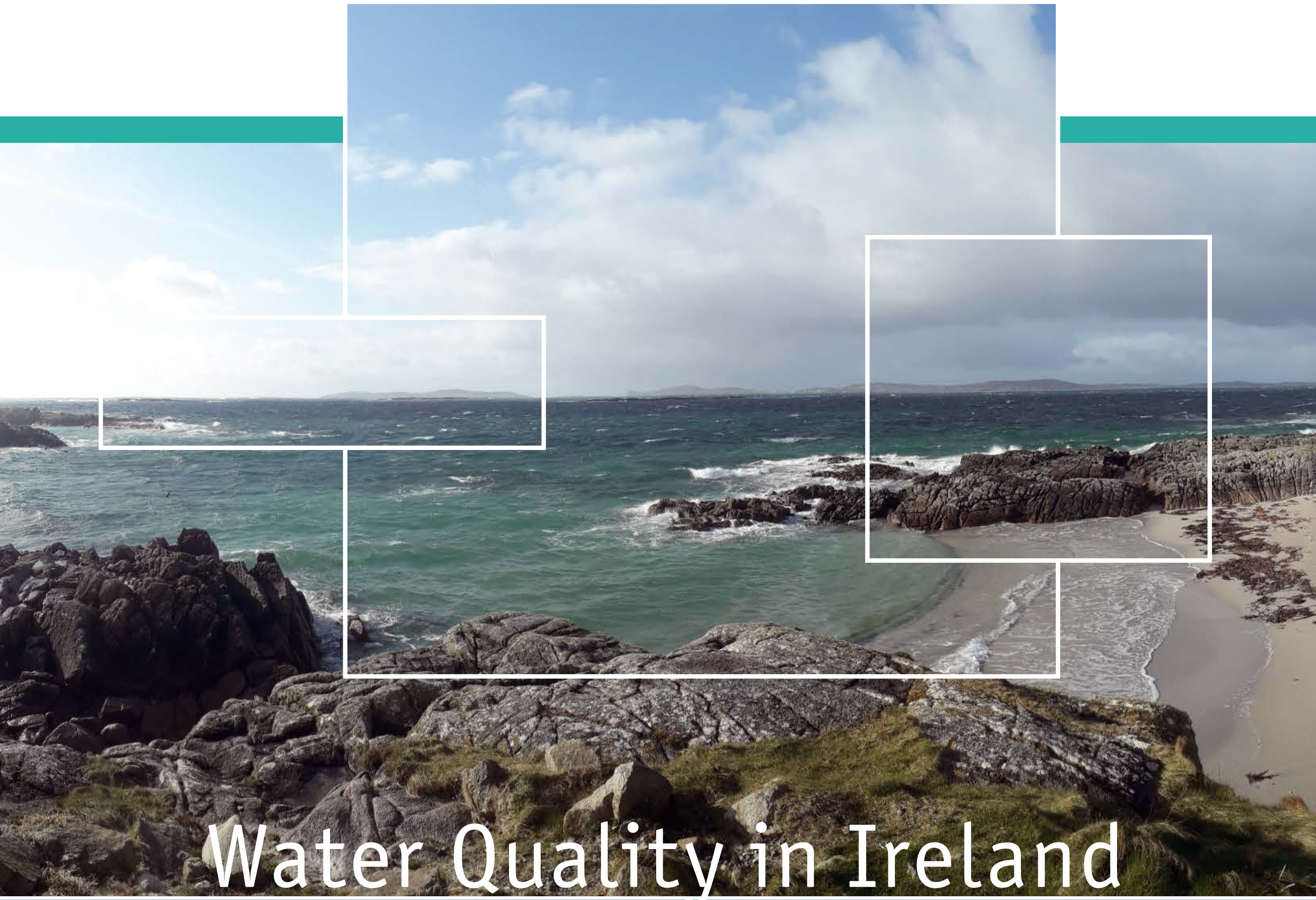
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil



Water Quality in Ireland

2016 - 2021

ENVIRONMENTAL PROTECTION AGENCY

The 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: *Implementing regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *Providing high quality, targeted and timely environmental data, information and assessment to inform decision making.*

Advocacy: *Working with others to advocate for a clean, productive and well protected environment and for sustainable environmental practices.*

Our responsibilities include:

Licensing

- Large-scale industrial, waste and petrol storage activities;
- Urban waste water discharges;
- The contained use and controlled release of Genetically Modified Organisms;
- Sources of ionising radiation;
- Greenhouse gas emissions from industry and aviation through the EU Emissions Trading Scheme.

National Environmental Enforcement

- Audit and inspection of EPA licensed facilities;
- Drive the implementation of best practice in regulated activities and facilities;
- Oversee local authority responsibilities for environmental protection;
- Regulate the quality of public drinking water and enforce urban waste water discharge authorisations;
- Assess and report on public and private drinking water quality;
- Coordinate a network of public service organisations to support action against environmental crime;
- Prosecute those who flout environmental law and damage the environment.

Waste Management and Chemicals in the Environment

- Implement and enforce waste regulations including national enforcement issues;
- Prepare and publish national waste statistics and the National Hazardous Waste Management Plan;
- Develop and implement the National Waste Prevention Programme;
- Implement and report on legislation on the control of chemicals in the environment.

Water Management

- Engage with national and regional governance and operational structures to implement the Water Framework Directive;
- Monitor, assess and report on the quality of rivers, lakes, transitional and coastal waters, bathing waters and groundwaters, and measurement of water levels and river flows.

Climate Science & Climate Change

- Publish Ireland's greenhouse gas emission inventories and projections;
- Provide the Secretariat to the Climate Change Advisory Council and support to the National Dialogue on Climate Action;
- Support National, EU and UN Climate Science and Policy development activities.

Environmental Monitoring & Assessment

- Design and implement national environmental monitoring systems: technology, data management, analysis and forecasting;
- Produce the State of Ireland's Environment and Indicator Reports;
- Monitor air quality and implement the EU Clean Air for Europe Directive, the Convention on Long Range Transboundary Air Pollution, and the National Emissions Ceiling Directive;
- Oversee the implementation of the Environmental Noise Directive;
- Assess the impact of proposed plans and programmes on the Irish environment.
- Environmental Research and Development
- Coordinate and fund national environmental research activity to identify pressures, inform policy and provide solutions;
- Collaborate with national and EU environmental research activity.

Radiological Protection

- Monitoring radiation levels and assess public exposure to ionising radiation and electromagnetic fields;
- Assist in developing national plans for emergencies arising from nuclear accidents;
- Monitor developments abroad relating to nuclear installations and radiological safety;
- Provide, or oversee the provision of, specialist radiation protection services.

Guidance, Awareness Raising, and Accessible Information

- Provide independent evidence-based reporting, advice and guidance to Government, industry and the public on environmental and radiological protection topics;
- Promote the link between health and wellbeing, the economy and a clean environment;
- Promote environmental awareness including supporting behaviours for resource efficiency and climate transition;
- Promote radon testing in homes and workplaces and encourage remediation where necessary.

Partnership and networking

- Work with international and national agencies, regional and local authorities, non-governmental organisations, representative bodies and government departments to deliver environmental and radiological protection, research coordination and science-based decision making.

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 advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

Water Quality in Ireland
2016 – 2021

Editors: Wayne Trodd, Shane O'Boyle and Mary Gurrie

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

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 ecology, laboratory and hydrometric teams, 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, Hydrometrics and Groundwater Unit and Analytics Unit is also gratefully acknowledged.

The lead authors (in bold) and contributing authors of individual chapters were as follows:

Summary: **Wayne Trodd, Shane O'Boyle**

Chapter 1 Introduction: **Wayne Trodd**, Shane O'Boyle

Chapter 2 Rivers: **Catherine Bradley, Jean Smith**, Neasa McDonnell

Chapter 3 Lakes: **Deirdre Tierney, Jason Barry**, Ruth Little

Chapter 4 Transitional and Coastal Waters: **Robert Wilkes**, Georgina McDermott

Chapter 5 Chemical Status of Surface Waters: **Alan Stephens, Jean Smith**

Chapter 6 Groundwater: **Philip Maher**, Regina McGinn

Chapter 7 Canals: **Paula Treacy (Waterways Ireland), Caroline Wynne**, Wayne Trodd.

Chapter 8 Pressures on our water Environment: **Darragh Cunningham**, Jenny Deakin.

Main Cover Photo: Ruth Little.
Main photos in report: Ruth Little, Hugh Feeley, Mary Sheehan, Phil Maher and Deirdre Tierney.

ISBN 978-1-80009-073-6

Table of Contents

List of Maps

List of Figures

List of Tables

EXECUTIVE SUMMARY

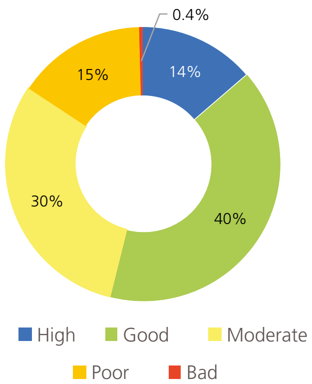
This report sets out the latest assessment of the health of Ireland's rivers, lakes, canals, groundwaters, transitional (estuaries) and coastal waters. The analysis is based on the assessment of over 4,000 surface water bodies and 514 groundwater bodies over the period 2016-2021.

It provides a national picture of the current ecological health of Ireland's surface waters and the chemical and quantitative status of its groundwater resource. The report highlights trends in water quality and identifies the main problems causing water quality issues. It concludes by setting out the actions that are needed to protect and improve this important national resource.

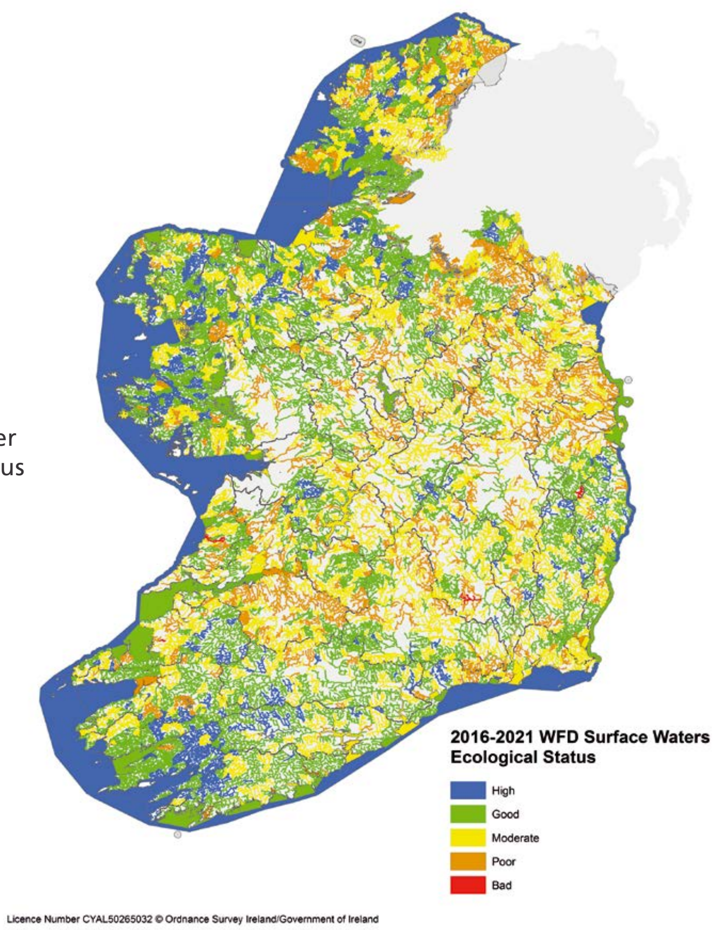
How Healthy are our Waters?

Ecological Status

This assessment shows that over half (54%) of our surface waters are in satisfactory ecological health being in either good or better ecological status. This means that at least half (46%) of the surface water bodies in Ireland are not as ecologically healthy or resilient as they should be.

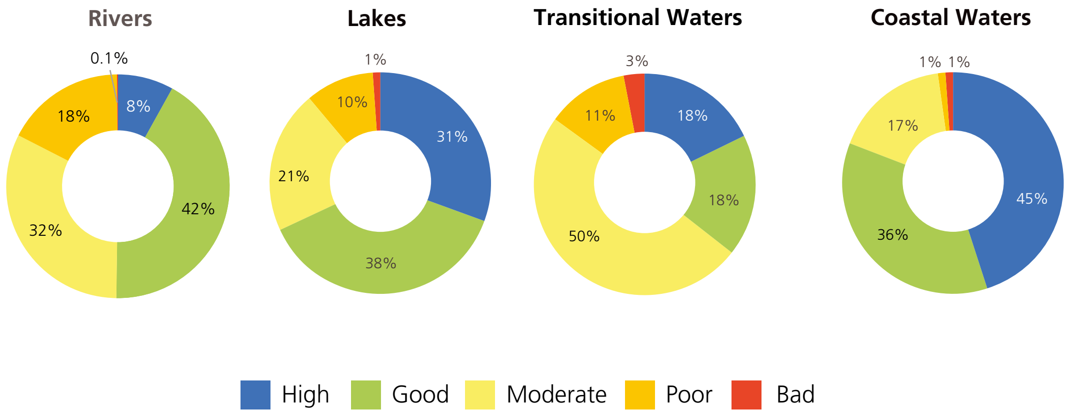


Proportion of all surface water bodies in each ecological status class 2016-2021



Surface water ecological status 2016-2021

Coastal waters had the highest percentage of waters in high or good ecological status (81%) followed by lakes (69%), rivers (50%) and transitional waters (36%), which have the worst water quality.



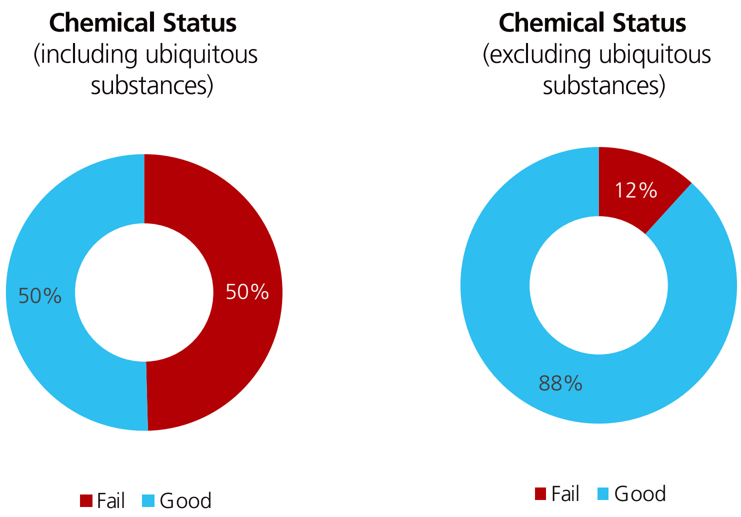
Proportion of surface water body categories in each ecological status class 2016-2021

Chemical Status

Half of surface water bodies assessed are in good chemical status which means that half have failed to achieve a good standard.

Many of these failures were due to substances, such as mercury and polycyclic aromatic hydrocarbons (PAHs), which are known as ubiquitous substances because they can be found nearly everywhere in the environment. When these substances are excluded from the assessment, 88% of water bodies are in good chemical status.

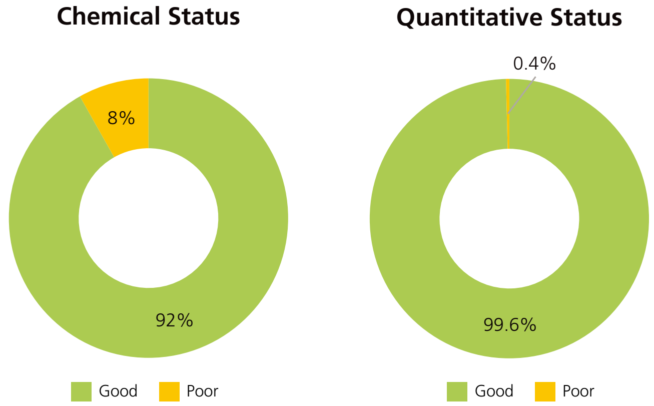
The information on chemical status is presented in this way to help identify those water bodies which are being impacted by non-ubiquitous substances likely to have come from local sources. These water bodies may benefit from measures to eradicate these substances from the environment.



Surface water chemical status; including and excluding ubiquitous substances

Groundwater – Chemical and Quantitative status

With a few localised exceptions, the quality of groundwater in Ireland is generally good. 92% of groundwater bodies are in good chemical status and 99% are in good quantitative status. Overall, 91% of bodies met both objectives, accounting for 97% of the country (69,519 km^2) by area.



Chemical and quantitative status of groundwaters

Is Water Quality Improving or Declining?

Overall, our water quality is declining and the number of water bodies in satisfactory condition (high or good status) across rivers, lakes, estuaries, coastal waters and groundwaters has decreased since the last assessment which covered the period 2013-2018.

Rivers: There has been a **1% decline** in the number of river water bodies in satisfactory condition. We are failing to protect our highest quality rivers; only 43% of our rivers which should be at high status are achieving that standard.

Over the period of this assessment there were 161 fish kills recorded. Any fish kill is unacceptable and their causes need to be eradicated.

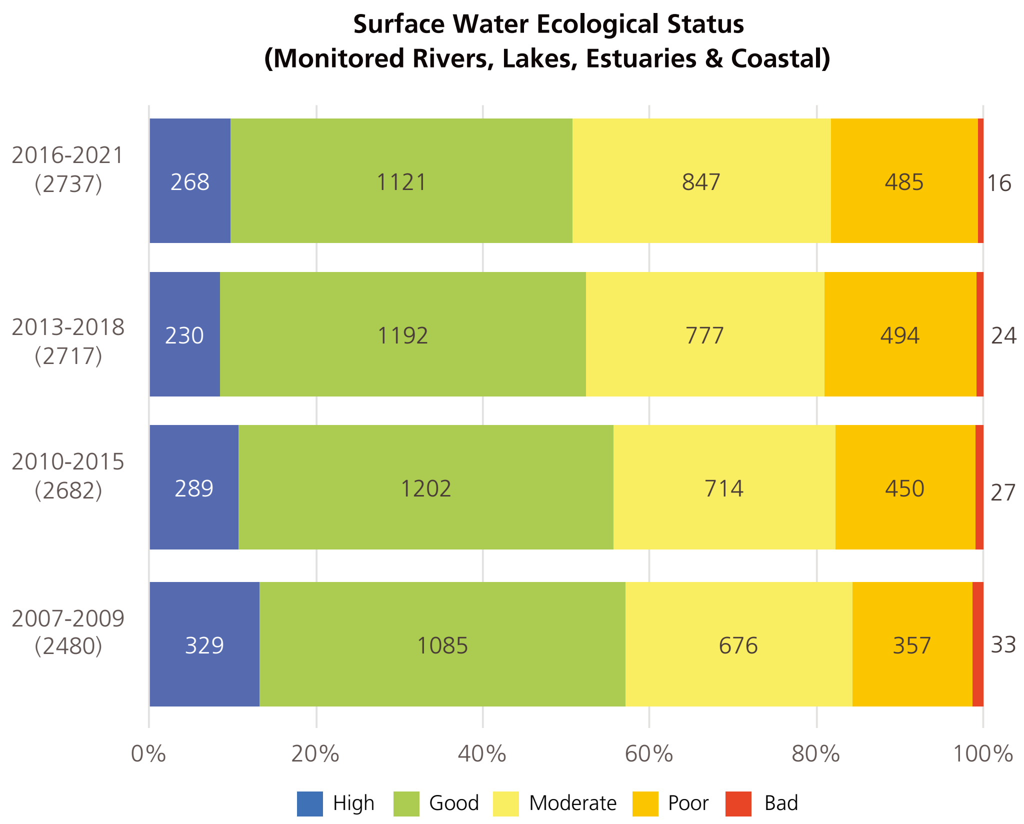
Lakes: There has been **2.7% decline** in the number of lake water bodies in satisfactory condition. The majority of high and good ecological status lakes are found in the southwest, west and northwest of the country. The catchments with the highest percentage of lakes with unsatisfactory water quality are situated in the northeast which is attributed to high phosphorus levels.

Estuaries: There has been a marked decline of **15.7% decline** in the number of estuarine water bodies in satisfactory condition. This decline is most evident in the south and southeast of the country where excessive nutrient losses to water are damaging the ecology of these waters.

Coastal water: There has been a **9.5% decline** in the number of coastal water bodies in satisfactory condition.

Groundwater: There has been a **0.8% decline** in the quality of our groundwaters with more groundwater bodies now in poor condition.

The decline reported in this assessment reflects the general pattern of decline in satisfactory water quality seen since the first assessment of ecological status was undertaken in the period 2007-2009.



Ecological status of monitored surface water bodies across each of the main assessment periods from the first assessment in 2007-2009 to the present assessment period (number of water bodies indicated)

What is the Problem?

The quality of our freshwater and marine ecosystems is being damaged by activities that release pollutants into the water environment and damage the physical integrity of water habitats.

The main causes are:

- Run-off of nutrients, sediment and pesticides from agricultural lands and farmyards;
- Activities such as land drainage, navigational dredging and the presence of barriers such as dams, weirs or culverts in water courses.
- Discharges of poorly treated sewage from urban waste water treatment plants, domestic treatment systems and storm water overflows;
- Run-off of nutrients and sediment from forestry operations.

When nutrients such as nitrogen and phosphorus enter our waterways they cause an increase in the growth of plants and algae. This in turn clogs up our water courses, uses up oxygen and harms other aquatic life such as insects and fish.

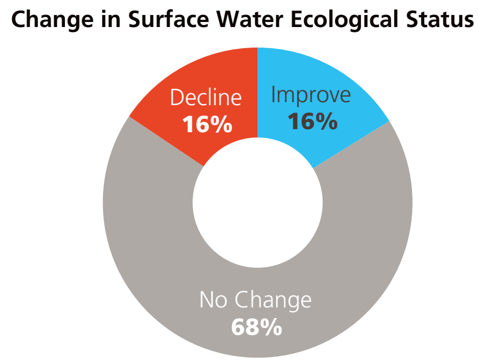
Concentrations of these nutrients are far too high in many of our water bodies. 43% of river sites, mostly in the south and southeast of the country, have high nitrate concentrations while nearly a third of river sites (30%) and a third of lakes (33%) have elevated phosphorus concentrations. Phosphorus levels are particularly high in lakes in the northeast of the country.

The presence of too much nutrients in our rivers and lakes has led to an increase in the nutrients flowing into our marine environment. Over the last decade, the amounts of nitrogen and phosphorus flowing into our estuaries have increased by 20% and 37%, respectively. The ecology of our estuaries, particularly in the south and southeast, is being damaged by these high nutrient inputs.

A significant proportion of our water bodies are being damaged by activities that impact on their physical shape, flow and form - these changes, referred to as hydromorphological alterations are most common in our river and estuarine water bodies. Physical barriers such as dams, weirs or culverts can block the movement of fish and other wildlife while activities such as land drainage and dredging can result in the loss of important habitats. Over 400 of our surface water bodies are known to be affected by these activities and modifications.

A number of water bodies are impacted by chemical pollution. Some rivers in the east are still suffering from the effects of historic mining while many rivers in the northwest of the country have experienced suspected chemical pollution leading to toxic impacts; the suspected cause being the use of pesticides in sheep dip and forestry.

While our waters are being impacted by numerous human activities it is important to point out that water quality is improving in some places. However, in many cases these improvements are not sufficient to bring a water body into satisfactory condition and furthermore the number of water bodies improving in status is being exactly matched by the number of water bodies declining. The result being that any improvements in water quality are being offset by declines occurring elsewhere.



Change in ecological status of surface waters from 2013-2018 to 2016-2021

What Needs to be Done?

Our surface waters and groundwaters continue to be under pressure from different human activities.

Nearly half are not as healthy as they should be and many are continuing to decline. This is particularly evident in our estuaries and coastal waters which have experienced a marked decline in quality since the previous assessment.

The evidence presented in this report clearly shows that the goal of restoring all waters to good status by 2027 will not be achieved. Our water quality is going in the wrong direction and any improvements we are seeing are being cancelled out by declines occurring elsewhere.

If we are to make progress and improve water quality, Ireland needs to take the following actions:

- The next River Basin Management Plan (2022-2027) must be published with a firm commitment to address the main pressures on water quality (agriculture, hydromorphology, waste water and forestry). The Plan needs to be clear on what will be achieved by 2027, the proposed measures, the timeframes for delivery and the expected improvements in water quality. The Plan should also build on the progress made in the Priority Areas for Action with a focus on preventing further declines.
- The Nitrates Action Programme must be fully implemented to deliver reductions in nutrient losses to our waters. The existing regulations must be fully implemented by the local authorities and the Department of Agriculture, Food and Marine using the full range of tools from compliance promotion to enforcement. To support this work, the EPA will develop and implement a National Agricultural Inspection Programme for local authorities.
- Sustained investment in water services infrastructure is required to eliminate waste water as a significant pressure on water quality.
- The development of a regulatory regime to better manage and regulate activities that cause hydromorphological alteration is required. In the interim, measures are required now to address hydromorphological pressures. Public authorities such as the Office of Public Works and Local Authorities must lead by example in terms of best practice for any works on or near rivers.
- Government departments and relevant state bodies need to deliver greater coherence and integration across national programmes and policies which could impact on water quality and seek opportunities for multiple benefits particularly from climate and biodiversity measures.

MAIN FINDINGS

Overall

- 54% of our surface waters are in high or good ecological status and the remaining 46% are in moderate poor or bad status.
- Water quality is declining and the number of monitored water bodies in satisfactory condition (high or good status) has decreased since the last assessment.
- 91% of groundwaters are in good status.
- 50% of the surface water bodies assessed failed to achieve good chemical status. This includes failures for ubiquitous substances such as mercury and polycyclic aromatic hydrocarbons (PAHs), which are known as ubiquitous substances because they can be found nearly everywhere in the environment.

Rivers

- Nationally, 50% of river water bodies are in high or good ecological status and 50% are in moderate, poor or bad ecological status.
- There has been a 1% decline in the ecological health of monitored river water bodies since the 2013-2018 period.
- 43% of rivers sites have high nitrate concentrations and 39% of sites have increasing concentrations, mostly in the south and southeast of the country.
- 30% of river sites have high phosphorus concentrations and 17% of sites have increasing concentrations.

Lakes

- Nationally, 69% of lake water bodies are in high or good ecological status and 31% are in moderate, poor or bad ecological status.
- There has been a 2.7% deterioration in the number of monitored lakes in satisfactory condition since 2013-2018.
- A third of lakes have high phosphorus concentrations. 10% of lakes assessed have increasing phosphorus concentrations.

Transitional and Coastal

- 36% of transitional water bodies (i.e. estuaries) are in high or good ecological status and 64% are in moderate, poor or bad ecological status. 81% of coastal water bodies are in high or good ecological status.
- There has been a 15.7% and 9.5% decline in the number of monitored transitional and coastal water bodies respectively in satisfactory quality since 2013-2018.
- 22% of transitional and coastal water bodies have high nitrogen concentrations.
- Loadings of phosphorus and nitrogen to the marine environment have increased since 2012-2014. Average nitrogen loads have increased by 20% and average total phosphorus loads have risen by 37%.

Chemical Status of Surface Waters

- 173 (50%) of the 349 surface water bodies assessed failed to achieve good chemical status; this includes ubiquitous substances.
- If failures for ubiquitous substance are omitted then 41 surface water bodies (12%) fail to achieve good chemical status.
- Most of the non-ubiquitous failures were due to metals such as cadmium and lead, cypermethrin, a pesticide, and perfluoro-octanyl sulphonic acid (PFOS), which are widely used in the manufacture of stain resistant clothes and household products, and its derivatives.

Groundwater

- 91% of groundwater bodies are in good chemical and good quantitative status.
- There has been a slight decline of 0.8% (4 water bodies) in the number of groundwater bodies at good status since the last assessment.
- The south and southeast of the country continues to have the greatest proportion of groundwater monitoring sites with elevated nitrate concentrations. This region has also seen the greatest increase in nitrate concentrations since 2016.

Canals

- 15 of the 16 canal water bodies assessed are in good ecological potential.
- Water quality in the canals has remained stable since the last assessment.

The significant stressors and pressures on our waters are:

- Excess nutrients, nitrogen and phosphorus, primarily from agriculture and waste water treatment activities are affecting the ecology of our waters. These nutrients cause excessive growth of plants and algae which in turn can clog water ways and lead to low oxygen levels that affect macroinvertebrates and fish.
- Changes to the flow and physical habitat conditions (i.e. hydromorphology) can cause significant damage to aquatic habitats and affect the ecology. Dams in rivers, for example, can disrupt their natural flow and act as barriers to migrating species such as salmon.
- Organic pollution typically associated with insufficient waste water treatment or farmyard effluent can enter watercourses and cause a proliferation of microorganisms. These microorganisms can multiply to such a degree that they deplete the dissolved oxygen in the water. Such oxygen depletions negatively affect macroinvertebrates and can cause fish kills.

INTRODUCTION

1. INTRODUCTION

1.1 About this Report

This is a report on the ecological and chemical status of Ireland's surface waters (rivers, lakes, canals and transitional and coastal waters) and the quantitative and chemical status of our groundwaters. This assessment is based on information collected over a 6-year period from 2016 to 2021 under Ireland's national water quality monitoring programme.

Clean and well protected water is vital for our health and well-being, as well as supporting many important economic activities such as agriculture, manufacturing and tourism. Clean water is essential to life on earth, it supports healthy and thriving ecosystems that are a home for our many native plants and animals that enrich our lives on a daily basis.

Unfortunately, the quality of our waters and aquatic ecosystems is being damaged by activities that cause water pollution and impact on the physical integrity of water habitats.

It is incumbent on us now more than ever to halt the pollution and destruction of our aquatic habitats and protect this vital national resource. This report assesses the latest information on the quality of these waters and highlights the problems that need to be addressed to improve their condition.

1.2 Assessing Water Status

The information collected in Ireland's national water quality monitoring programme is used to assess the status of surface waters and groundwaters. Surface waters are classified by their ecological status (biology, water quality and hydromorphology combined) and chemical status (level of harmful chemicals in the water). Groundwaters are classified according to their chemical status and quantitative status (the amount of water present). The way this information is combined to provide an overall status of surface waters and groundwaters is illustrated in Figure 1.1[1]. The element with the lowest status in each step of the process determines the overall classification. This is called the 'one out, all out' principle.

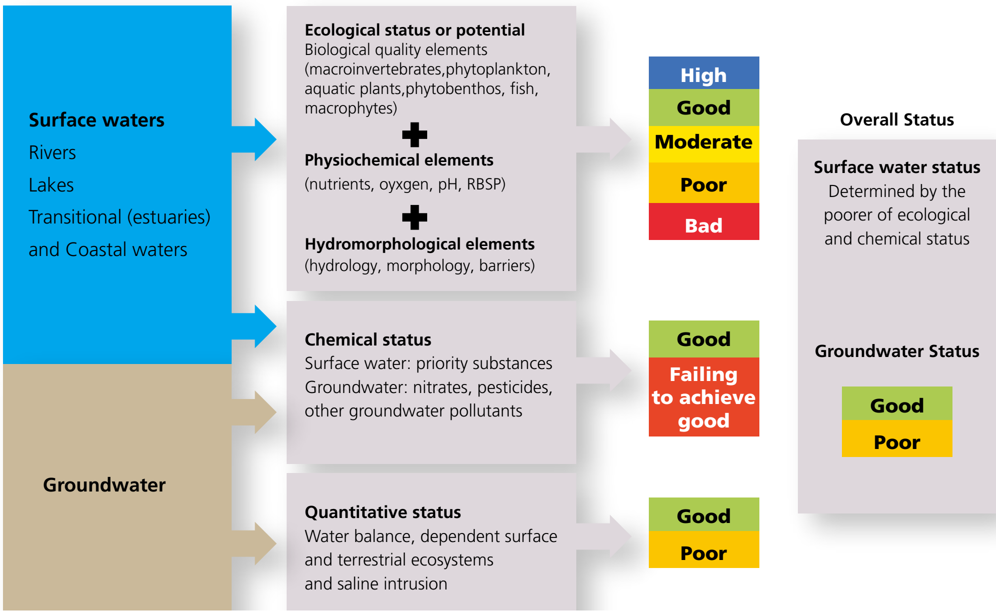


Figure 1.1 Schema detailing how the status of a water body is derived

1 More detail is available in the fact sheet 'How We Assess Water Quality' on the EPA website at https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/how-we-assess-water-quality---fact-sheet.php

The ecological status of our surface waters is assessed by looking at the range and abundance of the plants and animals that live in them (see Box 1.1). Data are collected on phytoplankton, phytobenthos (diatoms), algae, plants, invertebrates and fish. Supporting elements such as oxygen or nutrient concentrations (physico-chemical elements) or the hydromorphological condition of a water body[2] are also assessed. This information tells us how healthy our waters and the ecosystems they support are.

Waters in high and good ecological status show only minor or slight changes from natural conditions whereas waters in less than good status (moderate, poor or bad) range from moderately to severely damaged by pollution or habitat degradation (Figure 1.2).

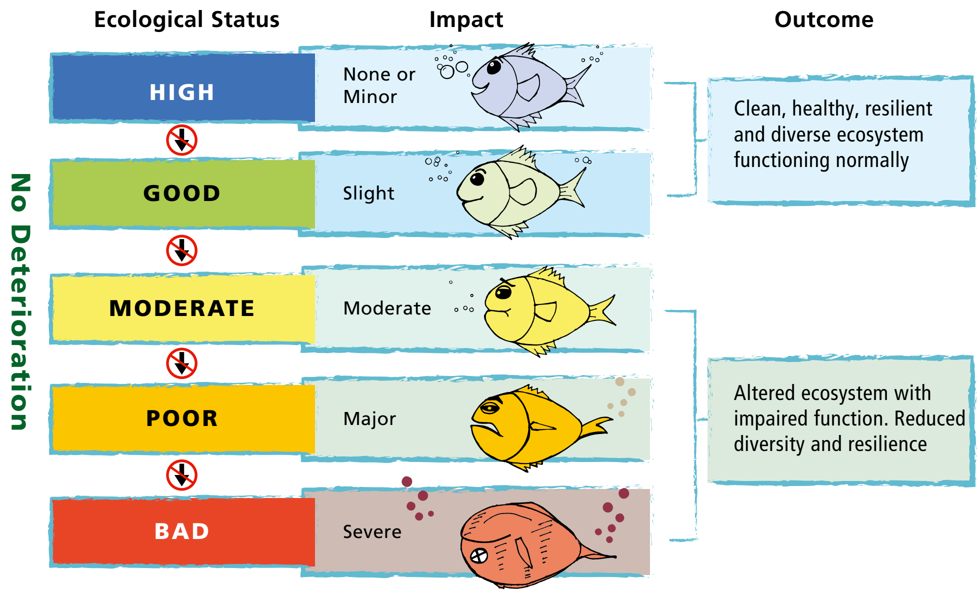


Figure 1.2 The five ecological status classes and the environmental impacts associated with them

1.3 Data Sources and Methodology

There are over 4,800 identified water bodies in the state and just over two-thirds of these are included in Ireland's national water quality monitoring programme. Typically, rivers and estuaries are made up of several water bodies, whereas lakes and most coastal waters are represented by a single water body.

Water status is presented in this report on:

- 3,192 river water bodies
- 812 lakes
- 156 transitional water bodies
- 98 coastal water bodies
- 514 groundwater bodies
- 16 canal water bodies

2 A 'water body' is the basic assessment unit used in the WFD to check compliance against the environmental quality objectives that have been set; water bodies can have a single or multiple monitoring points called 'sites' or 'stations'.

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.

There are thousands of water bodies so it is not possible to monitor all of them. However, to provide an accurate and complete picture of water quality across the country, unmonitored water bodies are classified using the information collected from monitored water bodies that have similar characteristics and pressures. Water body status is reported here for monitored and unmonitored rivers, lakes, transitional and coastal waters and groundwaters so the numbers of these water bodies will be higher than previously reported. However, when comparing the water quality changes between assessment periods we only compare monitored water bodies to ensure that we are comparing like with like.

1.4 National River Basin Management Plan

The EU Water Framework Directive requires all Member States to protect and improve water quality in all waters so that we achieve good water status by 2027. River Basin Management Plans (RBMPs) are the plans that Member States use to make this happen by ensuring that we protect and improve the water environment. In Ireland, the Department of Housing, Local Government and Heritage leads the development and implementation of Ireland's river basin management plans.

To date, there have been two cycles of river basin management planning in Ireland: the first cycle covered the period 2010-2015 and the second cycle the period 2018-2021.

The plans set out the environmental objectives for each water body (e.g. the achievement of good ecological status) and the measures or actions to be implemented to meet these objectives.

The 2018-2021 plan also identified a number of areas for focussed attention and these are referred to as Priority Areas for Action. In total 190 of these areas were selected covering just over 700 individual waters.

Ireland's third cycle RBMP for the period 2022-2027 has been out for public consultation and is expected to be published shortly.

1.5 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, Local Government and Heritage, 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 (https://www.eea.europa.eu/data-and-maps/dashboards/wise-wfd).

Box 1.1 – Monitoring Aquatic Biology

Information on the relative abundance and condition of different algal, plant and animal communities is used to assess the ecological health of Ireland's aquatic environment. Every year, over a thousand river sites and dozens of lakes, estuaries and coastal waters are surveyed by biologists. The following are examples of how some of our aquatic biological communities are surveyed.

River Macroinvertebrates – Q value

At each river site the macroinvertebrates such as juvenile (larvae) and adult insects, crustaceans, mites, snails, mussels, leeches, and worms are examined. The relative abundance of pollution sensitive species versus pollution-tolerant species give an indication of the ecological health of the river (Q-value).

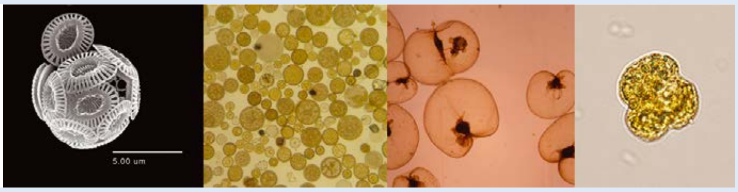
Lake Plants

In lakes the composition of aquatic plants and the depth to which they grow is used as a measure of ecological health. Plants are generally found at greater depths in unpolluted lakes due to the clearer water and lack of phytoplankton blooms. Polluted lakes, on the other hand have more plant species that are tolerant of pollution and water that is less clear.

Marine Phytoplankton

Most of the large estuaries around the coast are sampled on an annual basis. Biologists monitor the frequency of phytoplankton blooms and the occurrence of green opportunistic seaweed mats. The information collected in the field is subsequently used to assess the ecological status of these waters.

From left to right: Emiliania huxleyi, a coccolithopore species © Pauhla McGrane (GMIT). Centric diatoms © Caroline Cusack (Marine Institute). Noctiluca scintilians © Shane O'Boyle (EPA). Karenia mikimotoi © Joe SIlke (Marine Institute).



More information on how we monitor our aquatic biology can be found on the EPA website at https://www.epa.ie/publications/

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. Ireland's national water quality 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 3,192 river water bodies delineated in Ireland and 2,401 (75%) of these are monitored as part of the national river monitoring programme.

2.2 Summary for Rivers

- 1,603 (just over 50%) of river water bodies are in high or good ecological status and 1,589 (almost 50%) are in moderate, poor or bad ecological status.
- There has been a 1% decline in the number of monitored river water bodies in satisfactory condition since the 2013-2018 period.
- 319 rivers have a High Status Objective, which was set under the River Basin Management Plan 2018-2021, and only 43% have achieved this.
- Nearly one fifth (18.5%) of monitored river water bodies are in poor or bad status and are severely polluted.
- Over the period of this assessment there were 161 fish kills recorded.
- 43% of rivers sites have high nitrate concentrations and 39% of sites have increasing concentrations, mostly in the south and southeast of the country.
- 30% of river sites have high phosphorus concentrations and 17% of sites have increasing concentrations.

2.3 National Ecological Status

Nationally, high or good status was assigned to 1,603 rivers (just over 50%) in the period 2016–2021, and 1,589 (almost 50%) were assigned moderate or worse status (Figure 2.1). This includes both monitored and unmonitored rivers.

Map 2.1 illustrates the geographical distribution of ecological status for river water bodies across the country.

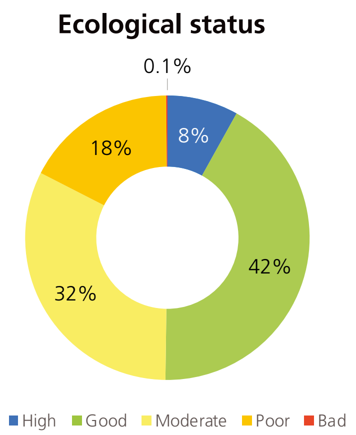
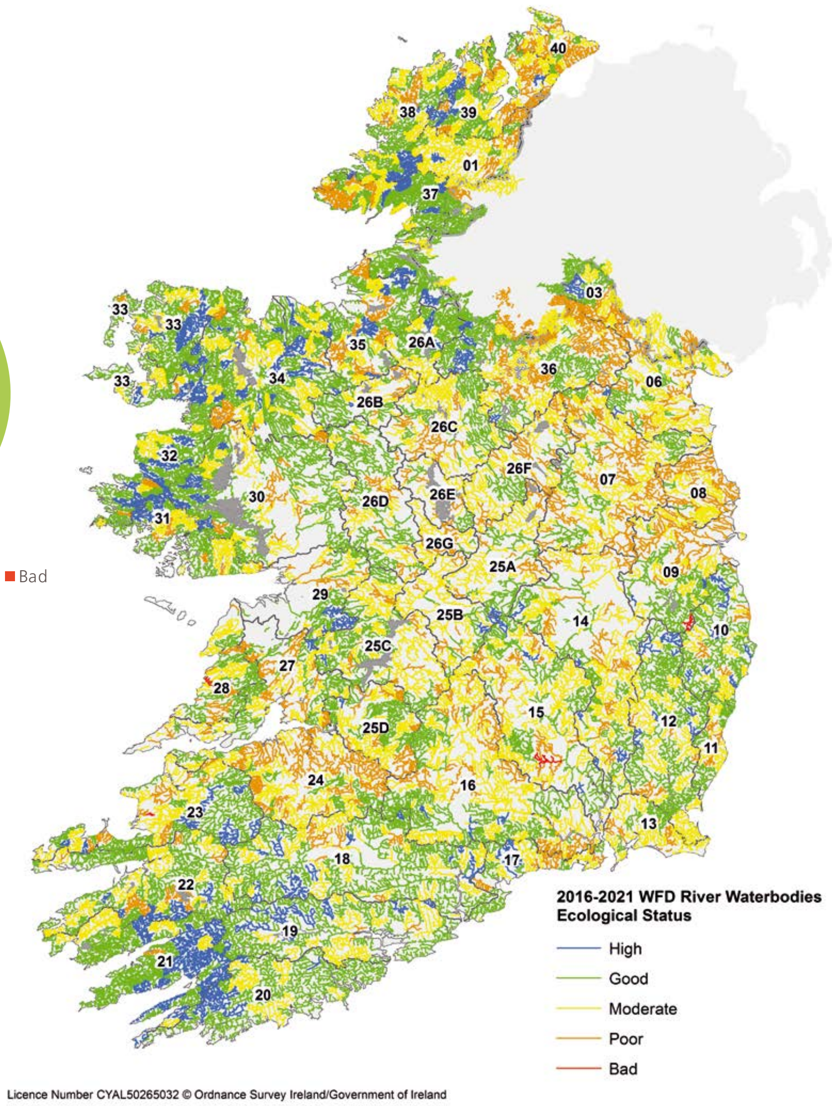


Figure 2.1 River ecological status 2016-2021



Map 2.1 The ecological status of river water bodies 2016–2021

2.4 Catchment Level Ecological Status

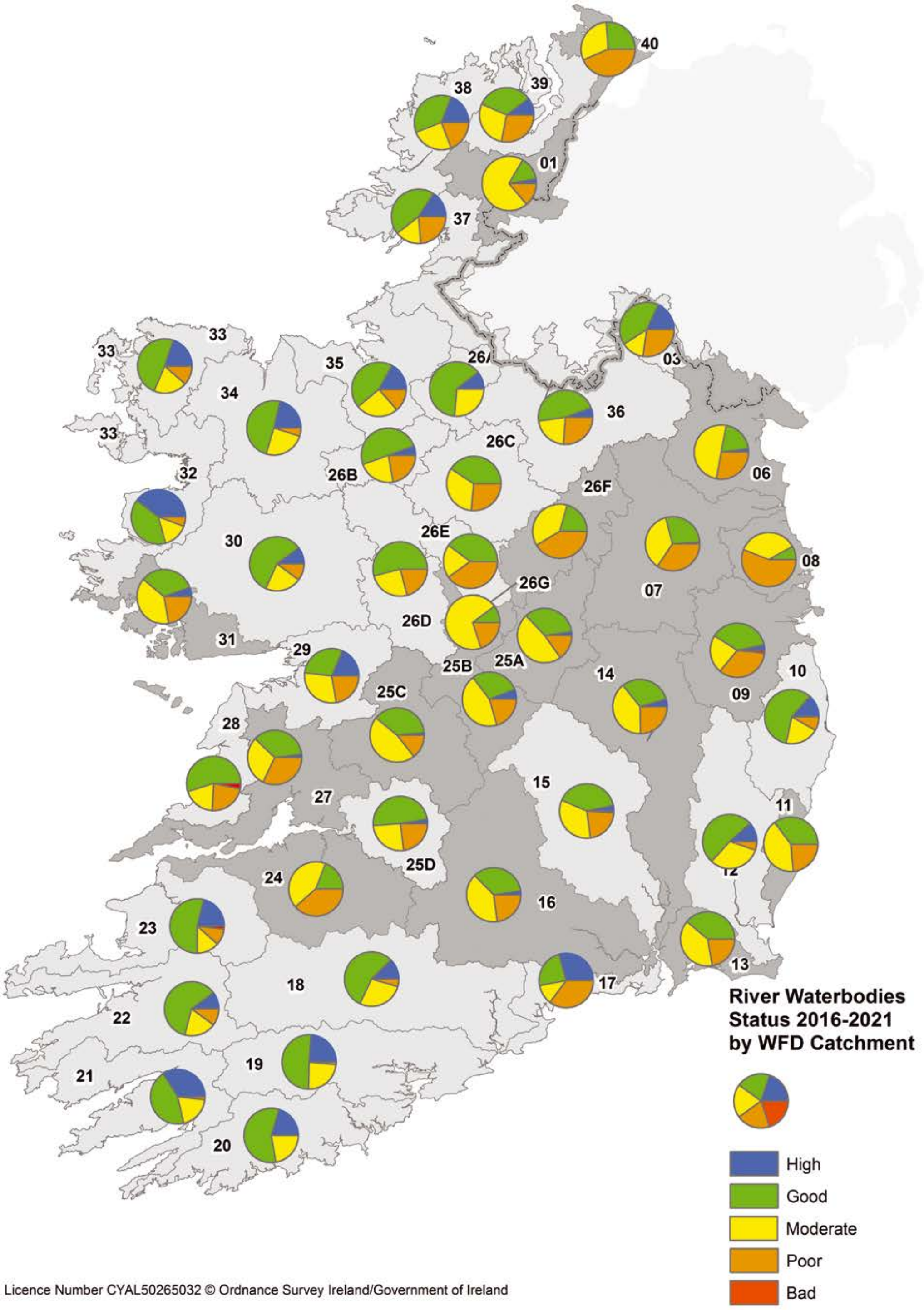
For this report, data are presented for the 46 catchment areas used as the main management units in the National River Basin Management Plan (Map 2.2). A catchment is an area of land draining towards a river, lake or other body of water.

Map 2.2 Location of Ireland’s river catchments

River ecological status for each of the 46 catchments monitored nationally is shown in Map 2.3 and Figure 2.2 and for each county in Figure 2.3. The catchments with the best river water quality are located mainly in the west and southwest of the country. However, there has been a notable decline in three catchments that were previously noted as having the best water quality, namely; the Bandon-Ilen (20), Dunmanus-Bantry-Kenmare (21) and Blacksod-Broadhaven (33) catchments in the southwest and west.

The catchments with the lowest percentage of monitored satisfactory river water bodies were located mainly in the northwest, east, southeast and midlands (catchment number in parenthesis):

- Liffey and Dublin Bay (09)
- Lower Shannon (25C)
- Galway Bay North (31)
- Ballyteigue-Bannow (13)
- Shannon Estuary North (27)
- Suir (16)
- Lower Shannon (25A)
- Barrow (14)
- Lower Shannon (25B)
- Owenavorragh (11)
- Boyne (07)
- Donagh-Moville (40)
- Newry, Fane, Glyde and Dee (06)



Map 2.3 Ecological status of monitored river water bodies at the catchment level for 2016–2021 (catchments with relatively high proportion of river water bodies in unsatisfactory condition are shaded)

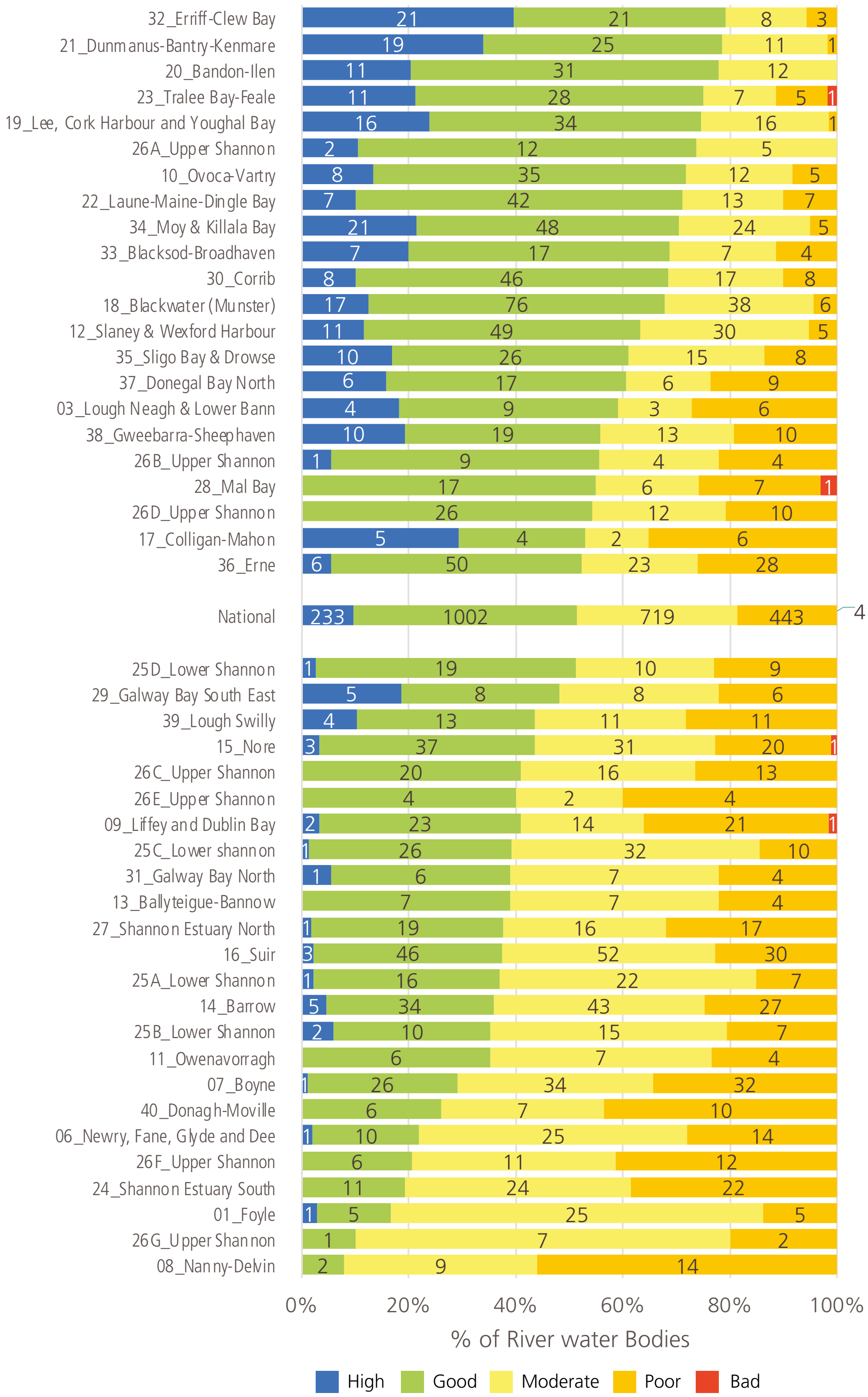


Figure 2.2 Ecological status of 2,401 monitored river water bodies by catchment region for 2016–2021 (number of water bodies in each status class displayed)

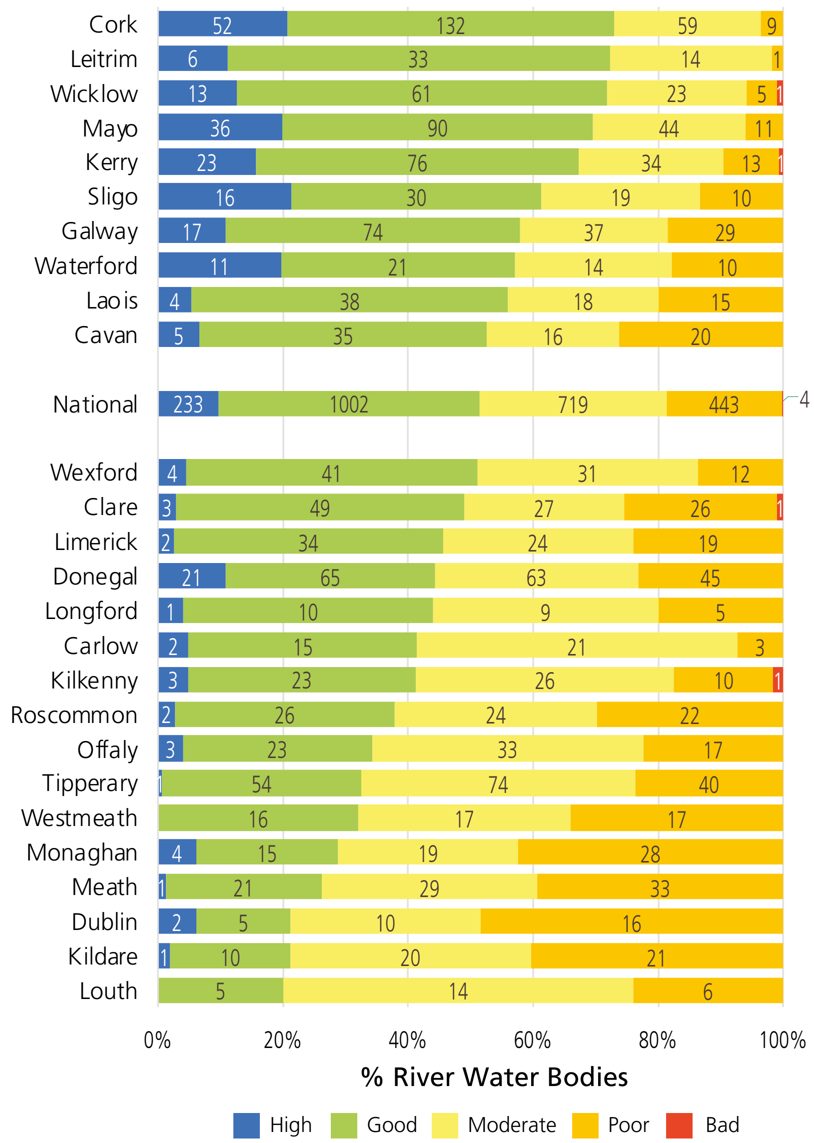


Figure 2.3 Ecological status of 2,401 monitored river water bodies by county for 2016–2021 (number of water bodies in each status class displayed)

2.5 Elements Determining 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 the overall ecological status classification.

The biological, physico-chemical and hydromorphological elements used to assess river water body ecological status is shown in Figure 2.4.

Macroinvertebrates (Q value) was the main biological element to determine the status outcome in most river water bodies in this assessment, which is expected, as the Q-value is the main biological tool used at all monitoring sites. The macroinvertebrate, phytobenthos and fish communities were highly impacted in the four water bodies that were assigned bad status:

- King's (Liffey)_010 – bad macroinvertebrate (AWIC)[3] status
- King's (Kilkenny)_050 – bad phytobenthos status
- Tyshe_010 – bad fish status
- Annagh (Clare)_010 – bad macroinvertebrate (Q Value) status

The overall physico-chemical status of the rivers was mostly influenced by their nutrient status. Hydromorphology is only considered when assigning status to high status sites and this led to 102 river water bodies being classified as good rather than high status.

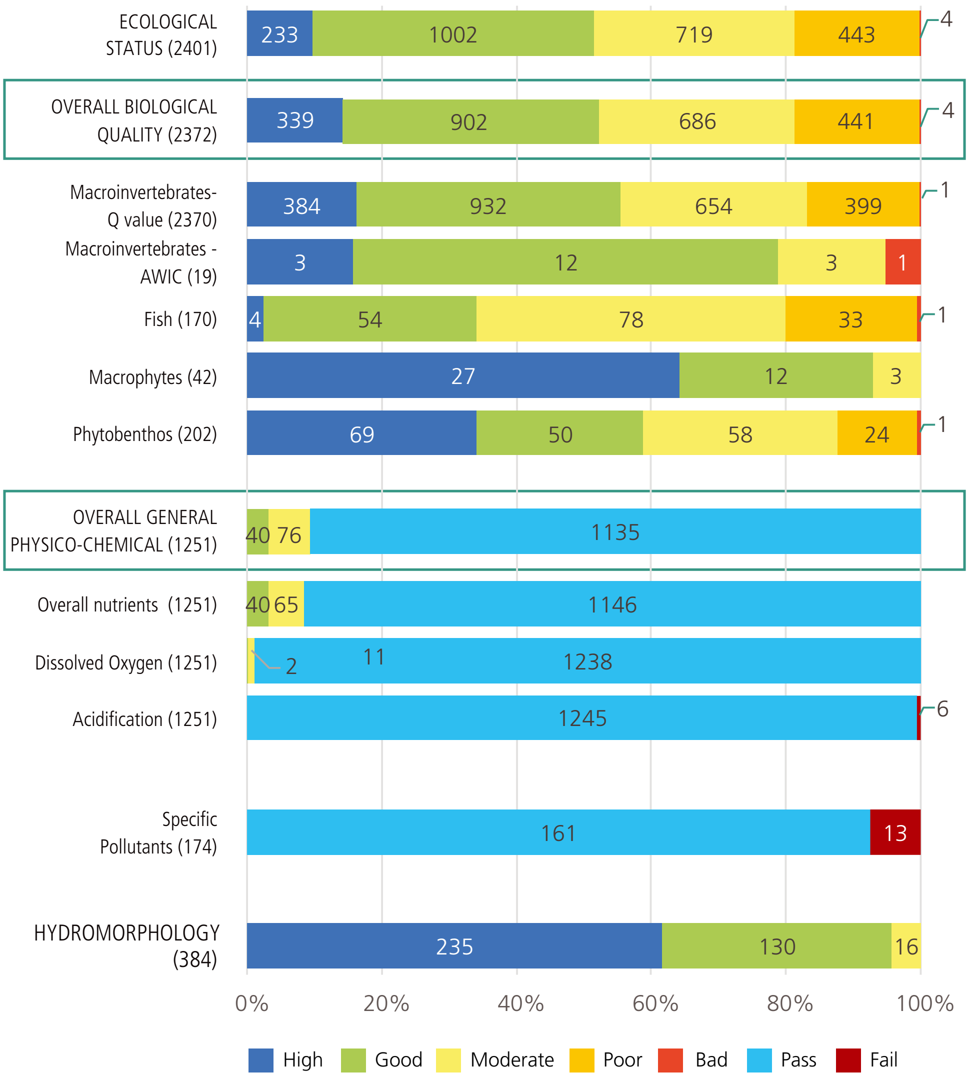


Figure 2.4 Ecological status and condition of individual elements in monitored rivers in 2016-2021 (number of rivers indicated-hydromorphology is at site level)

3 AWIC score tests for acid sensitivity

2.6 Changes and Trends

Figure 2.5 provides a summary of the total number of monitored river water bodies within each ecological status class across the last four assessment periods. Overall, the percentage of monitored river water bodies in good or high ecological status has declined by a further 1% since the last assessment. In this latest assessment period, there is a small and welcome increase in the number of high status water bodies (38 additional water bodies).

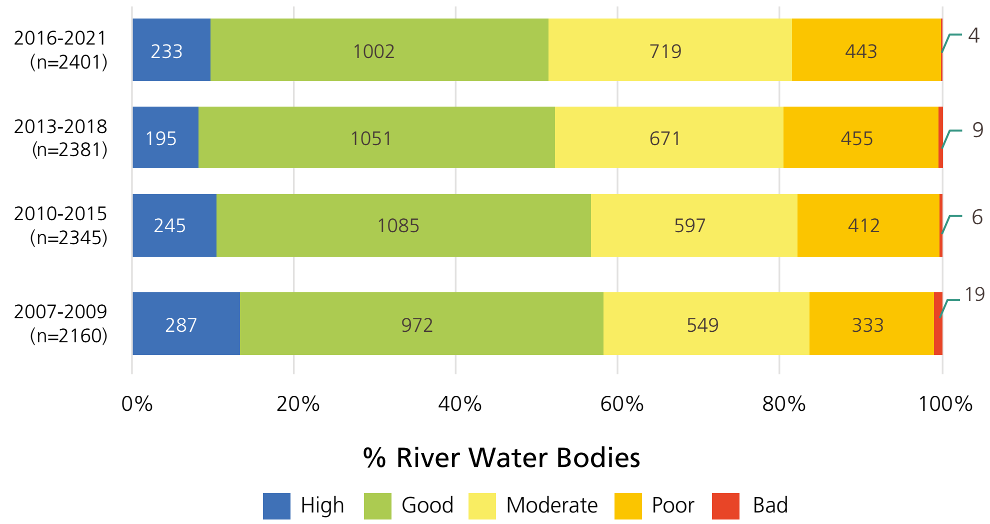


Figure 2.5 Change in ecological status for all rivers monitored since 2007 (number of water bodies is indicated)

When the current assessment period was compared to the last assessment period in 2013-2018, the ecological status of 1,633 river water bodies remained unchanged, 398 improved while 369 river water bodies declined. This represents a net improvement in status of 29 water bodies since 2013-2018. However, this net improvement did not result in an overall improvement in the percentage of water bodies in satisfactory condition. An improvement in status does not necessarily mean that the river is meeting its environmental objective, it could, for example, have improved from poor to moderate status. The number of water bodies improving and declining in status and by the number of classes is shown in Figure 2.6.

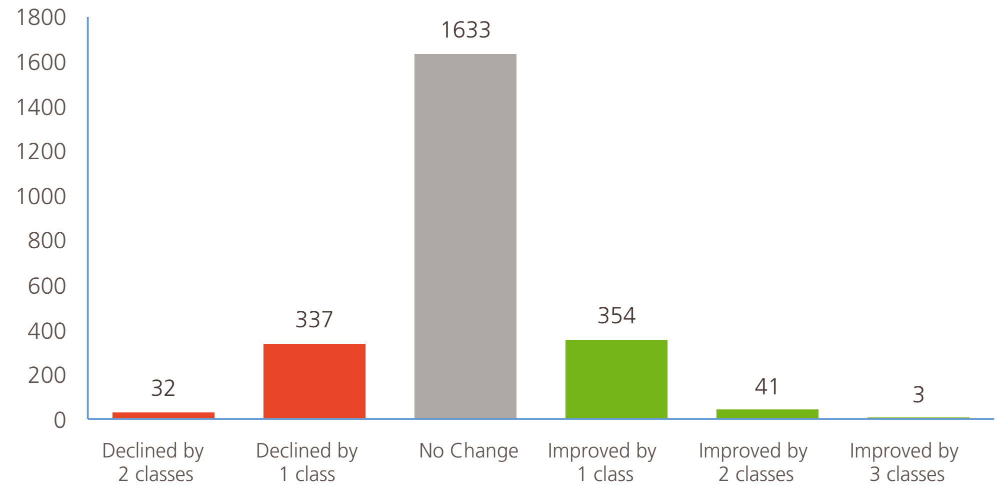


Figure 2.6 Changes in ecological status of river water bodies between 2013-2018 and 2016-2021

Map 2.4. and the Appendix summarise the changes in ecological status across the catchments between 2013-2018 and 2016-2021. The Blackwater Munster (18), Nore (15) and Suir (16) catchments had the highest number of declines in ecological status. The catchments with the highest number of declines were (catchment number is in parenthesis):

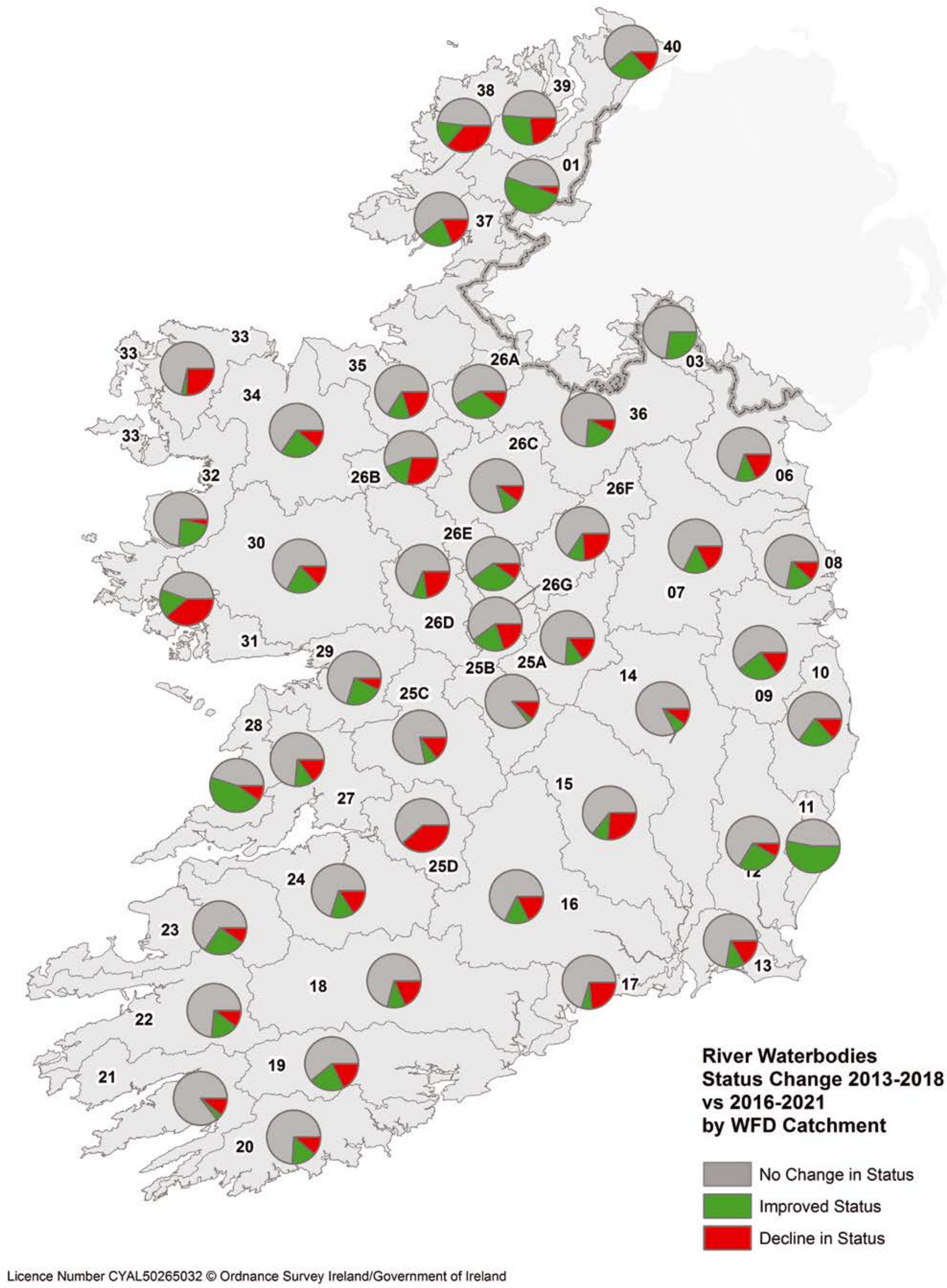
- Blackwater Munster (18) – 25 water bodies declined
- Nore (15) – 24 water bodies declined
- Suir (16) – 23 water bodies declined
- Gweebarra-Sheephaven (38) -19 water bodies declined
- Lower Shannon (25D) – 15 water bodies declined
- Sligo Bay & Drowse (35) – 12 water bodies declined
- Upper Shannon (26D) - 11 water bodies declined
- Lower Shannon (25C) - 10 water bodies declined
- Blacksod-Broadhaven (33) – 9 water bodies declined
- Galway Bay North (31) – 7 water bodies declined
- Upper Shannon (26F) – 7 water bodies declined
- Dunmanus-Bantry_Kenmare (21) – 6 water bodies declined
- Bandon-Ilen (20) - 6 water bodies declined

The declines in these 12 catchments represent almost half of all declines in status over the current assessment.

The Owenavorragh (11) and Lough Neagh and Lower Bann (03) catchments had no monitored water bodies decline in status in the current assessment.

The Slaney & Wexford Harbour (12), Moy & Killala Bay (34) and Erne (36) catchments had the highest number of improvements. The catchments with the highest number of improvements included (catchment number is in parenthesis):

- Slaney & Wexford Harbour (12) – 24 water bodies improved
- Moy & Killala Bay (34) – 23 water bodies improved
- Erne (36) – 20 water bodies improved
- Foyle (01) – 18 water bodies improved
- Mal Bay (28) – 14 water bodies improved
- Tralee Bay – Feale (23) – 13 water bodies improved
- Errif-Clew Bay (32)– 12 water bodies improved
- Owenavorragh (11) – 9 water bodies improved



Map 2.4 Ecological status change in river water bodies between 2013-2018 and 2016-2021

2.7 High Status Objective Water Bodies

The protection and restoration of high status water bodies is a requirement of the Water Framework Directive and is subsequently one of the main objectives of the 2018-2021 River Basin Management Plan. In Ireland, 319 river water bodies were identified as being of high status or had recently declined from high status and therefore needed extra protection. These river water bodies were given a high status objective, meaning that they had to achieve high status in the 2016-2021 period.

Of the 319 river water bodies designated with a high status objective in the 2016-2021 period, only 137 (43%) are currently meeting the objective (Figure 2.7). Of the total high status objective river water bodies, 229 did not change ecological status since the last assessment, 43 improved in ecological status and 47 declined. This represents an overall net decline of 4 river water bodies or 1% in the high status objective water bodies over this period. The scale of the decline in the proportion of high status river water bodies shown in Figure 2.7 illustrates the failure to protect these water bodies and the challenge in restoring them to their previous condition.

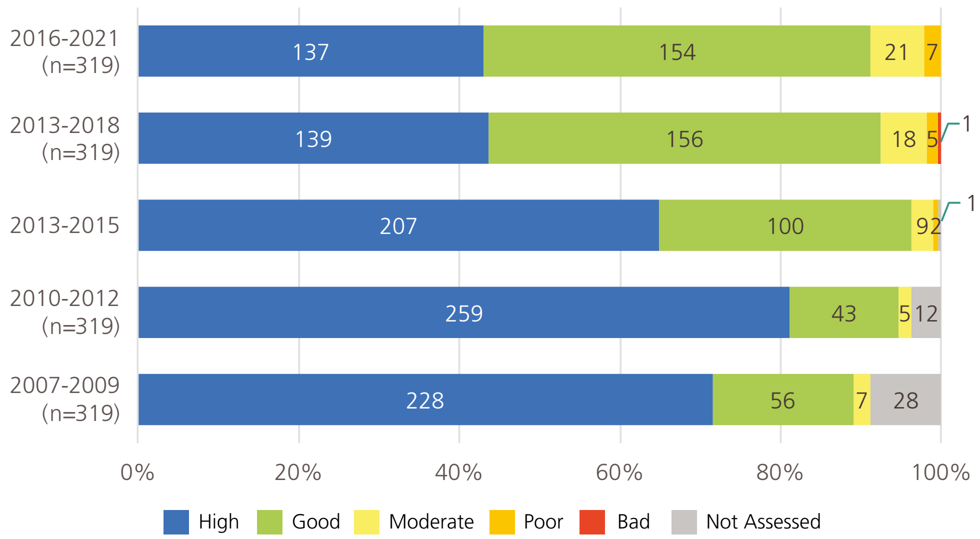


Figure 2.7 Change in ecological status for High Status Objective river water bodies since 2007 (number of water bodies is indicated)

2.8 Priority Areas for Action

The 2018-2021 River Basin Management Plan identified a number of areas for special attention and these are referred to as Priority Areas for Action (PAAs). In total 190 of these areas were selected covering just over 700 individual waters. Of the 500 river water bodies monitored in the designated Priority Areas for Action (PAAs) during 2019-2021, 316 remained stable with no change in ecological status. A total of 117 river water bodies showed improvements in status, while 67 declined, resulting in a net overall improvement in status class in 50 water bodies in the Priority Areas for Action (Figure 2.8).

The net improvement in river water quality in PAAs is higher than the improvements seen nationally and indicates that when targeted action is taken improvements in water quality can be achieved.

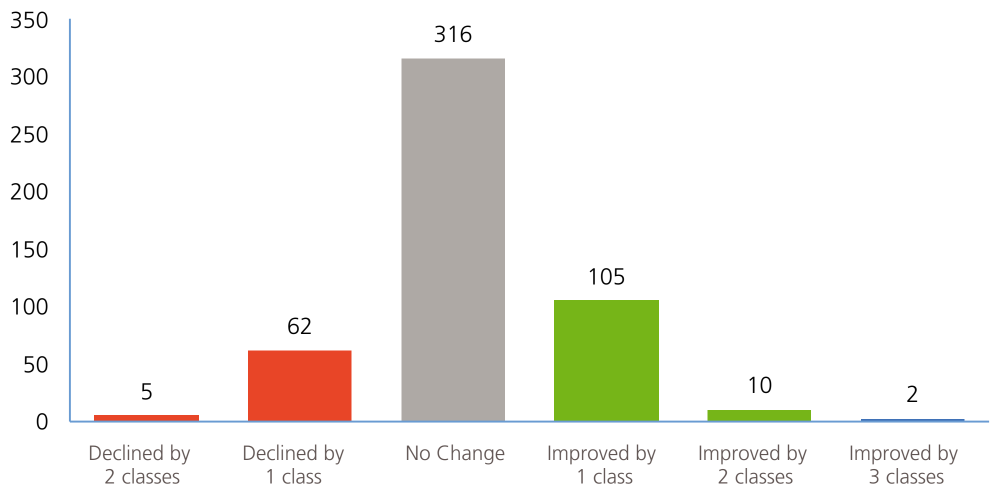


Figure 2.8 Changes in ecological status of river water bodies in PAAs between 2013-2018 and 2016-2021

2.9 Long-term Trends in Macroinvertebrate Q-value quality

The macroinvertebrate-based Quality Rating System (Q-value) has been used to assess river water quality in Ireland since the 1970s. This long-term time series provides a valuable record of environmental change in Irish rivers. In the latest survey period, 56% (1,310) of monitored river water bodies had satisfactory macroinvertebrate 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 a par with the mid 1990s, when the proportion of river water bodies in unsatisfactory quality was at its worst (Figure 2.9).

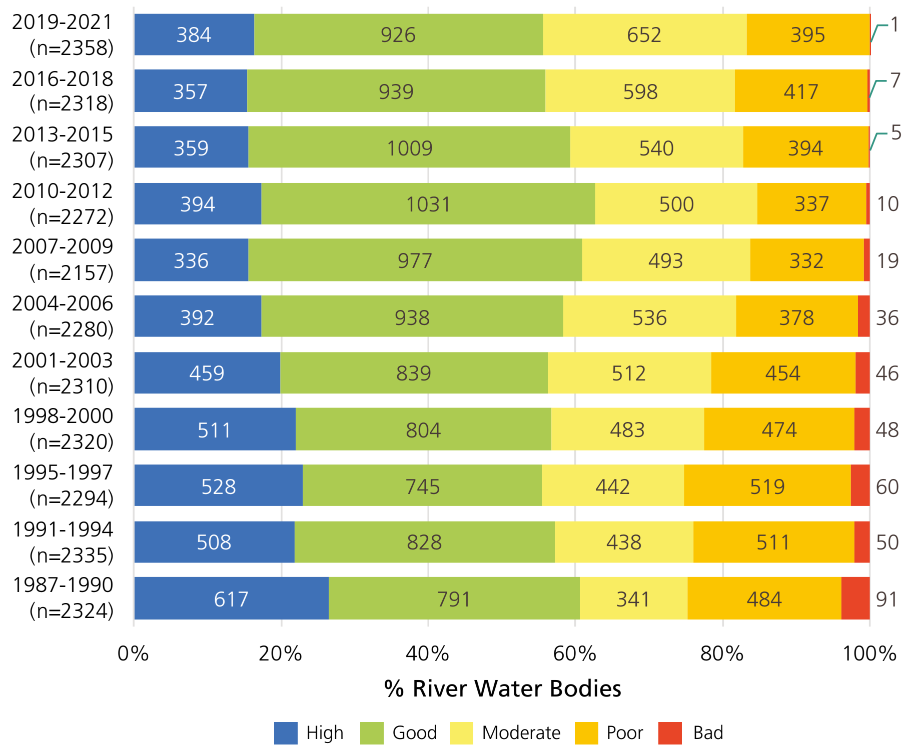


Figure 2.9 Macroinvertebrate quality of rivers (Q-value) from 1987 to 2021 (number of water bodies indicated)

2.10 Nutrients

Nitrate

The concentration of nitrate (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 (EQS) for nitrate in rivers but average nitrate concentrations less than 4 mg/l NO_3 and less than 8 mg/l NO_3 are indicative of high and good ecological quality respectively.

The data show that 43% of river sites have unsatisfactory nitrate concentrations above 8 mg/l NO_3 (Figure 2.10). The sites with the highest nitrate concentrations are located on the following rivers:

- Clareen (Nenagh) – Co. Tipperary – 3 year average of 51.8 mg/l NO_3
- Shambles – Co. Monaghan – 3 year average of 47.7 mg/l NO_3
- Aghalona – Co. Carlow – 3 year average of 43 mg/l NO_3 and 38.5 mg/l NO_3 at two sites
- Lerr – Co. Kildare – 3 year average of 37.6 mg/l NO_3.

Map 2.5 shows that nitrate concentrations are highest in rivers in the south and southeast where there is more intensive farming coupled with freely draining soils. Recent analysis by the EPA[4] shows that more than 85% of nitrogen in rivers in some catchments in the south and southeast comes from agriculture. Parts of the east of the country have higher nitrate concentrations associated with urban waste water discharges.

4 https://www.catchments.ie/assessment-of-the-catchments-that-need-reductions-in-nitrogen-concentrations-to-achieve-water-quality-objectives/

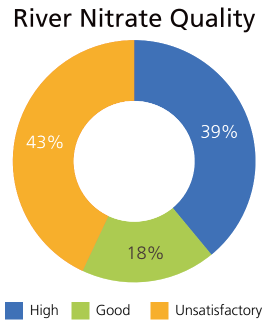
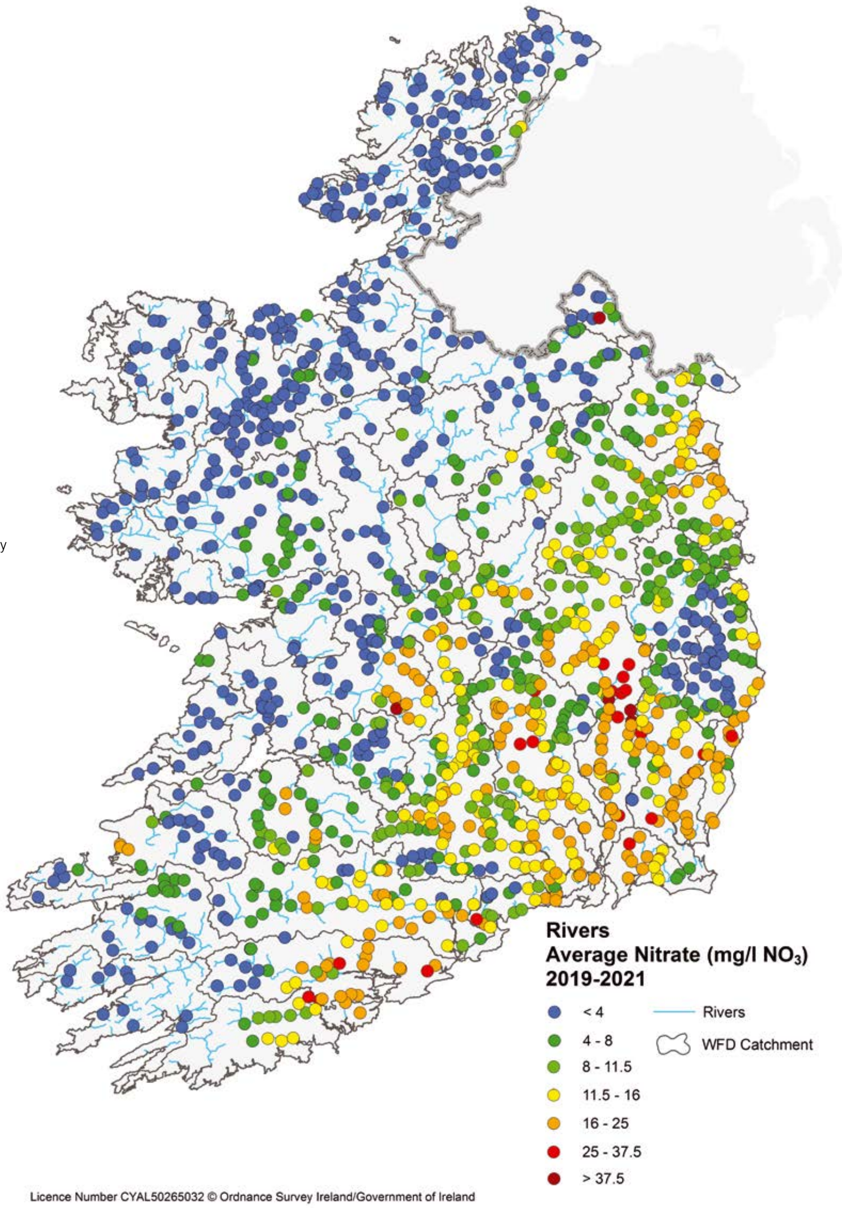


Figure 2.10 River nitrate quality



Map 2.5 Average nitrate concentration at WFD river sites for 2019-2021

Phosphate

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 EQSs 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 ecosystems.

The data show that 30% of river sites have unsatisfactory phosphate concentrations above 0.035 mg/l P (Figure 2.11). However, the remaining 70% of sites are in high or good quality.

Sites with higher phosphate concentrations are evident in the Liffey and Dublin Bay (09) and Nanny-Devlin (08) catchments in the east, in the Erne catchment (36) in the northeast, in the Shannon Estuary South catchment (24) in the southwest and in the Suir catchment (16) in the southeast of the country. Phosphorus losses in these catchments come primarily from run-off losses from agriculture on poorly draining soils and from waste water discharges (Map 2.6).

River Phosphate Quality

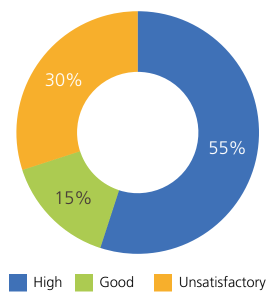
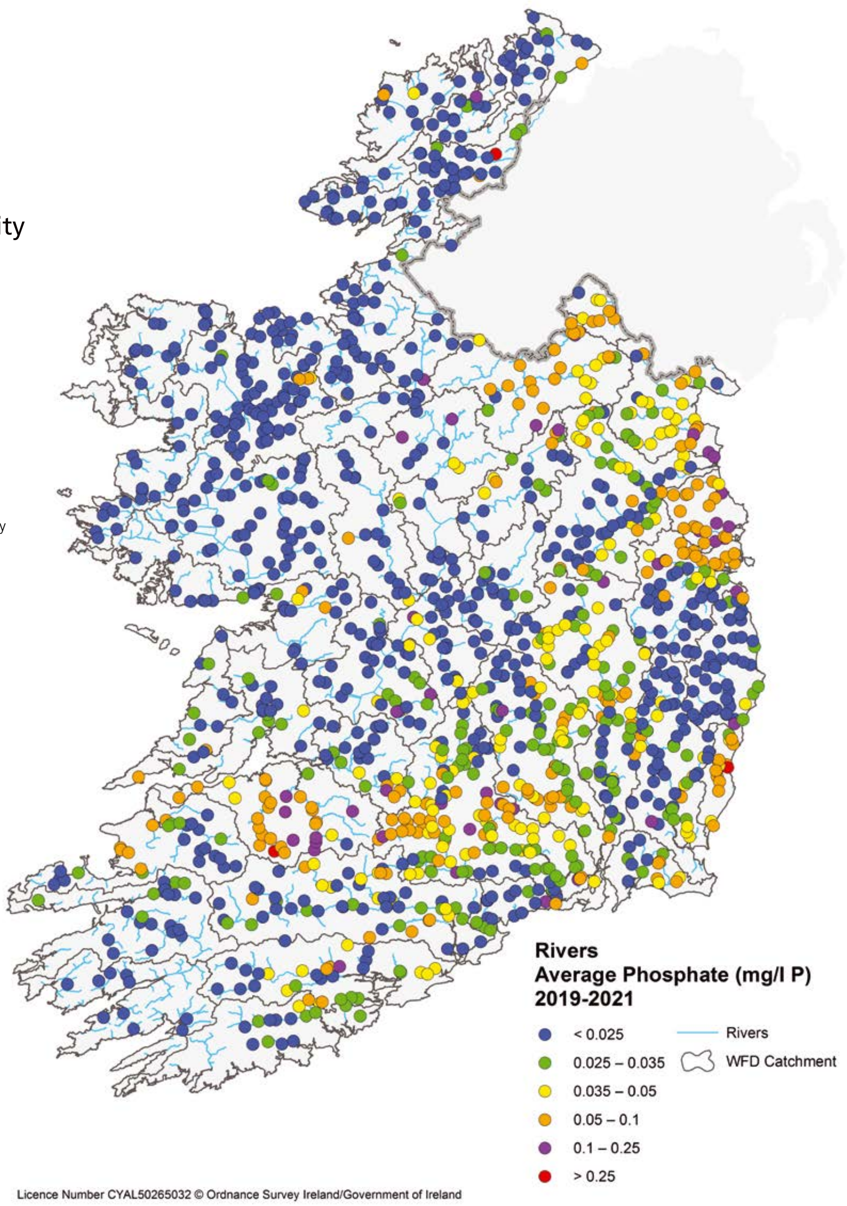


Figure 2.11 River phosphate quality



Map 2.6 Average phosphate concentration at WFD river sites for 2019-2021

2.11 Nutrient Trends

There has been an increase in the proportion of river sites with increasing nitrate concentrations in the most recent period compared to 2013-2018. Up to 2018, 26.8% of sites had an increasing trend[5] compared to 39.4% of sites now (Figure 2.12 and Figure 2.14). The proportion of sites with increasing phosphate[6] concentrations has decreased, from 26% to 16.8% (Figure 2.13 and Figure 2.15).

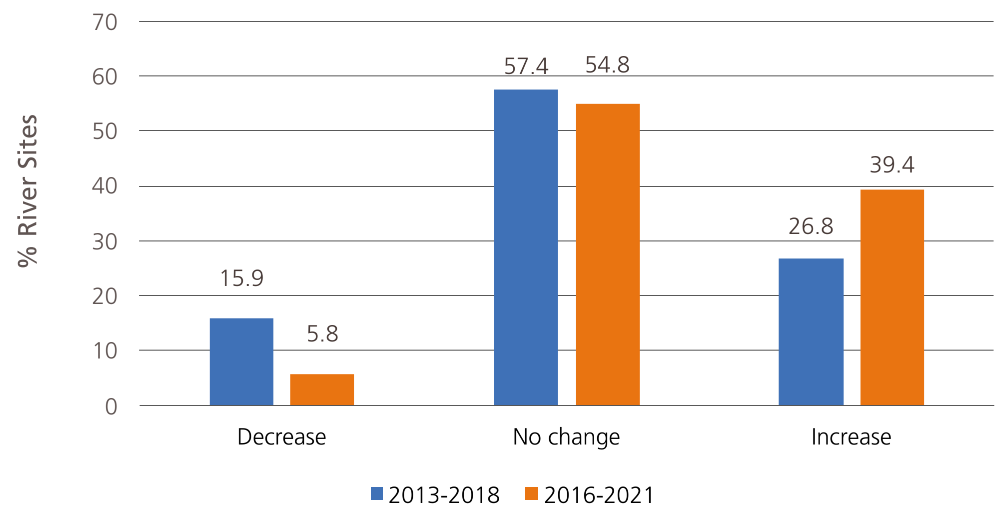


Figure 2.12 Change in river nitrogen concentration between 2013-2018 and 2016-2021. Nitrogen measured as total oxidised nitrogen.

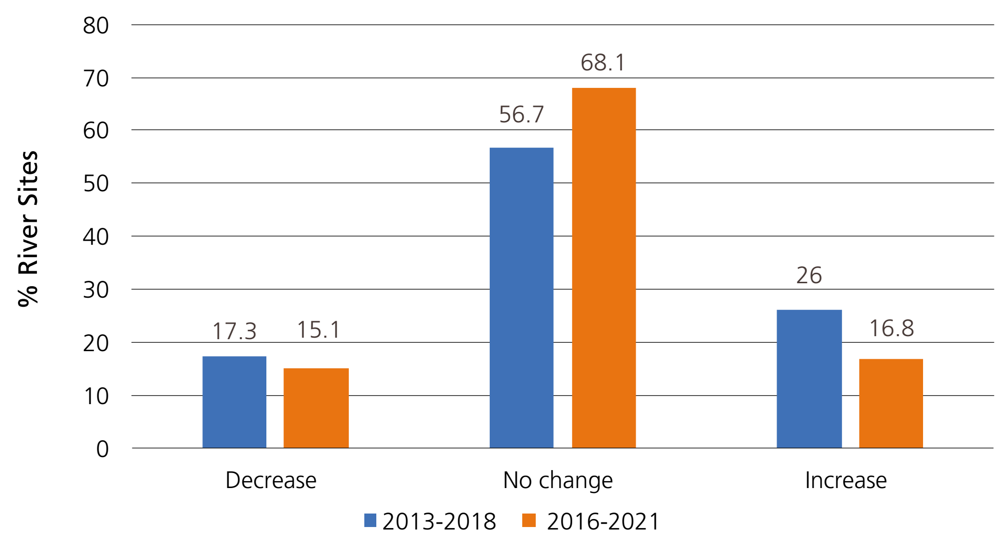


Figure 2.13 Change in river phosphorus concentration between 2013-2018 and 2016-2021. Phosphorus measured as molybdate reactive phosphorus.

5 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.

6 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.

The areas of the country with significant upwards trends of nitrogen concentration are mostly located in the more intensively farmed areas in the south, southeast and east of the country. The soils in these areas are more freely draining and therefore vulnerable to nitrate leaching (Map 2.6). The catchments with the highest number of river sites with increasing nitrogen concentration were (catchment number in parenthesis):

- Newry, Fane, Glyde and Dee (06)
- Boyne (07)
- Nanny-Delvin (08)
- Nore (15)
- Barrow (14)
- Slaney and Wexford Harbour (12)
- Lower Shannon (25C)

River sites with increasing phosphorus concentration often occur in the same catchments as nitrogen but are associated more closely with poorly draining soils (Map 2.7). The highest number of river sites with strongly increasing phosphate concentrations were found in the Suir (16) and the Lower Shannon (25D) catchments. Phosphorus loadings are mostly associated with pasture and urban wastewater discharges in the Suir and with pasture and forestry in the lower Shannon.

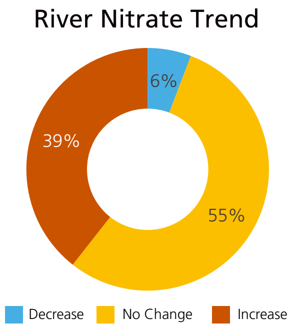
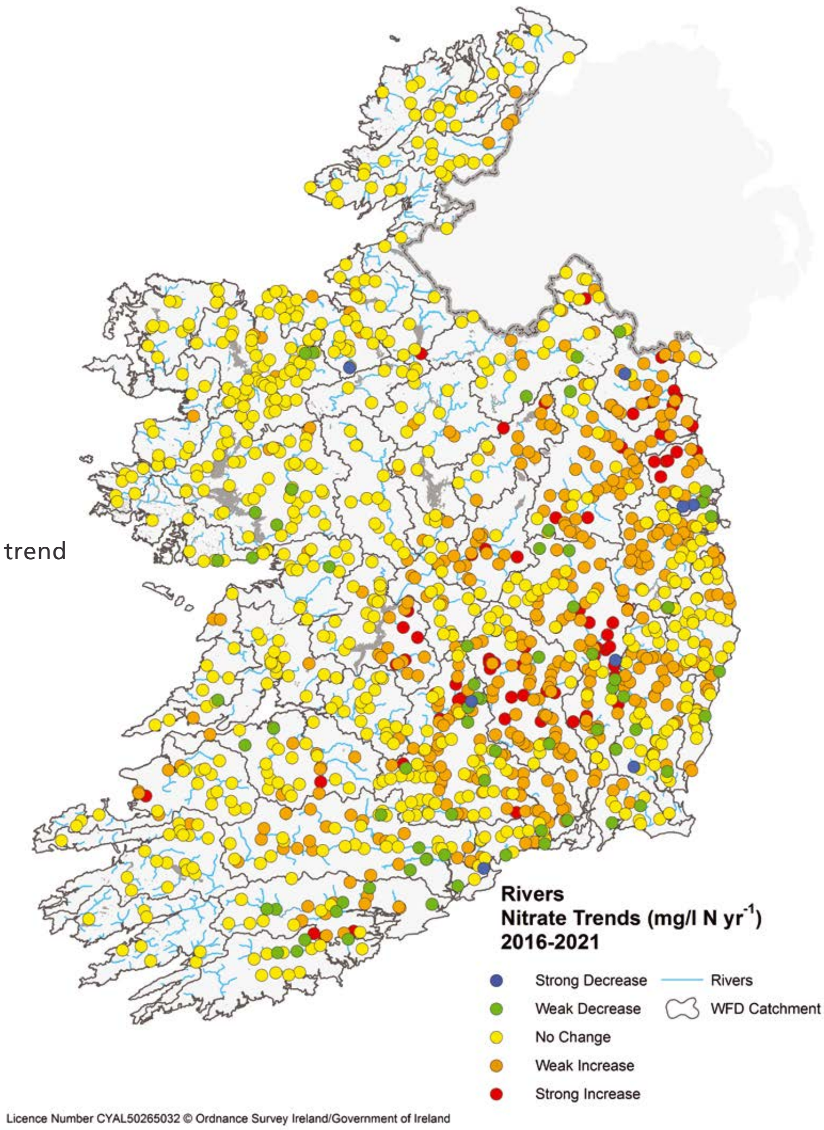


Figure 2.14 River nitrate trend 2016-2021



Map 2.7 Trends in average nitrate concentration at river sites from 2016 to 2021

River Phosphate Trend

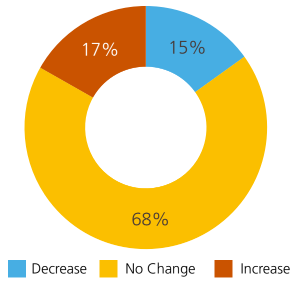
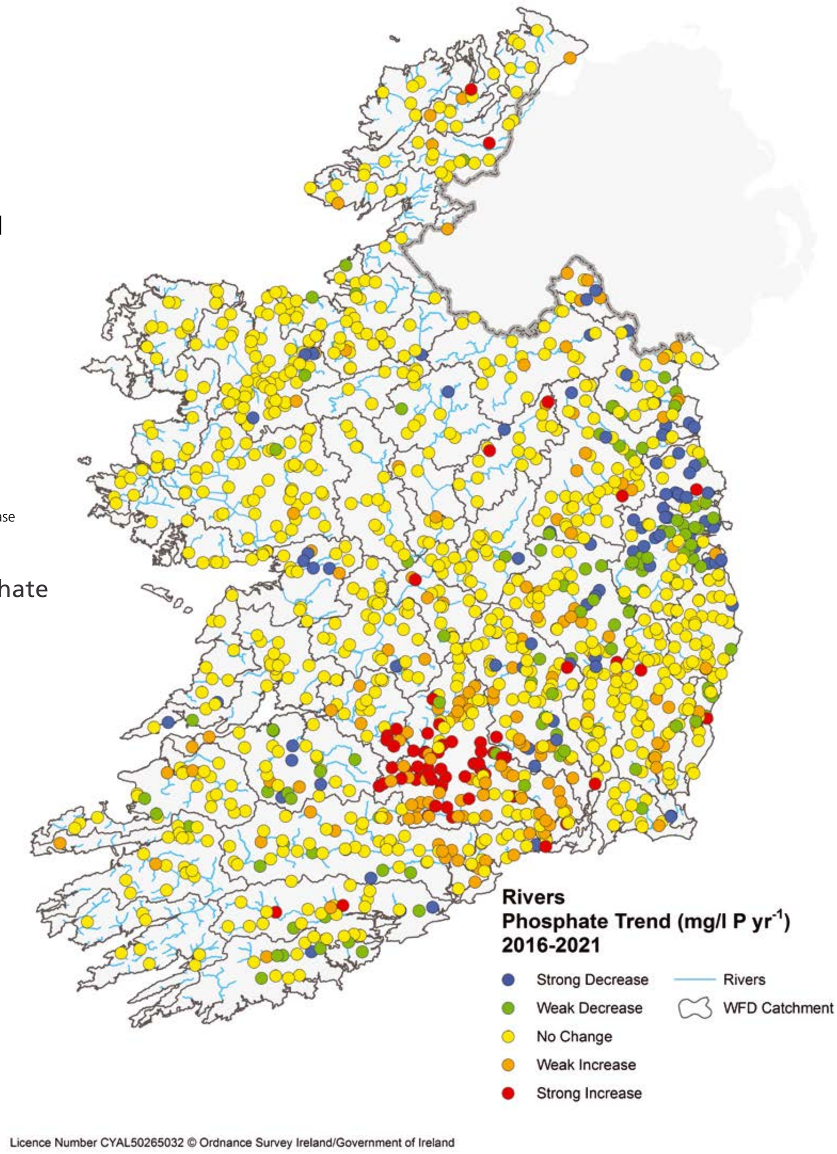


Figure 2.15 River phosphate trend 2016-2021



Map 2.8 Trends in average phosphorus concentration at river sites from 2016 to 2021

2.12 Oxygen Demand

When organic waste such as poorly treated sewage discharges enters a river it provides nutrients for the growth of bacteria and other microorganisms; this depletes the dissolved oxygen in the water affecting the macroinvertebrates and fish communities. The amount of oxygen consumed by the microorganisms to break down the organic matter is called the Biochemical Oxygen Demand or BOD. Higher amounts of organic matter in a river lead to higher BOD values which give an indication of organic pollution. Average BOD values of ≤1.3 mg/l O_2 and ≤1.5 mg/l O_2 have been established as the national standards to support achieving high and good ecological status respectively.

The data show that 13% of river sites have unsatisfactory BOD levels (Figure 2.16). The remaining 87% of sites had satisfactory (high and good) BOD levels. Sites with higher BOD concentrations are scattered throughout the country in relatively low densities (Map 2.9).

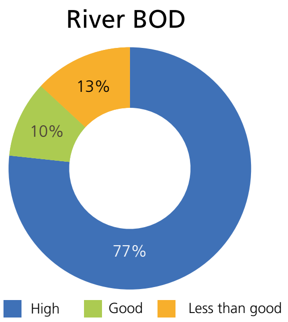
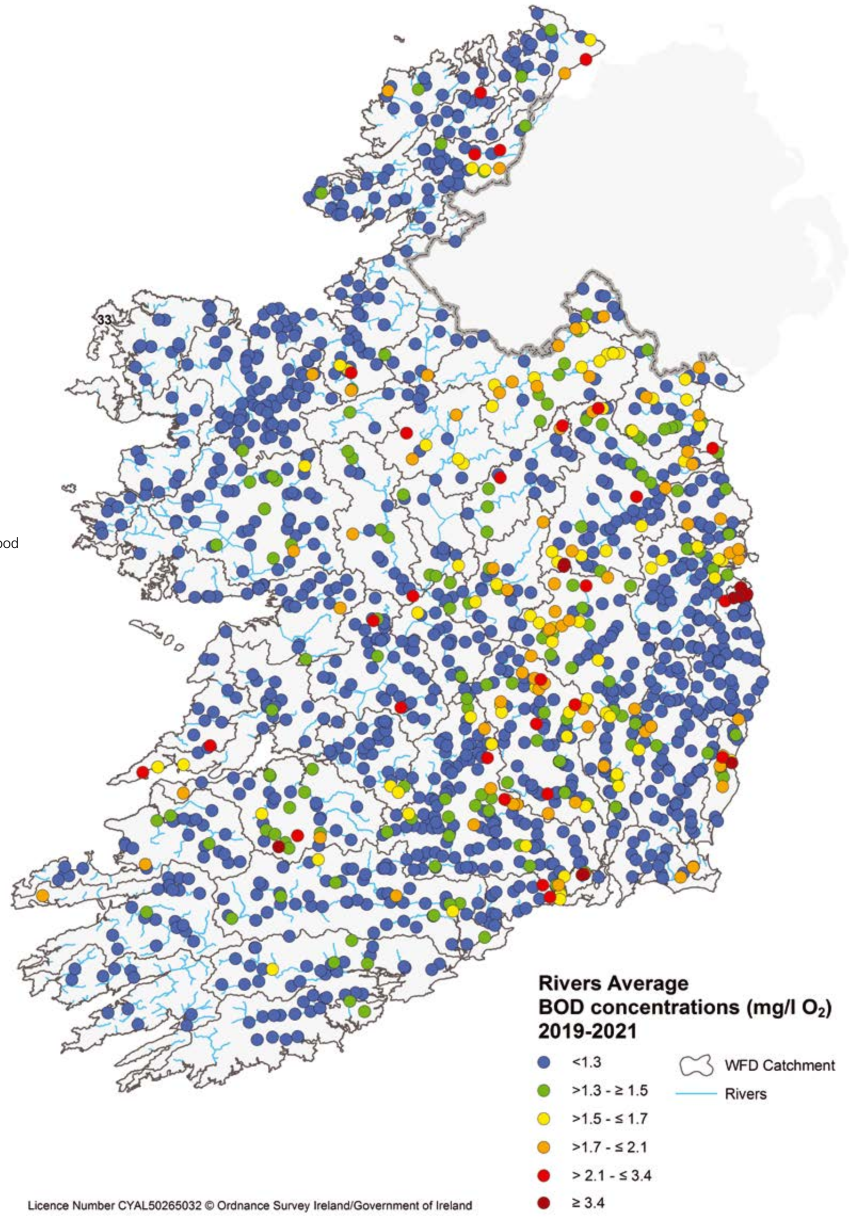


Figure 2.16 River BOD quality



Map 2.9 Average BOD concentration for 2019-2021

2.13 Conclusion

Almost a half of our river water bodies are in unsatisfactory condition. In addition to this our high status objective river water bodies are not where they should be with only 43% achieving high status despite having specific objectives to protect these high status water bodies. The catchments with the lowest percentage of monitored satisfactory river water bodies were located mainly in the northwest, east, southeast and midlands. The Blackwater Munster (18), Nore (15) and Suir (16) catchments in the south and southeast had the highest number of declines in status.

Excess nitrogen in the east and southeast continues to affect water quality in these areas. High phosphate concentrations in parts of the east, northeast, southwest and southeast of the country are a problem for our rivers in these regions. The data presented here show that these excess nutrients coupled with physical habitat damage are harming the ecology of our rivers.

The net improvement in river water quality in the Priority Areas for Action reported here is a good sign but these improvements need to be understood and the learnings expanded to other water bodies as a matter of urgency.

Box 2.1 Historic Trends in High Quality Q-value 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. Overall, the percentage of high quality sites (based only on the aquatic macroinvertebrate Q value score) has fallen from 31.6% of all river biological monitoring sites in 1987-1990 to 18.4% of the total monitored sites in 2019-2021 (see Figure 2.17). Within this grouping, the proportion of high quality reference sites (Q5 – those sites at or closest to natural condition) remains low at only 1.1% of monitored sites in 2019-2021, down from 13.4% in 1987-1990.

There was however a welcome small increase in the overall number of high status sites and sites scoring Q5 in the latest survey period. The number of Q5 sites in the current assessment is 32.

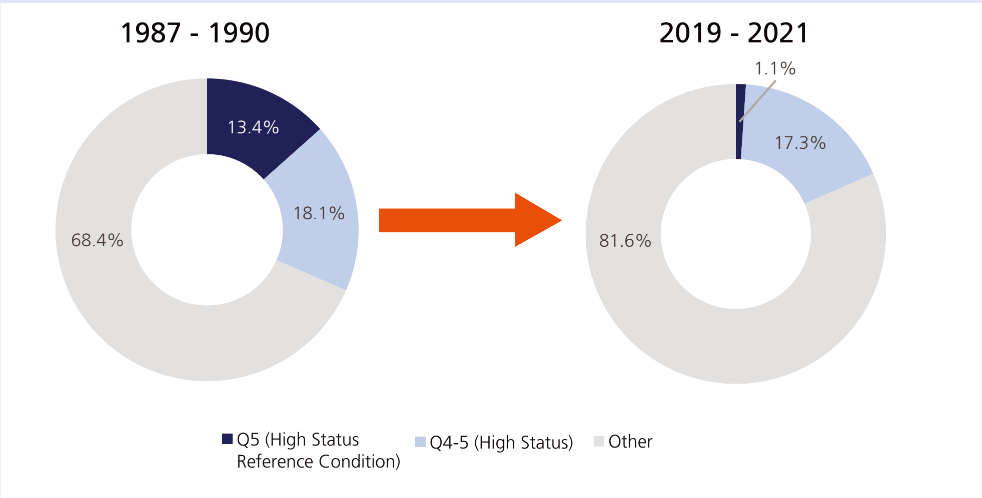
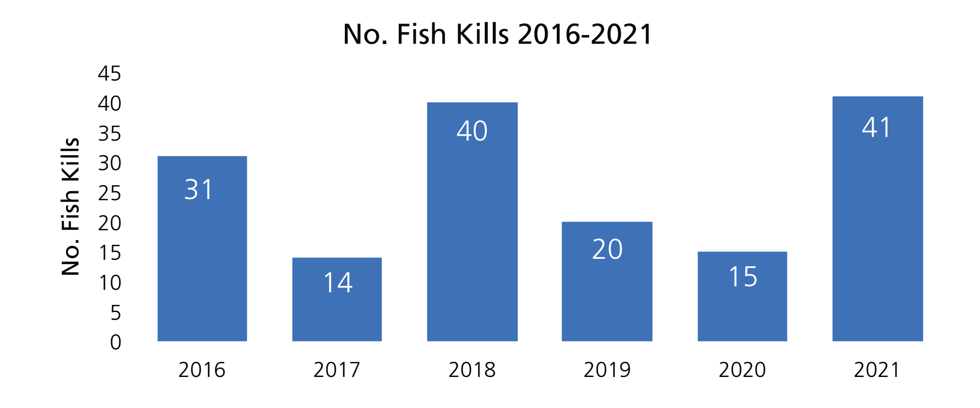


Figure 2.17: Change high ecological quality (macroinvertebrate) river sites (Q5 and Q4-5) from 1997 to 2021.

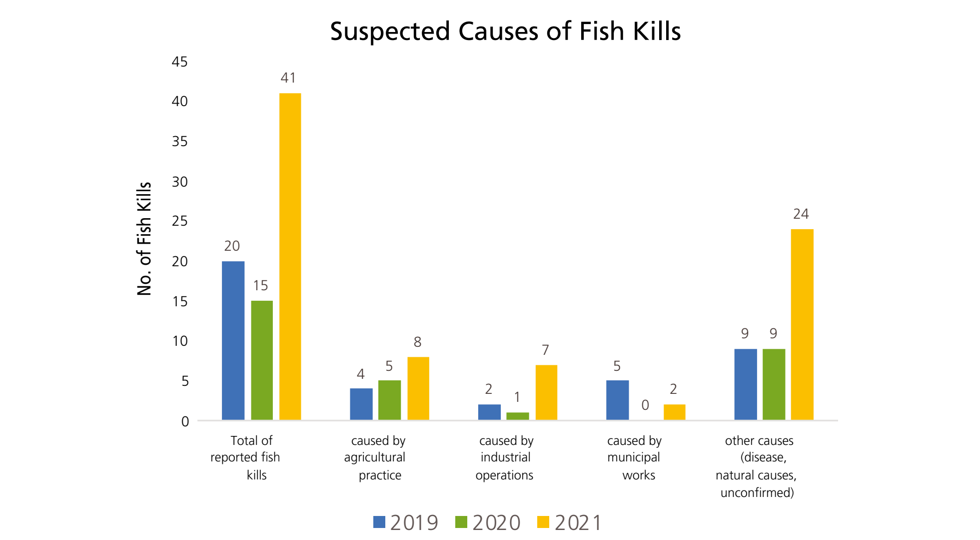
Box 2.2 Fish Kills

The presence of healthy fish stocks, such as salmon and trout, in rivers and lakes is an indicator of good water quality. The occurrence of a fish kill is typically an indicator of serious pollution. Fish kills can occur within a localised stretch or over a long distance in a water body. There are many possible causes, but oxygen depletion in water is the principle cause of 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. Data on fish kills in Ireland are compiled annually by Inland Fisheries Ireland (IFI).



The number of fish kills was noticeably higher in 2018 (40) and 2021 (41) when compared to other recent years. Low flow conditions experienced in the summers of these years may have contributed to this rise by increasing the vulnerability of fish to pollution events through increased water temperature and depleted oxygen concentrations.

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. The causes attributed to the fish kills based on investigations carried out by IFI environmental staff from 2019 to 2021 are outlined below.



LAKES

3. LAKES

3.1 Introduction

Our lakes have an uneven geographic distribution nationally with most occurring along the west and northeast of the country. The national water quality monitoring programme was used to assess 224 lakes during 2016-2021. These represent the majority of large lakes in the country including lakes used for drinking water abstractions and those that are of regional, local or scientific interest in relation to protected habitats and species.

Status is applied to the unmonitored lakes based on information gathered from monitored lakes that have similar characteristics and pressures. This results in the ecological status of 812 lakes being assessed which gives an overall national picture representing 90% of the total lake area in Ireland.

3.2 Summary for Lakes

- Nationally, 557 lakes (69%) are in high or good ecological status and 255 lakes (31%) are in moderate, poor or bad ecological status.
- There has been a 2.7% decline in the number of monitored lakes in satisfactory ecological health (high or good ecological status) since 2013-2018.
- The majority of lakes assessed (85%) are showing a stable total phosphorus trend since 2016. However, despite this, a third (33%) of lakes failed the environmental quality standard (0.025 mg/l P).
- 179 lakes (81%) assessed for hydromorphology are in good or better condition and 41 lakes (19%) are in less than good condition.

3.3 National Ecological Status

Nationally, 557 lakes (69%) in the period 2016–2021 are in good or high ecological status, and 255 lakes (31%) are in moderate or worse ecological status (Figure 3.1). This includes both monitored and unmonitored lakes.

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.

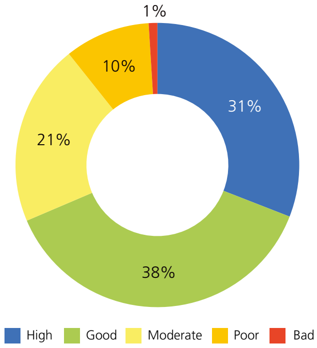
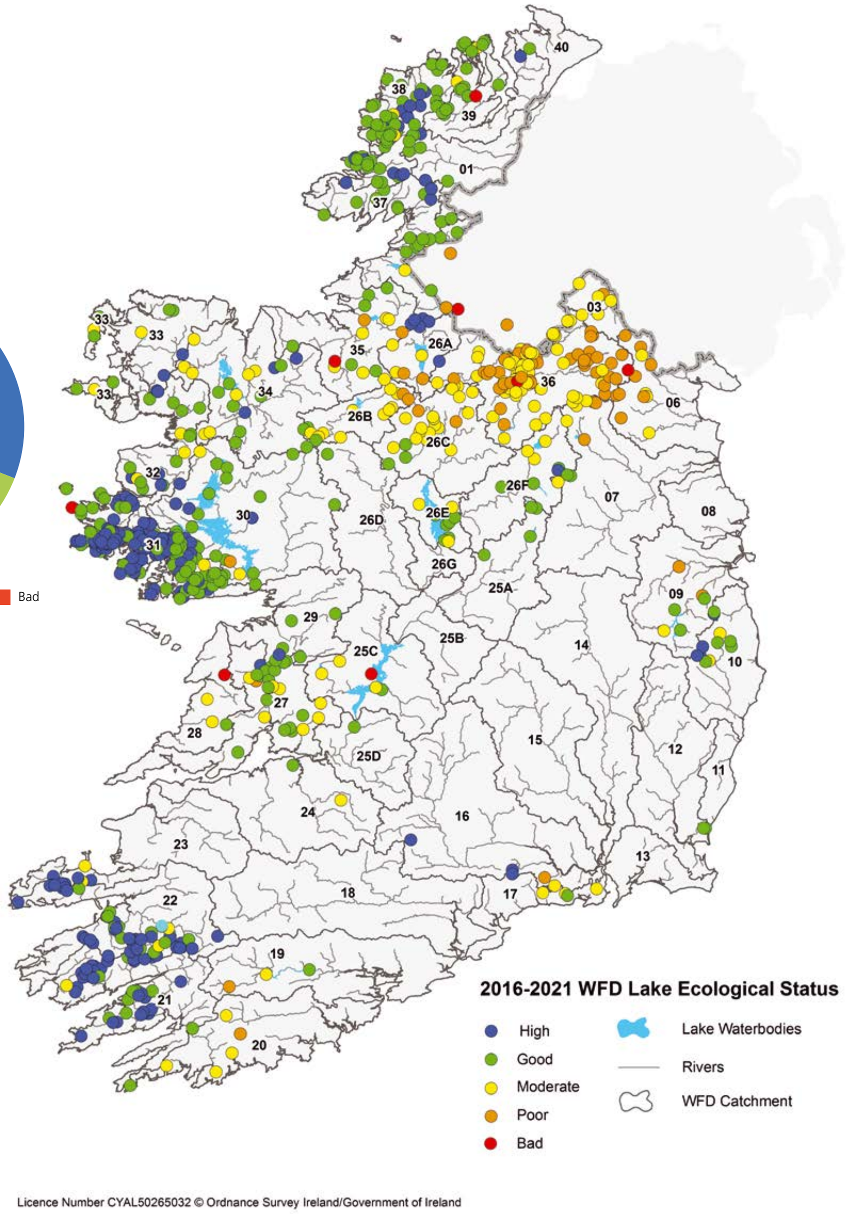


Figure 3.1 Lake ecological status 2016-2021



Map 3.1 Ecological status of all lake water bodies 2016–2021

3.4 Catchment Level Ecological Status

Lake ecological 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).

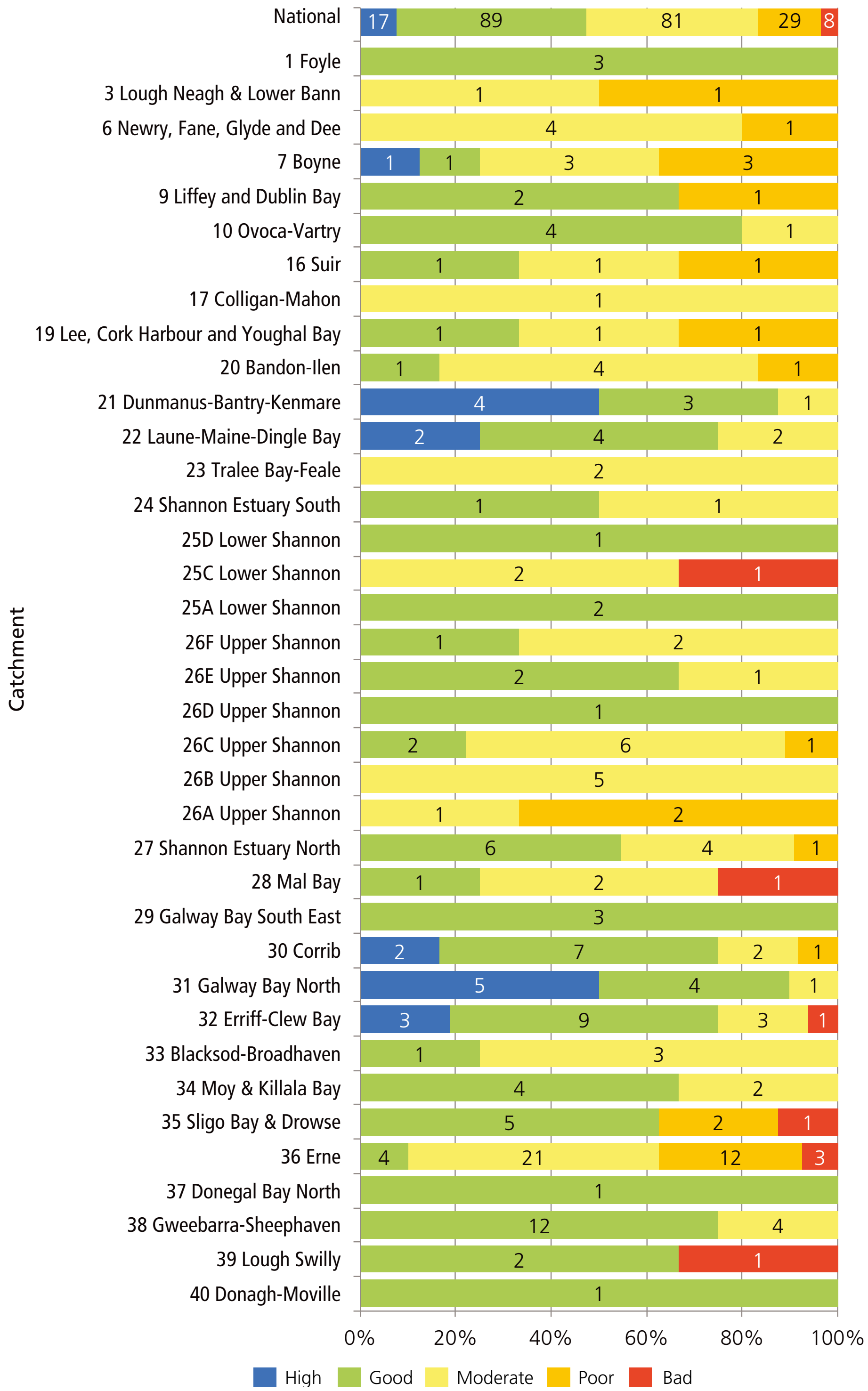


Figure 3.2 Ecological status of monitored lake water bodies at catchment level 2016-2021 (numbers of lakes indicated)

3.5 Elements Determining Ecological Status

The biological, physico-chemical and hydromorphological elements used to assess lake ecological status are shown in Figure 3.3.

Macrophytes was the main biological element to influence overall ecological status followed by fish and phytoplankton. The macrophyte and fish communities were highly impacted in the eight lakes that were assigned bad status:

- Alewnaghta (Co. Clare) - bad fish and moderate macrophyte status
- Aughrusbeg (Co. Galway) - bad fish status
- Corglass (Co. Cavan) - bad fish and moderate macrophyte status
- Egish (Co. Monaghan) - bad macrophyte and fish status
- Fern (Co. Donegal) - bad fish and moderate macrophyte status
- Lickeen (Co. Clare) - bad fish status
- Macnean Lower (Cavan) - bad fish and poor macrophyte status
- Templehouse (Co. Sligo) - bad macrophyte status

The overall driving factor in the physico-chemical status of the lakes was total phosphorus. Hydromorphology is only considered when assigning status to high status lakes and resulted in four lakes being classified as good status instead of high. These lakes were:

- Doo Lough (Co. Mayo)
- Guitane (Co. Kerry)
- Kilsellagh (Co. Sligo)
- Lough Veagh (Co. Donegal)

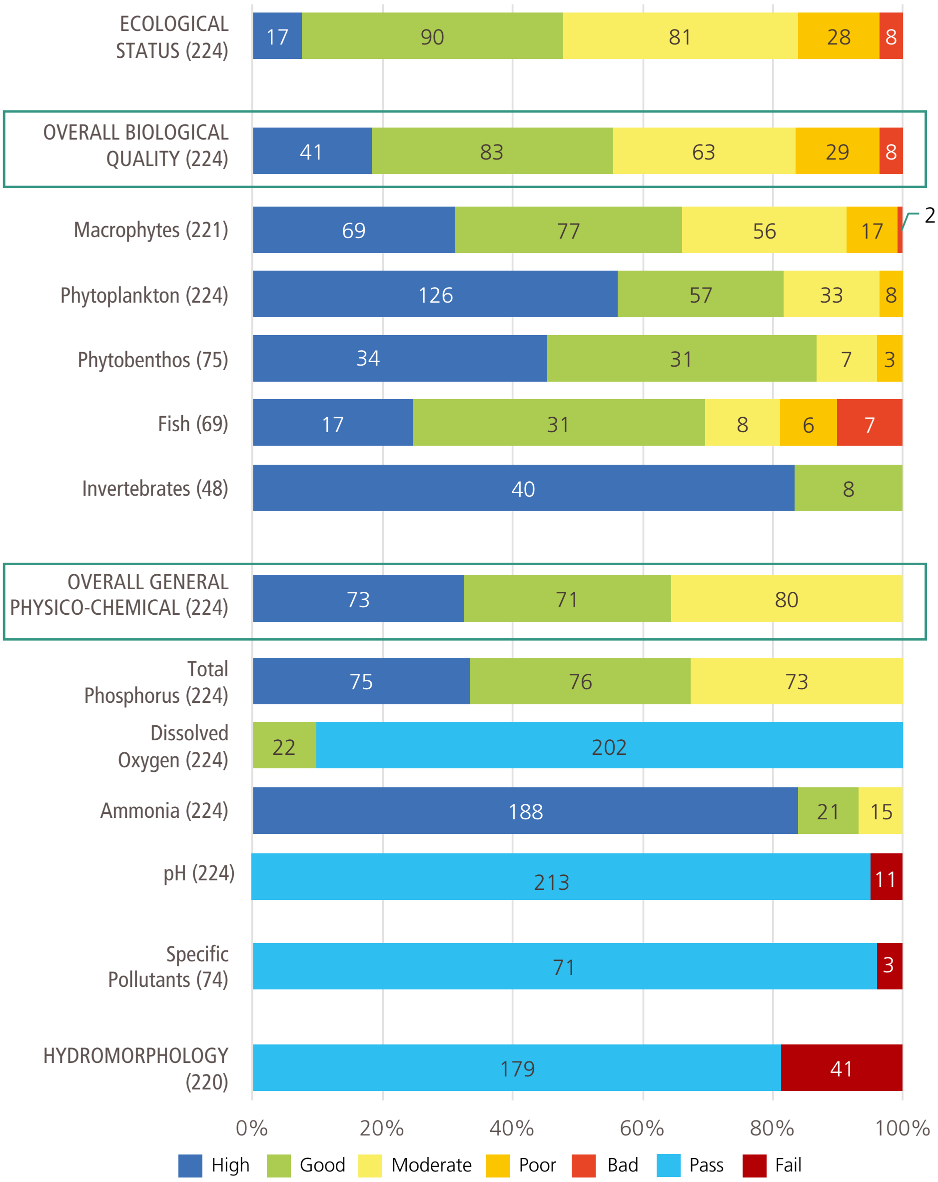


Figure 3.3 Ecological status and condition of individual elements in monitored lakes in 2016-2021 (number of lakes indicated)

3.6 Changes and Trends

The number of monitored lakes in satisfactory ecological health, in good or high ecological status, decreased by 2.7% from 113 lakes in 2013-2018 to 107 in the current assessment (Figure 3.4). When compared to the first baseline assessment in 2007-2009, the number of lakes currently in satisfactory ecological health is broadly similar.

In terms of general changes across all status categories (i.e., high, good, moderate, poor and bad) 28 lakes improved in ecological status, 29 declined and 167 remained unchanged. Most improving or declining lakes changed by a single ecological class (Figure 3.5). A lake may improve in ecological quality but still not achieve its environmental objectives e.g. a lake may improve from poor ecological status to moderate.

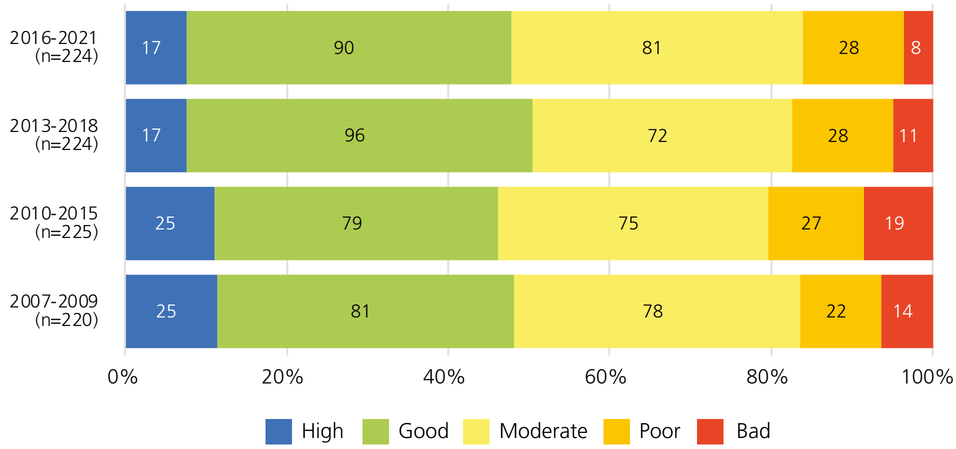


Figure 3.4 Change in ecological status for lakes monitored in each survey period since 2007 (number of lakes is indicated)

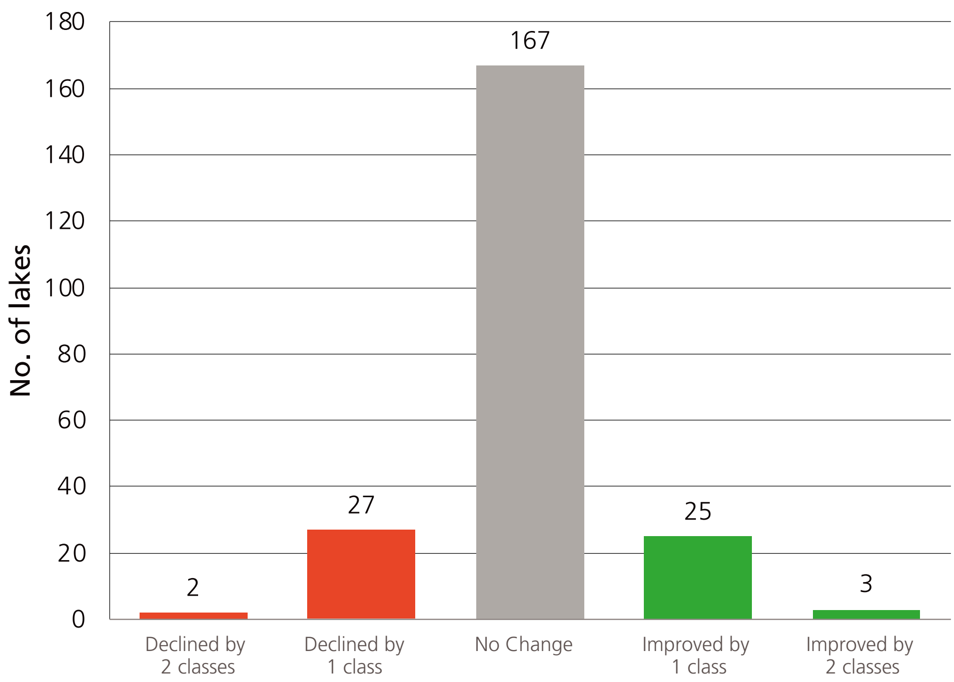


Figure 3.5 Changes in ecological status for lake water bodies between 2013–2018 and 2016–2021

3.7 Nutrients

Concentrations

The concentration of total phosphorus (mg/l P) in lakes is a key quality indicator because of its impact on biological quality in freshwater. Nutrients such as phosphorus are essential for plant growth, but if present in excess amounts can lead to a significant decrease in water quality due to the proliferation of plants and algal blooms.

Average total phosphorus concentrations in lakes of less than 0.01 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 are likely to result in the lake not achieving good ecological status.

Two-thirds (67%) of monitored lakes are classed as either high or good quality for total phosphorus for 2019-2021. The remaining one third (33%) have unsatisfactory phosphorus concentrations. (Figure 3.6).

Map 3.2 represents the average total phosphorus concentrations in Ireland's monitored lakes from 2019-2021. Five monitored lakes had very high average total phosphorus concentrations (greater than 0.1 mg/l P) in 2019–2021, all in the northeast of the country:

- Naglack (Co. Monaghan) – 3 year average 0.19 mg/l P
- Farnham Lough (Co. Cavan) – 3 year average 0.16 mg/l P
- Inner Lough (Co. Monaghan) – 3 year average 0.15 mg/l P
- Lough Egish (Co. Monaghan) – 3 year average 0.14 mg/l P
- White Rockcorry (Co. Monaghan) – 3 year average 0.11 mg/l P.

Lake Total Phosphorus Quality

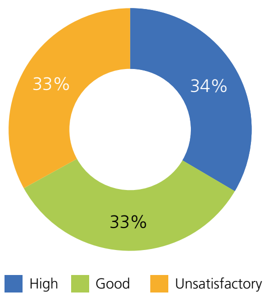
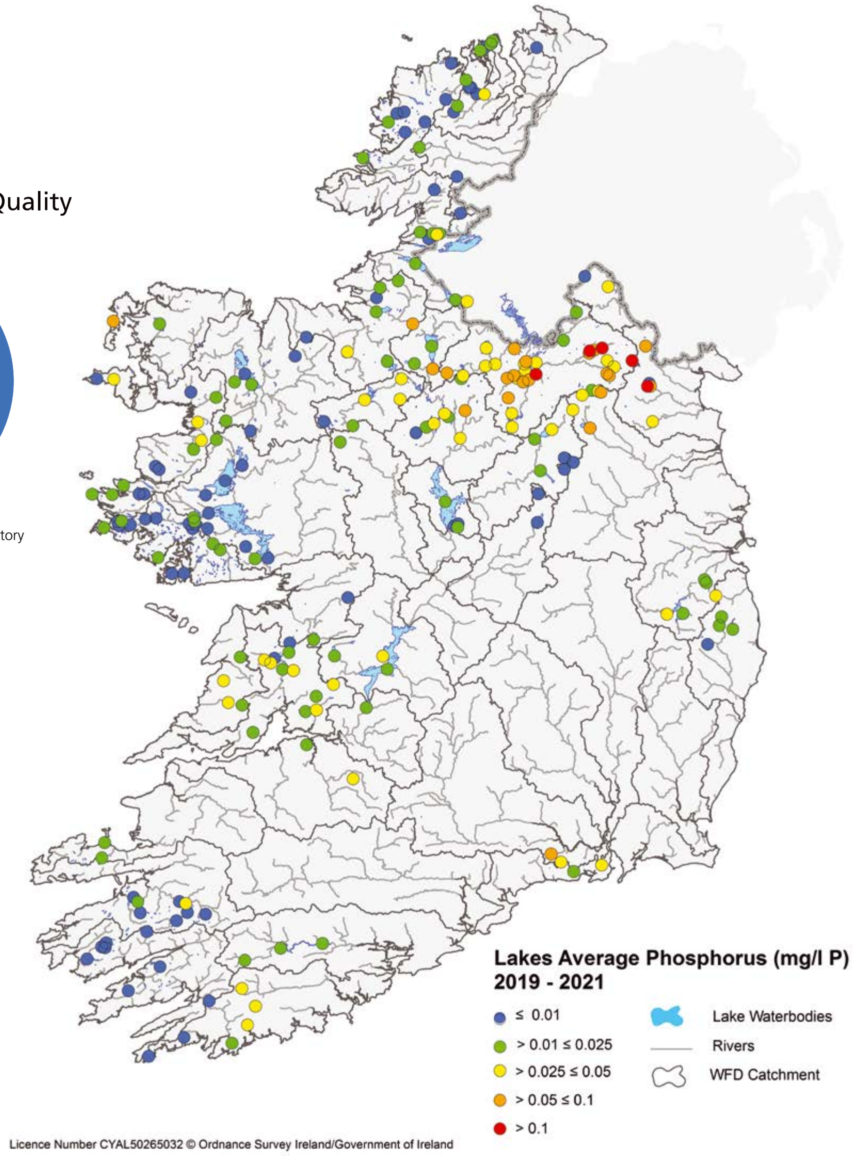


Figure 3.6 Lake total phosphorus quality



Map 3.2 Average total phosphorus concentrations in Ireland's monitored lakes 2019-2021

3.8 Nutrient Trends

A trend assessment of 213[7] lakes was carried out using annual average total phosphorus data from 2016 to 2021. Most of the lakes analysed (181) had a stable trend where total phosphorus was relatively unchanged (Figure 3.7)[8].

Seven lakes had a strong increasing trend in total phosphorus concentrations:

- Cross (Co. Mayo)
- Scur (Co. Leitrim)
- White Rockcorry (Co. Cavan)
- Bawn (Co. Cavan)
- Inner (Co. Monaghan)
- Naglack (Co. Monaghan)
- Ballyshunnock (Co. Waterford).

Five lakes had a strong decreasing trend in total phosphorus concentrations:

- Farnham Lough (Co. Cavan)
- Ardan (Co. Cavan)
- Tacker (Co. Cavan)
- Glasshouse (Co. Cavan)
- Abisdealy (Co. Cork).

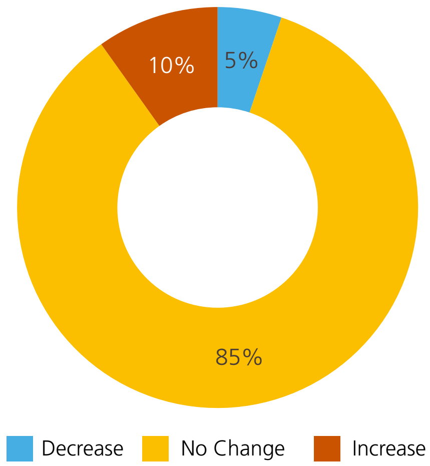


Figure 3.7 Lake total phosphorus trend 2016-2021

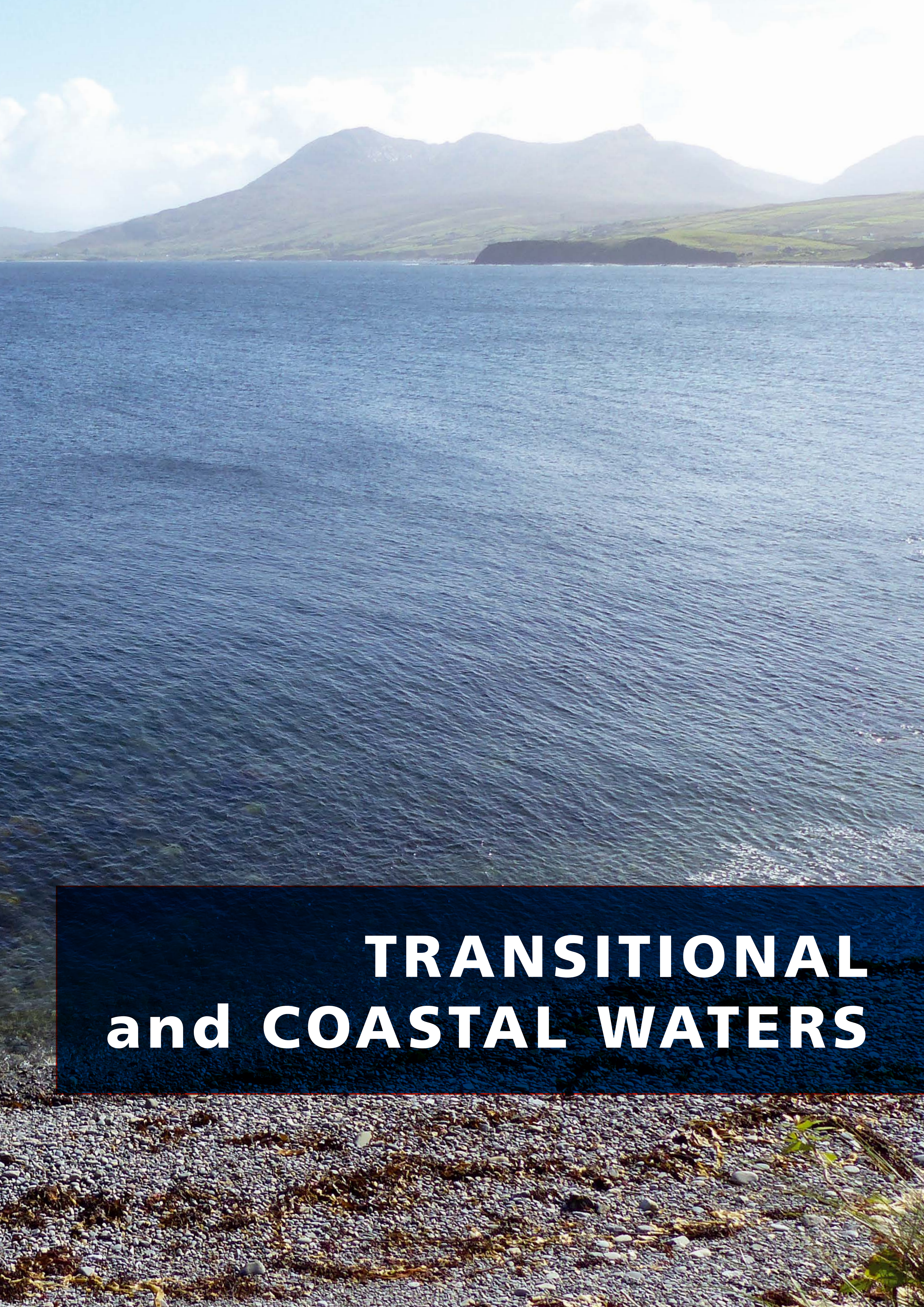
7 Number of lakes that met the criteria to undergo a trend assessment.

8 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.

3.9 Conclusion

Compared to the other water categories the distribution of lakes in the country is uneven, with very few in the midlands and southeast. 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. This distribution tends to reflect the difference in the level of human activity, hydrogeology and soil conditions in these regions. The analysis presented here show that there has been a 2.7% decline in the percentage of lakes in satisfactory status since the last assessment. The majority of declines in lake status are being driven by increasing total phosphorus concentrations that are in turn causing excessive macrophyte and phytoplankton growth which is upsetting the ecological balance of these lakes.

Lakes in the northeast of the country have the highest total phosphorus concentrations that are also rising. Restoring these lakes to at least good status by 2027 represents a significant challenge as they often contain a historical legacy store of phosphorus in their sediments that is slowly being released over time.



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 km^2; coastal 13,325 km^2) and represent a wide variety of types such as lagoons, estuaries, large coastal bays and exposed coastal stretches. Transitional water is the term used to describe estuaries and lagoons. The ecological status of these waters has been assessed using data from 2016 to 2021, as many of the biological assessments are undertaken over a six-year period. The saline waters of Ireland are comprised of 306 water bodies (110 coastal and 196 transitional) and approximately 40% of these are monitored in Ireland's national water quality monitoring programme. Status is applied to the unmonitored water bodies based on information gathered from monitored water bodies that have similar characteristics and pressures.

4.2 Summary for Transitional and Coastal Waters

- 56 transitional water bodies (36%) are in high or good ecological status and 100 (64%) are in moderate, poor or bad ecological status.
- 79 coastal water bodies (81%) are in high or good ecological status and 19 (19%) are in moderate, poor or bad ecological status. In terms of surface area, 95% of coastal waters are in high or good ecological status.
- There has been a marked decline in the percentage of monitored transitional and coastal water bodies achieving their environmental objectives since the 2013-2018 period. There is now 15.7% (11 water bodies) fewer transitional and 9.5% (4 water bodies) fewer coastal waters achieving satisfactory condition respectively.
- 22.2% 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 increased since 2012-2014. Average total nitrogen in 2019-2021 has increased by 11,131 tonnes (20%) and average total phosphorus rose by 394 tonnes (37%).

4.3 National Ecological Status

Figure 4.1 shows that 56 (36%) transitional water bodies are in high or good ecological status and 100 (64%) are in moderate or worse ecological status. Four of these water bodies are in bad ecological status (the worst status class) and 18 are in poor ecological status (Table 4.1) representing 14% of transitional water bodies in the most polluted categories. Map 4.1 gives a geographical representation of the status of our transitional and coastal waters. The transitional waters in less than good status are located primarily in the south and southeast of the country and include the estuarine reaches of the Bandon, Lee, Barrow, Nore, Suir and Slaney rivers.

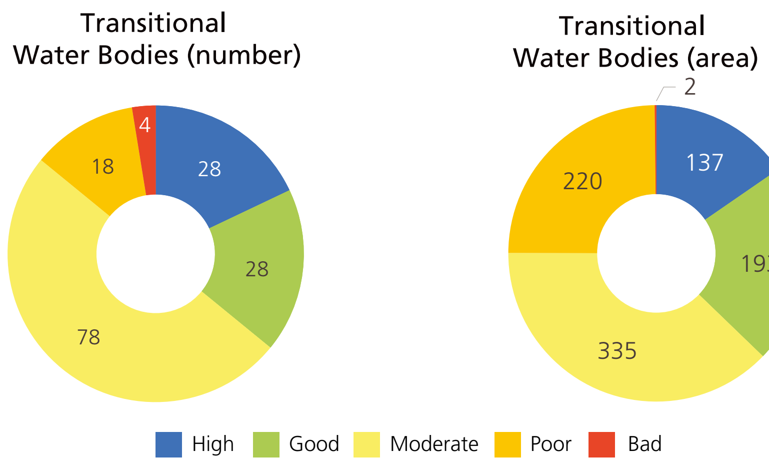


Figure 4.1 Status of transitional waters during 2016-2021, by number and by area (km^2)

Figure 4.2 shows that for coastal waters, 79 water bodies (81%) are in high or good ecological status, with 19 (19%) in moderate or worse status. The majority (95%) of the surface area of coastal waters are in high or good ecological status. One small coastal lagoon, Rincarna Pool North, was in bad status and one, Scattery Island Lagoon, was in poor status.

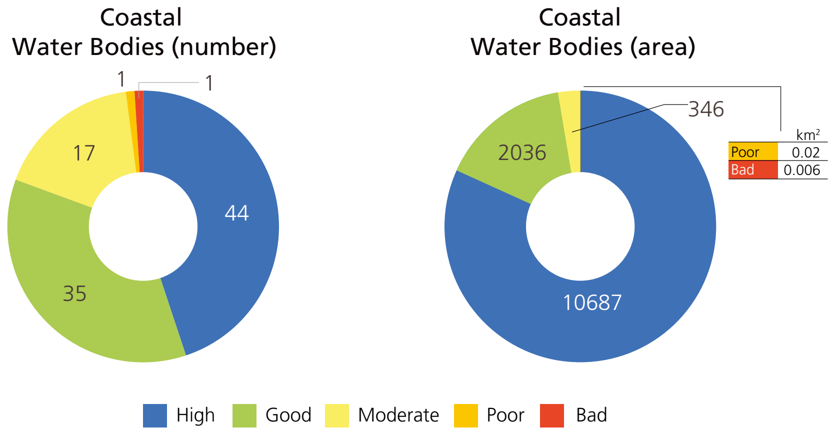
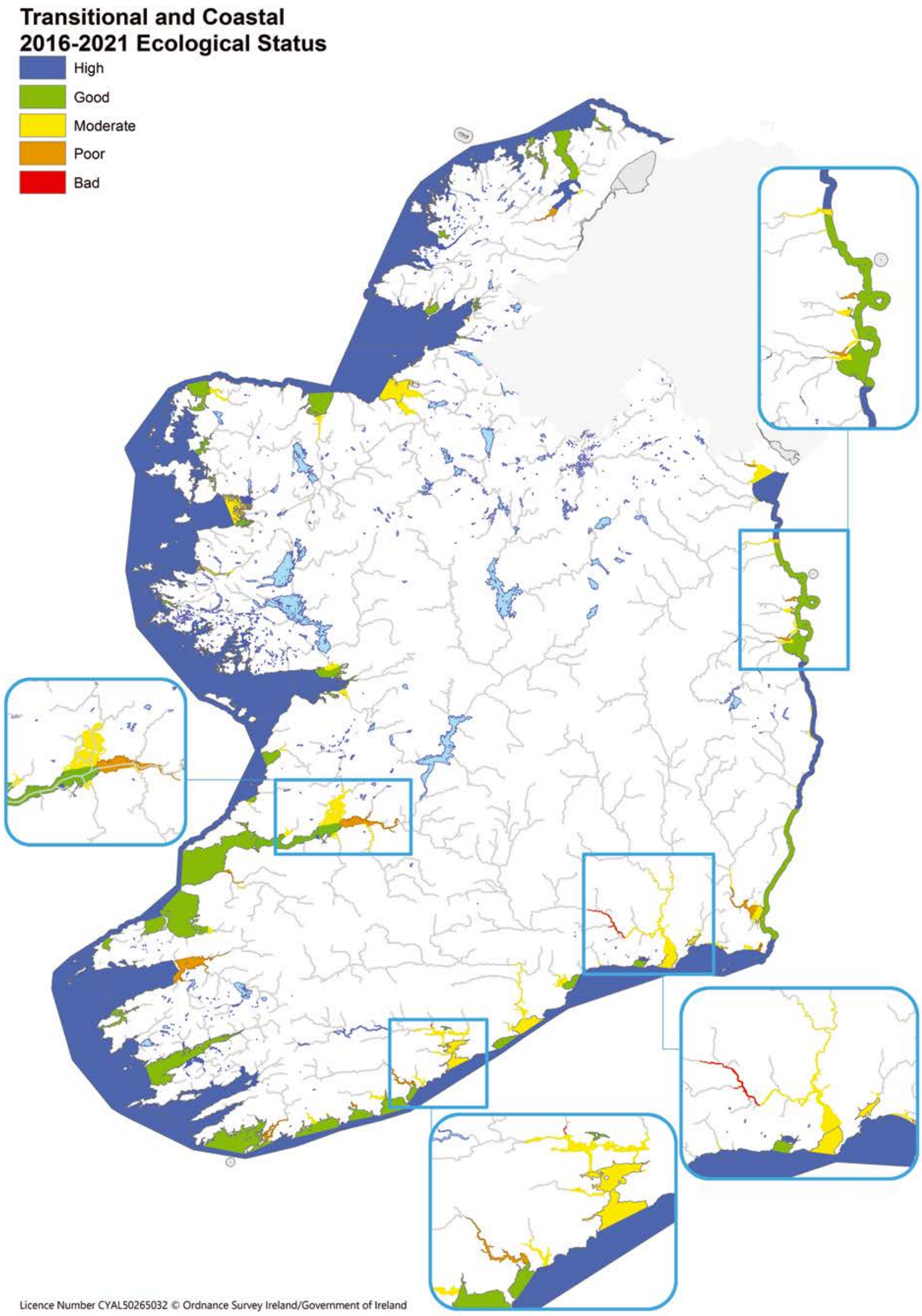


Figure 4.2 Status of coastal waters during 2016-2021, by number and by area (km^2)



Map 4.1 Ecological status of transitional and coastal water bodies during 2016-2021

4.4 Elements Determining Ecological Status

Transitional waters

The biological, physico-chemical and hydromorphological elements used to determine transitional water status is shown in Figure 4.3 and Table 4.1. As can be seen, the biological quality elements which have determined overall status vary across water bodies.

Phytoplankton and fish are key determining biological elements of the overall ecological status of transitional waters, followed by benthic invertebrates. Macroalgae monitoring looks at opportunistic algae (commonly known as sea lettuce blooms). The majority of the areas assessed were in moderate or poor status. Many of these water bodies have had prolonged occurrences of these elevated seaweed blooms. Intertidal seagrass communities are a sensitive and protected habitat. Most areas are in high or good status nationally, however, Rogerstown estuary on the east coast is in poor status for this element.

For the physico-chemical elements, oxygenation conditions are the main element determining status. Reduced concentrations can indicate organic pollution and increased concentrations can indicate excessive algal growth. Three water bodies, out of the 103 assessed, exceeded the phosphorus EQS[9;] namely the Maigue and Deel estuaries that flow into the Shannon estuary and the Tolka Estuary that flows into Dublin Bay.

Table 4.1 Transitional water bodies at poor and bad status indicating main biological element responsible for determining status

Water Body	Status	Element Determining Status
Durnesh Lough	Poor	Other aquatic flora (lagoons)
Shannon Airport Lagoon	Poor	Other aquatic flora (lagoons)
Tolka Estuary	Poor	Macroalgae
Rogerstown Estuary	Poor	Macroalgae
Castletown Estuary	Poor	Phytoplankton
Swilly Estuary	Poor	Phytoplankton
Lower Slaney Estuary	Poor	Phytoplankton
Upper Shannon Estuary	Poor	Angiosperms
Cashen	Poor	Phytoplankton
Limerick Dock	Poor	Fish
Lower Bandon Estuary	Poor	Phytoplankton
Upper Bandon Estuary	Poor	Phytoplankton
Castlemaine Harbour	Poor	Phytoplankton
Clonakilty Harbour	Poor	Macroalgae
Ilen Estuary	Poor	Phytoplankton
Ballyteige Channels	Poor	Other aquatic flora (lagoons)
Lady's Island Lake	Poor	Other aquatic flora (lagoons)
Lough Donnell	Poor	Other aquatic flora (lagoons)
Cuskinny Lake	Bad	Other aquatic flora (lagoons)
Kilkeran Lake	Bad	Other aquatic flora (lagoons)
Upper Suir Estuary	Bad	Phytoplankton
Glashaboy Estuary	Bad	Phytoplankton

9 Salinity related thresholds have been defined for phosphate in both our estuaries and coastal waters. The thresholds are 0.060 mg/l P for fresh to intermediate salinity waters and range from 0.040 to 0.059 mg/l P for intermediate to full salinity waters. Phosphate concentrations above these thresholds can indicate pollution.

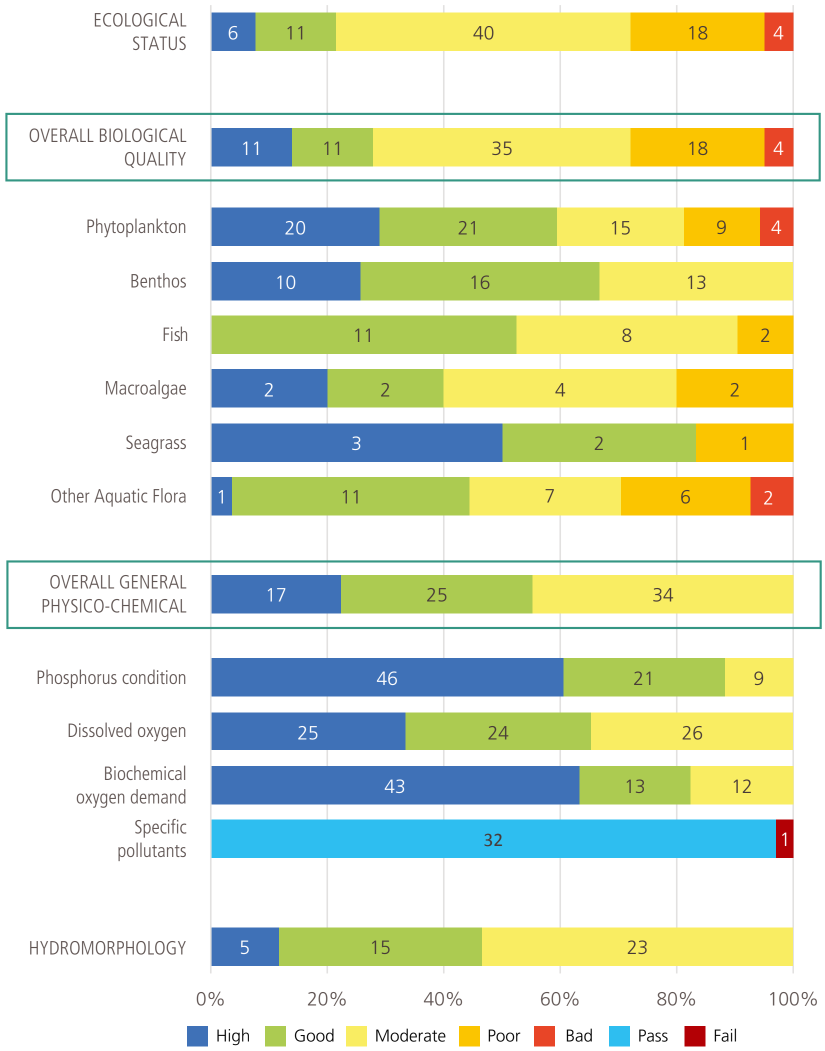


Figure 4.3 Ecological status and condition of individual elements in monitored transitional waters in 2016-2021 (number of waterbodies indicated)

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.

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.

Nine coastal water bodies were in moderate ecological status based on the condition of the benthic invertebrate quality element which can indicate organic pollution and/or habitat degradation:

- Boyne Estuary Plume Zone
- Inner Clew Bay
- Killary Harbour
- Killybegs Harbour

- Outer Cork Harbour
- Sligo Bay
- Waterford Harbour
- Wexford Harbour
- Portavaud East (small lagoon)

This represents a marked decline in the quality of this biological element; specific reasons for this decline are currently being investigated.

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 some 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 and Bannow Bay, the ecological status was moderate due to excessive growth of green algae.

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

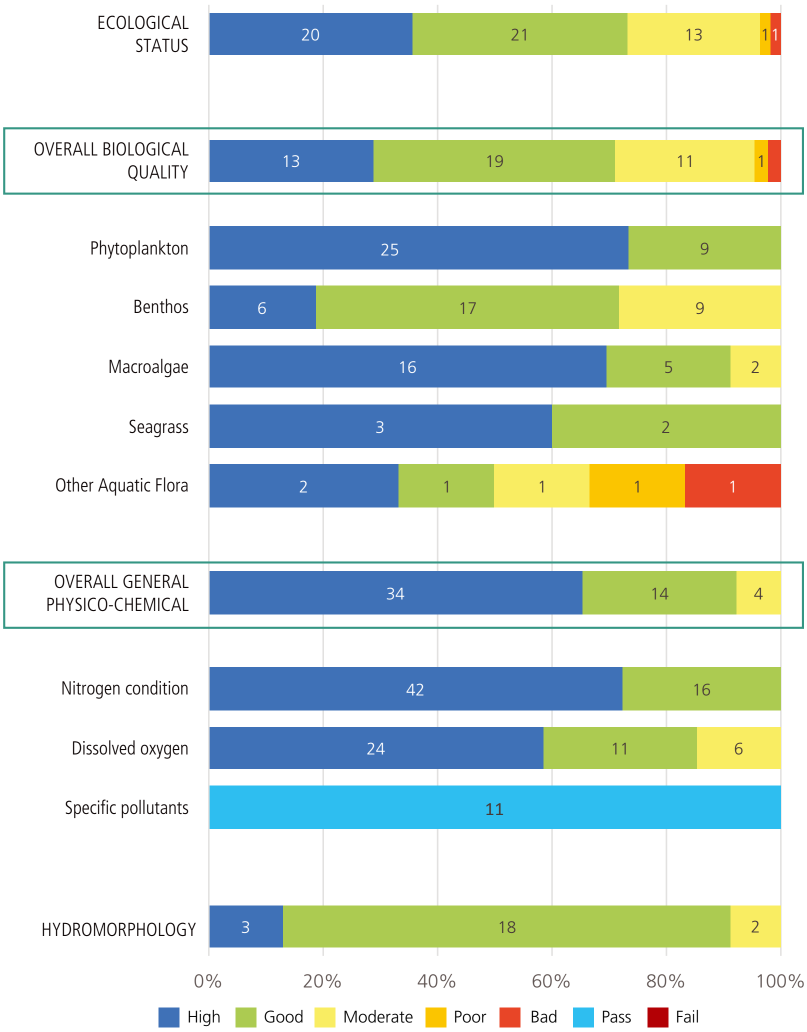


Figure 4.4 Ecological status and condition of individual elements in monitored coastal

waters in 2016-2021 (number of waterbodies indicated)

In coastal waters the main physico-chemical elements assessed are dissolved oxygen (DO) and nitrogen (as dissolved inorganic nitrogen (DIN)). 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:

- Bannow Bay
- Cork Harbour
- Youghal Bay
- Killary Harbour
- Killybegs Harbour

4.5 Hydromorphology in Transitional and Coastal Waters

Hydromorphology was assessed in 43 transitional and 23 coastal waters using the Hydromorphological Quality Index (HQI) developed by the EPA.

For transitional waters, 20 water bodies (47%) were in high or good hydromorphological condition and 23 (53%) were in moderate condition. In coastal waters, two water bodies, Cork Harbour and Outer Tralee Bay, were in moderate condition and the remaining 21 (91%) were high or good condition.

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. The comparisons are done on the same water bodies assessed in each period for consistency. The percentage of transitional and coastal water bodies achieving their environmental objectives have decreased significantly by 15.7% and 9.5% respectively since 2013-2018 (Figure 4.6). Figure 4.7 outlines the change in status class for both transitional and coastal water bodies between both periods; Table 4.2 shows the water bodies that have declined from satisfactory status. One transitional body, Glashaboy Estuary in Co. Cork, declined by 3 classes due to repeated phytoplankton blooms in recent years. These blooms occur when nutrients are in plentiful supply and this estuary had the highest observed nitrate concentration nationally.

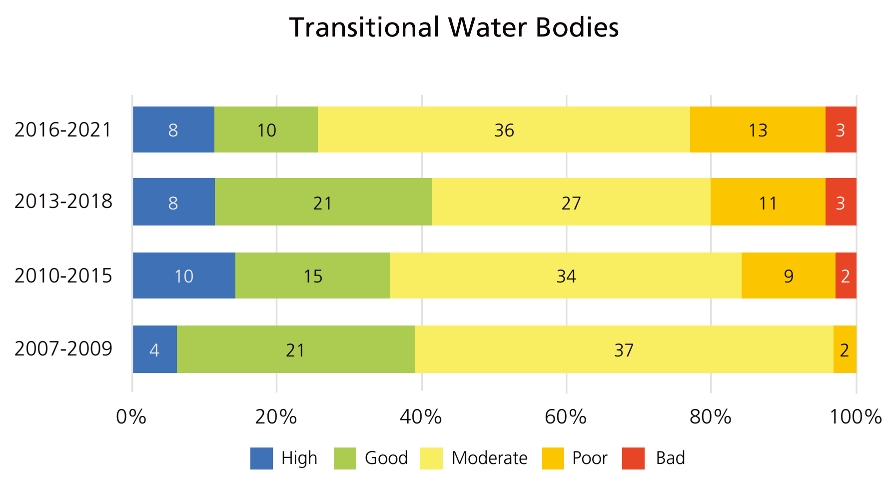


Figure 4.5 Changes in transitional water status since 2007[10] (numbers of water bodies indicated)

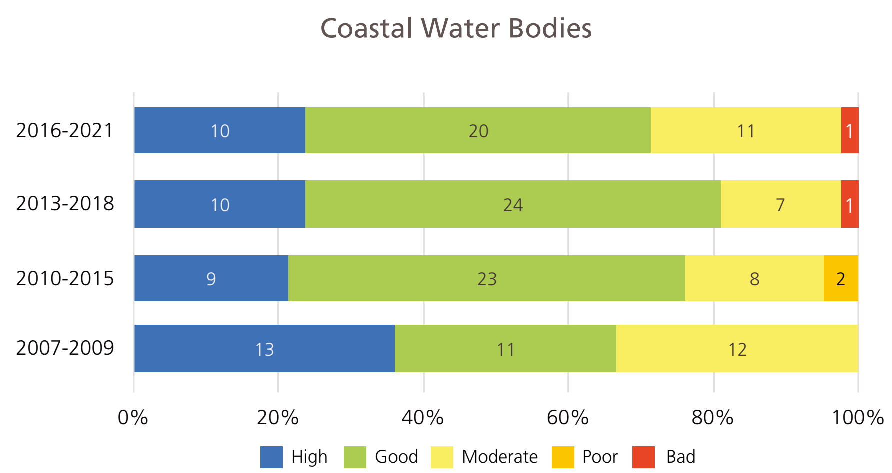


Figure 4.6 Comparison of coastal water status since 2007 (numbers of water bodies indicated)

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

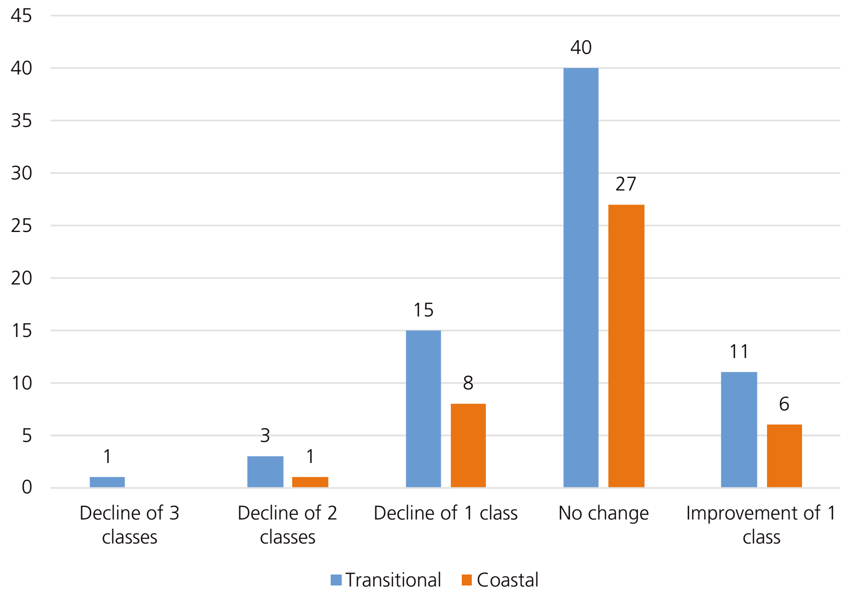


Figure 4.7 Changes in transitional and coastal water status across all status categories since 2013-2018

Table 4.2 Coastal and transitional waters that have declined from high and good status between 2013-2018 and 2016-2021.

Category	Water Body	2013-2018 Status	2016-2021 Status	Driver
Coastal	Killybegs Harbour	Good	Moderate	Benthic inverts and dissolved oxygen
Coastal	Outer Cork Harbour	Good	Moderate	Benthic inverts
Coastal	Sligo Bay	Good	Moderate	Benthic inverts
Coastal	Wexford Harbour	Good	Moderate	Benthic inverts
Coastal	Inner Clew Bay	High	Moderate	Benthic inverts
Transitional	Glashaboy Estuary	Good	Bad	Phytoplankton
Transitional	Castlemaine Harbour	Good	Poor	Phytoplankton
Transitional	Limerick Dock	Good	Poor	Fish
Transitional	Corrib Estuary	Good	Moderate	Phytoplankton
Transitional	Erriff Estuary	Good	Moderate	Fish
Transitional	Liffey Estuary Lower	Good	Moderate	Phytoplankton
Transitional	Lower Suir Estuary	Good	Moderate	Benthic inverts
Transitional	Nore Estuary	Good	Moderate	Fish
Transitional	Sruwaddacon Bay	Good	Moderate	Benthic inverts
Transitional	Upper Barrow Estuary	Good	Moderate	Fish
Transitional	Upper Slaney Estuary	Good	Moderate	Phytoplankton
Transitional	Upper Blackwater Estuary	High	Moderate	Phytoplankton

4.7 Nutrients in Transitional and Coastal Waters

Nitrogen is considered the primary limiting nutrient in coastal systems which controls the growth of phytoplankton and macroalgae while phosphorus or nitrogen can control their growth 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, and this is the time period used for assessment. Salinity related thresholds have been defined for nitrogen and phosphorus concentrations; median nutrient concentrations above the thresholds indicates the presence of increased levels from pollution sources.

Nitrogen Winter Exceedances

Of the 108 estuarine and coastal water bodies assessed, twenty-four (22.2%) 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 water bodies with the highest dissolved inorganic nitrogen concentration were located in the south and southeast:

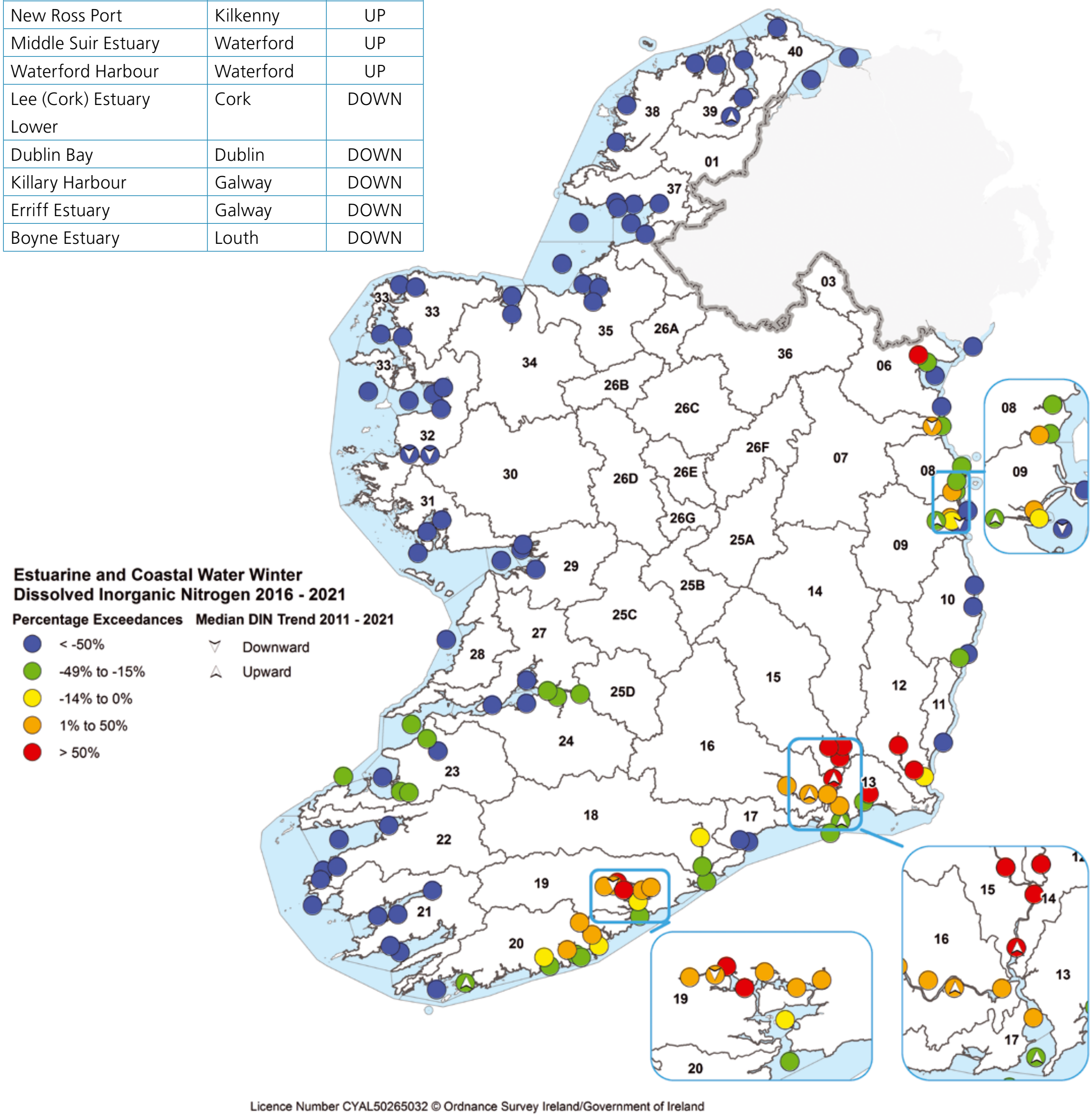
- Glashaboy Estuary, Co. Cork (6.02 mg N/l),
- Corock Estuary, Co. Wexford (4.7 mg N/l)
- Upper Barrow Estuary, Co. Kilkenny (5.2 mg N/l)
- Upper Slaney Estuary, Co. Wexford (5.5 mg N/l)
- Barrow Nore Estuary Upper, Co. Kilkenny (4.9 mg N/l)
- Nore Estuary, Co. Wexford (4.9 mg N/l)

Nitrogen Trends

A trend analysis was undertaken of winter median nitrogen concentrations (as dissolved inorganic nitrogen) in estuarine and coastal water bodies from 2011 to 2021. Of the 39 water bodies included in the analysis, six water bodies showed a significant upward trend. Of particular concern was the upward trend observed in nitrate in the coastal waters of Waterford Harbour. Five water bodies showed a significant downward trend, the remaining water bodies showed no trend (Table 4.3).

Table 4.3 Water bodies with a significant trend in winter median nitrogen concentrations

Water Body	County	Trend
Ilen Estuary	Cork	UP
Swilly Estuary	Donegal	UP
Liffey Estuary Upper	Dublin	UP
New Ross Port	Kilkenny	UP
Middle Suir Estuary	Waterford	UP
Waterford Harbour	Waterford	UP
Lee (Cork) Estuary Lower	Cork	DOWN
Dublin Bay	Dublin	DOWN
Killary Harbour	Galway	DOWN
Erriff Estuary	Galway	DOWN
Boyne Estuary	Louth	DOWN



Map 4.2 Nitrogen winter exceedances above the salinity related assessment thresholds

Phosphorus Winter Exceedances

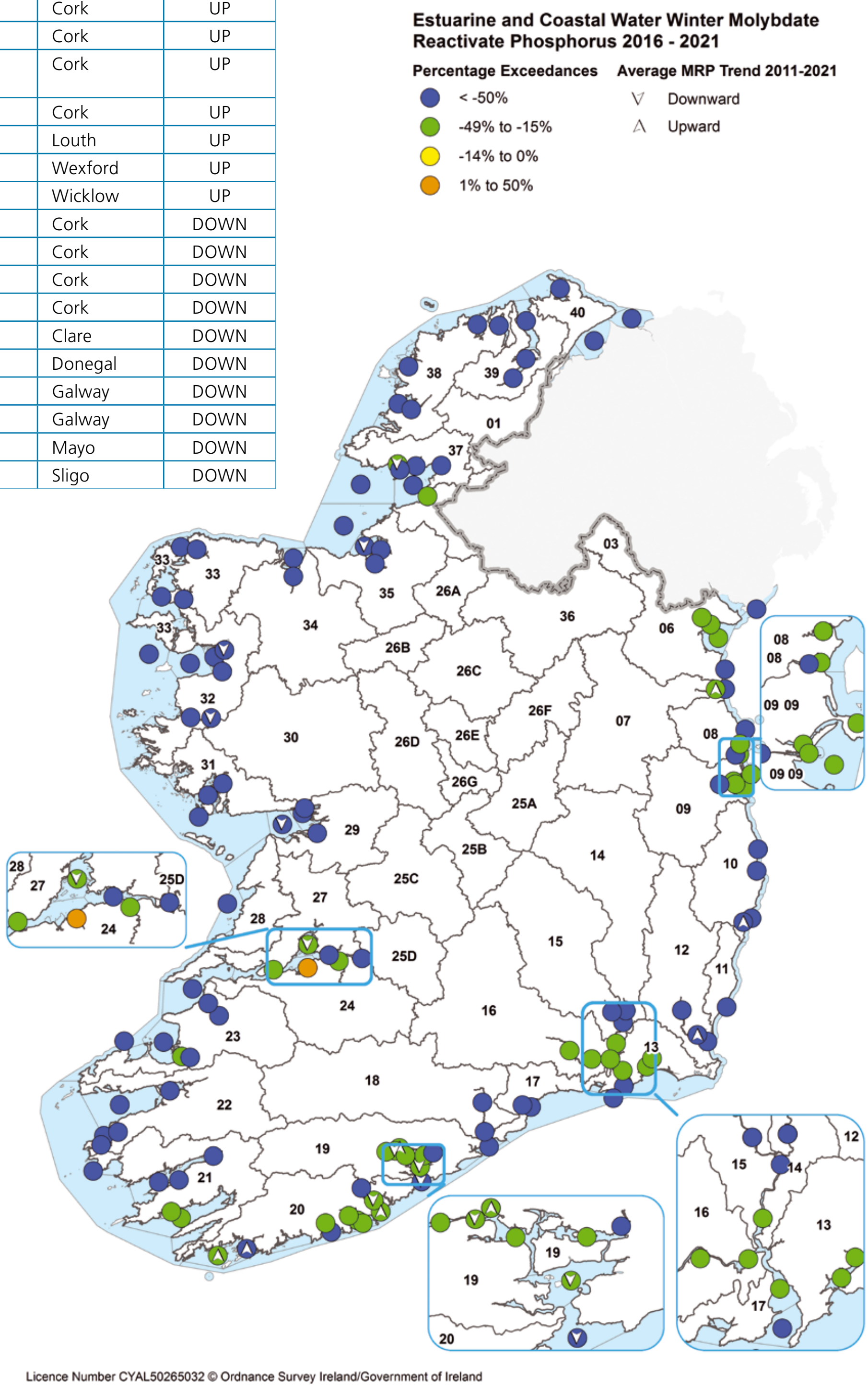
Only two of the 108 water bodies assessed, the Maigue estuary and the Deel estuary in Co. Limerick, exceeded the relevant salinity-related winter phosphorus thresholds (Map 4.3). The majority of estuaries and coastal waters (89%) had median winter phosphorus concentrations less than 0.04 mg/l P (the environmental quality standard for transitional waters), with 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 and the Deel, Co. Limerick.

Phosphorus Trends

Trend analysis was also carried out for winter median phosphorus concentrations (as molybdate reactive phosphorus). Of the water bodies included in the analysis, seven water bodies showed an upward trend, 10 showed a significant downward trend and the rest showed no trend (Table 4.4).

Table 4.4 Water bodies with a significant trend in winter median phosphorus concentrations

Water body	County	Trend
Kinsale Harbour	Cork	UP
Glashaboy Estuary	Cork	UP
Roaring Water Bay	Cork	UP
Ilen Estuary	Cork	UP
Boyne Estuary	Louth	UP
Lower Slaney Estuary	Wexford	UP
Avoca Estuary	Wicklow	UP
Cork Harbour	Cork	DOWN
Lower Bandon Estuary	Cork	DOWN
Lee (Cork) Estuary Lower	Cork	DOWN
Outer Cork Harbour	Cork	DOWN
Fergus Estuary	Clare	DOWN
Killybegs Harbour	Donegal	DOWN
Outer Galway Bay	Galway	DOWN
Erriff Estuary	Galway	DOWN
Newport Bay	Mayo	DOWN
Sligo Bay	Sligo	DOWN



Map 4.3 Phosphorus winter exceedances above the salinity related assessment thresholds

4.8 Nutrient Inputs to the Marine Environment

Monitoring of nutrient inputs from 19 major Irish rivers to estuarine and coastal waters has been ongoing since 1990 as part of the Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR). 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.

Nutrient inputs from Irish rivers have varied over the 31 years since monitoring began (Figure 4.8). Loads of total nitrogen and phosphorus were highest in the 1990s, then decreased until 2013. The reductions indicated the success of national measures aimed at reducing the loss of nutrients from terrestrial sources to surface waters.

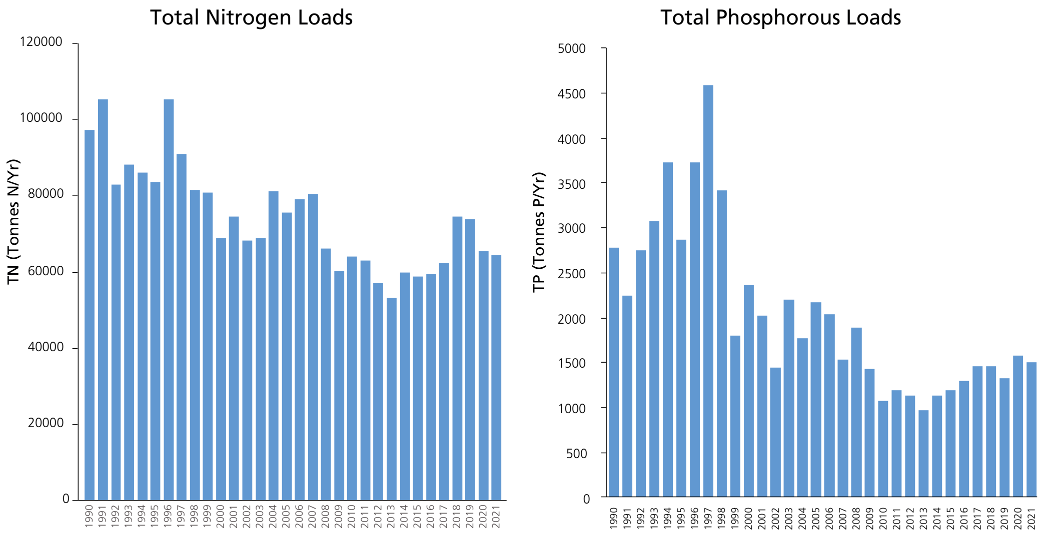


Figure 4.8 Loads of total nitrogen and total phosphorus (tonnes per year) between 1990 and 2021 for all monitored rivers combined

Since 2014 however, the trend has reversed, and nutrient inputs to the marine environment have increased. Average total nitrogen in 2019-2021 has increased by 11,131tonnes (20%) since 2012-2014. Average total phosphorus rose by 394 tonnes (37%) over the same period undoing the gains made over previous years (Figure 4.9). These trends, however, may be showing early signs of stabilising.

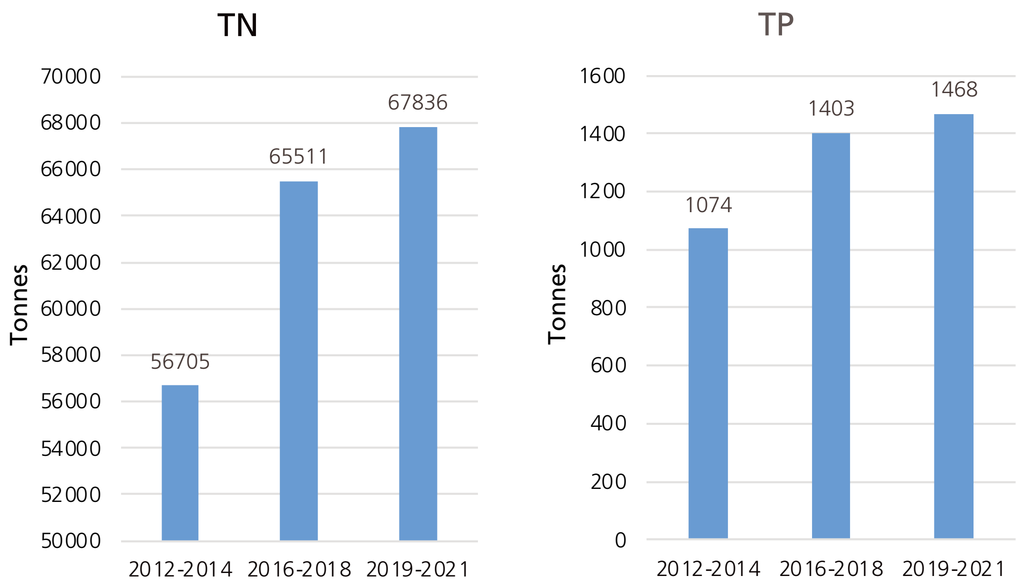


Figure 4.9 Changes in 3-year average total nitrogen and 3-year average total phosphorus inputs to the marine environment between 2012-2014, 2016-2018 and 2019-2021

The average increase in total nitrogen and total phosphorus for each of the monitored catchments is shown in Figure 4.10. Total nitrogen changes are greatest in the Erne, Blackwater, Barrow, Nore and Suir with the estuaries in the southeast currently showing elevated nitrogen levels. The largest increases for total phosphorus are in the Maigue, Blackwater, Nore, Suir and Slaney catchments. Only the Avoca and Lee catchments have shown a net decrease in loads for 2019-2021 compared to 2012-2014.

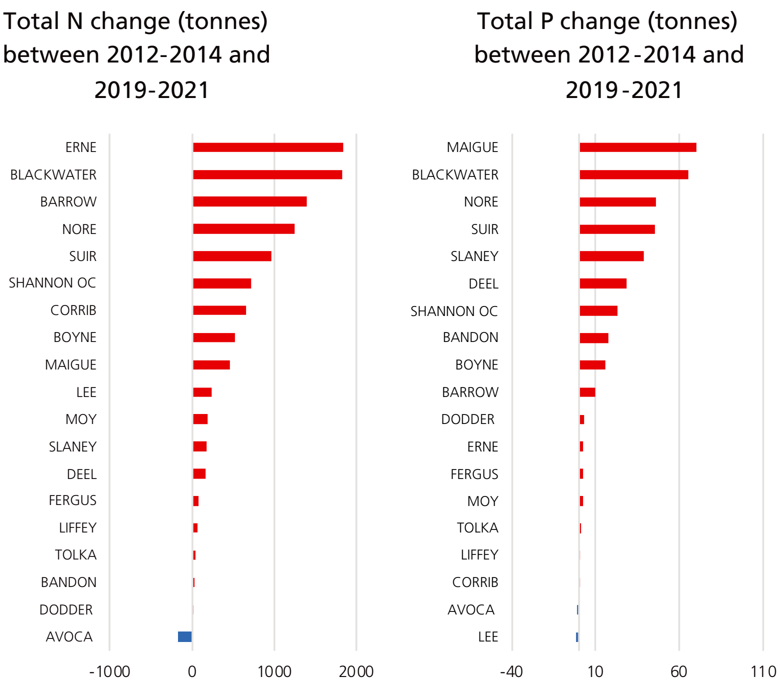


Figure 4.10 Changes in average total nitrogen and average total phosphorus inputs to the marine environment for each of the monitored catchments between 2012-2014 and 2019-2021 (red=increase; blue=decrease)

4.9 Conclusion

Transitional and coastal waters have seen a significant decline in status in this assessment, which is particularly worrying. The increase in nutrient inputs to the marine environment are likely a strong driver of these declines. Most of these increases have been seen in the south and southeast of the country and many of the declines in status are in these areas as well. This continued pressure is now having impacts on the biology of both the estuarine and coastal waters, particularly in the open water (e.g. phytoplankton and fish) and in invertebrates that live on the bottom (benthos). Further analysis is ongoing to better understand what has caused these declines but the preliminary evidence suggests that the primary factor is excessive nutrients.

CHEMICAL STATUS OF SURFACE WATERS

5. CHEMICAL STATUS OF SURFACE WATERS

5.1 Introduction

Surface water bodies (rivers, lakes, transitional and coastal waters) are vulnerable to pollution from certain chemical substances such as pesticides and metals that are known to be harmful to the environment. Assessment of chemical status is how we identify water bodies that are polluted by these substances. This is done by measuring the concentrations of the substances in the water body. Chemical status is assessed against compliance with the Environmental Quality Standards (EQS) Directive[11]. These substances include metals, pesticides and various industrial chemicals.

Some substances, such as mercury and polycyclic aromatic hydrocarbons (PAHs), are known as ubiquitous substances because they can be found nearly everywhere in the environment. Some of these substances can persist for decades even after their emissions have ceased and many are capable of long-range transport from their place of origin (e.g. via atmospheric deposition).

The EQS Directive aims to protect the most sensitive aquatic species from direct toxicity as well as predators and humans that may be exposed to chemical pollution. These EQS's may apply to either water or biota (e.g. fish), or both, depending on which is most appropriate for assessing the impact of that substance. Substances that are bio-accumulative (e.g. mercury), meaning that they accumulate in the tissue of animals such as fish, are often best monitored in biota.

Surface water bodies are monitored for the relevant substances. Where concentrations in excess of the EQS are found for one or more substance the water body is deemed to have failed to achieve good chemical status. Where concentrations are measured below the EQS the water body is deemed to have achieved good chemical status.

5.2 Summary for Chemical Status of Surface Waters

- 173 (50%) of the 349 of surface water bodies assessed failed to achieve good chemical status. This includes failures for ubiquitous substances.
- 41 (12%) of water bodies failed to achieve good chemical status due to non-ubiquitous substances.
- Most of the non-ubiquitous failures detected were due to metals such as cadmium and lead, and the pesticide cypermethrin.

5.3 Monitoring Programme Overview

The chemical monitoring programme uses the surveillance monitoring network of the national water quality monitoring programme to provide a comprehensive and long-term picture of chemical status. The programme is run on a six-year cycle with most sites monitored intensively for one year during the cycle. The 2016-2021 programme included targeted monitoring in areas where there are known or suspected sources of priority substances, for example monitoring for cadmium, nickel and lead close to historic mining sites and for pesticides in rivers that are suspected to have suffered ecological impacts from chemical pollution.

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

Assessment of historic monitoring results and risk assessments are used to inform which are the relevant substances to be included in the programme. Of the 45 substances listed in the EQS Directive, 23 substances are being monitored in rivers and lakes and 34 substances in transitional and coastal waters. The substances are monitored in water in rivers, and in water and biota in lakes, transitional and coastal waters.

The targeted monitoring undertaken in the 2016-2021 monitoring programme and the monitoring of additional substances has resulted in an increase in the number of chemical status failures detected but also has provided better evidence to allow for the identification, protection and restoration of affected water bodies.

5.4 Chemical Status of Surface Waters

Of the 349 water bodies that were assessed for chemical status, 173 (50%) failed to achieve good chemical status due to one or more EQS failure (Figure 5.1). If the failures for ubiquitous substances are removed, then a total of 41(12%) of water bodies failed to achieve good chemical status (Figure 5.2).

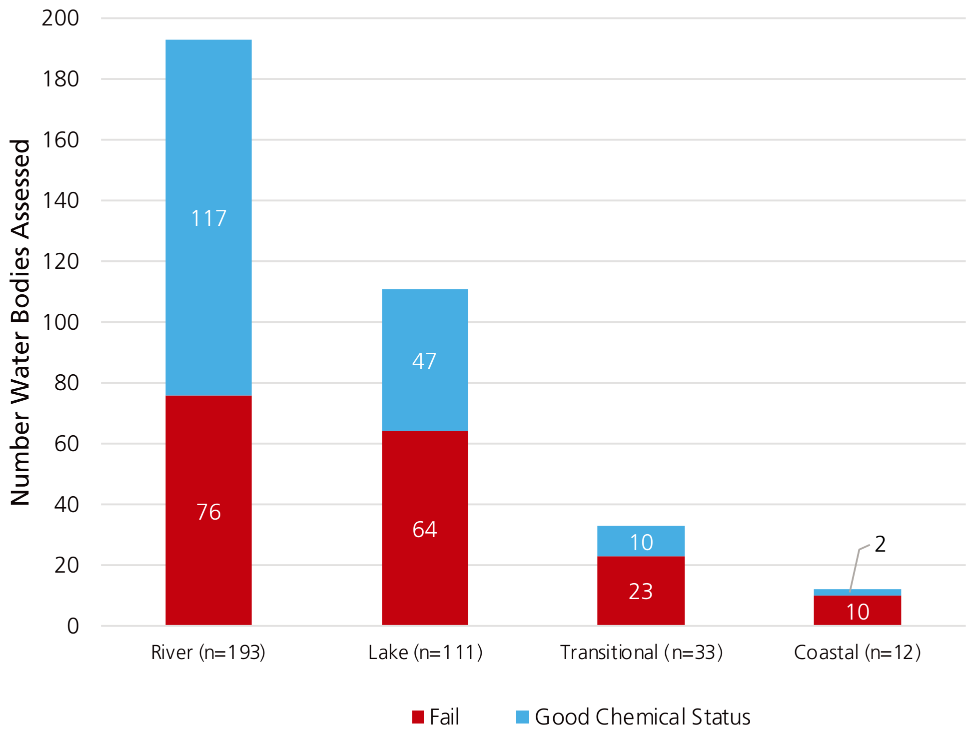


Figure 5.1 Chemical status of assessed water bodies in each water category (includes ubiquitous substances)

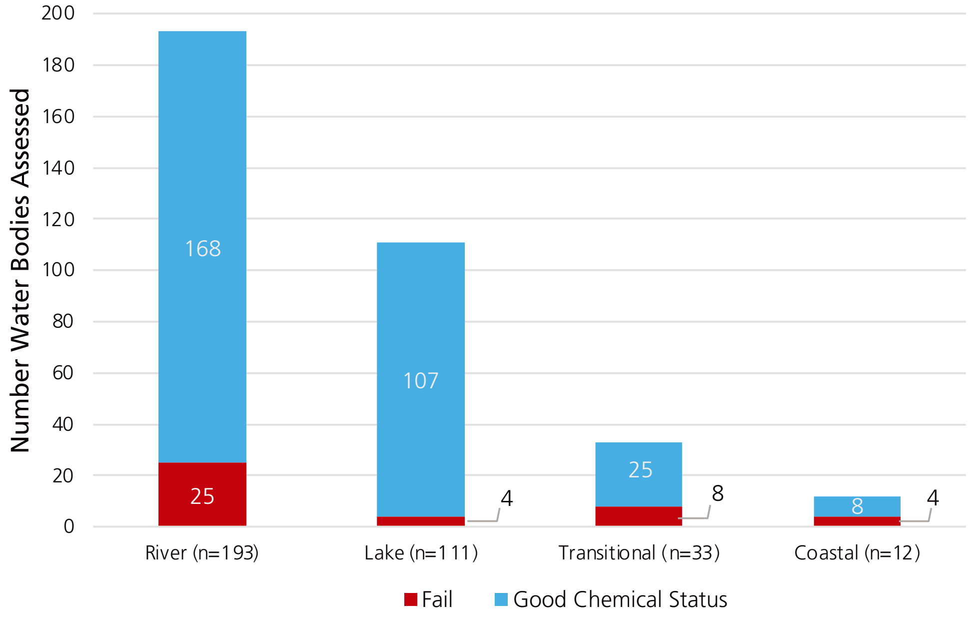


Figure 5.2 Chemical status of assessed water bodies in each water category (excludes ubiquitous substances)

5.5 Substances Determining Chemical Status

In total there were 329 EQS exceedances detected across the 349 water bodies assessed (Figure 5.3).

Polycyclic Aromatic Hydrocarbon substances (PAHs)

37.4% (123) of failures were due to polycyclic aromatic hydrocarbon substances (PAHs), mainly benzo(a)pyrene. PAHs are produced from burning substances containing carbon, such as petrol, diesel, coal, wood and plastics. They can reach water bodies via atmospheric deposition (e.g. rainfall), road run-off and discharges from waste water treatment plants.

Metals and Metalloids

26.4% (87) of failures were due to substances containing metals, mainly cadmium, lead and mercury. Cadmium and mercury are released into the atmosphere from the burning of fossil fuels and end up in water bodies via atmospheric deposition. Transboundary atmospheric depositions from volcanic eruptions and other natural sources can also result in mercury contamination of water bodies. Historic mining activities and emissions from waste water treatment plants are sources of cadmium, lead and mercury.

Poly Brominated Diphenyl Ethers (PBDEs)

19.1% (63) of failures were due to poly brominated diphenyl ethers (PBDEs). These substances are used as flame retardants in the manufacture of household goods, for example, and find their way into water bodies via emissions from wastewater treatment plants.

Herbicides and Pesticides

10.3% (34) of failures were due to pesticides and herbicides, mainly heptachlor and cypermethrin. Heptachlor is no longer in use as an insecticide, but it is still commonly detected in biota at concentrations above the EQS standard. Cypermethrin is used as an insecticide and herbicide in forestry and agriculture. It was detected above the EQS standards in river water samples from the northwest (see Box 5.1) and the southeast, where it was also routinely detected in transitional water samples.

Perfluoro-octanyl Sulphonic Acid (PFOS)

2.7% (9) of the EQS failures were due to per and poly fluoroalkyl substances such as perfluoro-octanyl sulphonic acid (PFAS). These substances are widely used in the manufacture of stain resistant clothes and household products as well as in industrial processes and fire-fighting foams. Emissions from waste water treatment plants are the main source.

Poly Chlorinated Biphenyl (PCBs)

The remaining 4% (13) of failures were due to detections of poly chlorinated biphenyl (PCBs) in biota samples at concentrations above the EQS. These substances were used in the manufacture of electrical equipment up until the 1970s but have not been used in manufacturing since. However, due to their persistence and bioaccumulation they continue to be found in biota samples at concentrations above the EQS.

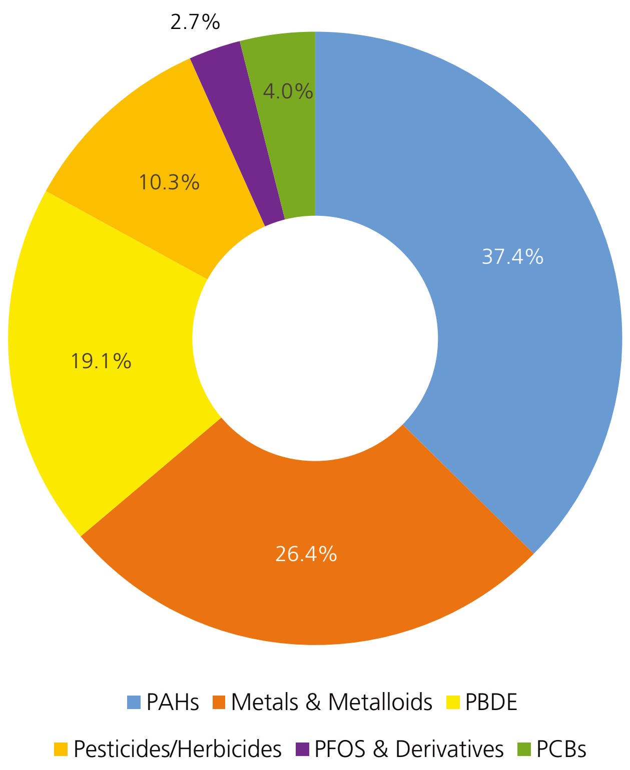


Figure 5.3 Percentage of EQS failures by priority substance

Ubiquitous Substances

The assessment of surface water chemical status takes account of ubiquitous substances that are already widely distributed in the environment. These are substances that persist in the environment for many years even after their use has ceased. PAHs, PCBs, heptachlor and mercury are examples of ubiquitous substances. Due to their persistence and their ability to bioaccumulate in biological food webs they continue to be detected at concentrations above EQS standards in biota. Reducing concentrations of these substances in water bodies is extremely challenging. Of the 173 water bodies that failed chemical status, 132 (76%) failed due to the presence of ubiquitous substances only. Most of the failures for non-ubiquitous substances were detected in water samples and were due to metals such as cadmium and lead, cypermethrin, and PFOS and its derivatives.

5.6 Conclusion

The monitoring for chemical status takes place at long term surveillance sites in addition to targeted monitoring at sites suspected to have chemical pollution. The proportion of monitored surface water bodies failing to achieve good chemical status (50%) is in line with the EU average of 46%[12].

Many of the chemical status failures are due the presence of substances that are either the legacy of historical pollution (e.g. PCBs from waste electrical equipment) or indirect pollution (e.g. mercury and PAHs from combustion of fossil fuels). It can be expected that the concentrations of these substances will fall as the sources are reduced. Controls on these substances at EU and national level are likely to be more appropriate than catchment specific remediation measures. Measures to achieve good chemical status may be more appropriate at the catchment or water body level for substances such as cypermethrin, PFOS and its derivatives, cadmium or lead.

12 https://www.eea.europa.eu/publications/state-of-water

Box 5.1- Cypermethrin Monitoring in Donegal

Concerns about the general decline in water quality and the overall ecological condition of some rivers in Donegal highlighted a need to increase the number of chemical monitoring stations in the region to characterise the stressors on these declining rivers. Some of the biological assessments of the rivers in the county indicated moderate or poor to bad ecological quality conditions. In some cases the number of macroinvertebrate species being recorded in the rivers was so greatly reduced that a toxic chemical effect was suspected. The general physico-chemical assessments, where available, did not indicate nutrient pollution.

Donegal has the largest number of sheep per county at 535,949 in 2020[13] and forestry covers 11% of the land area (55,534Ha)[14]. It was suspected that a possible cause for the decline in the river macroinvertebrates in the area could be from pesticides such as cypermethrin from sheep dipping or forestry activity in these areas.

Cypermethrin commonly enters aquatic ecosystems as a result of soil erosion and run-off from agricultural and forestry applications[15]. Although cypermethrin has a low toxicity for mammals and birds, low concentrations of cypermethrin are found to have detrimental effects on aquatic ecosystems, as aquatic invertebrates and fish are highly sensitive to cypermethrin.

A project commenced in 2020 which involved additional monitoring at a number of river sites in Donegal (see Table) for chemical substances including the pesticide cypermethrin. The sites chosen for this additional chemical monitoring project consisted of 19 operational monitoring river sites which were sampled on four occasions and two surveillance sites (Ballyhallan and Eany rivers) which were sampled on eleven occasions. These sites were chosen because their biological communities were exhibiting what seemed to be a significant impact from suspected chemical toxicity in their most recent surveys.

River (no. on map)	Site code	Sampling point Description
1. BUNADAOWEN	RS01B010100	Br. u/s Mourne Beg Confluence
2. CLOGHER (FINN)	RS01C060050	Br Sw Letterkillew
3. DEELE (DONEGAL)	RS01D010040	Bridge N. of Aughkeely
4. DEELE (DONEGAL)	RS01D010200	2nd Br d/s Br near Newtown
5. ELATAGH	RS01E020100	Br N of Stranabrack Lr
6. FINN (DONEGAL)	RS01F010400	Bridge due S. of Cloghan
7. MOURNE BEG	RS01M010200	Bridge S.W. of Tonreagh
8. REELAN	RS01R010300	Bridge E. of Carrickagh
9. BALLAGHDOO	RS37B010050	Br WNW Meenychanon
10. BALLAGHDOO	RS37B010200	Bridge in Kilcar

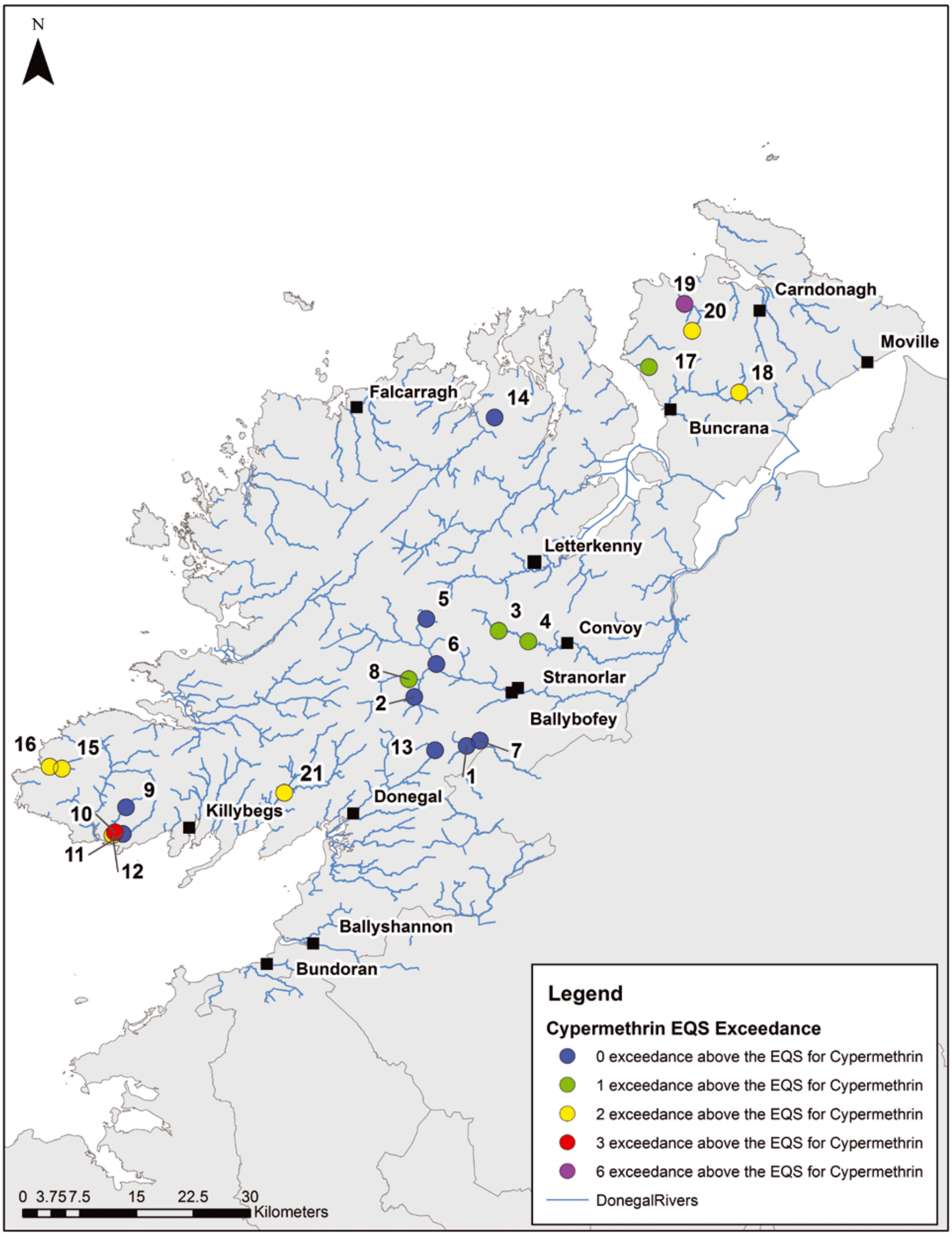
13 https://data.gov.ie/dataset/dafm-national-sheep-census-2020
14 https://assets.gov.ie/109397/d0d9f99b-b556-4f0f-86a0-5211354bd1c2.pdf
15 https://consult.environment-agency.gov.uk/++preview++/environment-and-business/challenges-and-choices/user_uploads/cypermethrin-pressure-rbmp-2021.pdf

River (no. on map)	Site code	Sampling point Description
11. GLENADDRAGH	RS37G020150	Drumnannagle Br. (I.5km E of Kilcar)
12. GLENADDRAGH	RS37G020200	500 m d/s Ballaghdoo River
13. LOWERYMORE	RS37L010100	Barnes Bridge
14. GLEN (LACKAGH)	RS38G040900	Bridge W. of Glen
15. MURLIN	RS38M030250	Ford 1km u/s Gannew Br
16. MURLIN	RS38M030400	Straid Bridge
17. AGHAWEEL	RS39A010300	Bridge S. of Ballyannan
18. OWENNASOP	RS39O050100	Bridge at Stracarragh
19. BALLYHALLAN	RS40B010200	Bridge u/s Clonmany River
20. CLONMANY	RS40C010050	Br S. E. of Cloughglass
21. EANY WATER	RS37E030300	Just d/s Eany Beg/More confl

The results of the study showed widespread detection of cypermethrin, with 26% of individual sample results showing levels above the surface water annual average EQS (0.00008ug/l). 11% of all results were above the Maximum Allowable Concentration (MAC)EQS (0.0006ug/l) for an individual sample. Exceedances for cypermethrin were observed particularly in southwest Donegal (Ballaghdoo, Glenaddragh, Eany Water and Murlin rivers) and in north Donegal (Ballyhallan and Clonmany rivers). Several of the sites where high exceedances of cypermethrin were identified, remain in poor ecological condition.

The Environmental Protection Agency has prepared the National Hazardous Waste Management Plan (NWHMP) for Ireland covering a six-year period from 2021 to 2027. The plan sets out the priorities to be pursued over the next six years and beyond to improve the prevention and management of hazardous waste. One of the key recommendations of the NWHMP is to:

- Establish a national cross-agency forum to focus on the appropriate management of spent sheep dip to prevent environmental pollution.


N
Carndonagh
Moville
Falcarragh
Buncrana
Letterkenny
Convoy
Stranorlar
Ballybofey
Killybegs
Donegal
Ballyshannon
Bundoran
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
Legend
Cypermethrin EQS Exceedance
0 exceedance above the EQS for Cypermethrin
1 exceedance above the EQS for Cypermethrin
2 exceedance above the EQS for Cypermethrin
3 exceedance above the EQS for Cypermethrin
6 exceedance above the EQS for Cypermethrin
DonegalRivers
0 3.75 7.5 15 22.5 30
Kilometers

GROUNDWATER

6. GROUNDWATER

6.1 Introduction

Groundwater originates as rainfall 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.

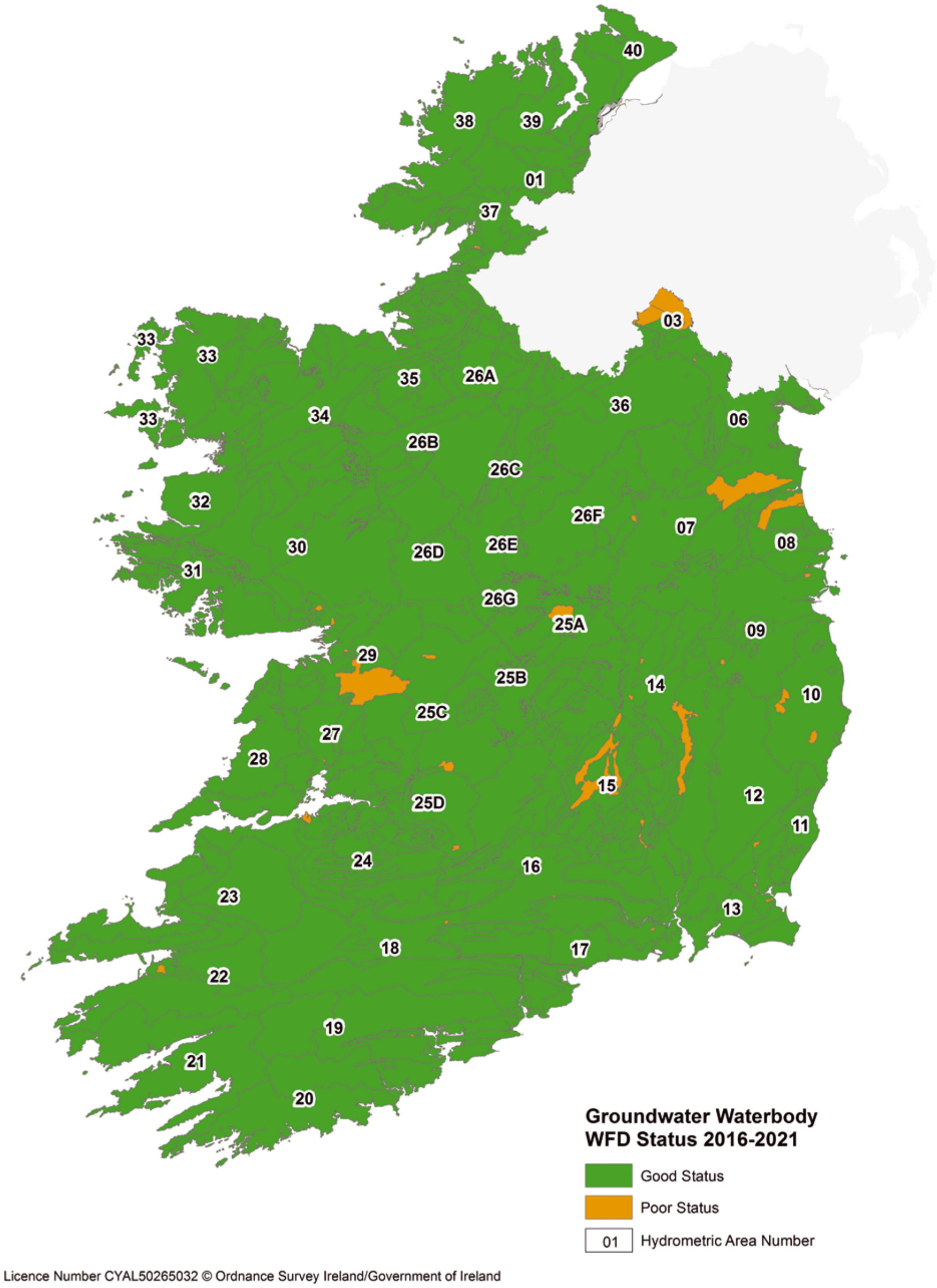
For management purposes, groundwater in Ireland is assigned, assessed and managed within 514 groundwater bodies, which range in size from less than 1 km^2 to 1,887 km^2.

6.2 Summary for Groundwater

- 92% (470) of groundwater bodies are in good chemical status and 99% of groundwater bodies are in good quantitatve status. 91% of bodies met both objectives, accounting for 97% of the country (69,519 km^2) by area.
- 8% (42) of groundwater bodies were in poor chemical status, a net increase of four poor status groundwater bodies compared to the previous assessment period of 2013-2018.
- Two groundwater bodies failed to meet the quantitative status objective, which is the same number of groundwater bodies as the previous assessment period.
- The average nitrate concentration in groundwater was below the threshold value of 37.5 mg/l NO_3 at 96% of monitoring locations during 2016-2021.
- The south and southeast 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 2016.
- The average phosphate concentration in groundwater was below the threshold value of 0.035 mg/l P at 93% of monitoring locations, which is the same as the previous assessment period of 2013-2018.

6.3 National Status

Of the 514 groundwater bodies, 470 (91%) met their good chemical and good quantitative status objectives in 2016-2021 (Map 6.1). Of the 44 poor status water bodies, 42 failed to meet the chemical status objective and two failed to meet the quantitative status objective. Approximately 75% of the poor chemical status groundwater bodies are small groundwater bodies (0.4 to 16.1 km^2) and the significant pressures at these locations relate to largely historical 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, with abstraction pressures (Bettystown).



Map 6.1 Groundwater body status 2016-2021

6.4 Elements Determining Status

Groundwater status is determined using five chemical and four quantitative tests[16]. Each test is applied independently and the results are combined to give an overall assessment of groundwater body chemical and quantitative status. 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. The worst result of the chemical and quantitative assessments is reported as the overall groundwater body status. The tests are as follows:

Chemical Status Classification Tests

- Saline (or other) Intrusions
- Impact of Groundwater on Surface Water Ecological/Chemical Status
- Groundwater Dependent Ecosystems (GWDTE) - Chemical Assessment
- Drinking Water Protected Area
- General Chemical Assessment

Quantitative Status Classification Tests

- Saline (or other) Intrusions
- Impact of Groundwater on Surface Water Ecological/Quantitative Status
- Groundwater Dependent Ecosystems (GWDTE) - Quantitative Assessment
- Water Balance

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

16 Details of the groundwater status tests are available in the EPA report Methodology for Establishing Groundwater Threshold Values, the Assessment of Chemical and Quantitative Status for Groundwater and Groundwater Trends https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/groundwater-threshold-values-and-assessment-of-chemical-and-quantitative-status.php

Table 6.1 Summary of groundwater status

Groundwater assessment	2016-2021 Summary (514 GWB)		2013-2018 Summary (514 GWB)	
	Good status	Poor status	Good status	Poor status
General Chemical	482	32	481	33
Drinking Water	507	7	512	2
Surface Water Quality	510	4	510	4
GWDTE Chemical	512	2	512	2
Intrusions	514	0	514	0
Overall chemical status	**472**	**42**	**476**	**38**
Water Balance	513	1	513	1
GWDTE Quantity	513	1	513	1
Surface Water Quantity	514	0	514	0
Intrusions	514	0	514	0
Overall quantitative status	**512**	**2**	**512**	**2**
Overall Status	**470**	**44**	**474**	**40**

Overall there has been a slight decline in groundwater status. The number of groundwater bodies failing to meet their status objective has increased by four (eight declined in status to poor and four improved in status to good) compared to the previous assessment period of 2013-2018.

Approximately 75% (32) of the poor chemical status groundwater bodies relate to contamination from historical mines, landfills and industrial licensed sites. The overall number of poor status groundwater bodies associated with historical mining, industrial and waste sites was the same as the previous assessment period of 2013-18. The status of one former industrial site improved to good status; however, this was offset by a groundwater body associated with a historical waste facility which was assigned poor status. The status of one cross-border groundwater body (Belcoo Boho) improved to good status compared to the previous assessment.

In relation to groundwater bodies which supply drinking water, seven groundwater bodies were assigned poor chemical status, including two cross-border groundwater bodies. The assignment of poor status was due to exceedances of the standards for nitrate in four groundwater bodies, ammonium in two groundwater bodies and mercury in one groundwater body. Overall, this is a net increase of five groundwater bodies at poor drinking water status compared to the previous assessment.

Three of the four poor status groundwater bodies associated with the Surface Water Quality Test are due to groundwater contributing metals to rivers which are at less than good status in the historic mining areas of Avoca, Tynagh and Silvermines. The fourth poor status groundwater body associated with this test is a cross-border groundwater body (Cooneen Water) where phosphate was identified by the Northern Ireland Environment Agency (NIEA) as the failing parameter.

The ecological and water quality 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. The groundwater bodies relating to both turloughs remain at poor status which is the same as the previous assessment 2013-2018.

6.5 Nutrients

Overall, the average annual nitrate concentration was below the groundwater threshold value of 37.5 mg/l NO_3 at 96% of the monitoring locations over the assessment period 2016-2021.

Figure 6.1 shows that nitrate concentrations in our groundwaters are relatively unchanged since 2016 despite an increase in concentrations in 2019 and 2020. However, the percentage of monitoring stations with nitrate concentrations less than 8 mg/l NO_3 and less than 25 mg/l NO_3 decreased by 1.6% and 2.1% respectively. The percentage of monitoring sites greater than 25 mg/l NO_3 increased by a corresponding 3.6% over the period 2016-2021.

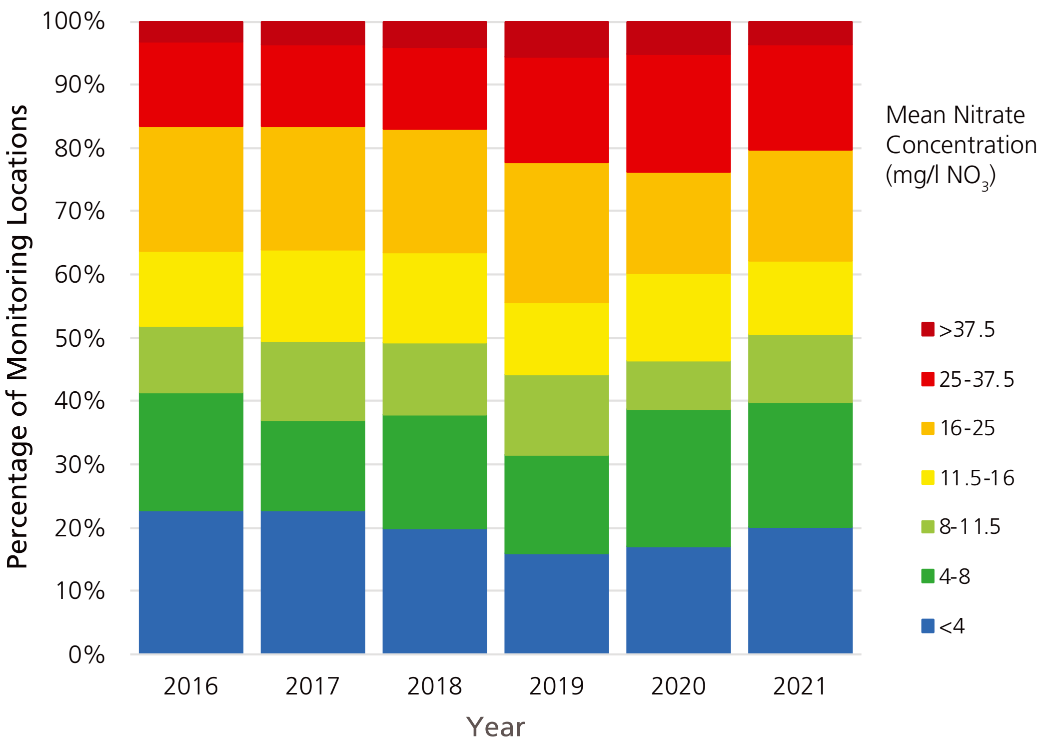
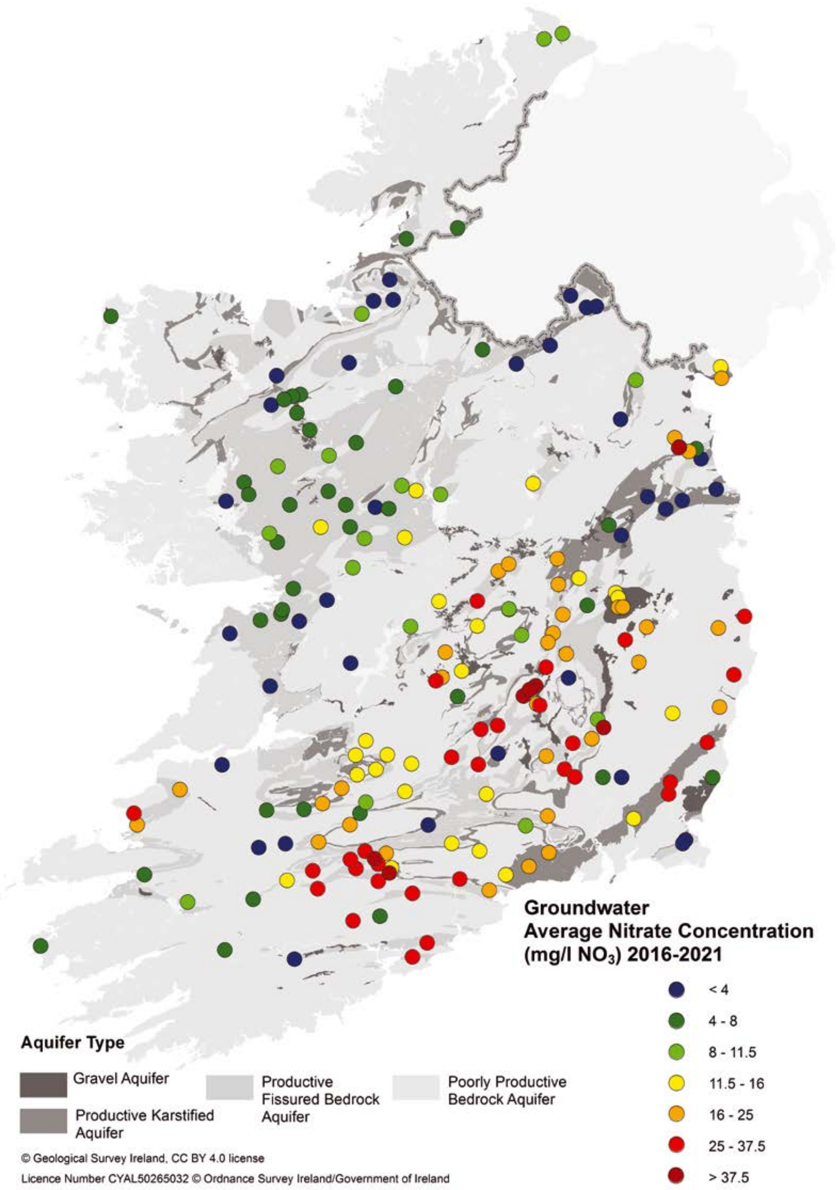


Figure 6.1 Average nitrate concentration in groundwater from 2016 to 2021

The most recent data from 2021 indicates that there are seven monitoring locations with an average nitrate concentration greater than 37.5 mg/l NO_3, all of which are water supplies. One of these locations (Cullohill in Durrow Groundwater body) had average concentrations above 50 mg/l NO_3, which is the drinking water standard, and therefore requires additional treatment to ensure that the water supplied does not breach the drinking water standards at the tap. An additional monitoring point in the Durrow groundwater body (Durrow PWS, Presentation Convent Well) and monitoring points in three other groundwater bodies (Athy-Bagnelstown Gravels, Wilkinstown and Stoneyford Gravels) had statistically significant upward trends in nitrate concentration, which were projected to be greater than the drinking water standard, therefore, these four groundwater bodies were assessed as poor status under the drinking water protected area test.

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 southeast of the country 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 2016. This is attributed largely to the impact of nutrient losses from agricultural sources.



Map 6.2 Average nitrate concentrations in groundwater 2016-2021

The average phosphate concentration in groundwater was below the threshold value (0.035 mg/l P) at 93% of the monitoring locations during 2016-2021.

Figure 6.2 indicates that phosphate concentrations in groundwater have remained broadly consistent from 2016-2021. However, there has been a 3.5% decrease in the percentage of monitoring points with concentrations less than 0.015 mg/l P (the lowest concentration category) over the same time period.

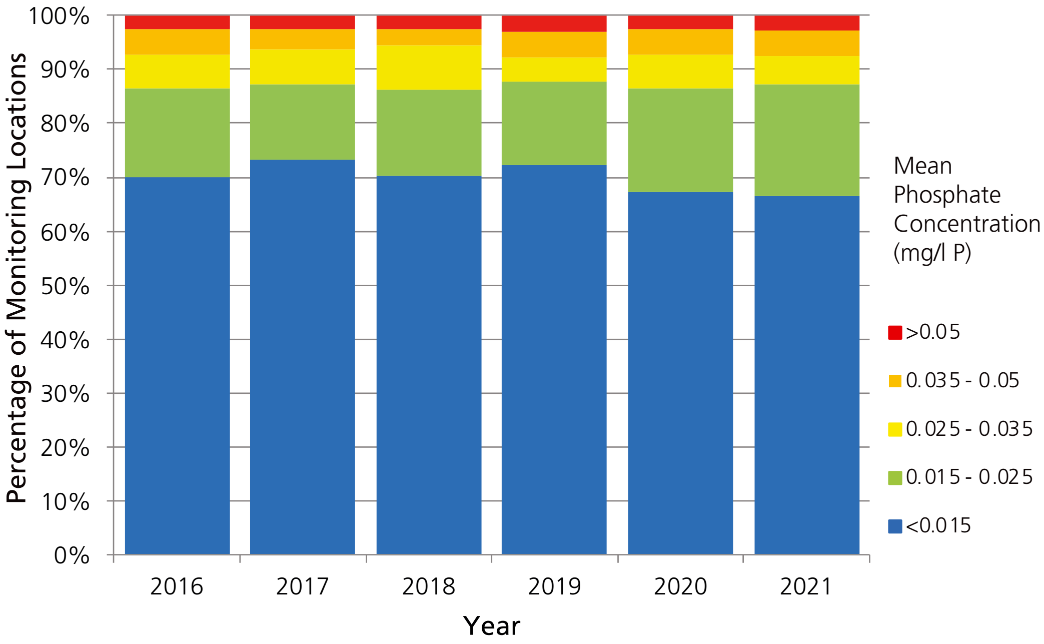
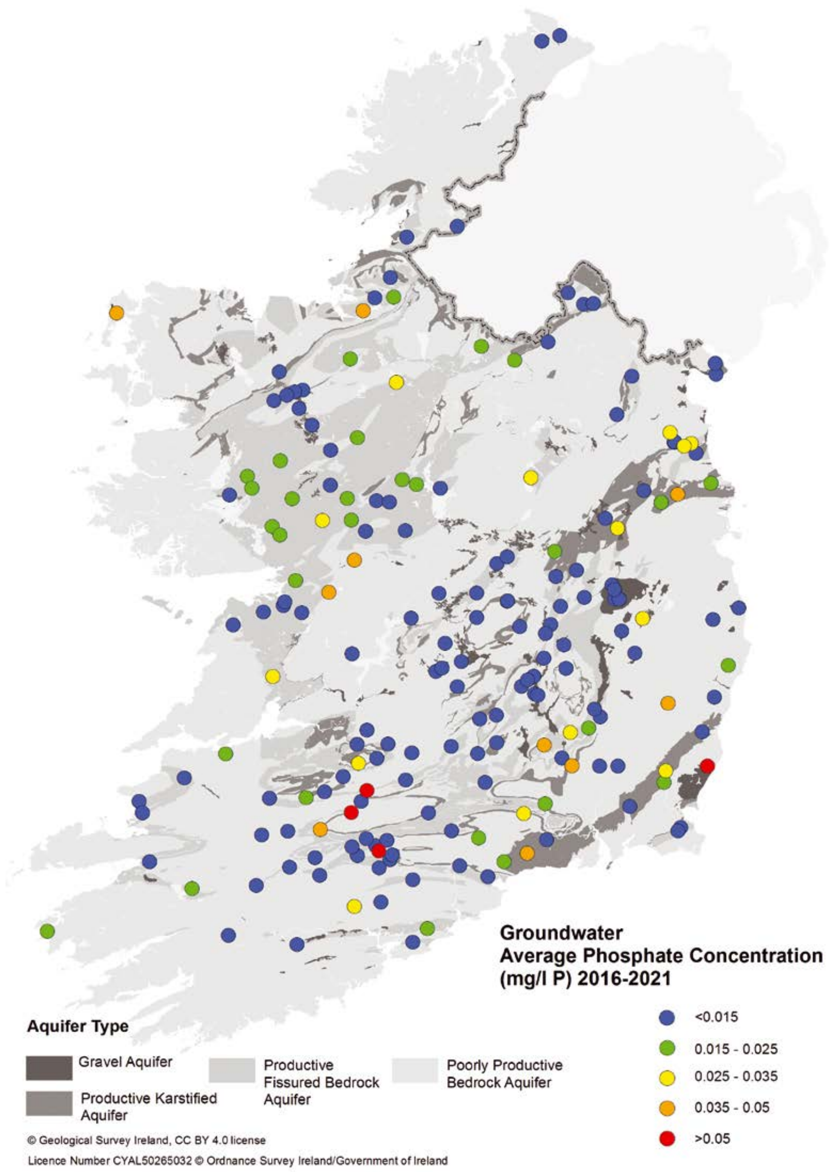


Figure 6.2 Average phosphate concentrations in groundwater from 2016 to 2021

Of the 14 monitoring locations with average 2016-2021 concentrations above the phosphorus threshold value (0.035 mg/l P), four had concentrations greater than 0.05 mg/l P (Map 6.3). These groundwaters could be a possible pressure on the rivers in the associated catchments. Therefore, management measures should also consider the groundwater pathway in these catchments.



Map 6.3 Average phosphate concentrations in groundwater 2016-2021

6.6 Hazardous Substances and Pesticides

A screening analysis for a wide suite of hazardous substances (volatile and semi-volatile organic chemicals, pharmaceuticals and PFAS type compounds) and pesticides in groundwater was undertaken in 2020 at 197 groundwater monitoring stations across the groundwater monitoring network. This screening, along with the screening undertaken from 2007-2009 and 2014 has shown that very few of these substances are found in groundwater in Ireland, and where they are found, they are typically at low concentrations. However, as part of monitoring undertaken under licence conditions, 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 and classified as being at poor chemical status, with measures to manage the contamination forming part of the conditions of the licence.

6.7 Conclusion

The majority (91%) of our groundwaters are in a satisfactory condition, which is a positive outcome. Groundwater quality in the country has been stable generally albeit with a slight increase in the number of groundwater bodies in poor status. As with our rivers and marine environment, groundwaters in the south and southeast of the country have elevated nitrate concentrations and are showing an increasing trend.

There are localised issues in our groundwaters with elevated nutrients and chemical substances affecting an increased number of drinking waters. In addition to this, chemical pollution related to historical mining, industrial and waste sites still persists in some areas.

CANALS

7. CANALS

7.1 Introduction

Canals are categorised as artificial water bodies (AWBs). AWBs are those that have been created by human activity to support a specific beneficial purpose in areas where a water body did not naturally exist before. Canals in Ireland are used primarily for navigation and recreation. They are important, biodiverse habitats and act as wildlife corridors. They are part of a wider network that includes feeder streams that supply the canals with water. Waterways Ireland is responsible for the monitoring and assessment of the water quality of our canals. This includes the Grand Canal (including the Barrow Line), the 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 16 water bodies for the canal monitoring programme.

In total, 45 surveillance sites were monitored over 377 km of canal channel in the 2019-2021 period. Forty-one of these sites were assessed for biological, physico-chemical, microbiological and hydromorphological quality elements and four were assessed for physico-chemical and microbiological elements only. The combination of the assessment of these quality elements is used to determine the overall ecological quality of our canals.

7.2 Summary for Canals

- 15 of the 16 (94%) canal water bodies assessed achieved good ecological potential.
- The Shannon-Erne Waterway failed to achieve its environmental objectives. It was classified as being at moderate ecological potential due to increased faecal coliform and BOD levels.
- Water quality in the canals has remained stable since the last reported period of 2016-2018.

7.3 Ecological Potential of Canals

The objective for canals is good ecological potential rather than good ecological status because they are categorised as AWBs. This is considered the best ecological condition they can achieve due to their modified nature. Ecological potential is classified according to five categories; maximum, good, moderate, poor or bad.

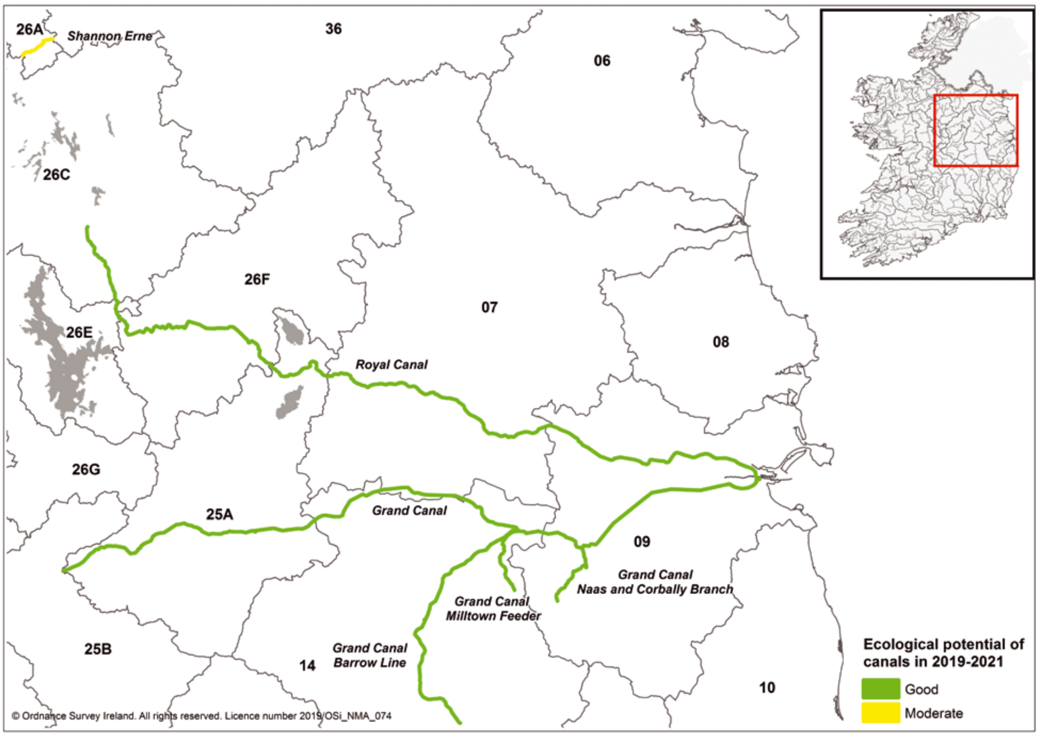
The assessment procedure has changed slightly in two ways since the last assessment period (2016-2018). Firstly, the ecological potential of a canal water body is no longer downgraded due to the presence of the invasive macrophyte *Elodea nuttallii* (Nuttall's waterweed). *E. nuttallii* is now widespread throughout the Royal, Grand and Barrow Canals and it is considered that no mitigation measures will bring about its effective control or eradication.

Secondly, the Shannon Erne Waterway was classified based on its physio-chemistry and microbiology only; the previous classification in the 2016-2018 period also included its biology and hydromorphology.

When all the quality elements were combined, all water bodies in the Grand and Royal Canals achieved good ecological potential in the 2019-2021 period (Table 7.1; Map 7.1). Only the Shannon-Erne Waterway failed to meet its environmental objective of good ecological potential due to elevated faecal coliform and BOD levels. Despite having achieved good ecological potential in this assessment, there are significant issues with sporadic elevated faecal coliform levels in the Grand Canal Basin.

Table 7.1 Ecological Potential of monitored canal water bodies 2019-2021

Canal Water Body (Catchment)	Ecological Potential
Grand Canal Main Line (Liffey and Dublin Bay)	Good
Grand Canal Basin	Good
Grand Canal Naas Line (Liffey and Dublin Bay)	Good
Grand Canal Milltown Feeder (Barrow)	Good
Grand Canal Barrow Line (Barrow)	Good
Grand Canal Main Line (Barrow) East	Good
Grand Canal Main Line (Barrow) West	Good
Grand Canal Main Line (Boyne)	Good
Grand Canal Main Line (Lower Shannon)	Good
Royal Canal Main Line (Boyne)	Good
Royal Canal Main Line (Liffey and Dublin Bay)	Good
Royal Canal Main Line (Lower Shannon)	Good
Royal Canal Main Line (Upper Shannon F)	Good
Royal Canal Main Line (Upper Shannon E)	Good
Royal Canal Main Line (Upper Shannon C)	Good
Shannon Erne (Upper Shannon A)	Moderate



Map 7.1 Ecological Potential of monitored canal water bodies 2019-2021

Figure 7.1 illustrates the condition of the individual elements used to classify the ecological potential of the canals for the 2019-2021 period.

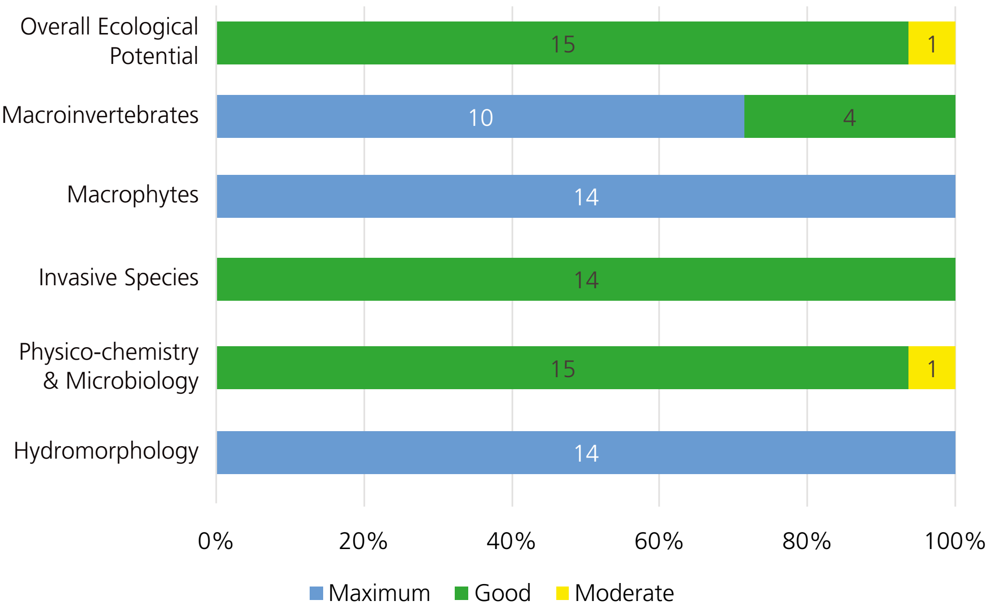


Figure 7.1 Ecological potential and condition of individual quality elements in canal water bodies in 2019-2021 (numbers of water bodies indicated)

7.4 Feeder Streams

The canal surveillance monitoring programme involves the routine sampling of physico-chemical and microbiological elements in five feeder streams that discharge into the canals. These feeder streams can be a source of nutrient and organic enrichment to the main canal channels and, depending on their location, can be subjected to point source pollution from municipal wastewater infrastructure or diffuse pollution from agricultural runoff. Conditions indicative of moderate ecological potential based on elevated faecal coliforms and nutrients were recorded in three feeder streams for the Grand Canal, the Monread, Ballymullen and Ballylennon feeders and also in the Athy Drain that feeds the Grand Canal Barrow Line. This highlights the need to protect the canals through the management of the feeder streams and engagement with local authorities.

7.5 Changes and Trends

Overall, the ecological potential of the canals assessed has improved slightly since the last assessment with just one canal failing to meet its objective. The majority of canals assessed achieved maximum ecological potential for the macrophyte, macroinvertebrate and hydromorphological elements.

7.6 Conclusion

The overall good ecological condition of our canals shows the value of these habitats; this emphasises the importance of the canals in Ireland as clean and diverse aquatic systems.

There are issues, however, with a small number of feeder streams that feed the canals, these feeders are acting as point sources of elevated faecal coliforms and nutrients to the receiving waters so it is important that the causes of the pollution in the feeders and surrounding catchments are dealt with. Recent work in identifying and addressing the issues in the Athy Drain feeder highlights the value of ongoing monitoring along with a partnership approach between statutory agencies to resolve water quality issues on a local level.

PRESSURES ON OUR WATER ENVIRONMENT

8. PRESSURES ON OUR WATER ENVIRONMENT

8.1 Introduction

Our surface waters and groundwaters continue to be under pressure from different human activities. The results from this assessment show that nearly half of our surface waters are not as ecologically healthy as they should be. The main pressure damaging water quality is the presence of too much nutrients coming mainly from agriculture and waste water discharges and the damage that various activities such as land drainage and urban development do to the physical condition of our water habitats.

8.2 Significant Pressures

In preparation for Ireland's third cycle River Basin Management Plan (2022-2027) an analysis has been undertaken to identify those water bodies at risk of not meeting their environmental objectives and the main significant pressures impacting on them. The analysis has identified over 1,600 water bodies which are at risk, a third of the total number of water bodies identified nationally. In terms of significant pressures agriculture is the most prevalent significant pressure impacting over 1,000 water bodies, followed by hydromorphology (453 water bodies impacted), forestry (232 water bodies impacted) and urban waste water (214 water bodies impacted) (Figure 8.1).

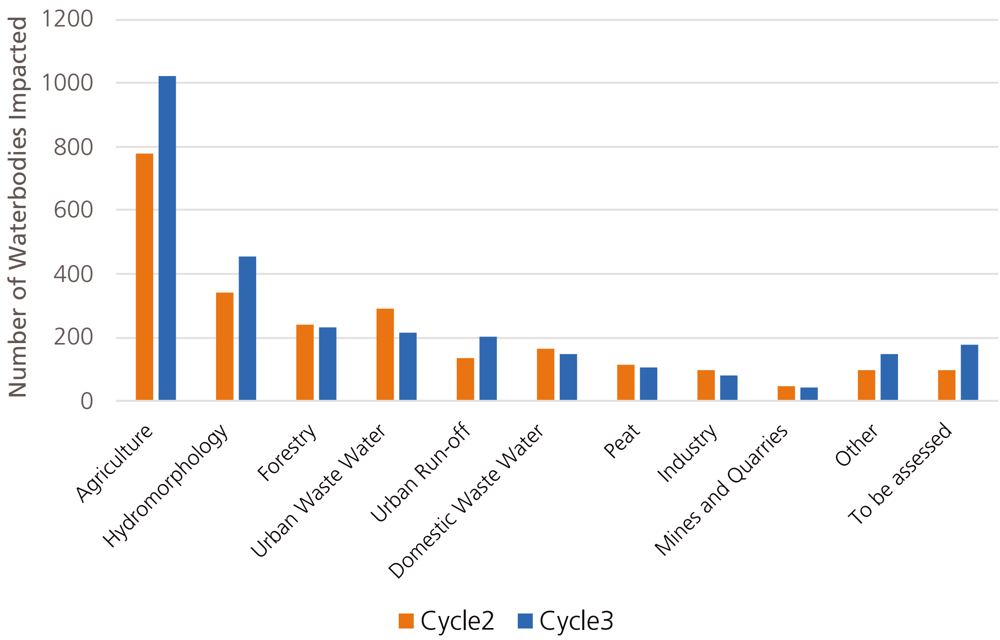


Figure 8.1 Comparison of significant pressures Cycle 2 and Cycle 3

Agriculture is the most prevalent significant pressure causing water quality impacts. Approximately 1000 waterbodies are impacted around the country, which is reflective of the fact that agriculture is the most dominant land use. Compared to the previous assessment for the 2nd cycle river basin management plan, which was published in 2018, the number of waterbodies impacted by agriculture has increased by nearly 30%. The main issues associated with agriculture are loss of excess nutrients, from point sources such as farmyards, or from diffuse sources such as spreading of fertilisers and manures. Excess nitrogen is the main issue for estuaries and coastal waters with nitrogen losses particularly associated with free draining soils in the south and southeast. Measures to reduce nitrogen leaching are needed in these areas.

Excess phosphorus and sediment are important stressors for our rivers and lakes and are more typically associated with the poorly draining soils which are located nationwide. Pathway interception measures that interrupt the connections between the land and watercourses, such as buffer zones, are needed in these areas.

Hydromorphology describes activities which lead to changes to the physical habitat conditions. Hydromorphology is the second most prevalent pressure type. The activities causing these impacts include channelisation, dredging, and land drainage. These activities damage the physical habitat conditions by clogging fish spawning beds with sediment and affecting the flow of water in a river for example. The number of water bodies with a hydromorphological pressure also increased by nearly 30% compared to the previous cycle but some of this increase is associated with an improved understanding of hydromorphological pressures in the environment rather than a deterioration.

Forestry is the third most significant pressure impacting on water quality and there has been little net change in the relative scale of its impacts between the assessment periods. The available evidence shows that water quality declines can be caused by forestry activities such as planting, thinning and clear-felling. The declines can often be very substantial, dropping by two or sometimes three status classes. However, there is evidence that the water bodies can recover within a few years, and that they can remain in very good condition when the forests are stable.

Discharges from **urban waste water treatment** plants or storm water overflows are the most common water quality problems associated with urban waste water. 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. There has been a net decrease in the number of water bodies impacted by urban wastewater, due largely to plant upgrades and optimisation of operations. However, water quality impacts due to plant overloading and non-compliance with standards and overflows, particularly in the midlands and eastern region continue to occur.

'Other' pressures include pressures such as abstraction, invasive species and aquaculture and have increased in the third cycle analysis. Pressures categorised as "To be assessed" refer to water bodies where an anthropogenic pressure exists but the specific pressure has not yet been identified – further work is required to identify these pressures and develop appropriate mitigation actions.

8.3 Are the measures working?

The second cycle river basin management plan set out a programme of measures to improve water quality. The current ecological status data can be used to assess progress against the environmental objectives that those measures were designed to achieve. The evidence shows that there have been both improvements and declines in the water quality in all water body types over this assessment period, and that these changes have largely offset one another at the national scale. In all just over half of all water bodies have achieved their environmental objective and there has been little net change in this proportion since the last assessment.

When we look at the Priority Areas for Action (PAAs), however, we see this trend is different to the national picture and a net overall improvement has been achieved (Figure 8.2). This indicates that when targeted action is taken improvements in water quality can be achieved.

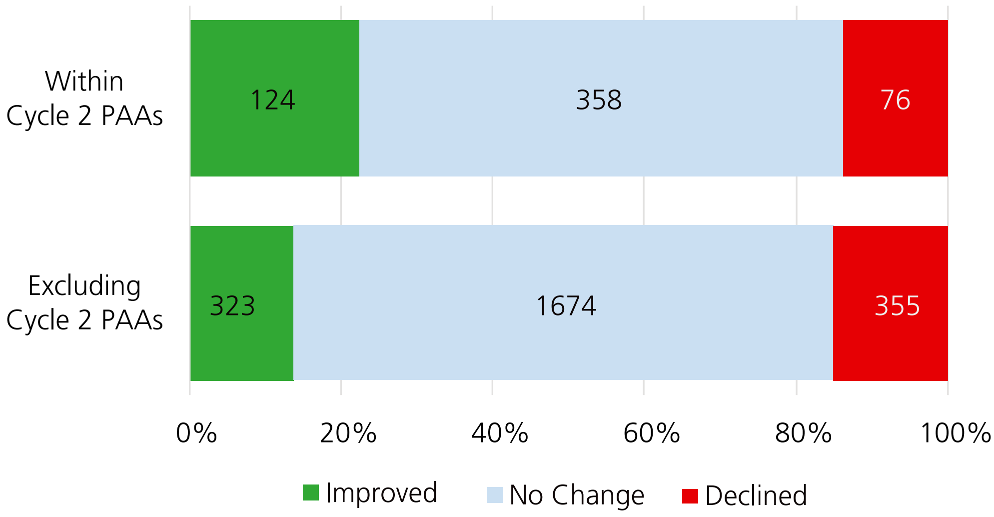


Figure 8.2 **Status change within and excluding the second WFD cycle PAAs (number of water bodies indicated)**

8.4 Next Steps

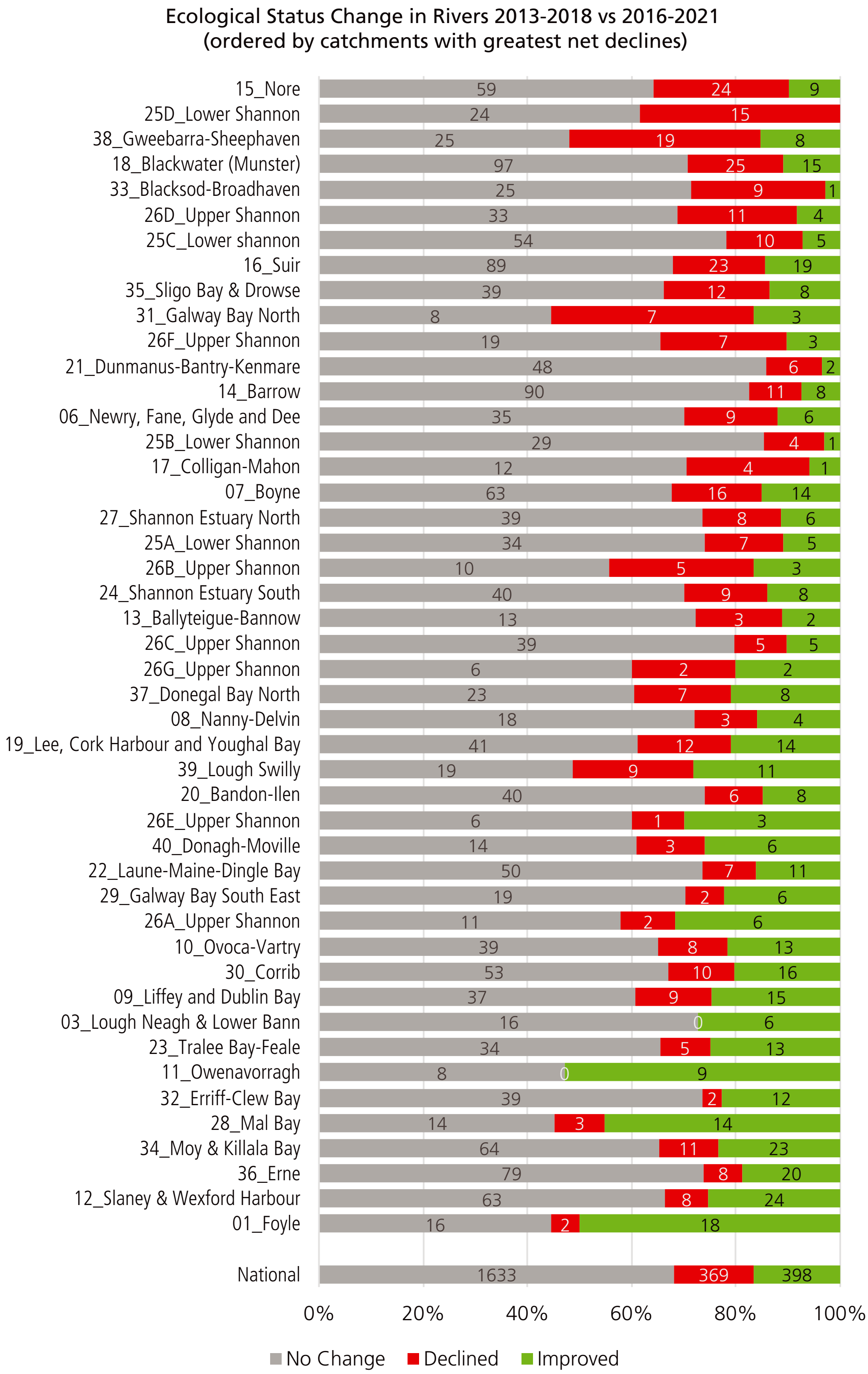
If we are to make progress and improve water quality, Ireland needs to take the following actions:

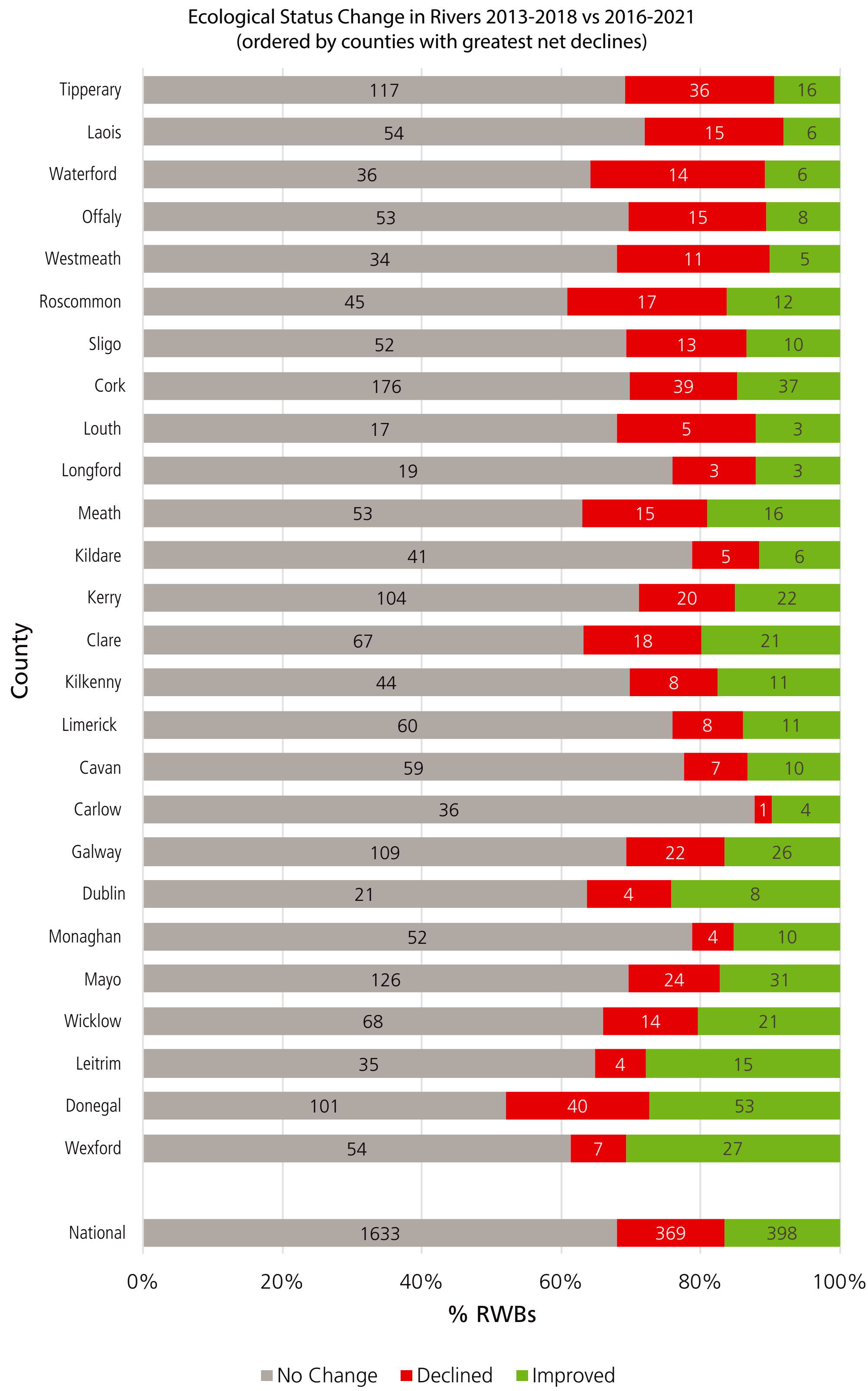
- The next River Basin Management Plan (2022-2027) must be published with a firm commitment to address the main pressures on water quality (agriculture, hydromorphology, waste water and forestry). The Plan needs to be clear on what will be achieved by 2027, the proposed measures, the timeframes for delivery and the expected improvements in water quality. The Plan should also build on the progress made in the Priority Areas for Action with a focus on preventing further declines.
- The Nitrates Action Programme must be fully implemented to deliver reductions in nutrient losses to our waters. The existing regulations must be fully implemented by the local authorities and the Department of Agriculture, Food and Marine using the full range of tools from compliance promotion to enforcement. To support this work, the EPA will develop and implement a National Agricultural Inspection Programme for local authorities.
- Sustained investment in water services infrastructure is required to eliminate waste water as a significant pressure on water quality.
- The development of a regulatory regime to better manage and regulate activities that cause hydromorphological alteration is required. In the interim, measures are required now to address hydromorphological pressures. Public authorities such as the Office of Public Works and Local Authorities must lead by example in terms of best practice for any works on or near rivers.
- Government departments and relevant state bodies need to deliver greater coherence and integration across national programmes and policies which could impact on water quality and seek opportunities for multiple benefits particularly from climate and biodiversity measures.

The EPA will continue to develop and communicate the science and evidence needed to support policy and measures to deliver water quality improvements and will through its own work address pressures from EPA-regulated activities.

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

APPENDIX


Ecological Status Change in Rivers 2013-2018 vs 2016-2021
(ordered by catchments with greatest net declines)
15_Nore 59 24 9
25D_Lower Shannon 24 15
38_Gweebarra-Sheephaven 25 19 8
18_Blackwater (Munster) 97 25 15
33_Blacksod-Broadhaven 25 9 1
26D_Upper Shannon 33 11 4
25C_Lower shannon 54 10 5
16_Suir 89 23 19
35_Sligo Bay & Drowse 39 12 8
31_Galway Bay North 8 7 3
26F_Upper Shannon 19 7 3
21_Dunmanus-Bantry-Kenmare 48 6 2
14_Barrow 90 11 8
06_Newry, Fane, Glyde and Dee 35 9 6
25B_Lower Shannon 29 4 1
17_Colligan-Mahon 12 4 1
07_Boyne 63 16 14
27_Shannon Estuary North 39 8 6
25A_Lower Shannon 34 7 5
26B_Upper Shannon 10 5 3
24_Shannon Estuary South 40 9 8
13_Ballyteigue-Bannow 13 3 2
26C_Upper Shannon 39 5 5
26G_Upper Shannon 6 2 2
37_Donegal Bay North 23 7 8
08_Nanny-Delvin 18 3 4
19_Lee, Cork Harbour and Youghal Bay 41 12 14
39_Lough Swilly 19 9 11
20_Bandon-Ilen 40 6 8
26E_Upper Shannon 6 1 3
40_Donagh-Moville 14 3 6
22_Laune-Maine-Dingle Bay 50 7 11
29_Galway Bay South East 19 2 6
26A_Upper Shannon 11 2 6
10_Ovoca-Vartry 39 8 13
30_Corrib 53 10 16
09_Liffey and Dublin Bay 37 9 15
03_Lough Neagh & Lower Bann 16 0 6
23_Tralee Bay-Feale 34 5 13
11_Owenavorragh 8 0 9
32_Erriff-Clew Bay 39 2 12
28_Mal Bay 14 3 14
34_Moy & Killala Bay 64 11 23
36_Erne 79 8 20
12_Slaney & Wexford Harbour 63 8 24
01_Foyle 16 2 18
National 1633 369 398
0%
20%
40%
60%
80%
100%
No Change
Declined
Improved


Ecological Status Change in Rivers 2013-2018 vs 2016-2021
(ordered by counties with greatest net declines)
Tipperary 117 36 16
Laois 54 15 6
Waterford 36 14 6
Offaly 53 15 8
Westmeath 34 11 5
Roscommon 45 17 12
Sligo 52 13 10
Cork 176 39 37
Louth 17 5 3
Longford 19 3 3
Meath 53 15 16
Kildare 41 5 6
Kerry 104 20 22
Clare 67 18 21
Kilkenny 44 8 11
Limerick 60 8 11
Cavan 59 7 10
Carlow 36 1 4
Galway 109 22 26
Dublin 21 4 8
Monaghan 52 4 10
Mayo 126 24 31
Wicklow 68 14 21
Leitrim 35 4 15
Donegal 101 40 53
Wexford 54 7 27
National 1633 369 398
County
0%
20%
40%
60%
80%
100%
% RWBs
No Change
Declined
Improved

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialáil: *Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.*

Eolas: *Sonraí, eolas agus measúnú ardchaighdeáin, spriocdhírithe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.*

Abhcóideacht: *Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.*

I measc ár gcuid freagrachtaí tá:

Ceadúnú

- Gníomhaíochtaí tionscail, dramhaíola agus stórála peitril ar scála mór;
- Sceitheadh fuíolluisce uirbigh;
- Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- Foinsí radaíochta ianúcháin;
- Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Dramhaíola agus Ceimiceáin sa Chomhshaol

- Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

Bainistíocht Uisce

- Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

Eolaíocht Aeráide & Athrú Aeráide

- Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Ghníomhú ar son na hAeráide;
- Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

Monatóireacht & Measúnú ar an gComhshaol

- Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.
- Taighde agus Forbairt Comhshaoil
- Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- 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 um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Ardú Feasachta agus Faisnéis Inrochtana

- Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

Comhpháirtíocht agus líonrú

- Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint chomhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

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

- An Oifig um Inbhuanaitheacht i leith Cúrsaí Comhshaoil
- An Oifig Forfheidhmithe i leith Cúrsaí Comhshaoil
- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht 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