Water Quality for the Nitrates Action Programme

Nitrates Directive Stakeholder Meeting
29th November 2013

Greenmount College

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DOE Department of the Environment www.doeni.gov.uk

NIEA Northern Ireland Environment Agency www.ni-environment.gov.uk

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Nitrates Action Programme 2015-18

- **This presentation summarises the water quality information that has been considered for the forthcoming Nitrates Action Programme (NAP)**

- **It includes Freshwater, Groundwater and Marine water quality data monitored and assessed by NIEA and DOE Marine Division**

- **The data is that submitted to the EC for the Article 10 report in 2012 along with trend data extended to the end of 2012.**

1. Freshwaters
Nitrates in Freshwaters

- **Not regarded as toxic at 'normal' levels**
- **They are nutrients, so excessive levels encourage major algal growth**
- **Subsequently can lead to Dissolved Oxygen depletion**
- **High levels in drinking water can disrupt ability of red blood cells to carry oxygen – 'blue baby' syndrome**
- **Drinking Water Directive**

Kilturk Lough, Co. Fermanagh (2010)

Phosphorous in Freshwaters

- **Generally seen as limiting nutrient in freshwaters (i.e. used first)**
- **Elevated levels can cause explosive algal growth and can include blue-green algae which can be toxic**
- **Eutrophic effects as for nitrates**
- **Phosphorus monitored in rivers known as soluble reactive phosphorus (SRP)**
- **For lakes total phosphorus (TP) is monitored**

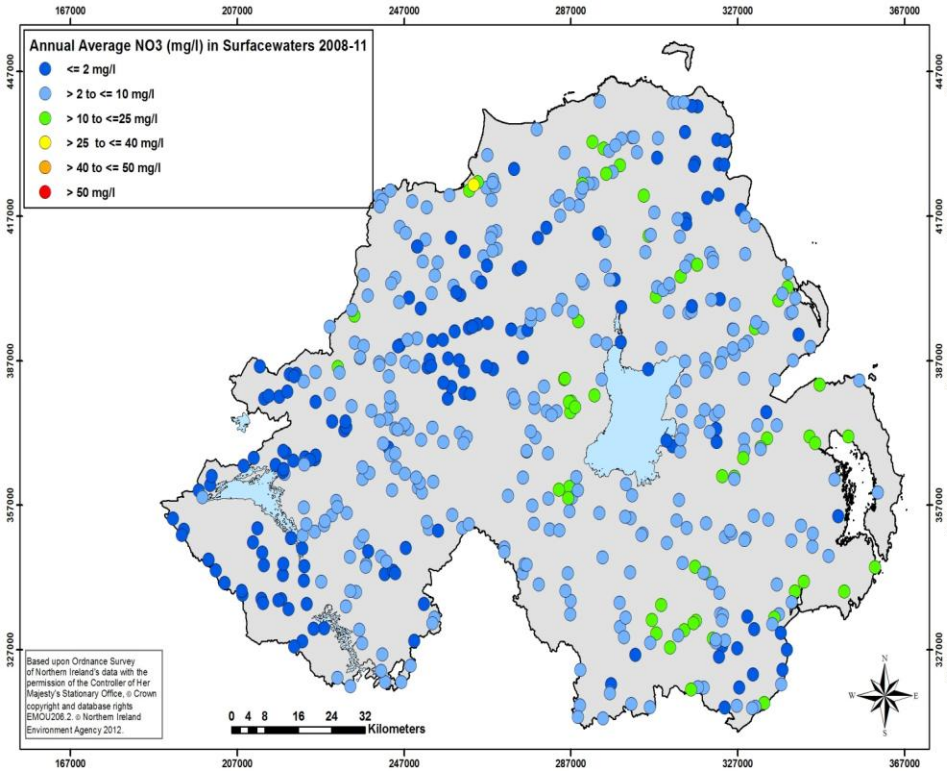
Excessive algal growth in the water column at Cashel Lough Upper, Co. Armagh (2006)

Sources of data

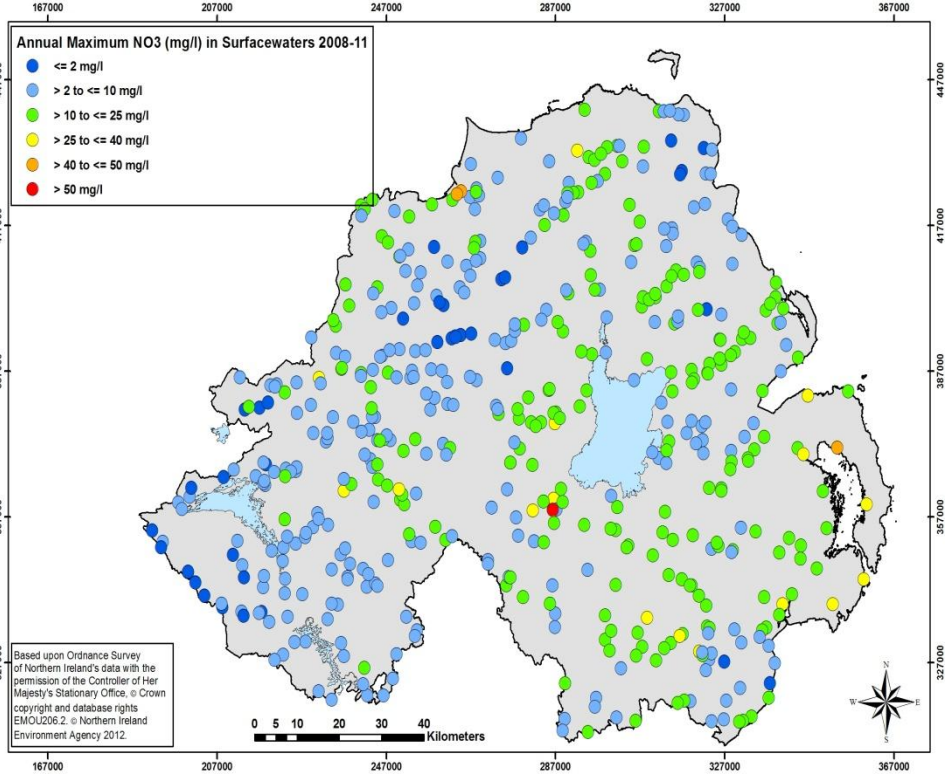
- **2008 and 2012 Article 10 reports**
  - **Nitrate and SRP concentrations across NI for 2004-07 and 2008-11**
  - **Nitrate and SRP trends across NI across the reporting periods**
  - **Trophic status assessment, based on phosphorus, macrophytes and diatoms across NI for 2008-2011**
- **Long term trends for Nitrates and SRP**
  - **1992-2012 for Nitrates**
  - **1998-2012 for SRP**

Nitrate concentrations (mg NO_3/l) at freshwater sampling points 2008–11

Averages

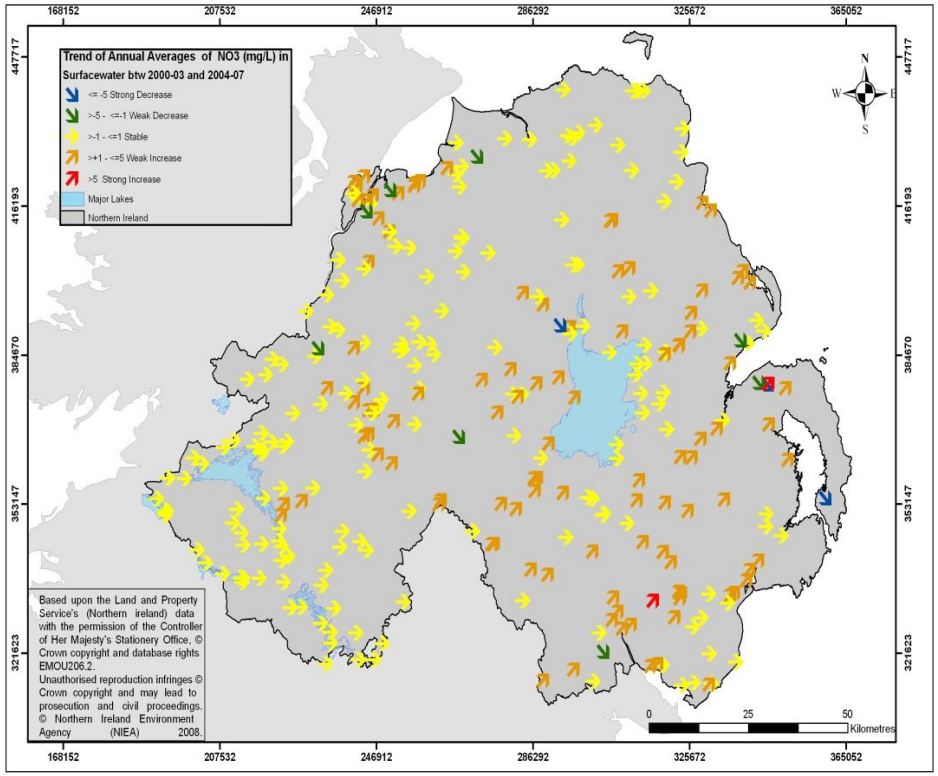


Maxima

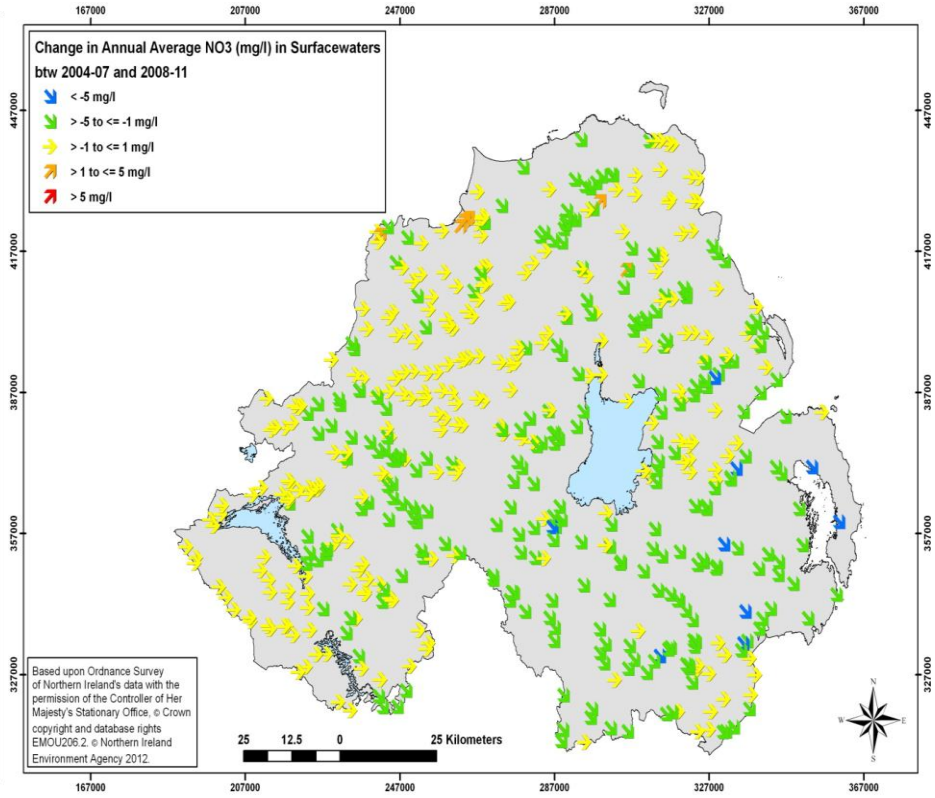


Change in average nitrate concentrations (mg NO_3/l) at freshwater sampling points between 2000-2003 to 2004-2007 and 2004-2007 to 2008-2011

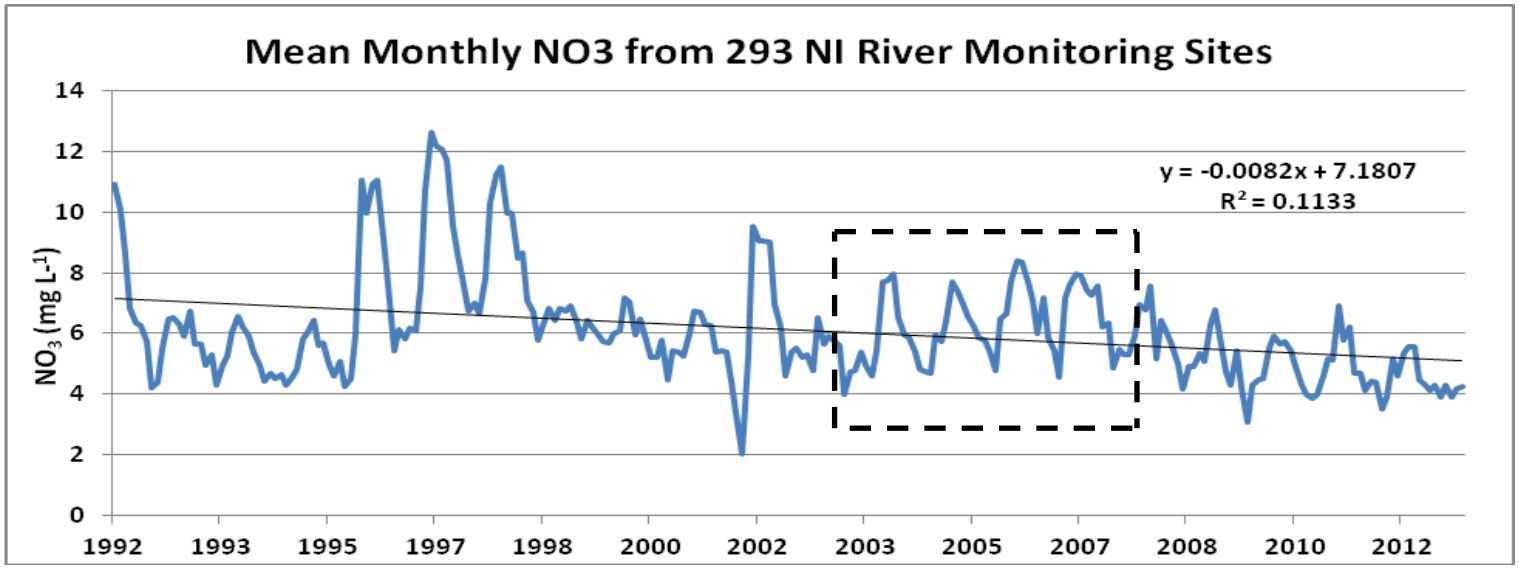
2000-03 to 2004-07



2004-7 to 2008-11



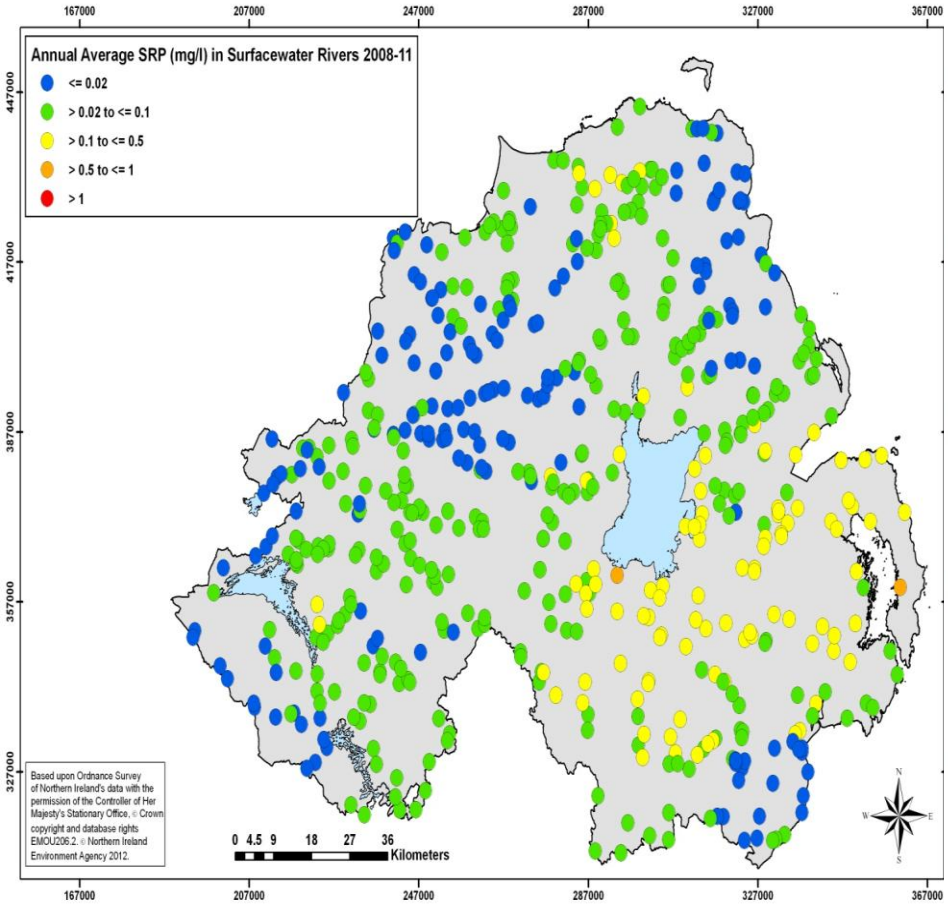
Nitrate concentrations in 293 river monitoring sites summarised by month into annual mean values of the site population



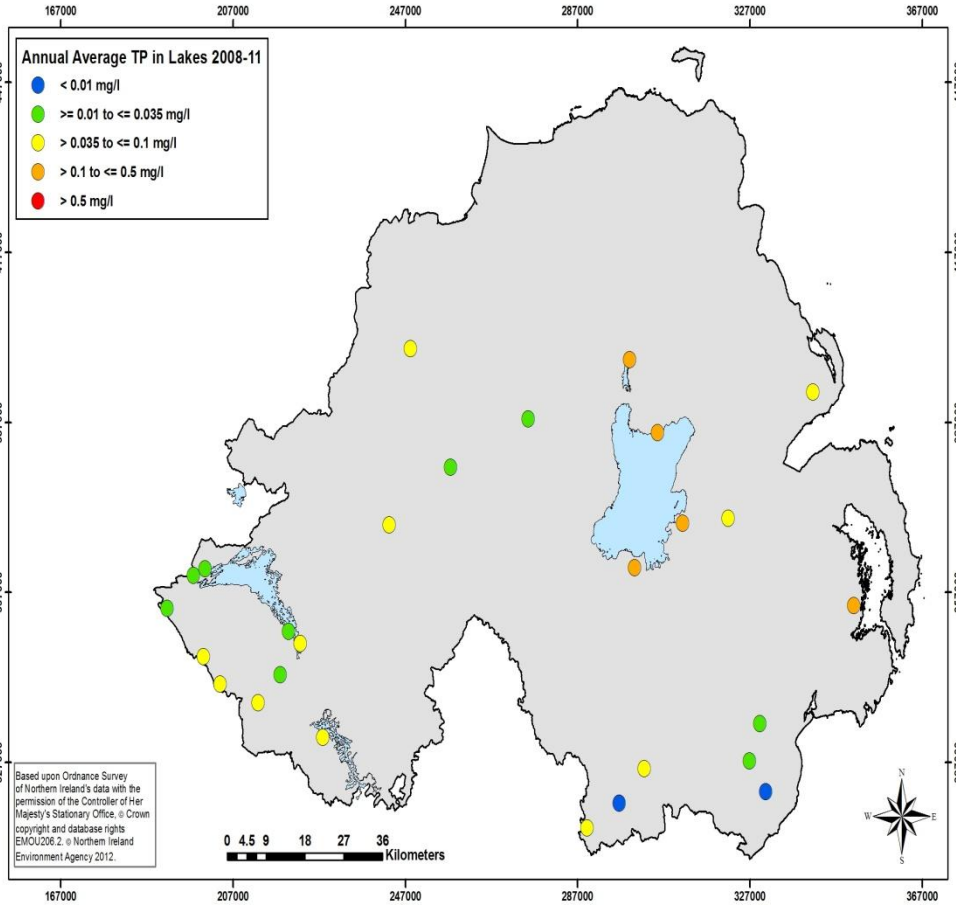
Overall a decrease, however evidence of a slight increase around 2003-2007 before decreasing again

Average rivers and lakes P (mgP/l) 2008-11

Rivers SRP

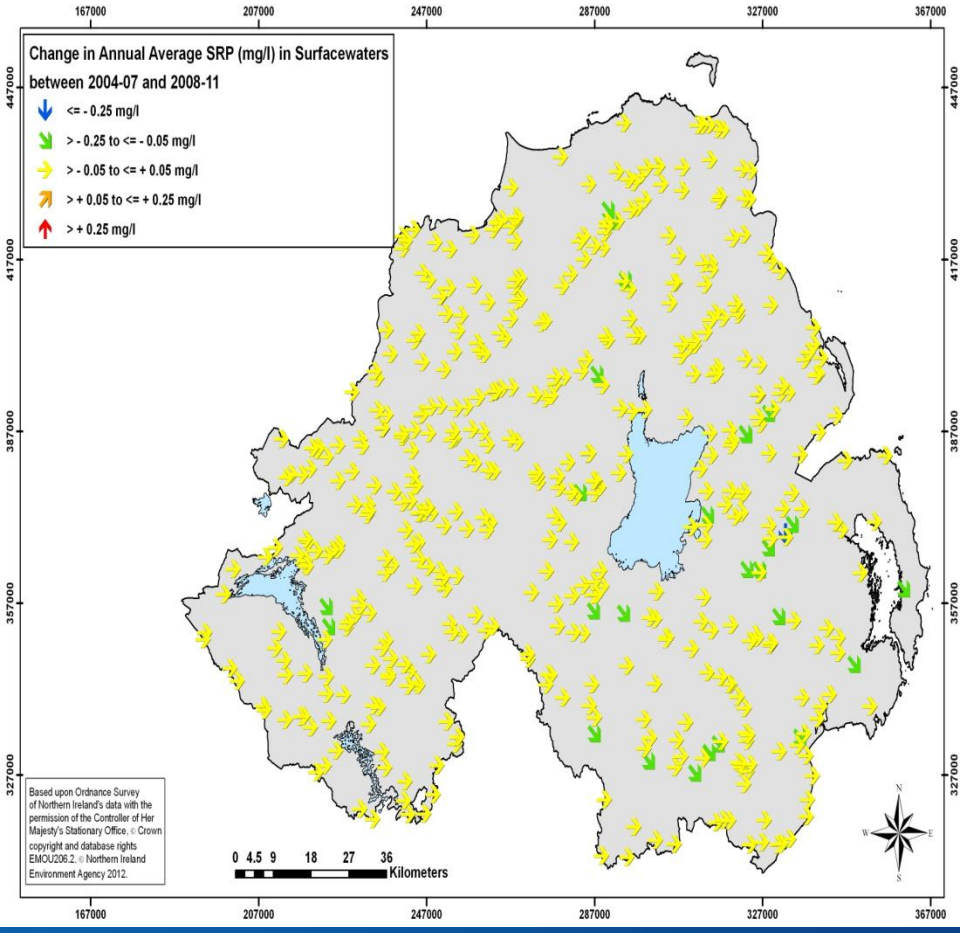


Lakes TP

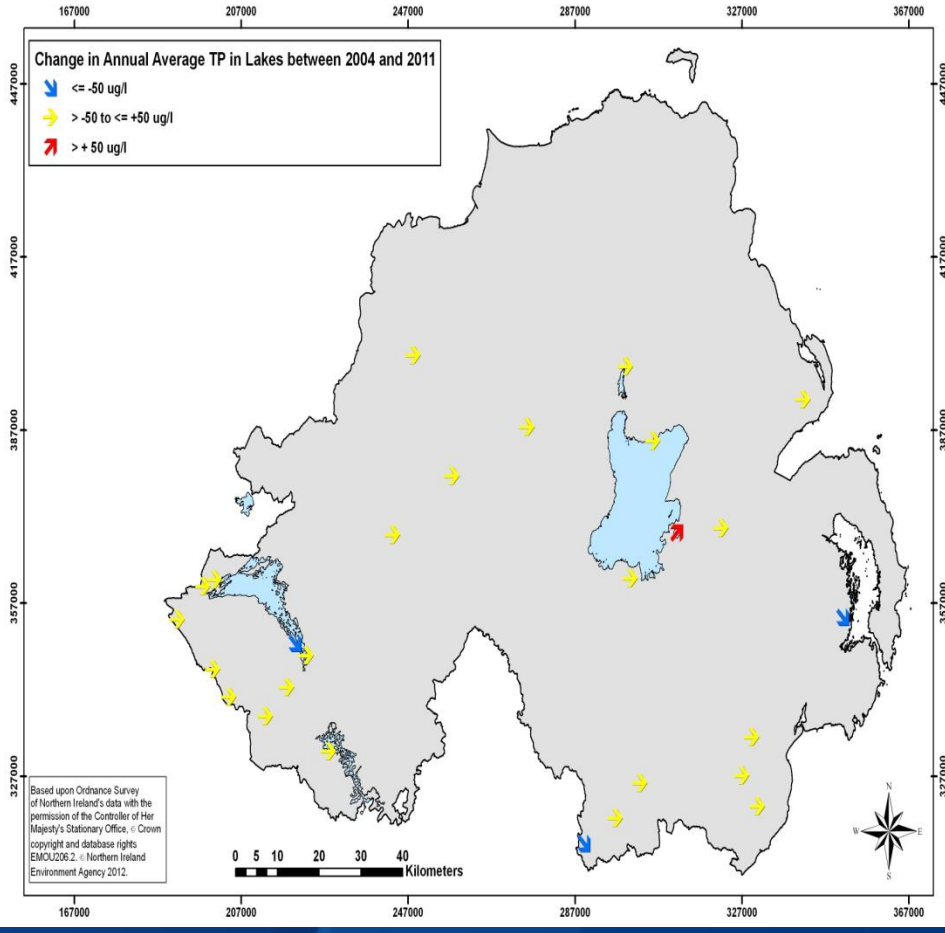


Changes in average P concentrations in rivers and lakes between 2004-07 to 2008-11

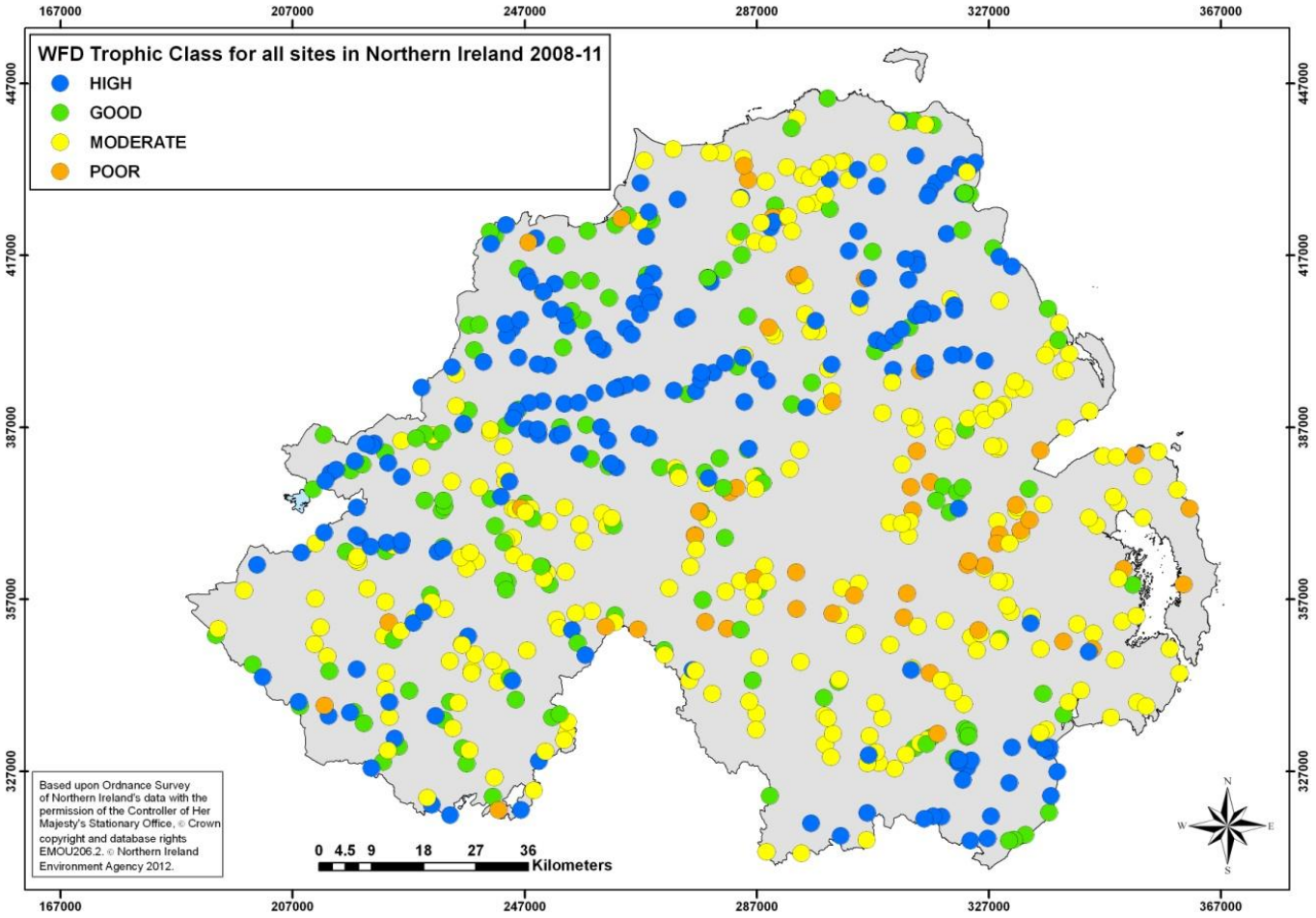
Rivers SRP



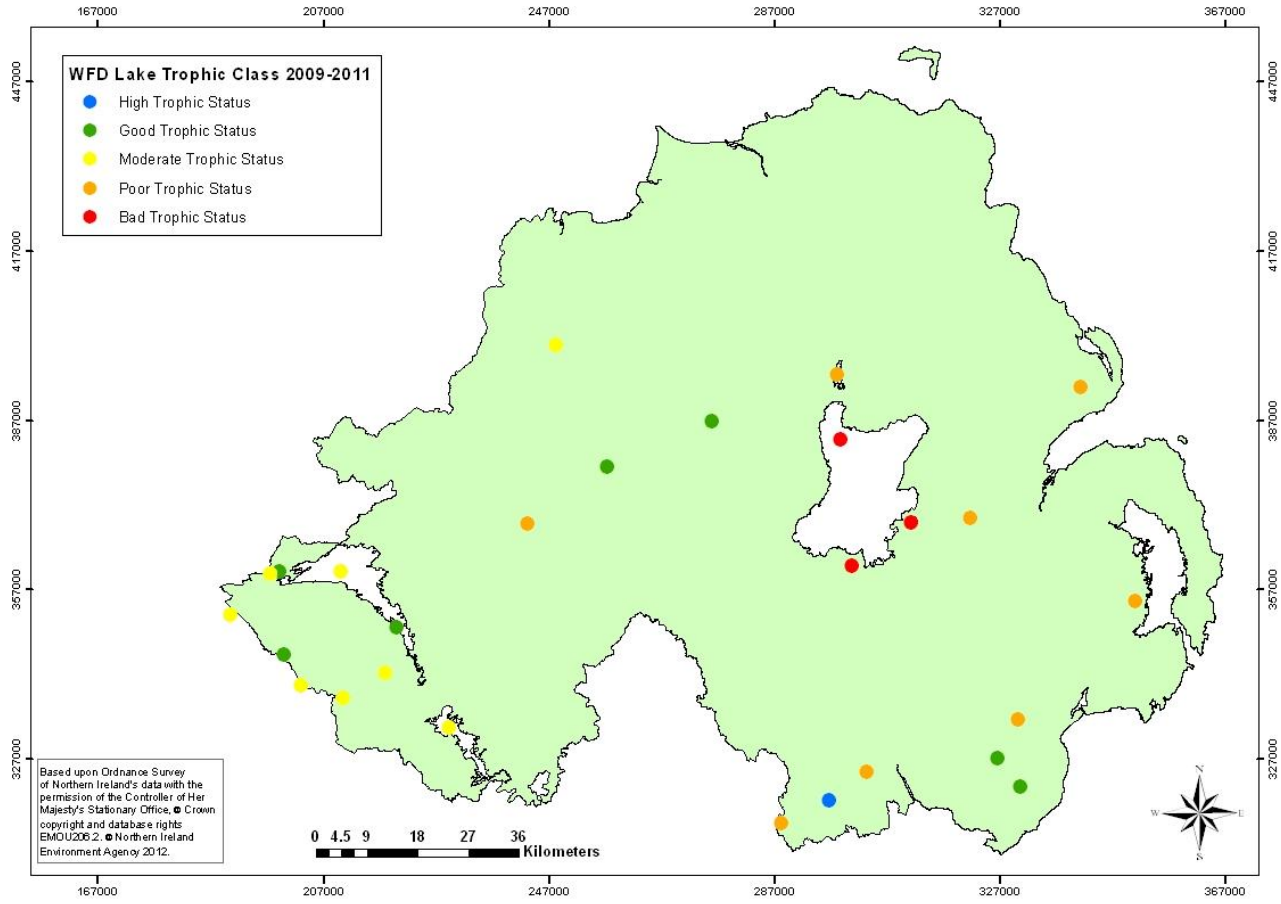
Lakes TP



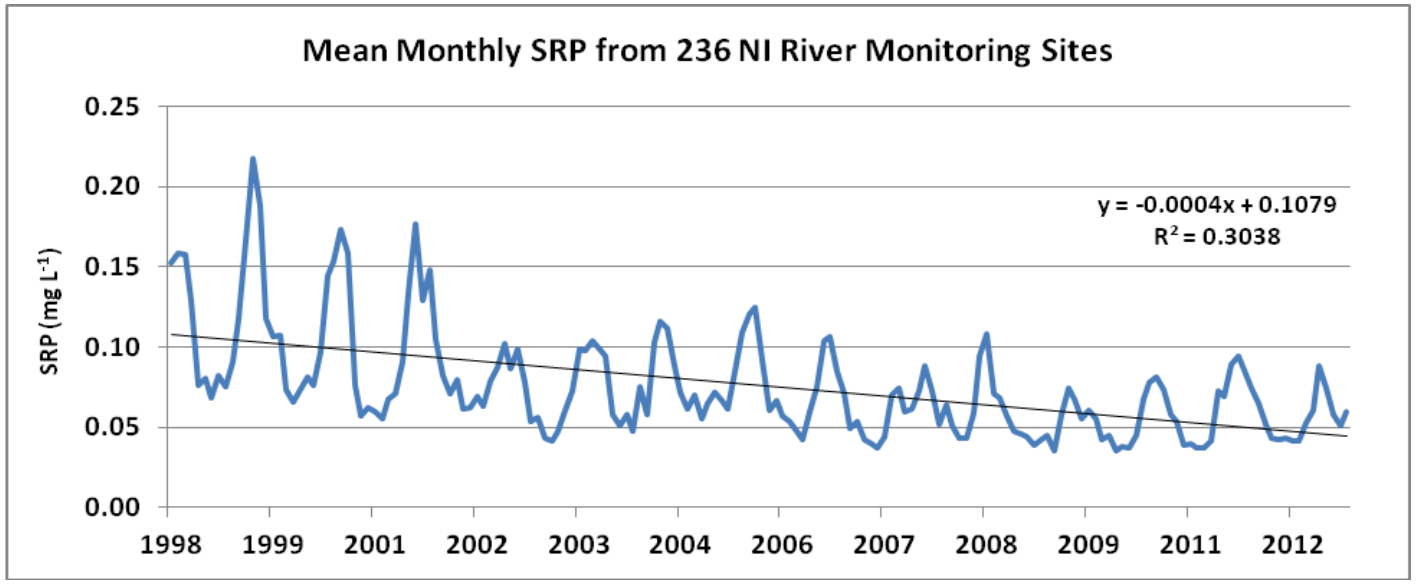
Distribution of overall river WFD site trophic classes in the period 2008-2011 based on SRP, macrophytes and diatoms



Overall lake WFD trophic class in the period 2009-2011 based on TP, phytoplankton (chlorophyll-α) macrophytes and diatoms



Soluble reactive phosphorus concentrations (mg SRP/l) in 236 river monitoring sites summarised by month into annual mean values of the site population



A good decrease from an initially high figure but seems to have stalled or reversed over the past year or two.

Summary of Freshwater quality data

Nitrate

- Nitrate levels in NI rivers remain relatively low
- The average nitrate concentrations in rivers, lakes and surface drinking waters were generally stable or decreasing (99% of sites) between 2004-07 and 2008-11.
- There is a similar pattern in maximum concentrations with 89.4% of sites remaining stable or showing a decrease and only 10.6% of sites showing an increase.

Summary of Freshwater quality data

SRP

- **There has been a good decrease in rivers SRP from a fairly elevated figure over the past 14 years.**
- **Average Phosphorus concentration is decreasing or stable at 99% surface freshwater stations. But the rate of decrease appears to have stalled which emphasises the need for ongoing action.**
- **Compared with 2004-07 period fewer river sites (17%) had SRP concentrations above 0.1 mg/l (considered indicative of nutrient enrichment) and more sites (28%) had annual average concentrations of below 0.02 mg/l.**

Summary of Freshwater quality data

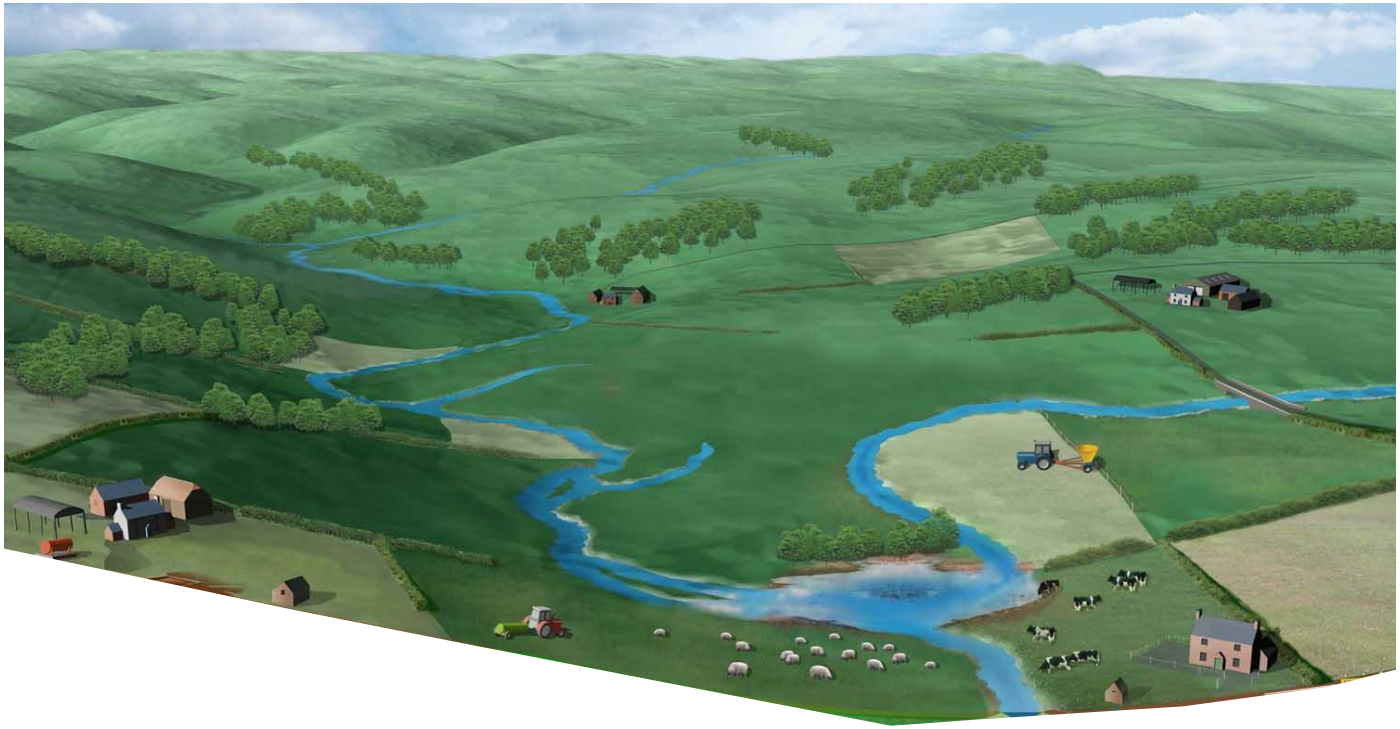
Trophic Classification

- **Trophic classification of river water bodies shows that over 50% are not at GOOD Status as required by WFD.**
- **Lakes trophic classification generally not as good as rivers.**

Starraghen Tributary, Co. Fermanagh (2013)

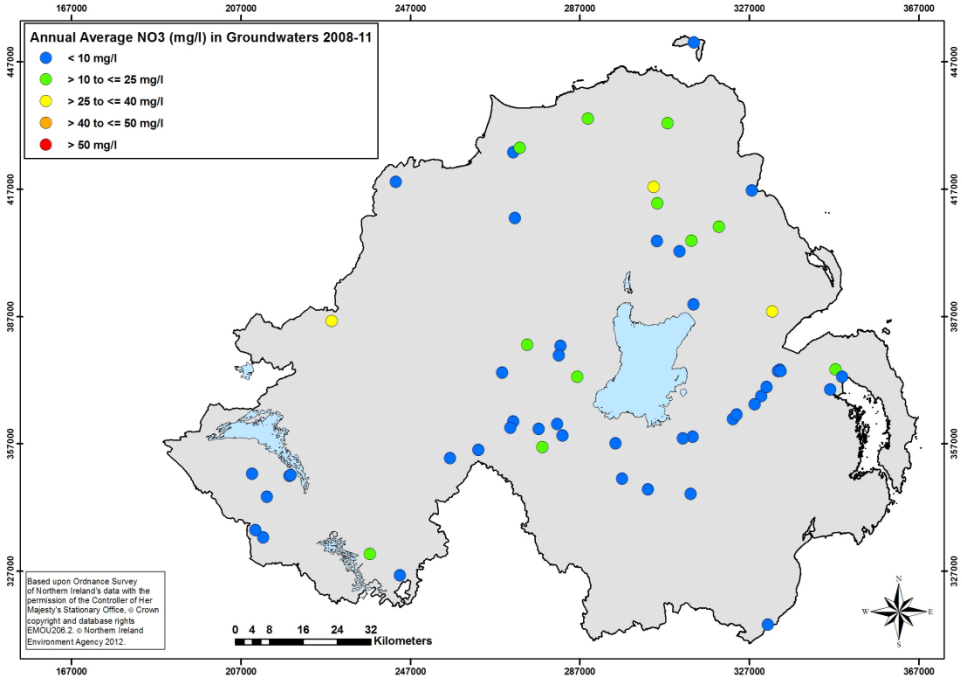
Encyonema prostratum

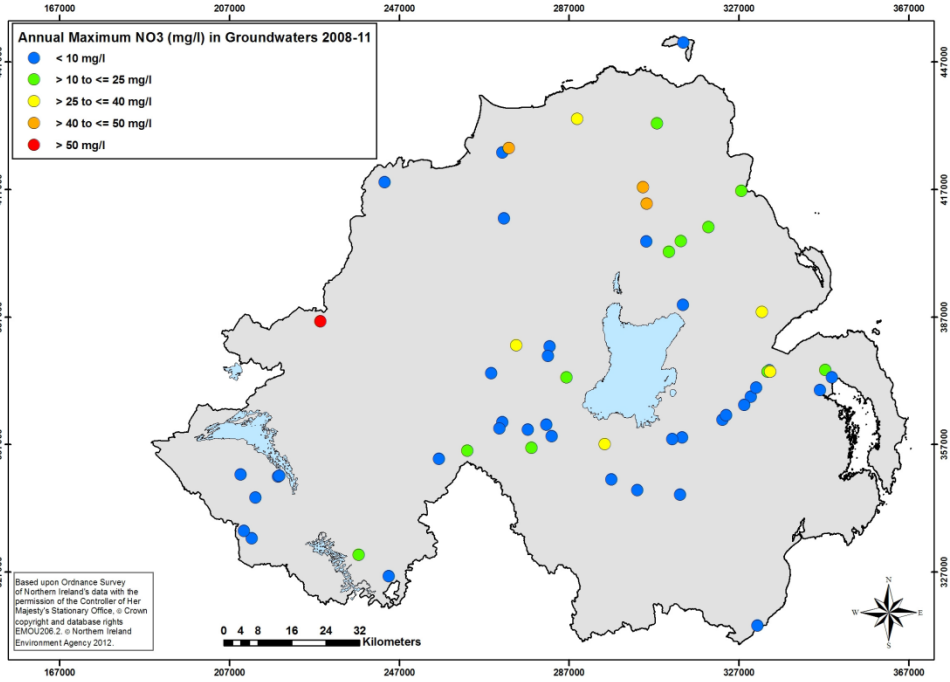
2. Groundwater



- 3D vision required for integrated catchment management (ICM)
- Groundwater is often the missing link

Annual average and maximum nitrate concentrations in groundwater



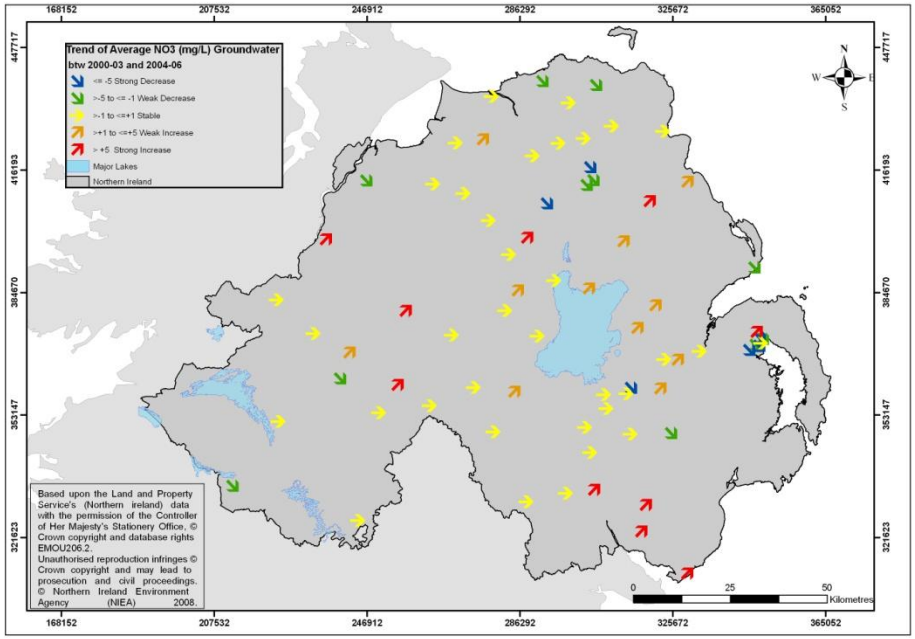


For 2008 -11 reporting period:

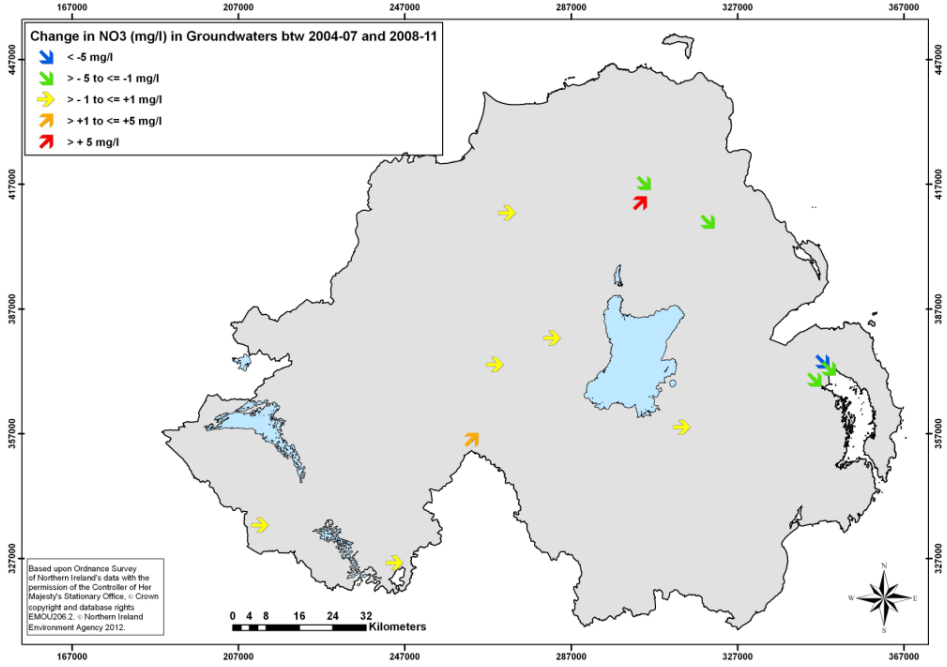
- All 58 sites have an annual average nitrate concentration of less than 40 mg/l
- 55 sites have an annual average nitrate concentration of less than 25 mg/ l
- 1 site had a max. nitrate concentration that exceeded the DWS of 50 mg/ l

Change in annual average nitrate concentrations in groundwater

2004-07



2008-11



Comparing 2004-07 with 2008-11 reporting period:

- 11 out of 13 common sites show stabilising or decreasing trend

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Eutrophication is an issue in some estuarine and coastal ecosystems around Northern Ireland. It occurs when the enrichment of water by nutrients including nitrates (often from fertilizer run-off from agricultural land or sewage discharges) causes an accelerated growth of algae and higher forms of plant life. This in turn leads to an undesirable disturbance to the balance of organisms present in the water and to the quality of water concerned.

Marine data sources

Data has been routinely collected historically to address multiple legislative drivers such as Sensitive Area reviews for the EU Urban Wastewater Treatment Directive, Shellfish Waters Directive, and OSPAR.

In recent years a much more integrated programme has been a status assessment to address the EU Water Framework and Marine Strategy Framework Directives which requires corroboration through biological effects.

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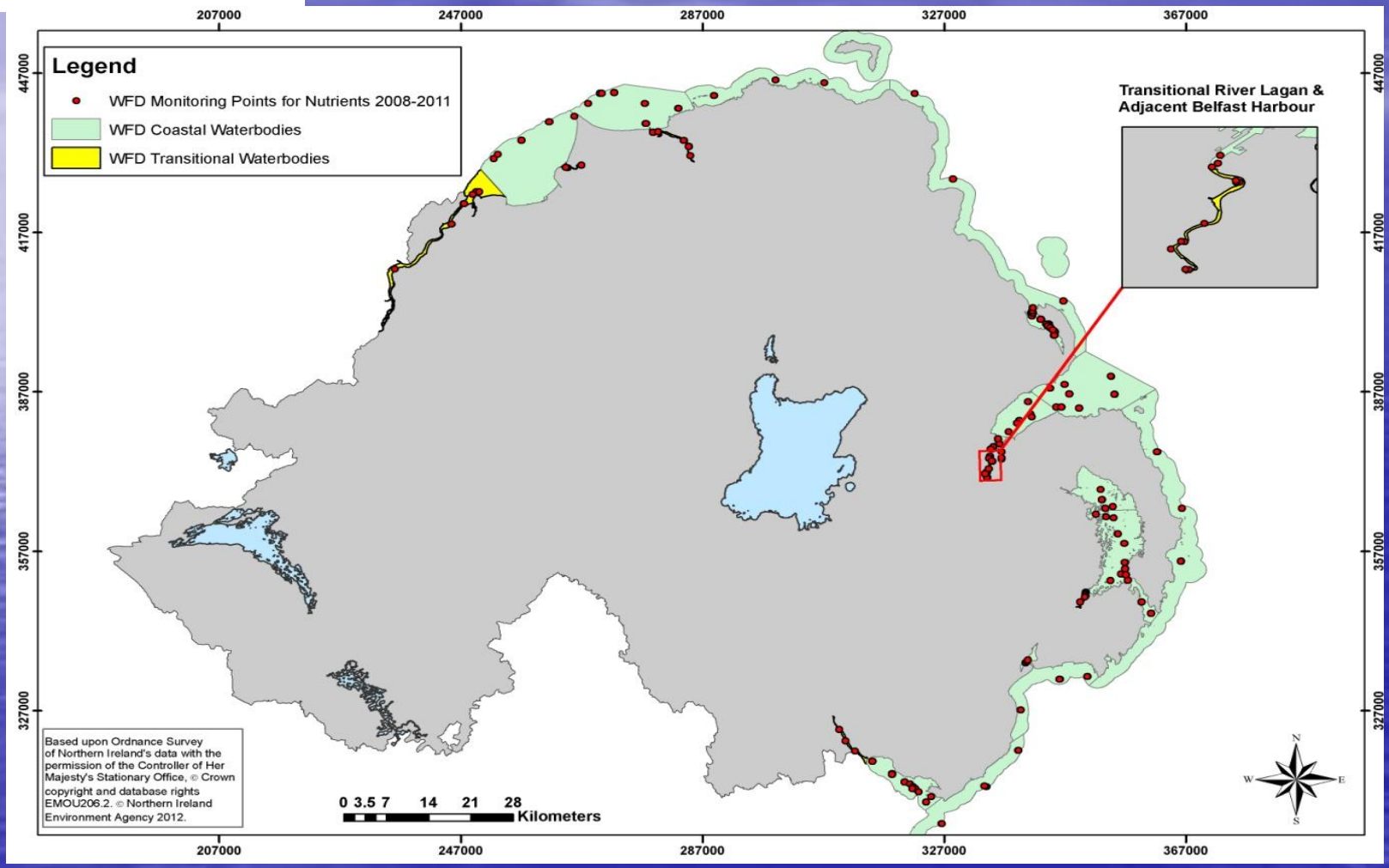

Water Framework Directive nutrient monitoring points for transitional and coastal marine water bodies 2008-2011

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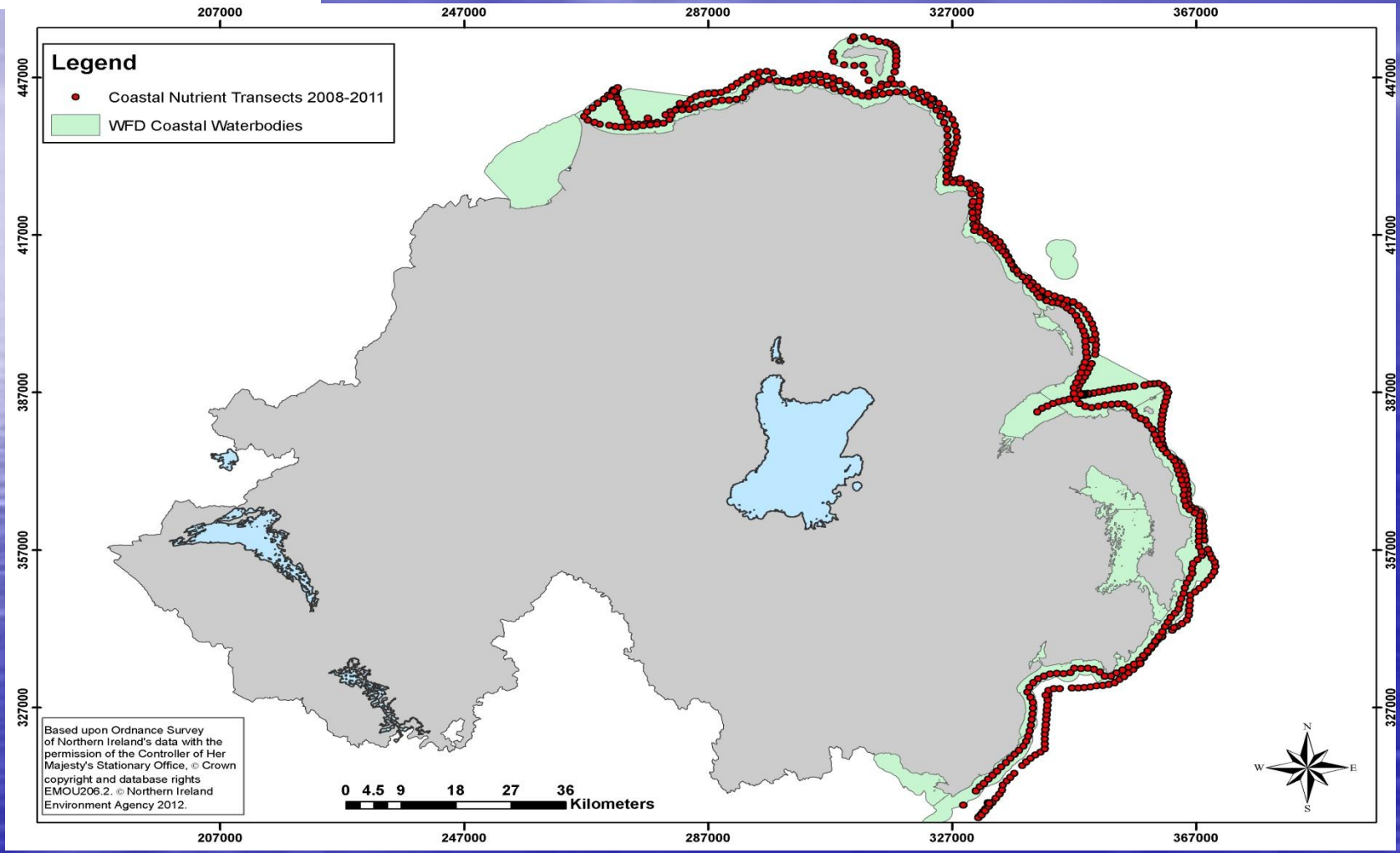

Water Framework Directive coastal nutrient monitoring transects 2008-2011

Marine assessment

The overall combined assessment of direct and indirect eutrophication related parameters demonstrates changes in status over the period of the this and previous reports . The results of the WFD assessment broadly align with previous assessments under both the Nitrates Directive and the UWWTD.

The parameters assessed include DIN (nitrate, nitrite and ammonia);dissolved oxygen; chlorophyll-a and macroalgae.

Nutrient inputs to marine waters are assessed using the winter mean of DIN.

Measurements of chlorophyll-α, used as an estimate of phytoplankton biomass, are included in most eutrophication monitoring programmes.

Plant tools are utilised to monitor the growth of green algal species which can form dense mats in response to localised nutrient enrichment.

The Reduced Species List (RSL) tool for marine macroalgae uses basic indices to assess nutrient enrichment and disturbance pressures; and the Macroalgal Blooming Tool (MBT) is designed to determine the extent of algal cover and associated biomass of green algal species which develop in response to local nutrient enrichment pressure.

There is now some confidence in the assessment of nutrients due to the availability of extensive datasets in coastal water bodies, and the enhanced monitoring which was put in place in areas that were previously reported to be vulnerable.

Problems are regularly apparent in some small areas which have been below 'good status' for WFD assessment in recent years.

These problems have been in areas where there have been long standing issues over nutrient enrichment, and they also tend to be in transitional estuaries and/or heavily modified water bodies.

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2012 Macroalgal blooms forming mats in Inner Dundrum Bay observed during the seagrass survey. Note the black mud which indicates anoxic conditions (where no oxygen is present) in the sediment beneath the mats.

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Ulva spp. Previously *Enteromorpha* – Strangford Lough North.

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Ulva spp over mud and gravel (freshwater tolerant) – Dundrum Bay

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Salicornia – Sea Asparagus – Dundrum Bay Inner

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Gracilaria vermiculophylla – a non-native seen here smothering Ulva spp.

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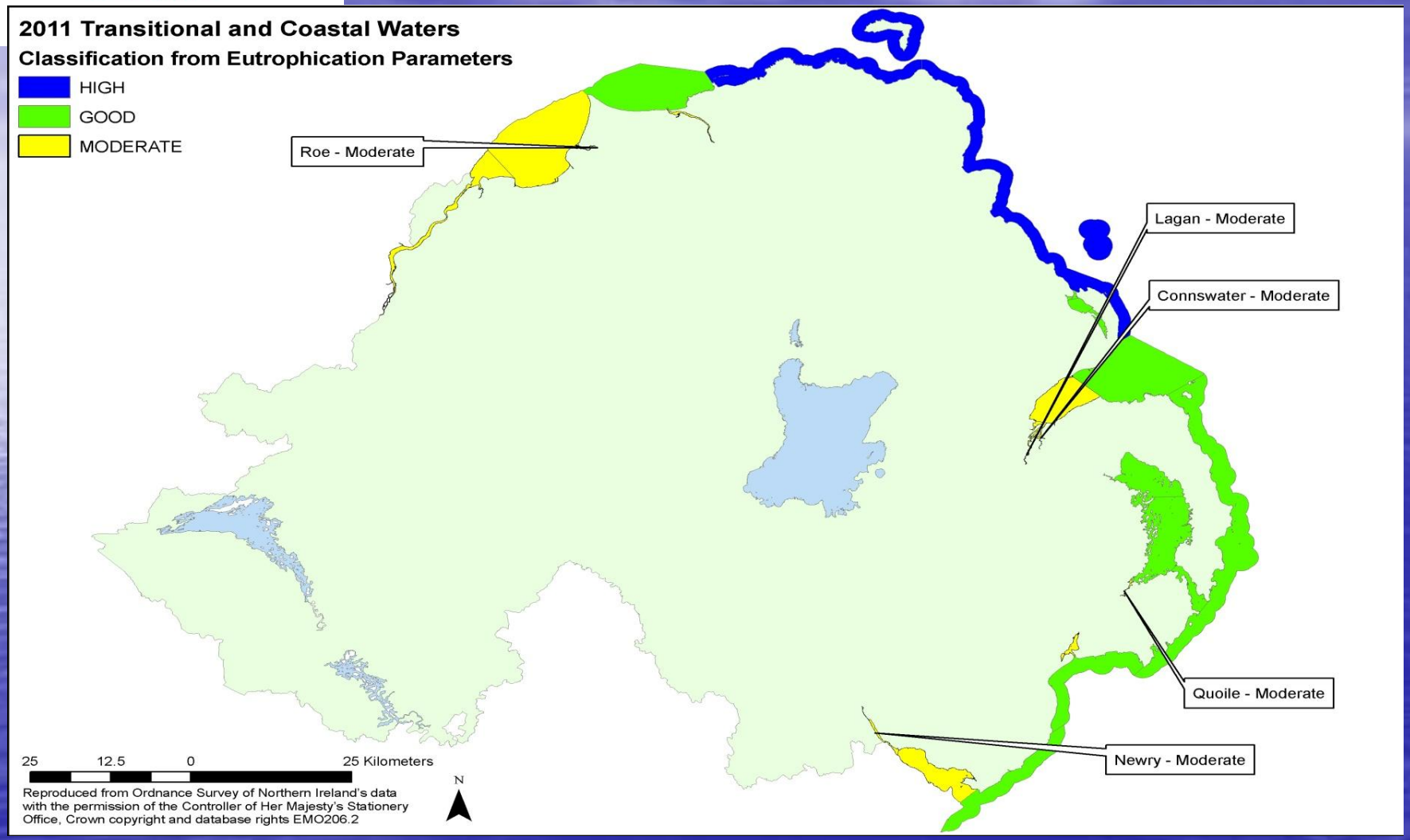

Northern Ireland overall water body classification based on the combination of all relevant direct and indirect eutrophication related parameters.

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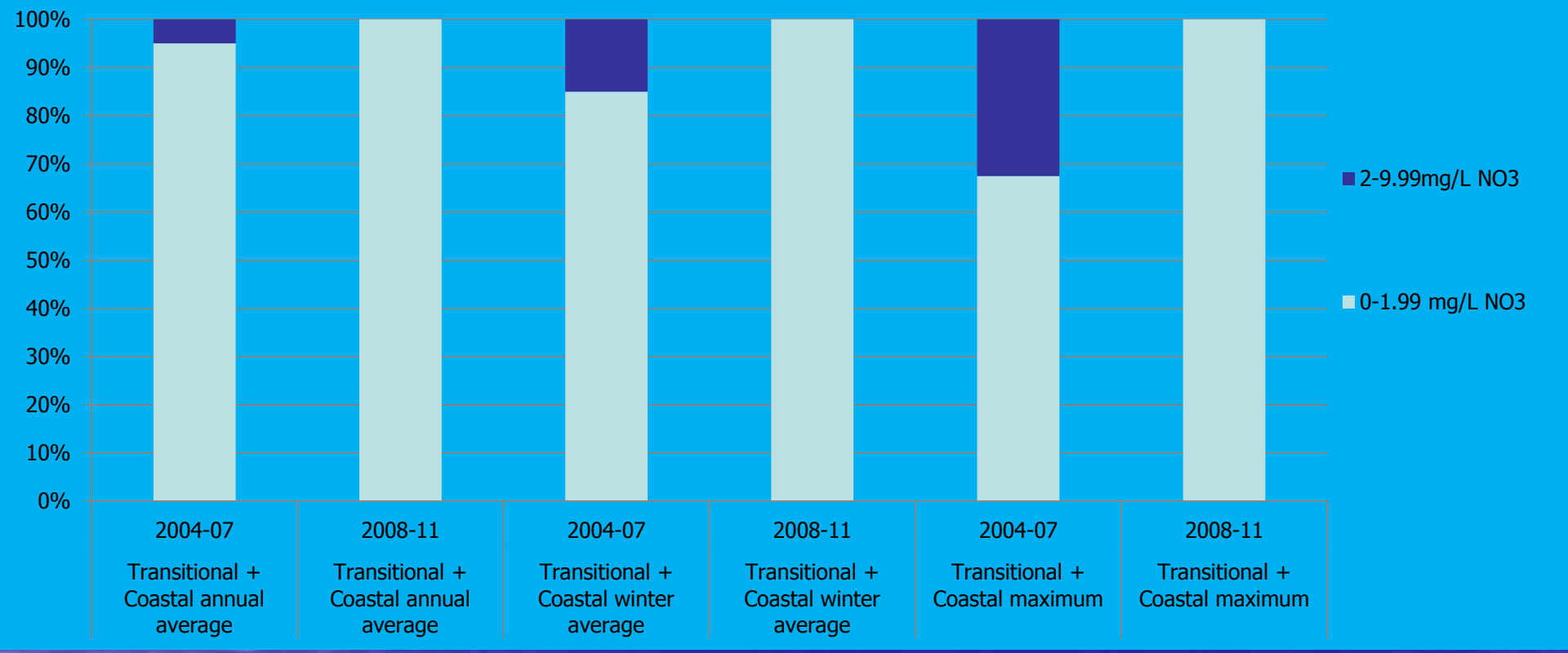

Monitoring for the current period (2008-2011) shows that nitrate concentrations in marine waters have reduced from those monitored in the previous reporting period, with all sites having annual average, winter average and maximum concentrations of less than 2.0 mg NO_3/l.

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A large proportion of eutrophically impacted marine areas in Northern Ireland are due largely to upstream agricultural inputs and storm discharges from sewage treatment works and their related nutrient introductions.

There is evidence of eutrophication in small areas of restricted water movement. These include the brackish and estuarine waters of inner Belfast Lough, the tidal Lagan Estuary and Inner Dundrum bay.

Recent monitoring has shown that winter concentrations of Dissolved Inorganic Nitrogen (DIN) in Northern Ireland's five sea loughs are either reducing or stable. Historical reductions are due to changes in nutrient inputs from both waste water treatment works and industry.