015

EPA Water Quality in Ireland

## ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

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- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.



# Water Quality in Ireland 2010–2015

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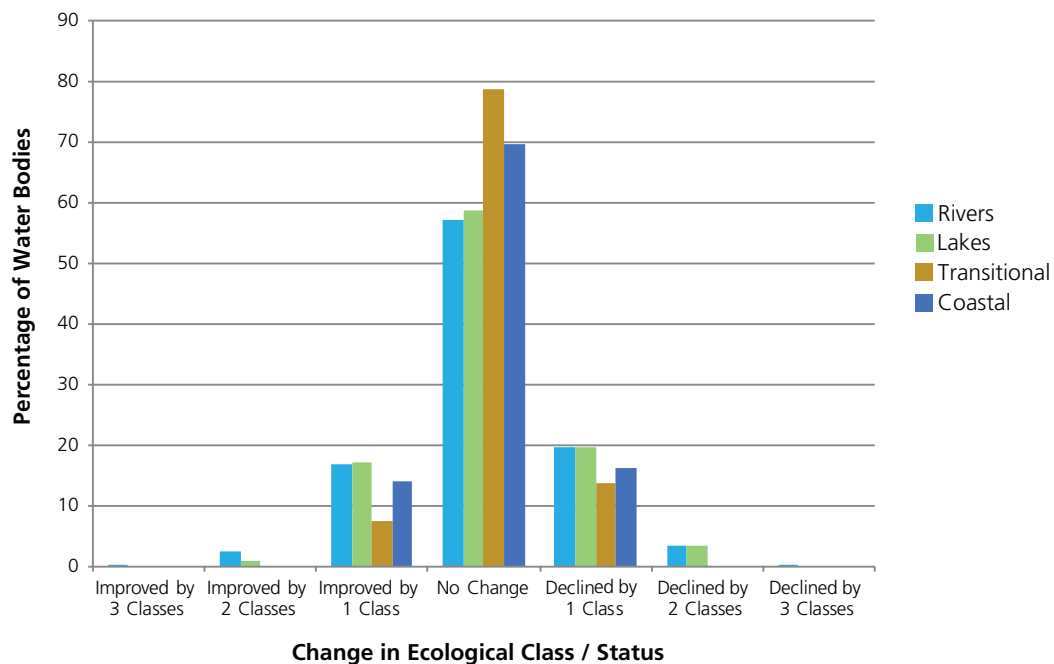
Main cover photo: Lough Carra in County Mayo (Source: Bryan Kennedy, EPA)



## Executive Summary

The quality of our surface waters has remained relatively static since 2007–2009 and improvements, planned for under the first river basin management cycle, have not been achieved. Nationally, 91% of groundwater bodies, 57% of rivers, 46% of lakes, 31% of transitional (estuarine) waters and 79% of coastal waters are achieving either good or high status under the Water Framework Directive (WFD).

While the national picture is relatively stable, some water bodies have improved while others have deteriorated, which highlights that not enough has been done to prevent deterioration of water quality (Figure 1). The EPA is currently assessing the reasons for these changes in water quality, both positive and negative, to help inform what actions are needed to protect and improve water quality.



**Figure 1:** Trends in the percentage of surface water bodies where the water quality has improved or deteriorated such as to cause an overall change in Water Framework Directive status class.

There were 1% and 2.6% declines respectively in high or good ecological status/potential of monitored river and lake water bodies since 2007–2009. The length of unpolluted river channel (Q4, Q4.5 and Q5 rivers) was static between 2007–2009 and 2013–2015 at 69% of the channel surveyed. There has been little net change in the quality of our monitored transitional water bodies since 2007–2009, with 69% of these water bodies classified as moderate or worse status during 2010–2015. 79% of coastal water bodies were classified as good or high status during 2010–2015. Groundwater quality remains good, with 99% of the groundwater underlying the country's area being at good status (91% of groundwater bodies). The quality of water in our canals remains very high.

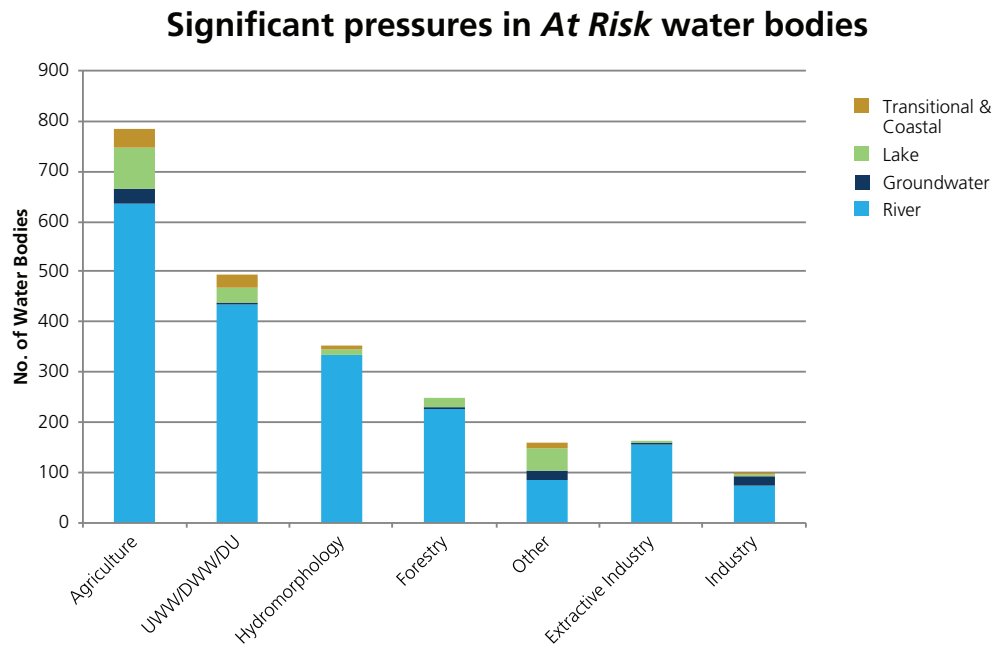
The reduction in the level of seriously polluted waters has continued, with only six river water bodies assigned bad status under the Water Framework Directive in 2010–2015 compared to 19 in 2007–2009. This is largely a result of the concerted effort led by the EPA to tackle these water bodies, called the 'red dots' programme.

At the other end of the scale, the worrying loss of the highest quality river sites has continued. This loss of high-status 'reference condition' sites ('Q5' sites) has been apparent over the past few decades: from 1.5% (no. 38) of sites in 2007–2009 to 1.0% (no. 27) of sites in 2010–2012 and 0.7% (no. 21) of sites in 2013–2015, compared with 13.4% of sites between 1987 and 1990 and 2.6% of sites between 2001 and 2003. The number of river water bodies assigned high status under the Water Framework Directive reduced from 287 in 2007–2009 to 245 in 2010–2015.

There has been an increase in the number of reported fish kills, with 97 reported between 2013 and 2015, an increase of 27 on the number reported between 2007 and 2009. The reason for this increase is unclear, but it may be a result of extended dry spells and/or flooding events, rather than a return to an increase in the number of serious pollution spills that would have been the main cause of fish kills in the past.

The EPA has been undertaking an assessment of the impact of human activities on the water environment over the past three years. This assessment is identifying the significant pressures that are contributing to water bodies being in a less than satisfactory condition or being at risk or deteriorating (Figure 2). Some initial outcomes of the review were included in the draft River Basin Management Plan. Nutrient losses from agriculture and domestic wastewater discharges are the primary reasons why the water quality objectives of the WFD will not be met. In relation to agriculture, the pressures relate to diffuse nutrient run-off (phosphorus and nitrogen) and sediment from land, and point source pollution associated with farmyards. In relation to wastewater, the primary pressure is from urban wastewater (UWW) discharges, but private wastewater (DWW) discharges, for example from septic tanks and diffuse urban (DU) discharges, which include losses from urban wastewater misconnections, are also significant contributors. Hydromorphological alterations to river, lake or coastal shoreline has a more direct impact on the ecology, while forestry and the extractive industries have an indirect impact on the ecology through the introduction of ammonium and sediment.

Elevated nutrient concentrations (phosphorus and nitrogen) continue to be the most widespread water quality problem in Ireland. In the freshwater environment, elevated concentrations of phosphorus are the primary reason for ecological impact in our rivers and lakes. While phosphorus concentrations have declined in recent decades, the downward trend appears to be tapering off and increases have been observed in some rivers since 2014. Nitrogen is a more significant factor in our transitional and coastal waters. Nutrient inputs into the marine environment have shown substantial decreases since 1990. However, the rate of decrease has slowed in recent years and in some cases the level of nutrient inputs to the marine environment has increased.



**Figure 2:** National summary of the significant pressures potentially causing water bodies to fail to meet their water quality objectives.

The level of pollution from hazardous substances is low, although some pesticides and herbicides, including Mecoprop, MCPA and 2,4-D, have been detected at low levels in a significant number of rivers during routine monitoring. Active management strategies for the sustainable use of plant protection products are being proposed by the National Pesticide and Drinking Water Action Group, with a view to minimising the risk of drinking water failures for those water bodies used for drinking water abstraction and their presence in the general water environment. Further information on the presence of MCPA and other plant protection products in drinking water can be found in the EPA Drinking Water Reports. Overall, the level of compliance with Environmental Quality Standards for hazardous substances remains high across all waters, which indicates that these substances are not a significant issue in the water environment in Ireland.

In summary, water status has been relatively static over the period of the first River Basin Management Plan and the improvements predicted during the first cycle have not been achieved. There are significant pressures on the water environment and there is also a clear challenge to be addressed in reversing the continuing loss of our highest status waters.

## 1. Introduction

### 1.1 Overview

This report provides an update on the status and trends in status of Irish waters (groundwater, rivers, lakes, canals, transitional waters and coastal waters) following the completion of the first six-year cycle of the Water Framework Directive (2010–2015). The data for individual water bodies for the period 2010–2015 were made publicly available through the new [www.catchments.ie](http://www.catchments.ie) website in 2016, and this report provides both a national and a catchment-level assessment of this data. The EPA in conjunction with local authorities and other public bodies has over the past three years undertaken a substantial characterisation of the physical water environment and the impact of human activities on waters, which is nearing completion and is being used to inform the next National River Basin Management Plan. Information flowing from this work will be made publicly available through [catchments.ie](http://www.catchments.ie) and has also been used to inform the assessments presented in this report. The EPA also consulted in 2016 on the content and format of the tri-annual Water Quality Report, with our stakeholders telling us that they wanted a stronger focus on the provision of data and summary assessments. Consequently, this report is a lot shorter than previous reports and should be read in conjunction with the information available through [www.catchments.ie](http://www.catchments.ie).

Summary assessments are presented for the first time for the 46 main catchments used for characterisation in the Republic of Ireland and between the Republic of Ireland and Northern Ireland. This enables the reader to see at a glance where water status is getting better or worse. This is an important step in developing a more targeted and localised evidence base that will support both better understanding and characterisation of the issues and pressures that need to be tackled and better targeting of measures needed to protect and improve water status. The report also contains analysis of the technical and scientific elements (ecological, chemical and physical) that influence water quality and are used to determine status, including water quality trend analysis. These elements are particularly important for supporting the identification of the causes of environmental impacts and for guiding the appropriate management of measures for the restoration and protection of waters. They also provide context for the core ‘one out, all out’ principle that is at the heart of the Water Framework Directive; that is, the principle that a failure of any one element leads to an overall failure in status.

### 1.2 Data Sources and National Water Monitoring Programmes

The underlying data for this report are sourced from the national monitoring programmes undertaken by the EPA, local authorities, Marine Institute, Inland Fisheries Ireland and Waterways Ireland. The WFD classification schemes provide the basis for describing the state of the aquatic environment, and for assessing the effectiveness of the programmes of measures in achieving the environmental objectives established through the river basin management planning process. A comprehensive and representative environmental water quality monitoring programme has been designed and implemented in Ireland (EPA, 2006) to support the implementation of the first river basin planning cycle. The WFD monitoring programme has been developing, with most of the programme in place since 2007 and some aspects added in subsequent years, specifically in relation to the coastal waters monitoring programme. The groundwater monitoring network consists of 336 monitoring sites. The river network consists of 3,193 monitoring sites covering 2,345 river water bodies. The lakes network consists of 216 lakes and nine reservoirs. The transitional waters network consists of

80 monitored water bodies and the coastal waters network consists of 43 monitored water bodies. Canals monitoring is undertaken on the Royal Canal, the Grand Canal (including the Barrow Line) and the Shannon–Erne Canal.

While the EPA has overall responsibility for the design and management of the monitoring programme, it has assigned responsibility for certain elements to other public bodies, including local authorities, Inland Fisheries Ireland, the National Parks and Wildlife Service, Waterways Ireland and the Marine Institute. The river network was recently reconfigured, resulting in a reduction in the overall number of water bodies from 4,565 to 3,192, and the overall programme is currently undergoing a review using the information gained from the characterisation process for the second river basin planning cycle.

The data presented in this report are available at a water body and monitoring station level via the [catchments.ie](http://catchments.ie) website. This website was developed collaboratively by the Department of Housing, Planning and Local Government, the Local Authority Waters and Communities Office and the Environmental Protection Agency (EPA) in 2016 to make it easier for people to get information about water quality in Ireland. In addition to providing access to data, the site provides easy access to a large range of information connected to our water environment including stories of good practice that we can all learn from when working out what to do to protect our local water catchments.

## 2. RIVERS

### 2.1 Introduction

Ireland has over 70,000 km of river channel with streams, rivers and tributaries flowing through almost every parish and townland in the country. The national river monitoring programme is designed to provide representative information on our entire river network through the monitoring of discrete sections of river called water bodies. There are now 3,192 river water bodies in Ireland and the national river monitoring programme is designed to obtain sufficiently representative information to assign a status to each of these water bodies.

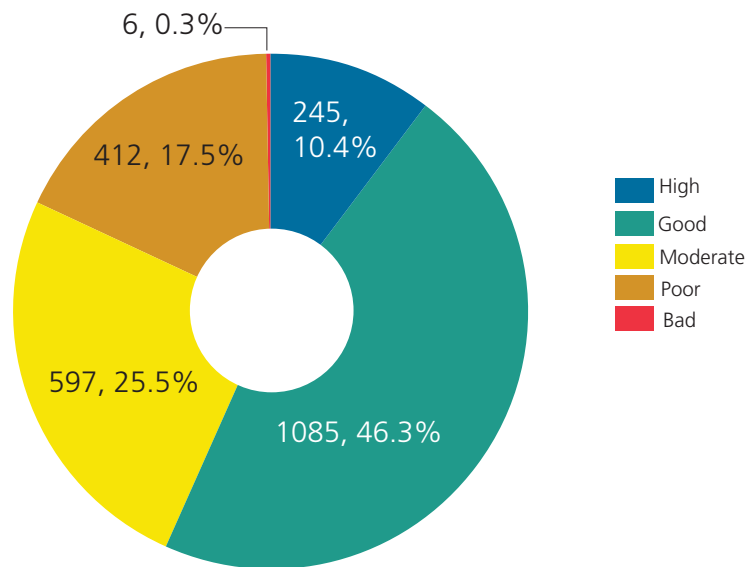
### 2.2 Summary for Rivers

- ▲ 1,330 monitored river water bodies (57%) were classified as being at high or good ecological status
- ▲ 1,015 monitored river water bodies (43%) were classified at less than good ecological status.
- ▲ Nationally there has been a 1% decline in the number of high or good ecological status river water bodies in 2010–2015 when compared with the status reported in the first RBMP in 2007–2009.
- ▲ A significant decline was observed in the number of high ecological status river water bodies from 287 in 2007–2009 to 245 in 2010–2015.
- ▲ The number of monitoring sites classified as Q5 reference sites has declined from 1.5% (no. 38) of sites in 2007–2009 to 1.0% (no. 27) of sites in 2010–2012 and 0.7% (no. 21) of sites in 2013–2015, compared with 13.4% of sites between 1987 and 1990 and 2.6% of sites between 2001 and 2003.
- ▲ The length of unpolluted channel (Q4, Q4.5 and Q5 rivers) was static at 69% of the channel surveyed between 2007–2009 and 2013–2015.
- ▲ 1,227 river water bodies remained stable with no ecological status change when compared with the assessments in 2007–2009 and 2010–2015.
- ▲ 418 river water bodies exhibited an improvement in ecological status while 499 river water bodies declined in status between 2007–2009 and 2010–2015.
- ▲ The number of bad status river water bodies declined from 19 in 2007–2009 to six in 2010–2015. The EPA 'red dot' programme has been highly successful in driving measures for improvement at such locations.
- ▲ 21% of river water bodies failed to achieve their chemical status objective; but only 6% (thirteen river water bodies) of these were not caused by failures for mercury and polycyclic aromatic hydrocarbons (PAHs) i.e. parameters that are ubiquitous in the water environment across Europe, and those that did fail were mainly for heavy metals in historically mined areas.
- ▲ Macroinvertebrates on their own, or in combination with other elements, are responsible for determining ecological status in 93% of the monitored river water bodies.
- ▲ 97 fish kills were reported in the 2013–2015 period, which represents an unwelcome change when compared to 72 fish kills between 2007 and 2009 and 70 fish kills between 2010 and 2012.

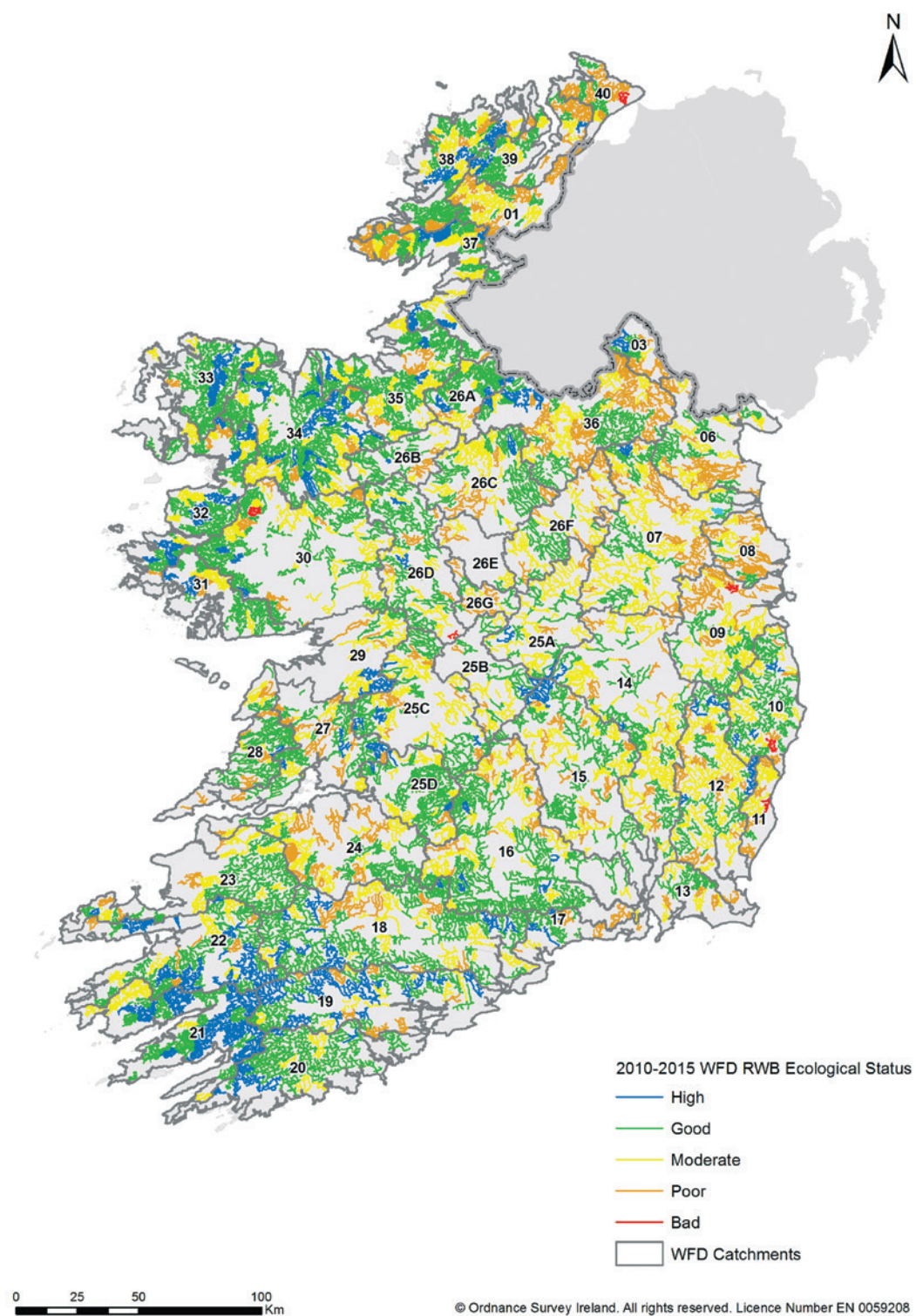


## 2.3 National Ecological Status

1,330 (57%) of monitored river water bodies were at high or good ecological status, with 1,015 (43%) at less than good ecological status (Figure 2.1). Map 2.1 illustrates the geographical distribution of ecological status for monitored river water bodies. The more densely populated and economically developed eastern and north-eastern parts of the country are most affected by water quality issues.



**Figure 2.1:** Ecological status of river water bodies 2010–2015 (labels show number of water bodies, percentage of water bodies).



**Map 2.1:** The ecological status of monitored river water bodies 2010–2015.

## 2.4 Catchment Level Ecological Status

Figure 2.2 presents a summary of river water status by catchment for each of the 46 catchments. The catchments with best river water quality are located mainly in the west and south-west of the country. Over 80% of the river water bodies monitored in the Bandon llen, Dunmanus Bantry Kenmare, Blacksod–Broadhaven, Errif–Clew Bay and Laune–Maine–Dingle Bay catchments were at satisfactory, i.e. high or good, ecological status in the latest survey period. The catchments with the lowest percentage of satisfactory river water bodies were located mainly in the east, south-east and midlands. Less than 40% of the river water bodies monitored in the catchments Foyle; Newry, Fane, Glyde and Dee; Boyne; Nanny–Delvin; Liffey and Dublin Bay; Owennavorrhagh; Shannon Estuary South; and two catchments in the Upper Shannon (26E and 26F) were at satisfactory ecological status.

## 2.5 Chemical Status

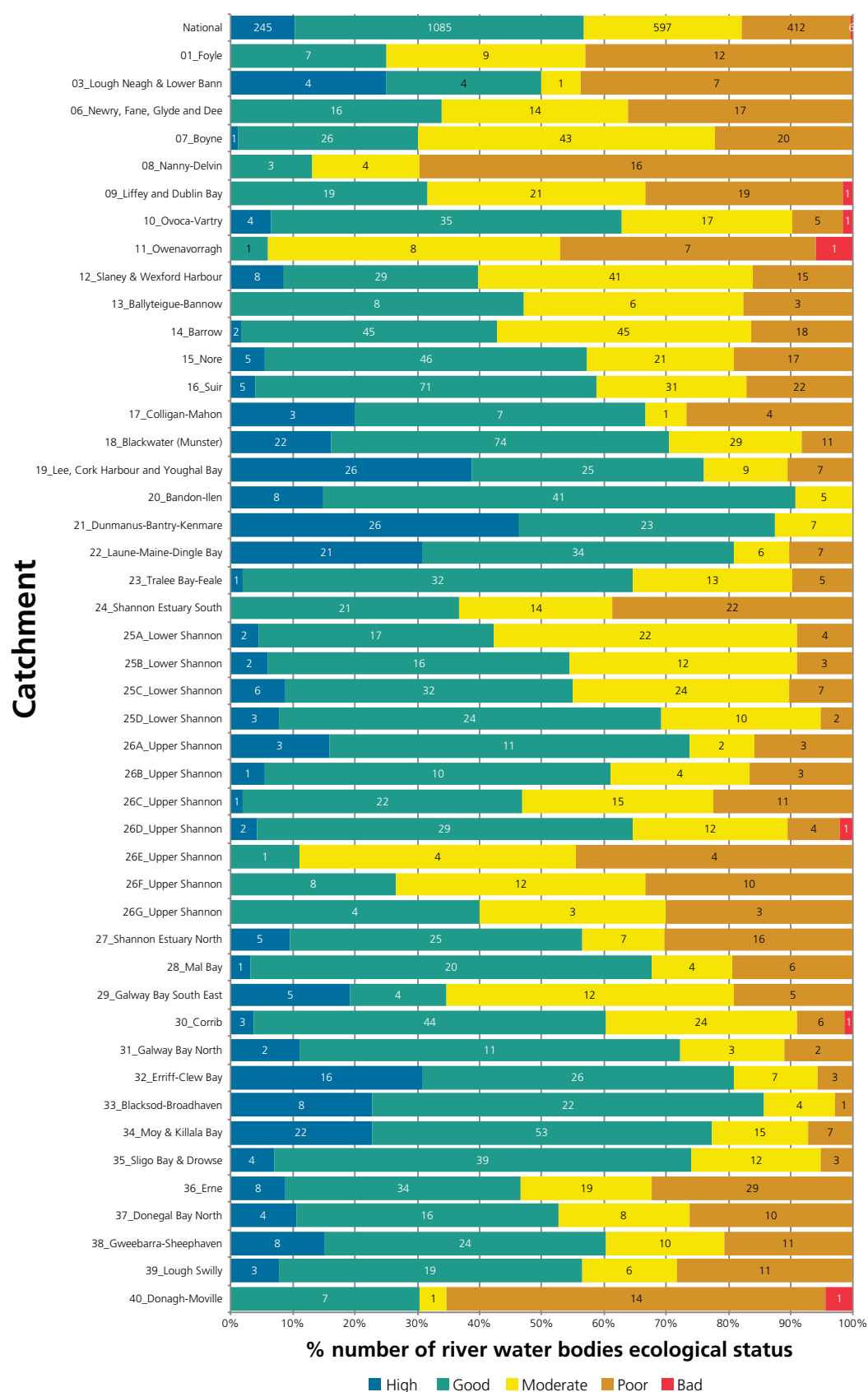
Chemical status is assessed by compliance with environmental standards for priority substances and priority hazardous substances that are listed in the Water Framework Directive (Annex X as amended) and the Environmental Quality Standards Directive (2008/105/EC). These priority substances and priority hazardous substances include metals, pesticides and various industrial chemicals. In total, data were available for 227 river water bodies in 2010–2015 and 47 (21%) of these water bodies failed to meet their chemical status objective, which included 33 surveillance water bodies. The parameters failing related to mercury in biota, PAHs and a small number of failures for heavy metals, Isoproturon (1 sample) and Hexachlorobutadiene (2 samples). The overall level of confidence for most PAH failures is low due to analytical performance i.e. current Limits of Quantification (LoQ) for most PAHs are inadequate to demonstrate compliance with the relevant Environmental Quality Standards (EQS). In summary, of the 21% of river water bodies that failed to achieve their chemical status objective, only 13 (6%) river water bodies were not failures for mercury and PAHs, i.e. parameters that are ubiquitous in the water environment across Europe, and those that did fail were mainly heavy metals in historically mined areas with elevated concentrations. Additional information on chemical assessments is provided at the end of this chapter in section 2.10.

## 2.6 Nutrients

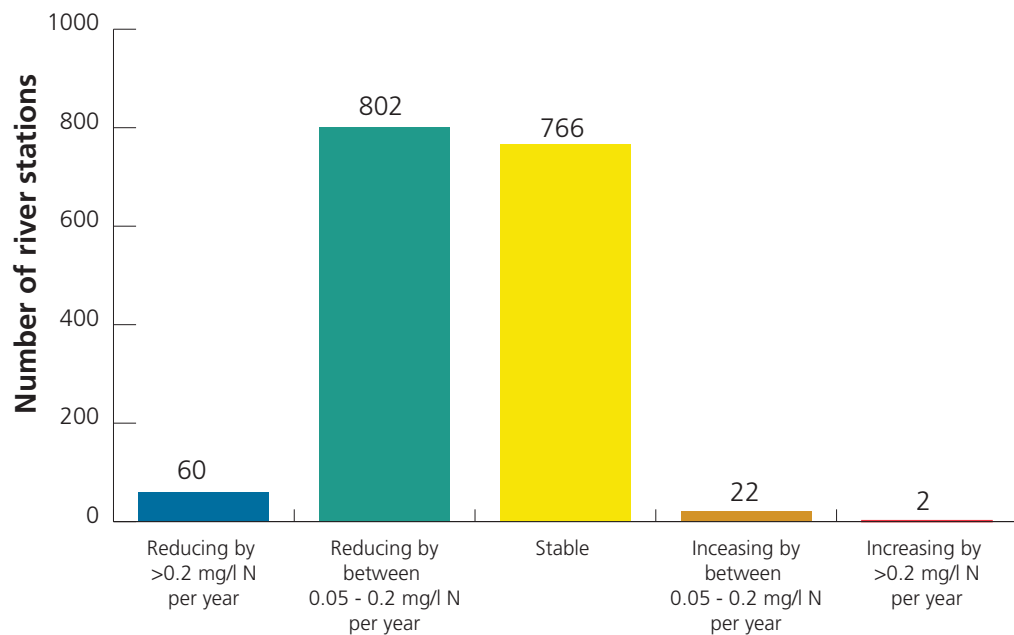
Figure 2.3 shows that there is a widespread pattern of reducing nitrogen concentrations in rivers nationally since the commencement of the WFD monitoring programme in 2006. However, a small number of monitoring stations indicate increasing trends in nitrogen, and upward trends in total nitrogen are being seen in several of the estuaries since 2010, including the Bandon, Blackwater, Boyne, Nore, Slaney and Tolka estuaries.

Phosphorus concentrations in rivers appear to be relatively stable nationally (Figure 2.4). Twenty-three of 1,654 stations showed evidence of strongly increasing phosphorus concentrations. In most cases these are close to wastewater treatment plant discharges. However, as with nitrogen, there appear to be upward trends in phosphorus concentrations in some rivers since 2013, although nationally concentrations remain lower than in 2007–2009.

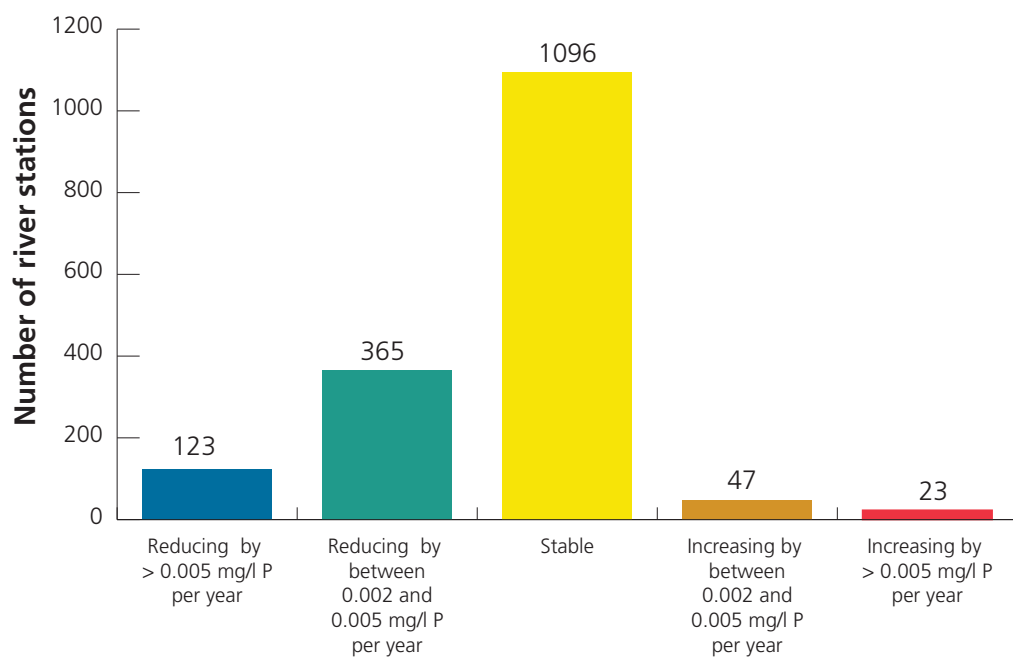
Overall, there has been a marked reduction in both nitrogen and phosphorus levels in Irish rivers over the past 20 years, which is very welcome and should have a positive impact on transitional and coastal waters. Significant decreases in the nitrogen load to transitional and coastal waters have been seen over the same period and the reductions indicate the success of national measures aimed at reducing the loss of nutrients from terrestrial sources to surface waters. However, the rate of decrease has slowed in recent years and in some locations, the level of nutrient inputs to the marine environment has increased.



**Figure 2.2:** Ecological status of monitored river water bodies at the catchment level for 2010–2015.



**Figure 2.3:** Total oxidised nitrogen linear regression trends for stations with 8 or more samples in 2006–2015.



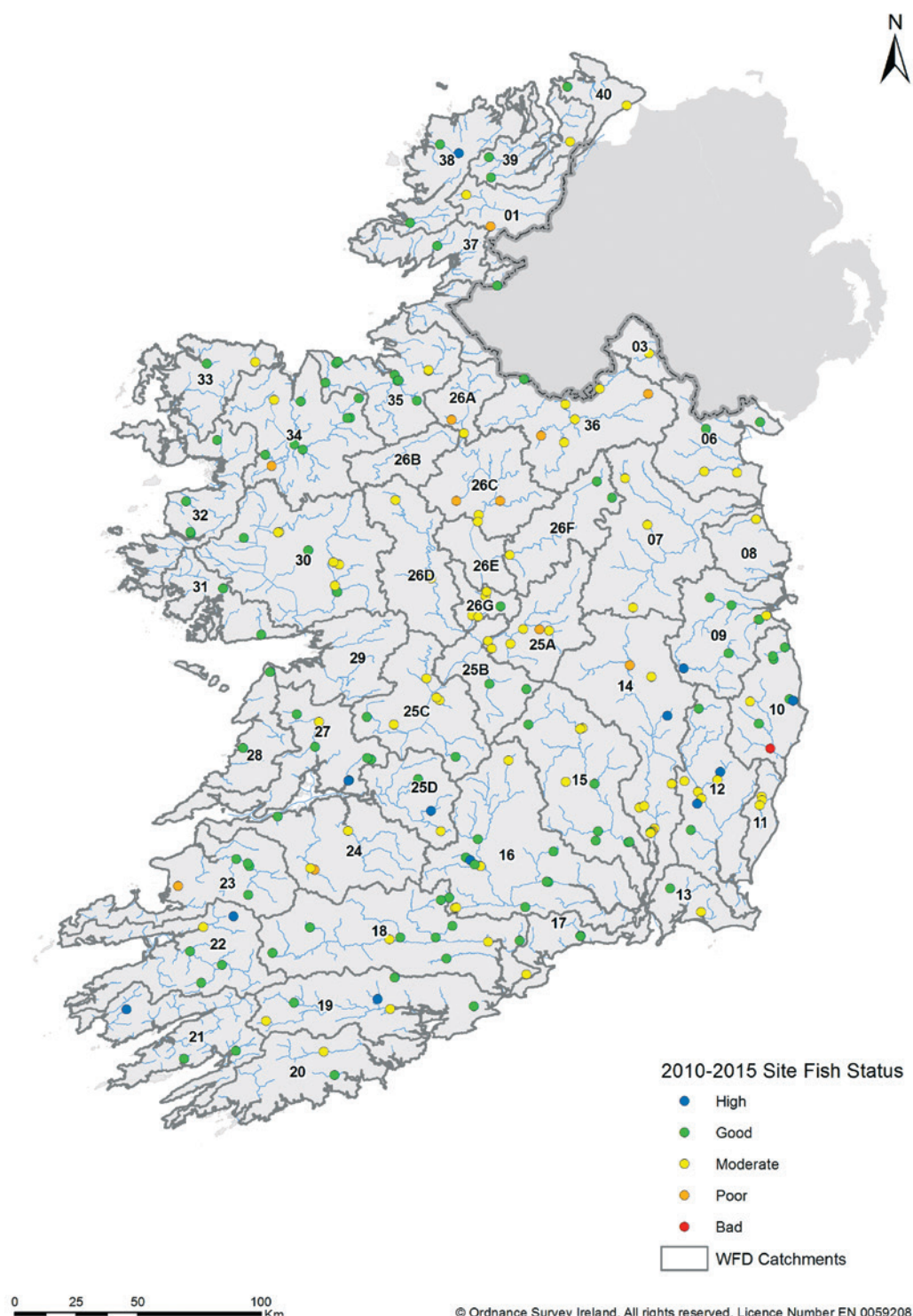
**Figure 2.4:** Phosphorus linear regression trends for stations with eight or more samples (MRP) in 2006–2015.

## 2.7 Fish Status and Fish Kills

Inland Fisheries Ireland has undertaken monitoring of 161 surveillance river water bodies since 2008. Fish data on an additional 12 operational river water bodies were included in the ecological status assessment, as these surveys were considered part of the surveillance river water body network before the water bodies were reconfigured. Map 2.2 shows that 57% of river sites surveyed across the country were of high or good status in relation to fish, 38% of sites were at moderate status, 6% of sites were at poor status, while 0.5% of sites were at



bad status. A total of 130 river water bodies remained stable with no change in the ecological condition of fish between 2010–2012 and 2013–2015. Declines in the condition of fish were observed in 18 of the monitored river water bodies, with an improvement in eight river water bodies observed between 2010–2012 and 2013–2015.<sup>1</sup>

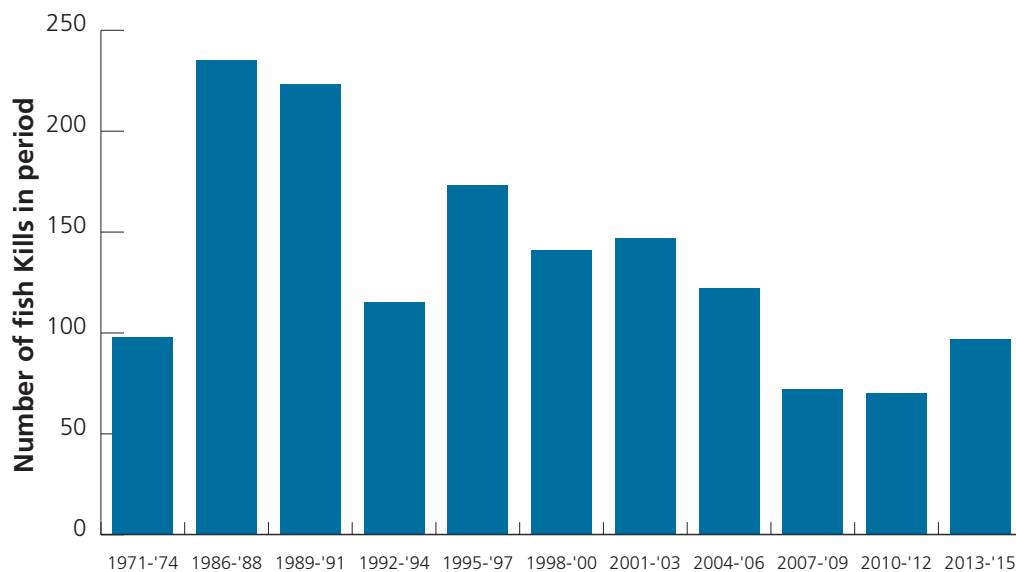


**Map 2.2:** Fish biological quality in Irish rivers 2010–2015 (Source: Inland Fisheries Ireland).

<sup>1</sup> 2010–2012 was chosen for comparison due to unsuitable weather conditions in 2008 and 2009, which prevented the completion of many of the scheduled river fish surveys during 2007–2009.

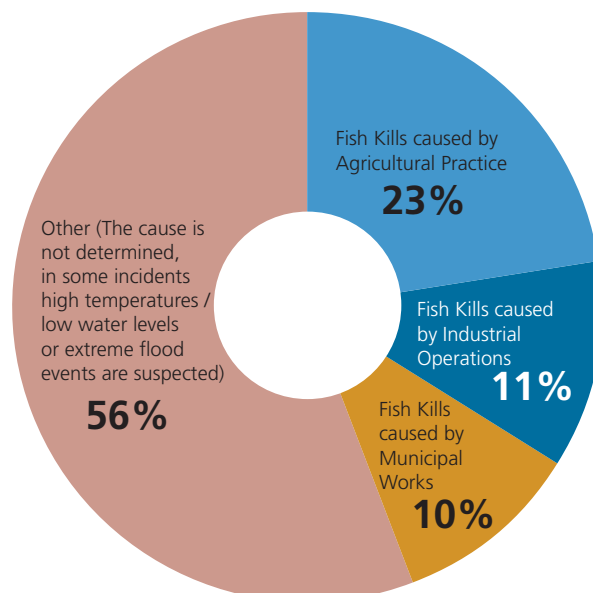


The total number of reported fish kills in 2013–2015 was 97, which represented an unwelcome change in the trend with an increase in fish kills compared to 2007–2009 and 2010–2012 (Figure 2.5).



**Figure 2.5:** Number of reported fish kills since 1971 (Source: Inland Fisheries Ireland).

Where possible, Inland Fisheries Ireland attribute fish kills to a few categories (Figure 2.6). However, usually the exact cause is unknown and multiple factors may have resulted in the fish kills. Nonetheless, it's clear that extended dry spells and/or flood events can result in fish kills, whereas in the past fish kills were more frequently attributed to spills and discharges, which, like the seriously polluted 'red dot' river sites, have steadily been reducing in number through the years.

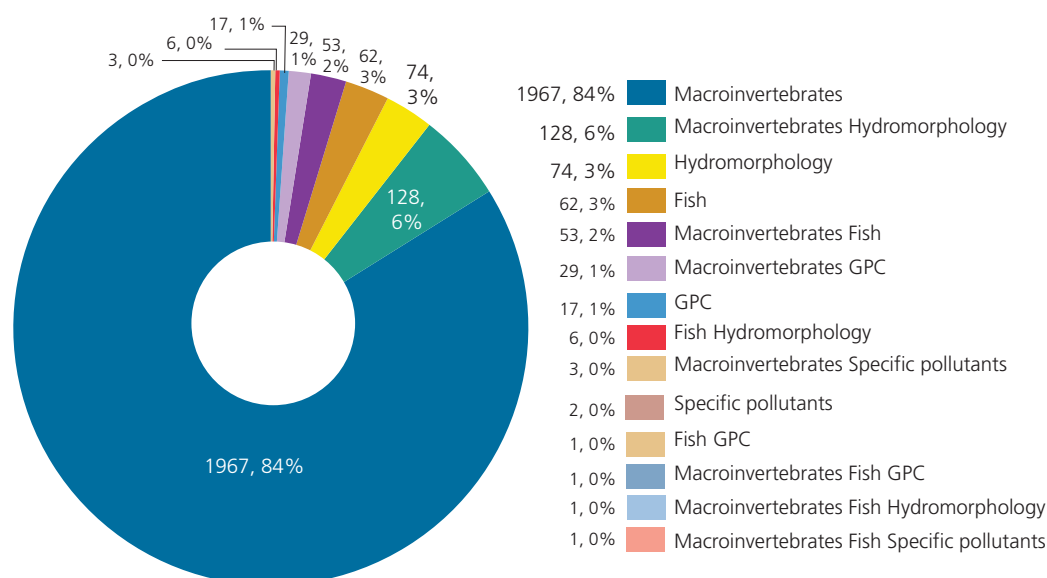


**Figure 2.6:** Suspected causes of fish kills 2013–2015 (Source: Inland Fisheries Ireland).

## 2.8 Factors Determining Ecological Status

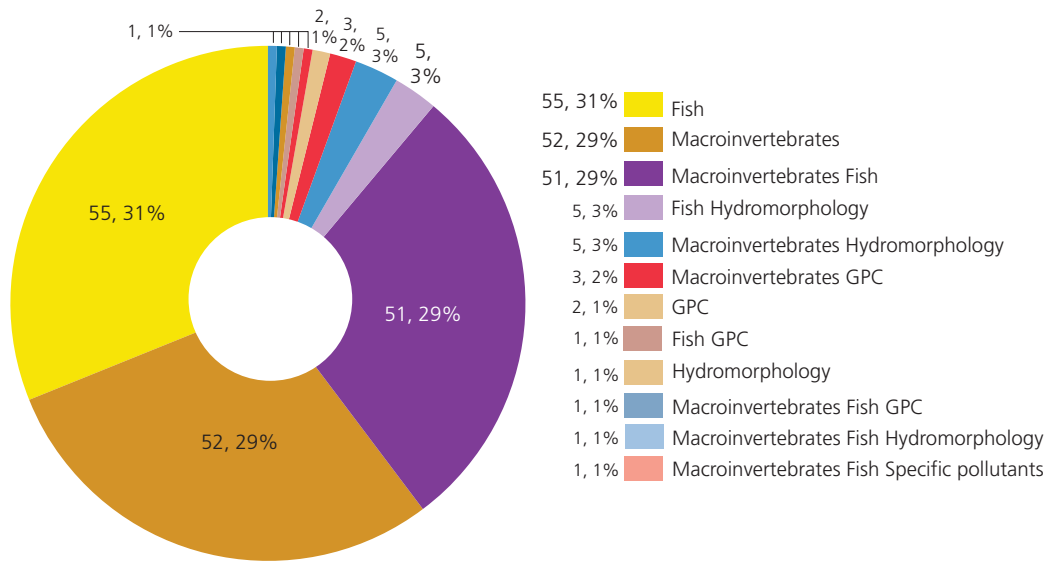
Macroinvertebrates, as an individual element or in combination with other elements, are responsible for determining ecological status in 93% of the monitored river water bodies (Figure 2.7). This is not unexpected as the macroinvertebrates are the main biological quality element surveyed at all monitoring sites. The macroinvertebrate monitoring and assessment method (Q-value system) is the most sensitive ecological assessment method available for detecting organic pollution and nutrient enrichment impacts on Irish rivers.

During the 1990s the proportion of unpolluted channel length (based on the macroinvertebrate Q value system) declined from 77% to 67% because of slight–moderate pollution. Over the years the proportion of satisfactory channel only marginally improved, with 69% of surveyed channel classified as being in satisfactory condition, which is the same percentage as was found in 2007–2009 (EPA, 2016).

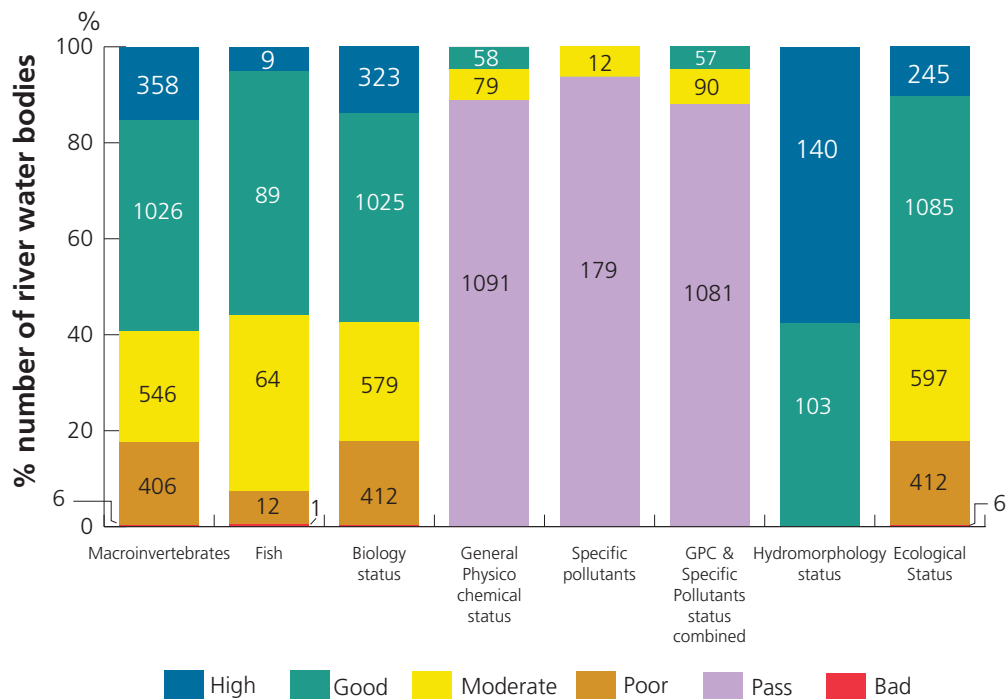


**Figure 2.7:** Elements determining river status at monitoring locations during 2010–2015 (labels show number of water bodies, percentage of water bodies).

Fish are not monitored at all operational sites. In the surveillance river water bodies the macroinvertebrates and fish quality elements were the main drivers of ecological status (Figure 2.8). The fish biological quality element results were the critical element that determined ecological status at 31% (55) of the monitored surveillance river water bodies (Figure 2.8). General physico-chemical parameters and specific pollutants downgraded a small number of river water bodies. Hydromorphology, which is considered for high-status sites, led to 103 river water bodies being classified as good rather than high status (Figure 2.9).



**Figure 2.8:** Elements determining river ecological status at surveillance monitoring locations during 2010–2015 (labels show number of water bodies, percentage of water bodies).



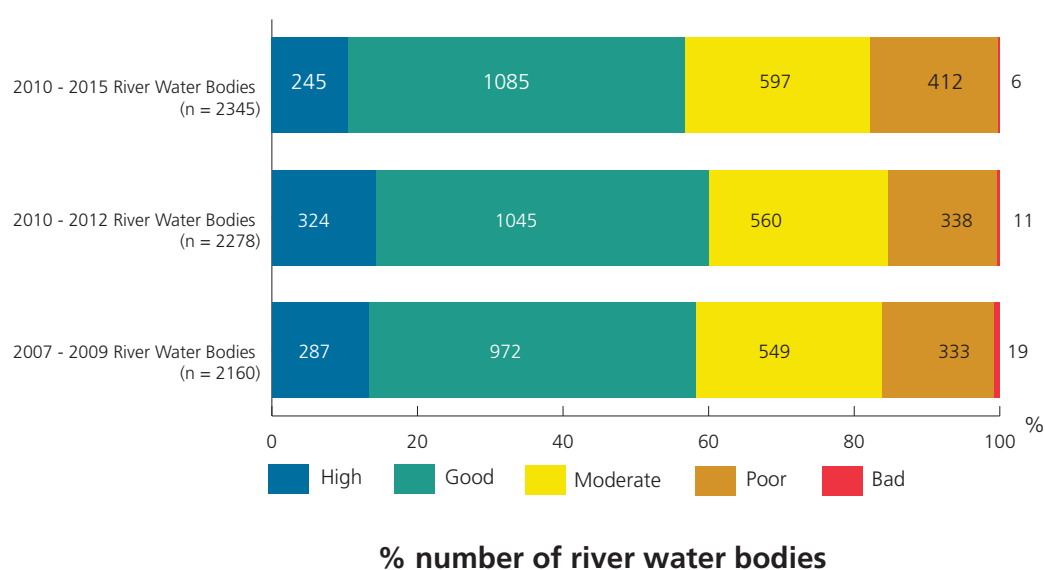
**Figure 2.9:** Overall ecological status and results based on quality elements and supporting elements.<sup>2</sup>

<sup>2</sup> Bars show percentage of assessed water bodies, with actual numbers noted on bar.

## 2.9 Changes and Trends

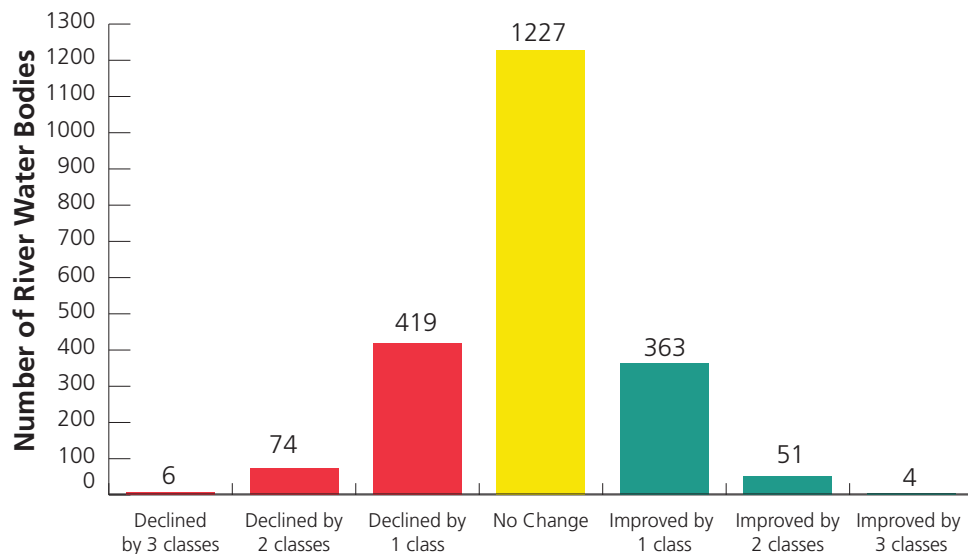
Figure 2.10 provides a summary of the total number of monitored river water bodies within each ecological status class across the last three survey periods based on the new river water body delineations. The percentage of satisfactory (high or good) river water bodies improved from 58% in 2007–2009 to 60% in 2010–2012 but declined to 57% in 2013–2015. The number of river water bodies classified as satisfactory declined by 1% since 2007–2009, the start of the WFD monitoring period, when comparison is made with the 2013–2015 monitoring period, i.e. the end of the first river basin management cycle. A similar trend was observed when comparing the 2,144 common river water bodies that were surveyed in both the 2007–2009 and 2010–2015 survey periods.

The number of bad status river water bodies declined from 19 in 2007–2009 to six in 2010–2015, indicating that the ongoing EPA 'red dot' programme has been highly successful in driving measures for improvement at these seriously polluted locations.



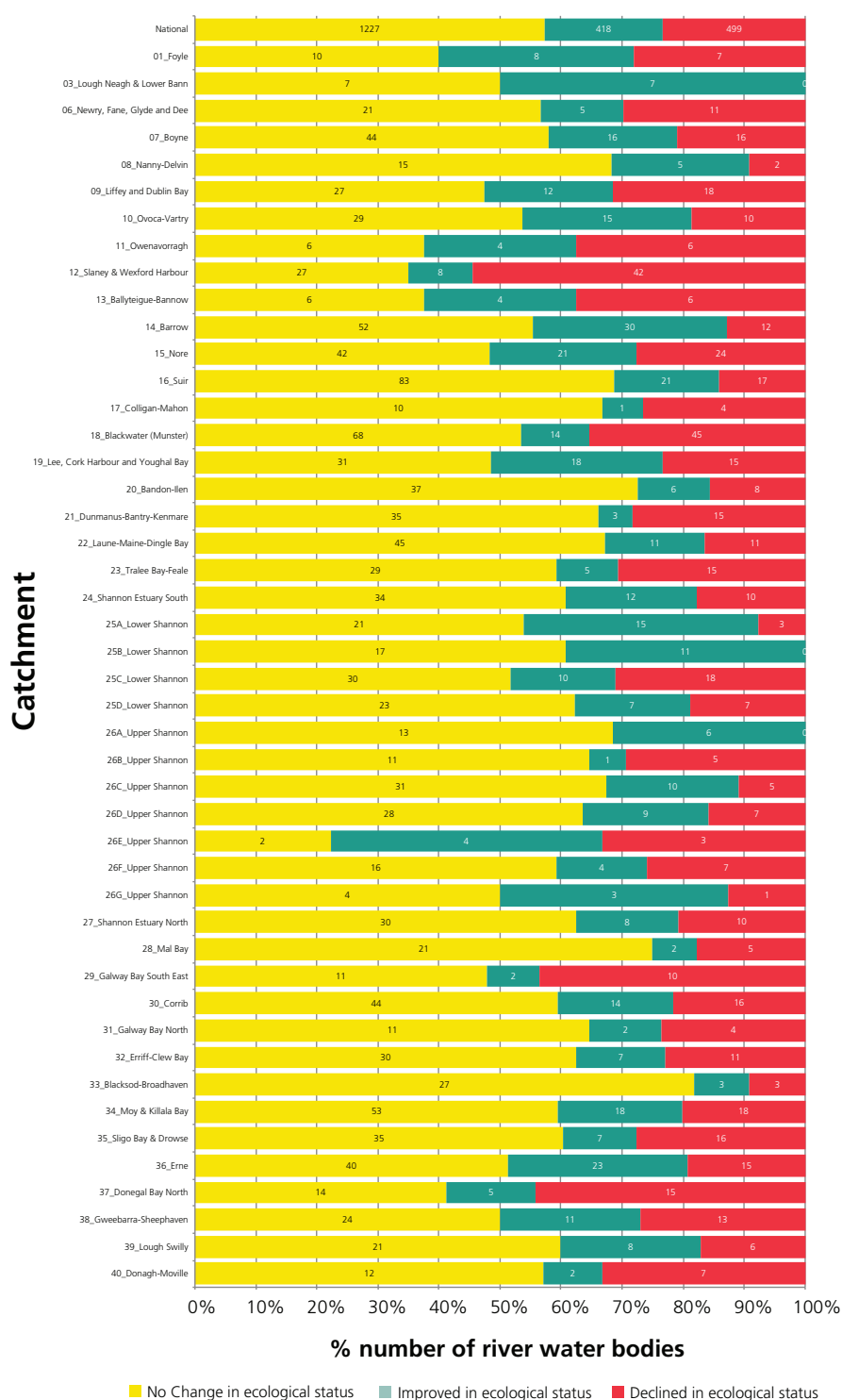
**Figure 2.10:** Change in ecological status for all river water bodies monitored in each survey period since 2007.

On the national scale 1,227 river water bodies remained stable with no ecological status change when the 2007–2009 and 2010–2015 periods were compared. A total of 418 river water bodies exhibited an improvement in ecological status, while 499 river water bodies declined in status between the survey periods (Figure 2.11).



**Figure 2.11:** Changes in ecological status of river water bodies between 2007–2009 and 2010–2015.

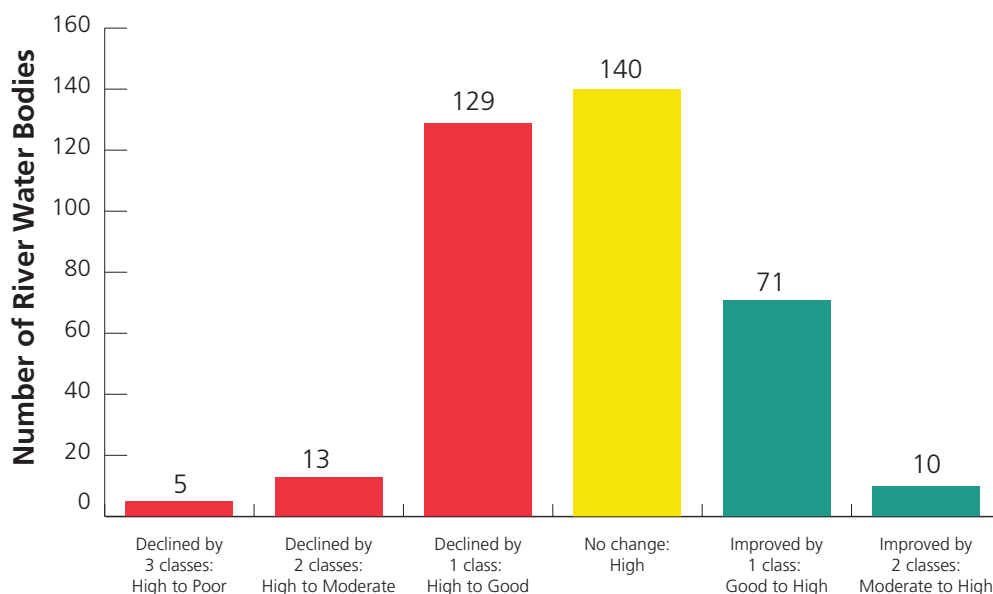
Figure 2.12 summarises the changes in ecological status across the catchments between 2007–2009 and 2010–2015. The Blackwater-Munster and Slaney & Wexford Harbour catchments had the highest number of declines in ecological status. The Nore, Liffey and Dublin Bay, Suir, Moy & Killala Bay and lower Shannon (25C) catchments also had significant declines in ecological status. There were no declines in river water bodies' status in the Lough Neagh & Lower Bann, Lower Shannon (25B) and 26A Upper Shannon catchments when the two periods were compared. The best net improvers were in the south-east (Barrow), lower Shannon (25A & 25B) and north-west (Erne, upper Shannon (26A), Lough Neagh & Lower Bann). The Dunmanus–Bantry–Kenmare catchment, although having over 85% of its monitored river water bodies at high and good ecological status, exhibited declines in 15 river water bodies between 2007–2009 and 2013–2015; the majority (nine) of these were losses from high to good status.



**Figure 2.12:** Changes in ecological status by catchment between 2007–2009 and 2010–2015.

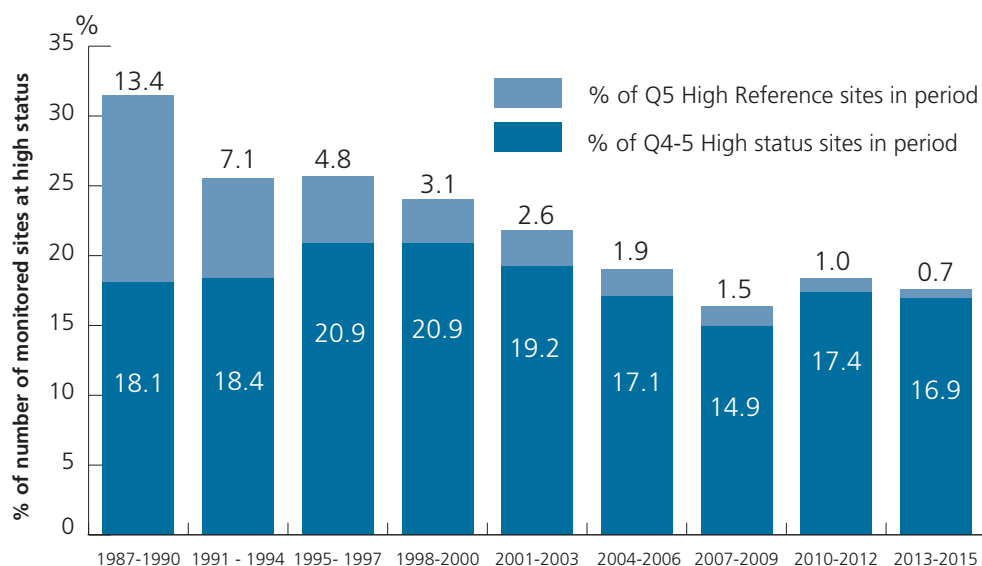
A total of 245 river water bodies were classified at high ecological status in 2010–2015. This represented an overall 1% decline in high status river water bodies when compared with 2007–2009. On the national scale, Figure 2.13 indicates that 140 high-status river water bodies remained stable, with no ecological status change when compared with 2007–2009. Eighty-one river water bodies improved to high ecological status while 147 river water bodies declined from high ecological status between the survey periods.





**Figure 2.13:** Changes in high ecological status river water bodies between 2007–2009 and 2010–2015.

Worryingly, the percentage number of sites assigned to the Q5 high status reference condition continued to decline (Figure 2.14). The number of monitoring sites classified as Q5 reference sites has declined from 1.5% (no. 38) of sites in 2007–2009 to 1.0% (no. 27) of sites in 2010–2012 and 0.7% (no. 21) of sites in 2013–2015, compared with 13.4% of sites between 1987 and 1990 and 2.6% of sites between 2001 and 2003.



**Figure 2.14:** Long term trends (1987 - 2015) in the percentage number of high ecological quality (macroinvertebrate) river sites (Q5 and Q4-5) in each survey period.

## 2.10 Other Chemical Assessments

There are currently around 350 'active substances' approved for use in Ireland, of which many are plant protection products or biocides. During 2013–2015 the analysis was focused on the screening of 14 substances totalling 9,464 measurements (Table 2.1). None of the pesticide substances monitored exceeded their annual average EQS (where applicable) during 2013–2015.

Overall there were 395 samples with pesticide detections (4.2%) affecting 72 of the 85 rivers assessed. MCPA was the most widely observed substance, detected in almost two-thirds of all rivers surveyed. Most values (86%) were <0.1 µg/l with six exceeding 0.2 µg/l. The highest value was recorded in 2013 (18 µg/l) in the Banoge River (Co. Wexford). Mecoprop was the next most abundant substance, found in 44% of rivers surveyed. Concentrations were typically <0.2 µg/l.

**Table 2.1:** Summary of pesticide analysis for rivers during 2013–2015.

Pesticide	No. of samples	No. of rivers	No. of detects (%)	No. (%) of rivers affected
Glyphosate*	790	79	21 (2.7%)	4 (5.1%)
Linuron*	794	78	13 (1.6%)	10 (12.8%)
Diuron*	794	77	6 (0.76%)	6 (7.8%)
Atrazine*	806	77	3 (0.3%)	3 (3.9%)
Simazine*	806	78	1 (0.12%)	1 (1.3%)
MCPA	868	83	166 (19.1%)	53 (63.8%)
Mecoprop	797	79	69 (8.7%)	35 (44.3%)
2 6-Dichlorobenzamide	705	75	49 (7.0%)	33 (44%)
Dichlobenil	704	75	21 (3.0%)	15 (20.0%)
2 4-D	797	78	28 (3.5%)	22 (28.2%)
Isoproturon	794	78	12 (1.5%)	11 (14%)
Malathion	29	18	4 (13.8%)	4 (22.2%)
AMPA	777	74	1 (0.1%)	1 (1.4%)
Triclopyr <sup>3</sup>	3	1	1 (33.3%)	1 (33.3%)
* Substances for which an EQS value has been established				

The main areas where metals are frequently found at elevated concentrations are in the traditional mineral mining areas – most notably in Co. Wicklow and Co. Tipperary. The Avoca, Drish, Rossestown and Yellow, and Kilmastulla rivers accounted for a largest proportion of the cadmium, lead, chromium and zinc exceedances. Like copper, zinc is ubiquitous being found virtually everywhere. Its presence is often linked to areas rich in lead ore albeit it is also a common plumbing metal. Of the 8,030 results, covering 228 rivers, EQS exceedances were observed in six rivers, all but one of which are in historic mining areas. Of the 2,796 results covering 131 rivers there were just five stations which exceeded the annual average-EQS with sufficient measurement confidence. These stations are in historic mining areas. Of the 2,761

3 Data supplied by local authorities

samples analysed for lead, covering 132 rivers, only four stations exceeded the annual average-EQS. Of the 7,978 copper results covering 226 rivers there were only three which exceeded the EQS. Of the 132 rivers surveyed for nickel only two showed any EQS exceedances. For mercury, of the 2,774 results, covering 132 rivers, 26 samples yielded detectable levels. These ranged from <0.01 µg/l to 0.31 µg/l with the highest value being recorded in one sample on the Blackwater (Munster) at Lismore. None of the 132 rivers surveyed for arsenic or chromium showed evidence of breaches of the EQS. Of the 2,655 results covering 132 rivers there were no Annual Average-EQS exceedances for chromium. Table 2.2 summarises the data analysed for metals in rivers during 2013–2015.

**Table 2.2:** Metal concentrations in rivers in 2013–2015.

Metal	No. results	Typical limit of detection (µg/l)	% detected	Annual average EQS	No. of river stations exceeding the annual average EQS
Zinc	8,030	0.5–20	86.9%	8, 50, or 100*	12
Cadmium	2,796	0.02–0.5	33.8%	≤0.08–0.25*	5
Lead	2,761	0.5–1	9.1%	7.2	4
Copper	7,978	0.5–1	81.6%	5 or 30	3
Nickel	2,697	0.5–1	46.3%	20	2
Mercury	2,774	0.02–0.5	0.94%	0.05	1
Arsenic	2,697	0.5–1	25.7%	20	0
Chromium	2,655	0.5–1	63.7%	4.7 (as Cr <sub>3</sub> )	0
* Annual Average-EQS depends on river typology					

The Marine Institute undertook a survey of fish to assess the presence of a range of hazardous substances including hexachlorobenzene (HCB), hexachlorobutadiene (HCBd), organo-chlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), polybrominated diphenylethers (PBDEs) and mercury. These data are summarised in Table 2.3.

**Table 2.3:** Summary of hazardous substances in biota in 2010–2012 and 2013–2015.

Substance	EQS (biota)	Observed range (mean) (µg/kg)	
		2010–2012	2013–2015
Hexachlorobenzene	10 µg/kg	<0.02–0.023 (Mean 0.020)	0.1–0.49 (Mean 0.36)
Hexachlorobutadiene	55 µg/kg	0.06–0.34 (Mean 0.013)	0.02–0.15 (Mean 0.094)
Cyclodiene pesticides	n/a	<0.01–0.18 (Mean 0.03)	0.007–0.30 (Mean 0.028)
Heptachlor Epoxide	0.0067 µg/kg	<0.01–0.049 (Mean 0.03)	0.008–0.12 (Mean 0.022)
OCPs (e.g. DDT)	0.01–0.025 µg/kg	<0.01–0.99 (Mean 0.21)	0.002–0.103 (Mean 0.024)
PCBs	n/a	<0.01–1.4 (Mean 0.13)	0.004–1.05 (Mean 0.146)
PBDEs	0.0085 µg/kg <sup>4</sup>	<0.006–0.77 (Mean 0.12)	0.02–1.46 (Mean 0.156)
Mercury	20 µg/kg	38–388 (Mean 142)	40–200 (Mean 120)

(Source: Marine Institute)

4 A new EQS came into effect on 22 December 2015

Mercury showed concentrations well above the 20 µg/kg EQS ranging from 38 to 388 µg/kg, with higher values generally associated with migratory brown trout caught in lakes closer to the coast. These concentrations are however consistent with other studies across Europe indicating the widespread distribution and persistence of this element. Airborne deposition of mercury from fossil fuel combustion is widely regarded as the principal source. HCB and HCBd were well within their respective standards. The detected presence of other substances such as PCBs and PBDEs at concentrations exceeding their respective EQS illustrates their ubiquitous distribution and persistence in the environment.

The WFD surveillance monitoring also includes a range of compounds known as volatile organic compounds. Very few instances of other trace organic pollutants, such as solvents and industrial chemicals, were reported during 2013–2015. During 2013–2015, 27,606 measurements were made covering 60 substances. There were no breaches of EQS values for any of these substances. Only 391 were detected at or above their respective limit of quantification (1.4%). Of these, 104 (26.5%) were for chloroform, which is a common by-product of drinking water disinfection processes.

During 2013–2015, 95 river stations were monitored and the presence of one or more of the five substances in the polycyclic aromatic hydrocarbons (PAHs) group was found in 76 of the 95 stations surveyed (80%). Anthracene, fluoranthene, and benzo-a-pyrene all have individual EQS values, but there were no exceedances of the annual average EQS or maximum acceptable concentration observed. This is a similar proportion to 2010–2012 (82.3%). Of the 5,477 results from 78 rivers, the detection rate was 21.3%, which is slightly higher than in 2010–2012 (14.9%).

Currently there are two sets of grouped PAHs where the EQS is set as the sum of both components. These are the sum of benzo(b)fluoranthene and benzo(k)fluoranthene with an Annual Average EQS of 0.03 µg/l. No EQS exceedances were observed. The second grouping is for the sum of benzo-g,h,i-perylene and indeno(1,2,3-cd)pyrene. These were detected in 74 of the 94 stations monitored, with the Annual Average-EQS of 0.002 µg/l exceeded at 41 stations.

A risk matrix based on the frequency and magnitude of occurrence was used to assess PAH exceedance in rivers and the mean values were significantly above the EQS in only eight stations (seven rivers). The average value across all 78 rivers was just over the Annual Average EQS at 0.0024 µg/l. By contrast, the allowable concentration in drinking water (for total PAHs) is five times higher at 0.01 µg/l. Calculations based on measurements of PAHs in ambient rainfall would indicate that the typical background concentrations in our rivers appear to be arising most likely from airborne deposition. Applying the drinking water standard as a basis on which to assess the overall environmental significance of the sum of benzo(b)fluoranthene and benzo(k)fluoranthene exceedances leads to just two stations recording averaged concentrations above the 0.01 µg/l drinking water standard – the Douglas Ballon (12D03) and the Glenamoy (33G01).

## 3. LAKES

### 3.1 Introduction

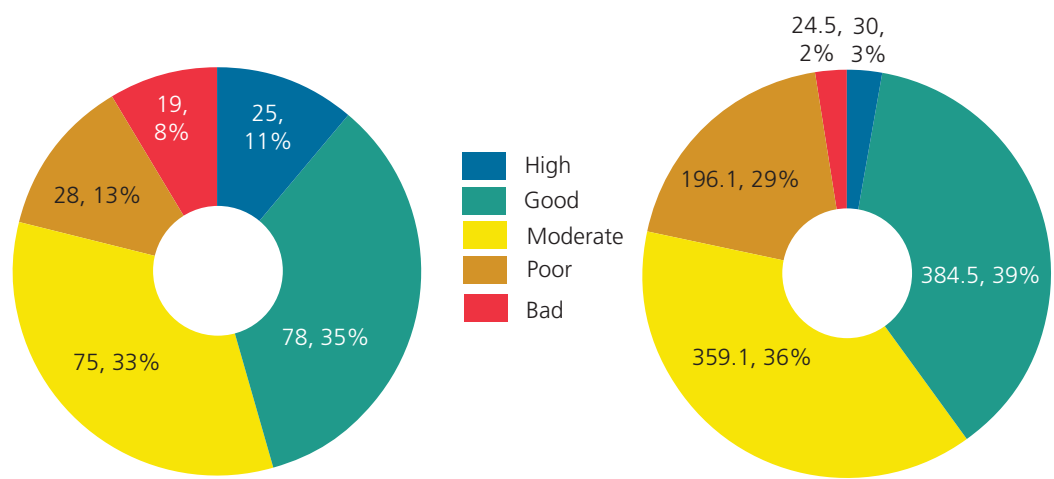
There are an estimated 12,000 lakes in Ireland, covering an area of more than 1,200 square kilometres. Of these, 812 lakes are designated as Water Framework Directive (WFD) water bodies. Two hundred and six lakes are greater than 50 hectares in area, with the remainder being lakes used for drinking water abstractions and lakes that are of regional, local or scientific interest in relation to protected habitats and/or species. Two hundred and sixteen lakes and nine heavily modified waterbodies (HMWBs) were monitored during 2010–2015. This represents 28% of all WFD lakes and 84% of total lake area in Ireland. The 20 largest monitored lakes account for over 60% of the total lake area in the country. The lakes and HMWBs are considered together in this report.

### 3.2 Summary for Lakes

- ▲ 103 monitored lakes were assessed as being at high or good ecological status/good ecological potential.
- ▲ 122 monitored lakes were classified as less than good status/good ecological potential.
- ▲ There is a 2.6% decline in the number of lakes and HMWBs in high or good ecological status/good ecological potential and/or condition compared to 2007–2009.
- ▲ 122 monitored lakes common to each reporting period showed no change in ecological status or ecological potential.
- ▲ 48 monitored lakes common to each reporting period declined in ecological status/ecological potential compared to 2007–2009. The majority had a one-class decline (41 lakes).
- ▲ 38 monitored lakes common to each reporting period improved in ecological status/ecological potential compared to 2007–2009. The majority had a one-class improvement (36 lakes).
- ▲ Nutrient condition was the main driver of status from a chemical standpoint, with total phosphorus being the dominant determinant.
- ▲ Hydromorphology was responsible for the downgrade of nine lakes from high status to good status.
- ▲ No evidence was found of any exceedances of EQS for priority substances in lakes.
- ▲ Of the 13 priority hazardous substances analysed in lakes, exceedances were found for mercury, cadmium and PAHs.
- ▲ 35 lakes failed on exceedances for hazardous substances, with 34 of these failures being caused by EQS exceedances for the ubiquitous hazardous substances of mercury and PAHs.

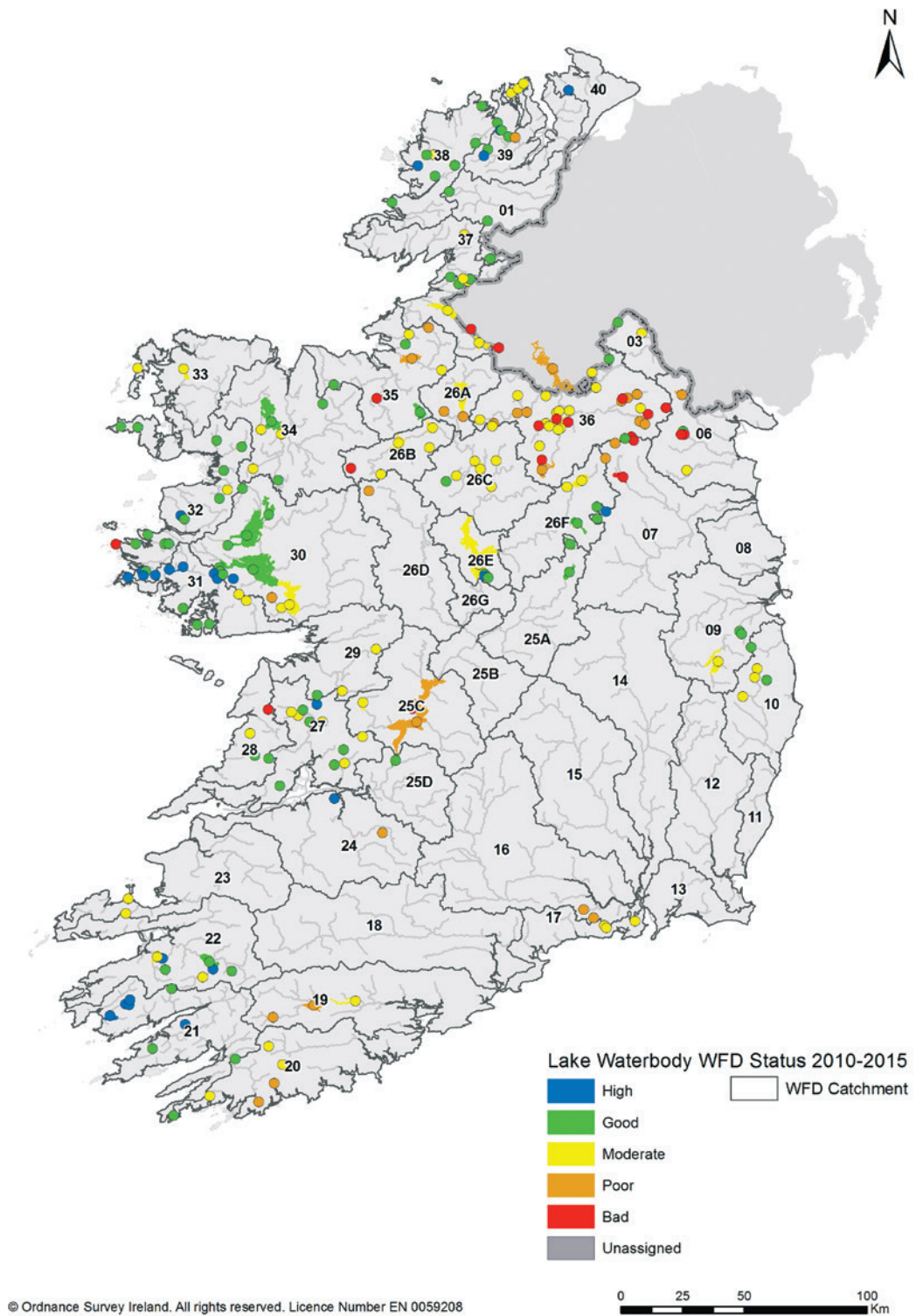
### 3.3 National Ecological Status

High or good status was assigned to 103 lakes (46%) in the period 2010–2015, with the remaining 122 lakes (54%) assigned moderate or worse status (Figure 3.1 and Map 3.1). There was a 2.6% reduction in the number of lakes and HMWBs with high or good ecological status/good ecological potential since 2007–2009.



**Figure 3.1:** The ecological status of monitored lakes in 2010–2015 in terms of (a) number and percentage of monitored lakes and (b) total area (km2) and percentage area of monitored lakes.

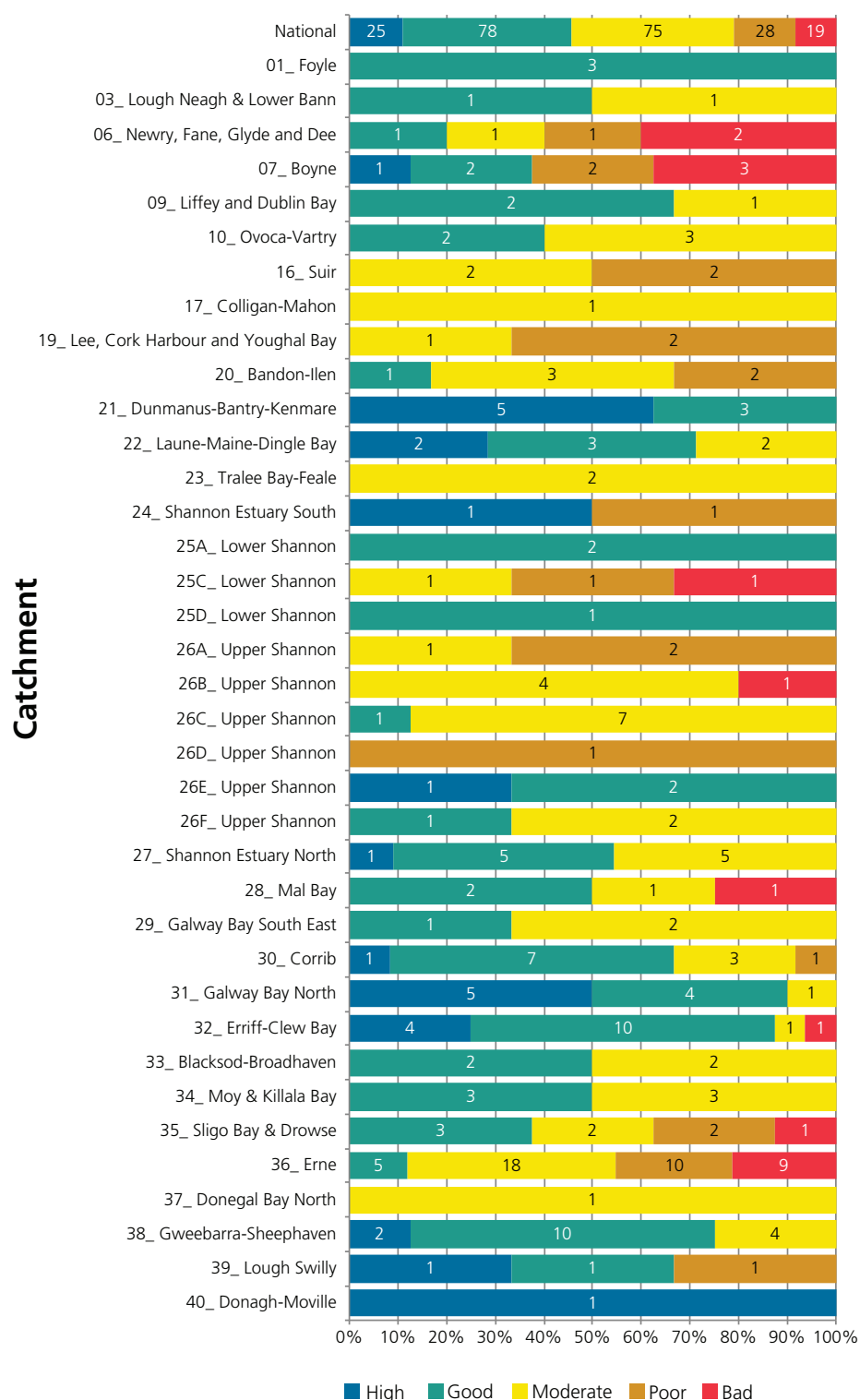




**Map 3.1:** Ecological status of monitored lake water bodies during 2010–2015.

### 3.4 Catchment Level Ecological Status

Monitored lakes are distributed over 37 catchments (Figure 3.2) but are predominantly in the following catchments: Erne (42 lakes), Erriff–Clew Bay (16 lakes), Gweebarra–Sheephaven (16 lakes), Corrib (12 lakes), Shannon Estuary North (11 lakes) and Galway Bay North (10 lakes).



**Figure 3.2:** Ecological status of monitored lake water bodies at catchment level.

Figure 3.2 indicates that the seven catchments with >80% of good or better status lakes are: Foyle, Dunmanus–Bantry–Kenmare, Lower Shannon (25A), Upper Shannon (26E), Galway Bay North, Erriff–Clew Bay and Donagh–Moville. The 13 catchments with >70% of moderate or worse status lakes are: Newry, Fane, Glyde and Dee; Suir; Colligan–Mahon; Lee, Cork Harbour and Youghal Bay; Bandon–Ilenn; Tralee Bay–Feale; Lower Shannon 25C; Upper Shannon (26A); Upper Shannon (26B); Upper Shannon (26C); Upper Shannon (26D); Erne; and Donegal Bay North.

### 3.5 Chemical Status

Chemical status is assessed by compliance with environmental standards for priority substances and priority hazardous substances that are listed in the Water Framework Directive (Annex X) and the Environmental Quality Standards (EQS) Directive (2008/105/EC). These priority substances and priority hazardous substances include metals, pesticides and various industrial chemicals.

No evidence was found of any exceedances for EQS for priority substances in lakes. Of the 13 priority hazardous substances analysed in lakes, exceedances were found for mercury, cadmium and PAHs. Lough Maumwee and Lough Tay failed for mercury and its compounds.

The first grouping of PAHs: the sum of benzo(b)fluoranthene and benzo(k)fluoranthene had an Annual Average EQS of 0.03 µg/l. This EQS was exceeded in Lough Kindrum during 2012. Lough Kindrum also failed for benzo(a)pyrene and the sum of (benzo-g,h,i-perylene) and (indeno(1,2,3-cd)pyrene) in 2012.

The second grouping of PAHs: the sum of benzo-g,h,i-perylene and indeno(1,2,3-cd)pyrene recorded the highest level of exceedances at 40.7% of monitored surveillance lakes (31 lakes). This group of PAHs are one of the most common causes of failure of EQSs across Europe, with up to 60% of river samples failing to meet standards.

Recent EPA-funded research in Ireland has shown the ubiquitous nature of PAHs; they are present even in upland headwater lake catchments not subject to direct industrial emissions (Scott et al., 2012).

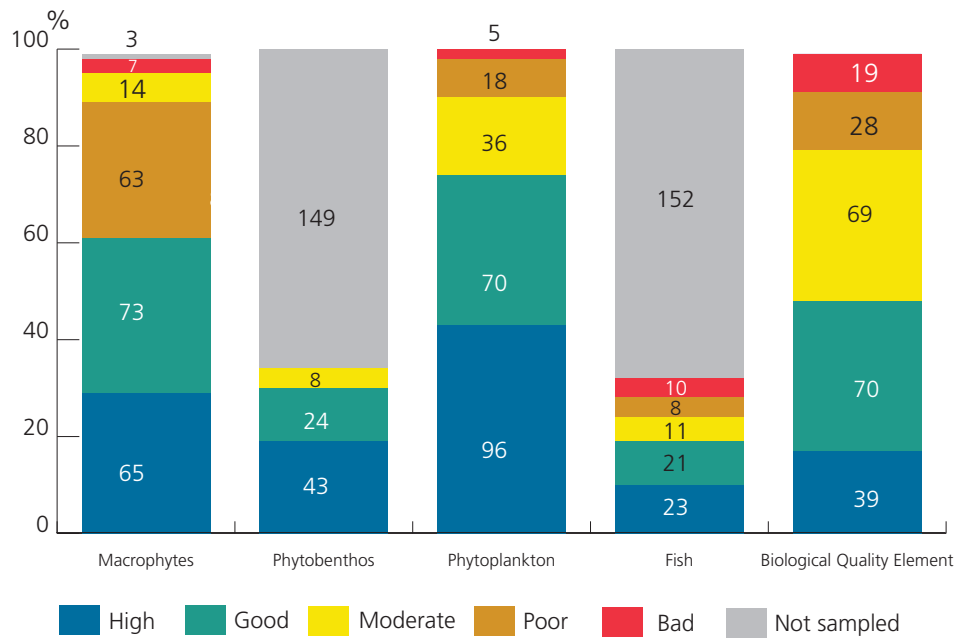
Cadmium was the only other priority hazardous substance with an exceedance of the EQS and this happened in Lough Muckno during 2010. This cadmium exceedance was caused by a single uncharacteristic high value, but there were detectable concentrations on other sampling occasions, making it more prudent to fail the lake in relation to its chemical status.

An additional three lakes, Caragh, Dan and Tay, had exceedances for the specific pollutant zinc, which impacted the overall ecological status classification of these lakes.

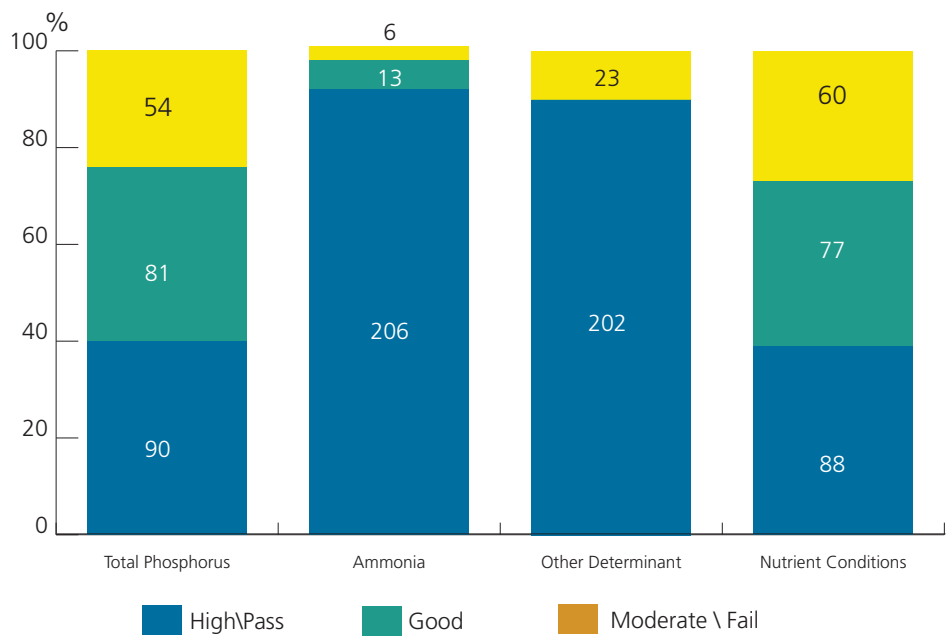
In summary, of the 35 lakes that failed to achieve their chemical status objective, all bar one were caused by failures for mercury and PAHs, i.e. parameters that are ubiquitous in the water environment across Europe.

### 3.6 Factors Determining Ecological Status

Determination of ecological status is based on a combined assessment of macrophytes, phytobenthos, phytoplankton and fish, and general chemistry impact on any of these elements can cause a lake to fail to meet its status objective. Fish and phytobenthos are only monitored in surveillance lakes. The assessment outcomes for the biological quality elements and the general physical chemical elements are presented in Figures 3.3 and 3.4.

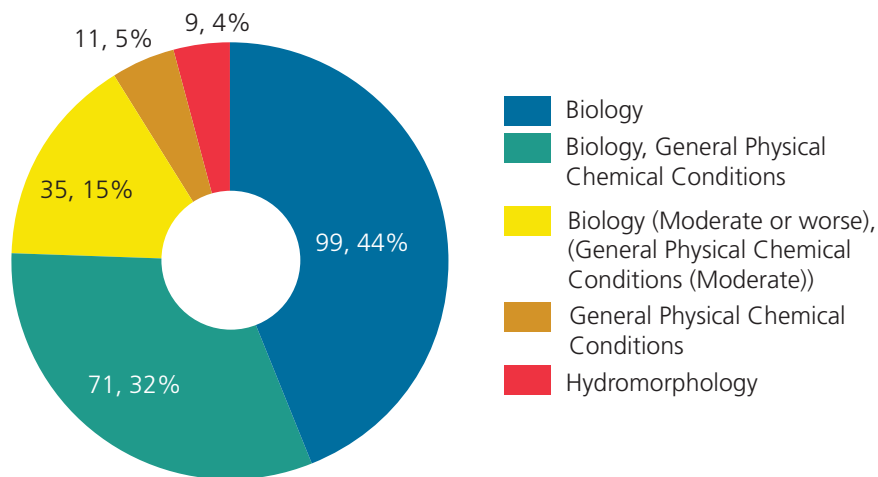


**Figure 3.3:** Number of lake water bodies assigned to each status class for the biological quality elements and the overall biological status outcome.

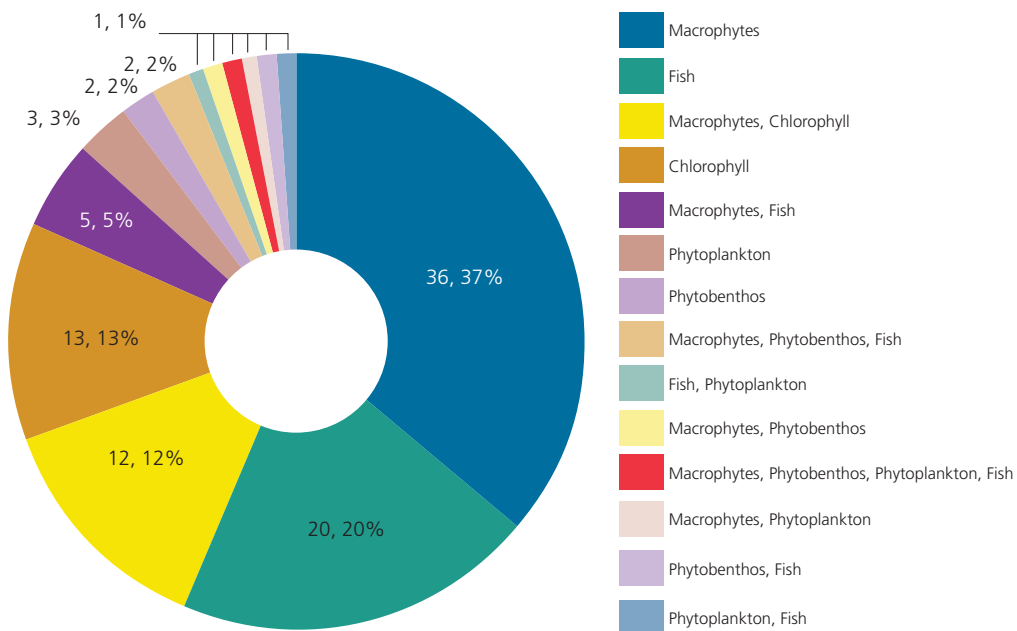


**Figure 3.4:** Nutrient enrichment determinants that influence lake status.

Biological status and supporting chemistry agreed for 47% of lakes (Figure 3.5). Ecological status was determined by a biological element/s for 44% of lakes. A general physical chemical element/s determined the ecological status for 5% of lakes. The remaining 4% had their ecological status determined by hydromorphology.



**Figure 3.5:** The main category of determinants for lake status.



**Figure 3.6:** Biological element(s) that determined lake status.

Macrophytes are the main biological determinant of ecological status (Figure 3.6). Hydromorphology was responsible for the downgrade of nine lakes from high to good status. The nine lakes downgraded were Carra, Doo, Guitane, Illauntrasna, Kiltorris, Kylemore, Mask Upper, Naminna and Pollacappul. The lakes were downgraded because of extensive hard- and soft-bank engineering and adjustments to water level relative to natural conditions because of historical arterial drainage or outflow control structures (e.g. weirs, sluices, dams), which result in less than high hydromorphological condition.

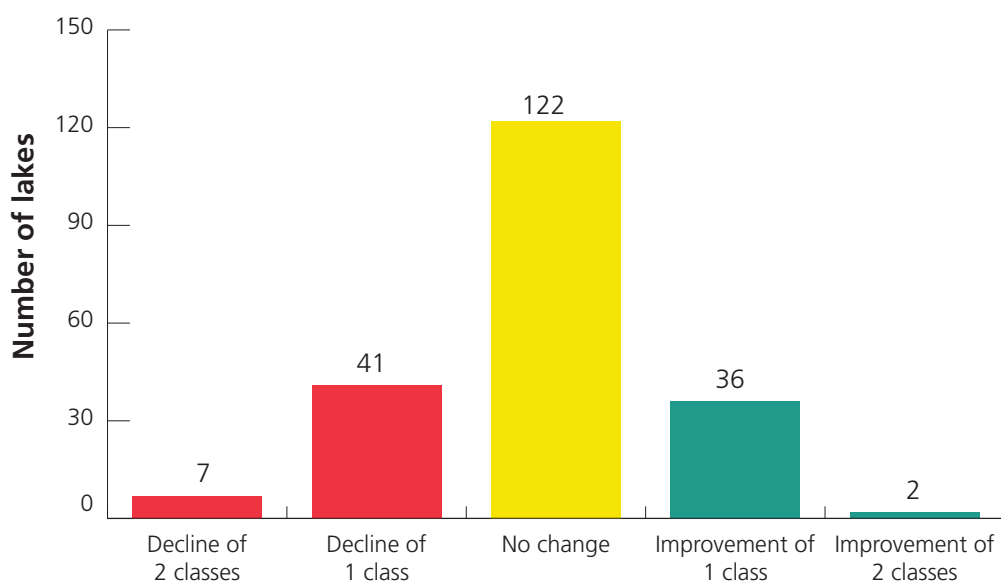
### 3.7 Changes and Trends

The number of lakes in the good or better category decreased to 103 (45.8%, 414.5 km<sup>2</sup>) from 106 (48.2%, 440.4 km<sup>2</sup>) in 2007–2009. Five new lakes were added to the monitoring programme in 2013–2015, with the overall number of lakes in the moderate or worse category increasing to 122 (54.1%, 579.7km<sup>2</sup>) from 114 (51.8%, 5328.3km<sup>2</sup>) in the previous reporting period. Trends in ecological status in terms of number, percentage and area of lakes are presented in Table 3.1.

**Table 3.1:** Number, percentage and area of lakes in each ecological status class in 2007–2009 and 2013–2015.

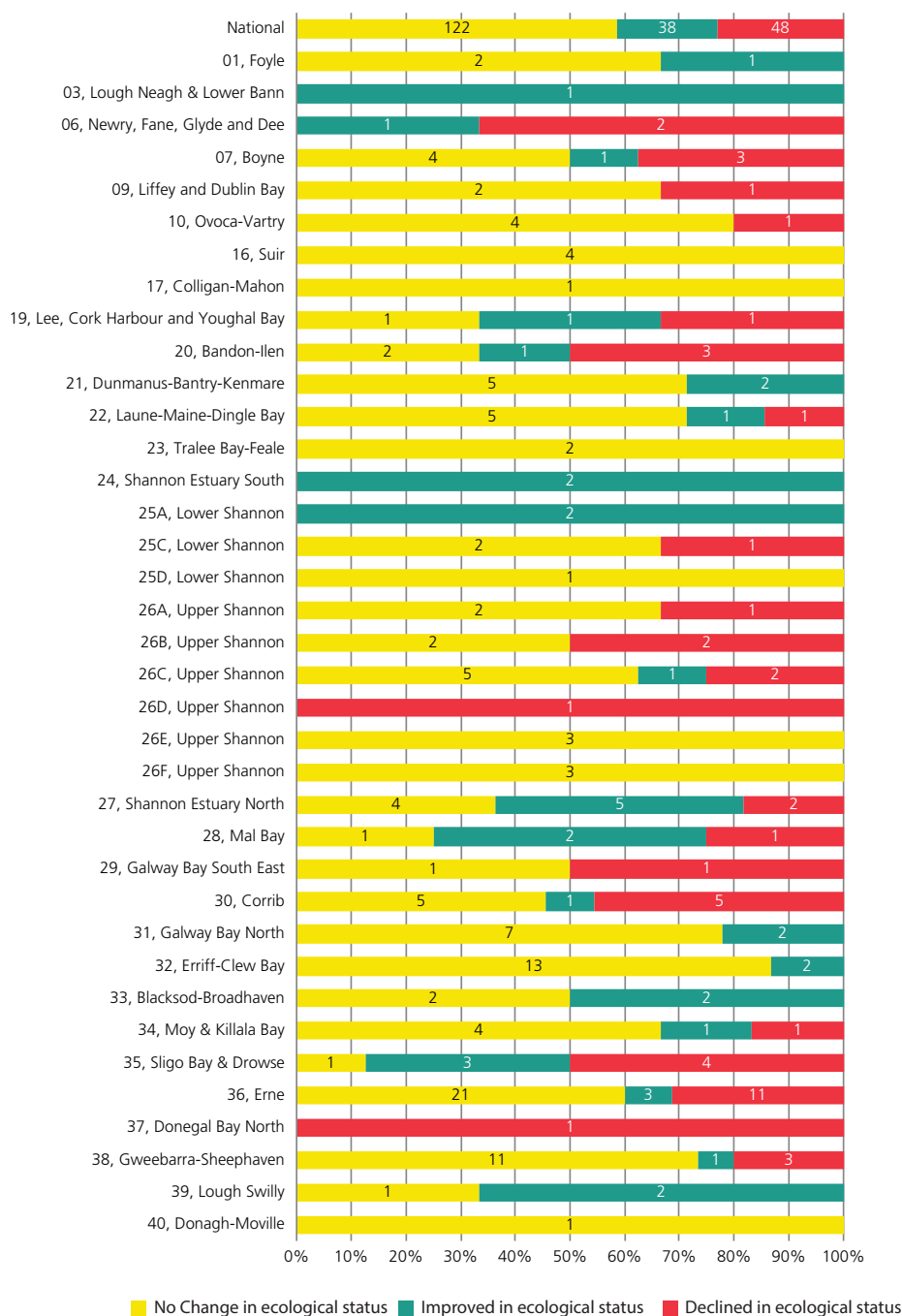
	2007–2009				2013–2015			
	Lake waterbodies		Area		Lake waterbodies		Area	
Ecological status	Number	%	km <sup>2</sup>	%	Number	%	km <sup>2</sup>	%
High	24	10.9	100.5	10.3	25	11.1	30.0	3.0
Good	82	37.3	340.0	38.7	78	34.7	384.5	39.9
Moderate	78	35.5	296.6	19.6	75	33.3	359.1	22.8
Poor	22	10.0	189.2	15.5	28	12.4	196.1	16.1
Bad	14	6.4	52.5	5.1	19	8.4	24.5	2.4
<b>Total</b>	<b>220</b>		<b>978.8</b>		<b>225</b>		<b>994.1</b>	

There were 208 lakes common to the 2007–2009 and 2013–2015 assessment periods, of which 122 (58.7%) did not change status between the two periods. Forty-eight lakes declined in status (188 km<sup>2</sup>) and 38 lakes improved in status (148 km<sup>2</sup>). Most improving or declining lakes changed by a single ecological class (Figure 3.7). The notable reduction in lake area at high status was due to Lough Mask (78 km<sup>2</sup>) declining from high to good status in 2013–2015.



**Figure 3.7:** Changes in ecological status for lake water bodies common to 2007–2009 and 2010–2015.

The number and percentage of lakes that remained stable, declined or improved in status by catchment is presented in Figure 3.7. Forty-eight monitored lakes declined in ecological status compared to 2007–2009. The majority had a one-class decline (41 lakes). Thirty-eight monitored lakes improved in ecological status when compared to 2007–2009. The majority had a one-class improvement (36 lakes). Figure 3.8 shows that catchment 36 Erne had the largest lake population (35 lakes) with the largest stable population (21 lakes) and the largest number of lakes that changed status (14 lakes), most of which were declines in status (11 lakes). There were fewer than five lakes in the declining or improving category in most catchments. Both catchment 38, Gweebarra–Sheephaven and catchment 32, Erriff–Clew Bay had a lake population of 15 lakes, of which 11 were stable.



**Figure 3.8:** Percentage change (with numbers of lakes labelled) in lake status by catchment for lakes common to 2007–2009 and 2010–2015.

## 4. TRANSITIONAL AND COASTAL WATERS

### 4.1 Introduction

In Ireland, transitional and coastal waters cover an area of over 14,000 km<sup>2</sup> (transitional 844 km<sup>2</sup>; coastal 13,325 km<sup>2</sup>) and represent a wide variety of types such as lagoons, estuaries, large coastal bays and exposed coastal stretches. The ecological status for transitional and coastal water has been assessed using data from 2010 to 2015 (Map 4.1), as many of the biological assessments are undertaken over a six-year period. The saline waters of Ireland have been split into 110 coastal water bodies and 194 transitional (estuarine) water bodies (Table 4.1) and the national monitoring programme assesses a representative subset of these water bodies (~40%).

**Table 4.1:** Number and extent of transitional and coastal water bodies in Ireland

	Waterbodies						
	Monitored			Unmonitored		Total	
	Number	Area km <sup>2</sup>	% of all waterbodies	Number	Area km <sup>2</sup>	Number	Area km <sup>2</sup>
Coastal water bodies	43	3,670	40	67	9,625	110*	13,295
Transitional water bodies	80	650	41	114*	234	194*	884

\*Four cross-border water bodies are not included in subsequent analyses.

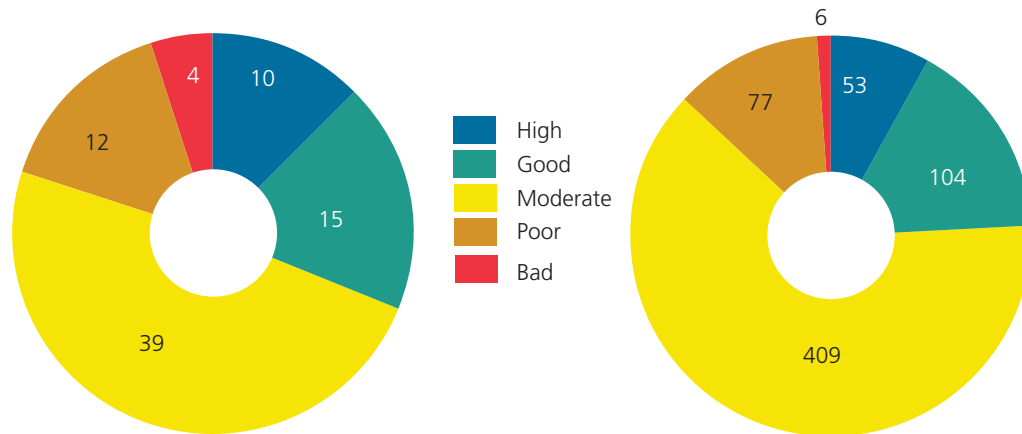
### 4.2 Summary for Transitional and Coastal Waters

- ▲ 55 monitored transitional water bodies (69%) were classified at moderate or worse status during 2010–2015, with 25 (31%) at high or good status. Four water bodies were classified as bad status.
- ▲ Only 24% of the surface area of monitored transitional waters was at high or good status.
- ▲ The status of 63 (79%) transitional water bodies has remained the same between 2007–2012 and 2010–2015. Eleven showed a decline in status and six had an improvement in status between the two periods.
- ▲ 34 monitored coastal water bodies (79%) were classified at high or good status, with nine (21%) at less than good status.
- ▲ 86% of the surface area of monitored coastal water bodies was at high or good status.
- ▲ The status of 30 (70%) monitored coastal water bodies has remained the same between 2007–2012 and 2010–2015, with seven showing a decline in status and six showing an improvement in status between the two periods.
- ▲ Chemical status for transitional and coastal waters is good, with only one water body, the Avoca estuary, failing the WFD standards for substances that are not ubiquitous in the water environment.
- ▲ Nutrient inputs into the marine environment have shown substantial decreases since 1990. These rates of decline have slowed and in some cases the nutrient inputs are increasing again.



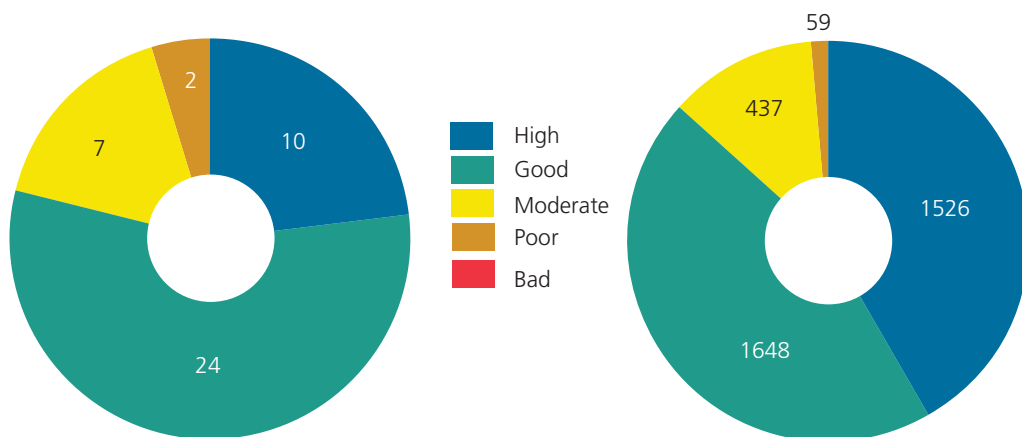
### 4.3 National Status

Figure 4.1 indicates that of the monitored transitional water bodies, 55 (69%) were classified at moderate or worse status during 2010–2015, and 25 (31%) at high or good status. Four of these water bodies were classified as bad status. 24% of the surface area of the transitional waters was at high or good status.

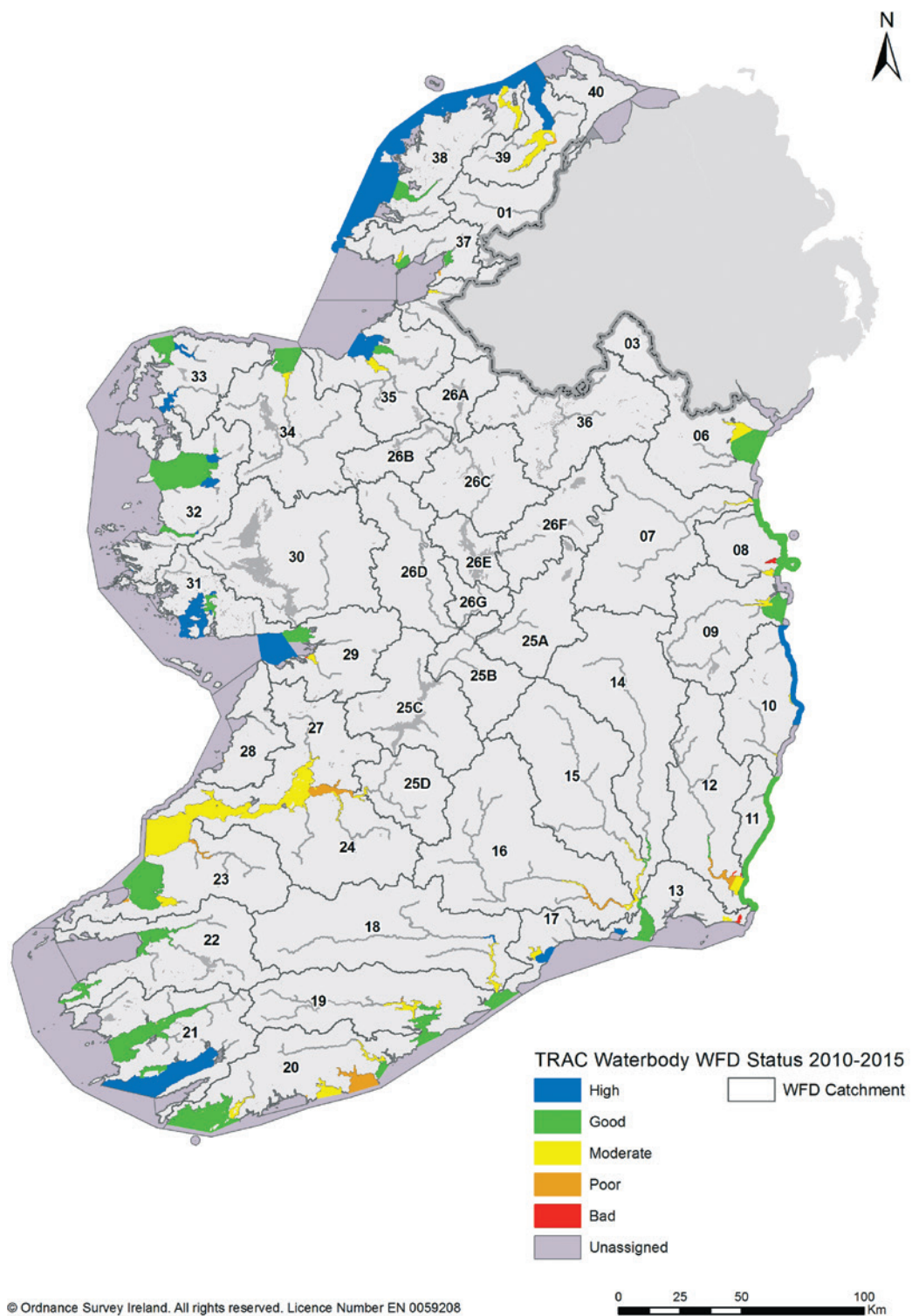


**Figure 4.1:** Status of transitional waters during 2010–2015, (left) by number and (right) by area (km²).

Figure 4.2 highlights that for coastal waters, 34 monitored water bodies (79%) were classified at high or good status during 2010–2015, with nine (21%) at less than good status. 86% of the surface area of the coastal waters was at high or good status.



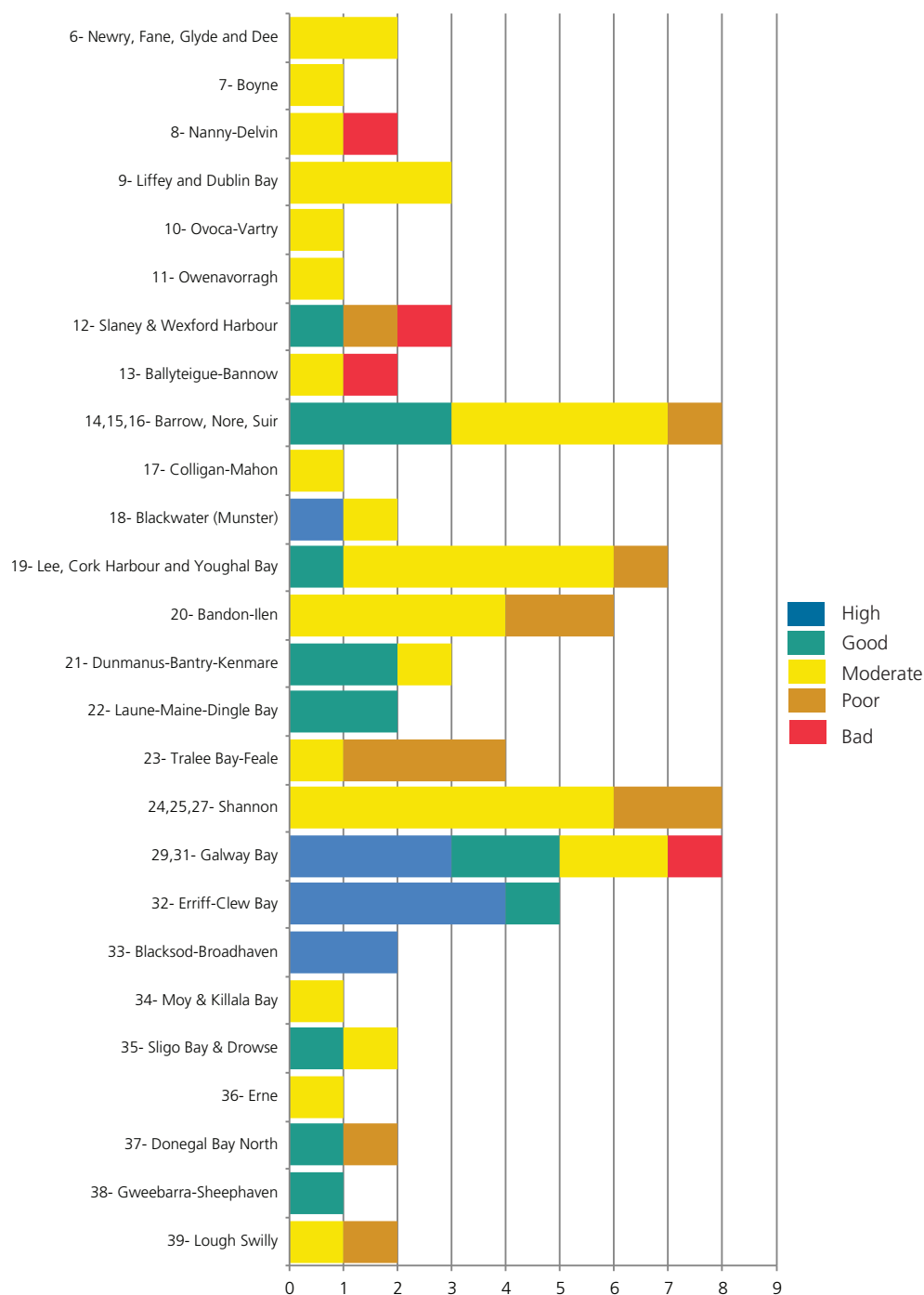
**Figure 4.2:** Status of coastal waters during 2010–2015, (left) by number and (right) by area (km²).



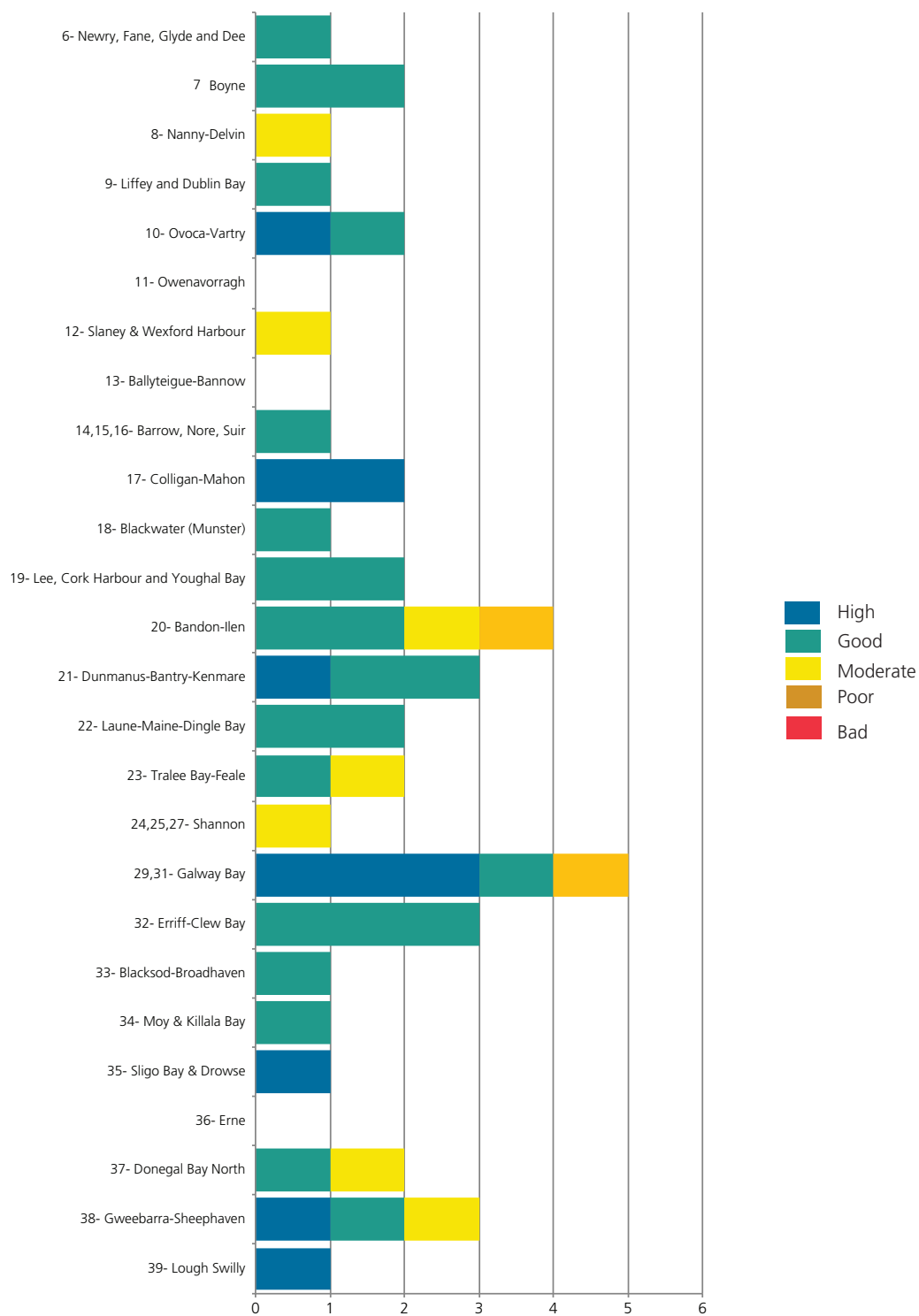
**Map 4.1:** Ecological status of monitored transitional and coastal water bodies during 2010–2015.

#### 4.4 Catchment Level Ecological Status

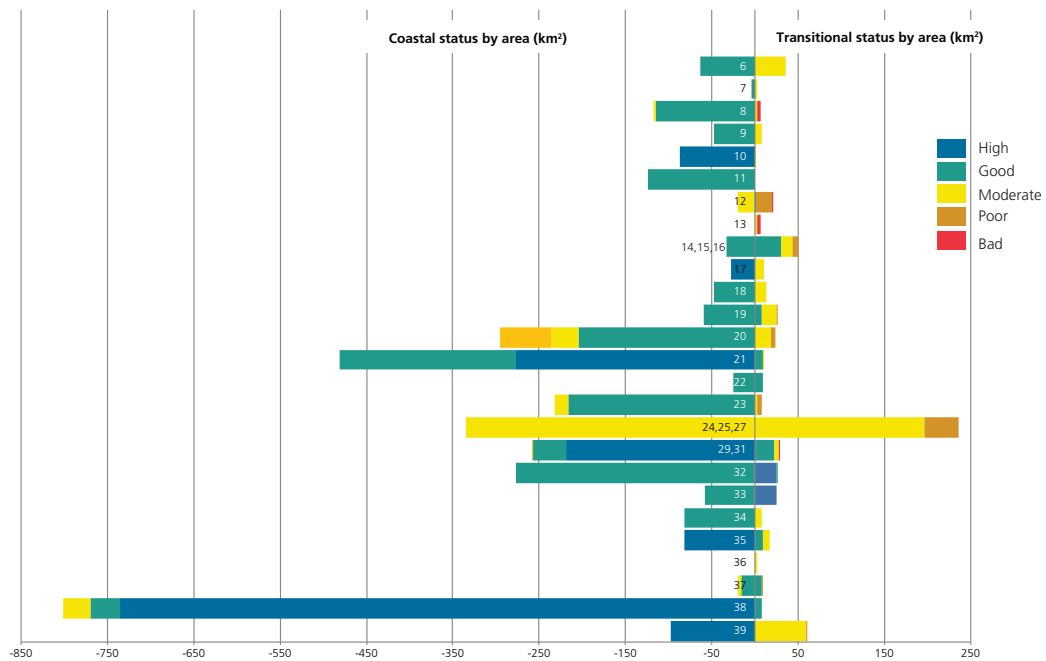
The distribution and status of the transitional and coastal waters associated with each catchment are shown by numbers in Figures 4.3 and 4.4 respectively and by total area (km<sup>2</sup>) in Figure 4.5. The assessment by water body numbers shows that the majority of transitional waters at less than good status are along the east, south-east and southern coasts. The largest areas of moderate status waters are in the Shannon catchments. The water bodies at poor and bad status are generally quite small and include areas such as coastal lagoons and smaller estuarine systems:



**Figure 4.3:** Number of monitored transitional water bodies in each ecological status class at the catchment level during 2010–2015.



**Figure 4.4:** Number of monitored coastal water bodies in each ecological status class at catchment level during 2010–2015.



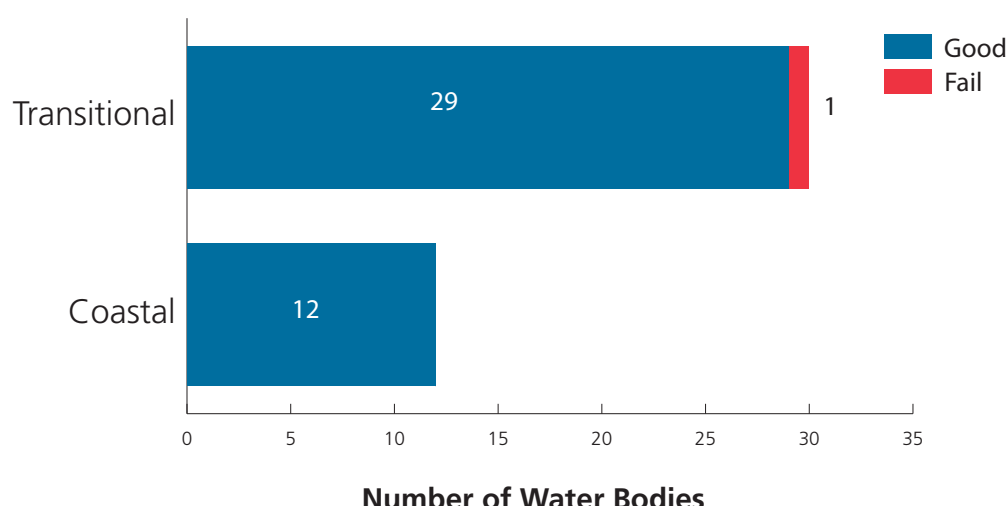
**Figure 4.5:** Area of each transitional and coastal water body status class in each catchment (km²).

## 4.5 Chemical Status

Chemical status is assessed by compliance with environmental standards for priority substances and priority hazardous substances that are listed in the WFD (Annex X) and the Environmental Quality Standards (EQS) Directive (2008/105/EC). These priority substances and priority hazardous substances include metals, pesticides and various industrial chemicals. The monitoring of these is undertaken by the Marine Institute on behalf of the EPA.

In the current assessment period, 12 coastal and 30 transitional water bodies were assessed for compliance. Sampling is undertaken monthly on a rolling cycle so that each water body has at least one year's monthly data for assessment over the six-year period. While there were detections of mercury in some water bodies, including Rogerstown estuary, Lower Shannon, Owenacurra estuary, Broadhaven Bay and Mulroy Bay, mercury exceedances have been identified at EU level as ubiquitous and occur widely in the environment on a global scale. These can be found for decades in the aquatic environment at levels posing a significant risk, even if extensive measures to reduce or eliminate emissions of such substances have already been taken. Some are also capable of long-range transport. Therefore, non-compliant results do not imply specific issues local to a water body and are not included in the final chemical status assessment.

Consequently, only one of the 42 water bodies assessed in 2010–2015 failed for parameters that aren't ubiquitous, and this was the Avoca estuary (Figure 4.6), which saw breaches of the EQS for copper, zinc and cadmium, which is unsurprising given its mining history and the naturally elevated concentrations of these metals in the catchment to this estuary.



**Figure 4.6:** Chemical status for transitional and coastal waters.

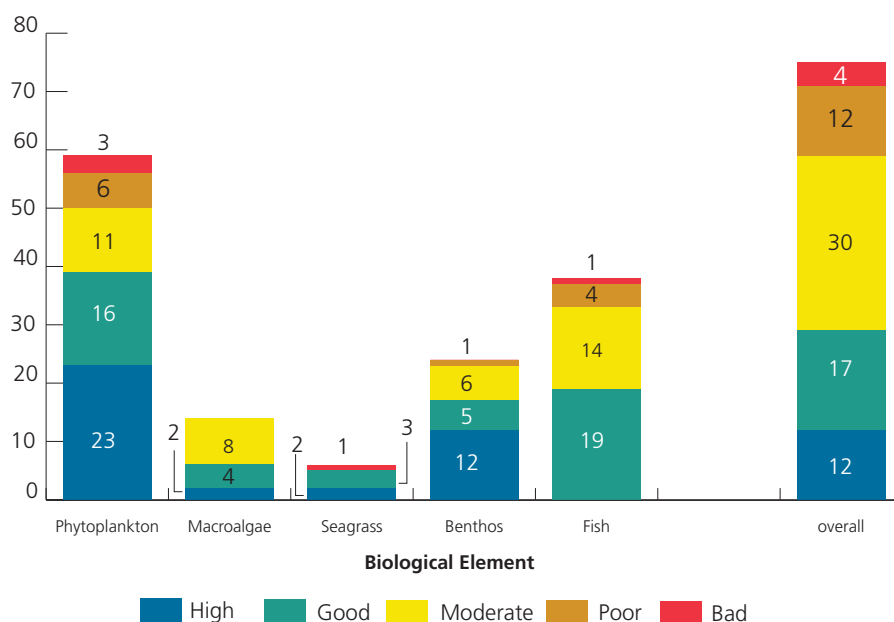
## 4.6 Factors Determining Ecological Status

In transitional waters, the biological quality element driving the overall status is quite varied and is not dominated by a specific quality element (Figure 4.7).

Phytoplankton is assessed in most transitional water bodies, and 34% of the areas assessed were at moderate status or worse. Fish status is also a key element for classification of water bodies, with 50% of areas assessed at unsatisfactory status. None of the water bodies assessed for fish had high status.

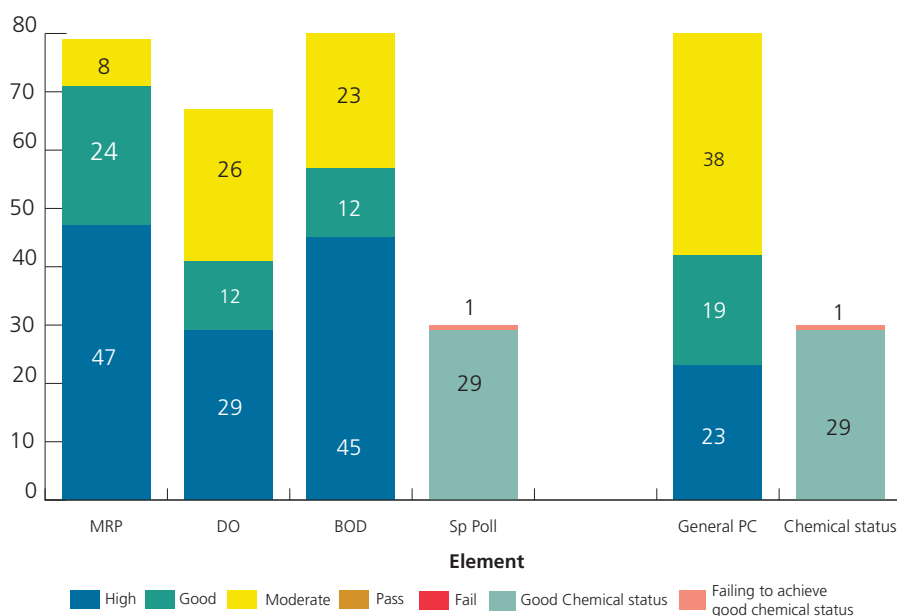
Benthic invertebrates are monitored in 24 transitional water bodies and seven of these water bodies have been classified as moderate or worse status. This includes the upper Shannon estuary; the reasons for this failure are currently being investigated by the Marine Institute to establish if the status is being driven by specific pressures or is a result of sampling or other methodological artefacts.

Macroalgae monitoring has been ongoing since 2007 and looks at opportunistic algae (due to their visual appearance, these are commonly known as sea lettuce blooms). The bias towards moderate status reflects that this tool is used in water bodies that are suspected to be impacted by elevated nutrient concentrations. Intertidal seagrass has also been used as an element since 2007 and in general the seagrass communities are in good condition, apart from Rogerstown estuary, where persistent eutrophication has driven excessive algal growths causing the smothering and subsequent loss of intertidal seagrass beds.



**Figure 4.7:** Transitional water status for each biological quality element.

For the supporting physico-chemical elements, oxygenation conditions were the main driver of status (Figure 4.8). Eight areas breached the salinity related standard for phosphorus (MRP). These included the Maigue and Deel associated with the Shannon, the Castletown estuary that flows into Dundalk Bay, the Tolka in Liffey Dublin Bay catchment, and a few small transitional lagoons.



**Figure 4.8:** Transitional water status for each general supporting physico-chemical element<sup>5</sup>.

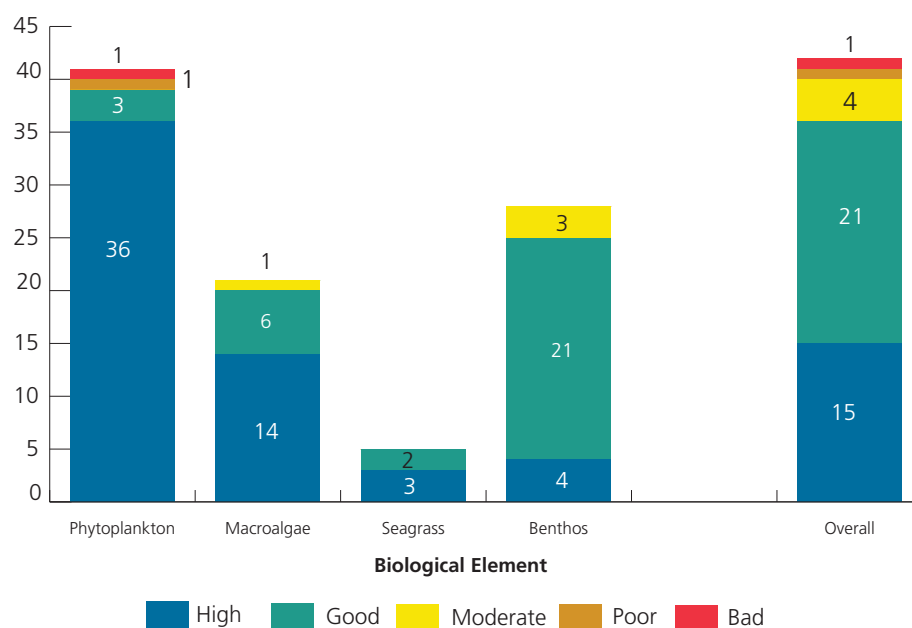
In coastal water the primary biological quality elements (BQEs) used for assessment of status are phytoplankton and benthic invertebrates. Fish are not used as BQEs in coastal waters for the WFD.

<sup>5</sup> MRP – molybdate reactive phosphorus; DO – dissolved oxygen; BOD – biological oxygen demand; Sp Poll – specific pollutants; General PC – general physico-chemical parameters; Chemical status – priority hazardous substances

An overview of the relative impacts of individual BQE on ecological status of coastal waters is shown in Figure 4.9. For phytoplankton, the assessment shows that all areas were at high or good apart from two water bodies. Courtmacsherry Bay showed elevated chlorophyll concentrations. Although the data availability is low for this area, and therefore confidence in the assessment is lower, the data show that the chronic eutrophication problems experienced in the adjacent Argideen estuary are also being seen in the associated coastal water. The other water body failing for phytoplankton was Rincarna Pools, a small coastal lagoon with eutrophication issues. This is currently being reviewed further as part of a joint EPA–NPWS monitoring project.

Only three coastal water bodies were at moderate status for the benthic invertebrate BQE: the mouth of the Shannon, Mulroy Bay and Wexford Harbour. While the assessment in Mulroy Bay and Wexford Harbour has been similar since 2007, the moderate status in the Shannon assessment for 2010–2015 needs further investigation to clarify the pressures causing this decline in status.

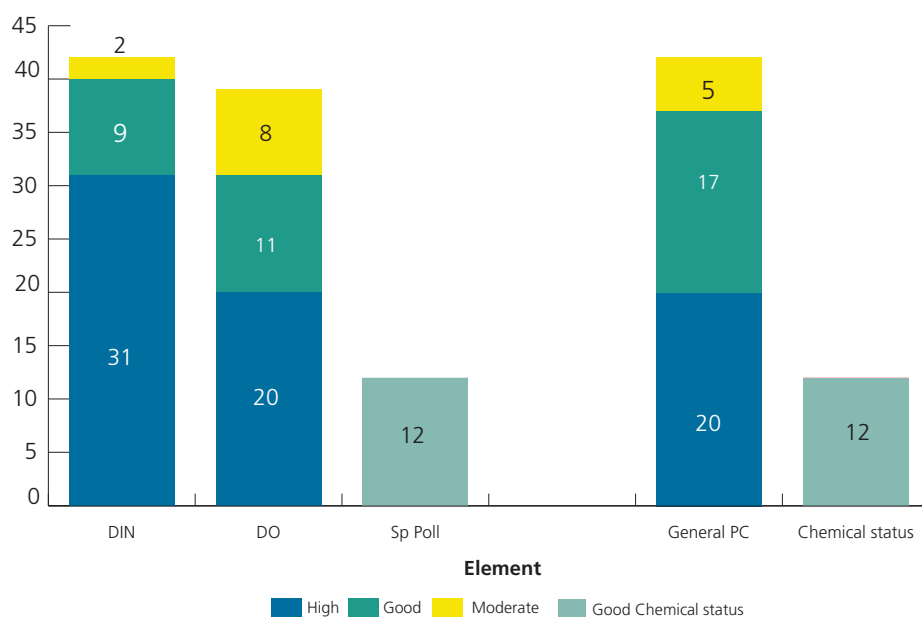
The macroalgal BQE is assessed in coastal waters primarily by looking at the seaweed diversity on rocky shores, but also by looking at green algal growths in suitable coastal areas. For all the areas assessed using seaweed diversity in 2010–2015, the status of this BQE was high or good. Malahide Bay in catchment 8 is at moderate status due to impacts of opportunistic algal growths. This assessment is not used extensively in coastal waters as the necessary habitat is more typically present in transitional waters.



**Figure 4.9:** Coastal water status for each biological quality element.

In contrast to transitional waters, nitrogen (as dissolved inorganic nitrogen) is set as an assessment standard in coastal waters in the Surface Water Regulations. This reflects N being the nutrient most likely to drive elevated eutrophication in coastal waters. As with transitional waters, oxygenation conditions are the main driver of physico-chemical quality (Figure 4.10). Only two water bodies breached the standard for dissolved inorganic nitrogen. These were Courtmacsherry Bay and Rincarna Pools.

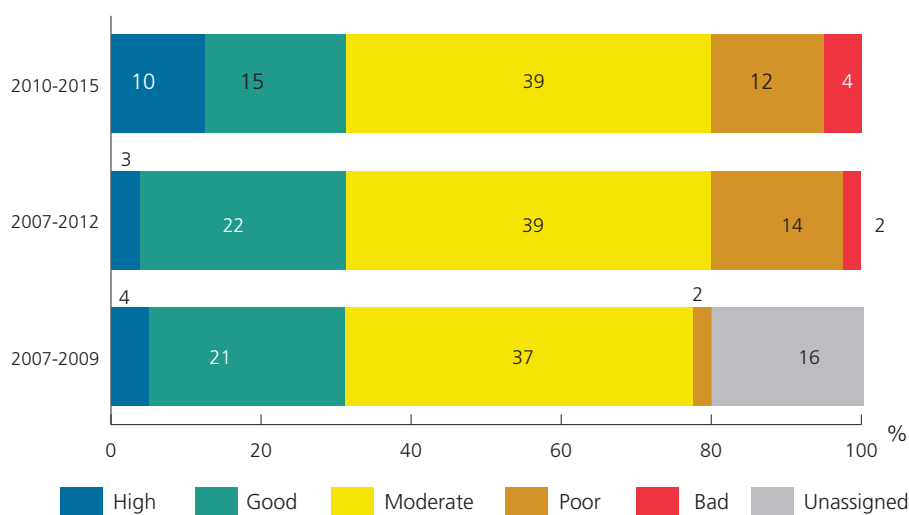




**Figure 4.10:** Coastal water status for each general supporting physico-chemical element.<sup>6</sup>

## 4.7 Changes and Trends

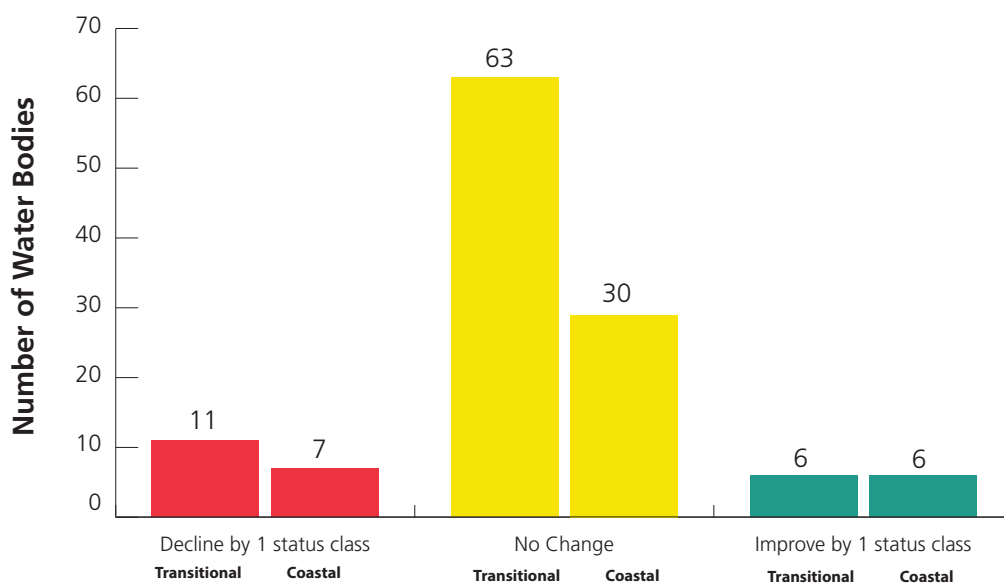
There has been relatively little net change in transitional water body status since 2007 (Figure 4.11). The status of 63 (79%) monitored transitional water bodies has remained the same between 2007–2012 and 2010–2015, with 11 monitored transitional water bodies showing a decline in status and six showing an improvement in status between the two assessment periods (Figure 4.12).



**Figure 4.11:** Changes in transitional water status since 2007.<sup>7</sup>

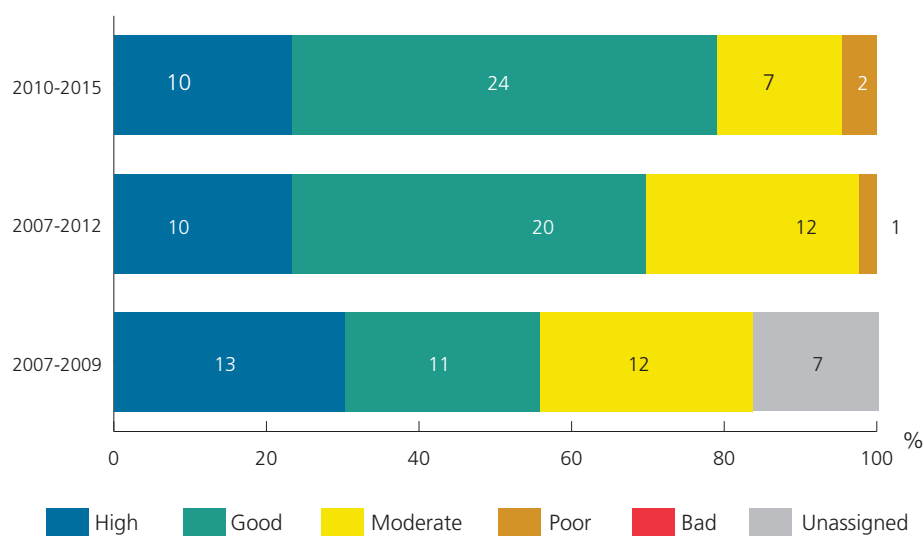
<sup>6</sup> DIN – dissolved inorganic nitrogen; DO – dissolved oxygen; Sp Poll – specific pollutants; General PC – general physico-chemical parameters; Chemical status – priority hazardous substances.

<sup>7</sup> The monitoring programme in 2007–2009 was not fully operational, so several water bodies do not have comparable data.



**Figure 4.12:** Changes in transitional and coastal water status class since 2007–2012.

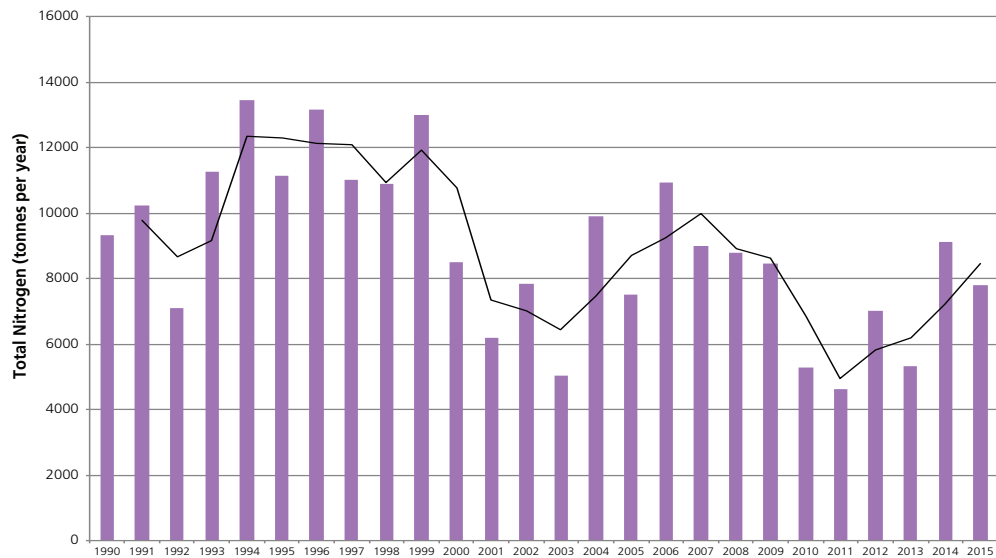
Figure 4.12 shows that the status of 30 (70%) monitored coastal water bodies remained the same between 2007–2012 and 2010–2015. Seven monitored coastal water bodies showed a decline in status; six showed an improvement in status between the two assessment periods. As with the transitional water bodies, there has been relatively little net change in coastal water body status since 2007 (Figure 4.13).



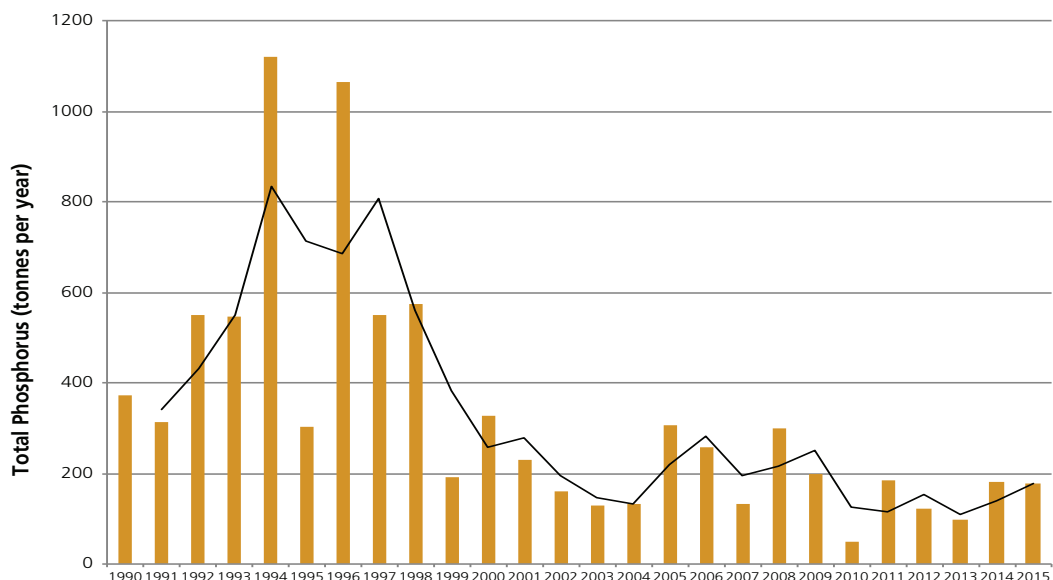
**Figure 4.13:** Comparison of coastal water status since 2007.

As part of the Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), monitoring of nutrient inputs from major Irish rivers to estuarine and coastal waters has been ongoing since 1990. These data have shown significant decreases over the past 26 years and the reductions indicate the success of national measures aimed at reducing the loss of nutrients from terrestrial sources to surface waters. The decreases in nutrient inputs appear to be slowing down, or in some cases reversing. Increases in total

nitrogen are now being seen in several of the estuaries including the Bandon, Blackwater, Boyne, Nore, Slaney and Tolka estuaries. In the Blackwater, the high total nitrogen inputs into the marine areas continued up to 1999 (Figure 4.14). Inputs then declined, with the lowest value recorded in 2011. However, this decline has now reversed, with the average total nitrogen input during 2013–2015 being 32% greater than the average total nitrogen input during 2010–2012. This has resulted in an increase in dissolved inorganic nitrogen coupled with a concurrent increase in chlorophyll concentrations and opportunistic algal growths in the estuarine system. Total phosphorus input was at its lowest in the Blackwater in 2010. However, the average total phosphorus input during 2013–2015 is 29% greater than the average total phosphorus input during 2010–2012 (Figure 4.15). The WFD status for the associated transitional water body is now moderate.



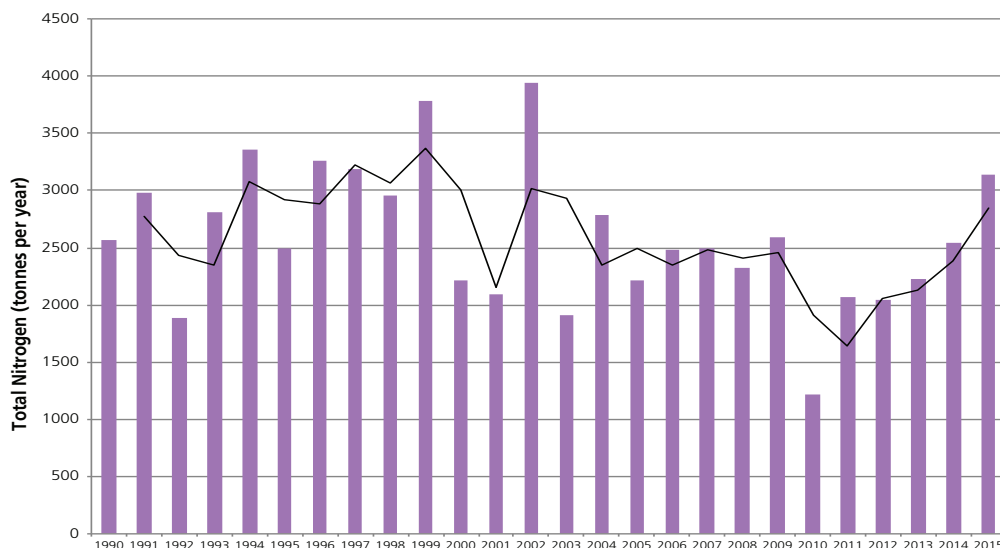
**Figure 4.14:** Riverine inputs of total nitrogen from the Blackwater River.<sup>8</sup>



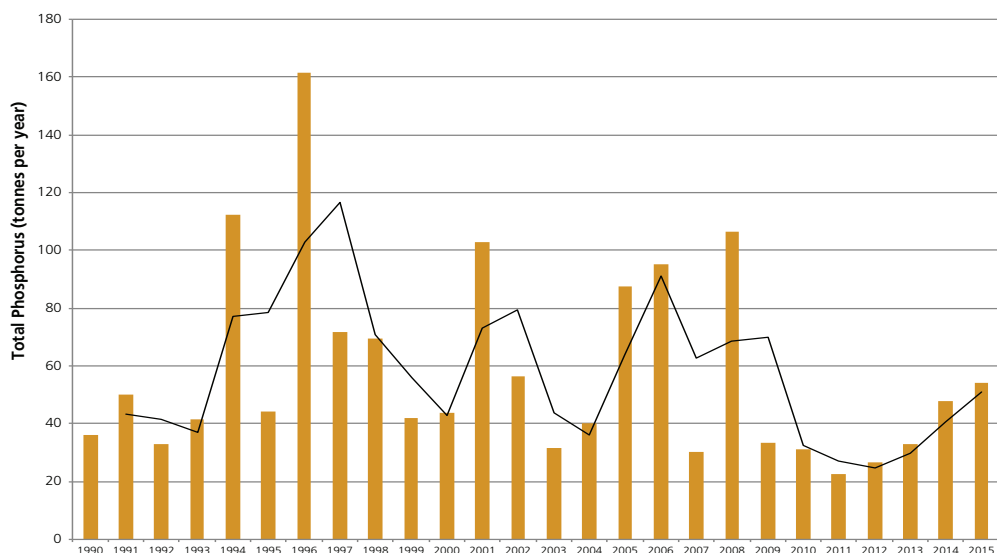
**Figure 4.15:** Riverine inputs of total phosphorus from the Blackwater River.

<sup>8</sup> Solid line indicates a two-year rolling mean.

In the Bandon estuary, total nitrogen input decreased to its lowest value in 2010. However, this improvement has now reversed, with the average total nitrogen input during 2013–2015 being 48% greater than the average total nitrogen input during 2010–2012 (Figure 4.16). Similarly, the average total phosphorus input during 2013–2015 is 68% greater than the average total phosphorus input during 2010–2012 (Figure 4.17). The moderate WFD status in the Bandon estuary in this reporting period is driven by oxygenation conditions and elevated phytoplankton growths.



**Figure 4.16:** Riverine inputs of total nitrogen from the Bandon River.



**Figure 4.17:** Riverine inputs of total phosphorus from the Bandon River.

## 5. GROUNDWATER

### 5.1 Introduction

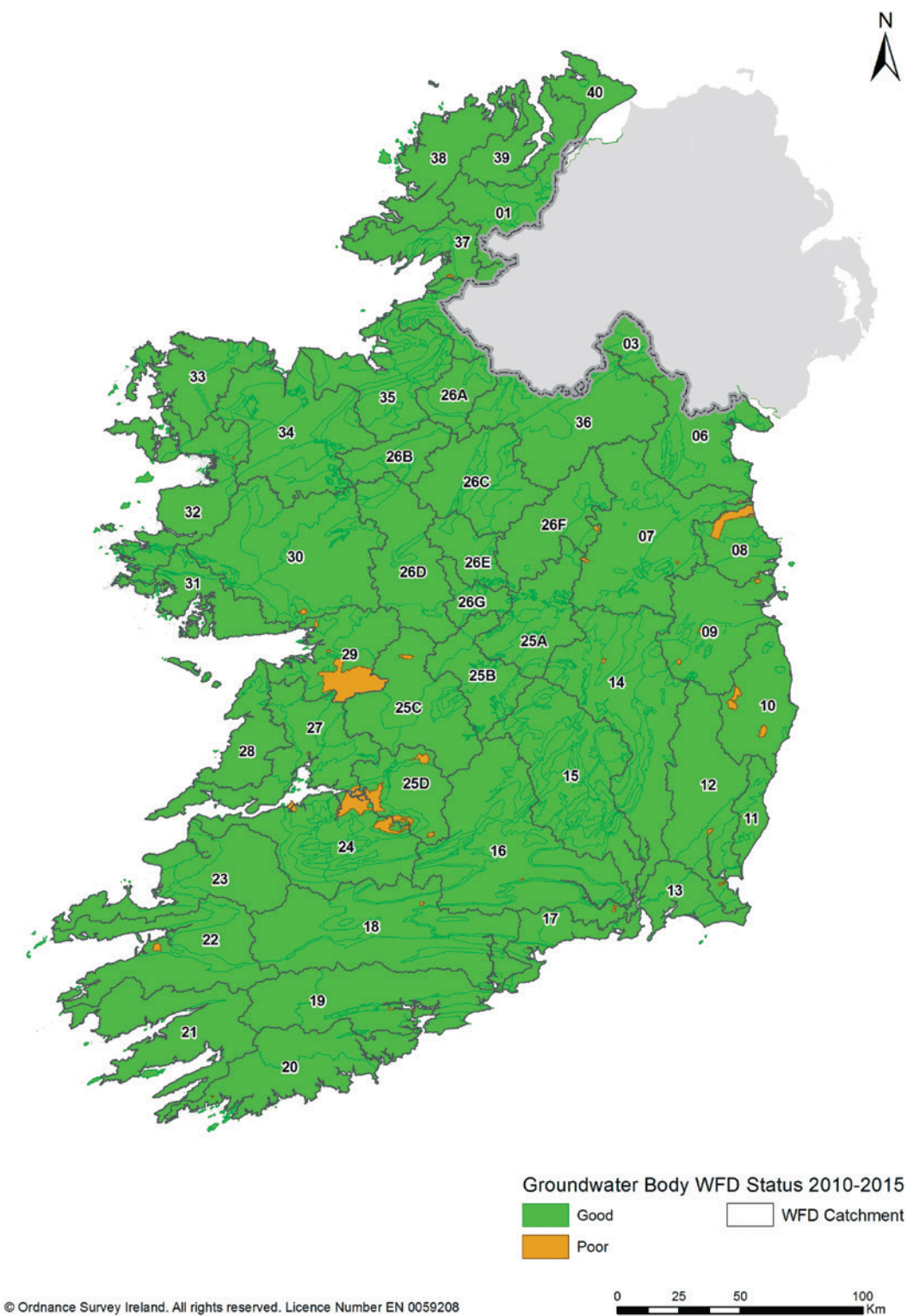
For the first WFD cycle the groundwater assessment was based on a greater number of water bodies (757). Further investigation and assessment of groundwater bodies associated with potentially significant point source pressures has resulted in reduced uncertainty, and it was determined for many water bodies that there was no risk of failing the WFD status objective. This has resulted in a reduction in overall number of water bodies to 513. These groundwater bodies range in size from <1 km<sup>2</sup> to 1,887 km<sup>2</sup>.

### 5.2 Summary for Groundwater

- ▲ 468 out of a total of 513 groundwater bodies (91%) met their good chemical and good quantitative status objectives in 2010–2015, accounting for 99% of the country by area (70,899 km<sup>2</sup>).
- ▲ 1% of the area of the country is classified as being at poor chemical status for 2010–2015. This is a significant reduction from 14% of the area of the country classified as poor chemical status for 2003–2008.
- ▲ 44 groundwater bodies (8.6%) were at poor chemical status for the 2010–2015 period. These poor-status groundwater bodies are generally small and the significant pressures typically relate to largely historic contamination from point sources including mines, landfills and industry.
- ▲ One water body failed to meet the quantitative status objective for the 2010–2015 period, which was associated with historical regional and local drainage schemes.
- ▲ The average nitrate concentration in groundwater was below the threshold value of 37.5 mg/l NO<sub>3</sub> at 97% of the monitoring locations during 2010–2015.
- ▲ There was an increase in the percentage of groundwater sites with average nitrate levels greater than 25 mg/l NO<sub>3</sub> in 2014 and 2015. Further assessment will be carried out during the next WFD cycle to look for the development of any upward trend in nitrate concentrations.
- ▲ The south and south-east regions of the country continue to have the greatest proportion of monitoring locations with elevated nitrate concentrations.
- ▲ The average phosphate concentration in groundwater was below the threshold value of 0.035 mg/l P at 92% of the monitoring locations during 2010–2015. There has been a generally stable picture nationally for phosphate in groundwater since 2010.
- ▲ Hazardous substances in groundwater are not a widespread national water quality issue.

### 5.3 National Status

Out of a total of 513 groundwater bodies, 468 (91%) met their good chemical and good quantitative status objectives in 2010–2015, accounting for 99% by area or 70,899 km<sup>2</sup> (Map 5.1). Of the 45 poor-status water bodies, 44 were due to failures to meet the chemical status objective and one was due to failure to meet the quantitative status objective. These poor chemical status groundwater bodies are generally small and the significant pressures typically relate to largely historic contamination from point sources including mines, landfills and industry. The poor quantitative status groundwater body was associated with historical regional and local drainage schemes.



**Map 5.1:** WFD groundwater body chemical status 2010–2015.

## 5.4 Factors Determining Status

Table 5.1 provides a summary of the main elements that resulted in groundwater bodies failing to meet their chemical or quantitative status objective.

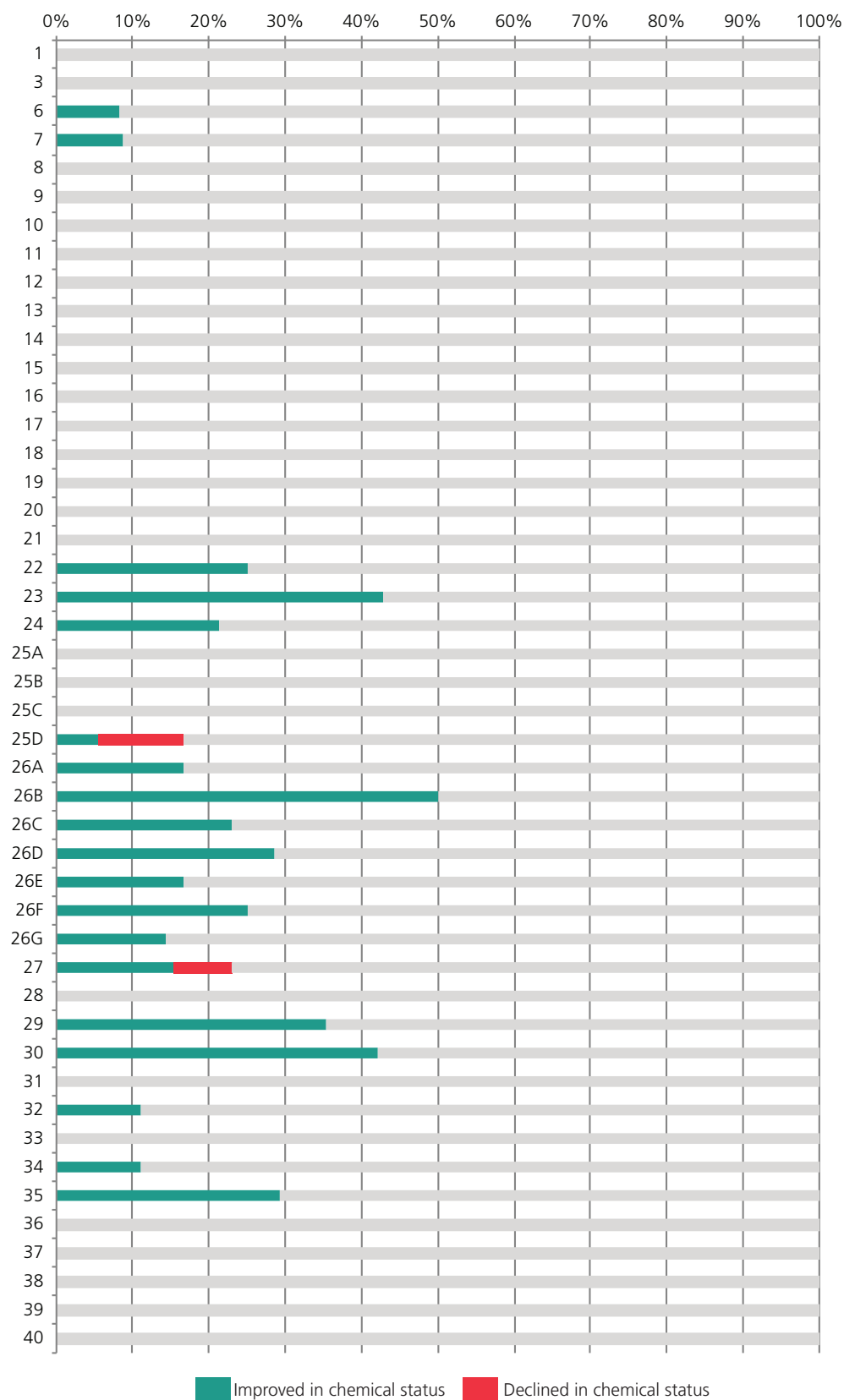
**Table 5.1:** Summary of 2010–2015 and 2003–2008 status results.

Groundwater assessment	2010–2015 Summary (513 GWB)		2003–2008 Summary (757 GWB)	
	Good status	Poor status	Good status	Poor status
<b>Surface Water Quality</b>	504	9	662	95
GWDTE <sup>9</sup> Chemical	511	2	757	0
Drinking Water	513	0	757	0
General Chemical	477	36	749	8
Intrusions	513	0	757	0
<b>Overall chemical status</b>	<b>469</b>	<b>44</b>	<b>654</b>	<b>103</b>
<b>Surface Water Quantity</b>	513	0	757	0
GWDTE Quantity	512	1	755	2
Water Balance	513	0	756	1
Intrusions	513	0	757	0
<b>Overall quantitative status</b>	<b>512</b>	<b>1</b>	<b>754</b>	<b>3</b>

## 5.5 Changes and Trends

The status reported in the first RBMP (2003–2008) identified that 106 of 757 (14%) groundwater bodies failed to meet either their chemical or quantitative status objective, accounting for 14% by area. Comparison between the two reporting periods indicates that there has been an overall improvement, with 5% more groundwater bodies achieving their status objective (13% by area). The surface water quality assessment saw the most improvement and this assessment relates to contribution of nutrients to associated surface waters. The associated improvement in status is due to a slight reduction in average phosphate concentrations in WFD groundwater monitoring in certain catchments for the period 2010–2015 compared with 2003–2008 (Figure 5.1). The increase in the number of poor status groundwater bodies for the general chemical assessment from the previous assessment was due to improved information and technical approach rather than deterioration in water quality. These poor-status groundwater bodies for the general chemical assessment relate to historic mines, industrial licensed sites and waste licensed sites.

<sup>9</sup> Groundwater Dependent Terrestrial Ecosystems

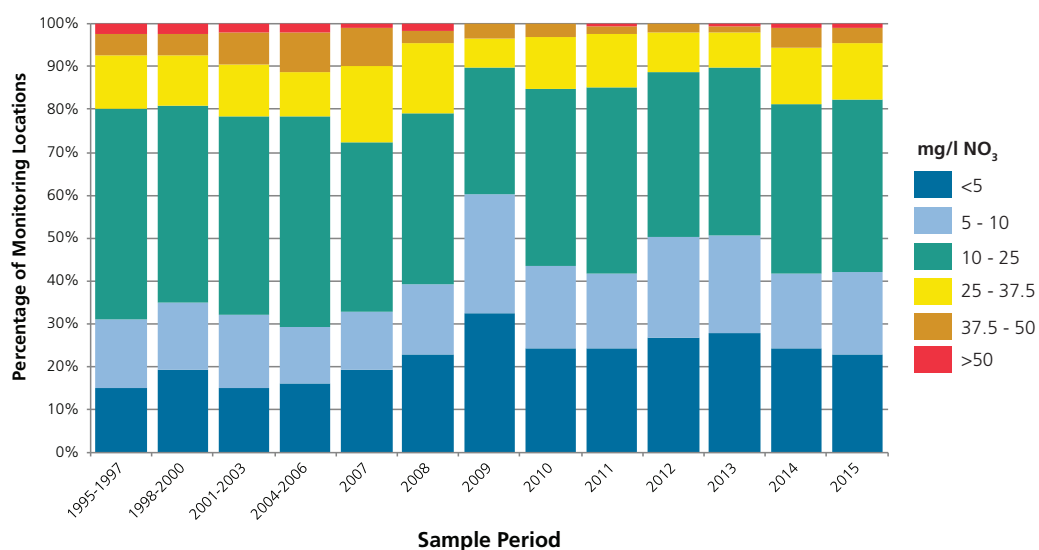


**Figure 5.1:** Percentage of groundwater bodies by catchment which improved or declined in relation to the contribution of phosphorus to rivers between 2003–2008 and 2010–2015.



Where there was an exceedance of a threshold value at a monitoring location, trends were assessed for that location using annual average data for the ten-year period from 2006 to 2015. An environmentally and statistically significant trend was flagged where the trend had statistical significance and the average concentration in 2027 was projected to be greater than the threshold value. None of the six monitoring locations with average nitrate concentrations greater than 37.5 mg/l NO<sub>3</sub> during 2010–2015 had a statistically significant trend.

For nitrate in groundwater a mean concentration greater than the Threshold Value of 37.5 mg/l NO<sub>3</sub> is an indication of appreciable contamination, which, given the dynamic nature of groundwater in Ireland, would probably result in the drinking water maximum acceptable concentration of 50 mg/l NO<sub>3</sub> being exceeded at the monitoring point at some time during the sampling period. Figure 5.2 summarises the mean nitrate concentration during the period 1995–2015 for the 200 groundwater quality monitoring locations in the current national groundwater monitoring programme.

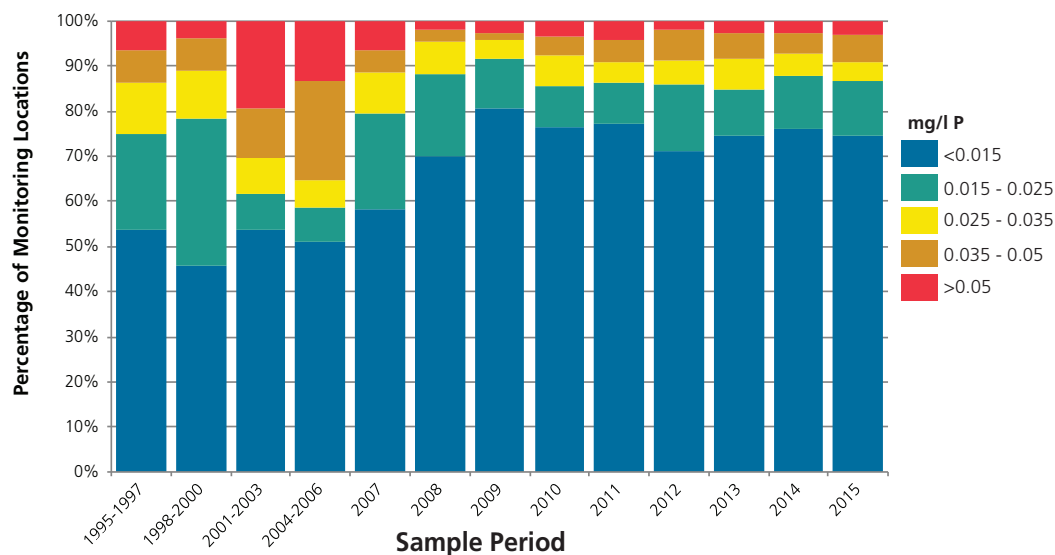


**Figure 5.2:** Comparison of the mean nitrate concentrations in groundwater since 1995.

Figure 5.2 highlights that, since 1995, there has been a modest improvement in overall groundwater nitrate concentration. Since 2010, the pattern has changed slightly, with the 2014 and 2015 data indicating a slight decline in the situation when compared to 2010–2013. The average concentration was below 37.5 mg/l NO<sub>3</sub> at 97% of the monitoring locations during 2010–2015 (Map 5.2). Three of the six monitoring locations with averages greater than 37.5 mg/l NO<sub>3</sub> are water supplies, and only one of these locations (Durrow–Fermoyle) had sample concentrations above 50 mg/l NO<sub>3</sub>. At Durrow–Fermoyle nitrate concentrations are reduced using ion exchange before water is supplied to the public.

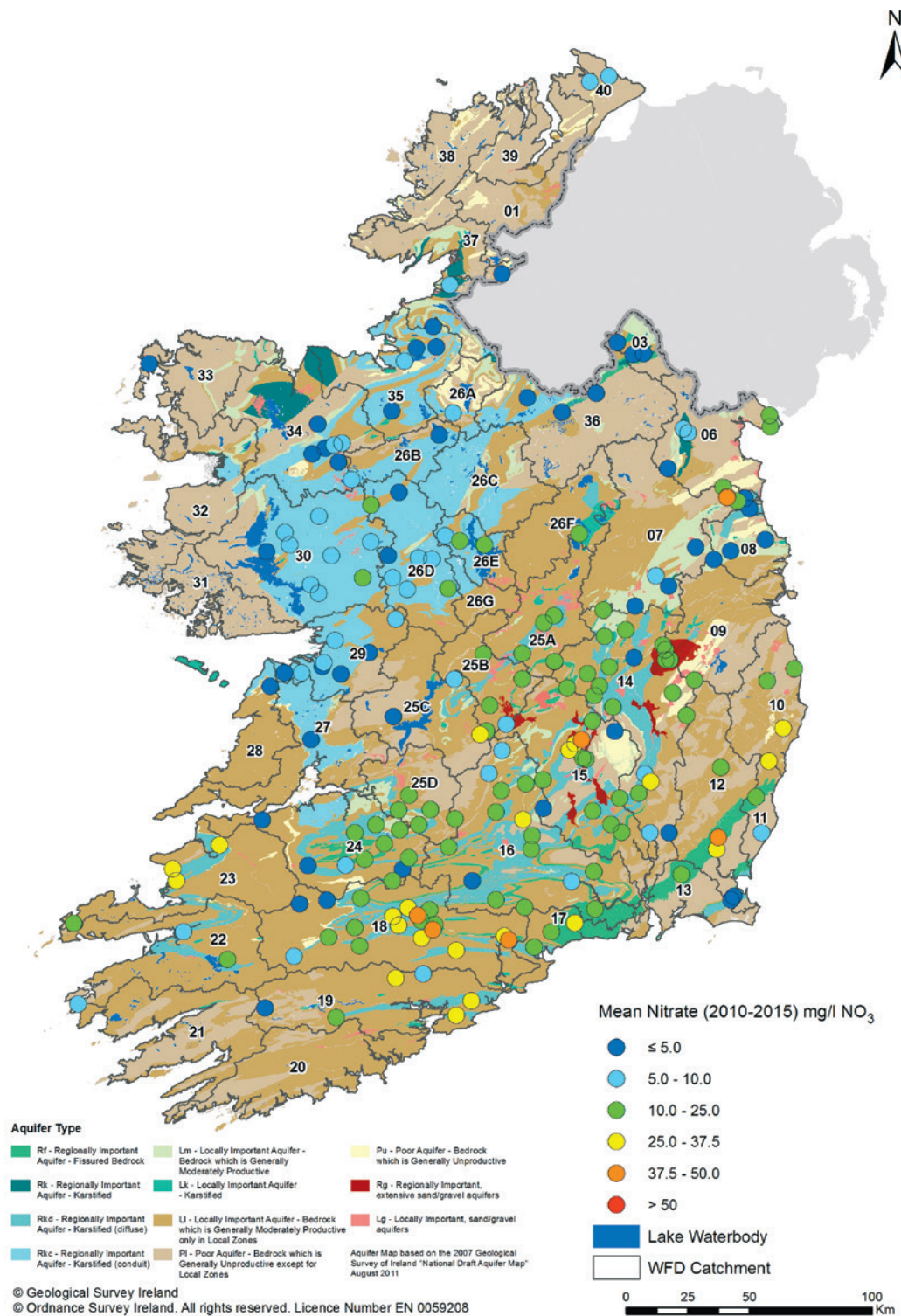
Groundwater with nitrate concentrations below the threshold value of 37.5 mg/l NO<sub>3</sub> may still be contributing to impact in surface waters. Generally, the south and south-east of the country continue to have the greatest proportion of monitoring stations with higher nitrate concentrations. This is attributed largely to the impact of nutrient losses from agricultural sources.

Figure 5.3 indicates that for phosphate in groundwater there has been a generally stable picture nationally since 2010 following a gradual reduction in the proportion of monitoring locations with higher concentrations between 1995 and 2009. Only one monitoring location had a statistically significant upward trend that would result in the concentration exceeding the Threshold Value of 0.035 mg/l P in 2027.

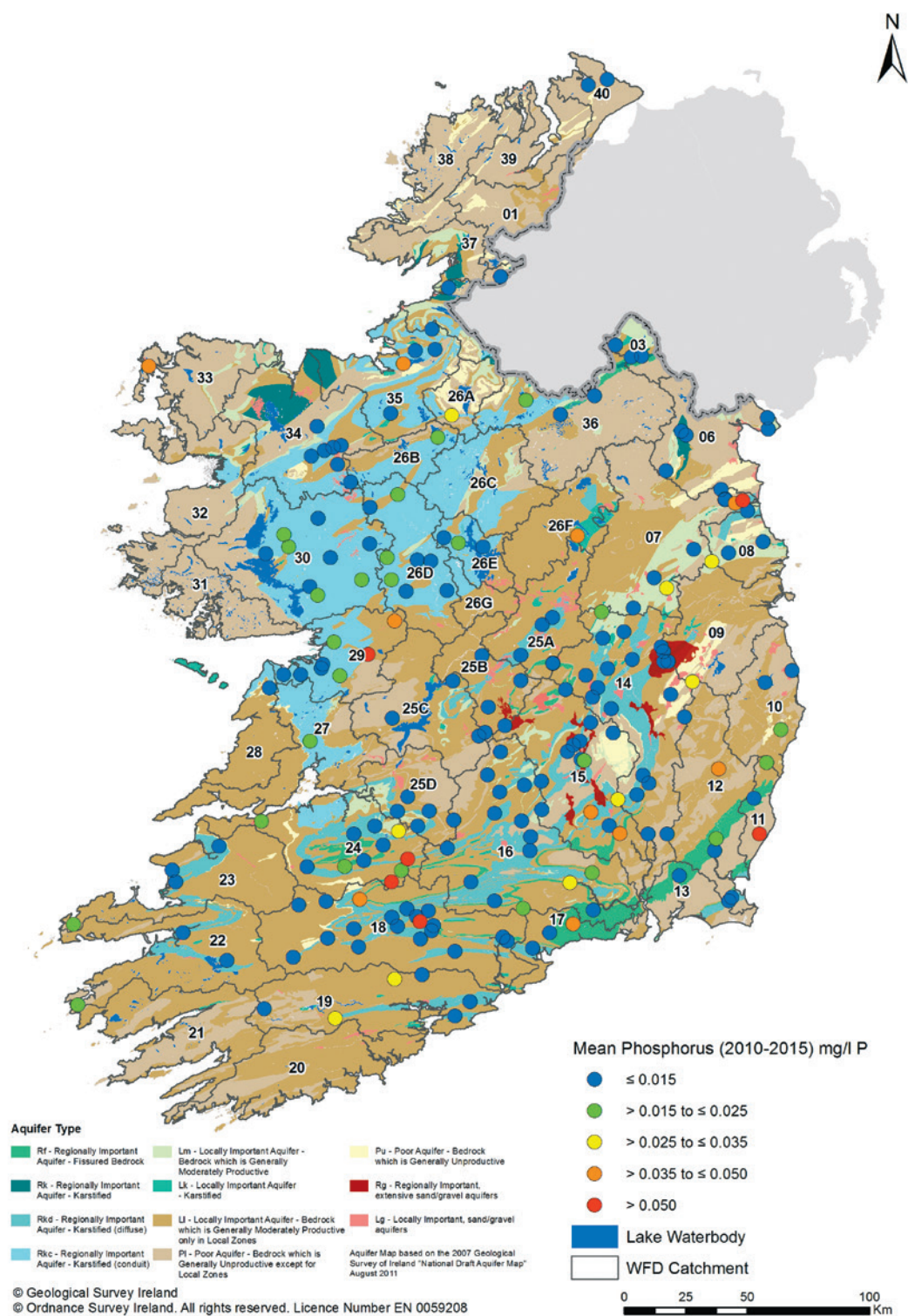


**Figure 5.3:** Comparison of the mean phosphate concentrations in groundwater since 1995.

The average phosphate concentration in groundwater was below the Threshold Value, 0.035 mg/l P, at 92% of the monitoring locations during 2010–2015 (Map 5.3). Of the 16 monitoring locations with higher average concentrations, six were greater than 0.05 mg/l P. Although most groundwater monitoring locations had average phosphate concentrations below the river environmental quality standard of 0.035 mg/l P, there is potential for groundwater in certain areas to contribute a significant proportion of the phosphate load to surface waters.



**Map 5.2:** Average nitrate concentrations in groundwater 2010–2015.



**Map 5.3:** Average phosphate concentrations in groundwater 2010–2015.

## 5.6 Other Factors

A screening analysis was undertaken for a wide suite of hazardous substances and pesticides in 2014. Two hundred and ten samples were analysed from 204 monitoring sites, with 35,671 individual results reported for 174 different parameters including acid herbicides, organochlorine pesticides, and other pesticides such as glyphosate, volatile organics and polycyclic aromatic hydrocarbons (PAHs). Only 0.25% of results were above the limit of quantification. Of these there were only four individual exceedances of the relevant standards (0.01% of results). These were single exceedances of the drinking water standard for the pesticides fluroxypyr and triclopyr and twice for 2,6-dichlorobenzamide (BAM). It should be noted that these samples were prior to any treatment, and highlight that data gathered prior to treatment can be used to guide treatment solutions and/or help inform solutions in the catchment that may preclude the requirement for subsequent treatment.

The results of the 2014 assessment and previous assessments of hazardous substances in groundwater (EPA, 2010) have reaffirmed that hazardous substances in groundwater are not a widespread national water quality issue. There has not been evidence of pesticides contributing to groundwater body scale water quality problems, though local scale issues may still exist. However, historical contamination from a small number of mining, waste and industrial activities has resulted in significant localised groundwater pollution and the groundwater bodies associated with these activities have been identified and classified as being at poor chemical status.

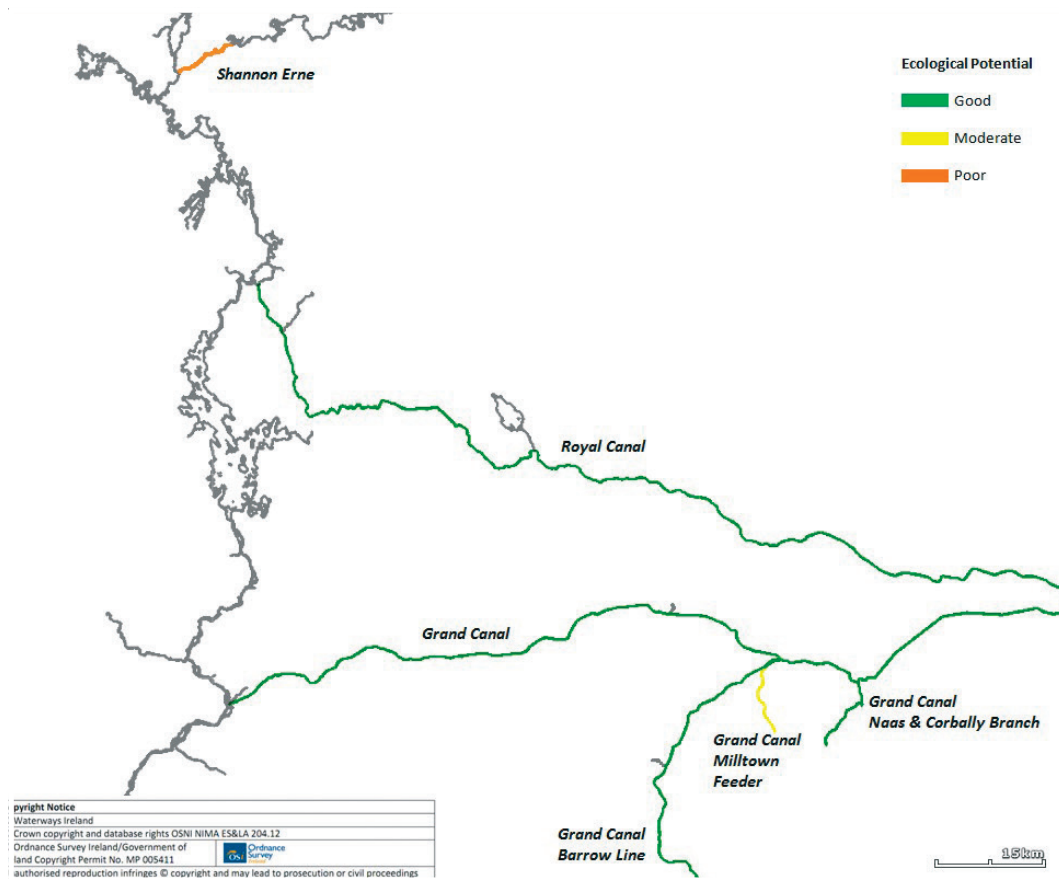


## 6. CANALS

Canals are artificial water bodies and consequently are classified based on their ecological potential rather than ecological status. Assessment of the canals using macroinvertebrates indicates generally good biological conditions in the Royal and Grand Canals, with 52% of sites classified at maximum, and 29% achieving good potential. Results were similarly positive for the Royal and Grand Canals in terms of macrophyte assessment, with 27% of sites at maximum potential and 71% of sites classified as good. When assessed for hydromorphology, all Royal and Grand Canal sites were at maximum ecological potential, while the Shannon–Erne Waterway was classified as less than good. When the biological, physico-chemical and hydromorphological quality elements were combined, 90% of the water bodies in the Grand and Royal Canals achieved good ecological potential in 2013–2015 (Table 6.1 and Map 6.1). The canalised section of the Shannon–Erne Waterway was classified as poor overall. The box-shaped profile of this waterway means that it cannot achieve good ecological potential when assessed using the macrophyte and macroinvertebrate quality elements.

**Table 6.1:** Ecological potential classification of canals in 2013–2015.

Catchment	Catchment reference	Artificial water body	Ecological potential
Royal Canal			
Liffey and Dublin Bay	09	Royal Canal Main Line	Good
Boyne	07		Good
Lower Shannon	25A	Royal Canal Main Line West of Lough Owel	Good
Upper Shannon	26F		Good
Upper Shannon	26C		Good
Grand Canal			
Liffey and Dublin Bay	09	Grand Canal Main Line East of Lowtown	Good
Barrow	14		Good
Boyne	07	Grand Canal Main Line West of Lowtown	Good
Barrow	14		Good
Lower Shannon	25A	Grand Canal Main Line	Good
Barrow	14	Grand Canal Naas and Corbally Branch	Good
Barrow Line			
Liffey and Dublin Bay	09	Grand Canal Milltown Feeder & old Barrow Line	Moderate
Barrow	14	Grand Canal Barrow Line	Good
Shannon Erne			
Upper Shannon	26A	Shannon Erne Waterway	Poor



**Map 6.1:** Ecological potential of canals in 2013–2015. (Source: Waterways Ireland)

## 7. REFERENCES

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy as amended by Decision 2455/2001/EC and Directives 2008/32/EC, 2008/105/EC and 2009/31/EC.

Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.

EPA (2006). *EU Water Framework Directive Monitoring Programme*. Prepared to meet the requirements of the EU Water Framework Directive (2000/60/EC) and National Regulations implementing the Water Framework Directive (S.I. No. 722 of 2003) and National Regulations implementing the Nitrates Directive (S.I. No. 788 of 2005). Environmental Protection Agency, Wexford.

EPA (2010). *Water Quality in Ireland 2007–2009*. Environmental Protection Agency, Wexford.

EPA (2016). *Ireland's Environment - An Assessment 2016*. Environmental Protection Agency, Wexford.

Scott, H.E., Aherne, J. & Metcalfe, C.D. (2012). Fate and transport of polycyclic aromatic hydrocarbons in upland Irish headwater lake catchments. *Scientific World Journal*, December. DOI: 10.1100/2012/828343







# AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an Gníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaoil a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaoil a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

## Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

**Rialú:** Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.

**Eolas:** Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírthe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.

**Tacaíocht:** Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaoil atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaoil inbhuanaithe.

## Ár bhFreagrachtaí

### Ceadúnú

- Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaoil:
- saoráidí dramhaíola (*m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola*);
- gníomhaíochtaí tionsclaíocha ar scála mór (*m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta*);
- an diantalmhaíocht (*m.sh. muca, éanlaith*);
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (OGM);
- foinsí radaíochta ianúcháin (*m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha*);
- áiseanna móra stórála peitрил;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

### Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíríú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídionn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaoil.

### Bainistíocht Uisce

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchríosacha agus cósta na hÉireann, agus screamhuisc; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

## Monatóireacht, Anailís agus Tuairisciú ar an gComhshaoil

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil (*m.sh. tuairisciú tréimhsiúil ar staid Chomhshaoil na hÉireann agus Tuarascálacha ar Tháscairí*).

## Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn

- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn

## Taighde agus Forbairt Comhshaoil

- Taighde comhshaoil a chistiú chun brúnna a shainaitheint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

## Measúnacht Straitéiseach Timpeallachta

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaoil in Éirinn (*m.sh. mórfhleananna forbartha*).

## Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

## Treoir, Faisnéis Inrochtana agus Oideachas

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaoil ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaoil (*m.sh. Timpeall an Tí, léarscáileanna radóin*).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

## Múscailt Feasachta agus Athrú Iompraíochta

- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

## Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair inné agus le comhairle a chur ar an mBord.



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