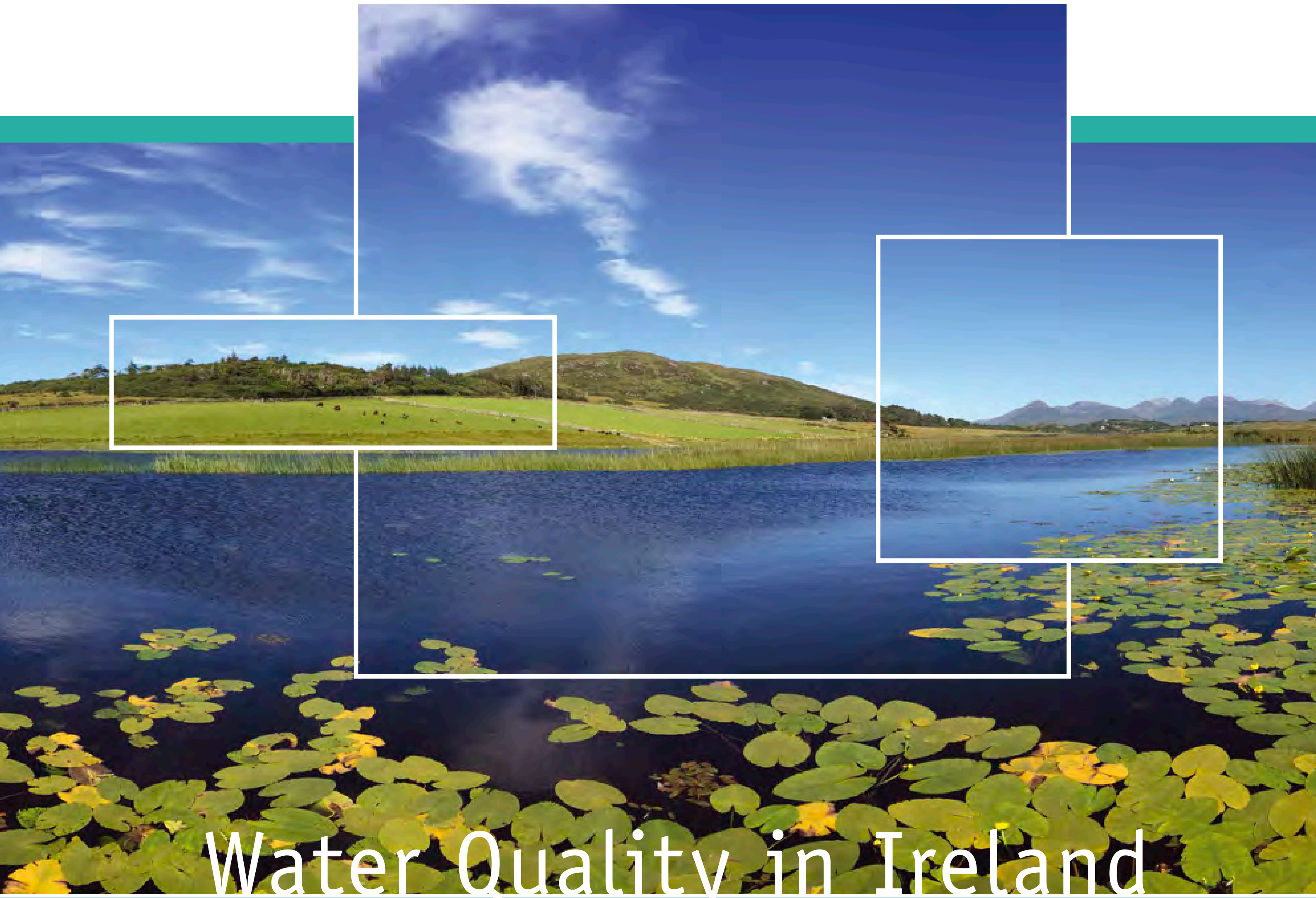
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil



Water Quality in Ireland

2013 - 2018

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.

The work of the EPA can be divided into three main areas:

Regulation: *We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.*

Advocacy: *We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.*

Our Responsibilities

Licensing

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities (*e.g. landfills, incinerators, waste transfer stations*);
- large scale industrial activities (*e.g. pharmaceutical, cement manufacturing, power plants*);
- intensive agriculture (*e.g. pigs, poultry*);
- the contained use and controlled release of Genetically Modified Organisms (*GMOs*);
- sources of ionising radiation (*e.g. x-ray and radiotherapy equipment, industrial sources*);
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

National Environmental Enforcement

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by coordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

Water Management

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government (*e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports*).

Regulating Ireland's Greenhouse Gas Emissions

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

Environmental Research and Development

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

Strategic Environmental Assessment

- Assessing the impact of proposed plans and programmes on the Irish environment (*e.g. major development plans*).

Radiological Protection

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

Guidance, Accessible Information and Education

- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making (*e.g. My Local Environment, Radon Maps*).
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Awareness Raising and Behavioural Change

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

Management and Structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- 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
2013–2018

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland
Telephone: +353 53 916 0600 Fax: +353 53 916 0699
Email: info@epa.ie Website: www.epa.ie

Report Prepared by:

S. O'Boyle, W. Trodd, C. Bradley, D.Tierney, R. Wilkes, S. Ní Longphuirt, J. Smith, A. Stephens, J. Barry, P. Maher, R. McGinn, E. Mockler, J. Deakin, M. Craig and M. Gurrie.

Acknowledgements

The authors wish to express their gratitude to the following organisations that provided data and information for this report: Inland Fisheries Ireland, local authorities, Marine Institute, National Parks and Wildlife Service, Northern Ireland Environment Agency and Waterways Ireland.

The support of the EPA laboratory and hydrometric staff, skippers and other field assistants in undertaking the monitoring programme and analytical work is greatly appreciated. The advice and assistance of colleagues in the Ecological Monitoring and Assessment Unit, Catchment Science and Management Unit and Analytics Unit is also gratefully acknowledged.

Main cover photo: Ballynakill Lough, Ruth Little
Ruth Little (Introduction, Rivers and Lakes); Robert Wilkes (Coastal Waters);
Conor Nolan (Canals) and Philip Maher (Groundwater)

ISBN 978-1-84095-876-8

CONTENTS

LIST OF MAPS

LIST OF TABLES

LIST OF FIGURES

Executive Summary

The National picture

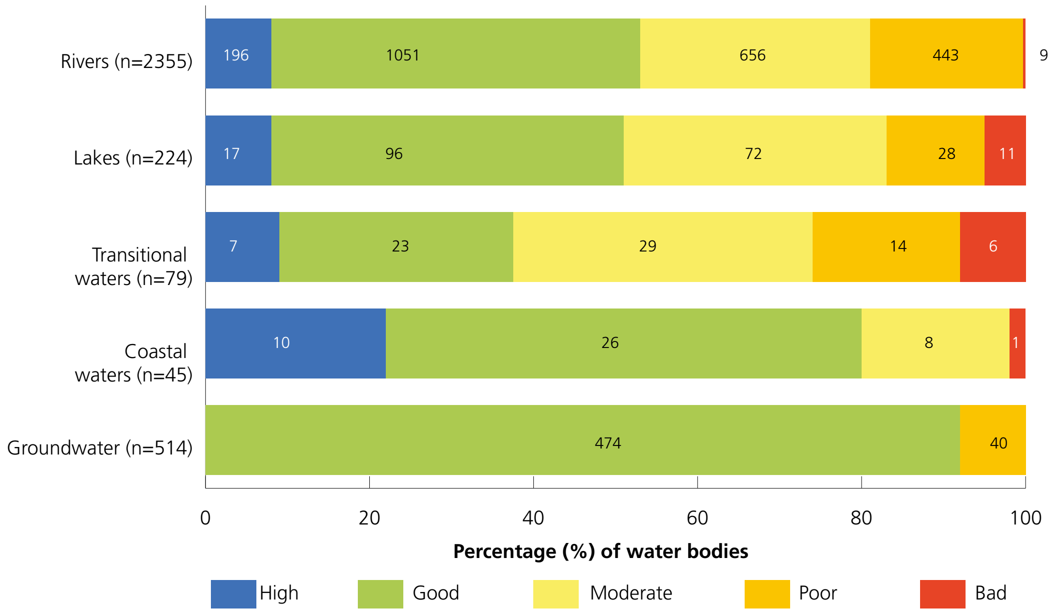
This assessment provides an evaluation of the ecological health of Ireland's rivers, lakes, canals, groundwaters, estuaries and coastal waters against the standards and objectives set out in the EU Water Framework Directive and National River Basin Management Plan 2018-2021.

The analysis is based on the assessment of biological and environmental data collected from 2,703 surface water bodies and from 514 groundwater bodies over the period 2013-2018.

The report finds that 52.8% of surface water bodies assessed are in satisfactory ecological health being in either good or high ecological status. The remaining 47.2% of surface water bodies are in moderate, poor, or bad ecological status. This compares with 55.4% at satisfactory status for the last assessment period of 2010 – 2015, a decrease of 2.6%.

Coastal waters have the highest proportion of water bodies in good or high ecological status (80%), followed by rivers (53%), lakes (50.5%) and estuaries (38%).

92% of groundwater bodies were found to be in good chemical and quantitative status, accounting for 98% of the country by area. This is a 1% improvement in the number of water bodies in good chemical and quantitative status when compared with the previous assessment (2010-2015).



Surface water ecological status for rivers, lakes, transitional and coastal waters and groundwater status 2013-2018 (Numbers in parentheses represent the total number of water bodies assessed).

In relation to the presence of priority substances and hazardous priority substances, 75% of surface water bodies assessed are in good chemical status. This increases to 99% of surface waters bodies when ubiquitous priority substances such as mercury and polyaromatic hydrocarbons (PAHs), which are already widely distributed in the environment, are omitted. These substances can be found in the environment many decades after measures have been put in place to reduce or eliminate them. Many are also capable of long-range transport which means exceedances in a water body is unlikely to be caused by local issues in that water body or indeed even in the surrounding catchment.

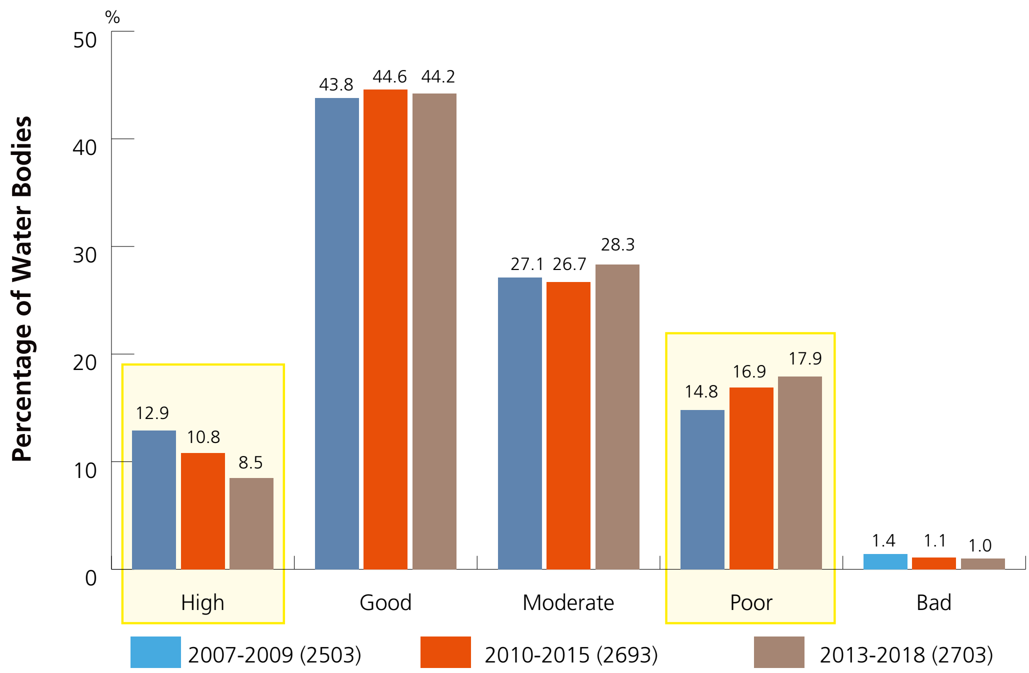
National Trends and Changes

In terms of change since the last full assessment in 2010-2015, 68.4% (1,831) of water bodies did not change in status, 18% (481) declined and 13.6% (364) improved. This resulted in an overall net decline in 117 surface water bodies or 4.4%. This was nearly entirely driven by the decline in river water bodies, with a net decline in 128 water bodies or 5.5%. The surface water categories to display a net improvement in water quality were coastal waters (a net improvement in 2 coastal water bodies) and lakes (a net improvement in 12 lakes).

Change in surface water ecological status between 2010-2015 and 2013-2018

Category	Stable	Declined	Improved	Net Change
Rivers	1,612	429	301	-128
Lakes	150	30	42	12
Transitional	47	13	10	-3
Coastal	22	9	11	2
Total	**1,831**	**481**	**364**	**-117**
Percentage	**68.4%**	**18.0%**	**13.6%**	**-4.4%**

Of particular note, in terms of change across status categories, is the continuing decline in the proportion of high status surface water bodies, which have decreased from 12.9% in 2007-2009 (the first WFD baseline assessment) to 8.5% in 2013-2018, and the very unwelcome increase in the proportion of poor status surface water bodies, which have increased from 14.8% in 2007-2009 to 17.9% in 2013-2018. This represents a loss of 94 high status surface water bodies and an increase in 115 poor status surface water bodies since 2009. These findings indicate that water quality is getting worse after a period of relative stability and improvement.



Change in the percentage of each of the five WFD status classes over three assessment periods for all surface waters – key trends highlighted.

River quality decline

Nearly all of the negative trends are driven by changes in river water quality. The substantial increase in the number of river water bodies in poor status, which have increased by a third (or 110 water bodies) since 2007-2009 is evidence that river water quality is getting worse.

Furthermore, some of the positive trends previously reported, such as the reduction in the number of seriously polluted (bad status) river water bodies, are now going in the wrong direction. The number of seriously polluted waters had dropped dramatically from 91 in 1987-1990 to only six in the last assessment period, mainly driven by concerted action to address the causes of pollution in these areas. In this current assessment the number of bad status water bodies has increased to nine. While a relatively small increase numerically, this is disappointing from both an ecological and water management perspective.

Loss of high-quality river sites

The deterioration in our highest biological quality river waters (Q5, Q4-5) has been apparent over the past few decades, with a decline from 31.6% of sites in 1987-1990 to 17.2% in this assessment. Within this grouping, there has also been a dramatic loss in our most pristine river sites (Q5), from 13.4% of sites in 1987-1990 to 0.7% of sites in 2016-2018. The number of remaining Q5 sites is now at an all-time low of just 20. These sites are important reservoirs of aquatic biodiversity and their loss is a very significant concern.

The Blue Dots Catchment Programme has been established under the current River Basin Management Plan specifically to improve the protection and restoration of these high ecological status water bodies. A significant collaborative effort will be required from all stakeholders to ensure that the loss of these high status waters is halted and where possible, reversed.

Lakes

The picture for lakes is more positive; a number of water bodies have improved in status since the last report and the overall picture for lakes is relatively stable since the baseline assessment in 2007-2009. However, trend analysis shows that total phosphorus concentrations are on the rise in over a quarter of lakes analysed. Higher nutrient concentrations can increase the likelihood of algal blooms which can damage lake ecology.

Transitional and coastal waters

Transitional waters, the collective term for estuaries and lagoons, have the poorest water quality; only 38% of water bodies are in good or better ecological status. While the status of these waters has changed little since the last report, the large percentage of water bodies at less than good status indicates these waters are under significant pressure from human activities. Phosphorus and nitrogen inputs to the marine environment have increased by 31% and 16%, respectively, since 2014, indicating that these water bodies are seeing an increase in pressures from catchment-wide sources.

In contrast, 80% of coastal waters are in good or high ecological status, making them some of the best quality coastal waters in Europe. This tends to reflect their more open exposed nature and greater capacity to absorb nutrients when compared to more sheltered transitional waters.

Groundwater

Groundwater quality remains good; 98% of the groundwater underlying the country is in good status (92% of groundwater bodies). There has, however, been a 6.5% increase in the percentage of groundwater sites with average nitrate levels greater than 25 mg/l NO_3.

Canals

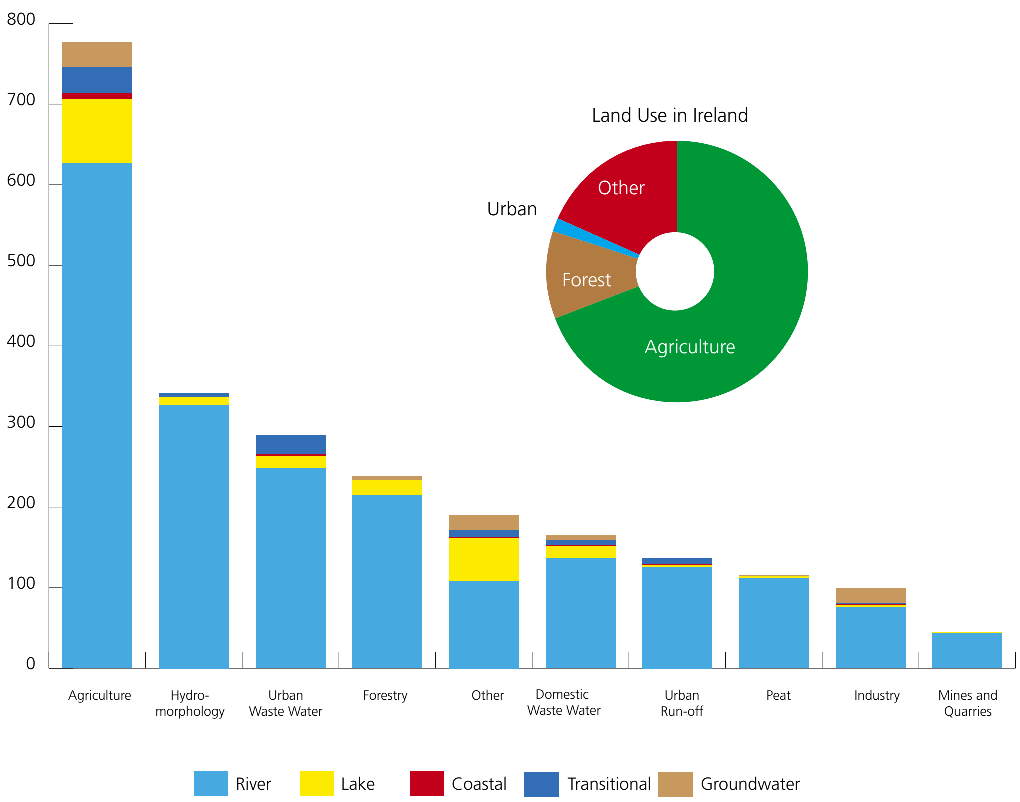
All canals assessed are in good ecological potential with the exception of the Grand Canal Basin and the Shannon-Erne canal which are in moderate and poor ecological potential respectively. Canal water quality has remained stable since the last assessment.

Fish Kills

After reaching a historic low of 14 fish kills in 2017 the number of fish kills increased to 40 in 2018. The low-flow conditions experienced in the summer of 2018 may have contributed to this rise by increasing the vulnerability of fish to pollution events (i.e. increased water temperature, depressed oxygen concentration). This highlights the importance of water body resilience; water bodies in good ecological health are likely to be more resilient than water bodies with impaired ecological health.

Pressures on the aquatic environment

The deterioration in water quality, and in particular river water quality, seen since 2015 indicates an increase in pressures coming from human activities. Overall, 1,460 individual water bodies were identified in the River Basin Management Plan as being at risk of not achieving their water quality objectives due to the damage being caused by significant pressures. The main significant pressures impacting water quality in Ireland include agriculture, waste water discharges, impacts to the physical habitat conditions including excess fine sediment (hydromorphology), and pressures from forestry activities.



Significant pressures on Ireland's aquatic environment

The main problem impacting on our waters is nutrient pollution (nitrogen and phosphorus) which can cause excessive plant growth and increase the likelihood of harmful algal blooms. A third of rivers and lakes and a quarter of estuaries are failing to meet their nutrient-based environmental quality standards. Over a quarter of monitored river sites are now seeing increasing phosphorus and nitrogen concentrations. Nutrient loads to the marine environment have also increased; phosphorus loads have increased by almost a third and nitrogen by 16% since the lowest three-year average value in 2012-2014.

Agriculture and waste water are the main sources of nutrient losses to water. Nitrogen is primarily an issue for estuaries and coastal waters while phosphorus is an issue for rivers, lakes and estuaries. Since 2013 nitrogen emissions to water have increased as both cattle numbers and fertilizer use have increased. Nitrogen emissions to water are a particular concern in the south and southeast of the country where losses to the marine environment are elevated and increasing, and the relatively freely draining soils are very susceptible to nitrogen leaching from agriculture. Nitrogen loss reduction measures need to be targeted in these areas, for example by improving nutrient use efficiencies and reducing the use of chemical fertilisers.

Phosphorus concentrations are elevated in various parts of the country including parts of the north west, north east, east coast, south east and south of the Shannon Estuary. Phosphorus losses come primarily from waste water discharges, and from runoff losses from agriculture on poorly draining soils. The increase in human population since 2013 has resulted in an increase in waste water to be treated. Works are ongoing by Irish Water to improve the level of treatment nationally however further work is required to reduce the impact of waste water discharges on our water quality.

Diffuse phosphorus losses from agriculture can be difficult to manage as the sources do not occur uniformly in the landscape. Phosphorus loss reduction measures need to be targeted at breaking the pathways which connect phosphorus sources to rivers and streams in critical source areas. Measures can include buffer strips, farm ponds and management of ditches.

Excess nutrients are not the only issue impacting on our waters. Excess sediment in run-off from land, and land drainage and channel maintenance is also impacting habitat quality in many places and more will need to be done to address this problem. There is also evidence that chemicals such as pesticides and herbicides, are impacting on the aquatic environment in some areas and a number of drinking water supplies in Ireland have been affected by pesticide exceedances. The National Pesticide and Drinking Water Action Group is working with stakeholders to raise awareness of best practices and the requirements of the Sustainable Use of Pesticides and Good Agricultural Practice regulations.

Actions to improve water quality are underway across all pressure types and sectors and while there have been some improvements, significant work for all sectors remains. The key to improving our water quality will be implementing the right measure in the right place. Moreover, there is significant potential to deliver multiple benefits for human health and for the environment in terms of biodiversity and climate from measures to improve water quality.

Outlook

This assessment finds that there has been an overall decline in surface water quality, especially in our rivers, following a period between 2004 and 2012 when overall water quality levels had improved, albeit with persistent deterioration of our highest quality waters. This recent net decline in water quality means meeting the targets set in Ireland's River Basin Management Plan 2018-2021 will be extremely challenging unless urgent steps are taken to address the causes of deterioration. The increase in nutrient concentrations, which coincide with areas impacted by agricultural activities, are a particular concern, in the context of the ambition for further growth in the sector under the Foodwise 2025 strategy.

One of the key steps in addressing water quality issues has been the establishment of the Local Authority Waters Programme (LAWPRO), a local government shared service established to carry out local catchment assessments and promote the implementation of mitigation measures to improve water quality at a local level. The Agricultural Sustainability Support and Advisory Programme (ASSAP) operated by Teagasc and the dairy cooperatives is advising farmers on measures they can take to protect water courses. Together with the Local Authority Waters Programme they will provide the means to implement targeted and measurable actions to protect and improve our waters. The initial focus for this work is in the Priority Areas for Action identified in the 2018-2021 River Basin Management Plan.

Despite the net overall deterioration seen nationally, there has been a net improvement of 16.7% (or 81 water bodies) in water quality in water bodies that were prioritised in the Areas for Action in the second cycle river basin management plan. This is an encouraging trend which highlights the on-going efforts of Local Authorities and other public bodies who have been working collaboratively to improve water quality during this monitoring period.

Outside the Areas for Action, the establishment of a Blue Dots Catchment Programme is a welcome step, as this signifies significant collaborative intent from all stakeholders to protect and hopefully reverse the significant water quality declines observed in these precious high-status water bodies

Success of these initiatives, however, depends not just on the organisations involved but also on the cooperation of other public bodies and communities and businesses living and working in our catchments.

A new sense of urgency is now needed to address the issues effecting water quality particularly in relation to agriculture and other land management practices which are key drivers behind the recent increases in nitrates and phosphorus that we are seeing in our rivers and lakes and the increasing inputs of these nutrients to our marine environment.

The EPA will continue to develop and communicate the science and evidence to support the work of the Local Authorities Water Programme, ASSAP and the other implementing bodies, and will through its own work address pressures from EPA-regulated activities. The EPA is commencing the third characterisation of our water bodies where the significant pressures will be analysed on a water body by water body basis. This analysis will be used to update the next national River Basin Management Plan (RBMP) which will be published in 2021.

Main Findings

Overall Surface water and Groundwater status

- 52.8% of surface waters (rivers, lakes, transitional, coastal waters) are in good or high ecological status and the remaining 47.2% are in moderate, poor or bad ecological status.
- Overall there has been a 4.4% net decline (117 water bodies) in the quality of surface water bodies since 2010-2015.
- 92% of groundwater bodies are in good chemical and quantitative status which reflects a 1% improvement since the last period of assessment.
- 75% of monitored surface waters are in good chemical status. When ubiquitous priority substances are omitted, the percentage in good chemical status increases to 99% of surface waters.

Rivers

- 53% of river water bodies are in good or high ecological status and the remaining 47% are in moderate, poor or bad ecological status.
- Overall there has been a 5.5% net decline (128 water bodies) in the quality of river water bodies.
- The number of high status river water bodies has dropped by nearly a third (91 water bodies) since the baseline assessment in 2007-2009.
- The dramatic loss of high quality biological sites (Q5 and Q4-5) seen since the late 1980s shows no sign of recovery. The number of remaining Q5 highest biological quality sites is now at an all-time low of just 20.
- The number of poor status river water bodies has increased by a third (110 water bodies) since the first assessment in 2007-2009.
- The number of seriously polluted bad status river water bodies has increased to nine having reached a low of six water bodies in the last assessment 2010-2015.
- Over a third (35.8%) of monitored river sites failed to meet the environmental quality standard for phosphorus of 0.035 mg/l P.
- At least a quarter of river sites had increasing nutrient concentrations between 2013-2018.

Lakes

- 50.5% of lake water bodies are in good or high ecological status; the remaining 49.5% are in moderate, poor or bad ecological status.
- There has been a 4.3% improvement in the number of lake water bodies in good or high ecological status since the last assessment in 2010-2015, but overall lake status has remained stable since the first assessment in 2007-2009.
- Almost a third (29%) of lakes failed to meet the environmental quality standard for total phosphorus of 0.025 mg/l P.
- Over a quarter (28.8%) of lakes analysed had increasing trends in total phosphorus concentration.

Canals

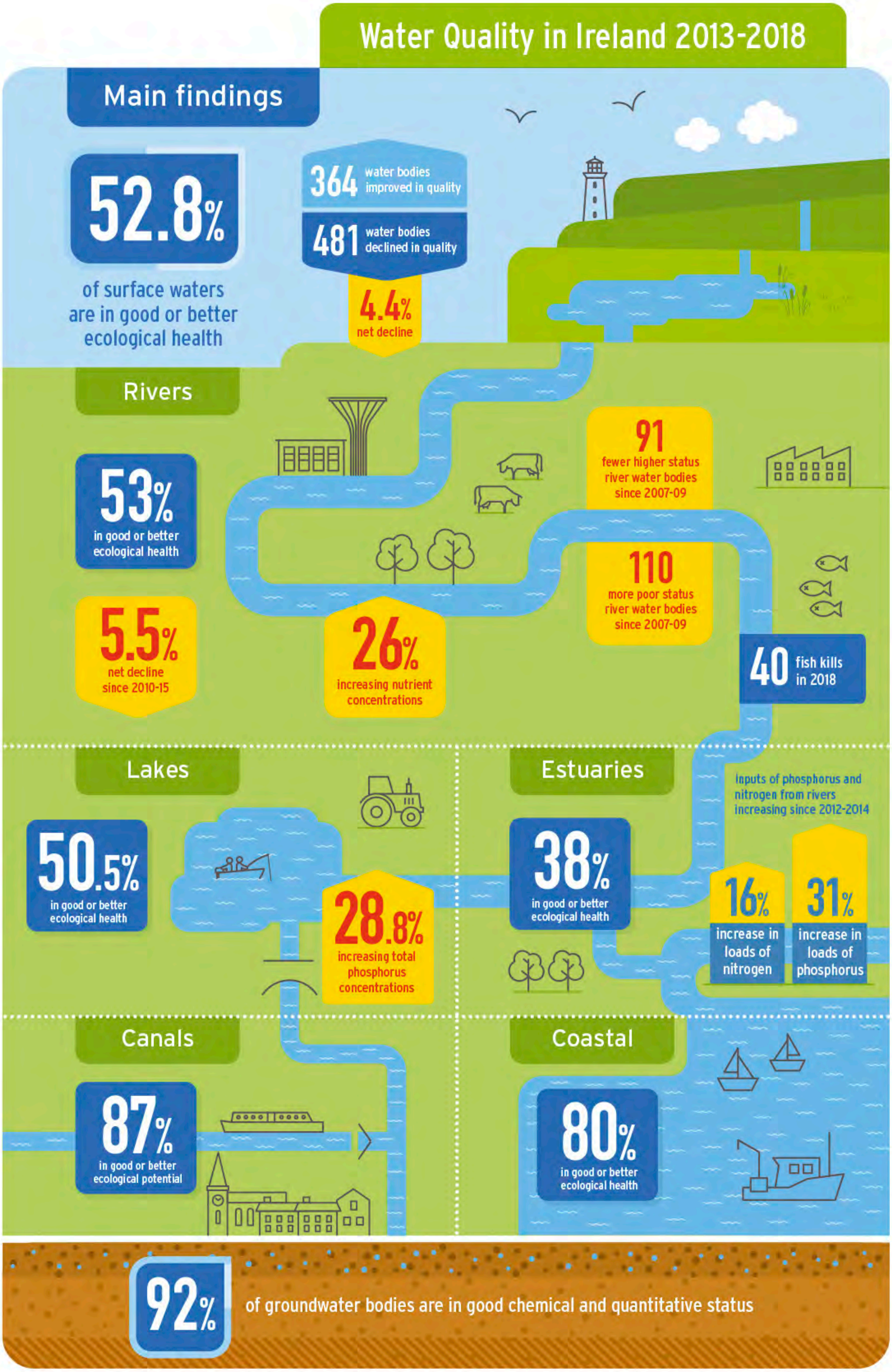
- There has been little change in the quality of our canals since the last assessment; 13 of the 15 water bodies (87%) assessed are in good ecological potential.

Transitional and coastal waters

- 80% of coastal water bodies are in good or high ecological status, the highest for any surface water category.
- Transitional water bodies are the worst performing water category with only 38% in good or high ecological status and the remaining 62% in moderate, poor or bad status.
- Almost a quarter (23.3%) of estuaries and coastal waters failed the assessment criteria for dissolved inorganic nitrogen (DIN).
- After many years of reductions, loadings of phosphorus and nitrogen to the marine environment have started to increase. The average total nitrogen and total phosphorus loads have increased by 8,806 tonnes (16%) and 329 tonnes (31%) respectively, since a low in 2012-2014.

Groundwater

- 92% of groundwater bodies (474 out of 514) are in good chemical and quantitative status.
- 38 groundwater bodies (7.4%) are in poor chemical status and two groundwater bodies (0.4%) failed to meet the quantitative status objective.
- 97% of groundwater monitoring locations had an average nitrate concentration below the threshold value of 37.5 mg/l NO_3.
- However, since 2013, there has been a 6.5% increase in the percentage of groundwater sites with average nitrate levels greater than 25 mg/l NO_3.


Water Quality in Ireland 2013-2018
Main findings
52.8% of surface waters are in good or better ecological health
364 water bodies improved in quality
481 water bodies declined in quality
4.4% net decline
Rivers
53% in good or better ecological health
5.5% net decline since 2010-15
26% increasing nutrient concentrations
91 fewer higher status river water bodies since 2007-09
110 more poor status river water bodies since 2007-09
40 fish kills in 2018
Lakes
50.5% in good or better ecological health
28.8% increasing total phosphorus concentrations
Estuaries
38% in good or better ecological health
Inputs of phosphorus and nitrogen from rivers increasing since 2012-2014
16% increase in loads of nitrogen
31% increase in loads of phosphorus
Canals
87% in good or better ecological potential
Coastal
80% in good or better ecological health
92% of groundwater bodies are in good chemical and quantitative status

INTRODUCTION

1. Introduction

1.1 About this report

This is a report on the ecological and chemical status of Ireland's surface waters and the quantitative and chemical status of its groundwater resource. The evaluation is based on information collected over a 6-year period between 2013-2018.

Water is critical to life on earth. Good water quality underpins our economy and our quality of life. It provides a clean source of drinking water, a vital raw material for industry, and a home for a huge variety of aquatic plants and animals ranging from tiny river insects to kingfishers and otters. Protecting Ireland's water resource is therefore of critical importance.

Unfortunately, this important natural resource is under threat from a range of human activities that cause water pollution and impact on the physical integrity of water bodies and water habitats. These activities together with climate change continue to threaten the quality and availability of water.

Since 2009, the quality of Ireland's surface waters (i.e. rivers, lakes, estuaries and coastal waters) and groundwater resource has been assessed against the standards and objectives set out in the EU Water Framework Directive. The Directive requires the achievement of good status in both surface water and groundwater bodies and the prevention of deterioration in water bodies that are already in good or better status.

This report presents the results of the second 6-year assessment undertaken since the introduction of the Water Framework Directive (WFD) and it provides a full assessment of the state of Ireland's aquatic environment. The results from this assessment will be compared to those of the previous assessment in 2010-2015 and the first WFD baseline assessment in 2007-2009.

The Irish government has established a national River Basin Management Plan for Ireland 2018-2021 which sets out the steps to be taken to protect and improve water quality. The plan outlines the key measures that will be implemented over this period and the level of expected improvement in water quality.

1.2 Ecological status of surface waters

The quality of surface waters is assessed by looking at a range of aquatic organisms whose presence and abundance tells us about the ecological health of different water bodies. These biological quality elements include phytoplankton, macroalgae, aquatic plants, macroinvertebrates and fish (these are described in Box 1.1 below). Changes in the composition and abundance of these different biological communities against what would be expected in the absence of pollution and impacts from human activities are measured.

The ability of a water body to support different biological communities is also assessed. Information on biology and supporting physico-chemical and hydromorphological quality elements is used to assess ecological status which is an expression of the ecological health of these different water categories (how this is done is illustrated in Box 1.2 below).

Ecological status indicates if a natural water body is being damaged by pollution or habitat degradation. Waters in high and good ecological status show only minor or slight changes from natural conditions whereas waters at less than good status (moderate, poor or bad) range from moderately to severely damaged by pollution or habitat degradation. The extent of deviation from reference condition for each status class and what this means from an ecological perspective is illustrated by Figure 1.2. The ecological status of a water body provides a useful marker to help guide the identification of appropriate water management measures needed for the protection and restoration of these waters.

Artificial water bodies, such as canals, and heavily modified water bodies, such as reservoirs, which have been significantly physically altered from their natural state to serve a certain beneficial purpose, are classified according to their ecological potential. The ecological potential is the maximum ecological quality they can achieve without losing their beneficial purpose. Nationally, about 2% of surface water bodies have been identified as either heavily modified or artificial. Across Europe the percentage is higher; 13% of surface waters are identified as heavily modified and 4% as artificial (EEA, 2018).

Box 1.1 Biological Quality Elements and Supporting Quality Elements

Macroinvertebrates are small animals that live on the bottom of rivers, lakes, estuaries and coastal areas. They include aquatic insects, snails, worms, clams and brittle stars and are a key source of food for other animals such as fish. Macroinvertebrates are sensitive to many pressures, such as organic enrichment causing oxygen depletion, physical alterations to habitats, siltation and acidification.

Aquatic plants include macrophytes and angiosperms that grow in and along river banks and on the bottom of lakes. Seagrass, a type of angiosperm, grows on soft sediment in estuaries and is an important habitat and nursery for juvenile fish.

Macroalgae are large algae visible to the human eye. They can grow in rivers and lakes and on soft substrates and rocky shores in transitional and coastal waters. Some types of macroalgae can respond quickly to the presence of too much nutrient in the water by forming dense algal mats that can smother other animals and plants.

Phytoplankton are microscopic algae that drift along with water movements. Their small size and ability to grow quickly means that this biological element is often the first to respond to the presence of too much nutrient in the water by forming blooms which can cause the colour of the water to change. Cyanobacteria are a type of phytoplankton which are known to bloom in Irish lakes.

Phytobenthos are microscopic algae that grows on rocks and other types of substrate. Phytobenthos are sensitive to nutrient enrichment.

Fish are particularly sensitive to physical changes to their environment and changes in water flows. Barriers that prevent fish from travelling along a water way will limit their ability to forage for food or to reach upstream breeding areas. Fish are also harmed by pollution that causes oxygen depletion or the introduction of non-native fish species which may out compete native species for food resources.

Physico-chemical quality elements support the biological quality elements listed above. They generally consist of nutrient conditions, oxygenation conditions and river basin specific pollutants. In rivers and lakes, they also include acidification conditions. These supporting elements are set at levels to protect the most sensitive plants and animals.

Hydromorphological quality elements support the biological quality elements. They generally consist of flow conditions (i.e. quantity of flow and connection to other surface water bodies) and morphological conditions (i.e. shape, depth, width and substrate of the bed).

Box 1.2 How is overall status assessed?

An overview of how the status of surface waters and groundwaters is determined under the Water Framework Directive (WFD) is illustrated in Figure 1.1. As explained above ecological status is assessed by considering the values of the biological quality elements and the supporting physico-chemical quality elements and hydromorphological quality elements. The Directive specifies which elements are to be assessed for each water category and requires that biological and supporting quality elements achieve at least good status. Overall ecological status for a water body is determined according to the 'one out, all out' principle, by the element with the lowest status out of all the biological and supporting quality elements assessed.

Water bodies must also be in good chemical status. For surface water bodies this means that the concentration of priority substances do not exceed the concentration permitted for by their respective environmental quality standard. For groundwater bodies good chemical status is achieved when concentrations of specified substances do not exceed those permitted by relevant standards and when concentrations do not prevent associated surface water from achieving good status or cause significant damage to terrestrial ecosystems that depend directly on groundwater. Groundwater bodies must also be in good quantitative status.

Information on the ecological and chemical status of surface water bodies and the chemical and quantitative status of groundwater bodies is used to provide an assessment of overall status.

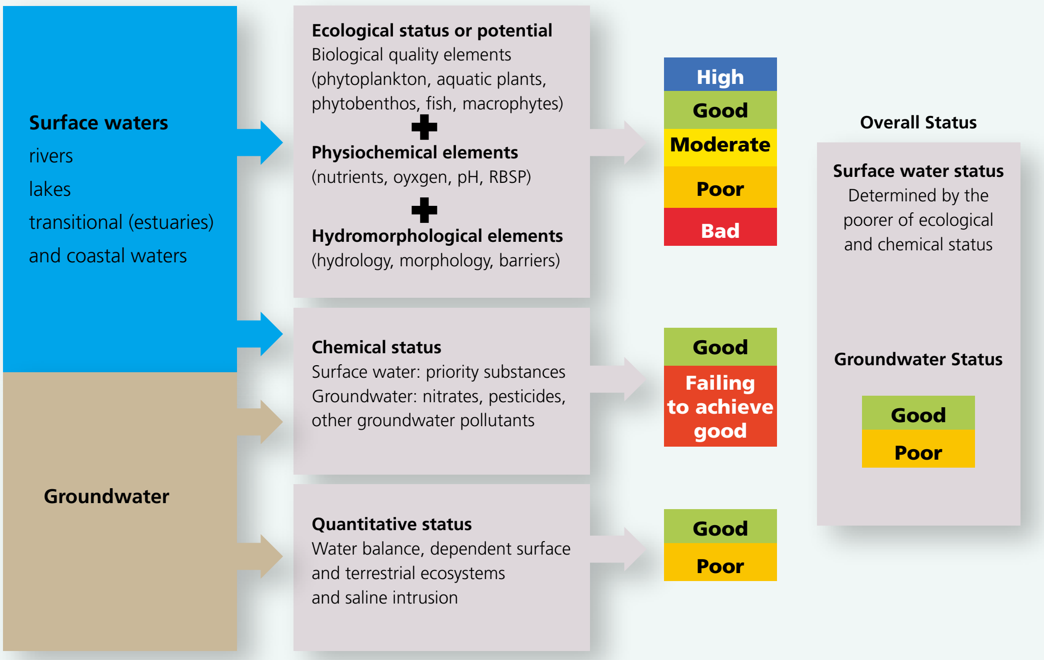


Figure 1.1: Classification of status of surface waters and groundwater according to the WFD (modified from EEA, 2018)

1.3 Chemical status of surface waters

The presence of chemical substances known as priority substances or priority hazardous substances, is assessed against a range of environmental quality standards (EQSs). These standards have been set at levels to protect the most sensitive aquatic organisms and to protect those higher up the food chain (predators and humans) from their damaging effects. Waters which have concentrations below the EQS for these substances are defined as being in good chemical status.

1.4 Chemical and quantitative status of groundwater

Chemical status is also assessed for groundwater. To achieve good chemical status, the entry of chemical substances to groundwater should be prevented for priority hazardous substances or limited for other chemical substances such as nitrate. The quantitative status of groundwater is assessed based on the volume of groundwater resource present. Groundwater status is classified as either good or poor.

1.5 Catchment-based report

For water, a catchment is simply defined as an area of land draining towards a river, lake or other body of water. For this report, assessments are presented for the 46 catchment areas used as the main management units in the National River Basin Management Plan (Map 1.1.). This enables the reader to see at a glance where water status is getting better or worse. This information is also provided on a county basis for river water bodies.

1.6 Data sources and methodology

The total number of water bodies in the state is 4,829 and just over two-thirds of these are included in the national Water Framework Directive monitoring programme. A 'water body' is the basic assessment unit used in the WFD to check compliance against the environmental quality objectives that have been set for that water body. Typically, rivers and estuaries are made up of several water bodies, whereas lakes and most coastal waters are represented by a single water body.

Information has been collected from:

- 2,355 river water bodies
- 215 lakes and nine reservoirs
- 79 transitional water bodies
- 45 coastal water bodies
- 514 groundwater bodies
- The Royal Canal, the Grand Canal (including the Barrow Line) and the Shannon–Erne Canal.

The public bodies involved in the collection of this information include the Environmental Protection Agency, Marine Institute, Inland Fisheries Ireland, Waterways Ireland, National Parks and Wildlife Service and local authorities.

The monitoring programme is split into two main elements: a surveillance monitoring programme which is designed to provide a representative picture of water status across a river basin district and an operational monitoring programme which is designed to assess change in water status as a result of measures. Many of the biological elements are updated every three-years but other elements such as hydromorphology and priority substances are updated every six-years.

1.7 Significant pressures and impacts

The aquatic environment in Ireland is subjected to impacts from many different human activities and pressures. These activities, either acting alone or together, can damage the quality of Ireland's surface water and groundwater resource. Characterisation by the EPA of these pressures has identified the most prevalent pressures causing damage to the quality of water bodies. These are:

- agriculture (affecting 53% of water bodies)
- discharges from urban and domestic waste water treatment systems (affecting 29% of water bodies)
- hydromorphological alterations that change the flow and structure of water bodies (affecting 24% of water bodies) and
- forestry (affecting 16% of water bodies).

Other less common but significant pressures include pollution from diffuse urban run-off and industry and pressures caused by peat extraction, mining and quarrying. Over half of water bodies that are impacted, are impacted by more than one pressure type.

Agricultural pressures, which are the most prevalent, include point source pollution associated with farmyards and other places where animals congregate, and diffuse pollution associated with nutrient (phosphorus and nitrogen), sediment and pesticide runoff from land. In relation to wastewater, the primary pressure is from urban wastewater discharges, but domestic waste water (septic tanks) can have impacts at the local scale. Diffuse urban discharges, including runoff from paved areas, leaking sewers, and misconnections from domestic plumbing systems into the wrong pipes, are also significant contributors.

Alteration of hydromorphological conditions is currently the third most prevalent significant pressure on our surface waters. Hydromorphology can be described as the study of the physical character and processes that take place within our surface waters. Physical alterations to river banks and lake and coastal shorelines and changes to flow patterns can damage surface water ecology.

Forestry and peat extraction can cause ecological problems through increased erosion rates, siltation and nutrient loss.

1.8 National River Basin Management Plan

River Basin Management Plans (RBMPs) are plans to protect and improve the water environment. To date, there have been two cycles of river basin management planning: the first cycle covered the period 2010-2015. The target set out in the first-cycle plan of a 13% improvement in water quality was not met.

The Government published a second-cycle RBMP 'River Basin Management Plan for Ireland, 2018 – 2021' in 2018. The Plan aims to implement the lessons learned from the first cycle and outlines the measures that will be taken to protect and improve water quality up to 2021. Some of the key measures include:

- Establishment of the Local Authority Waters Programme to carry out localised assessments and promote the implementation of mitigation measures to improve water quality at a local level.
- Setting up the Agricultural Sustainability Support and Advisory Programme (ASSAP). ASSAP is run by Teagasc and the dairy cooperatives and will provide water quality advice to the farming community whilst working closely with the Local Authority Waters Programme.
- Establishment of the Blue Dot Catchments Programme and working group to ensure the protection of our remaining high status waters.

The Plan has prioritised a total of 190 Areas for Action which will receive greater attention during the period of the second cycle (see Map 1.2). In terms of water quality, the objective of the plan is to see signs of water quality improvements (for example a change in nutrient trends) in 726 water bodies (in the 190 Areas for Action) and for 152 of these to have improved sufficiently so they achieve good or high ecological status. The Plan also envisages that water bodies outside Areas for Action will benefit from existing and newly introduced measures.

1.9 Accessing information on water quality

The data presented in this report are available at a water body and monitoring station level via the www.catchments.ie website. This website was developed collaboratively by the Department of Housing, Planning and Local Government, the Local Authority Waters Programme 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 access to a large range of information connected to our water environment including examples of good practice to help protect our local water catchments.

Information on how water quality In Ireland compares to that of Europe is also available on the European Environment Agency's website through its WISE Water Framework Directive Data Viewer (www.eea.europa.eu/data-and-maps/dashboards/wise-wfd) (see Box 1.3).

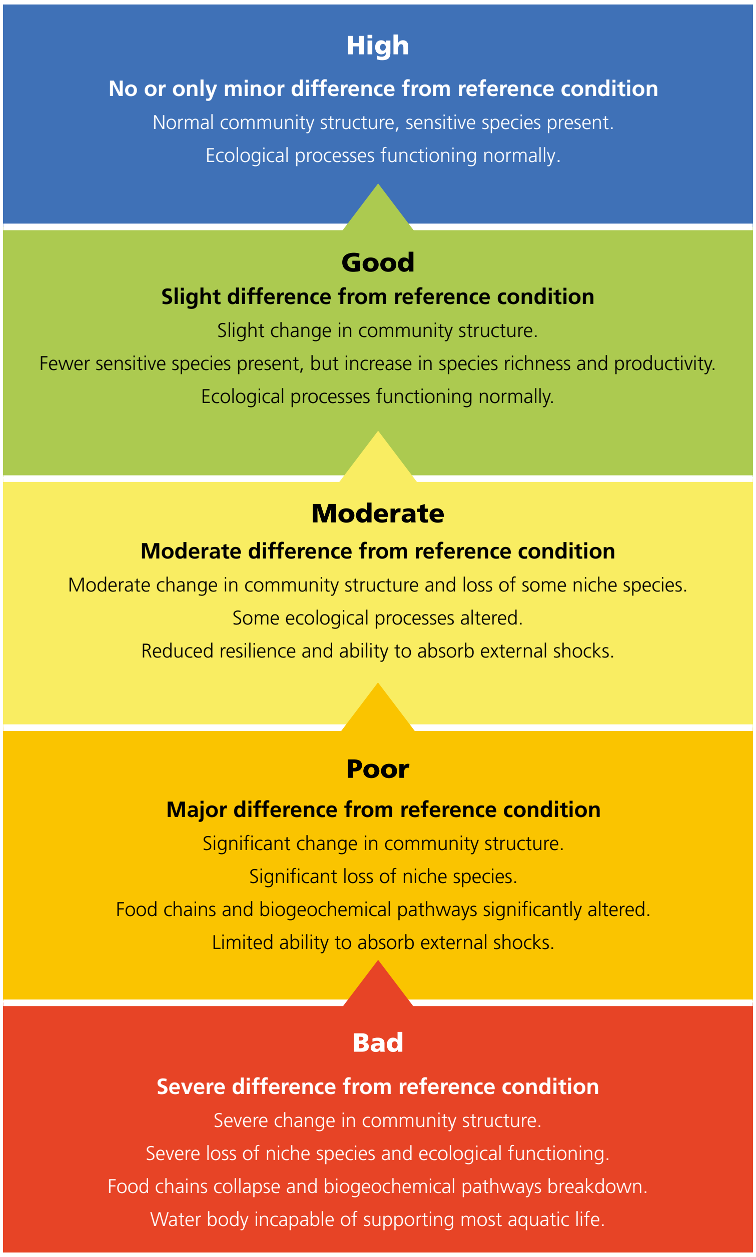
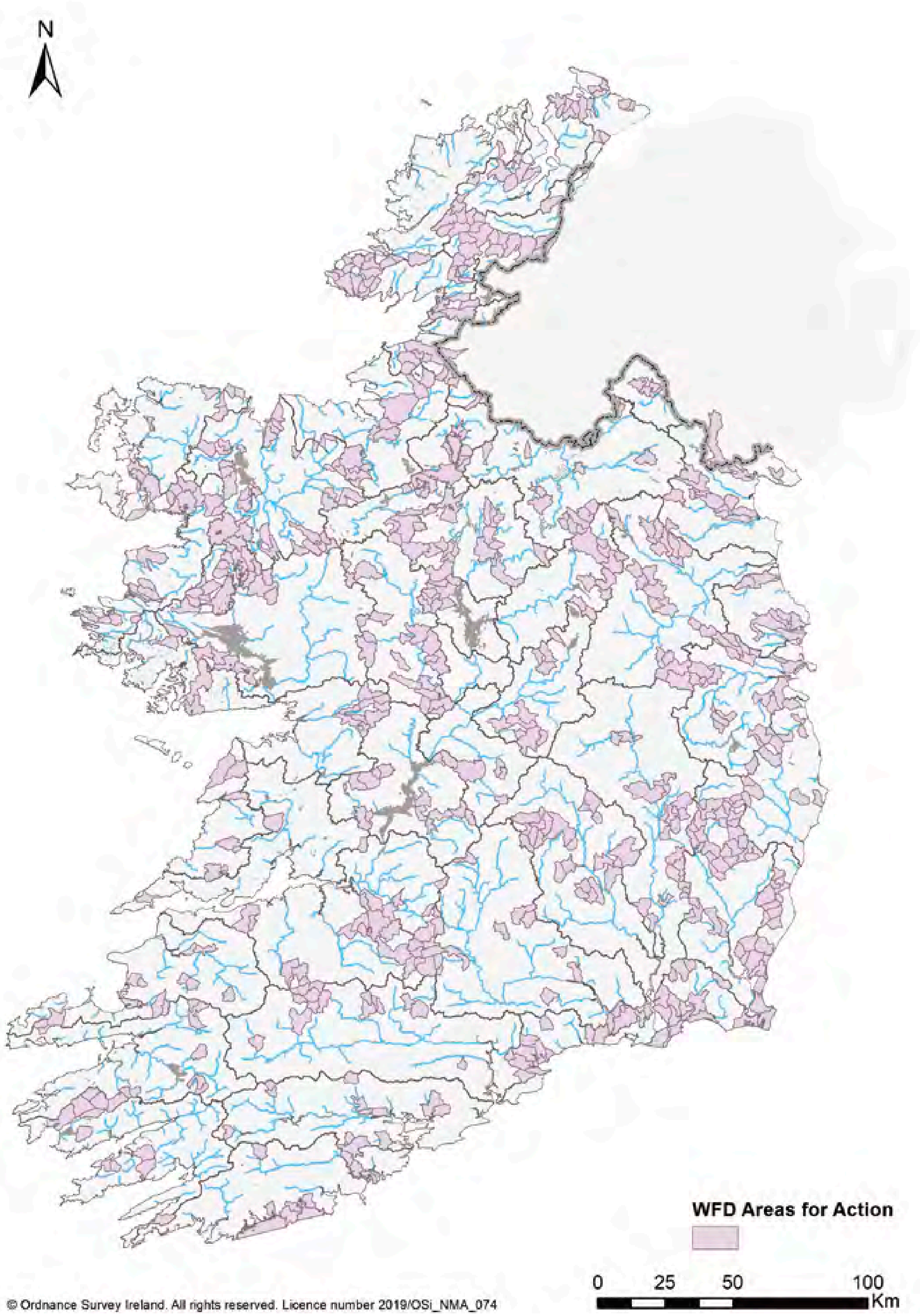


Figure 1.2: A description of each of the ecological status classes based on the definitions in the WFD and the typical ecological responses associated with each class.

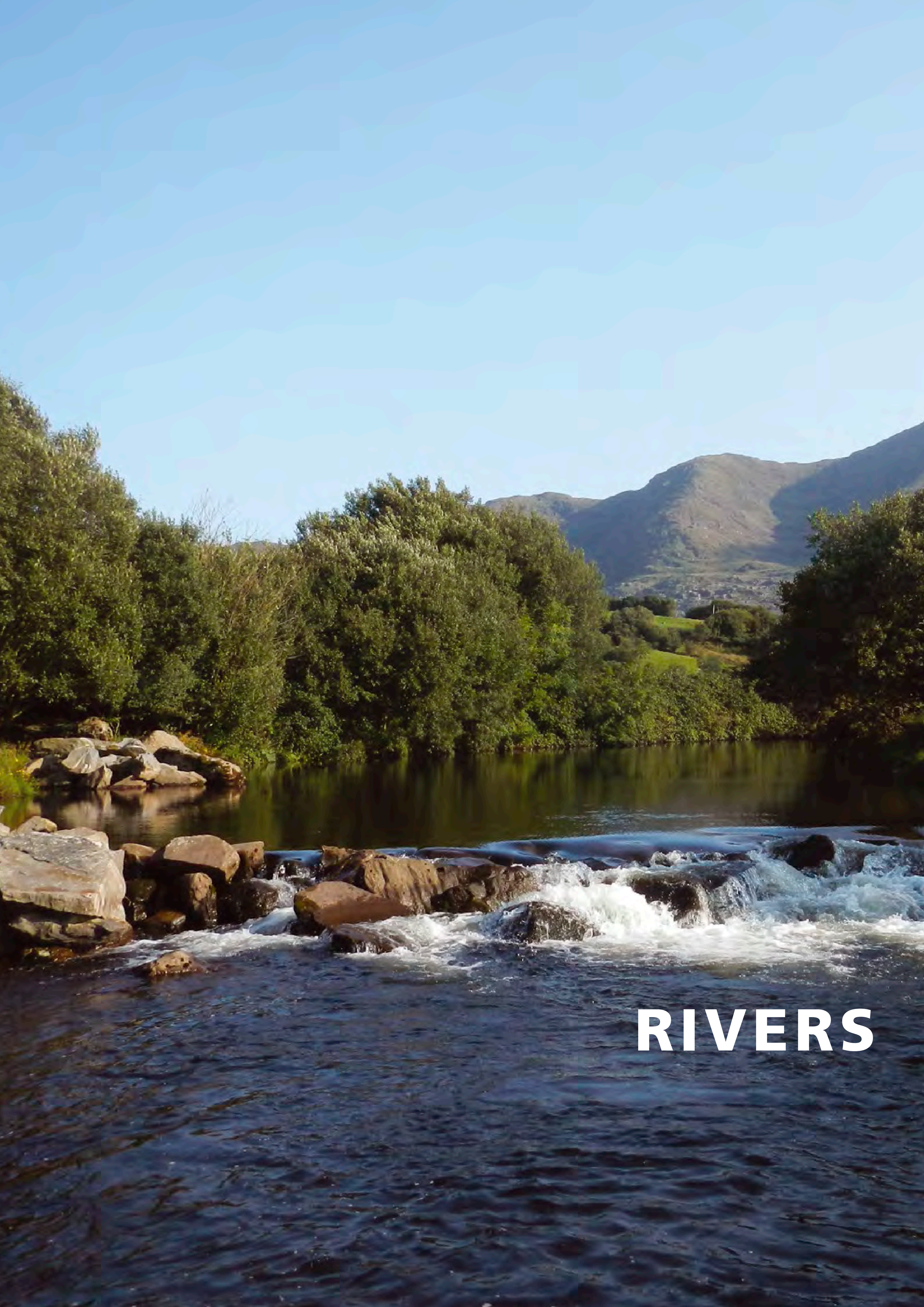
Box 1.3 Water quality across Europe

One of the benefits of the standardised approach used in the Water Framework Directive is it allows us to compare water quality in Ireland to that across Europe. The most recent pan-European assessment of surface waters and groundwaters (2010-2015) found that approximately 40% of surface water bodies were in good ecological status and 74% of groundwater bodies were in good chemical and quantitative status (EEA, 2018). Coastal waters had the highest proportion of water bodies in good or high ecological status (54.6%), followed by lakes (53.6%), rivers (41.5%) and estuaries (30.2%).

Map 1.1: Location of Ireland's river catchments.



Map 1.2: Location of the Areas for Action prioritised in Ireland's second-cycle River Basin Management Plan 2018-2021.



RIVERS

2. RIVERS

2.1 Introduction

Ireland has over 84,800km of river channel with streams, rivers and tributaries flowing from their headwaters through a network of channels that reaches almost every community 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 delineated in Ireland; 2,355 of these are assessed as part of the national river monitoring programme.

2.2 Summary for Rivers

- 1,247 monitored river water bodies (53%) are in high or good ecological status and 1,108 monitored river water bodies (47%) are in moderate, poor or bad ecological status.
- 301 river water bodies improved in ecological status class, 429 declined and 1,612 remained unchanged resulting in a net decline of 128 river water bodies since 2010-2015.
- There has been a 3.7% decline in the number of high or good ecological status river water bodies since 2010-2015 and a 5.3% decline since the baseline assessment in 2007–2009.
- The number of high status river water bodies has fallen by nearly a third (91 water bodies) since the baseline assessment in 2007-2009.
- The highest quality biological sites (Q5) show no sign of recovery having fallen from 13.4% of sites in 1987-1990 to only 0.7% of sites in this assessment. The number of Q5 sites currently stands at twenty.
- The length of satisfactory river channel (Q4, Q4-5 and Q5 rivers) has declined by 2.7% of channel surveyed between 2013-2015 and 2016–2018.
- The number of poor status river water bodies has increased by a third (110 water bodies) since the first baseline assessment in 2007-2009.
- Just over a third (35.8%) of river sites failed the environmental quality standard for phosphorus (> 0.035 mg/l P - measured as molybdate reactive phosphorus).
- A quarter of river sites had increasing phosphorus and nitrogen concentrations between 2013-2018. These increases did not necessarily occur at the same river site.
- After reaching a historic low of 14 fish kills in 2017 the number of fish kills increased to 40 in 2018. The drought conditions experienced in the summer of 2018 may have contributed to this rise by increasing the vulnerability of fish to pollution events.

2.3 National Ecological Status

Of the 2,355 monitored river water bodies 1,247 (53%) are in high or good ecological status; 1,108 (47%) were at less than good ecological status (Figure 2.1). Of the less than good water bodies, 656 (28%) were in moderate status, 443 (19%) were in poor status, and nine were in bad status (< 0.4%). Map 2.1 illustrates the geographical distribution of ecological status for monitored river water bodies across the country.

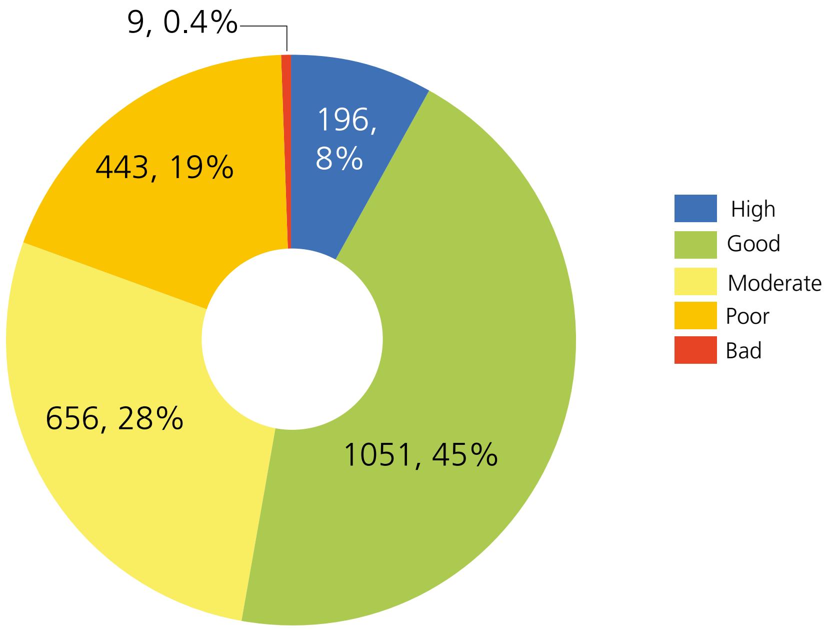
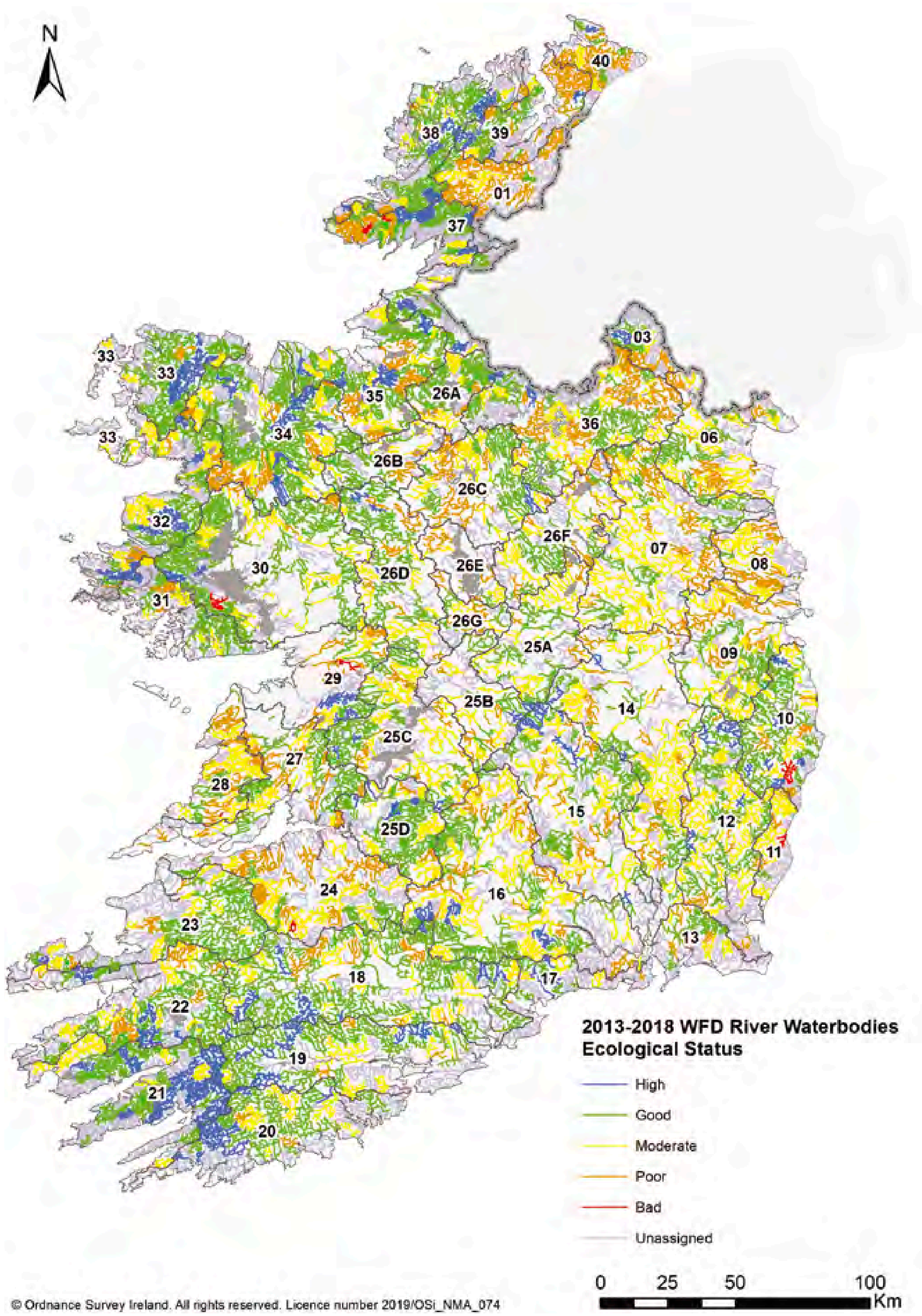


Figure 2.1: Ecological status of river water bodies 2013–2018 (labels show number of water bodies and percentage of water bodies).



Map 2.1: The ecological status of monitored river water bodies 2013–2018.

2.4 Catchment Level Ecological Status

River water status for each of the 46 catchments nationally is shown in Map 2.2. The catchments with the best river water quality, above the national average of 53%, are located mainly in the west and south-west of the country. Over 80% of the river water bodies monitored in the following catchments were in satisfactory ecological status (i.e. high or good):

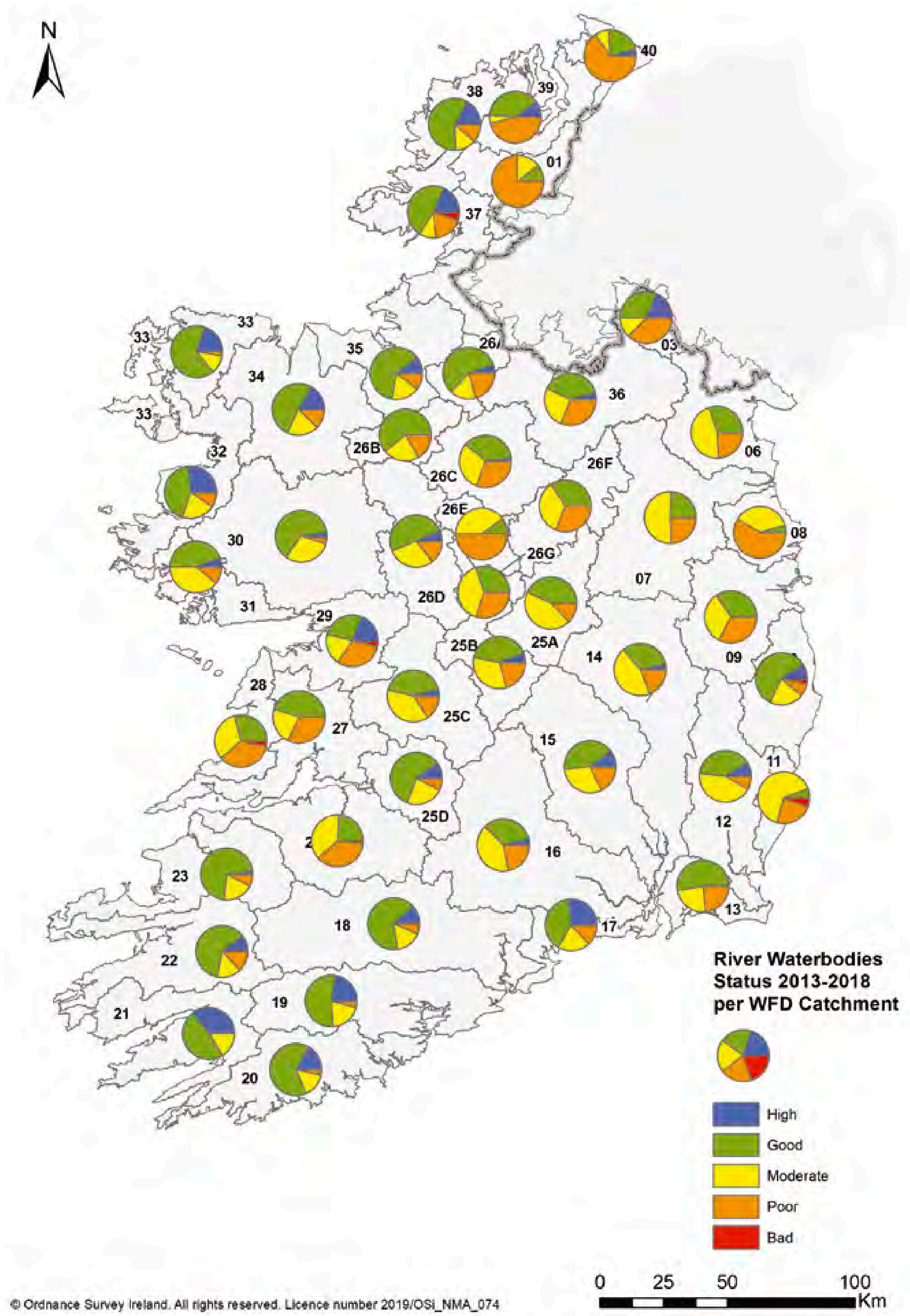
- 20_ Bandon-Ilen
- 21_Dunmanus-Bantry-Kenmare
- 33_Blacksod–Broadhaven.

Both the western 32_Errif Clew Bay and 22_Laune-Maine-Dingle Bay catchments have seen a decline with the percentage of river water bodies classified in high and good ecological status now falling below 80% in this latest period when compared to 2013-2015.

The catchments with the lowest percentage of satisfactory river water bodies, below the national average, were located mainly in the north west, east, south-east and midlands. Less than 40% of the river water bodies monitored in the following catchments were in satisfactory ecological status:

- 01_Foyle;
- 40_Donagh-Moville;
- 06_Newry, Fane, Glyde and Dee;
- 07_Boyne;
- 08_Nanny–Delvin;
- 09_Liffey and Dublin Bay;
- 11_Owenavorragh;
- 24_Shannon Estuary South;
- Four catchments in the Upper Shannon (26C, 26E, 26F and 26G);
- 28_Mal Bay.

The breakdown on a local authority basis is also shown in Figure 2.2



Map 2.2 : Ecological status of 2,355 monitored river water bodies at the catchment level for 2013–2018.

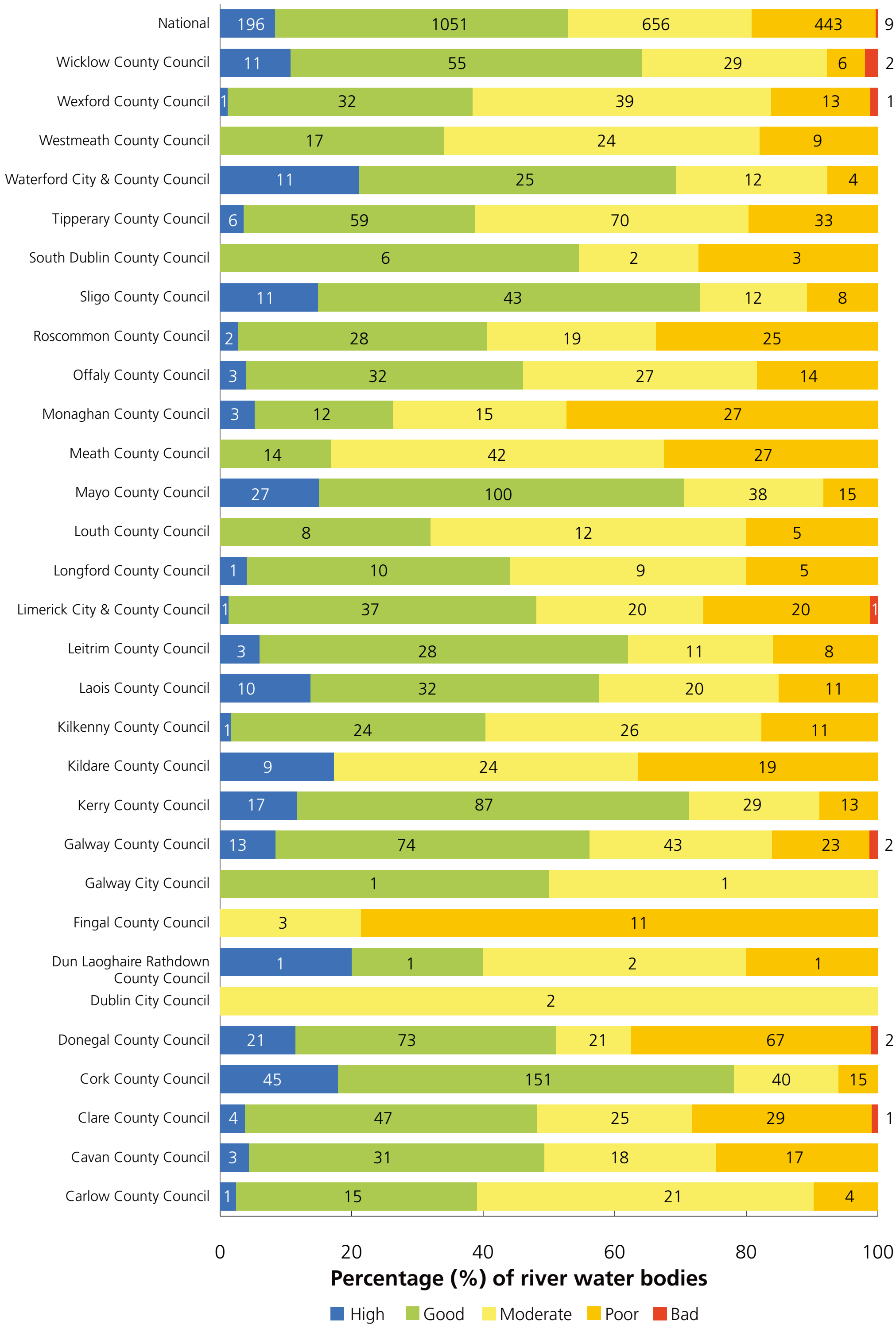


Figure 2.2: Ecological status of 2,355 monitored river water bodies by local authority region for 2013–2018 (number of water bodies in each status class in each region is also shown).

2.5 Factors Driving Ecological Status

In addressing areas with less than satisfactory ecological status is it important to know what element, or combination of elements, is responsible for less than satisfactory status classification.

The biological, physico-chemical and hydromorphological elements used to assess river water body ecological status is shown in Figure 2.3. The biological quality elements used in rivers are macroinvertebrates and fish. Macroinvertebrates, as an individual element or in combination with other elements, are responsible for determining ecological status in 91% of the monitored river water bodies. 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.

In the surveillance river water bodies, the macroinvertebrates and fish quality elements were the critical elements that determined ecological status. General physico-chemical parameters and specific pollutants downgraded the status of a small number of river water bodies. Hydromorphology, which is considered as a supporting element for high-status sites, led to 111 river water bodies being classified as good rather than high status (Figure 2.3).

A total of 191 monitoring sites have specific pollutant status available for the 2013-2018 survey period. 173 of these monitoring sites passed for specific pollutant status while 18 monitoring sites failed. The 18 sites which failed for parameters including copper, iron and chromium are all located around known mining locations. The ecological status for four river water bodies was determined by their failing on specific pollutants status (Figure 2.3).

Hydromorphology was assessed at 375 river sites using the River Hydromorphological Assessment Technique (RHAT). Of these, 222 (59%) sites were in high hydromorphology condition, 132 (35%) were in good condition and 21 (6%) were in moderate condition.

Hydromorphology is a supporting element for rivers at high biological status so for a river to achieve overall high ecological status the hydromorphological condition must also be high. As mentioned previously, 111 rivers which were in high biological status were deemed to be at good ecological status rivers because their corresponding hydromorphological condition was less than high.

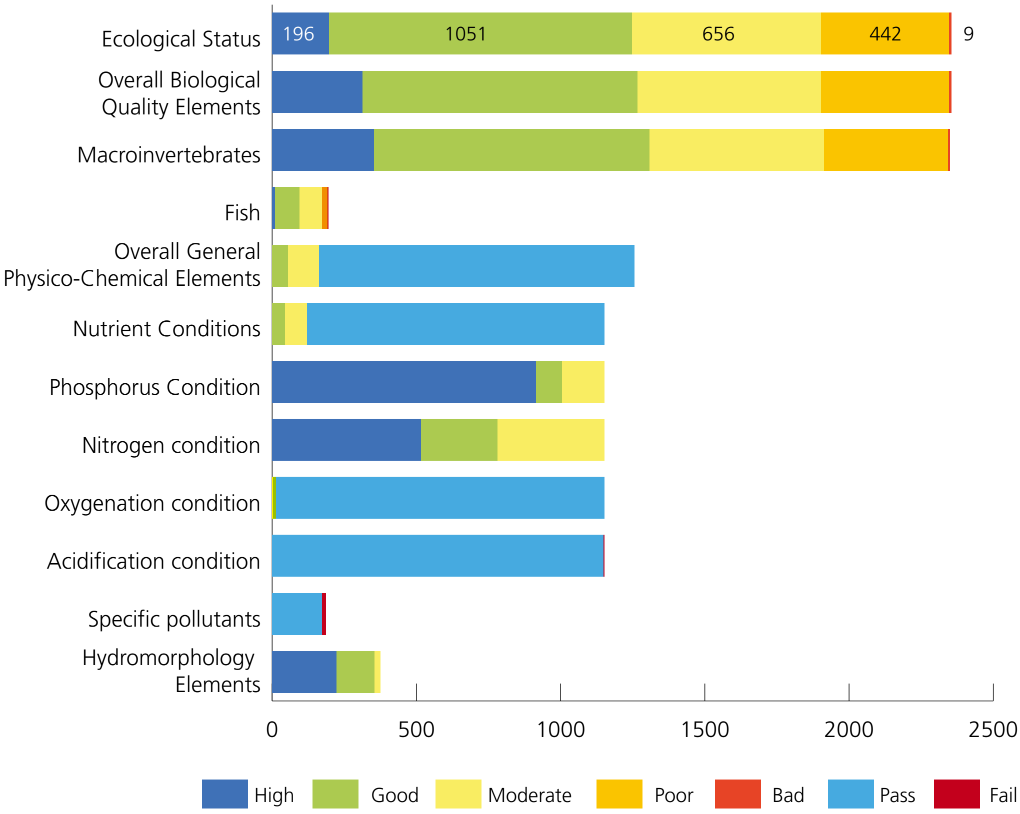


Figure 2.3: Ecological status and condition of individual biological quality elements, physico-chemical elements and hydromorphological quality elements in river water bodies in 2013-2018. The hydromorphological element is broken down at site level.

2.6 Changes and Trends

Figure 2.4 provides a summary of the total number of monitored river water bodies within each ecological status class across the last four assessment periods. The percentage of river water bodies in good or high ecological status has declined by 3.7% since 2010-2015 and by 5.3% since the first WFD assessment in 2007-2009. The percentage of river water bodies in good or high status had improved between 2007-2009 and 2010-2012 before declining in subsequent assessment periods.

The number of high ecological status river water bodies has dropped from 245 in 2010-2015 to 196 in the current assessment. The number of high status river water bodies has fallen by nearly a third (91 water bodies) since the baseline assessment in 2007-2009. This overall decline in high status waters reflects the general decline in high quality biological river sites seen in recent decades (see section 2.10 below).

The number of bad ecological status river water bodies declined from 19 in 2007–2009 to six in 2010–2015, indicating that the EPA 'Red Dot' programme has been highly successful in driving measures for improvement at these seriously polluted locations. However, the number of these badly polluted sites has increased to nine in the latest period. In addition, the number of poor ecological status river water bodies has increased by a third (110 water bodies) since the first assessment in 2007-2009. The increase in the number of serious (bad status) and severely (poor) polluted river water bodies since the first WFD assessment is a significant cause for concern.

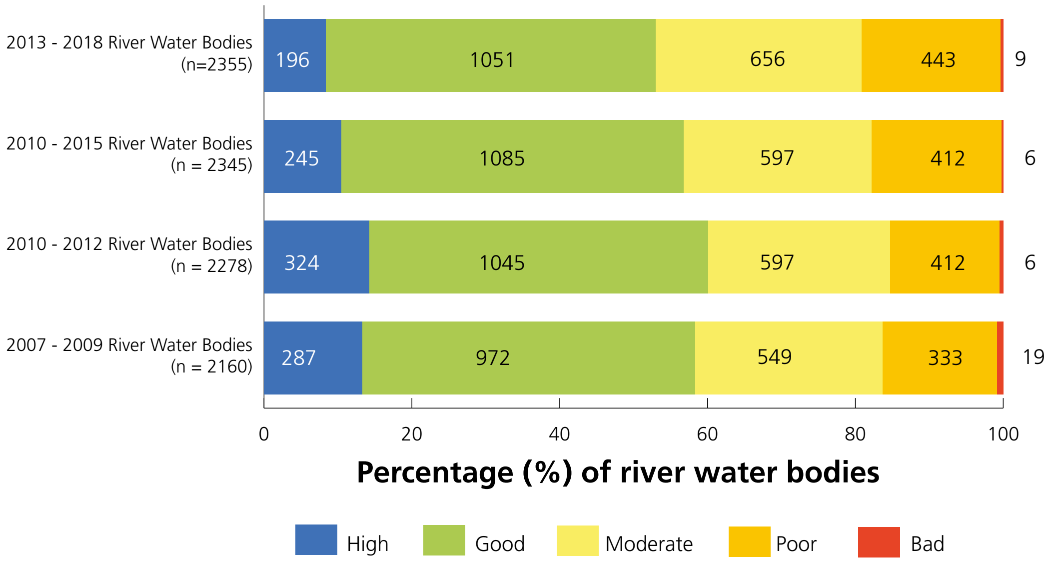


Figure 2.4: Change in ecological status for all river water bodies monitored in each survey period since 2007 (number of water bodies in each status class in each survey period is also indicated).

When the current assessment period was compared to the last assessment period in 2010-2015, the ecological status of 1,612 river water bodies remained unchanged, 301 improved and 429 declined. This represents a net decline of 128 water bodies or 5.5% since 2010-2015. The number of water bodies improving and declining and by the number of classes is also shown in Figure 2.5.

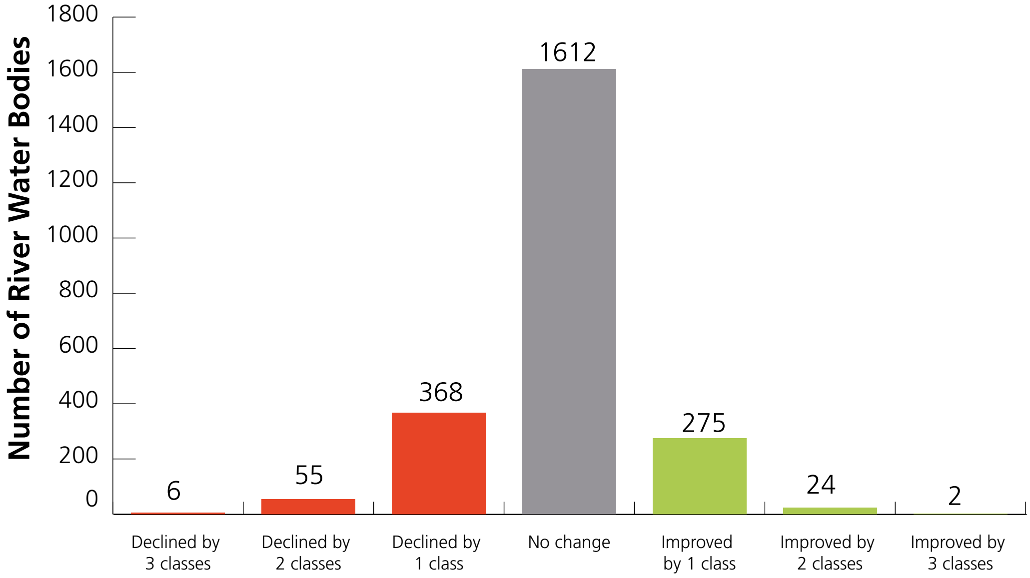


Figure 2.5: Changes in ecological status of river water bodies between 2010–2015 and 2013–2018.

Map 2.3. summarises the changes in ecological status across the catchments between 2010–2015 and 2013- 2018. The Suir and Moy & Killala Bay catchments had the highest number of declines in ecological status, with a decline of 39 and 23 river water bodies, respectively. The catchments with the worst net declines were;

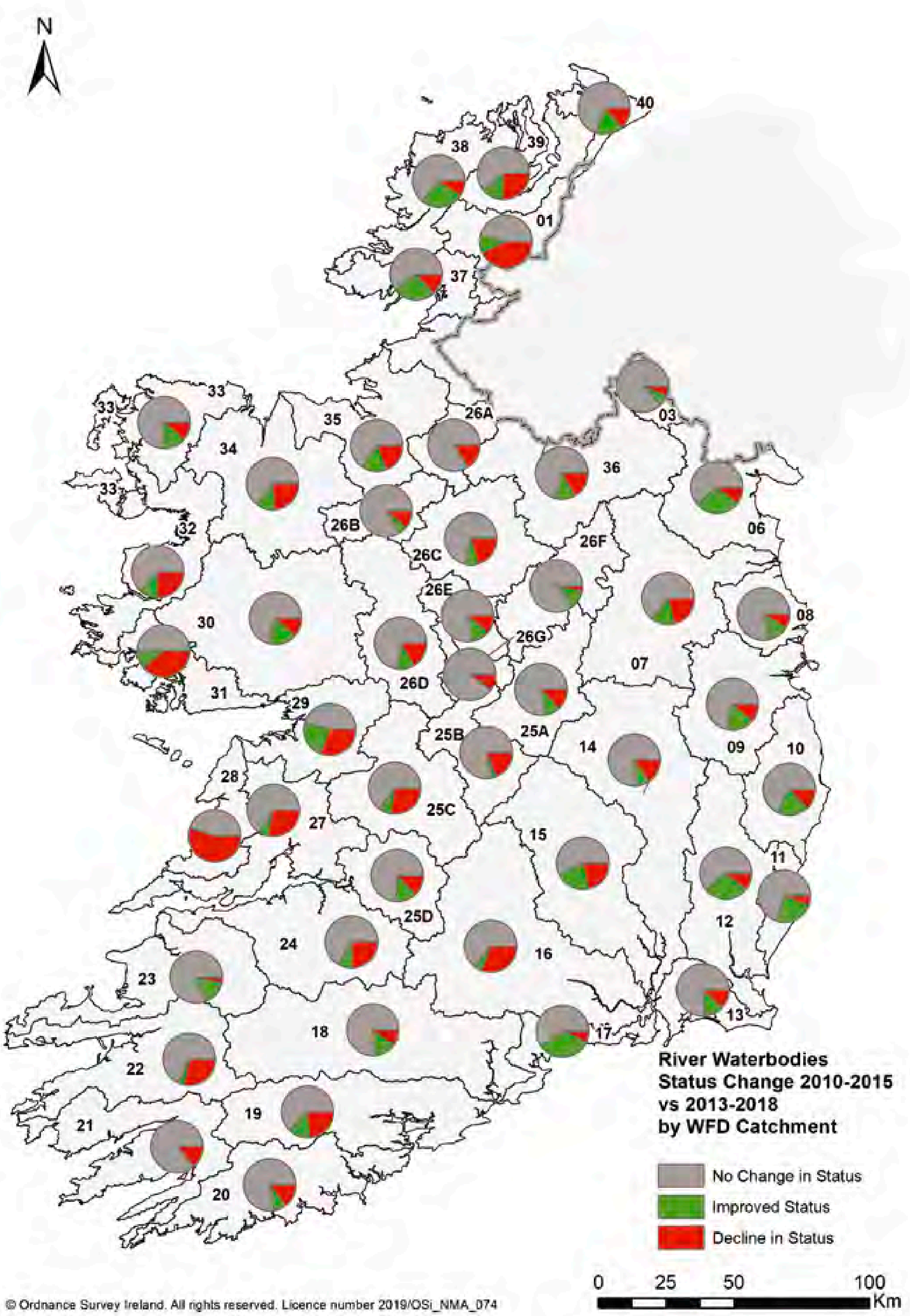
- 16_Suir (39 water bodies declined);
- 14_Barrow (17 water bodies declined);
- 15_Nore (19 water bodies declined);
- 25C_Lower Shannon (19 water bodies declined);
- 27_Shannon Estuary North (15 water bodies declined);
- 24_Shannon Estuary South (14 water bodies declined);
- 28_Mal Bay (16 water bodies declined);
- 22_Laune-Maine-Dingle Bay (19 water bodies declined);
- 34_Moy and Killala Bay (23 water bodies declined);
- 01_Foyle (12 water bodies declined);
- 36_Erne (15 water bodies declined);
- 07_Boyne (20 water bodies declined).

Overall, 228 river water bodies have declined in these 12 catchments. This represents over half the number of declines seen across all 46 catchments.

The best net improvements included:

- 12_Slaney & Wexford Harbour (25 water bodies improved);
- 38_Gweebarra- Sheephaven and 37_Donegal Bay North (14 water bodies improved);
- 06_Newry-Fane_Glyde_Dee (13 water bodies improved);
- 23_Tralee Bay-Feale (8 water bodies improved), and
- 30_Corrib (14 water bodies improved).

The 21_Dunmanus–Bantry–Kenmare catchment and the 22_Laune-Maine-Dingle Bay, although having over 80% of their monitored river water bodies at high and good ecological status in the previous survey period, exhibited declines in 8 and 19 river water bodies between 2010–2015 and 2013-2018; the majority (six and fifteen) of these were losses from high status.



Map 2.3: Ecological status change in river water bodies between 2010-2015 and 2013-2018.

2.7 Areas for Action

Of the 492 river water bodies monitored in the designated Areas for Action during 2016-2018, 303 remained stable with no change in ecological status. A total of 132 river water bodies showed improvements in status, while 51 declined, resulting in a net overall improvement in status class in 81 water bodies, or 16.7% of water bodies monitored in the Areas for Action.

One of the reasons for selecting an Area for Action was the presence of on-going works or planned works by Local Authorities and other public bodies or the existence of an active community group. Many of these areas appear to have benefited from measures such as upgrades to waste water treatment plants, riparian management schemes, improvement to fish habitats and environmentally sensitive forestry schemes.

The net improvement in river water quality in Areas for Action contrasts with the net decline seen nationally and indicates that when targeted action is taken improvements in water quality can be achieved.

2.8 High status objective water bodies

The decline in high quality river water bodies has been recognised as an important issue in Ireland's River Basin Management Plan 2018-2021. A high ecological status objective has been set for 319 river water bodies which are either at high status or were at high status in the recent past but which have since declined.

Of the 319 river water bodies designated with a high status objective only 140 (44%) are currently meeting the objective (Figure 2.6). Of the total high status objective water bodies, 197 did not change status since the last assessment, 27 improved in status and 94 declined (Figure 2.7). This represents a significant overall net decline of 21% in the status of high status objective water bodies over this period and illustrates the scale of the challenge in achieving the target set out in the 2018-2021 River Basin Management Plan. The Blue Dot programme is specifically aimed at addressing this issue (see section 1.8).

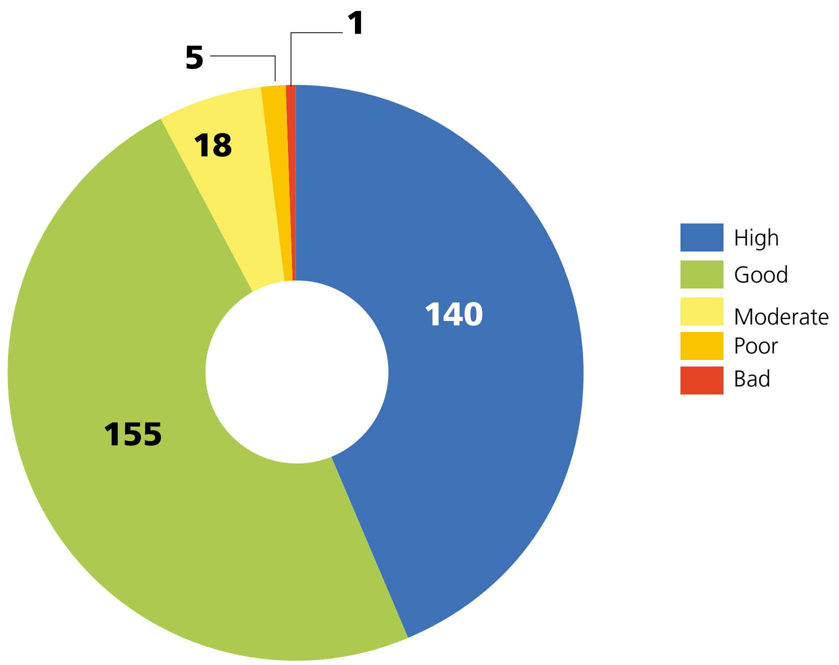


Figure 2.6: Ecological status of the 319 designated high status objective river water bodies.

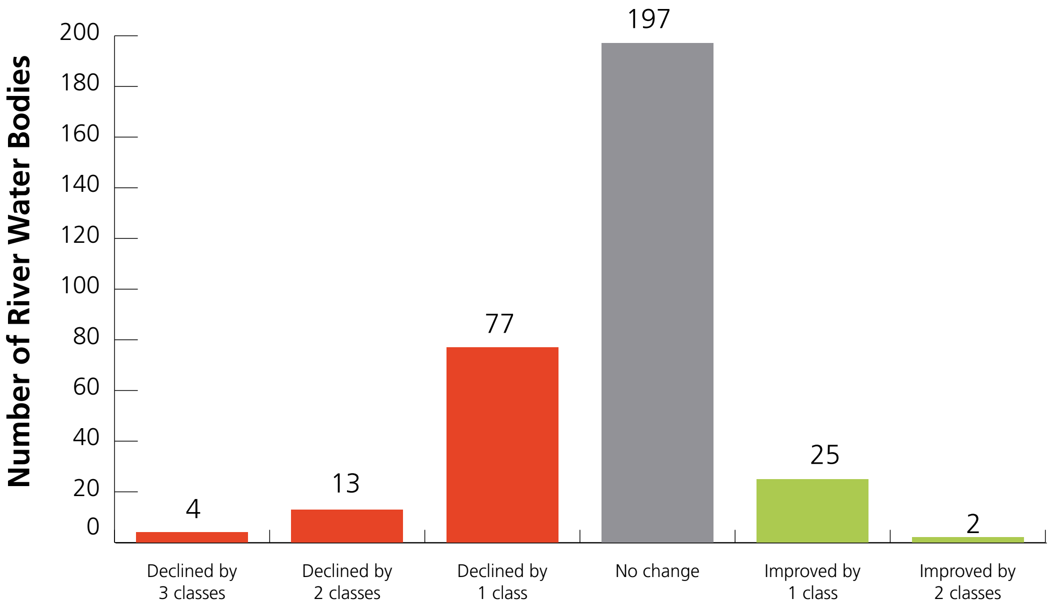


Figure 2.7: Changes in ecological status of the 319 designated high status objective river water bodies between 2013-2018 and previous 2010-2015 period.

2.9 Macroinvertebrate Q-value quality

Since the 1970s river water quality in Ireland has been assessed using macroinvertebrates and the Quality Rating system (Q-value). This long-term time series provides a valuable record of environmental change in Irish rivers. In this survey period, 56% (1,296) of monitored river water bodies had satisfactory quality (i.e. high or good) while 44% had less than satisfactory quality (i.e. moderate, poor or bad). The proportion of river water bodies in unsatisfactory condition, at 44%, is on par with the mid 1990s, when the proportion of river water bodies in unsatisfactory quality was at its worst (Figure 2.8).

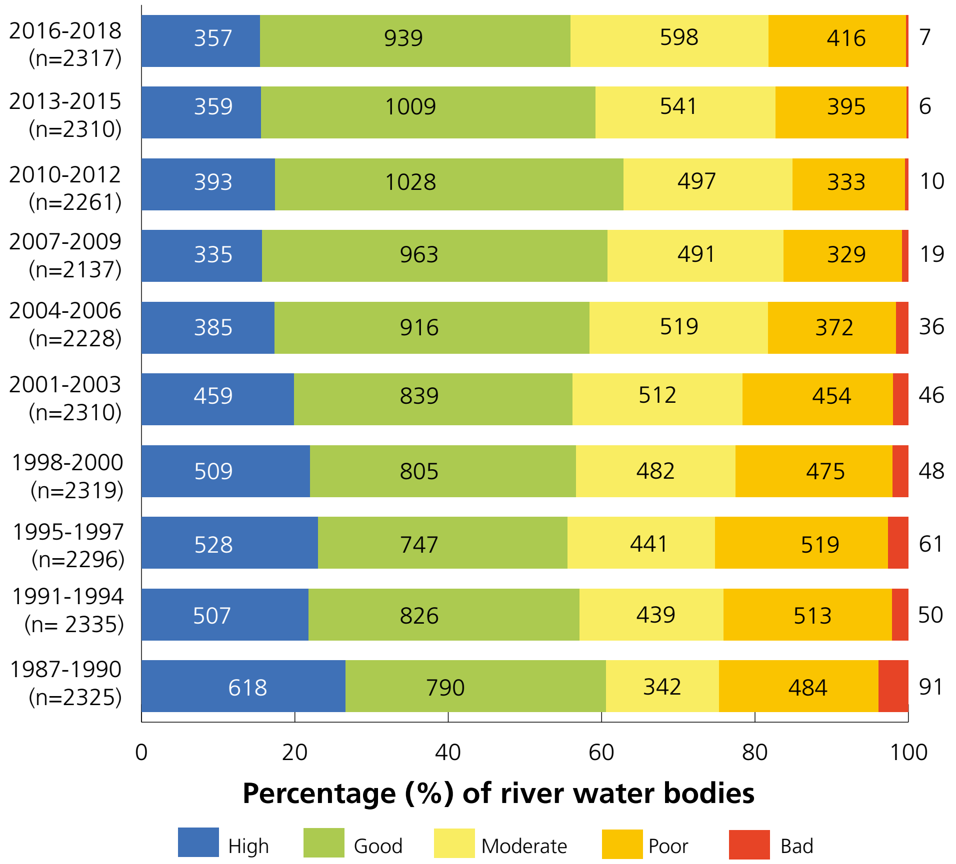


Figure 2.8: National trends in macroinvertebrate quality of water bodies using the Q-value rating system between 1987 and 2017. Number in parentheses on y-axis is total number of water bodies

River water quality is also presented in terms of river channel length (Figure 2.9). In total,13,376 km of river channel has been monitored nationally since 1987 for macroinvertebrate quality. Since 2007-2009, the proportion of channel length in satisfactory condition (high or good) declined by 2.7 % (from 68.9% to 66.2%). The total length of river channel in satisfactory condition is 8,853 kms, while the length of channel classified as seriously polluted (i.e. bad) is 28.4 kms.

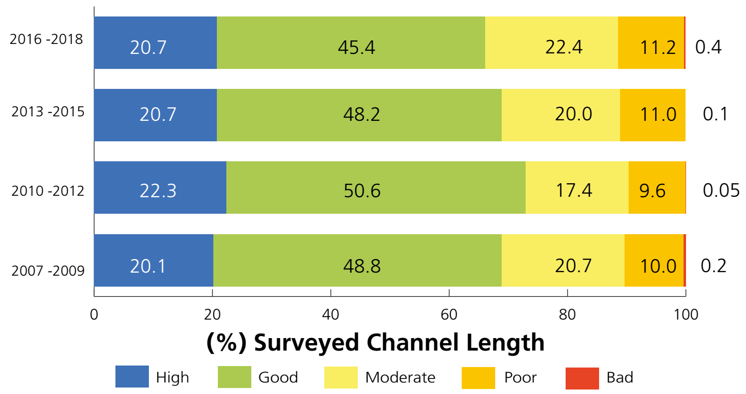


Figure 2.9: Trends in the 13,376 km baseline showing the percentage of surveyed channel in the five WFD biological quality classes between 2007 and 2018.

2.10 Long-term loss in high quality biological river sites

High quality biological river sites generally indicate undisturbed natural conditions. These sites are important for supporting sensitive aquatic species such as juvenile salmon and trout and the protected, but declining, freshwater pearl mussel. The number of high quality sites (Q5 and Q4-5) which have declined substantially in recent years show no sign of recovery. Overall, the percentage of high quality sites has fallen from 31.6% of all river biological monitoring sites in 1987-1990 to 17.2% of sites in 2016-2018 (Figure 2.10). Within this grouping, the proportion of high quality reference sites (Q5 – those sites at or closest to natural condition) has dropped even more dramatically from 13.4% of all biological monitoring sites in 1987-1990 to only 0.7% of sites in 2016-2018. The number of Q5 sites in the current assessment is 20.

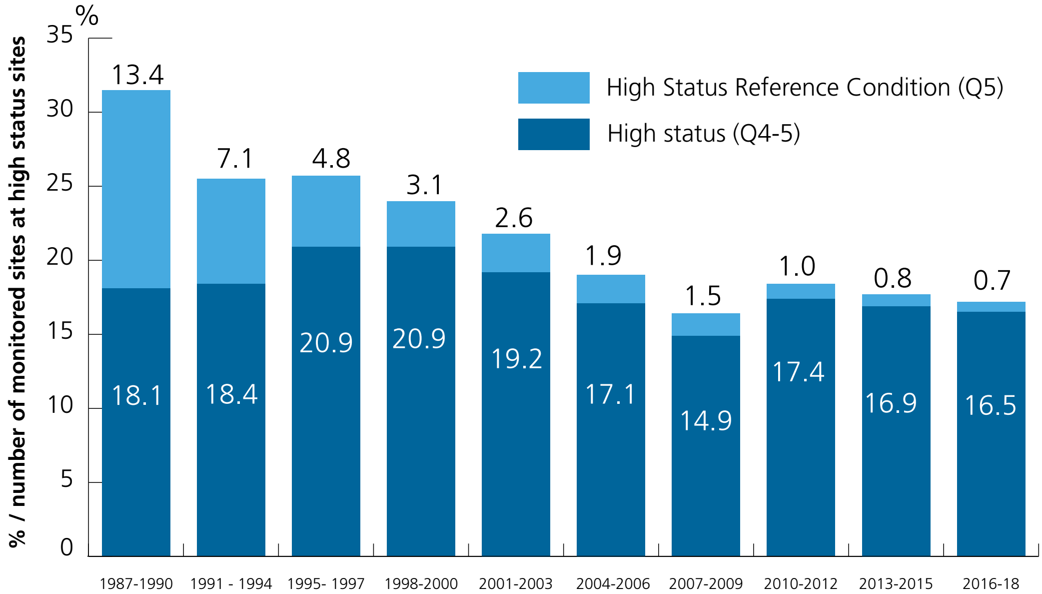


Figure 2.10: Long term trends (1987 - 2018) in the percentage and number of high ecological quality (macroinvertebrate) river sites (Q5 and Q4-5) in each survey period.

2.11 Fish Kills

The occurrence of a fish kill is typically a sign of a serious pollution event. There are many possible causes, but oxygen depletion in water is the principle mechanism leading to fish deaths. Oxygen depletion can occur following the break-down by bacteria of organic pollutants which can come from agricultural, municipal or industrial sources. As the bacteria decompose the organic matter, they use up oxygen and concentrations fall to levels that can cause harm to other organisms such as fish.

After reaching a historic low of 14 fish kills in 2017 the number of fish kills increased to 40 in 2018 (Figure 2.11). The low flow conditions experienced in the summer of 2018 may have both directly and indirectly contributed to this rise by increasing the vulnerability of fish to pollution events (i.e. increased water temperature, depressed oxygen concentration).

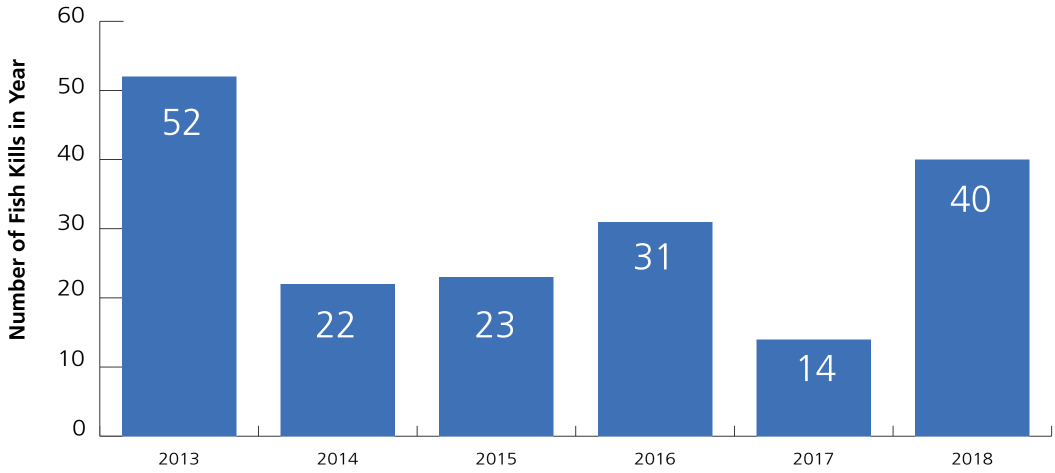


Figure 2.11: Number of fish kills per year from 2013 to 2018 (Source: Inland Fisheries Ireland)

Where possible, Inland Fisheries Ireland categorise fish kill causes. However, usually the exact cause is unknown and multiple factors may have resulted in the fish kills. Figure 2.12 illustrates the difference between the suspected causes of fish kills in both 2017 and 2018.

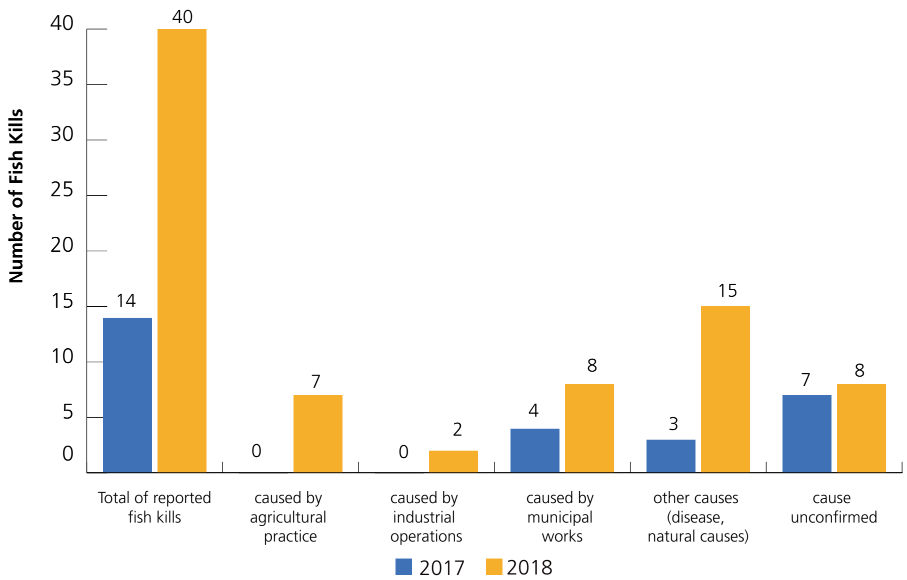


Figure 2.12: Suspected causes of fish kills in 2017 and 2018 (Source: Inland Fisheries Ireland).

2.12 Nutrients

Concentrations

The concentration of nitrate[1] (NO_3) in rivers is an indicator of nutrient enrichment and a potential human health indicator in drinking water. There are no environmental quality standards for nitrate in rivers but average nitrate concentrations less than 4 mg/l NO_3 and less than 8 mg/l NO_3 are considered by the EPA to be indicative of high and good quality respectively, from an ecological perspective. The maximum concentration allowable in drinking water to protect human health is 50 mg/l NO_3. Taking account of variability in concentrations throughout the year, the annual average concentrations should remain below 75% of the threshold, i.e. 37.5 mg/l NO_3, to ensure the maximum concentration is not exceeded.

Concentration data for nutrients (divided into concentration ranges) for river sites and river channel are presented in Tables 2.1 and 2.2. The data shows that 57.3% of monitored sites have values below 8 mg/l NO_3 and five river sites had average concentrations above 37.5 mg/l NO_3.

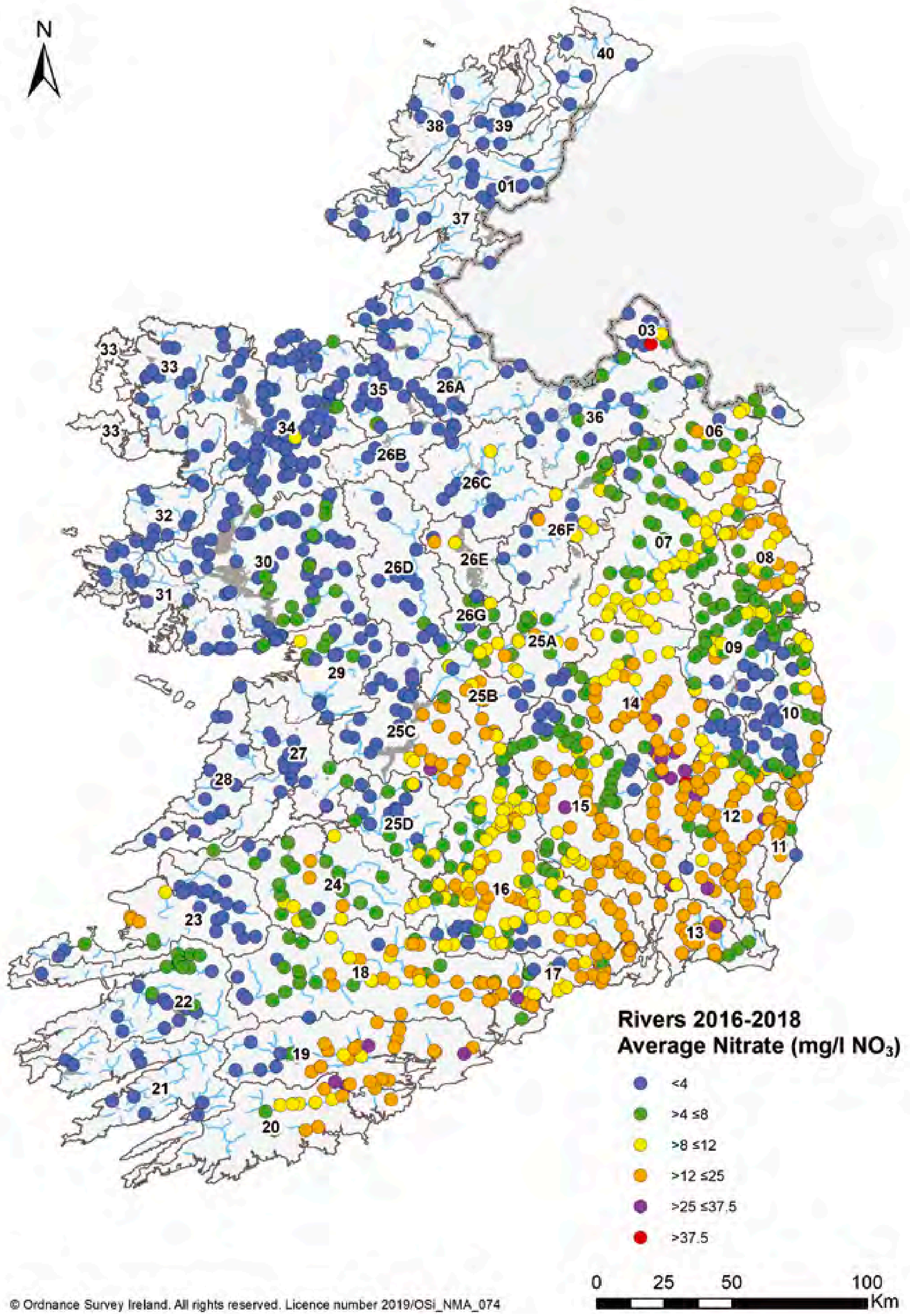
River sites with higher nitrate concentrations are mostly located in the south-east and south of the country (Map 2.4).

Table 2.1 : Percentage and number of rivers and river sites in each nitrate concentration category for 2016–2018.

3-year average	Categories of nitrate concentrations in rivers					
mg/l (as NO_3)	< 4	4-8	8-12	12-25	25-37.5	37.5- 50
No. of sites	578	314	233	401	26	5
% sites	37.1	20.2	15	25.8	1.7	0.3
No. of rivers	291	137	87	137	13	2
% of rivers	43.6	20.5	13.0	20.5	1.9	0.3

Average phosphate concentrations of less than 0.025 mg/l P and less than 0.035 mg/l P have been established in Ireland as legally binding environmental quality standards (EQS) to support the achievement of high and good ecological status respectively. Concentrations of phosphate consistently greater than 0.035 mg/l P are likely to lead to nutrient pollution which can cause harm to other plants and animals.

1 Nitrate is generally measured as nitrate and nitrite together (total oxidised nitrogen (TON)), as the concentration of nitrite is usually negligible. Nitrate was measured separately for some sites, however.



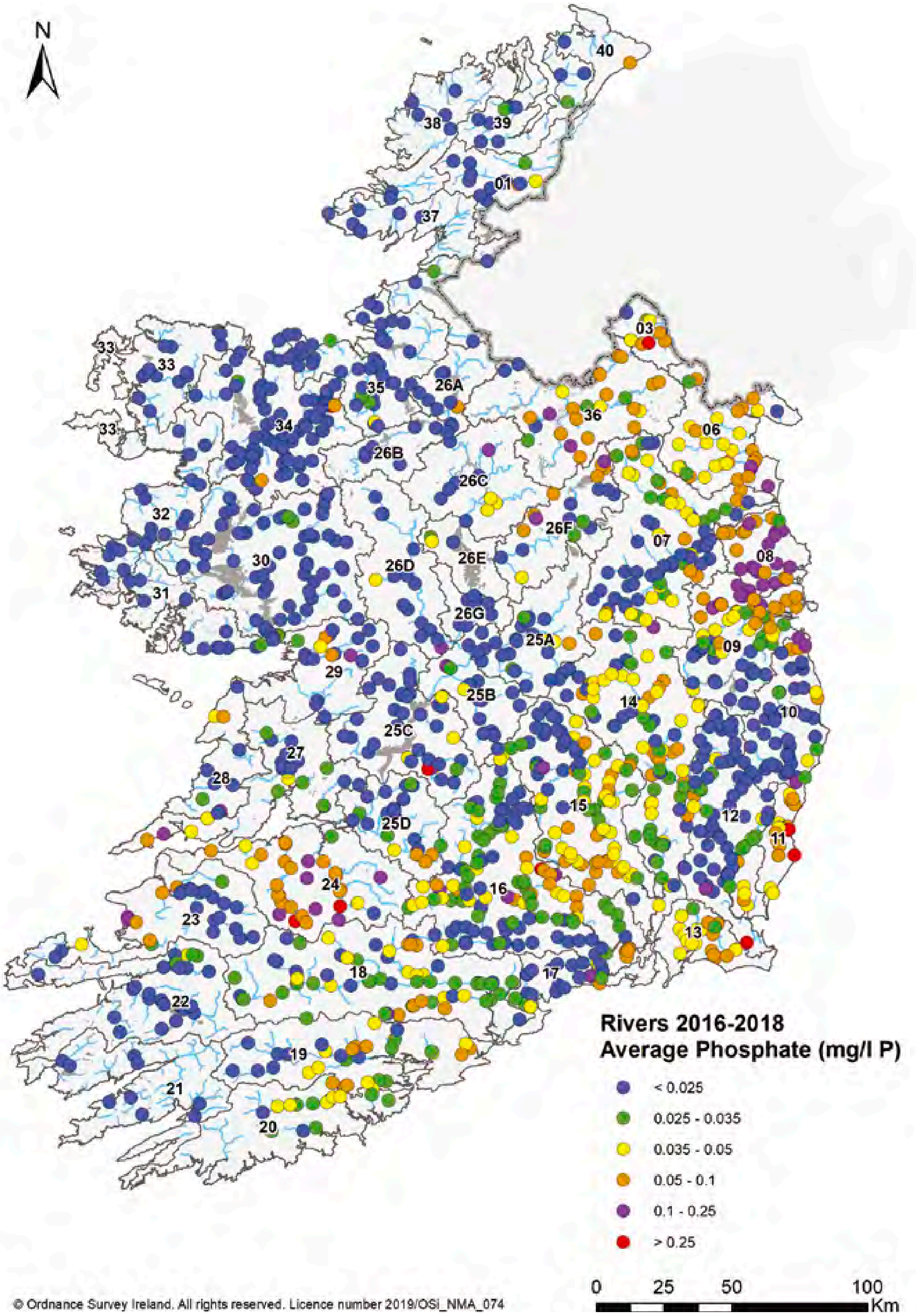
Map 2.4: Average nitrate concentration at WFD river sites for 2016-2018.

The 2016–2018 data for phosphate concentrations show that 64.2% of monitored river sites are classed as either high or good quality (less than 0.035 mg/l) for phosphorus nutrient condition. The remaining 35.8% of sites are classed as being of moderate, poor or bad quality (Table 2.2) having average values greater than the EQS of 0.035 mg/l P.

Map 2.5 shows the distribution of average phosphate concentrations. Sites with higher concentrations are evident in the catchments of Liffey and Dublin Bay and Nanny-Devlin in the east, in the Erne catchment in the northeast and in the Shannon Estuary south catchment in the southwest of the country (Map 2.5).

Table 2.2: Percentage and number of rivers and river sites in each phosphate concentration category for 2016–2018.

3-Year Average	Categories of phosphorus concentrations in rivers					
mg/l (P)	< 0.025	0.025-0.035	0.035-0.05	0.05-0.1	0.1-0.25	>0.25
No. of sites	893	268	259	288	85	16
% sites	49.4	14.8	14.3	15.9	4.7	0.9
No. of rivers	364	87	86	125	41	8
% of rivers	51.2	12.2	12.1	17.6	5.8	1.1



Map 2.5: Average phosphate concentration (mg/l P) at WFD river sites for 2016-2018.

2.13 Trends

Previous assessments reported by EPA indicated a widespread pattern of reducing nitrogen and phosphorus concentrations in rivers nationally between 2006 and 2015 – which mirrors the trend in macroinvertebrate river quality discussed earlier. However, there has been a marked increase in the proportion of sites with increasing nutrient concentrations in this assessment. Over a quarter of sites surveyed are now displaying an increase in both nitrogen (26.8%) and phosphorus concentrations (26.0%) (Figure 2.13 and Figure 2.14). This increase in nutrients is also seen in the loads of nutrients from rivers entering the marine environment; loads of total nitrogen and total phosphorus have increased by 16% and 31%, respectively, since reaching a low in 2012-2014 (see chapter 4).

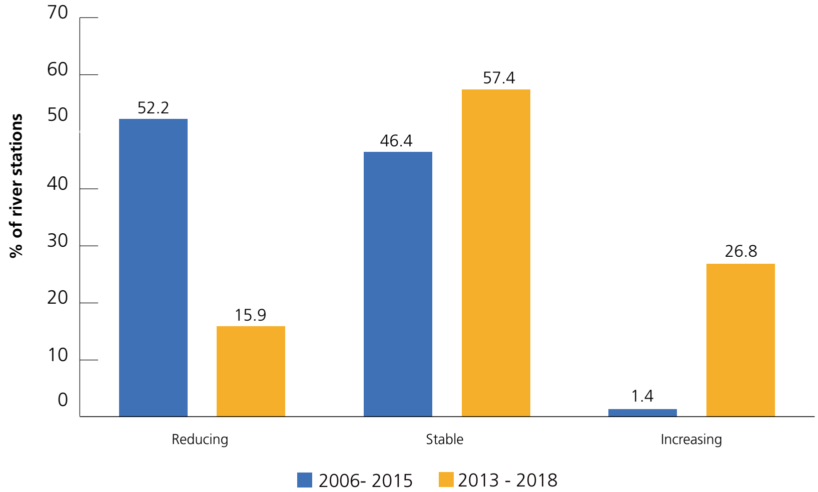


Figure 2.13: A comparison of the proportion of river sites with reducing, stable or increasing nitrogen concentration during 2006-2015 and 2013-2018.[2] Nitrogen measured as total oxidised nitrogen.

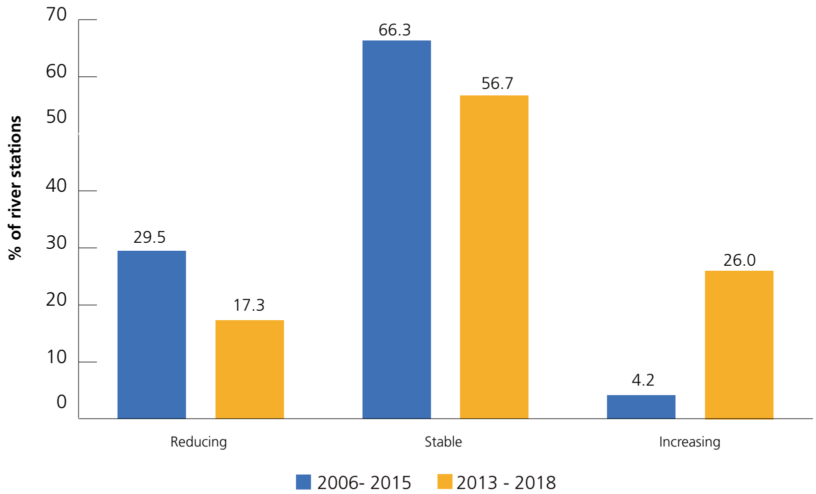


Figure 2.14: A comparison of the proportion of river sites with reducing, stable or increasing phosphorus concentration during 2006-2015 and 2013-2018[3]. Phosphorus measured as molybdate reactive phosphorus

2 Trend for nitrogen is indicated by a decrease/increase of 0.05mg/l N per annum. Using Mann-Kendall and Sen's slope statistical methodology.

3 Trend for phosphorus is indicated by a decrease/increase of 0.002mg/l P per annum. Using Mann-Kendall and Sen's slope statistical methodology.

River sites with increasing nitrogen concentration are mostly located in the more intensively farmed areas in the south, south-east and east of the country, where the soils are more freely draining and vulnerable to nitrate leaching (Map 2.6). The highest number of river sites with increasing nitrogen concentration were found in the following catchments:

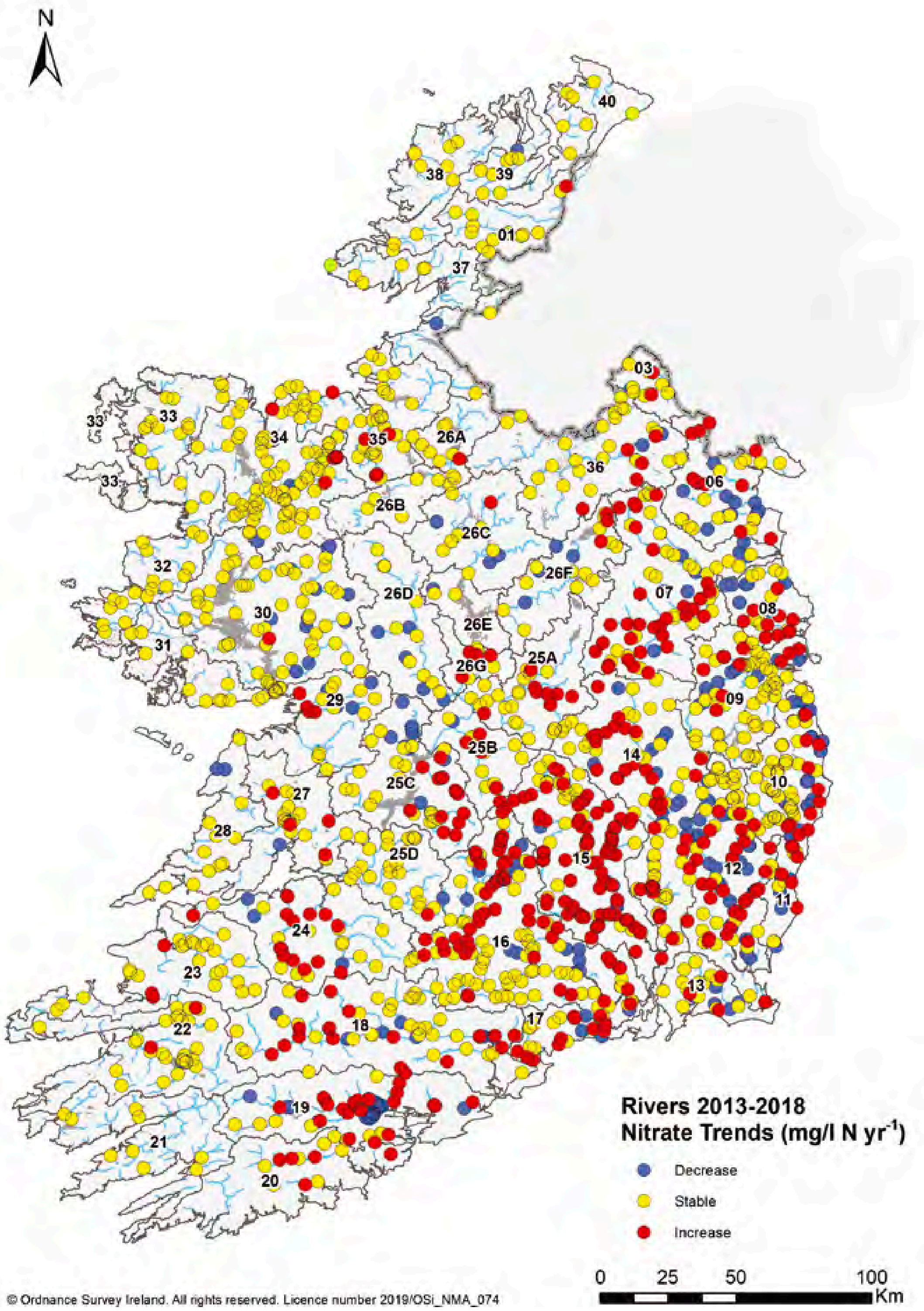
- 15_Nore
- 16_Suir
- 14_Barrow
- 07_Boyne
- 12_Slaney and Wexford Harbour
- 19_Lee, Cork Harbour and Youghal Bay
- 18_Blackwater (Munster)
- 17_Colligan Mahon
- 24_Shannon Estuary South and 25C_Lower Shannon

River sites with increasing phosphorus concentration often occur in the same catchments as nitrogen but are associated more closely with poorly draining soils. They are also more densely clustered around the urban population centres in the east and north-east of the country (Map 2.7). The highest number of river sites with increasing phosphate concentrations were found in the following catchments:

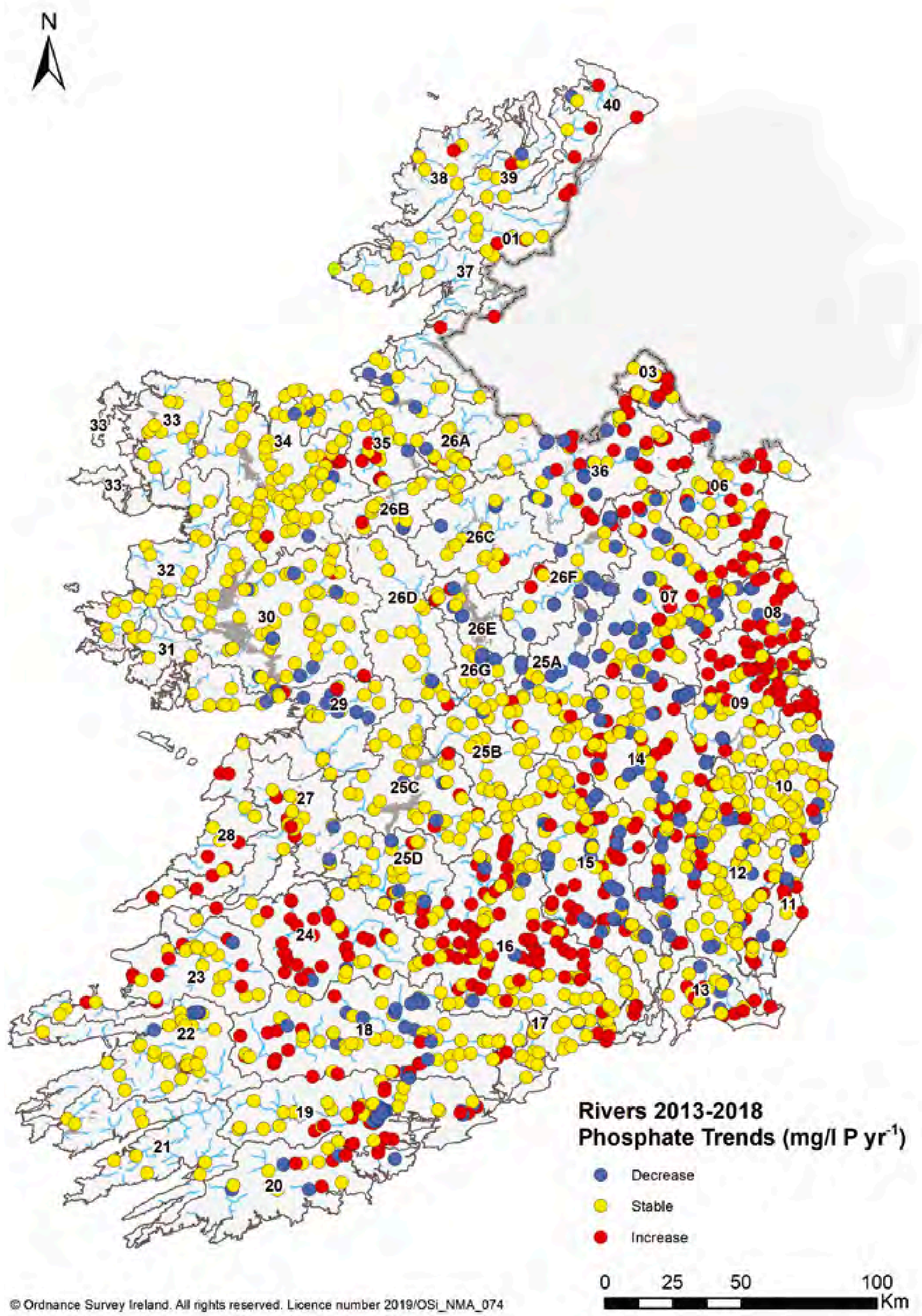
- 16_Suir
- 15_Nore
- 14_Barrow
- 09_Liffey and Dublin Bay
- 24_Shannon Estuary South
- 07_Boyne
- 36_Erne
- 06_Newry, Fane Glyde and Dee
- 18_Blackwater Munster
- 12_Slaney and Wexford Harbour
- 19_Lee, Cork Harbour and Youghal Bay
- 08_Nanny Devlin

Eight of these catchments with increasing nutrient concentrations also have the highest number of river water body declines (see section 2.6) and they account for over a third (159 water bodies) of the declines seen nationally across all 46 catchments. This finding highlights the link between general environmental disturbance as indicated by increasing nutrient concentrations and deterioration in the ecological status of river water bodies. These catchments are:

- 16_Suir (39 river water body declines)
- 14_Barrow (17 river water body declines)
- 15_Nore (19 river water body declines)
- 25C_Lower Shannon (19 river water body declines)
- 24_Shannon Estuary South (14 river water body declines)
- 19_Lee Cork Harbour and Youghal Bay (16 river water body declines)
- 36_Erne (15 river water body declines)
- 07_Boyne (20 river water body declines)



Map 2.6: Trends in average nitrate concentration at river sites from 2013 to 2018.



Map 2.7: Trends in average phosphorus concentration at river sites from 2013 to 2018.

LAKES

3. LAKES

3.1 Introduction

There are an estimated 12,000 lakes in Ireland, covering an area of more than 1,200 km^2. Of these, 812 lakes are designated as Water Framework Directive (WFD) water bodies. Two hundred and six of these lakes are greater than 50 hectares in area; the remainder are 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 fifteen lakes and nine heavily modified waterbodies (HMWBs), representing 84% of the total lake area in Ireland, were monitored during 2013–2018. The lakes and HMWBs are considered together in this report.

3.2 Summary for Lakes

- 113 monitored lakes (50.5%) are in high or good ecological status and 111 lakes (49.5%) are in moderate, poor or bad ecological status.
- 42 lakes improved in ecological status, 30 declined and 150 remained unchanged. This represents a net improvement in the ecological status of 12 lakes since 2010-2015.
- There has been a 4.3% improvement in the number of lakes in satisfactory ecological health, in high or good ecological status, since 2010-2015.
- Lake macrophytes are the main driver of biological quality condition while total phosphorus was the dominant element driving physico-chemical condition.
- Over a quarter (29%) of lakes failed the environmental quality standard (0.025 mg/l P) for total phosphorus.
- Over a quarter (28.8%) of lakes analysed had increasing total phosphorus concentration. This represents an increase in the proportion of lakes with increasing concentrations when compared to the last assessment period, when only 11.8% of analysed lakes had increasing nutrient concentration.
- 182 lakes (82%) are in good or better hydromorphological condition and 41 lakes (18%) are in less than good hydromorphological condition. Hydromorphology was responsible for the downgrading of 16 lakes from high to good ecological status.

3.3 National Ecological Status

High or good status was assigned to 113 lakes (50.5%) in the period 2013–2018, with the remaining 111 lakes (49.5%) assigned moderate or worse status (Figure 3.1). This represents a 4.3% net improvement in the number of lakes in satisfactory ecological health when compared to the previous assessment in 2010-2015.

The majority of high and good ecological status lakes are found in the southwest, west and northwest of the country while the majority of moderate or worse ecological status lakes are located in the northeast of the country (Map 3.1). This distribution tends to reflect the difference in the level of human activity, hydrogeology and soil conditions in these regions.

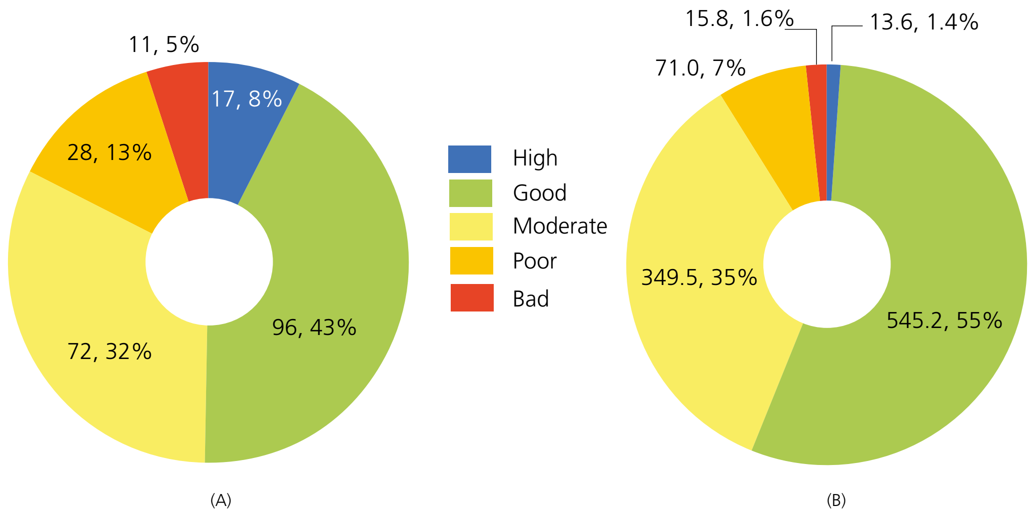
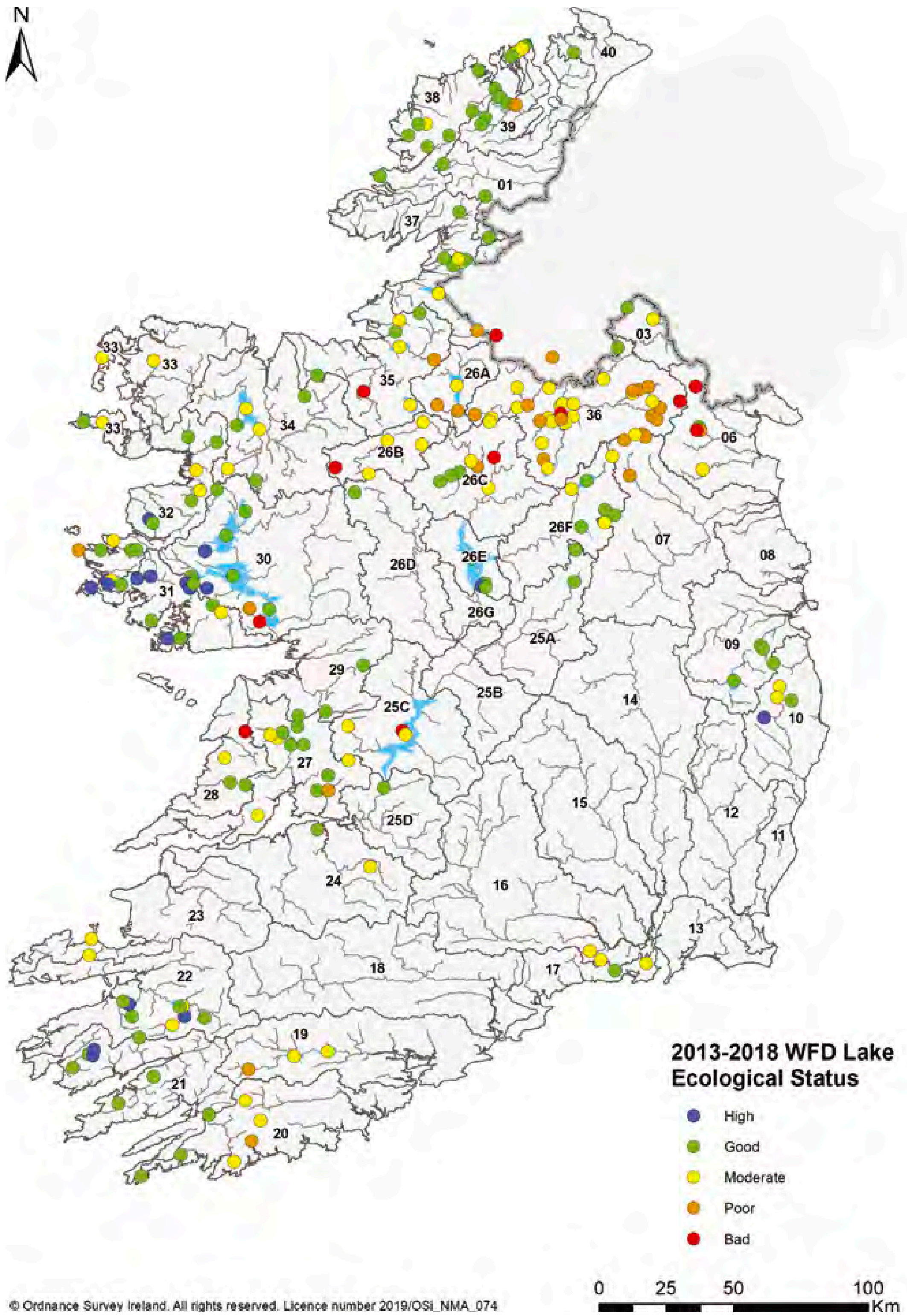


Figure 3.1: The ecological status of monitored lakes in 2013–2018 in terms of (a) number and percentage of monitored lakes and (b) total area (km^2) and percentage area of monitored lakes.



Map 3.1: Ecological status of monitored lake water bodies during 2013–2018.

3.4 Catchment Level Ecological Status

Lake water status for each of the 37 catchments with monitored lakes is shown in Figure 3.2. Catchments with the highest number of lakes are: Erne (40 lakes), Erriff–Clew Bay (16 lakes), Gweebarra–Sheephaven (16 lakes), Corrib (12 lakes), Shannon Estuary North (11 lakes) and Galway Bay North (10 lakes).

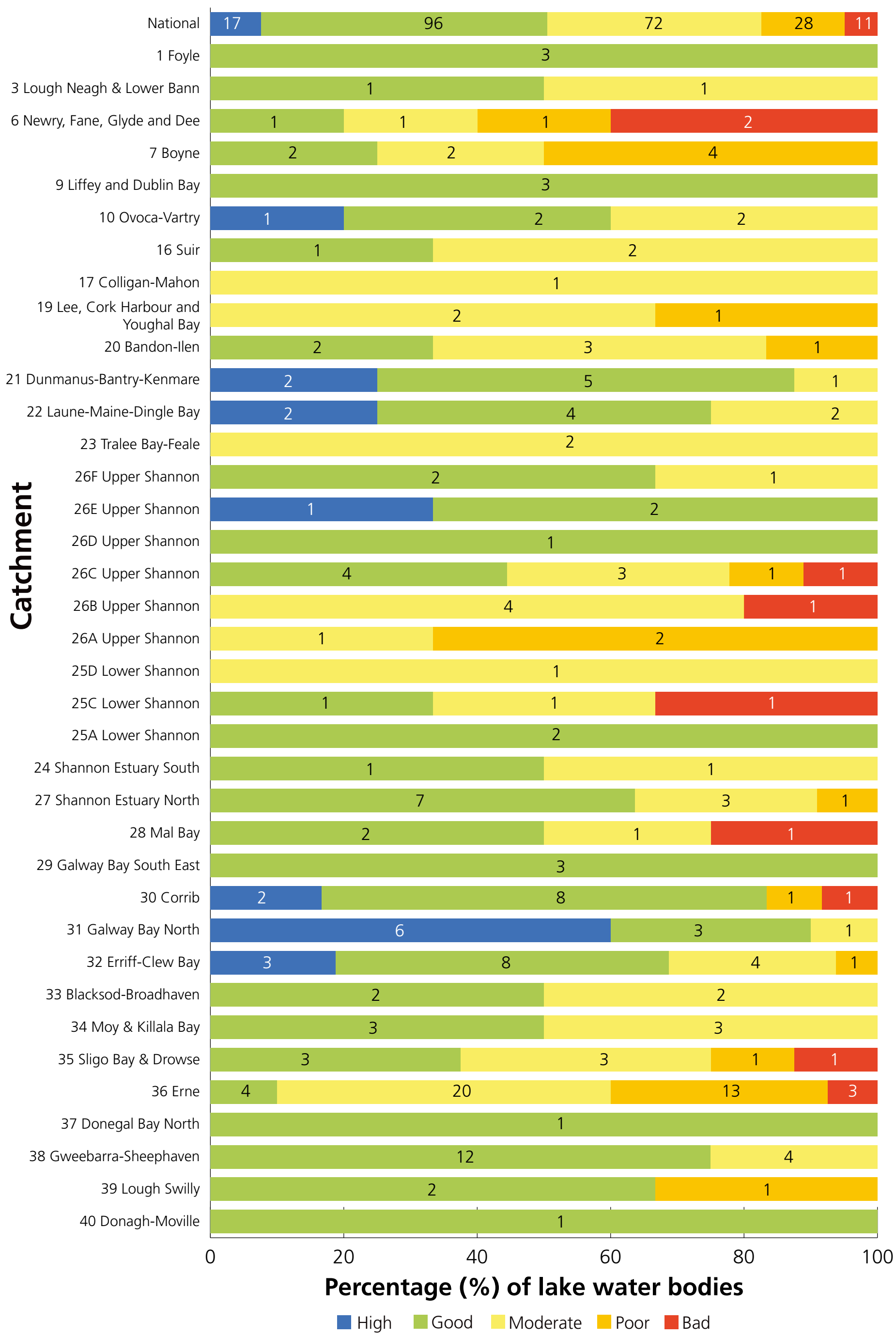


Figure 3.2: Ecological status of monitored lake water bodies at catchment level. Numbers indicate the number of lakes in each ecological class within a catchment.

3.5 Factors Driving Ecological Status

The biological, physico-chemical and hydromorphological elements used to assess lake ecological status are shown in Figure 3.3. The biological quality elements used in lakes are macrophytes, phytoplankton, phytobenthos and fish. The elements used to assess the physico-chemical condition in lakes are total phosphorus, ammonia, dissolved oxygen and pH (acidification status); specific pollutants are assessed on a subset of lakes also.

Ecological status in 42% of lakes was determined by the condition of a biological quality element or elements, while in a further 42% of lakes ecological status was determined by both the biological elements and physico-chemical elements. Ecological status was determined by the physico-chemical elements and hydromorphological elements in the remaining 9% and 7% of lakes respectively. Where ecological status was determined by a biological element, 42% of these were determined by the condition of the macrophyte biological element, 20% were determined by fish and 13% were determined by phytoplankton. The main driver of the overall physico-chemical element condition is phosphorus condition which is based on the concentration of total phosphorus.

The assessment gives an indication of the quality element or elements, that are most sensitive to the pressures impacting on a water body. This information can be used to help identify the measures required to address these impacts and to improve the environmental condition of our lakes.

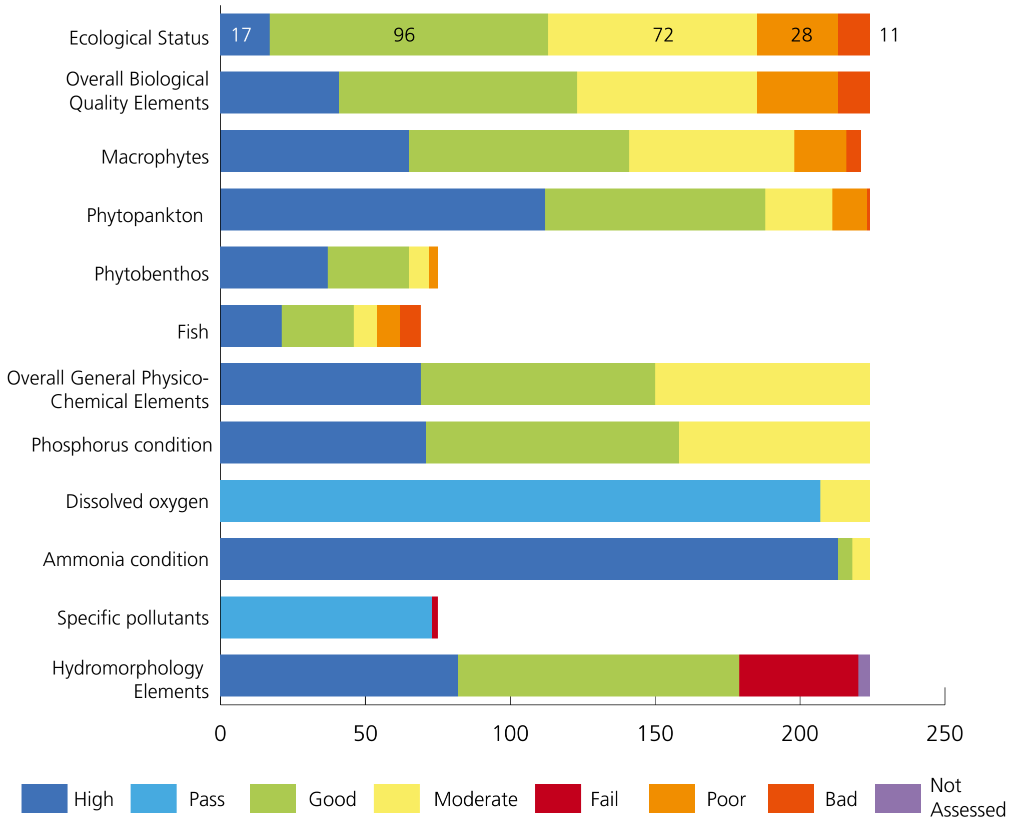


Figure 3.3: Ecological status and condition of individual biological quality elements, physico-chemical elements and hydromorphological quality elements in lakes in 2013-2018.

Hydromorphology was assessed in 223 monitored lakes over the period of this report using the lake MImAS (Morphological Impact Assessment System) method. Of these, 84 (38%) were found to be in high hydromorphological condition, 98 (44%) were in good condition and 41(18%) were classified as failing.

Hydromorphology is a supporting element for lakes at high biological status so for a lake to achieve overall high ecological status the hydromorphological condition must also be high. The status of sixteen lakes that were at high biological status was reduced to good ecological status due to physical shore zone modifications affecting the MImAs score. These lakes were: Auwillan, Bleach, Carra, Corrib Upper, Cullaun, Doo, Gartan, Greenan, Guitane, Inchiquin, Kilsellagh, Kylemore, Loughaunore, Mourne, Pollacappul and Lough Rea.

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.

3.6 Changes and Trends

The number of lakes in satisfactory ecological health, in good or high ecological status, increased by 4.3% from 104 lakes (46.2%) in 2010-2015 to 113 (50.5%) in the current assessment (Figure 3.4). When compared to the first WFD baseline assessment in 2007-2009, the number of lakes currently in satisfactory ecological health has increased by 2.3%.

In terms of general changes across all status categories (i.e. high, good, moderate, poor and bad) 42 lakes improved in ecological status, 30 declined and 150 remained unchanged, representing a net improvement in the status of 12 lakes since 2010-2015. Most improving or declining lakes changed by a single ecological class (Figure 3.5). Of note is the loss of 8 high status lakes since 2013-2015.

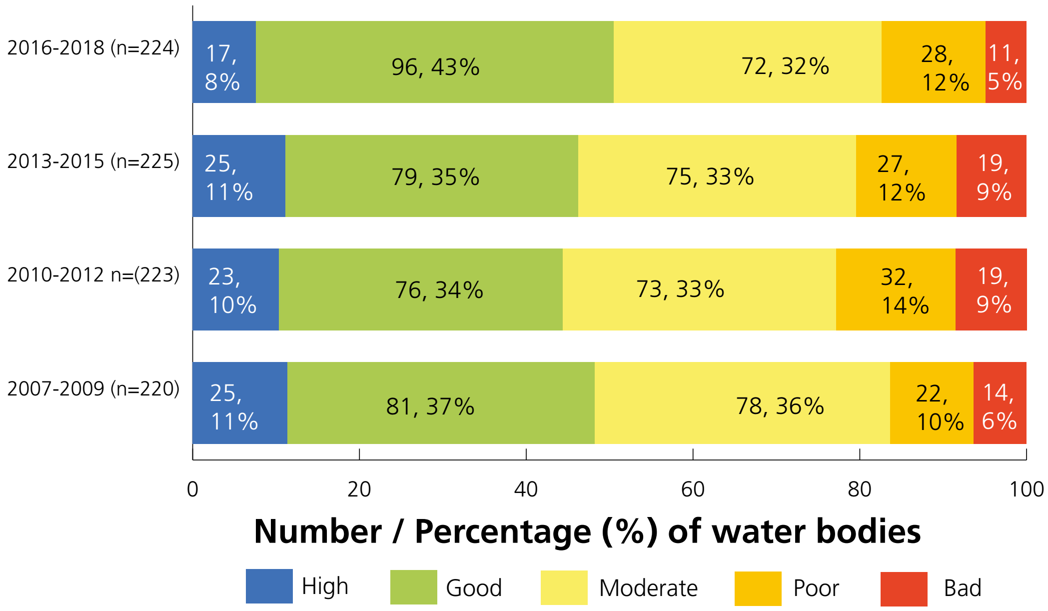


Figure 3.4: Change in ecological status for lakes monitored in each survey period since 2007.

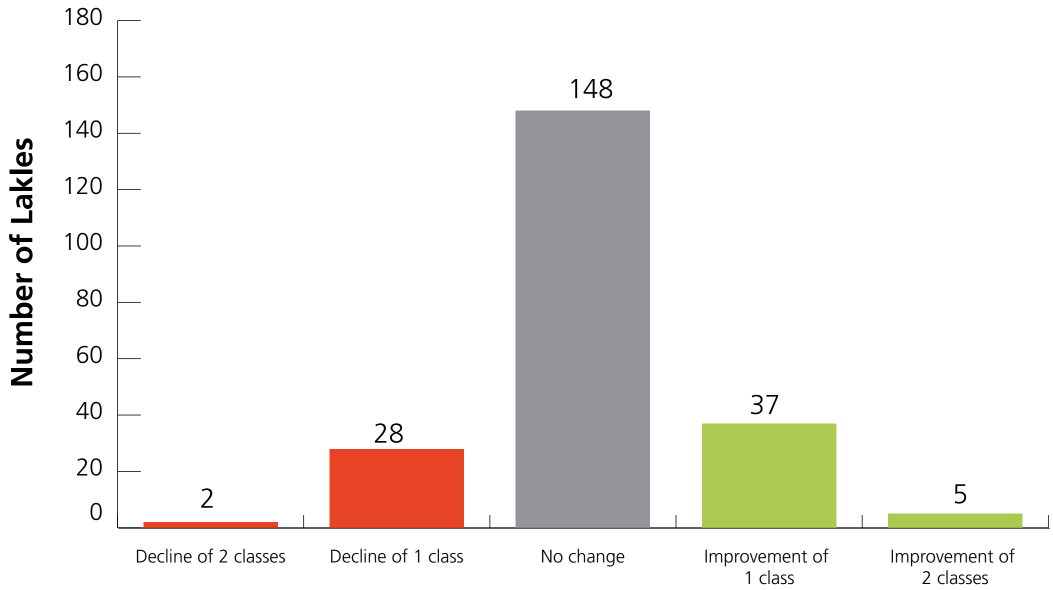


Figure 3.5: Changes in ecological status for lake water bodies monitored in both 2010–2015 and 2013–2018.

3.7 Nutrients

Concentrations

The concentration of total phosphorus (mg/l P) in lakes is a key indicator of lake water quality. Nutrients such as phosphorus are essential for plant growth, but if present in too high quantities can lead to the over growth of algae which can harm other plants and animals.

Average total phosphorus concentrations of less than 0.010 mg/l P and less than 0.025 mg/l P have been established in Ireland as legally binding environmental quality standards (EQS) to support the achievement of high and good ecological status. Concentrations of total phosphorus consistently greater than 0.025 mg/l P will cause nutrient pollution.

The 2016–2018 data for total phosphorus concentrations show that 71% of monitored lakes are classed as either high or good quality nutrient condition based on the environmental quality standard (i.e. less than 0.025 mg/l P). The remaining 29% of sites are classed as being of moderate or worse quality having average total phosphorus concentrations greater than 0.025 mg/l P (Table 3.1).

Three monitored lakes had very high average phosphorus concentrations (greater than 0.1 mg/l P):

- Farnham Lough (Co. Cavan)
- Lough Egish (Co. Monaghan)
- Inner Lough (Co. Monaghan).

Table 3.1: Percentage and number of lakes in each phosphorus concentration category for 2016–2018.

	3-Year Average	Categories of phosphorus concentrations in lakes				
Assessment 2016-2018	mg/l P	< 0.010	0.010-0.025	0.025-0.05	0.05-0.1	>0.1
	No. of lakes	71	87	41	22	3
	% lakes	32	39	18	10	1

3.8 Trends

An assessment of total phosphorus concentration in 59 lakes was carried out using annual average data for 2013 to 2018. Of the 59 lakes analysed, 29 lakes were stable, 13 lakes had an improving trend and 17 lakes had a deteriorating trend. Two lakes had a strong deteriorating trend; these were Inner Lough (Co. Monaghan) and Drumlaheen Lough (Co. Leitrim).

The proportion of lakes with an increasing total phosphorus concentration is 28.8%; this is substantially higher than the 11.3% of lakes seen in the period 2006-2015 (Figure 3.6) and is similar in magnitude to the proportion of river sites with increasing phosphate concentration (i.e. 26.0%) over the same time period (see section 2.12). Increasing phosphorus concentrations in lakes can lead to the proliferation of algal blooms which can cause harm to the other plants and animals living in a lake. For example, algal blooms in the water can prevent light reaching the bottom of the lake which can prevent some bottom dwelling species of aquatic plants from living there.

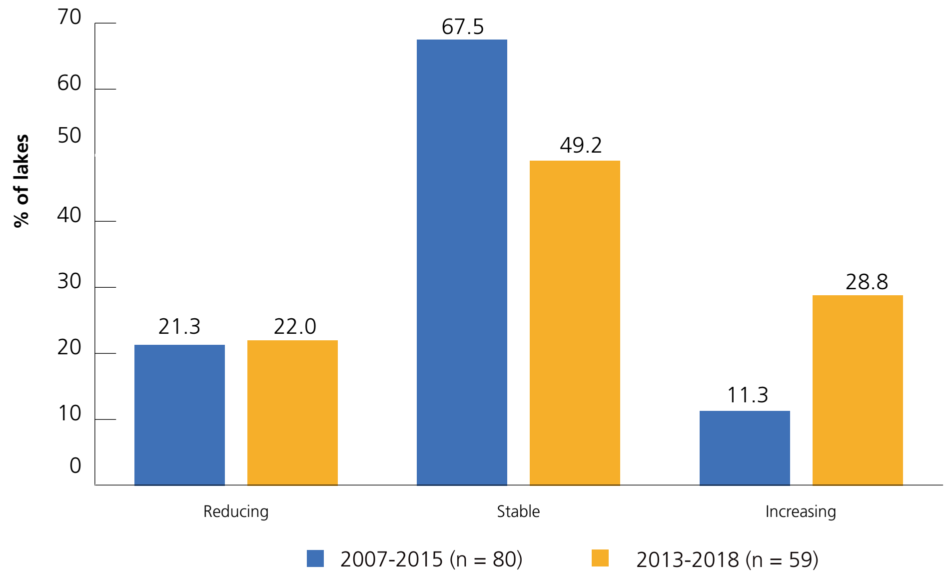
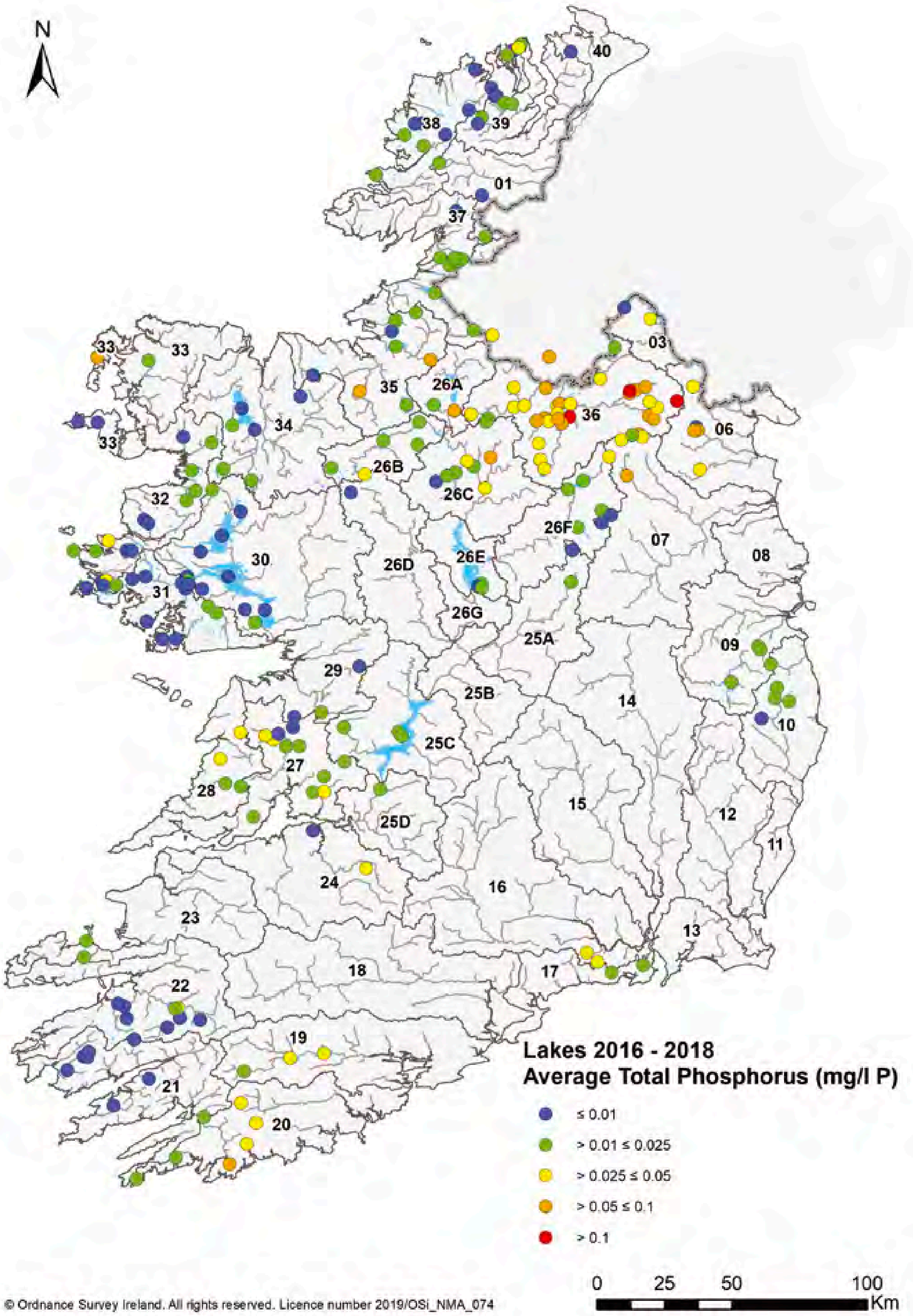


Figure 3.6: A comparison of the proportion of lakes with reducing, stable or increasing total phosphorus concentration during 2007-2015 and 2013-2018. Trend for phosphorus is indicated by a decrease/increase of 0.002mg/l P per annum. Using Mann-Kendall and Sen's slope statistical methodology.



Map 3.2: Average total phosphorus concentrations at all lakes for 2016-2018.

TRANSITIONAL and COASTAL WATERS

4. TRANSITIONAL AND COASTAL WATERS

4.1 Introduction

In Ireland, transitional and coastal waters cover an area of over 14,000 km^2 (transitional 844 km2; coastal 13,325 km2) and represent a wide variety of types such as lagoons, estuaries, large coastal bays and exposed coastal stretches (Map 4.1). Transitional water is the term used to describe estuaries and lagoons. The ecological status of these waters has been assessed using data from 2013 to 2018, as many of the biological assessments are undertaken over a six-year period. The saline waters of Ireland are comprised of 304 water bodies (110 coastal and 194 transitional) and approximately 40% of these are monitored in the national Water Framework Directive monitoring programme.

4.2 Summary for Transitional and Coastal Waters

- 30 transitional water bodies (38%) are in high or good ecological status and 49 (62%) are in moderate, poor or bad ecological status.
- 36 coastal water bodies (80%) are in high or good ecological status which is substantially higher than the European average of 54.6%. Nine coastal water bodies (20%) are in moderate ecological status and a single water body is in bad status. In terms of surface area, 93% of coastal waters are in high or good ecological status.
- Ten transitional water bodies improved in status, 13 declined and 47 remained unchanged. This represents a net decline in status of three water bodies since 2010-2015.
- Eleven coastal water bodies improved in status, 9 declined and 22 remained unchanged. This represents a net improvement in the ecological status of two water bodies since 2010-2015.
- A quarter (24.5%) of transitional and coastal water bodies failed the environmental quality standard and assessment criteria for dissolved inorganic nitrogen (DIN).
- Loadings of phosphorus and nitrogen to the marine environment have started to increase after many years of reductions. The average total nitrogen and total phosphorus loads have increased by 8,806 tonnes (16%) and 329 tonnes (31%), respectively, since 2012-2014.

4.3 National Ecological Status

Figure 4.1 shows that of the monitored transitional water bodies 30 (38%) are in high or good ecological status and 49 (62%) are in moderate or worse ecological status. Six of these water bodies are in bad ecological status (the worst status class) and 14 are in poor ecological status (these are listed in Table 4.1). Just over two-fifths (42%) of the surface area of transitional waters is in high or good status.

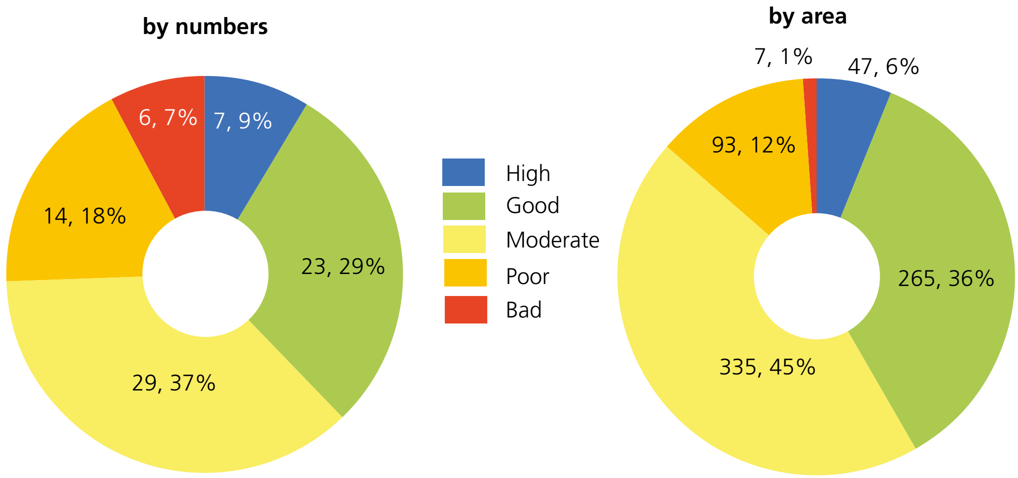


Figure 4.1: Status of transitional waters during 2013-2018, (left) by number and (right) by area (km^2).

Table 4.1: Transitional water bodies at poor and bad status. Also showing the main biological element responsible for determining status

Water Body	County	Ecological Status	Biological Driver
Lough Donnell	Clare	Bad	Lagoonal communities
Cuskinny lake	Cork	Bad	Lagoonal communities
Kilkerran lake	Cork	Bad	Lagoonal communities
Rogerstown Estuary	Dublin	Bad	Seagrass loss
Lady's Island Lake	Wexford	Bad	Lagoonal communities
Ballyteige lagoon	Wexford	Bad	Lagoonal communities
Shannon airport lagoon	Clare	Poor	Lagoonal communities
Argideen Estuary	Cork	Poor	Opportunistic Macroalgae
Clonkilty Harbour	Cork	Poor	Opportunistic Macroalgae
Upper Bandon Estuary	Cork	Poor	Phytoplankton
Durnesh lough	Donegal	Poor	Lagoonal communities
Broadmeadow Water	Dublin	Poor	Phytoplankton
Cashen estuary	Kerry	Poor	Phytoplankton
Upper Feale Estuary	Kerry	Poor	Phytoplankton

Water Body	County	Ecological Status	Biological Driver
Upper Shannon Estuary	Limerick	Poor	Angiosperms (saltmarsh)
Castletown Estuary	Louth	Poor	Phytoplankton
Colligan Estuary	Waterford	Poor	Opportunistic Macroalgae
Middle Suir Estuary	Waterford/ Kilkenny	Poor	Phytoplankton
Upper Suir Estuary	Waterford/ Kilkenny	Poor	Phytoplankton
Lower Slaney Estuary	Wexford	Poor	Phytoplankton

Figure 4.2 highlights that for coastal waters, 36 monitored water bodies (80%) are in high or good ecological status, with nine (20%) at less than good status. The majority (93%) of the surface area of coastal waters are in high or good ecological status. A single small lagoon water body, Rincarna Pools, in Co. Galway, was classified at bad status due to the effects of eutrophication on the biological communities.

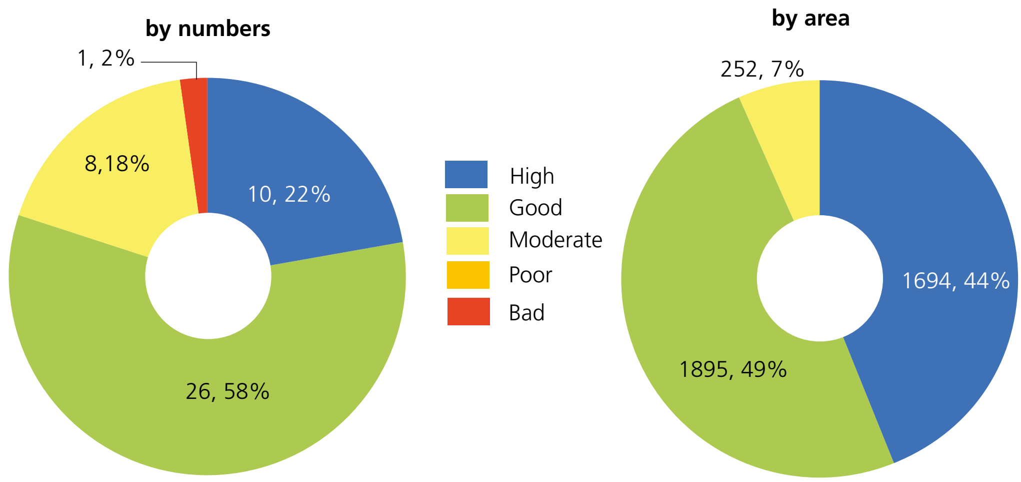


Figure 4.2: Status of coastal waters during 2013-2018, (left) by number and (right) by area (km2).

Map 4.1: Ecological status of transitional and coastal water bodies during 2013-2018. This includes monitored and grouped water bodies[4] .

4 In addition to monitored status, information on unmonitored water bodies is also presented. This is done by extrapolating status from monitored water bodies to comparable unmonitored water bodies under similar pressures.

4.4 Factors Driving Ecological Status

Transitional waters

The biological, physico-chemical and hydromorphological elements used to determine transitional water status is shown in Figure 4.3. As can be seen the biological quality elements which have determined overall status varies across water bodies.

Phytoplankton is assessed in most transitional water bodies, and 41% of the water bodies assessed are in moderate or worse status based on the condition of this biological element. The condition of fish is also a key element for the classification of transitional water bodies, with 9% of water bodies assessed for fish in unsatisfactory status. The remaining water bodies assessed for fish were in good ecological status. None of the water bodies assessed for fish reached high status.

Benthic invertebrates are monitored in 43 transitional water bodies (including small lagoon water bodies) and seven of these water bodies have been classified as moderate or worse status.

Macroalgae monitoring looks at opportunistic algae (due to their visual appearance, these are commonly known as sea lettuce blooms). Intertidal seagrass communities are a sensitive and protected habitat and have been used as an element since 2007. In general, seagrass communities are in good condition, apart from the Rogerstown estuary, in Co. Dublin, where persistent eutrophication has driven excessive algal growths causing the smothering and subsequent loss of intertidal seagrass beds.

For the supporting physico-chemical elements, oxygenation conditions are the main driver of status. Water bodies are assessed against two standards for dissolved oxygen, one to look at reduced oxygen concentration because of oxygen consumption of polluting organic matter and the second to look at elevated concentration which can indicate excessive algal growth. The lowest oxygen concentrations were found in the Lee estuary, Co. Cork, with values less than 50% saturation. The highest concentrations were found in the Upper Bandon, Co. Cork, the Broadmeadow estuary, Co. Dublin and the Maigue estuary, Co. Limerick.

Ten water bodies, out of the 79 assessed, breached the salinity-related environmental quality standard for phosphorus (as molybdate reactive phosphorus (MRP)). These include the Maigue and Deel estuaries that flow into the Shannon estuary, the Castletown estuary that flows into Dundalk Bay, the Tolka estuary that flows into Dublin Bay, and a few small transitional lagoons.

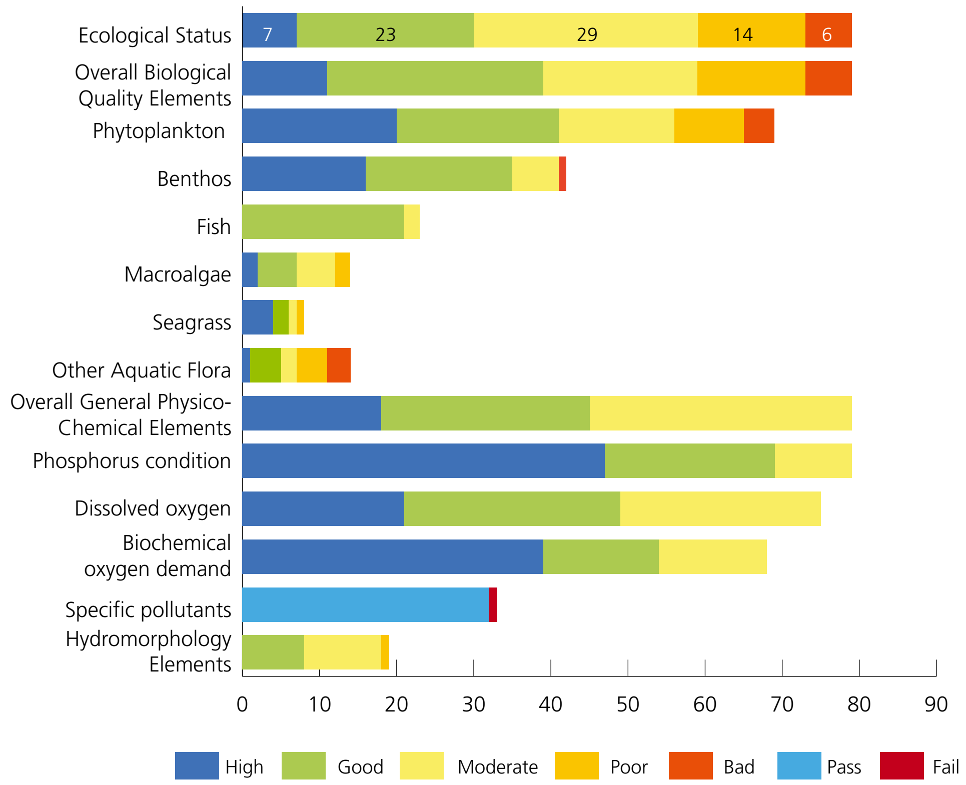


Figure 4.3: Ecological status and condition of individual biological quality elements, physico-chemical elements and hydromorphological quality elements in transitional waters in 2013-2018. Phosphorus condition is based on the assessment of molybdate reactive phosphorus (MRP).

Coastal waters

In coastal waters the primary biological quality elements used for assessment of ecological status are phytoplankton and benthic invertebrates. Fish are not used as a biological element in coastal waters for the WFD.

An overview of the relative impacts of individual biological elements on ecological status of coastal waters is shown in Figure 4.4. Based on the assessment of phytoplankton, all areas were in high or good ecological status apart from two water bodies – the Boyne estuary plume zone and Portavaud lagoon, Co Sligo.

Three coastal water bodies were in moderate ecological status based on the condition of the benthic invertebrate quality element – the Southwestern Irish Sea; Waterford Harbour and Portavaud East.

The macroalgal quality element is assessed in coastal waters primarily by looking at seaweed diversity on rocky shores, but also by looking at green algal growths in a limited number of coastal areas. Based on the diversity of seaweeds found on rocky shores all water bodies assessed were in good or high ecological status, in Malahide Bay, however, the ecological status of the Bay was moderate due to excessive growth of green algae.

A single coastal water body, Rincarna Pools lagoon was in bad ecological status. This was due to the effects of eutrophication on the plant communities.

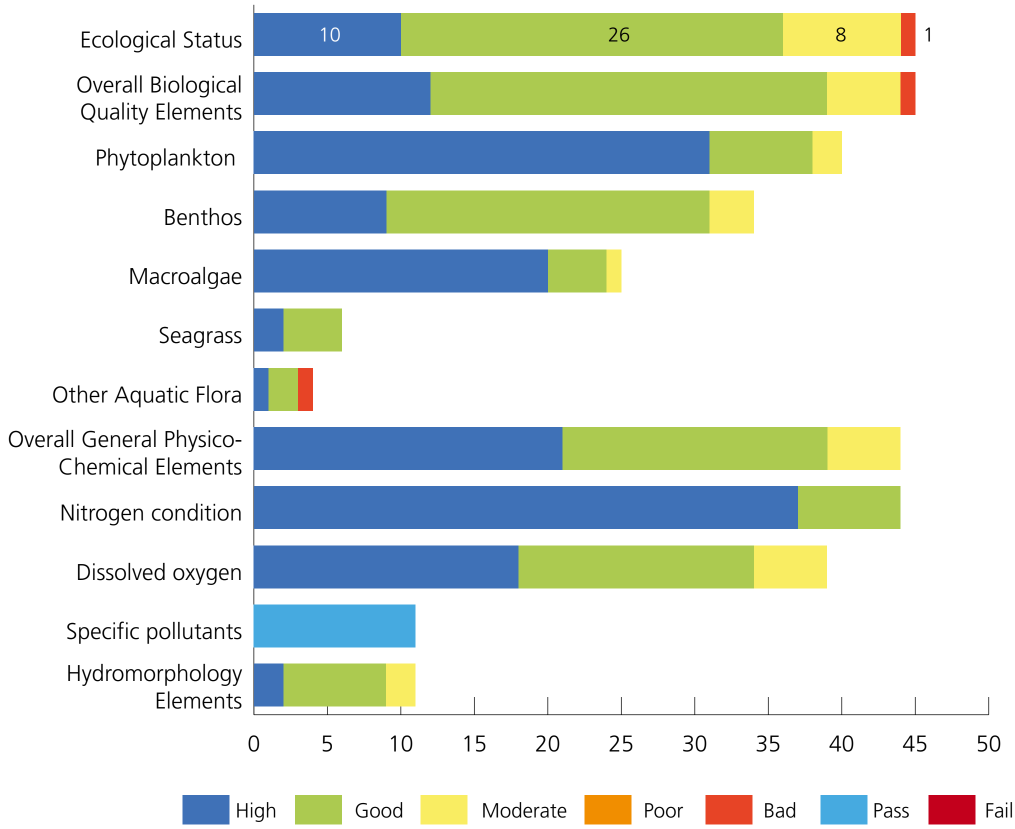


Figure 4.4: Ecological status and condition of individual biological quality elements, physico-chemical elements and hydromorphological quality elements in coastal waters in 2013-2018. Nitrogen condition is based on the assessment of dissolved inorganic nitrogen (DIN).

In coastal waters the main physico-chemical elements assessed are dissolved oxygen (DO) and nitrogen (as dissolved inorganic nitrogen (DIN)) which is generally considered to be the limiting nutrient in marine waters. This means that this nutrient is typically found in relatively low concentrations which limits the growth of algae. When there is too much nitrogen present this can cause problems with the excessive growth of algae which in turn can harm other plants and animals. All of the coastal water bodies assessed passed the environmental quality standard for DIN. For dissolved oxygen, five water bodies failed the environmental quality standard. These were:

- the Boyne estuary plume zone
- Killary Harbour
- Youghal Bay
- Waterford Harbour
- Cork Harbour

4.5 Hydromorphology in Transitional and Coastal Waters

Hydromorphology was assessed in 30 transitional and coastal waters using the Hydromorphological Quality Index. Nineteen water bodies (63%) were in high or good hydromorphological condition and 10 were in moderate condition, of which only two are coastal water bodies, Cork Harbour and Dungarvan Harbour. A single water body, the Boyne estuary was in poor hydromorphological condition, a reflection of the historical changes from navigation channels and port development.

4.6 Changes and Trends

Figure 4.5 and Figure 4.6 show the ecological status of transitional and coastal water bodies, respectively, over four assessment periods. In transitional waters, the overall proportion of high and good status water bodies has increased when compared to earlier periods (Figure 4.5). However, when changes are compared across all water bodies and the full spectrum of the five status classes there was a net decline in three water bodies (i.e. 10 water bodies improved in status while 13 water bodies declined) (Figure 4.7).

In coastal waters, the proportion of water bodies in good ecological status increased since 2012 and when changes, in terms of water body declines and improvements, are compared across all water bodies and the five status classes there was also a net improvement in two water bodies (Figure 4.7).

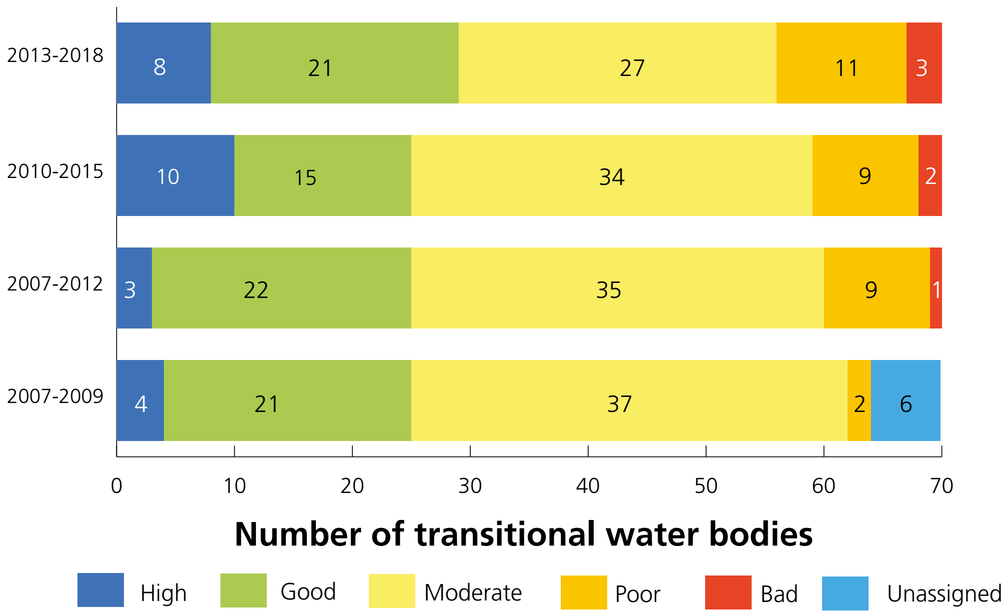


Figure 4.5: Changes in transitional water status since 2007.[5]

5 The monitoring programme in 2007–2012 was not fully operational, so some water bodies do not have comparable data.

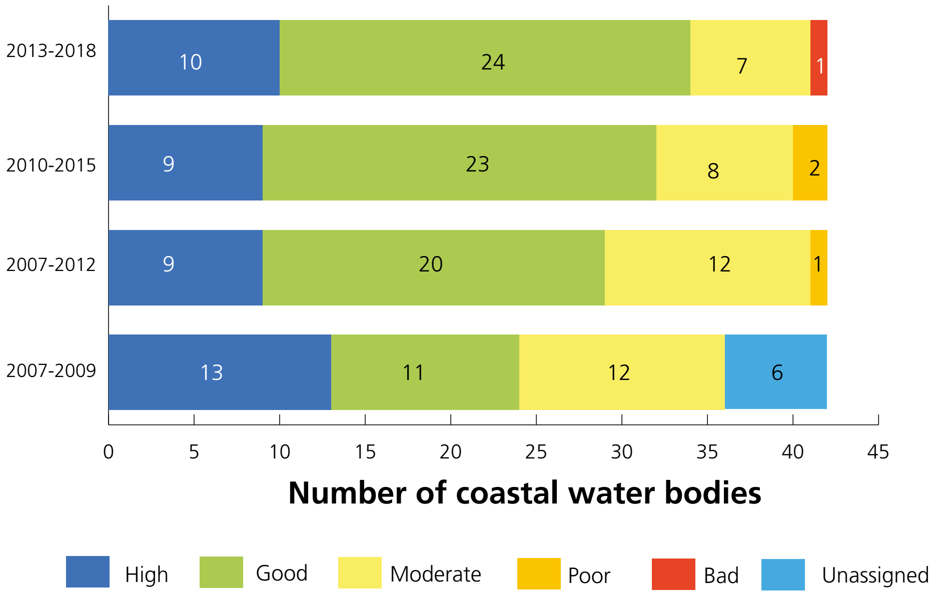


Figure 4.6: Comparison of coastal water status since 2007.

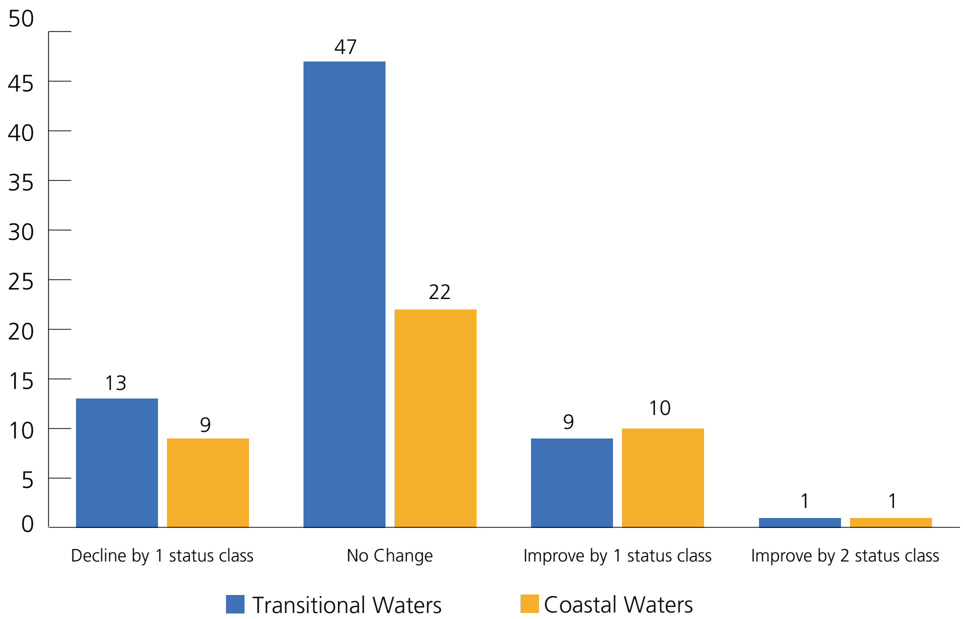


Figure 4.7: Changes in transitional (blue bars) and coastal water (orange bars) ecological status class since 2015.

4.7 Nutrients in Estuaries and Coastal Waters

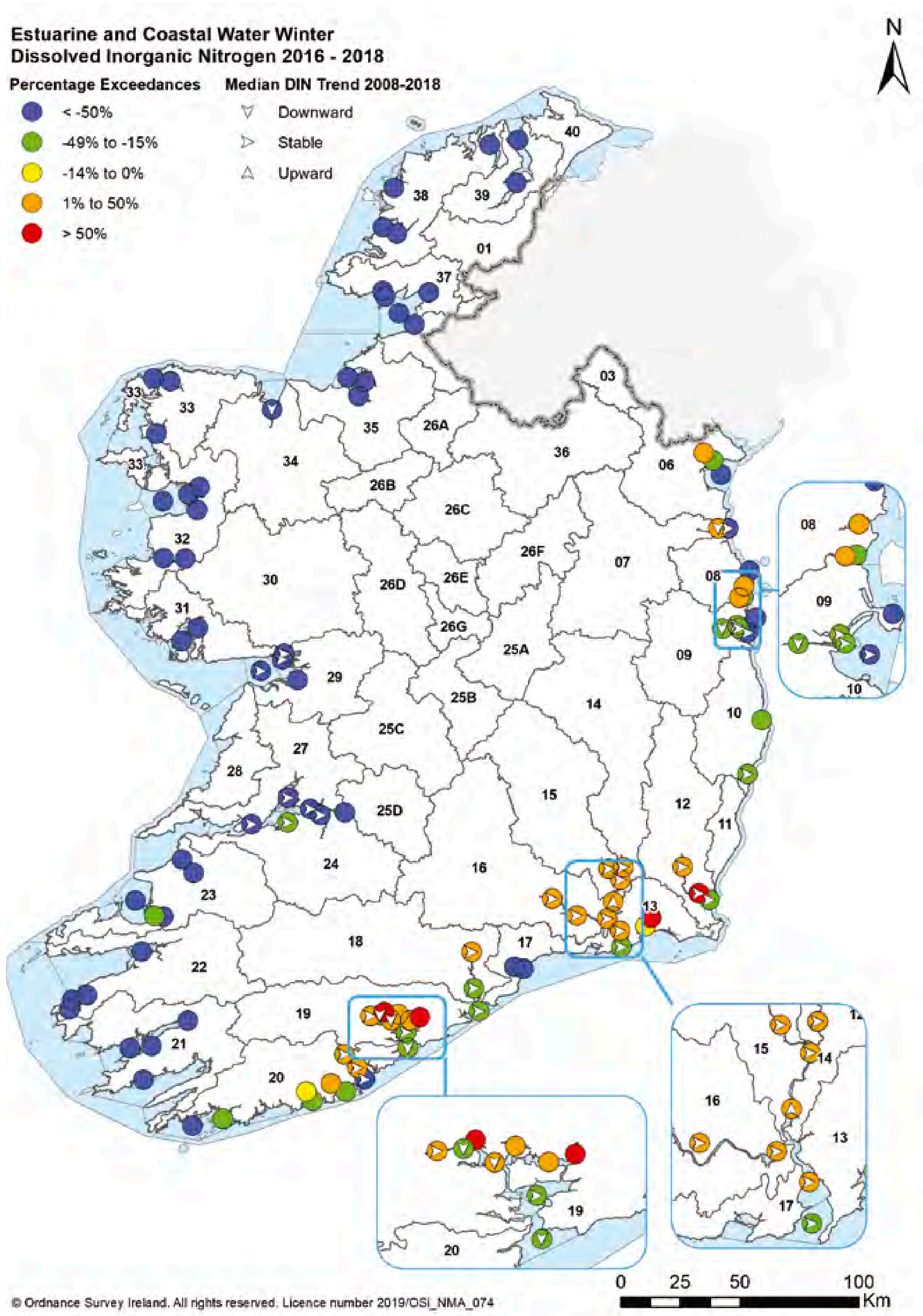
Nitrogen is considered the primary limiting nutrient in coastal systems while phosphorus or nitrogen can limit the growth of phytoplankton and macroalgae in estuarine systems. In winter, the concentrations of both nutrients are expected to be at their highest due to the absence of any signification plant or algal growth. Salinity related thresholds have been defined for nitrogen and phosphorus and median nutrient concentrations above the thresholds indicates the presence of increased levels from pollution sources.

Nitrogen Winter Exceedances

Twenty-five (24.5%) of the 102 estuarine and coastal water bodies assessed were above the salinity-related nutrient criteria (Map 4.2) which ranges between 2.6 mg/l of N at the freshwater end of the spectrum to 0.25 mg/l of N at the fully saline end of the spectrum. All exceedances in this period were in transitional waters, the coastal waters that previously exceeded the EQS are now just below the assessment threshold.

The water bodies with the highest dissolved inorganic nitrogen concentration were:

- Glashaboy Estuary, Co. Cork (5.2 mg N/l)
- Corock Estuary, Co. Wexford (5.0 mg N/l)
- Upper Barrow Estuary, Co. Kilkenny (3.8 mg N/l)
- Upper Slaney Estuary, Co. Wexford (3.8 mg/l)
- Barrow Nore Estuary Upper, Co. Kilkenny (3.3 mg/l)
- New Ross Port, Co. Wexford (3.3 mg/l)



Map 4.2: Nitrogen winter exceedances above the salinity related assessment thresholds

Nitrogen Trends

A trend analysis was undertaken of winter median nitrogen concentrations (as dissolved inorganic nitrogen) in estuarine and coastal water bodies in 17 catchments from 2008 to 2018. Of the 39 water bodies included in the analysis, one water body showed a significant upward trend (New Ross Port), six showed a significant downward trend and 32 showed no trend.

The six water bodies with a significant decreasing trend were:

- Boyne Estuary (Co. Louth)
- Lower Lee Estuary (Co. Cork)
- Lough Mahon (Co. Cork)
- Outer Cork Harbour (Co. Cork)
- Upper Liffey (Co. Dublin)
- Moy Estuary (Co. Mayo)

Phosphorus Winter Exceedances

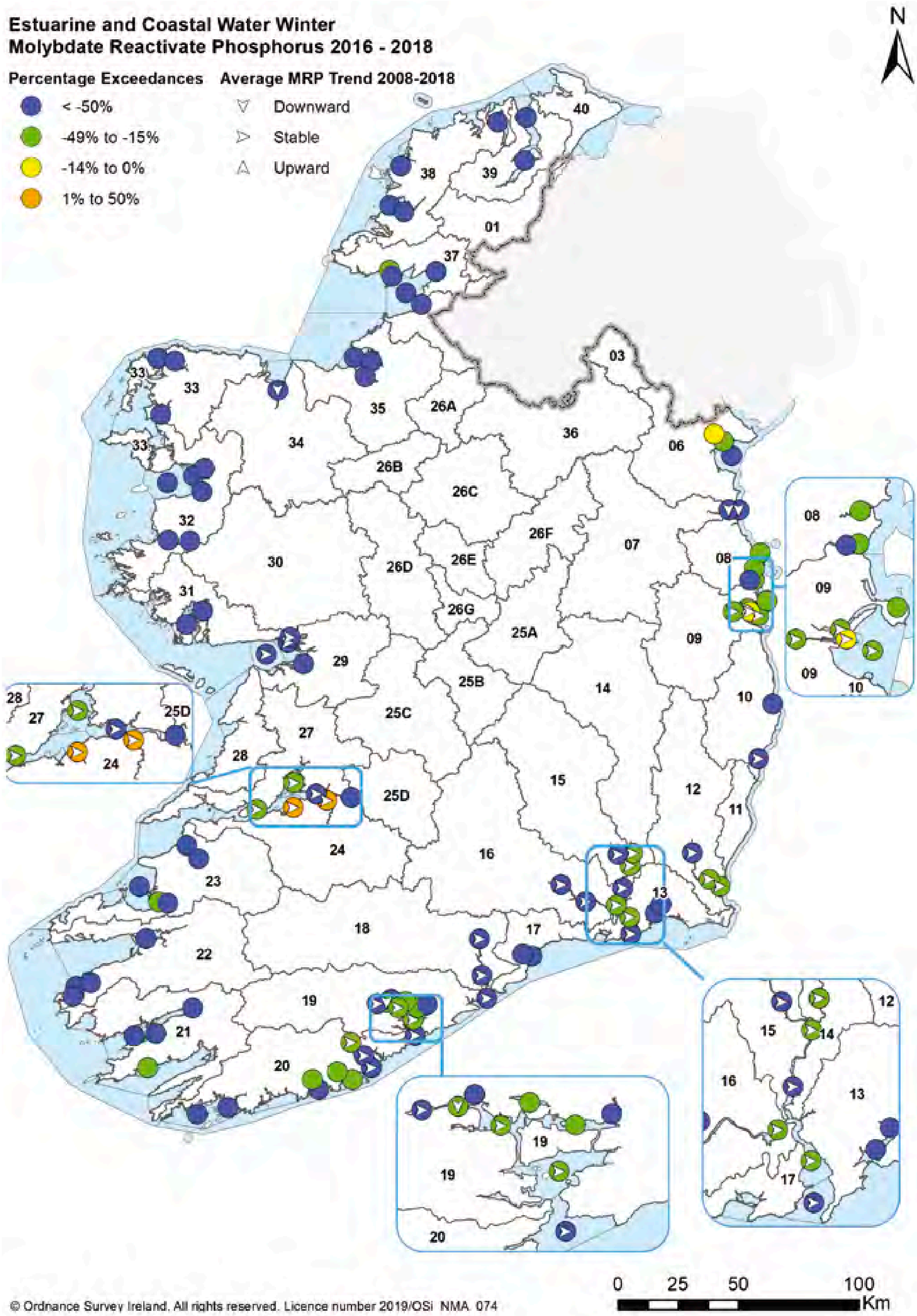
Only two of the 102 water bodies assessed, the Maigue estuary and the Deel estuary in Co. Limerick, exceeded the relevant salinity-related winter phosphorus thresholds (Map 4.3). The majority of estuaries and coastal waters (95%) had median winter phosphorus concentrations less than 0.04 mg/l (the environmental quality standard for transitional waters), with just under half of these having levels less than 0.02 mg/l P. Some estuaries also breached the phosphorus threshold in summer, these include the Tolka estuary, Co. Dublin, Castletown estuary, Co. Dundalk and some small lagoon water bodies.

Phosphorus Trends

Trend analysis was also carried out in the same 17 catchments for winter median phosphorus concentrations (as molybdate reactive phosphorus). Of the 39 water bodies included in the analysis, one water body showed an upward trend (upper Shannon estuary), four showed a significant downward trend and 35 showed no trend.

The four water bodies with a significant decreasing trend were:

- Boyne Estuary (Co. Louth)
- the Boyne Estuary plume zone (Co. Louth)
- Lower Lee Estuary (Co. Cork)
- Moy Estuary (Co. Mayo)



Map 4.3: Phosphorus winter exceedances above the salinity related assessment thresholds

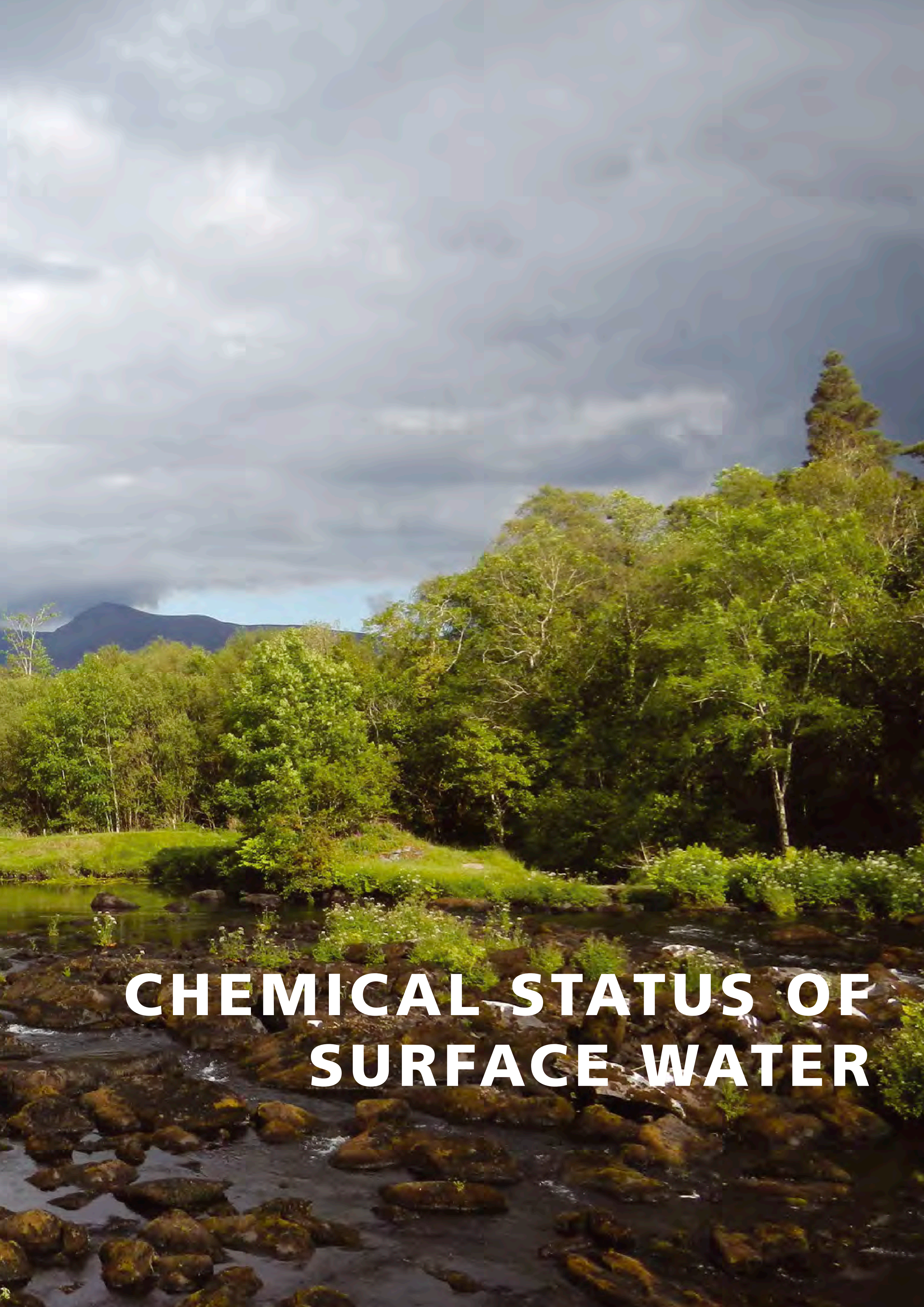
4.8 Nutrient Inputs to the Marine Environment

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 19 major Irish rivers to estuarine and coastal waters has been ongoing since 1990. Measuring these inputs provides a useful indicator of trends in the transfer of nutrients from land-based sources. The inputs are calculated based on nutrient concentrations, which are measured 12-times a year, and river flow, which is measured continuously.

Figure 4.8: Loads of total nitrogen and total phosphorus (tonnes per year) between 1990 and 2018 for all monitored rivers combined. The bottom graph indicates if loads are increasing or decreasing relative to the previous three-year averaged period. Green bars indicate a reduction from one three-year rolling period to the next; red bars indicate an increase.

Nutrient inputs from Irish rivers have varied over the 29 years since monitoring began (Figure 4.8). Loads of total nitrogen were highest in the 1990s, then decreased until 2013. The reductions suggest that national measures aimed at reducing the loss of nutrients from terrestrial sources to surface waters were successful over that period.

Since 2014 however, the trend has reversed and we are now seeing an increase in nutrient inputs to the marine environment. Average total nitrogen in 2016–2018 has increased by 8,806 tonnes (16%) since 2012–2014, the majority of which is coming from the catchments to the south and southeast of the country. Average total phosphorus rose by 329 tonnes (31%) over the same period undoing the gains made over previous years.



CHEMICAL STATUS OF SURFACE WATER

5. CHEMICAL STATUS OF SURFACE WATERS

Chemical status is assessed against compliance with Environmental Quality Standards (EQS) for priority substances and priority hazardous substances[6]. These substances include metals, pesticides and various industrial chemicals. The EQS aims to protect the most sensitive species from direct toxicity as well as predators and humans that may be exposed to the substance. These EQSs may apply to either water or biota (e.g. fish) or both depending on which matrix is most appropriate for assessing the impact of that substance. Substances that are bio-accumulative (e.g. mercury) are often best monitored in biota.

In total, 322 water bodies comprising of 179 river water bodies, 98 lakes, 33 transitional waters and 12 coastal waters were sampled in 2013-2018. A quarter of water bodies sampled (80 water bodies) are in poor chemical status having failed to meet their respective EQS (Figure 5.1). Rivers have the highest proportion of water bodies in poor chemical status at 43%, followed by lakes at 16% and transitional waters at 5.8%. Coastal waters had no failures.

The parameters causing poor chemical status in biota were mercury, heptachlor and heptachlor epoxide (insecticides), and poly brominated diphenyl ethers (PBDEs) (flame retardants used in many manufactured goods). The parameter causing poor chemical status in water samples was benzo(a)pyrene, which is a polyaromatic hydrocarbon (PAH). These substances are ubiquitous in the water environment across Europe (see Box 5.1). When ubiquitous priority substances such as mercury and PAHs are omitted from the analysis the number of surface water bodies failing to achieve good chemical status falls to 1% (Figure 5.1) or three water bodies. These water bodies are the Owvane river, Co. Cork (which fails for hexachlorobutadiene), the Glenealo river, Co. Wicklow (for cadmium) and the Avoca estuary (for copper, zinc and cadmium).

By comparison, across Europe, 46% of surface waters are in poor chemical status; this drops to 3% when ubiquitous substances are omitted (EEA, 2018).

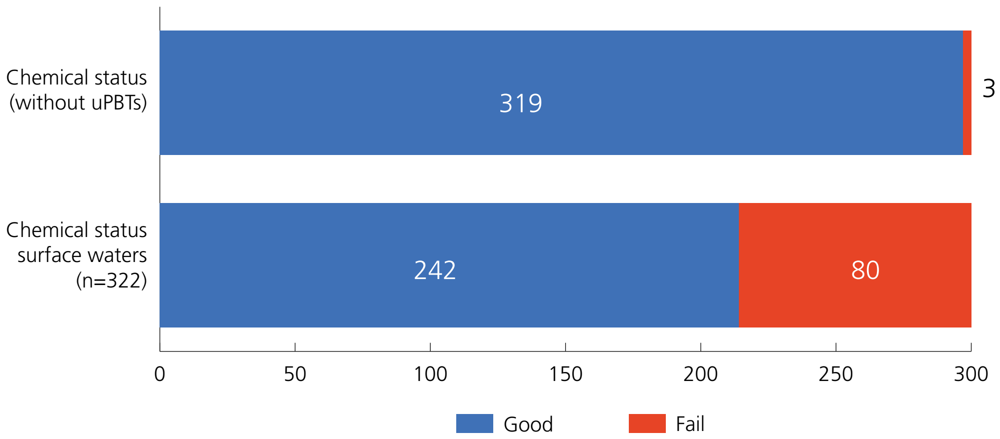


Figure 5.1: Chemical status of monitored surface water bodies, with and without ubiquitous substances (uPBTs), 2013-2018.

6 As listed in the Environmental Quality Standards Directive (2008/105/EC) as amended by the Priority Substances Directive (2013/39/EU

Box 5.1 Ubiquitous substances

The assessment of surface water chemical status needs to take account of ubiquitous substances that are already widely distributed in the environment. Ubiquitous substances are characterised by their ability to persist in the environment for many years, in some cases decades, even after their production has ceased or been greatly reduced. For example, PCBs (polychlorinated biphenyls) are still found in the aquatic environment even though their manufacture declined drastically in the 1960s. Ubiquitous substances are also characterised by their ability to bioaccumulate in biological food webs and by their toxicity. These substances are often referred to as uPBTs (ubiquitous, persistent, bioaccumulative and toxic substance).

The list of ubiquitous substances includes, mercury and its compounds, pBDEs (brominated fire retardants), PAHs (polyaromatic hydrocarbons) and tributyltin (TBT) compounds. Given the widespread pervasive nature of these compounds and the relatively low EQS concentrations, exceedances of EQSs in water bodies are common. Reducing concentrations of these substances in water bodes is extremely challenging.

In presenting information on chemical status, results can be presented with and without ubiquitous substances. This is done to ensure that improvements achieved with other substances, which can be addressed through local and national programmes of measures, are not obscured by including uPTBs. Assessment of chemical status in this way does not exempt Ireland from taking additional measures, including at international level, to reduce or eliminate discharges and emissions of uPTBs.

5.1 Monitoring of Pesticides

During 2013–2018 pesticide analysis was focused on the screening of 14 substances totalling 16,069 measurements in 144 rivers nationally (Table 5.1). Not all the pesticides monitored have an EQS set for them and while none of the pesticide substances monitored exceeded their annual average EQS (where applicable) there were a number of positive detections during 2013-2018. Overall there were 665 river samples with pesticide detections (4.1%), affecting 117 rivers.

MCPA was the most widely observed substance, detected in over half of all rivers it was monitored in. Most values were <0.1 µg/l with thirty-three results exceeding 0.2 µg/l. The highest MCPA value was recorded in 2013 (18 µg/l) in the Banoge River (Co. Wexford). MCPA is a selective herbicide specifically designed to kill weeds without harming crops. It is a common active ingredient in both agricultural and domestic herbicide products and is widely used in agriculture to control rush growth in grassland. It is also used on golfcourses and in parks and home gardens. If MCPA is applied too close to a watercourse it can contaminate water which may be subsequently abstracted for drinking water. Mecoprop, another commonly used herbicide used to control broad-leaf weeds was the next most abundant substance with concentrations typically <0.1 µg/l.

In 2018, 42 drinking water supplies had pesticide concentrations above the required standard. Three-quarters of all failures were due to MCPA (EPA, 2019a). The National Pesticide and Drinking Water Action Group (NPDWAG) was set up in 2016 and includes representatives from the EPA, Irish Water, local authorities, the farming community and pesticide manufacturers and suppliers. This group works together to identify problems with pesticide contamination in water supplies and to raise awareness of the need to use pesticides responsibly.

Table 5.1: Summary of positive detections for pesticides in rivers 2013-2018

Pesticide	No. of samples	No. of rivers	No. of detects (%)	No. (%) of rivers affected
MCPA	1292	144	277 (21.4%)	80(55.6%)
Mecoprop*	1158	141	102(8.8%)	53(37.6%)
2 6-Dichlorobenzamide	1093	117	87(8.0%)	60(51.3%)
2 4-D	1158	141	60(5.2%)	41(29.1%)
Isoproturon*	1468	141	34(2.3%)	19(13.5%)
Dichlobenil	1111	117	30(2.7%)	24(20.5%)
Atrazine*	1480	141	23(1.6%)	18(12.8%)
Linuron*	1438	141	16(1.1%)	13(9.2%)
Malathion	336	60	15(4.5%)	13(21.7%)
Glyphosate*	1158	141	11(0.9%)	4(2.8%)
Diuron*	1438	141	7(0.5%)	7(5.0%)
AMPA	1143	138	2(0.2%)	2(1.4%)
Simazine*	1470	141	1(0.1%)	1(0.7%)
Terbutryn*	326	46	0 (0%)	0 (0%)

*denotes that the substance has an EQS

5.2 Substances in Biota

An assessment of fish populations from rivers and lakes found mercury concentrations ranging from 38 to 388 µg/kg, well above the 20 µg/kg EQS, with higher values generally associated with migratory brown trout caught in lakes closer to the coast. Mercury was also detected in shellfish in the Rogerstown estuary. These concentrations are consistent with other studies across Europe indicating the widespread distribution and persistence of this element. Heptachlor and heptachlor epoxide and PBDE were also detected above their respective EQS. The detected presence of these substances at concentrations exceeding their respective EQS illustrates their ubiquitous distribution and persistence in the environment. In contrast other priority hazardous substances, such as hexachlorobenzene and hexachlorobutadiene, were either not detected or were found at concentrations well below their respective EQS.

GROUNDWATER

Kinvara Springs, Co. Galway

6. GROUNDWATER

6.1 Introduction

Groundwater originates as rainfall, or snow melt, that soaks through the soil to the underlying subsoil and bedrock. Groundwater flows from the upper reaches of catchments through interconnected spaces or fractures in the subsoil or bedrock to the streams, rivers, lakes or estuaries. During periods when there is little or no rain, almost all the water flowing in streams and rivers originates from groundwater.

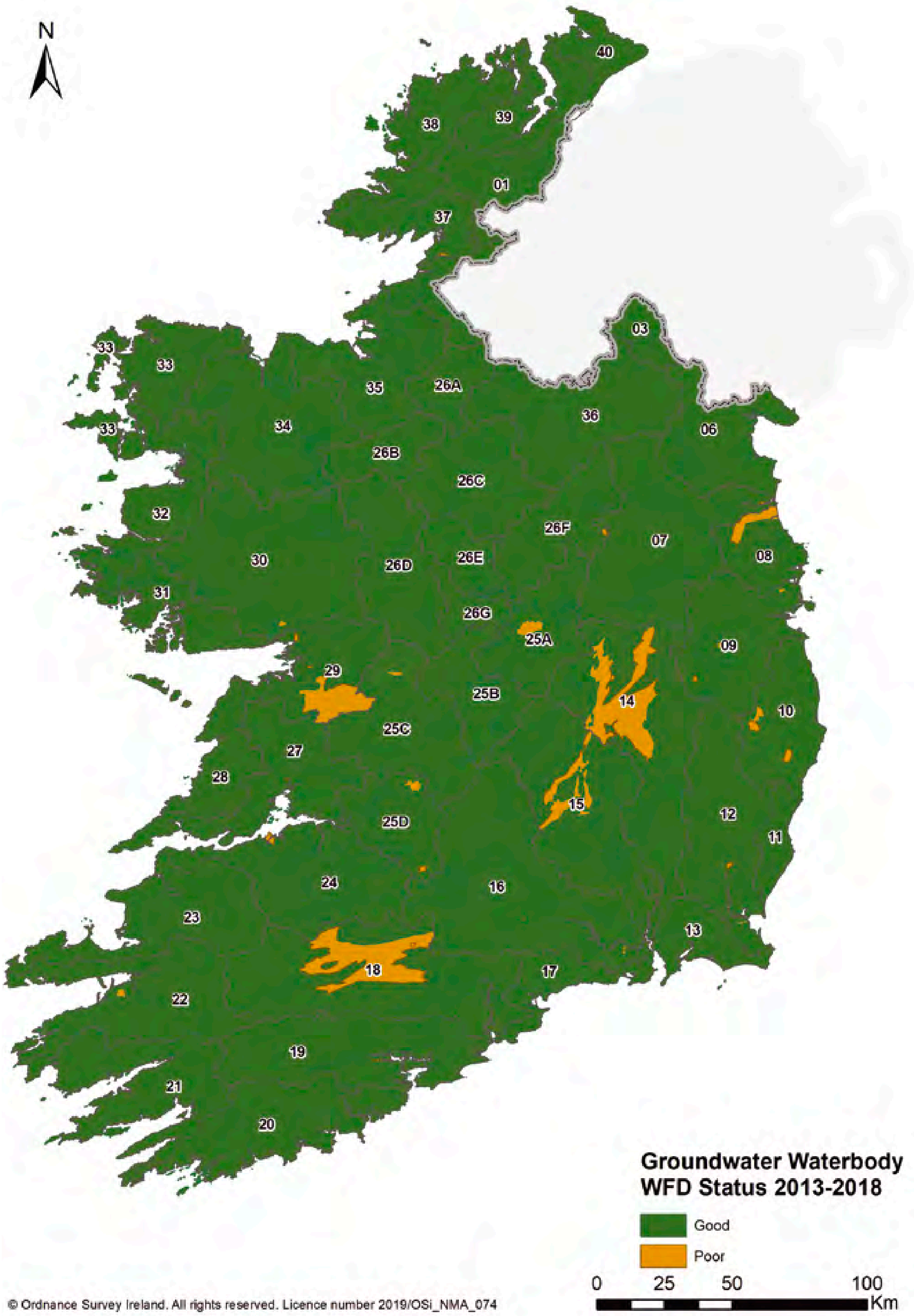
For the purposes of WFD water management, groundwater in Ireland is assigned, assessed and managed within 514 groundwater bodies, which range in size from <1 km^2 to 1,887 km^2.

6.2 Summary for Groundwater

- 474 out of a total of 514 groundwater bodies (92%) met their good chemical and good quantitative status objectives, accounting for 98% of the country (69,944 km^2) by area.
- 38 groundwater bodies (7.4%) were at poor chemical status, a reduction of six groundwater bodies on the previous assessment 2010-2015. These are generally small groundwater bodies impacted by historic contamination from point sources including mines, landfills and industry.
- Two groundwater bodies failed to meet the quantitative status objective. The first (Clara Bog, Co. Offaly) is associated with historical regional and local drainage schemes, and the second (Bettystown, Co. Meath) failed as a result of abstraction pressures.
- The average nitrate concentration in groundwater was below the threshold value of 37.5 mg/l NO_3 at 97% of monitoring locations during 2013-2018. However, there has been a 6.5% increase in the percentage of monitoring stations with mean nitrate concentrations greater than 25 mg/l NO_3 since 2013.
- The south and south-east regions of the country continue to have the greatest proportion of monitoring locations with elevated nitrate concentrations and this region has also seen the greatest increase in nitrate concentrations since 2013.
- The average phosphate concentration in groundwater was below the threshold value of 0.035 mg/l P at 93% of monitoring locations. This represents an improvement since 2013, with 2.5% more monitoring points having concentrations below the threshold value.
- The presence of hazardous substances in groundwater is not a widespread water quality issue.

6.3 National Status

Of the 514 groundwater bodies, 474 (92%) met their good chemical and good quantitative status objectives in 2013-2018 (Map 6-1). Of the 40 poor status water bodies; 38 failed to meet the chemical status objective and two failed 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. One of the poor quantitative status groundwater bodies (Clara Bog) is associated with historical regional and local drainage schemes and, in the other case, abstraction pressures (Bettystown).



Map 6.1: Overall WFD groundwater body status 2013-2018.

6.4 Factors Determining Status

Groundwater status is determined using five chemical and four quantitative tests. The worst-case classification from the relevant chemical status tests is reported as the overall chemical status for the groundwater body, and the worst-case classification of the quantitative tests is reported as the overall quantitative status for the groundwater body.

Table 6.1 provides a summary of the main elements that resulted in groundwater bodies failing to meet their chemical or quantitative status objective.

Table 6.1: Summary of the 2013-2018 status results, and comparison with 2010-2015 and 2003–2008.

Groundwater assessment	2013-2018 Summary (514 GWB)		2010-2015 Summary (513 GWB)		2003-2008 Summary (757 GWB)	
	Good status	Poor status	Good status	Poor status	Good status	Poor status
Surface Water Quality	510	4	504	9	662	95
GWDTE[7] Chemical	512	2	511	2	757	0
Drinking Water	512	2	513	0	757	0
General Chemical	481	33	477	36	749	8
Intrusions	514	0	513	0	757	0
Overall chemical status	**476**	**38**	**469**	**44**	**654**	**103**
Surface Water Quantity	514	0	513	0	757	0
GWDTE Quantity	513	1	512	1	755	2
Water Balance	513	1	513	0	756	1
Intrusions	514	0	513	0	757	0
Overall quantitative status	**512**	**2**	**512**	**1**	**754**	**3**

6.5 Changes and Trends

Overall there has been an improvement in groundwater status, with the number of groundwater bodies failing to meet their status objective reducing from 45 in 2010-2015 to 40 in 2013-2018. Of the 40 poor status groundwater bodies, 38 are at poor chemical status and two are at poor quantitative status.

The majority (33) of poor chemical status groundwater bodies relate to contamination from historic mines, industrial licensed sites and waste licensed sites. The number of poor status groundwater bodies associated with historic mining, industrial and waste sites fell due to

7 Groundwater Dependent Terrestrial Ecosystems

improvements in groundwater quality beneath four licensed sites. However, an additional poor status groundwater body was created following review of historic contamination beneath another licensed industrial site.

Increased nitrate concentrations in groundwater have resulted in two groundwater bodies (Durrow and Mitchelstown) being assigned poor chemical status. This has arisen because the average nitrate concentrations have exceeded the nitrate threshold value and are continuing to increase in groundwater bodies that supply drinking water.

Five groundwater bodies are no longer at poor status due to the contributions of groundwater to the quality of surface water. The improvements are primarily due to improved conceptual understanding of how groundwater is contributing phosphorus to rivers that are at less than good status, rather than a reduction in groundwater phosphorus concentrations. Three of the four remaining poor status groundwater bodies are associated with groundwater contributing metals to less than good status rivers in the historic mining areas of Avoca, Tynagh and Silvermines. The fourth poor status groundwater body relates to a groundwater body that straddles the border with Northern Ireland and further investigation into the pollution source impacting the less than good status river in Northern Ireland is required.

Water quality data and ecological assessments of two Turloughs (Caherglassaun and Tullynafrankagh), undertaken by the National Parks and Wildlife Service (NPWS), indicate that these Groundwater Dependent Terrestrial Ecosystems (GWTDE) do not meet their conservation objectives due to excessive phosphorus concentrations in groundwater, and the groundwater bodies relating to the Turloughs remain at poor status.

In relation to quantitative status, the Bettystown groundwater body is at poor status due to abstraction pressures and the Clara Bog GWTDE groundwater body remains at poor status as the NPWS have indicated the bog is not meeting its conservation objective because the ecology is impacted by historical regional and local drainage schemes.

6.6 Nutrients

Figure 6.1 shows that the average nitrate concentration was below 37.5 mg/l NO_3 at 97% of the monitoring locations over the assessment period 2013-2018. However, the percentage of monitoring stations with mean nitrate concentrations greater than 25 mg/l NO_3 has increased by 6.5% during the same period.

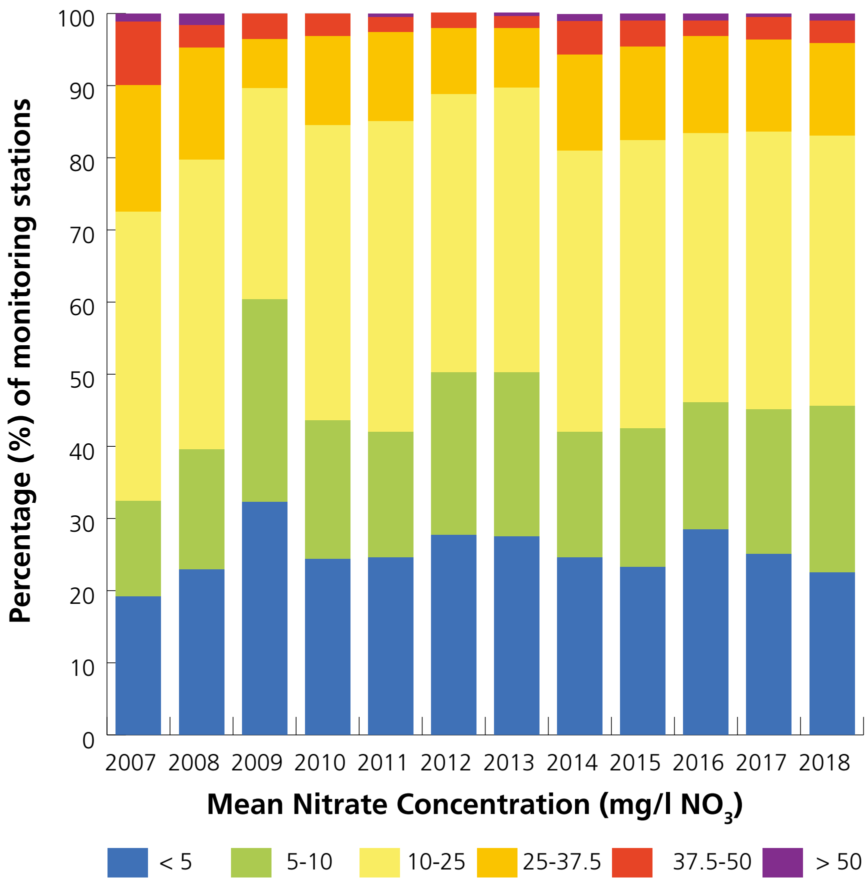
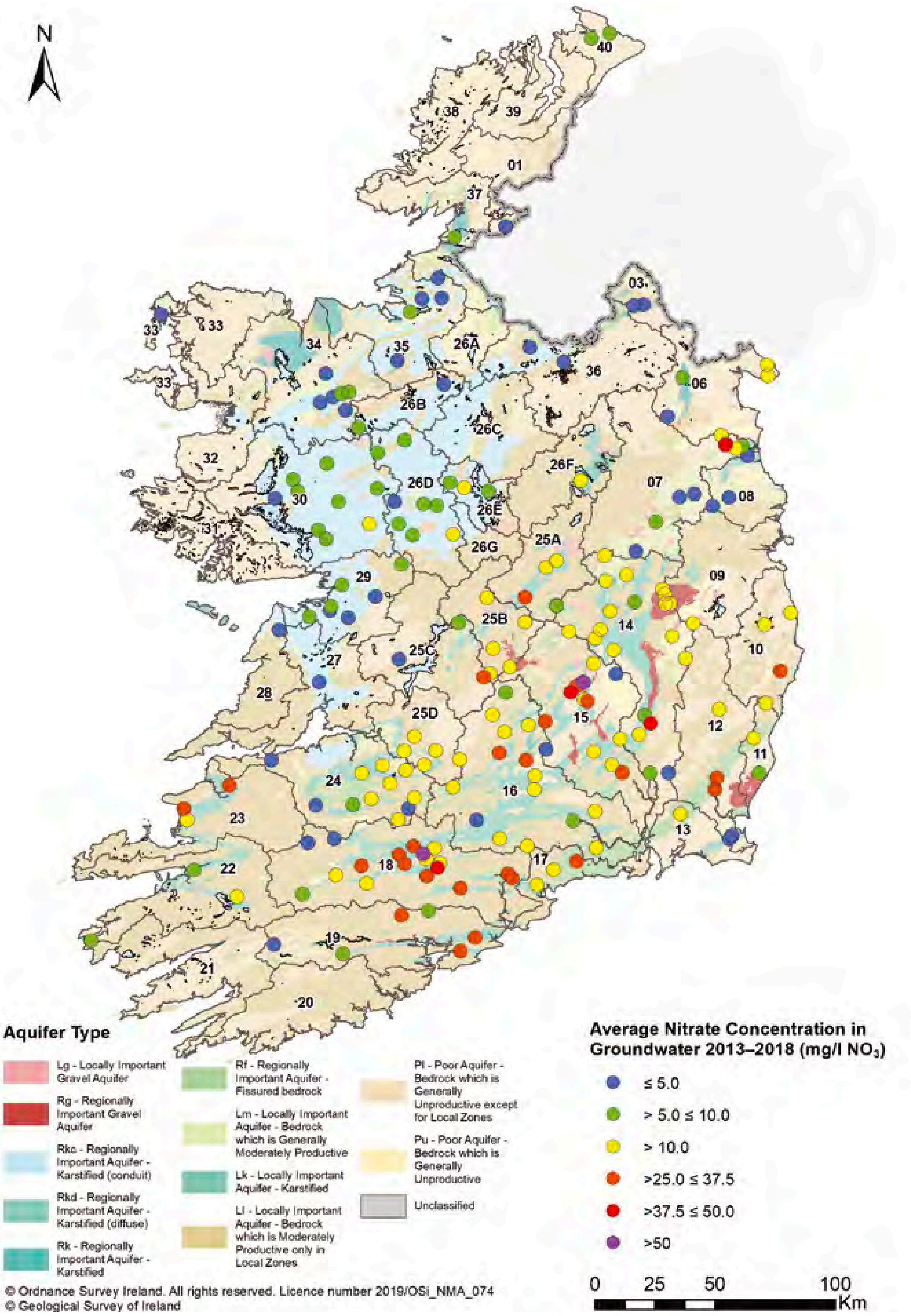


Figure 6.1: Comparison of the mean nitrate concentrations in groundwater from 2007 to 2018.

There are six monitoring locations with average nitrate concentration greater than 37.5 mg/l NO_3, all of which are water supplies. Two of these locations (Durrow–Fermoyle and Glanworth) had average concentrations above 50 mg/l NO_3, which is the drinking water standard, and therefore require additional treatment to ensure that the water supplied does not breach the drinking water standards at the tap. Further assessments of nitrate trends identified that these monitoring points, plus and additional monitoring point in the Durrow groundwater body, had statistically significant upwards trends in nitrate concentration.

Although groundwater has a nitrate threshold value (37.5 mg/l NO_3) associated with protecting drinking water resources, it is known that lower concentrations may be impacting on the quality of surface water, particularly those rivers, lakes or estuaries where the ecology is sensitive to inputs of nitrogen. Generally, the south and south-east of the country continue to have the greatest proportion of monitoring stations with higher nitrate concentrations (Map 6.2) and it is this area where nitrate concentrations increased the most since 2013. This is attributed largely to the impact of nutrient losses from agricultural sources.

Map 6.2 summarises the mean nitrate concentration during the period 2013-2018 for 195 groundwater quality monitoring locations in the national groundwater monitoring programme assessed for this report.



Map 6.2: Average nitrate concentrations in groundwater 2013-2018.

Figure 6.2 indicates that the average phosphate concentration in groundwater was below the threshold value (0.035 mg/l P) at 93% of the monitoring locations during 2013-2018. This represents an improvement since 2013, with 2.5% more monitoring points having concentrations below the threshold value. However, there has also been a 5.4% decrease in the percentage of monitoring points with concentrations less than 0.015 mg/l P.

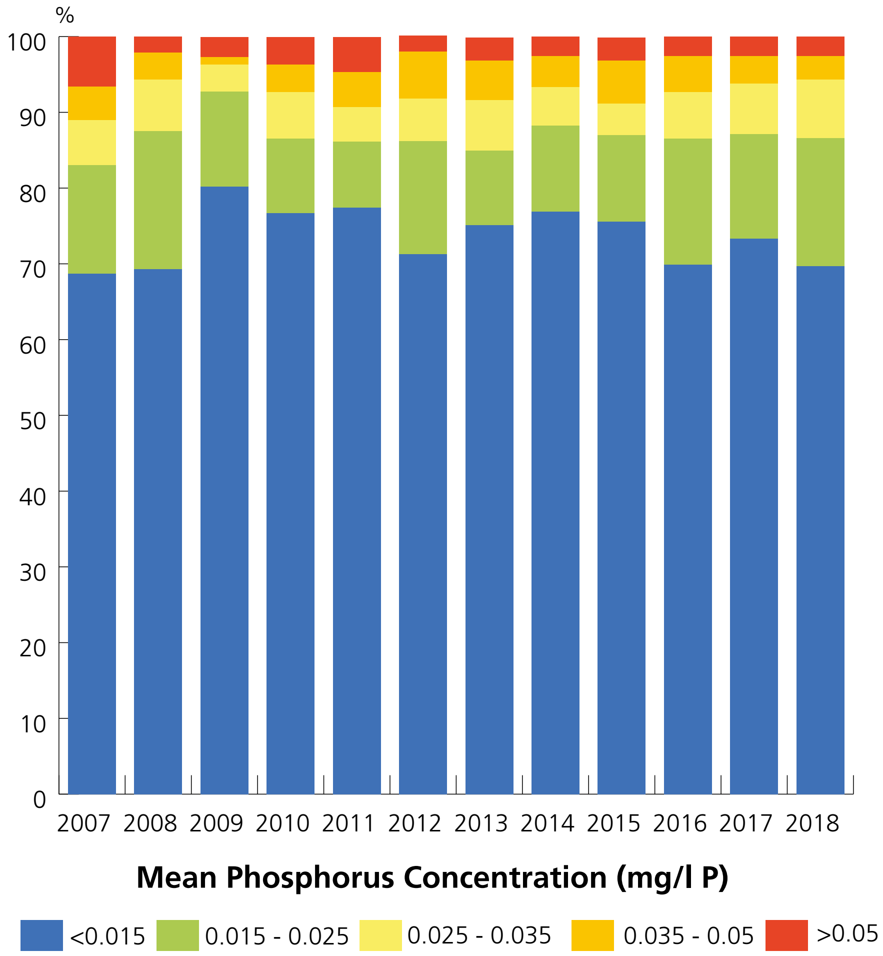
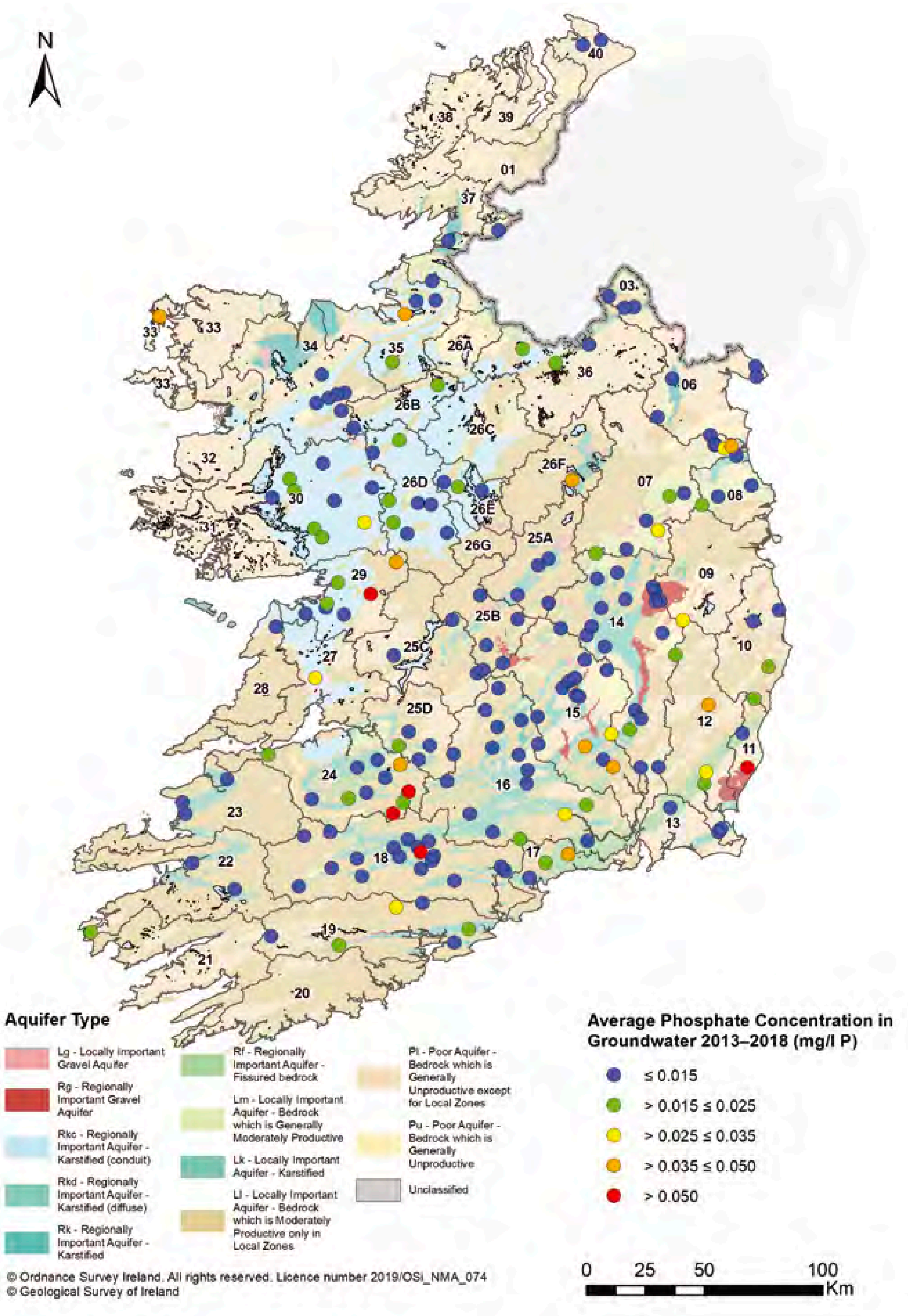


Figure 6.2: Comparison of the mean phosphate concentrations in groundwater from 2007 to 2018.

Four monitoring locations had environmentally and statistically significant upward phosphorus trends that could result in the concentration exceeding the threshold value of 0.035 mg/l P in 2027. However, following further assessment, these upward trends appear to be confined to these specific monitoring locations. Consequently, these trends did not result in statistically significant upward trends for the associated groundwater bodies.

Of the 14 monitoring locations with average concentrations above the phosphorus threshold value (0.035 mg/l P), five had concentrations greater than 0.05 mg/l P (Map 6.3). The river catchments associated with these monitoring locations have greater potential for groundwater to be contributing phosphorus to rivers, such that it would also cause an exceedance of the river EQS. Therefore, management measures should also consider the groundwater pathway in these river catchments.



Map 6.3: Average phosphate concentrations in groundwater 2013-2018.

6.7 Hazardous Substances and Pesticides

The last screening analysis for a wide suite of hazardous substances and pesticides in groundwater was undertaken in 2014. This screening, coupled with the screening undertaken from 2007-2009, has shown that very few of these substances are found in groundwater and where they are found, they are typically at low concentrations. However, some of these substances have been detected at significant concentrations in groundwater associated with a small number of historical mining, waste and industrial activities, resulting in localised groundwater pollution. Where the contamination from these activities is significant, groundwater bodies have been identified, created and classified as being at poor chemical status, with measures to manage the contamination forming part of the conditions of the licence. The national screening analysis is completed once per six-year WFD cycle, and the planned screening analysis for the current cycle is in 2020.

CANALS

7. CANALS

7.1 Introduction

Canals are artificial water bodies that are used primarily for recreation. They are part of a wider network that includes feeder streams that supply the canals with water. Waterways Ireland is responsible for the water quality monitoring of the canals for the purposes of the WFD. The waterways covered include the Grand Canal, Royal Canal and the canalised section of the Shannon-Erne Waterway. The canals traverse eight catchments across Ireland, from the Upper Shannon catchment in the west to the Liffey and Dublin Bay catchment in the east, and are divided into 15 water bodies for the WFD canal monitoring programme.

7.2 Summary for Canals

- 13 of the 15 canal water bodies assessed achieved good ecological potential for the 2016-2018 period.
- The Grand Canal basin was deemed to be in moderate ecological potential due to elevated levels of faecal coliforms and ammonia.
- The canalised part of the Shannon-Erne Waterway was classified as being at poor ecological potential due to the box shape profile of the waterbody affecting the biological communities.
- Water quality in the canals has remained stable since the last reporting period in 2013-2015.

7.3 Assessment of Canals

Canals are required to achieve good ecological potential rather than good ecological status because they are artificial water bodies. Ecological potential can be maximum, good, moderate, poor or bad.

In total, 332 km of canal channel was monitored, with 42 surveillance monitoring sites assessed for biology (macroinvertebrates and macrophytes including invasive species), physico-chemistry (parameters including total phosphorus, soluble reactive phosphorus, total oxidised nitrogen, ammonia and BOD), microbiology (faecal coliforms) and hydromorphology. The combination of these quality elements was used to determine the overall ecological potential.

Assessment of the canals using macroinvertebrates indicates good biological conditions in the Royal and Grand Canals. 41% of sites (17) are classified at maximum ecological potential, and 48.8% (20) are achieving good potential. The canalised section of the Shannon-Erne Waterway was classified as good, when assessed using the macroinvertebrate quality element.

Results were similarly positive for the Royal and Grand Canals in terms of macrophyte assessment, with 92.7% of sites (38) at maximum potential and 7.3% of sites (3) classified as good. However, subsequently, 35 out of the 38 sites had to be downgraded from maximum to good due to the presence of the invasive aquatic plant Nuttall's Pondweed. The Shannon-Erne Waterway was classified at moderate potential in terms of the macrophyte quality element.

The majority of sites (95%) were compliant with the physico-chemical and microbiological water quality standards. The only sites failing to reach the water quality standard are both located at the Grand Canal Basin in Dublin: one is failing because of high levels of faecal coliforms and the other because of high levels of ammonia.

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 due to its box shaped profile.

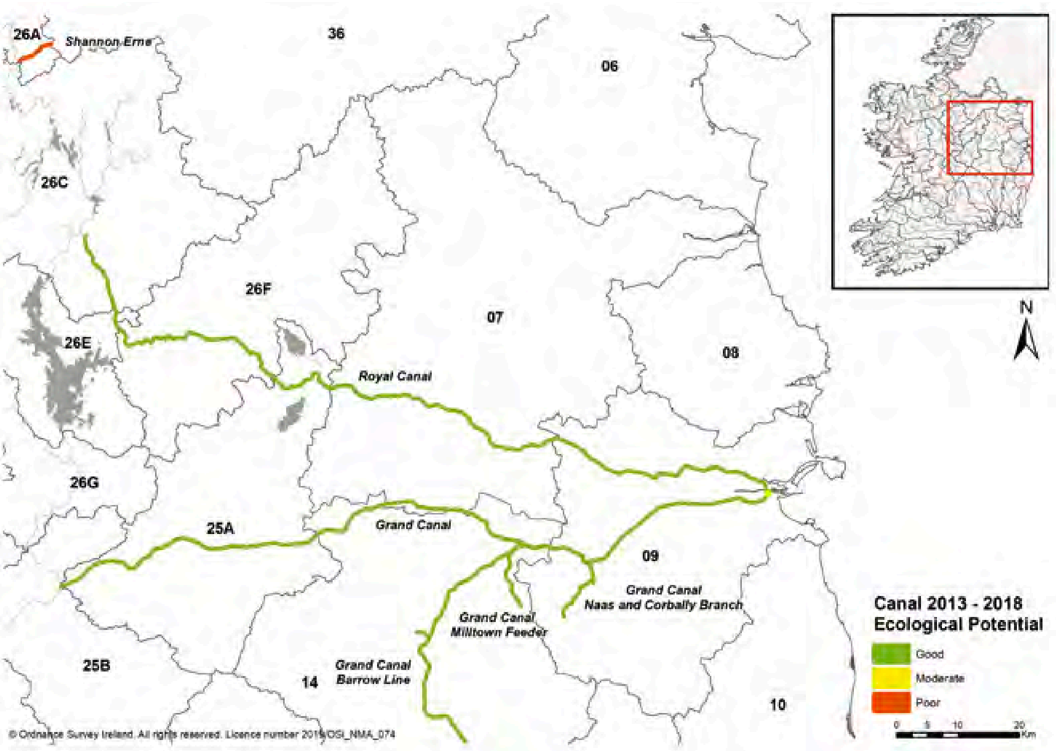
7.4 Feeder Streams

The surveillance monitoring programme on the canals involved the routine sampling of a number of feeder streams. These feeders can be a source of nutrient and organic enrichment to the main channels and, depending on their location, can be subjected to point source pollution from municipal wastewater infrastructure or diffuse pollution from agricultural run-off. Any impacts from the feeder streams in 2013-2018 tended to be minor and localised, and did not affect overall water quality in the canal water bodies.

7.5 National Ecological Potential

When the all the quality elements were combined, 13 of the 14 water bodies in the Grand and Royal Canals achieved good ecological potential in the 2013-2018 period (see Map 7.1).

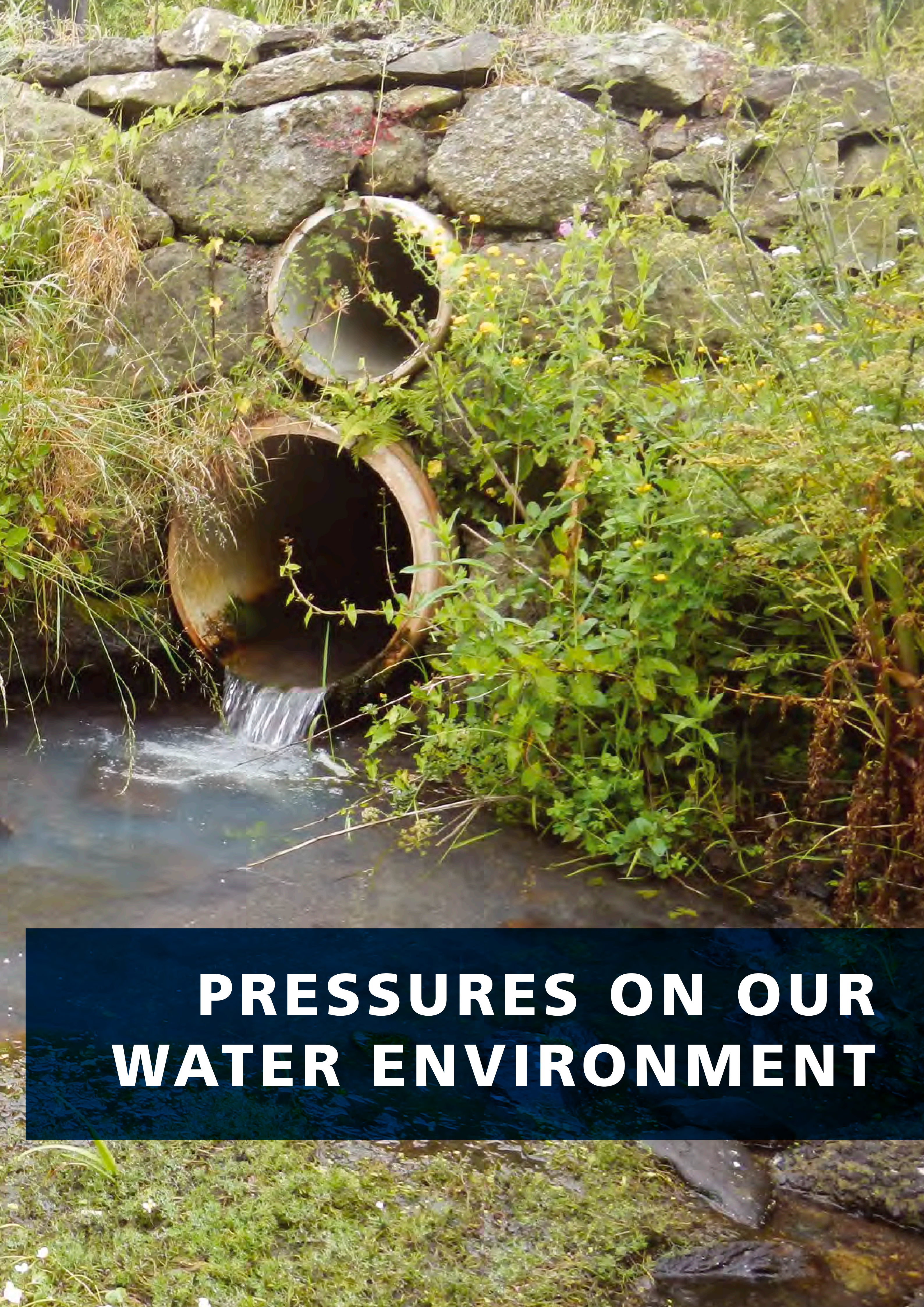
The canalised section of the Shannon-Erne Waterway had a less than good classification in terms of hydromorphology and therefore was classified as poor overall. While this water body was compliant with the water quality standards for the period, the biological potential is compromised by the hydromorphology of the canal. Its box-shaped profile and resultant poor aquatic flora means that it cannot achieve good ecological potential when assessed using the macrophyte and macroinvertebrate quality elements.



Map 7.: Ecological potential of monitored canal water bodies 2013-2018

7.6 Changes and Trends

Overall the ecological potential of our canal system has remained unchanged since the 2013-2015 period with 13 of the 14 water bodies in the Grand and Royal canal systems achieving good ecological potential. The Shannon Erne waterway remains at poor ecological potential due to hydromorphological conditions.



PRESSURES ON OUR WATER ENVIRONMENT

8. PRESSURES ON OUR WATER ENVIRONMENT

This assessment shows that water quality in Ireland is improving in some areas and getting worse in others, but that overall there has been a net decline in water quality since 2013. The continuing decline in the ecological health of our rivers is associated with a rise in the concentration of nutrients in our rivers and lakes, as well as impacts from chemicals, and changes to the physical habitat conditions. Furthermore, the rise in nutrient inputs to our estuaries and coastal waters may lead to further ecological decline in these environments.

8.1 Significant Pressures

An assessment of the pressures, or human activities, impacting on our waters was carried out by the EPA as part of the development of the current river basin management plan (2018-2021). Overall, 1,460 individual water bodies were identified as being at risk of not achieving their water quality objectives due to the damage being caused by significant pressures (Figure 8.1). The main significant pressures impacting water quality in Ireland include agriculture, waste water discharges, physical impacts on habitats including excess fine sediment, and pressures from forestry activities (these are described further in Box 8.1).

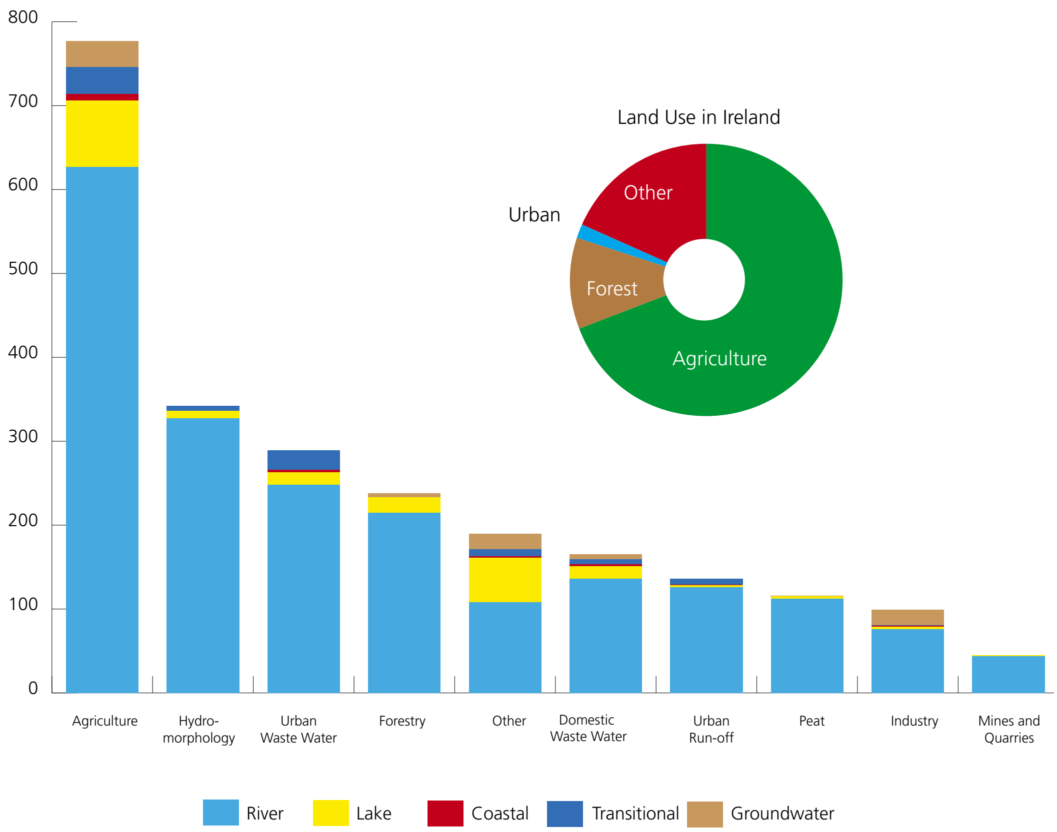


Figure.8.1: Significant pressures on Ireland's aquatic environment.

Box 8.1 Pressures on our waters

Agriculture covers over 65% of the land area of Ireland and is the most frequent significant pressure in water bodies that are not meeting their Water Framework Directive targets. The main problems from farming are loss of excess nutrients and sediment to water. Excess ammonium may also be a problem in some water bodies. These losses arise from point sources such as farmyards or from diffuse sources such as spreading of fertilisers and manures. Excess phosphorus and sediment are typically issues for rivers and lakes, and too much nitrogen is the main issue for estuaries and coastal waters.

Hydromorphology: Hydromorphological modification means change to the physical habitat conditions or the natural functioning of a water body which can impact on the ecology. Changes are caused by, for example, dredging and straightening of rivers (channelization), land drainage, or hard infrastructure such as dams, weirs, culverts, or other obstructions. Our understanding of how hydromorphological pressures impact water quality has advanced in recent years and is receiving a greater focus in water quality impact assessments.

Urban Waste Water: Direct discharge of nutrients from waste water treatment plants and discharge from combined storm overflows or storm water overflows are the most common water quality problems associated with urban waste water. Discharges of elevated concentrations of phosphorus, ammonium and nitrogen impact on the ecology of surface waters, while elevated concentrations of bacteria and pathogens impact bathing waters and shellfish waters.

Domestic Waste Water includes septic-tank systems associated with one-off housing and small unlicensed private urban waste-water treatment plants. If not correctly installed and well maintained, these systems can result in leakage of untreated effluent to waters.

Forestry: Poorly managed and inappropriately sited forest operations can negatively impact on water quality and aquatic habitats and species. The most common water quality problems arising from forestry relate to the release of sediment and nutrients and the impacts from acidification. Forestry may also give rise to changes in stream flow regimes caused by associated land drainage.

Urban Run-off is a mixture of leakage from sewers, runoff from paved and unpaved areas, and misconnections where private foul connections are connected to storm sewers instead of the foul sewer network.

Peat: Impacts on water quality and river habitat arising from peat extraction and drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

Industry pressures include impacts from discharges and emissions from industrial and commercial facilities.

Other pressures include impacts from activities such as water abstractions, invasive species and historically polluted sites. These activities each impact a relatively small number of water bodies so they have been grouped together.

The main problem impacting on our waters is nutrient pollution (nitrogen and phosphorus) which can cause excessive plant growth and increase the likelihood of harmful algal blooms. Excess nitrogen impacts on our estuaries and coastal waters is a concern in the south and southeast of the country where losses to the marine environment are elevated and increasing. In these areas, the soils are relatively freely draining and are very susceptible to nitrogen leaching from agriculture, which is often intensive. In these areas nitrate losses are closely correlated with farm intensity; the higher the application of nitrogen to land, the higher the nitrate concentrations in waters. Since 2013 nitrogen emissions have increased as both cattle numbers and fertilizer use have increased (Figure 8.2). Nitrogen loss reduction measures need to be targeted in these areas by improving nutrient use efficiencies and by reducing chemical fertiliser use.

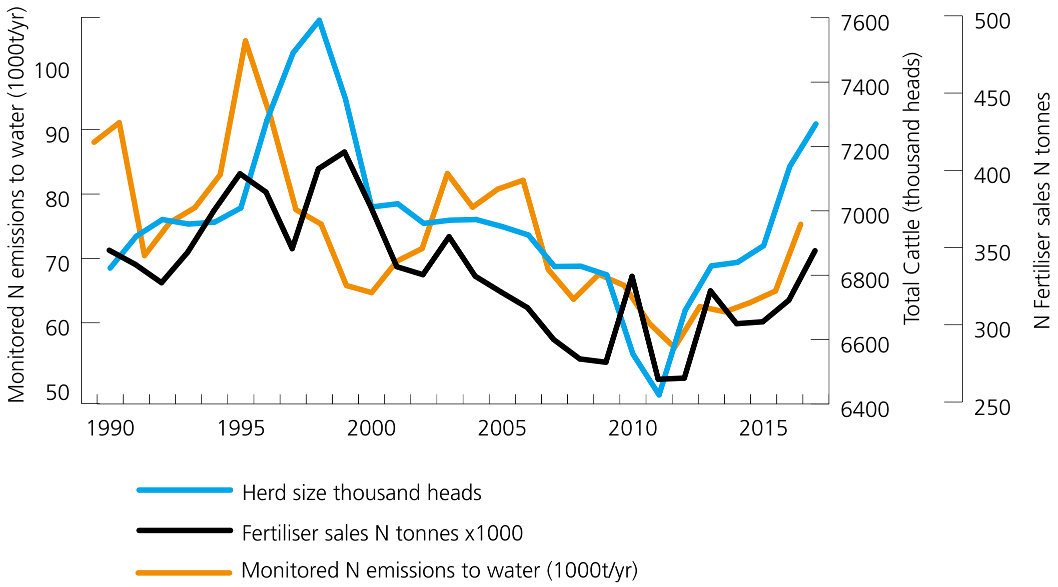
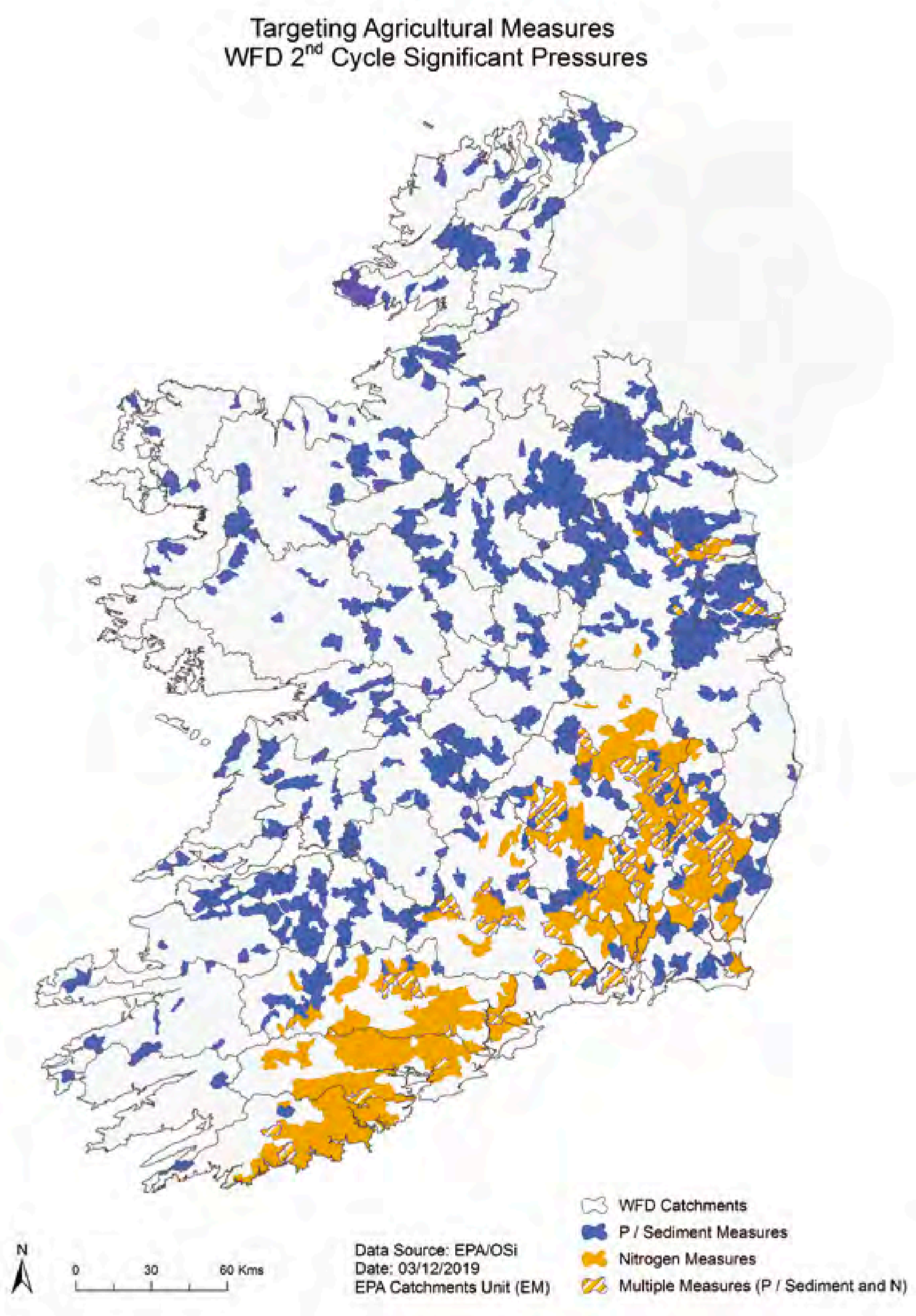


Figure 8.2: Trends in nitrogen emissions to water, total cattle and nitrogen fertilizer sales from 1990 to 2018.

Excess phosphorus is the key concern in freshwaters and in some of our estuaries. Phosphorus concentrations are elevated in various parts of the country including parts of the north west, north east, east coast, south east and south of the Shannon Estuary. Phosphorus losses come primarily from waste water discharges, and from runoff losses from agriculture on poorly draining soils.

Since 2013, the national population has increased by almost a quarter of a million with a resultant increase in the amount of waste water requiring treatment. Works are ongoing by Irish Water to improve the level of waste water treatment nationally, however the level of treatment is still inadequate at 120 locations around the country and raw sewage from 36 towns and villages is being released into rivers (5 locations) and coastal waters (31 locations) (EPA, 2019b).

Diffuse phosphorus losses from agriculture are particularly difficult to manage as the sources do not occur uniformly in the landscape, but from 'hot spots', or critical source areas where runoff pathways connect phosphorus sources to rivers and streams. It takes only very small amounts of phosphorus to be lost, relative to the amounts used in agriculture, to cause a water quality problem. Phosphorus loss reduction measures need to be targeted at breaking the pathways between the sources and the watercourses in these critical source areas, for example, buffer strips, farm ponds and management of ditches. Figure 8.3 below shows the locations where measures to reduce nitrogen and/or phosphorus losses from agriculture need to be targeted.



Map 8.1: Locations where nitrogen and phosphorus measures from agriculture need to be targeted

8.2 Addressing Significant Pressures in the Aquatic Environment

The river basin management planning process identified the water bodies that are being impacted by significant pressures and prioritised a range of measures to address the impacts from them.

The plan includes 255 projects to improve waste water treatment in urban areas. 73 of these projects were completed prior to 2018 and a further 21 were completed during 2018. The plan identifies 57 priority areas where waste water is the sole significant pressure on waters at risk of pollution. As of 2018, Irish Water had improvement works completed, scheduled or ongoing at 35 of the 57 areas.

Where agriculture is identified as a significant pressure, the Local Authorities Waters Programme is working with the newly established Agricultural Sustainability Support and Advice Programme (ASSAP) who are providing farmers with a free and confidential advisory service to help improve water quality. The programme is facilitating a far more targeted approach in terms of delivering the right measure in the right place with a major focus in 190 areas that have been identified for priority action in the plan (see Map 1.2).

Actions to improve water quality are underway across all pressure types and sectors. Using the data in this assessment, a review of progress shows that 242 of the 1,460 water bodies where actions are needed to improve water quality are now achieving their objectives. Figure 8.3 shows that improvements have occurred across all pressure types. This represents welcome progress but significant work for all sectors remains.

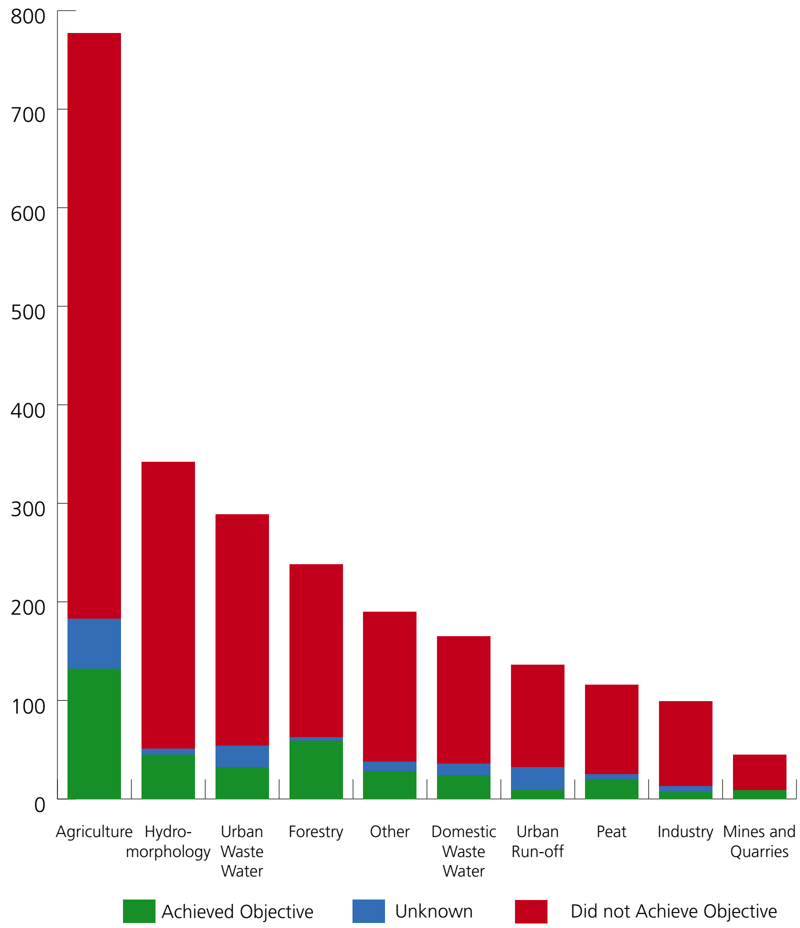


Figure 8.3: Progress made since 2016 on addressing the significant pressures on Ireland's aquatic environment.

8.3 Protecting High Status Waters

One of the most worrying trends reported in the assessment is the continuing loss in our high status water bodies whose numbers have fallen by a third since 2009. These near pristine unpolluted waters are vital for the survival of sensitive aquatic species and the protection of aquatic biodiversity. Over half are failing to meet their objective and over a fifth of high status objective water bodies have declined since 2015 highlighting that these waters remain significantly impacted.

The 'Blue Dots' Catchment Programme has been established under the current River Basin Management Plan specifically to improve the protection and restoration of these precious water bodies. A significant collaborative effort is now required from all stakeholders to ensure that the loss of these high status waters is halted and where possible, reversed.

8.4 Involving Local Communities

Local communities are central to the success of the national River Basin Management Plan 2018-2021. The recently established Community Water Development Fund aims to support communities in progressing water related projects and initiatives. The fund is administered by the Local Authorities Water Programme and is providing funding for community engagement, river enhancement schemes and other water quality projects that are helping to meet the objectives of the WFD. Further information is available at www.watersandcommunities.ie/

8.5 Next Steps

The EPA will continue to develop and communicate the science and evidence to support the work of the Local Authorities Water Programme, ASSAP and the other implementing bodies and will through its own work address pressures from EPA-regulated activities.

The EPA has commenced the third national characterisation of our waters which will inform the actions to be undertaken in the next river basin management plan (2022 to 2027). This is a vital step towards further developing our understanding of water quality issues in Ireland and any changes, positive or negative, that are taking place. The characterisation process is drawing on a wide range of data and evidence, including the water quality data presented here, and is contributing to a more granular and targeted understanding of the factors affecting water quality on a water body and site level. The process will update our evidence and knowledge about which water bodies are at risk of not meeting their water quality objectives and help identify the measures and actions to be included in the 2022 – 2027 River Basin Management Plan.

Further information on water quality data and catchments assessments is available on www.catchments.ie.

References

EPA, 2017. *Water Quality in Ireland 2010-2015*. Environmental Protection Agency, Wexford Ireland, 62 pp.

EPA, 2018. *Water Quality in 2017: An Indicators Report*. Environmental Protection Agency, Wexford Ireland, 66 pp.

EPA, 2019a. *Drinking Water Quality in Public Supplies 2018*. Environmental Protection Agency, Wexford Ireland, 32 pp.

EEA, 2018. *European Waters: Assessment of Status and Pressures 2018*. European Environment Agency, Copenhagen, Denmark, 85 pp.

EPA, 2019b. *Urban Waste Water Treatment in 2018*. Environmental Protection Agency, Wexford, Ireland, 44 pp

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol 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, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

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

Ár bhFreagrachtaí

Ceadúnú

- Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- 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 peitril;
- 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 dhíriú 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 ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; 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 gComhshaol

- 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 Chomhshaol 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 shainaithint, 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 gcomhshaol in Éirinn (*m.sh. mórphleananna 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 gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol (*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 imní agus le comhairle a chur ar an mBord.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters

PO Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

T: +353 53 916 0600
F: +353 53 916 0699
E: info@epa.ie
W: www.epa.ie
LoCall: 1890 33 55 99

Regional Inspectorate
McCumiskey House,
Richview, Clonskeagh Road,
Dublin 14, Ireland

T: +353 1 268 0100
F: +353 1 268 0199

Regional Inspectorate
Inniscarra, County Cork,
Ireland

T: +353 21 487 5540
F: +353 21 487 5545

Regional Inspectorate
Seville Lodge, Callan Road,
Kilkenny, Ireland

T +353 56 779 6700
F +353 56 779 6798

Regional Inspectorate
John Moore Road, Castlebar
County Mayo, Ireland

T +353 94 904 8400
F +353 94 902 1934

Regional Inspectorate
The Glen, Monaghan, Ireland

T +353 47 77600
F +353 47 84987

Regional Offices

The Civic Centre
Church St., Athlone
Co. Westmeath, Ireland
T +353 906 475722

Room 3, Raheen Conference Centre,
Pearse House, Pearse Road
Raheen Business Park, Limerick,
Ireland
T +353 61 224764

Printed on environmentally friendly paper stock