Water Quality in 2022

An Indicators Report

epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

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 wastewater 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 wastewater 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 AND 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.

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

- An Oifig um Inbhunaitheacht 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.

Water Quality in 2022:
An Indicators Report

ENVIRONMENTAL PROTECTION AGENCY

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Disclaimer

Acknowledgements

The data presented in this report are based on the work of many individuals and organisations involved in monitoring and assessing our waterways. These include:

Local Authorities, Marine Institute, Inland Fisheries Ireland and Office of Public Works staff together with staff in the EPA Office of Evidence and Assessment (OEA) and Office of Radiation Protection and Environmental Monitoring (ORM).

An effort has been made in this report to make the maps more accessible to readers with a colour vision deficiency (colour blindness). Some of the symbols in the maps have changed to facilitate this.

Cover Image: Ruth Little

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Contents

Introduction

The EPA undertakes a full assessment of the overall quality and ecological status of Ireland's waters every three years[1] and we report on the indicators of water quality in the intervening years to provide an update on trends in the biological quality[2] and nutrient levels of our waterbodies. This indicators report provides an update on the water quality of Ireland's rivers, lakes, estuaries, coastal, and groundwaters using monitoring data collected in the 2022 period.

Stressors on Water Quality

One of the most significant stressors on our water quality and ecosystem health is increased concentrations of nutrients, such as phosphorus and nitrogen, entering our waterways. These nutrients can enter our waters as a result of human activities such as agriculture, waste water (domestic and urban) and forestry.

When excess nutrients enter our water courses, they cause an overgrowth of plants and algae. This in turn clogs up our water courses, uses up oxygen and harms other aquatic life such as insects (invertebrates) and fish in a process known as eutrophication. Changes in nutrient concentrations and biological quality are thus key indicators of progress in achieving our water quality objectives.

While increased concentrations of both phosphorus and nitrogen can lead to eutrophication, the presence of excess phosphorus is a particular concern for the ecological health of our rivers and lakes while the impact of elevated levels of nitrogen is more of a concern for our estuaries. In addition, high nitrate concentrations in our drinking water supplies pose a risk to human health.

Regional Variations

The quality of our waters, and the issues impacting on water quality, can vary depending on the soils, geology, and the nature of human activities in a region. Phosphorus entering our waters is a particular problem in agricultural areas with poorly draining soil, while nitrogen leaching through the free draining soils in the south east of the country is a problem for the estuaries along the southern seaboard. Where relevant, the indicators in this report have been presented at both national and regional level. The five regional areas are the Border, Midlands and East, South East, South West and Western Regions[3].

1 https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/EPA_WaterQualityReport2016_2021.pdf

2 Biological quality is assessed based on macroinvertebrates and other biological elements and is a subset of the overall ecological status assessment. Indicators for elements used to determine overall ecological status, such as hydromorphology, are not included in this report.

3 The five regions correspond with the water management structures in place under governance arrangements for the River Basin Management Plan (visit the LAWPRO website here for a map of regions)

Key Findings

- There has been no significant change in the biological quality of our rivers or lakes in 2022. The rate of decline largely matches the rate of improvement.
- Nitrate concentrations are too high in 40% of river sites nationally and in 20% of estuarine and coastal water bodies. These elevated levels are found mainly in the south and south east and are too high to support good water quality in our estuaries. This is primarily attributable to intensive agricultural activities on freely draining soils in these areas. Most of the nitrogen in Irish waters comes from organic and inorganic fertilisers.
- Average nitrate levels in rivers and groundwaters increased nationally between 2021 and 2022. While levels can fluctuate between years based on climate there is no indication that nitrate levels are reducing.
- Phosphate concentrations are too high in 28% of rivers and 36% of lakes which impacts on their biological quality. Concentrations will need to reduce in these rivers and lakes to improve water quality. Phosphate primarily comes from wastewater discharges and from agricultural run-off in areas with poorly draining soils.
- Phosphate levels in rivers and lakes fluctuate between years but have been generally stable over recent years.
- Nitrogen and phosphorous loadings to the marine environment have been generally increasing since 2013. Loads of both nutrients were higher in 2022 than in 2021, placing continued pressure on our marine water bodies.

Indicators

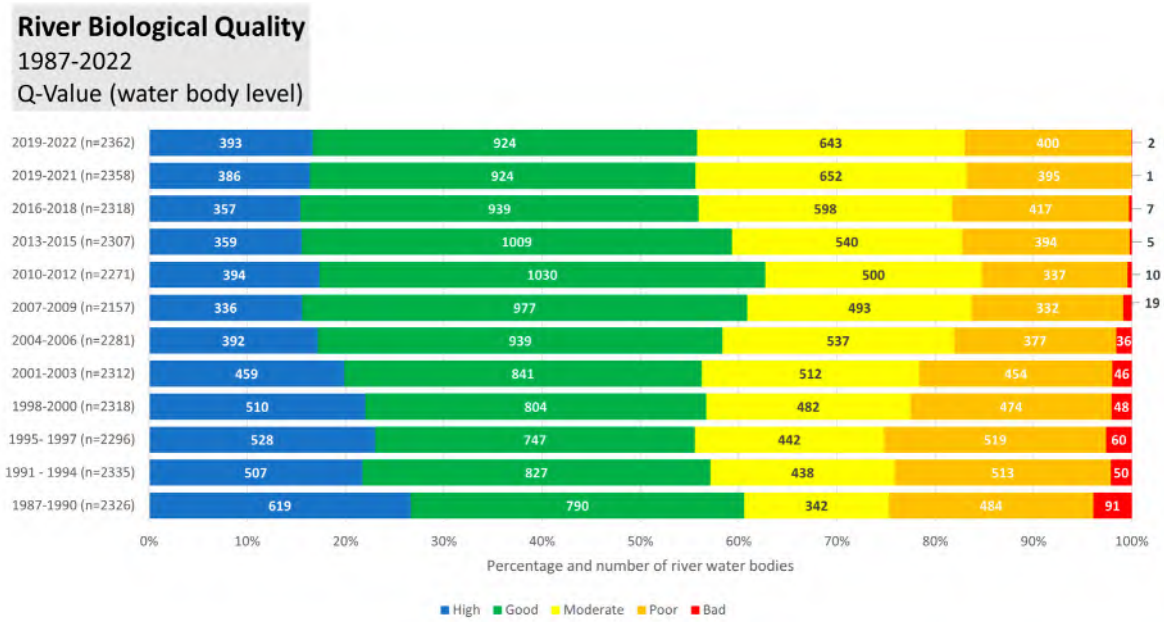
River Biological Quality

The biological quality of rivers is assessed as part of the national water quality monitoring programme. River invertebrates are assessed to categorise the biological quality (Q value[4]) of each monitored river water body[5] into five classes: high, good, moderate, poor, and bad, based on the known sensitivities and tolerances of each invertebrate group to water pollution. High and good quality is considered satisfactory and moderate or worse quality is considered unsatisfactory.

Findings

56% (1,317) of the river water bodies assessed over the period 2019-2022[6] were in high or good biological quality. The remaining 44% (1,045) were in moderate, poor, or bad quality. The number of river water bodies in bad condition has reduced to two; Annagh (Clare)_010 in Co. Clare (the cause of this recent deterioration is currently under investigation) and Laune_010 in Co. Kerry (where urban waste water is a pressure).

671 (out of 2362) river water bodies were assessed in 2022. Of these, 84 improved while 77 declined, this is a small net improvement in biological quality in seven river water bodies when compared to their previous survey.



4 Q value system: Q5 and Q4-5=High; Q4=Good; Q3-4=Moderate; Q3 and Q2-3=Poor; Q2, Q1-2 and Q1=Bad.

5 A 'water body' is the basic assessment unit used to check water quality. Water bodies can have single or multiple monitoring points called 'sites'.

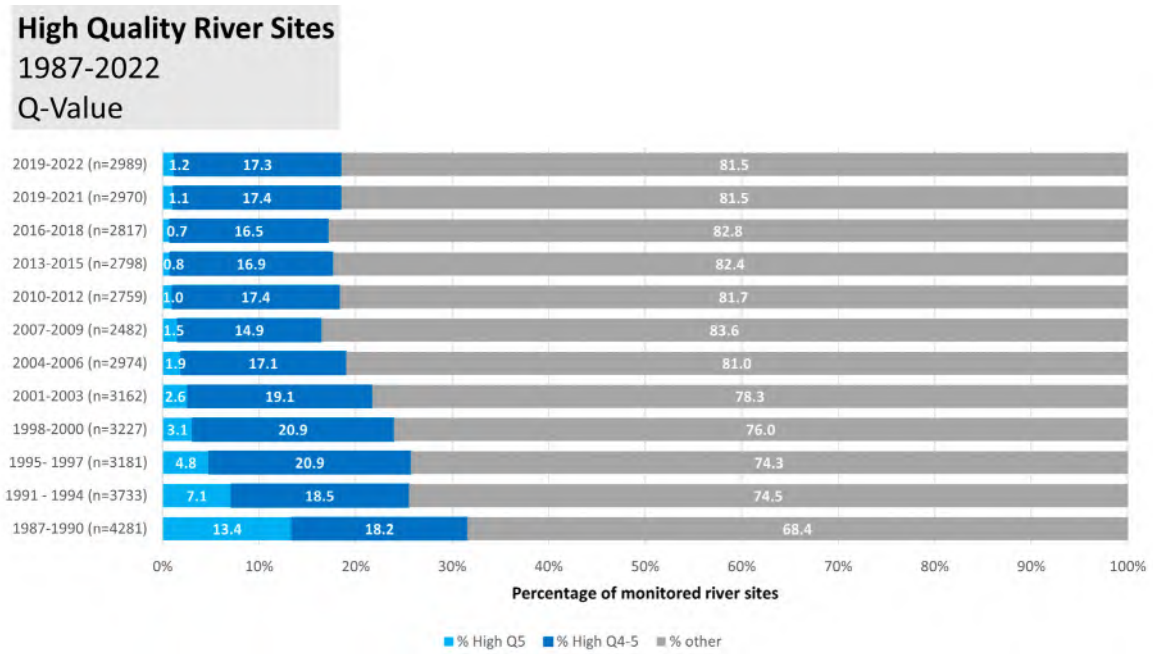
6 The full river network is assessed over a three year period with approximately one third of rivers monitored each year.

Priority Areas for Action (PAAs)

There were 190 Prioritised Areas for Action (PAAs) identified in the second River Basin Management Plan which were subjected to targeted action aimed at bringing about an improvement in water quality. Of the 671 river water bodies assessed in 2022, 174 were in PAAs. There was a small net improvement of biological quality of six river water bodies in the PAAs (27 improved, 21 declined and 126 water bodies did not change).

High Quality Sites

There were an additional three sites in the Q5 category (highest quality) during the 2019-2022 period, bringing the total number of these sites to 35 (1.2% of monitored river sites). These high quality sites are important for supporting sensitive aquatic species and are vital reservoirs of biodiversity that help in river recovery.



Nitrate in Rivers

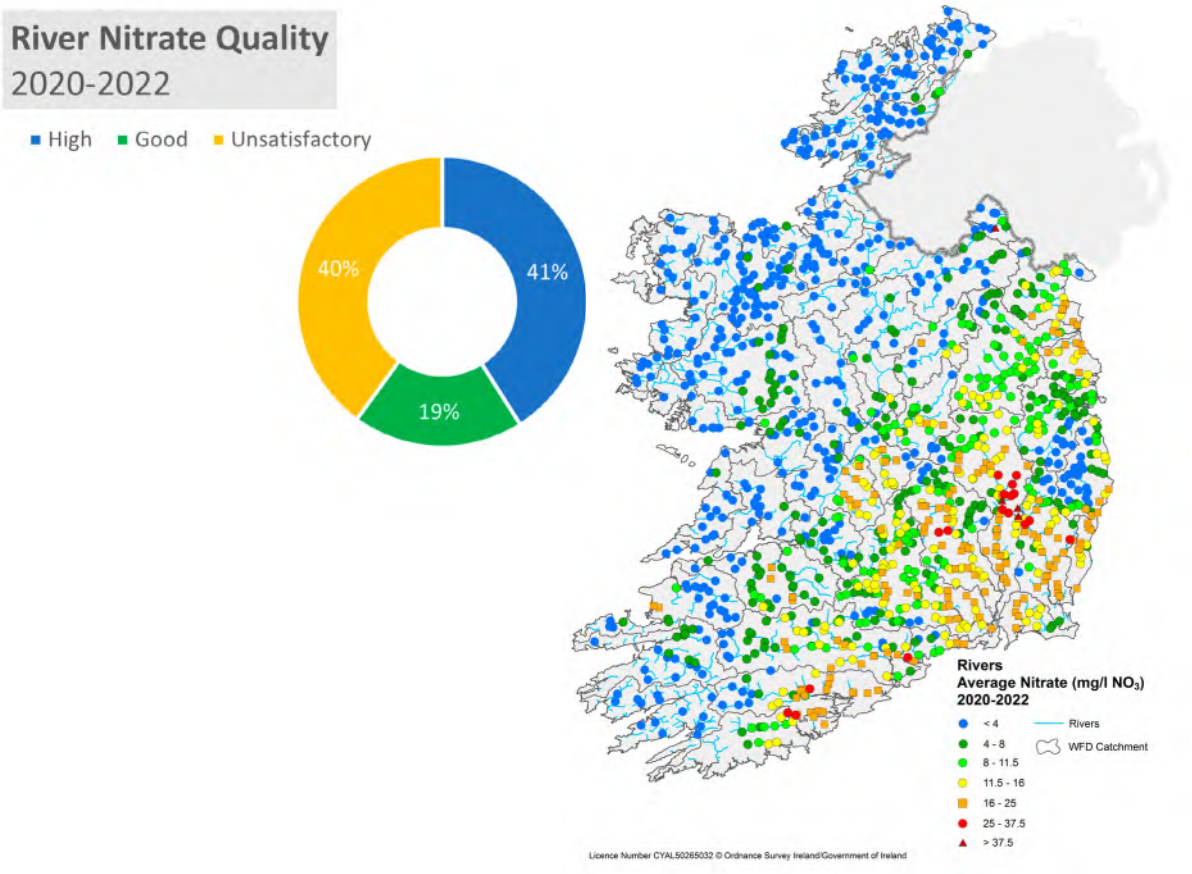
The concentration of nitrate (NO_3) in rivers is an indicator of nutrient enrichment and elevated levels can indicate problems in drinking water.

Nitrate enters our waterways from the land through free draining soils to our groundwaters where it can then discharge to rivers and ultimately to our marine waters. It mainly comes from agriculture through chemical and organic (manures and urine from livestock) fertilisers or from direct discharges from waste water.

This indicator is based on an assessment of average nitrate concentrations over three-years (2020-2022) at 1,305 river sites. A regional analysis of average annual river nitrate concentrations from 2010-2022 was also undertaken.

Findings

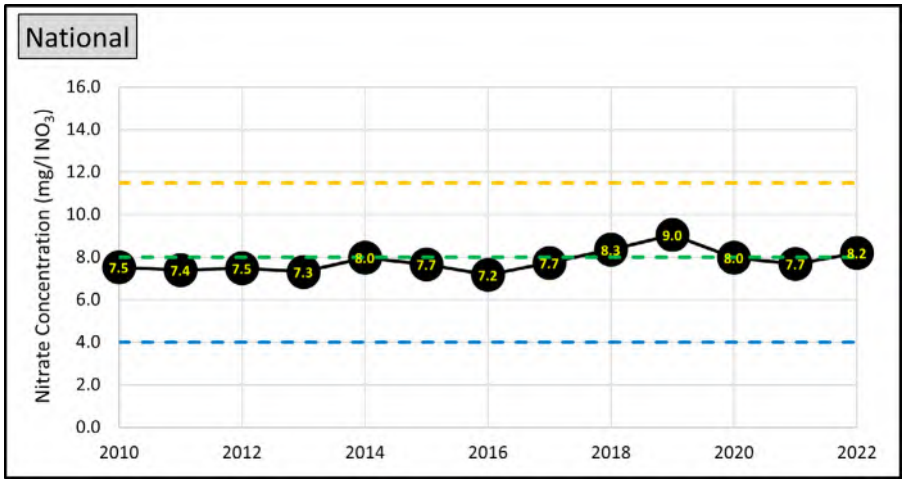
The 2020-2022 data for nitrate in rivers show that 40% of river sites nationally have unsatisfactory nitrate concentrations (above 8 mg/l NO_3)[7].

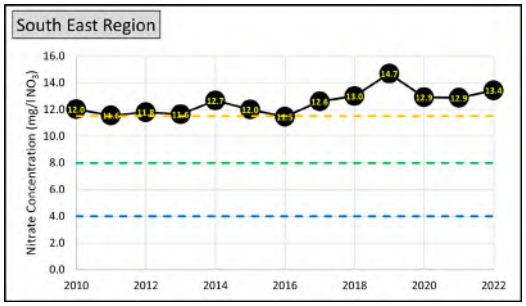


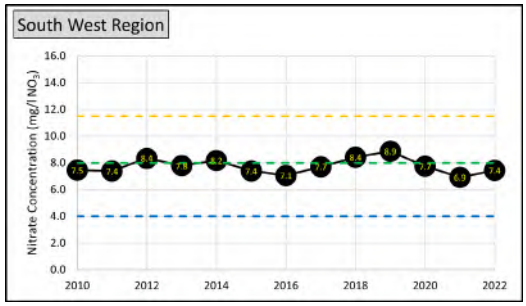
[7] There are currently no environmental quality standards for nitrate, however, average nitrate concentration values less than 4 mg/l NO_3 (0.9 mg/l N) and less than 8 mg/l NO_3 (1.8 mg/l N) are considered by the EPA to be indicative of high and good quality respectively. The nitrate standard for drinking water is 50 mg/l NO_3. Nitrate concentrations are converted to nitrogen by multiplying the concentration by a factor of 0.2259.

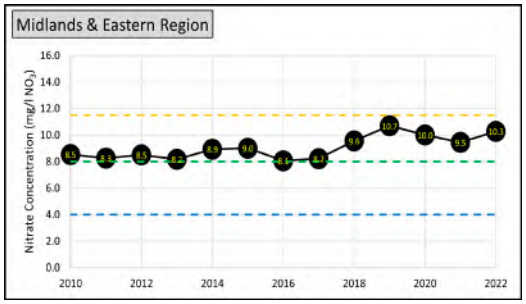
Regional River Nitrate

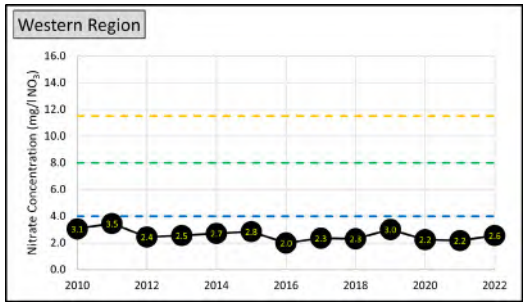
The graphs below show the national and regional profile of average annual nitrogen concentrations between 2010 and 2022. In general nitrogen levels were at their lowest in 2012/2013. A temporary rise and fall in concentrations occurred in 2018-19 associated with climate conditions and agricultural practices during the 2018 drought period but, overall, concentrations in the South East and Midlands and Eastern regions have been increasing since 2012. Levels in the other regions are generally lower and more stable.

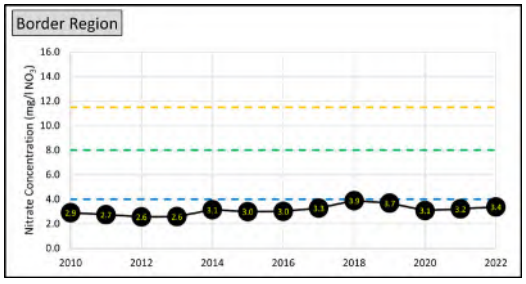


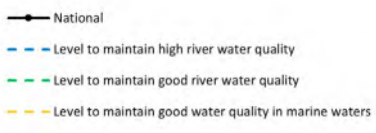












The South East region has consistently had the highest nitrate concentrations over time which is associated with more intensive farming coupled with freely draining soils and lower effective rainfall. The annual averages in this region exceed concentrations that are likely to have a negative impact on estuaries and coastal water quality.

The Western and Border regions have the lowest overall river nitrate concentrations. There has, however, been an increase in river nitrate concentrations in all regions over the 12 months from 2021 to 2022.

Phosphate in Rivers

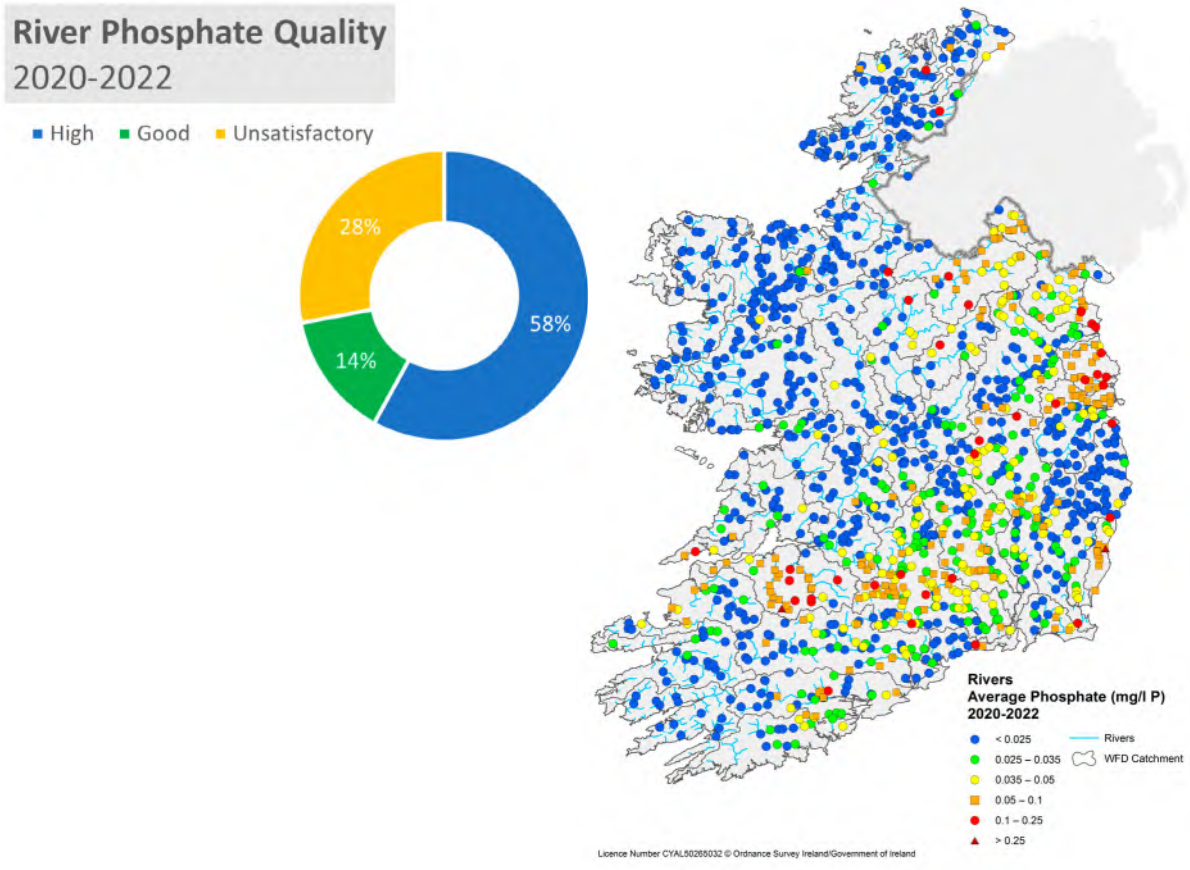
Increased phosphate concentrations in rivers can be a sign of nutrient pollution from human activities.

Phosphate enters our waterways from a variety of sources, but primarily from sewage and industrial discharges and agricultural land from organic and inorganic fertilisers.

This indicator is based on an assessment of average phosphate[8] concentrations over the period 2020-2022 at 1,305 river sites. A regional analysis of average annual river phosphate concentrations from 2010-2022 was also undertaken.

Findings

The 2020-2022 data for phosphate in rivers shows that 28% of sites have unsatisfactory phosphate concentrations while the remaining 72% are at levels which support high (58%) or good (14%) water quality[9]. Phosphorus losses in these catchments come primarily from runoff losses from agriculture on poorly draining soils and from waste water discharges.

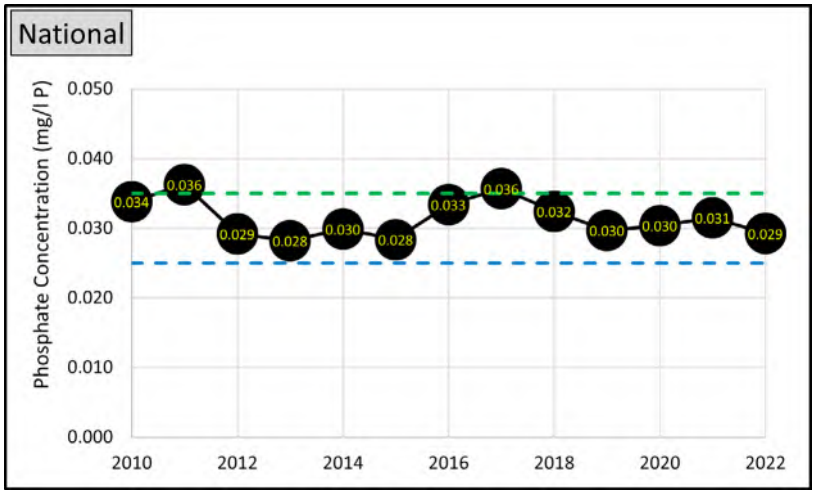


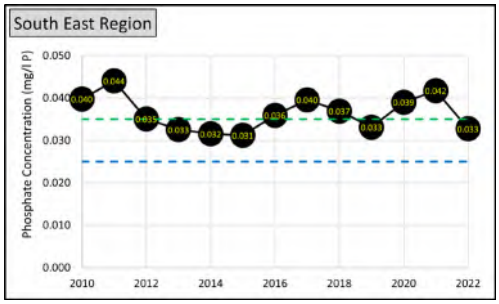
[8] Measured as molybdate reactive phosphate (MRP).

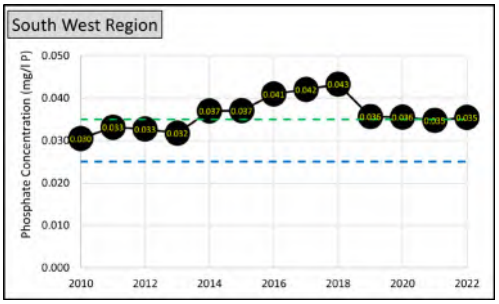
[9] Average phosphate concentrations of less than 0.025 mg/l P and less than 0.035 mg/l P have been established in Ireland as legally binding national standards to support the achievement of high and good ecological status respectively.

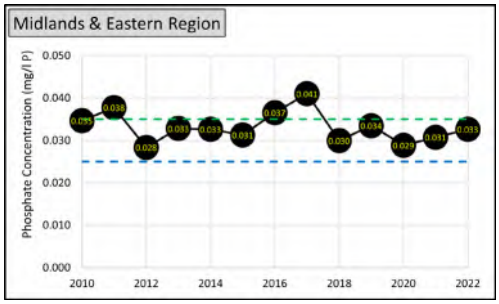
Regional River Phosphate

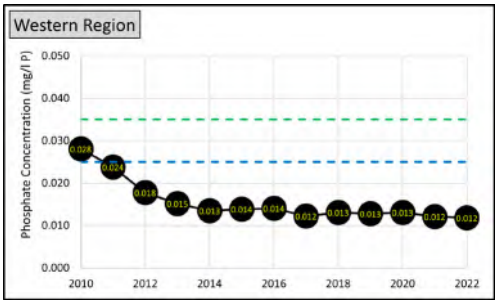
The graphs below show the national and regional profile of the average annual phosphate concentrations between 2010 and 2022.

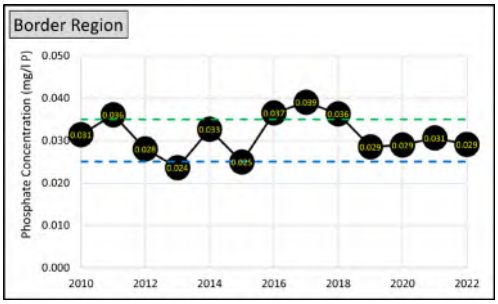












Phosphate levels in rivers fluctuate between years but have been generally stable over recent years. The South East and South West Regions both exhibit the highest river phosphate concentrations in the country.

Total Phosphorus in Lakes

Increased concentrations of total phosphorus in lakes is an indicator of nutrient enrichment caused by human activities.

The concentration of total phosphorus in lakes is a key indicator because of its impact on the ecological health of freshwater systems. If phosphorus is present in excess amounts it can lead to a significant decrease in water quality due to an overgrowth of plants and algal blooms. This over-growth reduces the amount of dissolved oxygen in the water and causes shading of sunlight needed by aquatic plants that grow in deeper waters. This can negatively affect the lake's ecology (see Topic Box). The waters of such lakes can often have a characteristic 'pea-soup' appearance due to the intense algal blooms that can occur.

This indicator is based on an assessment of the average three-year total phosphorus concentration in 222[10] monitored lakes during 2020-2022.

Findings

Over one third (36%) of lakes had unsatisfactory total phosphorus concentrations[11] in the period 2020-2022.

The majority of lakes with unsatisfactory total phosphorus concentrations, at levels that do not support good water quality, are located in the border region. Lakes with lower total phosphorus concentrations[11] are predominantly situated in the west of the country. This distribution tends to reflect the difference in the level of human activity, hydrogeology, and soil conditions in these areas.

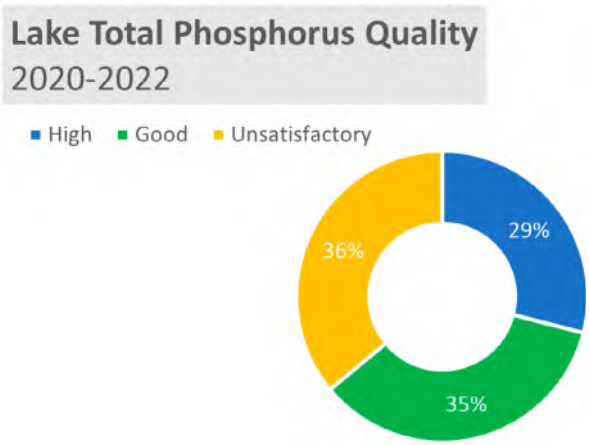
Some individual lakes in the border region have significantly elevated annual average total phosphorus concentrations that are consistently above the good quality standard (0.025 mg/l P). The five lakes with highest total phosphorus concentrations over the 2020-2022 period are:

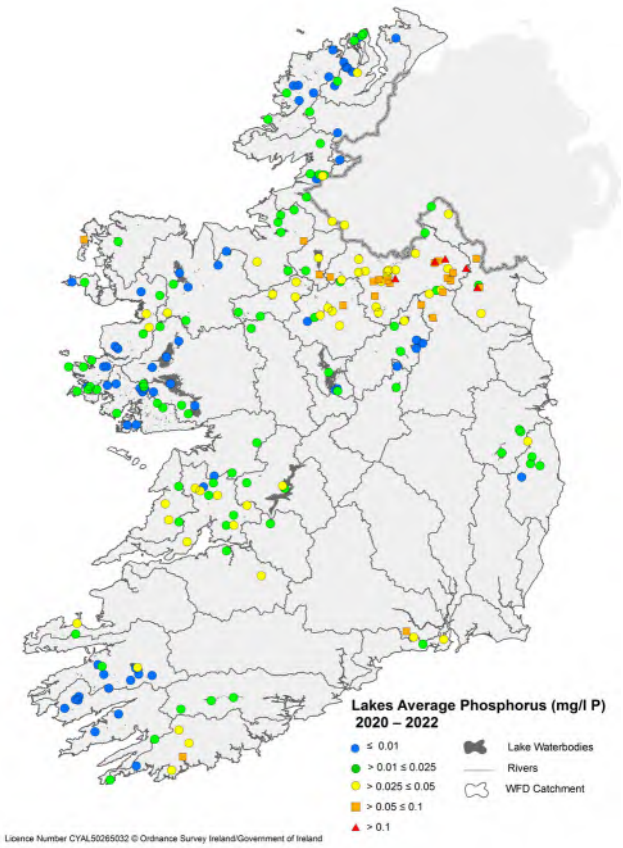
- Naglack (Co. Monaghan) – 3 year average 0.33 mg/l P
- Inner (Co. Monaghan) – 3 year average 0.21 mg/l P
- Farnham (Co. Cavan) – 3 year average 0.21 mg/l P
- Egish (Co. Monaghan) – 3 year average 0.16 mg/l P
- White Rockcorry (Co. Monaghan) – 3 year average 0.10 mg/l P

The ecological recovery of these lakes may take a long time due to legacy stores of phosphorus in their sediments.

10 Data from 2022 for some western lakes was removed due to issues with sample analysis.

11 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 a national standard to support the achievement of high and good ecological status as required by the Water Framework Directive (WFD).


Lake Total Phosphorus Quality
2020-2022
High
Good
Unsatisfactory
29%
36%
35%


Lakes Average Phosphorus (mg/l P)
2020 – 2022
≤ 0.01
> 0.01 ≤ 0.025
> 0.025 ≤ 0.05
> 0.05 ≤ 0.1
> 0.1
Lake Waterbodies
Rivers
WFD Catchment
Licence Number CYAL50265032 © Ordnance Survey Ireland/Government of Ireland

Lake Biological Quality

This indicator is based on the assessment of the biology of 224 monitored lakes for the period 2020-2022. Lake biology is categorised into five classes: high, good, moderate, poor, and bad. Lakes in high and good quality are in a satisfactory condition and lakes in moderate or worse quality are in an unsatisfactory condition.

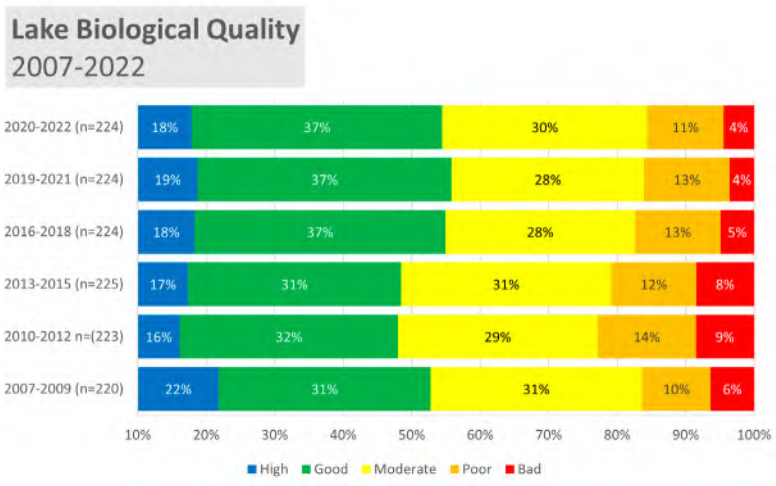
The biological elements that are assessed for this indicator are plants, phytoplankton, phytobenthos[12], and fish. These biological indicators give an indication of the long-term water quality of a lake; certain species are tolerant of pollution, like excess nutrients, whereas other species are very sensitive to it (see Topic Box).

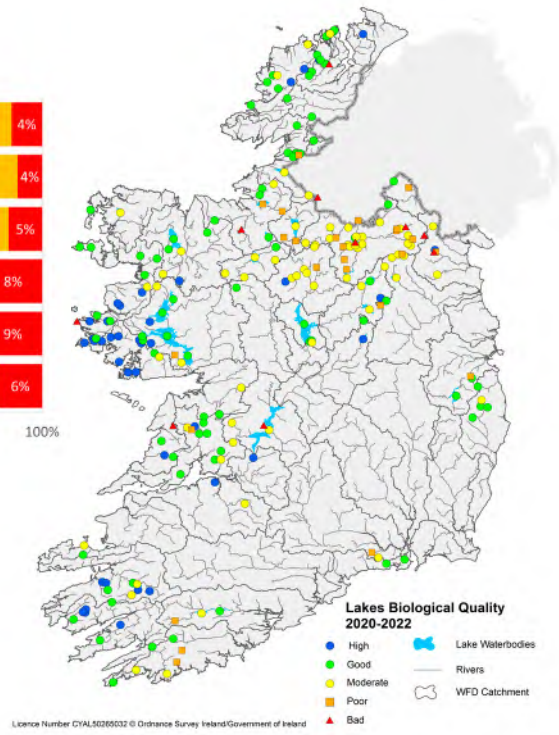
Findings

Over half (55%) of monitored lakes are in high or good biological quality for the period 2020-2022 with the remaining 45% in moderate or worse quality.

Lake biological quality is closely aligned with the amount of phosphorus in the water. Most of the lakes that are in unsatisfactory biological quality are in the border region, an area with predominantly elevated phosphorus levels.

The proportion of lakes at satisfactory quality (high and good) has remained relatively unchanged in recent years. These lakes are predominantly located in the west and south west.





12 Phytobenthos is the name given to the tiny organisms (e.g. diatoms and algae) commonly found on stones in the bottom of rivers and lakes.

Macrophytes as indicators of ecological change in lakes

Aquatic plants play a key role in the functioning of lake ecosystems. Like all plants and animals, they respond to changes in the environment. While all lakes and their plant communities are unique, how they respond to environmental change, in general, follows a typical pattern. Plants that prefer low nutrient concentrations gradually become scarcer in lakes that are polluted by nutrients such as phosphorus, while those that prefer high nutrient concentrations become more common. Additionally, the depth at which plants are found decreases with increasing nutrient levels.

The plants growing in a lake can therefore be used as indicators of changes in water quality and ecology.

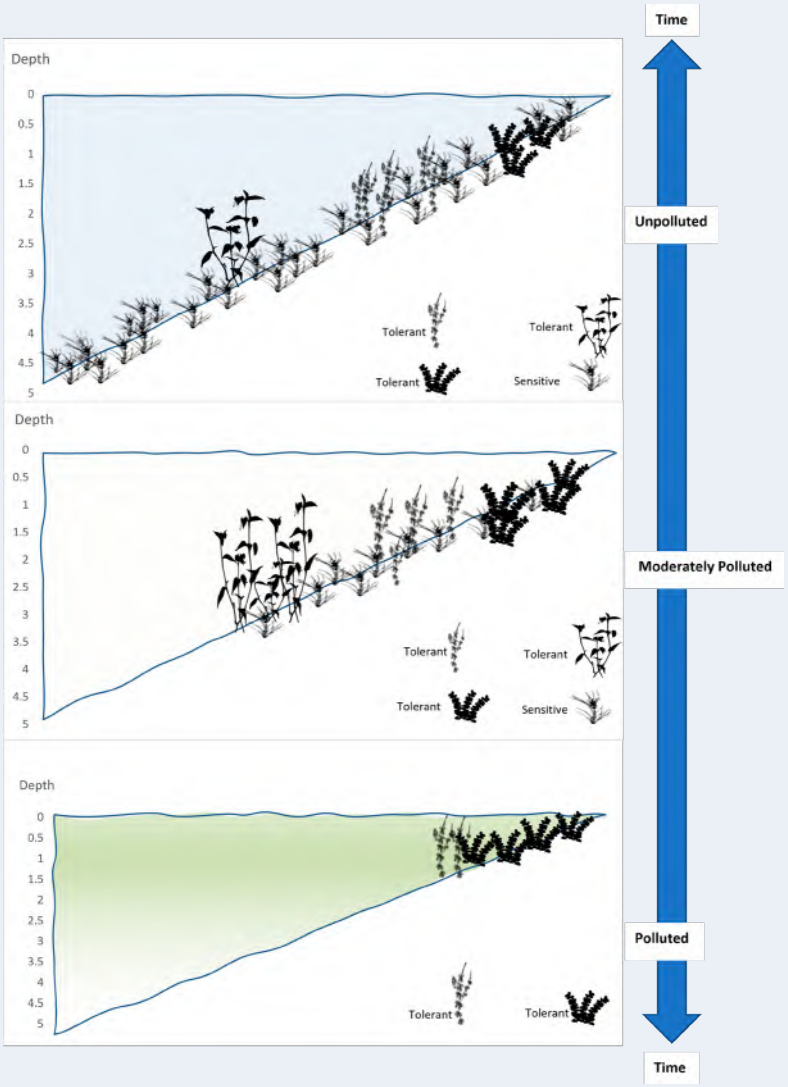


Illustration representing the gradual loss of sensitive plant species and the shallower depths of plant growth in a lake as nutrients increase over time. (Source: Caroline Plant)

All unpolluted lakes will have a diverse mixture of both nutrient sensitive and nutrient tolerant plants. However, sensitive plants will dominate as they can outcompete tolerant plants where nutrient levels are low. Many of these sensitive plants live deep under the water surface. This is made possible because phytoplankton levels in the water column are low, allowing sunlight to reach plants in deeper water.

As nutrient levels rise, sensitive plants lose their competitive edge. Tolerant plants begin to grow larger and to colonise areas of the lake that were previously dominated by sensitive plants. At the same time phytoplankton levels in the water begin to increase. This results in reduced sunlight levels in deeper water and in turn reduces the depth at which plants can grow.

Sensitive plants will decline over time (can take decades) until they disappear from increasingly nutrient rich lakes. Eventually the concentration of phytoplankton in the water column will block the sunlight and restrict tolerant plants to very shallow areas of the lake where they can grow up to the water surface to get enough light to photosynthesise.

Example of an algal bloom in a lake caused by increased nutrients (Photo: Wayne Trodd)

If nutrient levels in the lake start to decrease, this sequence of events can reverse. This process of improvement can potentially take as long or longer than the initial decline depending on the amount of change in the lake plant community and the amount of nutrient stored in the lake bottom sediment. A simple representation of this reversible progression is shown in the diagram.

Nitrogen in Estuaries and Coastal Waters

The ecology of our estuaries and coastal waters is particularly sensitive to nitrogen. Increased nitrogen concentrations in these waters is an indicator of human activities in the upstream catchments affecting water quality.

Nitrogen is generally the primary limiting nutrient in coastal ecosystems, meaning that its concentration will control the growth of algae and aquatic plants. This increased algal growth can lead to problems such as low oxygen levels and the shading of sunlight needed by aquatic plants. These changes can damage the ecology of these systems.

This assessment is based on winter levels of dissolved inorganic nitrogen[13] (DIN). The concentration of DIN is expected to be at its highest in winter because of the absence of any significant plant or algal growth at that time of year, therefore less nitrogen is used up and remains in the water.

Findings

Twenty one of the 103 (20%) estuarine and coastal water bodies assessed were in unsatisfactory condition for DIN.

The majority of the estuaries with the highest concentrations above the assessment thresholds for winter dissolved inorganic nitrogen[14] were in the south and south east of the country, which is also the area with the highest river nitrate concentrations. Four of the top five highest areas were in the south east (with the exception of the Castletown Estuary), namely:

- Glashaboy Estuary (Co. Cork) – 124% above threshold value
- Wexford Harbour (Co. Wexford) – 89% above threshold value
- Castletown Estuary (Co. Louth) – 85% above threshold value
- Upper Barrow Estuary (Co. Kilkenny) – 83% above threshold value
- Corock Estuary (Co. Wexford) – 83% above threshold value

An analysis of change over time has shown that nitrogen levels have significantly increased in four water bodies from 2012 to 2022:

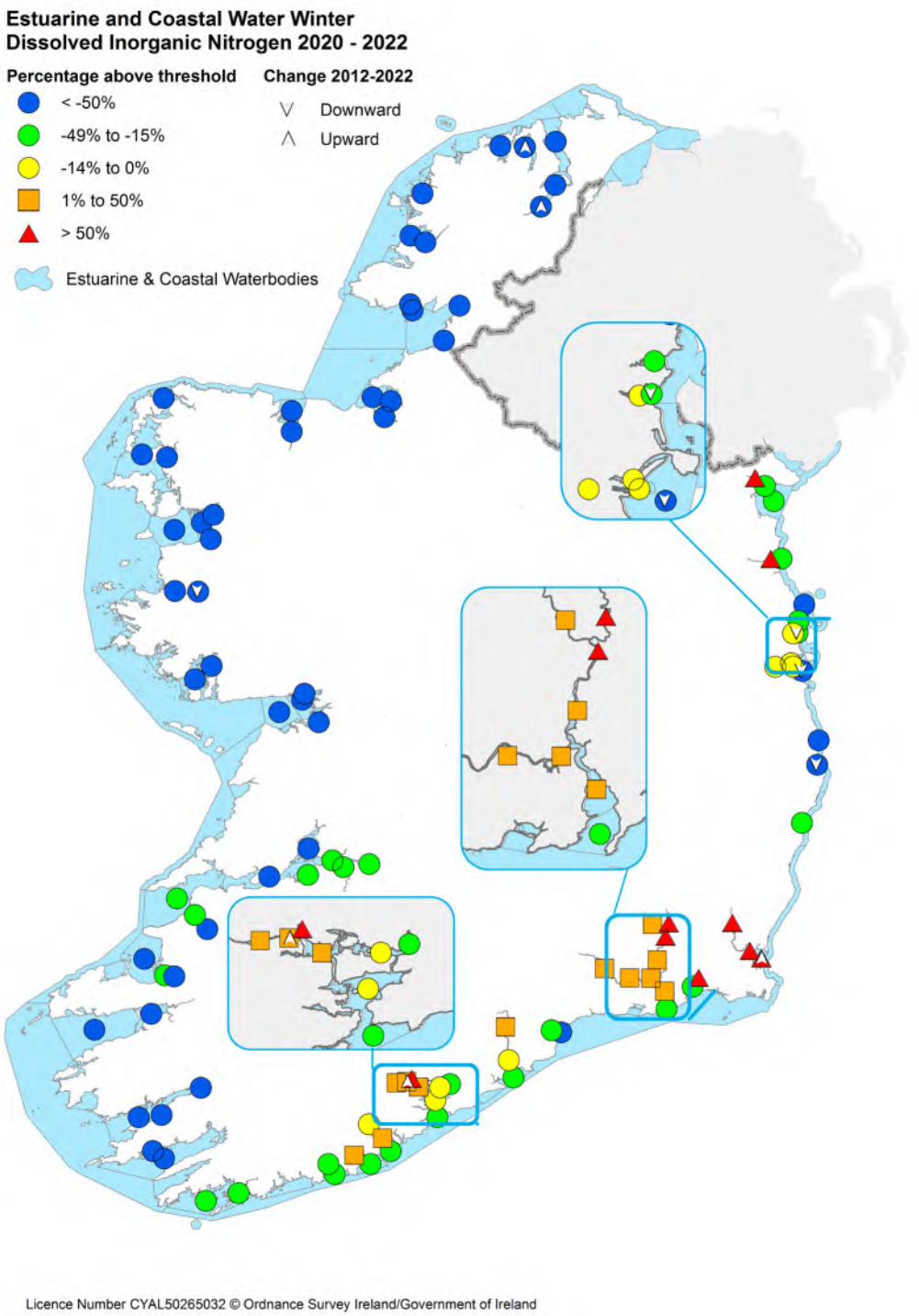
- Lee Estuary (Co. Cork)
- Wexford Harbour (Co. Wexford)
- Swilly Estuary (Co. Donegal)
- Mulroy Bay (Co. Donegal)

13 Dissolved Inorganic Nitrogen is the sum of nitrite, nitrate and ammonia. DIN is expressed as nitrogen (N).

14 Salinity related thresholds have been defined for DIN in our estuaries and coastal waters. The thresholds range from 2.6 mg/l N in freshwater to 0.25 mg/l N in fully saline waters. DIN concentrations above these thresholds can indicate pollution.

Significant decreases have been observed in the following water bodies since 2012:

- Erriff Estuary (Co. Galway)
- Broad Lough (Co. Wicklow)
- Dublin Bay (Co. Dublin)
- Malahide Bay (Co. Dublin)



Phosphate in Estuaries and Coastal Waters

Increased phosphate concentrations in estuaries can be problematic as they affect the ecology and hence the functioning of the ecosystem.

Phosphate is important in estuarine systems because it is typically the limiting nutrient in lower salinity waters meaning that the concentration of this nutrient can control the growth of algae and aquatic plants. If present in sufficient concentration it can cause eutrophication.

This assessment is based on winter phosphate[15] levels. In winter the concentration of phosphate is expected to be at its highest due to the absence of any significant plant or algal growth.

Findings

Nearly all (97%) estuaries and coastal waters assessed were in satisfactory condition for phosphate. Only three waterbodies were in unsatisfactory condition, having exceeded the relevant threshold[16]:

- Deel Estuary (Co. Limerick) – 55% above threshold value
- Maigue Estuary (Co. Limerick) – 40% above threshold value
- Castletown Estuary (Co. Louth) – 6% above threshold value

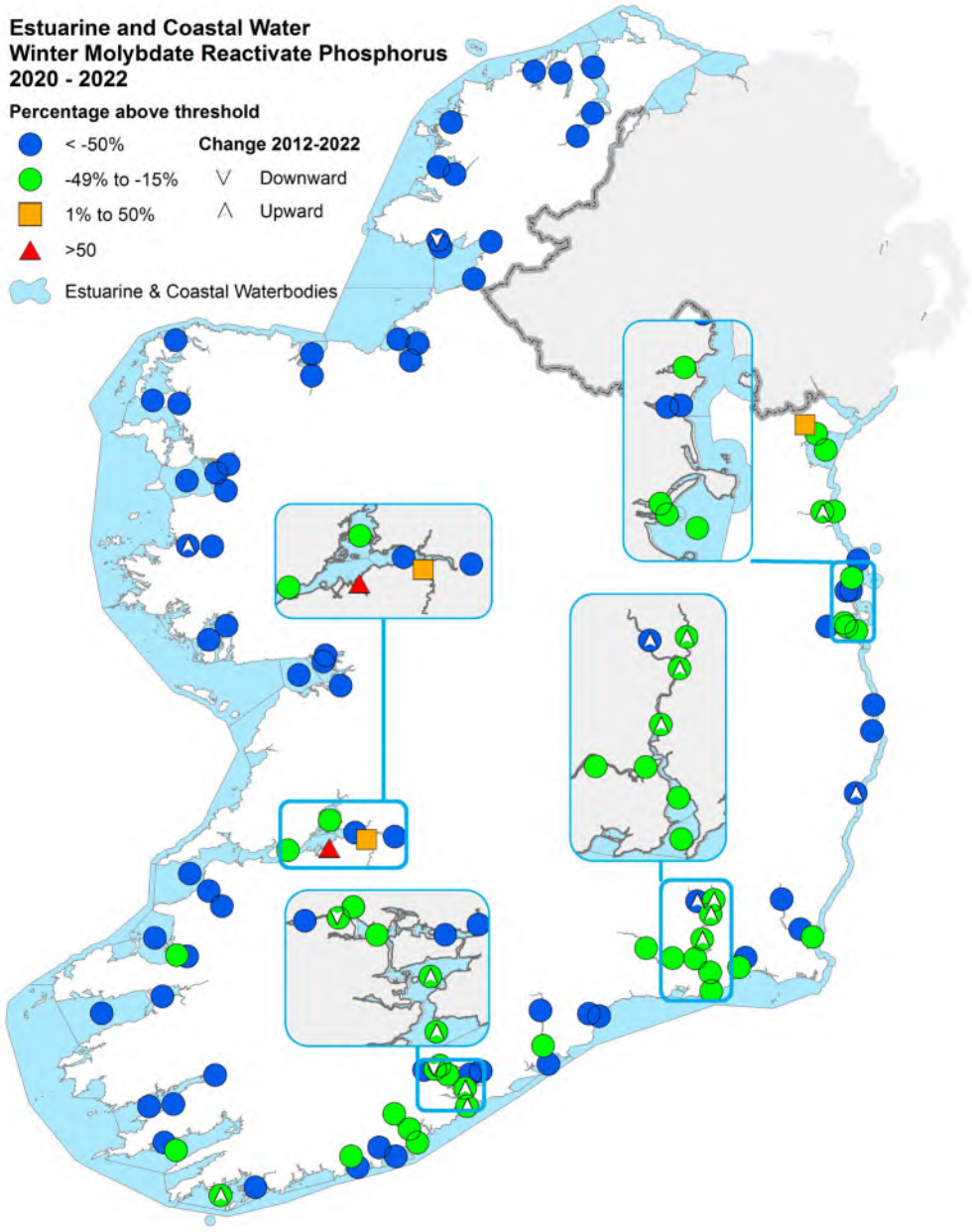
An analysis of change over time from 2012-2022 shows that there has been significant increase in winter median phosphate concentrations in 10 water bodies:

- Cork Harbour (Co. Cork)
- New Ross Port (Co. Wexford)
- Barrow Nore Estuary Upper (Co. Wexford)
- Outer Cork Harbour (Co. Cork)
- Upper Barrow Estuary (Co. Kilkenny)
- Boyne Estuary (Co. Louth)
- Roaring Water Bay (Co. Cork)
- Nore Estuary (Co. Kilkenny)
- Killary Harbour (Co. Galway)
- Avoca Estuary (Co. Wicklow)

Two water bodies showed a significant decrease, the Lower Lee estuary (Co. Cork) and Killybegs Harbour (Co. Donegal).

15 Measured as molybdate reactive phosphate (MRP).

16 Salinity related thresholds have been defined for phosphate in estuaries and coastal waters. The thresholds range from 0.060 mg/l P for fresh and intermediate salinity waters to 0.040 mg/l P for fully saline waters. Phosphate concentrations above these thresholds can indicate pollution.



Nutrient Inputs to the Marine Environment

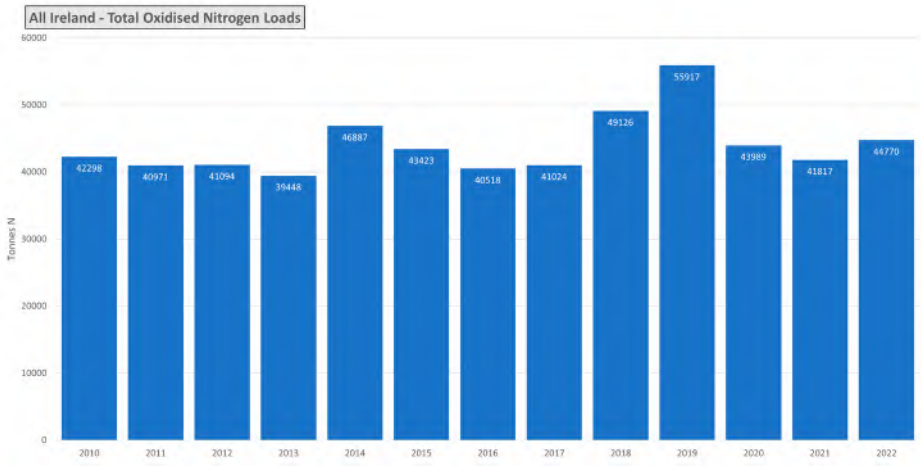
The inputs of nutrients[17], expressed as loadings, from 19 major rivers into the marine environment are monitored to provide an indicator of the loss of nutrients from land-based sources[18]. High loadings of these nutrients can negatively impact our marine ecosystems.

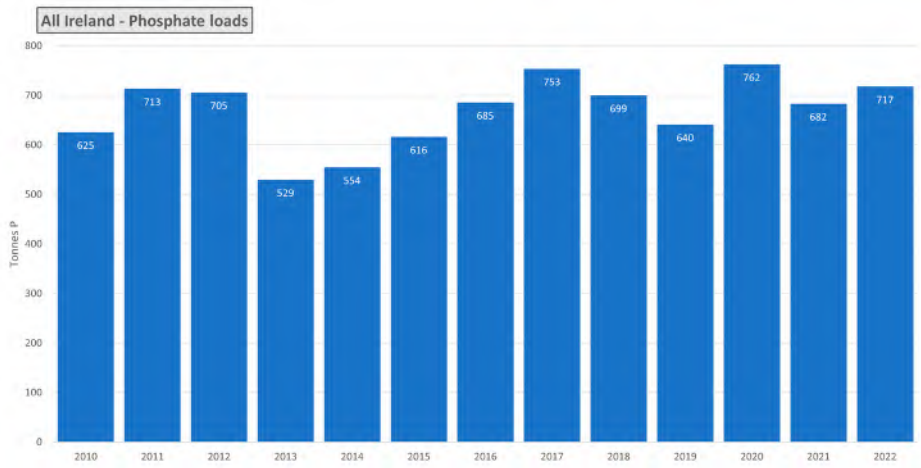
Findings

Loads of nitrogen and phosphate can fluctuate between years depending on the climate however the overall trend is that loads to the marine environment have increased nationally since 2013.

Nitrogen loads in 2022 were higher than in 2021 after reducing from the peaks arising from the drought in 2018 and 2019. Phosphate loadings were also higher in 2022 than in 2021.

The largest contributions of both nutrients come from catchments that drain from the south east of the country.





17 Previous reports have used Total Nitrogen (TN) and Total Phosphorus (TP). Total Oxidised Nitrogen (TON) and Orthophosphate (PO_4) have been used here to better align with data used in other indicators. The values for these parameters are lower than for the TN and TP previously shown as TON and PO_4 only represent a portion of the total.

18 The inputs are calculated based on nutrient concentrations, which are measured 12 times a year, and river flow, which is measured continuously. Changes due to varying river flows between years are accounted for.

Nitrate in Groundwater

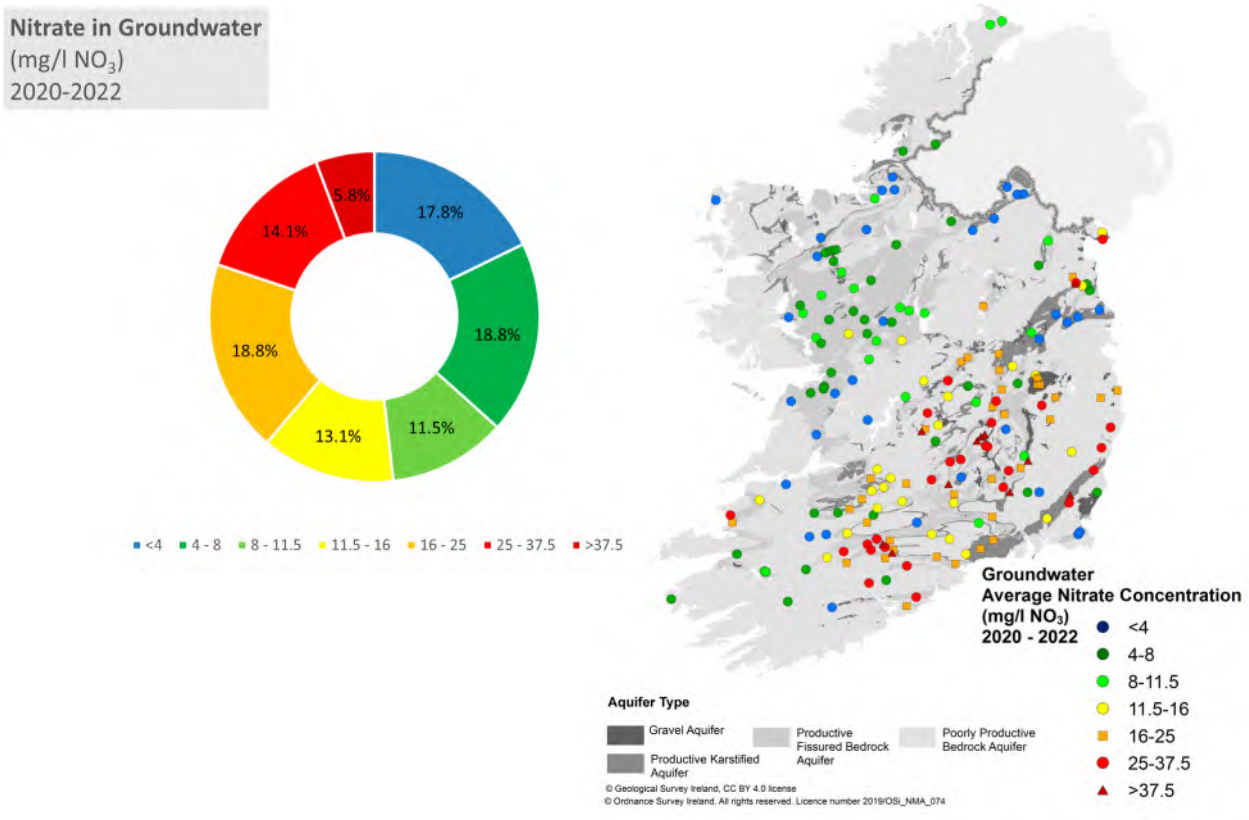
Groundwater flows through the subsoil or bedrock to streams, rivers, lakes, and estuaries. During periods when there is little or no rain, almost all the water flowing in streams and rivers originates from groundwater. Groundwater can be an important contributor of nitrate into surface water bodies.

This indicator is based on the three-year average nitrate concentration (as mg/l NO_3) at 191 groundwater monitoring sites for the 2020-2022 monitoring period. A regional analysis of groundwater nitrate concentrations since 2010 was also undertaken.

Findings

The 2020-2022 average nitrate concentration exceeded 37.5 mg/l NO_3 at 11 (6%) monitoring sites and exceeded the drinking water standard of 50 mg/l NO_3 at two (1%) monitoring sites[19].

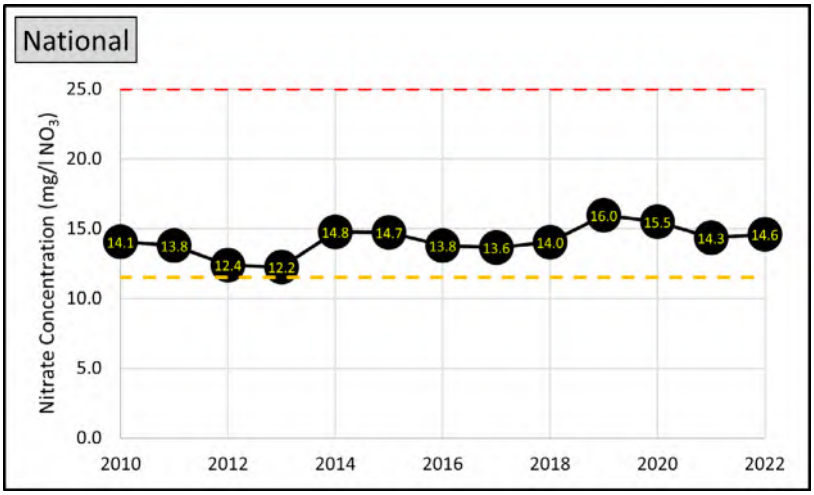
One-fifth (20%) of monitoring sites had nitrate concentrations greater than 25 mg/l NO_3 (considered as a high nitrate concentration).

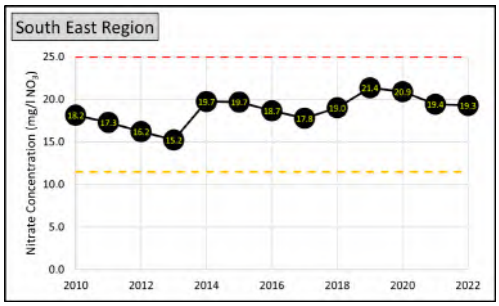


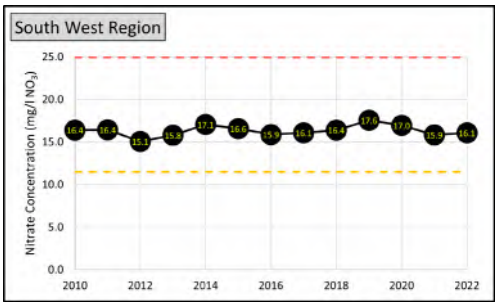
[19] Nitrate concentrations in groundwater that are higher than 10 mg/l NO_3 are usually indicative of inputs relating to human activities, anything above 25 mg/l NO_3 is considered an elevated nitrate concentration. The Irish groundwater WFD threshold value is 37.5 mg/l NO_3. Groundwater is widely abstracted for drinking water in Ireland and the drinking water standard of 50 mg/l NO_3 relates to the potential for harm to human health.

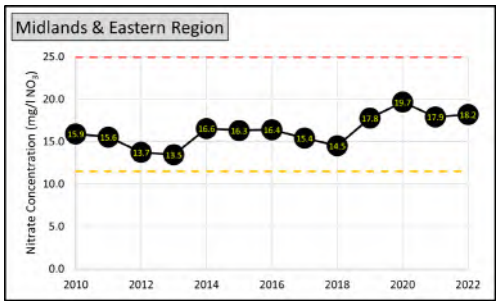
Regional Groundwater Nitrate

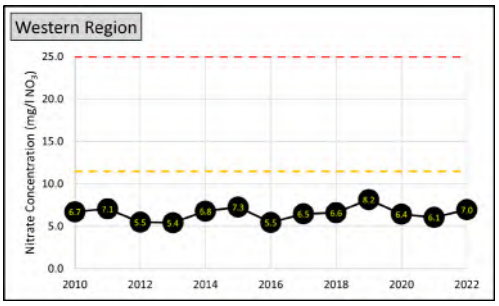
The graphs below show the national and regional profile of average annual nitrate concentrations in groundwater between 2010 and 2022. Concentrations above which there is a risk to good marine and drinking water quality are indicated.

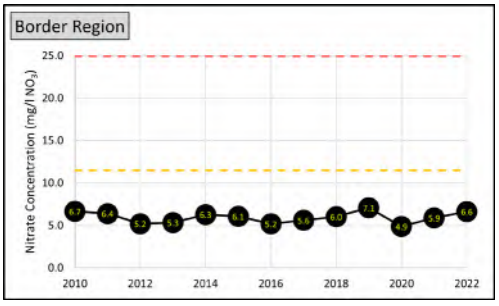


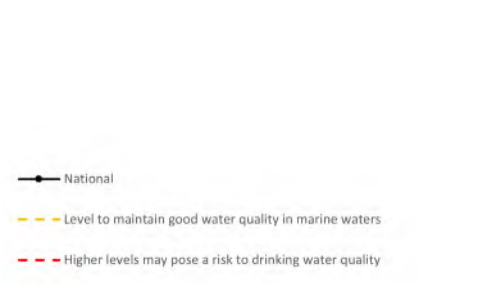












Although drinking water standards are occasionally exceeded at some sites, on average, groundwater nitrate concentrations are below the levels that may pose a widespread risk to human health. Nationally, there has been an overall increase in groundwater nitrate concentrations since 2012/2013 when concentrations were at their lowest. The increasing nitrate concentration is most notable in the South East and Midlands and Eastern Region.

Nitrate concentrations in the South East, Midlands and Eastern, and South West Regions have been consistently above levels that are needed to protect surface water ecology, particularly in our marine waters, since 2010. Nitrate concentrations in the Western and Border Regions have remained low and relatively static since 2010.

Conclusion

Our surface waters and groundwaters continue to be under pressure from human activities. There has been no significant change in the biological quality of our rivers and lakes in 2022 and any improvements we are seeing are being offset by declines elsewhere.

Nutrients

Two-fifths of our river sites nationally are exhibiting high nitrogen concentrations and the rivers, groundwaters and estuaries in the south east are under particular pressure from excessive nitrogen coming from intensive agricultural activities over freely draining soils in these areas. Phosphorus concentrations are too high in over a quarter of our rivers and over one third of lakes and this is impacting on their biological quality.

The loads of nitrogen and phosphorus coming from our major rivers to our marine environment have been increasing since 2013 and are putting the water quality of our estuaries and coastal waters, particularly in the south east, under sustained pressure.

Overall nutrient levels remain too high in many water bodies and there is no indication that they are decreasing. We will not meet our water quality objectives unless, and until, we reduce the emissions of nitrogen and phosphorus to our waters. Addressing this must be a priority.

Agriculture and Waste Water

Ireland's 5th Nitrates Action Programme 2022-2025 is designed to prevent pollution of surface waters and groundwaters from agricultural sources and to protect and improve water quality. The programme 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. Agricultural measures need to be targeted to the areas where they are needed and further measures to achieve this are required.

Uisce Éireann must prioritise investment in urban waste water infrastructure in areas where it is a significant pressure on our waters. The next investment cycle should prioritise these areas.

Further information

Detailed information and data on water quality in Ireland can be found at https://www.catchments.ie/.

A series of fact sheets providing information about the different elements of the Water Framework Directive monitoring programme can be found at Monitoring & Assessment: Freshwater & Marine Publications | Environmental Protection Agency (epa.ie).

To find out more about how to get involved in protecting and managing your local waters visit the Local Authority Waters Programme website at www.lawaters.ie.


epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil