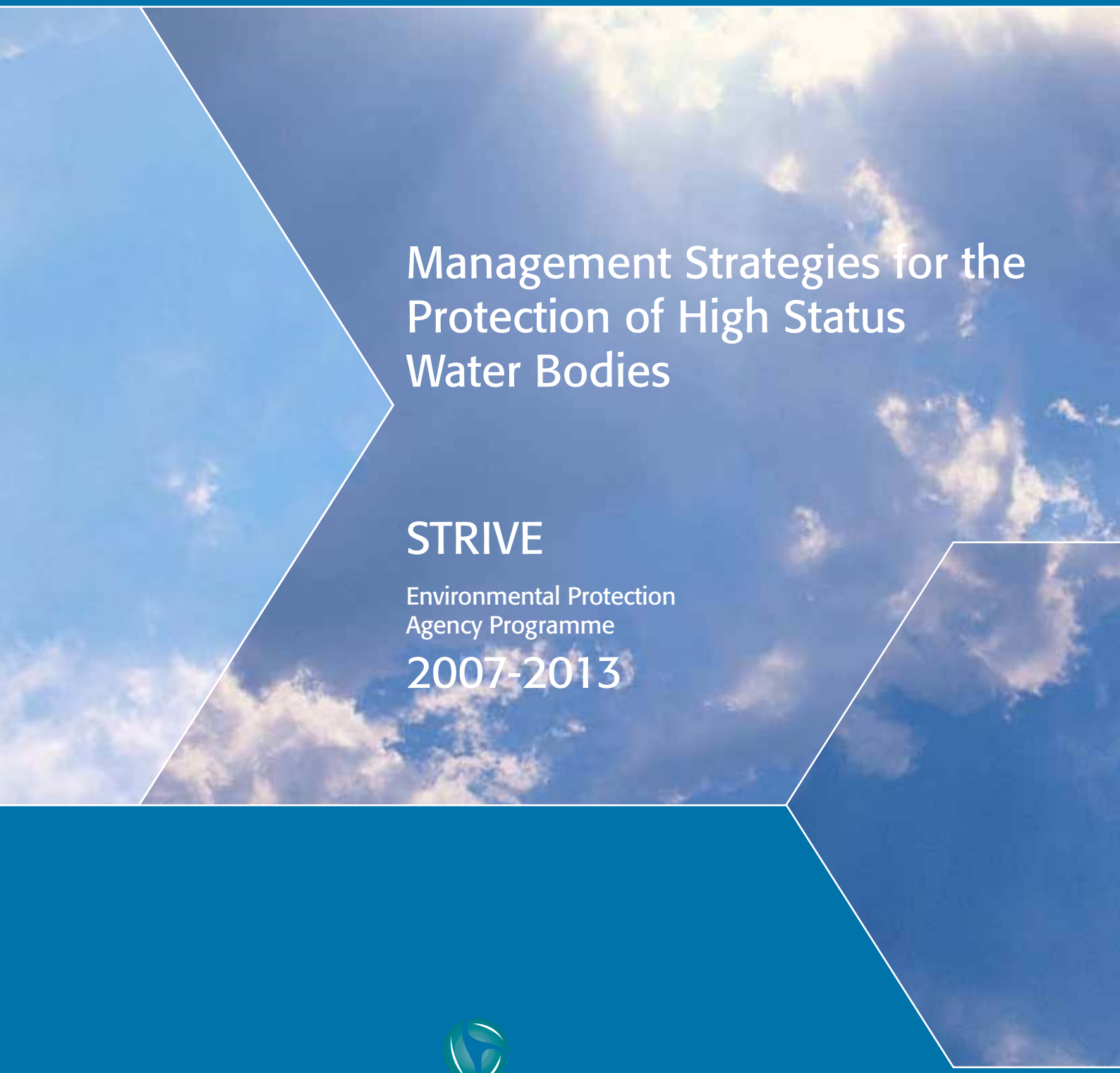
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

STRIVE
Report Series No.99



Management Strategies for the Protection of High Status Water Bodies

STRIVE

Environmental Protection Agency Programme

2007-2013

SSTI
Strategy for Science, Technology and Innovation

Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Community and Local Government.

OUR RESPONSIBILITIES

LICENSING

We license the following to ensure that their emissions do not endanger human health or harm the environment:

- waste facilities (e.g., landfills, incinerators, waste transfer stations);
- large scale industrial activities (e.g., pharmaceutical manufacturing, cement manufacturing, power plants);
- intensive agriculture;
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- large petrol storage facilities;
- waste water discharges.

NATIONAL ENVIRONMENTAL ENFORCEMENT

- Conducting over 2,000 audits and inspections of EPA licensed facilities every year.
- Overseeing local authorities' environmental protection responsibilities in the areas of - air, noise, waste, waste-water and water quality.
- Working with local authorities and the Gardaí to stamp out illegal waste activity by co-ordinating a national enforcement network, targeting offenders, conducting investigations and overseeing remediation.
- Prosecuting those who flout environmental law and damage the environment as a result of their actions.

MONITORING, ANALYSING AND REPORTING ON THE ENVIRONMENT

- Monitoring air quality and the quality of rivers, lakes, tidal waters and ground waters; measuring water levels and river flows.
- Independent reporting to inform decision making by national and local government.

REGULATING IRELAND'S GREENHOUSE GAS EMISSIONS

- Quantifying Ireland's emissions of greenhouse gases in the context of our Kyoto commitments.
- Implementing the Emissions Trading Directive, involving over 100 companies who are major generators of carbon dioxide in Ireland.

ENVIRONMENTAL RESEARCH AND DEVELOPMENT

- Co-ordinating research on environmental issues (including air and water quality, climate change, biodiversity, environmental technologies).

STRATEGIC ENVIRONMENTAL ASSESSMENT

- Assessing the impact of plans and programmes on the Irish environment (such as waste management and development plans).

ENVIRONMENTAL PLANNING, EDUCATION AND GUIDANCE

- Providing guidance to the public and to industry on various environmental topics (including licence applications, waste prevention and environmental regulations).
- Generating greater environmental awareness (through environmental television programmes and primary and secondary schools' resource packs).

PROACTIVE WASTE MANAGEMENT

- Promoting waste prevention and minimisation projects through the co-ordination of the National Waste Prevention Programme, including input into the implementation of Producer Responsibility Initiatives.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

MANAGEMENT AND STRUCTURE OF THE EPA

The organisation is managed by a full time Board, consisting of a Director General and four Directors.

The work of the EPA is carried out across four offices:

- Office of Climate, Licensing and Resource Use
- Office of Environmental Enforcement
- Office of Environmental Assessment
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

EPA STRIVE Programme 2007–2013

Management Strategies for the Protection of High Status Water Bodies

(2010-W-DS-3)

STRIVE Report

Prepared for the Environmental Protection Agency

by

RPS Group

Evelyn Moorkens & Associates

Trinity College Dublin

Authors:

Bernadette Ní Chatháin, Evelyn Moorkens and Kenneth Irvine

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

This report is published as part of the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme 2007–2013. The programme is financed by the Irish Government under the National Development Plan 2007–2013. It is administered on behalf of the Department of the Environment, Community and Local Government by the Environmental Protection Agency which has the statutory function of co-ordinating and promoting environmental research.

DISCLAIMER

The EPA STRIVE Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

EPA STRIVE PROGRAMME 2007–2013

Published by the Environmental Protection Agency, Ireland

ISBN: 978-1-84095-482-1

Price: Free **Online version**

Details of Project Partners

Dr Bernadette Ní Chatháin
RPS Group
Lyrr Building
IDA Business and Technology Park, Mervue
Galway
Ireland
Fax: +353 91 400299
Tel.: +353 91 400258
Email: bernadette.nichathain@rpsgroup.com

Dr Evelyn Moorkens
Evelyn Moorkens & Associates
53 Charleville Square
Rathfarnham
Dublin 14
Ireland
Tel.: +353 1 4948500
Email: emoorkens@eircom.net

Dr Kenneth Irvine
School of Natural Sciences
Zoology Building
Trinity College
University of Dublin
Dublin 2
Ireland
Tel.: +353 1 8961366
Email: kirvine@tcd.ie

Table of Contents

Executive Summary

In December 2010, the Environmental Protection Agency (EPA) appointed RPS in conjunction with University College Dublin, Trinity College, and Evelyn Moorkens & Associates, to undertake a desk study with overall aims as follows:

- To review existing legislation relevant to the protection and management of high status sites and its interaction with other legislation;
- To review best practice on protecting high status sites in other European states; and
- To suggest new approaches to ensuring that high status water bodies remain at high status.

1 Background

The EPA has highlighted, as a key concern, the decline in high ecological quality river sites (EPA, 2009[1]). Such waters are indicators of largely undisturbed conditions and reflect natural background status or only minor distortion by anthropogenic influences. They are used as reference from which deviation in quality is measured. Their importance includes supporting aquatic species sensitive to enrichment or siltation, e.g. freshwater pearl mussel (*Margaritifera margaritifera*) and juvenile salmon (*Salmo salar*). A decline in the percentage number of high quality river sites was noted in all River Basin Districts (RBDs) between 1987 and 2009. The most striking decline is the sevenfold decrease in Q5 sites, which accounted for only less than 2% of all sites in the 2006–2008 survey period (EPA, 2009). One of the objectives of the Water Framework Directive (WFD) is to maintain high status water quality where it exists but, where practical, the RBDs should, strive to restore former high quality sites (EPA, 2009).

1. EPA, 2009. *Water Quality in Ireland 2007–2008: Key Indicators of the Aquatic Environment*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

2 Key Points

- To date, the key focus in the implementation of the WFD has largely been on the objective that all water bodies meet at least good status by 2015. The WFD environmental objective that specifies no deterioration has received far less attention.
- The need to stem the degradation of high status sites merits high priority, not least because preventing or addressing small impacts is a feasible option, and likely much more cost-effective than large-scale restoration to good status for sites at moderate status or worse.
- The importance of the decline of high status sites is not confined to a breach of a European Directive, but is of fundamental significance for maintenance of biodiversity, ecological integrity and as refugia of species from a widely impacted landscape.
- While serious pollution has decreased significantly in the period 1987–2008 and the rate of increase in the channel length classified as being in moderate and poor status has been reduced, there has been a dramatic loss of the best quality high status sites. Rivers best illustrate this; however, there is no reason to suppose that lakes in such catchments are not also impacted by many of the same pressures.
- In order to protect the remaining high status sites and to reverse the trend of decline, it is important to tackle the principal pressures causing the ecological damage. Apart from obvious point source pollution or accidental releases of pollutants, **relatively low intensity activities** are important in this context, including, e.g., land-use changes such as field drainage and fertilisation, one-off housing, forestry activities, wind farms, animal access to waters, and sheep dip pesticides.

3 Findings/Recommendations

- A series of strategies has been proposed in this Discussion Document in order to address the decline of high status sites and water bodies, but **the most urgent response is needed within local and public authorities until such time as some of the proposed mechanisms are in place**. Strategies presented in this document are based on the following five key points:

  (i) Planning and development in high status catchments is an environmental issue;

  (ii) High status catchments provide valuable ecosystem services;

  (iii) High status catchments have little to no capacity for further intensification;

  (iv) High status catchments and protected areas require similar protection strategies; and

  (v) County Development Plans and all plans and policies should reflect the sensitivity of high status water bodies.

- The key strategies proposed are:

  (i) High status catchment delineation and prioritisation for protection measures;

  (ii) Establishment of a spatial network of high status waters;

  (iii) Establishment of a 'blue dot' monitoring system by the EPA;

  (iv) Potential additional measures under the WFD over and above European Directive requirements;

  (v) Assessment of potential impacts, and consideration of the risk of failing to meet high status;

  (vi) Planning/Licensing control and assessment of cumulative impacts;

  (vii) Centralised GIS database, or activities database;

  (viii) Integrated monitoring and protection;

  (ix) Unregulated activities – where control mechanisms are required; and

  (x) Public awareness campaigns.

1 Introduction

1.1 Background

In December 2010, the Environmental Protection Agency (EPA) appointed RPS, in conjunction with Trinity College Dublin and Evelyn Moorkens and Associates, to undertake a desk study with the overall aims and main objectives as follows:

Overall Aims:

- To review existing legislation relevant to the protection and management of high status sites and its interaction with other legislation (e.g. planning);
- To review best practices on protecting high status sites in other European states; and
- To suggest new approaches to ensuring that high status water bodies remain at high status.

Main Objectives:

- Review existing outputs of recent scientific research with a clear emphasis on knowledge gaps;
- Review practices in other European Union (EU) countries;
- Review the interactions between water- and non-water-related legislation and highlight where new legislation may be required;
- Provide guidance for local authorities (LAs) and other public bodies on how to handle the protection of high status water bodies in their day-to-day work;
- Suggest management strategies to ensure that high status water bodies remain at high status; and
- Make recommendations towards future research needed to address this issue.

RPS proposed to deliver on the above aims and objectives by producing the following deliverables:

Work Package 1: Scoping and Literature Review

A detailed Literature Review, to include a review of best practices in other EU countries, and the interactions between water- and non-water-related legislation.

Work Package 2: Guidance Preparation

Guidance for LAs and other public authorities on management strategies for the protection of high status water bodies.

Work Package 3: Management Strategies

Recommended management strategies for the protection of high status water bodies.

1.2 Change in Project Scope and Key Deliverables

A change in the scope of Work Packages 2 and 3 from a guidance document and a management strategies document, to one discussion document was requested by the EPA in December 2011, in response to a review of initial proposals for management strategies.

The key deliverables from this desk study therefore evolved to be:

- A **Literature Review**: Management Strategies for the Protection of High Status Water Bodies (Box 1.1); and
- A **Discussion Document** for the EPA on Management Strategies for the Protection of High Status Water Bodies.

Key findings or points of note from the Literature Review are incorporated into this Discussion Document where pertinent; however, it is advised that the Literature Review is read in conjunction with this Discussion Document.

Box 1.1. Management Strategies for the Protection of High Status Water Bodies – Literature Review, p. 8, Point of note:

The need to stem the degradation of high status sites merits high priority, not least because preventing, or addressing small impacts is a feasible option, and likely much most cost effective than large scale restoration to good status for sites at moderate status or worse.
The importance of the decline of high status sites is not confined to a breach of a European Directive, but is of fundamental significance for maintenance of biodiversity, ecological integrity and as refugia of species from a widely impacted landscape (Aroviita et al., 2009a,b; Bradley et al., 2003; Hering et al., 2010). *Such refugia are likely crucial for recolonisation of restored sites, as the target for good status is realised* (Meyer et al., 2007; see also Section 2.2 of the Literature Review). *A network of high status sites provides a mechanism for the preservation of European aquatic biodiversity, and as a possible buffer to impacts of climate change* (Hering, 2010). *This is also crucial to meet European and global ambitions to halt biodiversity decline* (Secretariat of the Convention of Biological Diversity, 2001; EC, 2011).

1.3 Context for this Discussion Document

1.3.1 Current position in relation to high status sites

The EPA has highlighted, as a key concern, the decline in high ecological quality river sites (EPA, 2009). An extract from the EPA Indicators report (EPA, 2009) is quoted below:

Indicator 2: High Ecological Quality River Sites

*High ecological quality at sites is an indicator of largely undisturbed conditions and reflects the natural background status or only minor distortion by anthropogenic influences. Such sites are used as reference from which deviation in quality is measured. Sites of high ecological quality are important for supporting aquatic species sensitive to enrichment or siltation such as the protected, but declining, freshwater pearl mussel (*Margaritifera margaritifera*) and juvenile salmon (*Salmo salar*). The presence of high status sites along a river system can contribute significantly to the overall species diversity and recolonisation of species to rehabilitated stretches. These sites play an important part in conserving individual species and overall catchment biodiversity. The Water Framework Directive (WFD) requires Member States to protect and maintain high and good status water bodies.*

A decline in the percentage number of high quality river sites was noted in all River Basin Districts (RBDs) between 1987 and 2009 (Figs 1.1 and 1.2). The largest percentage number of high status river sites continues to be located in the less densely populated and less developed, as well as less intensively farmed, regions (South Western and Western RBDs). The greatest decline in the percentage number of high status river sites was noted in the North Western, Neagh Bann and Shannon regions. The most striking decline is the sevenfold decrease in Q5 sites, which accounted only for less than 2% in the 2006–2008 survey period (EPA, 2009). One of the objectives of the WFD is to maintain high status water quality where it exists but, where practical, the RBDs should, in addition, strive to restore former high quality sites (EPA, 2009).

To date, the key focus in the implementation of the WFD has largely been on the objective that all water bodies meet at least good status by 2015. The WFD environmental objective that specifies no deterioration has received far less attention. This Discussion Document focuses on the protection of high status within the context of the objectives set under the WFD.

1.3.2 Causes of decline

While serious pollution has decreased significantly in the period 1987–2008 and the rate of increase in the channel length classified as being in moderate and poor status has been reduced, there has been a dramatic loss of the best quality high status sites.

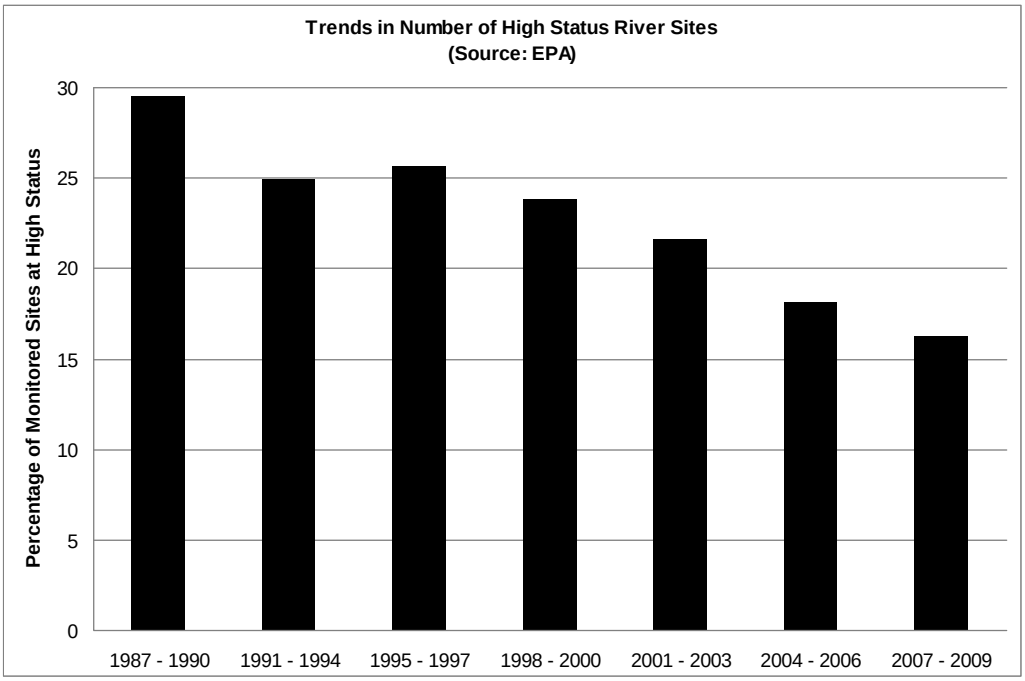


Figure 1.1. Trends in the number of river sites at high ecological status 1987–2009 shown as percentage of the total number of sites monitored (source: EPA, 2012).

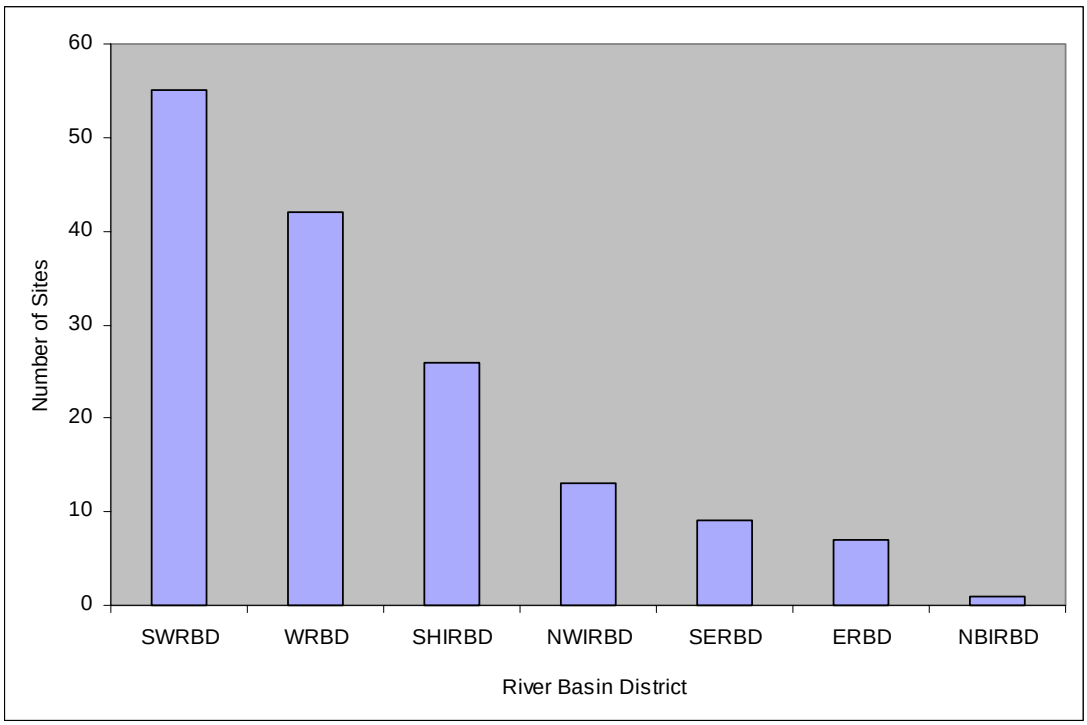


Figure 1.2. Long-term high ecological quality (Q5 and Q4–5) river sites 1971–2008 (n = 153) – number in River Basin Districts (RBDs), i.e. sites consistently achieving high status since first monitored (source: EPA, 2009). SWRBD, South Western RBD; WRBD, Western RBD; SHIRBD, Shannon International RBD; NWIRBD, North Western International RBD; SERBD, South Eastern RBD; ERBD, Eastern RBD; NBIRBD, Neagh Bann International RBD.

Rivers best illustrate this; however, there is no reason to suppose that lakes in such catchments are not also impacted by many of the same pressures.

In order to protect the remaining high status sites and to reverse the trend of decline, it is important to tackle the principal pressures causing the ecological damage. Apart from obvious point source pollution or accidental releases of pollutants, **relatively low intensity activities** are important in this context including, e.g., land-use changes such as field drainage and fertilisation, one-off housing, forestry activities such as clear-felling, road building, and wind farms. Animal access to waters and sheep dip pesticides are also important pressures on high status waters. It is important to note that the smallest pressure can impact on high status. The input of a few grams of phosphorus will have a much more damaging impact on the ecology of a high status sensitive system than the same addition to an already eutrophic system. Similarly, small increases in silt inputs, hydromorphological pressures or priority substances will have a disproportionate impact on a high status system relative to the impact of the same input to an already degraded system.

1.4 Relevance of this Discussion Document

The key authorities responsible for implementation of the WFD in Ireland are the LAs, the Department of Environment, Community and Local Government (DECLG), and the EPA. All public authorities are required to exercise their functions in a manner that is consistent with the objectives of the WFD and River Basin Management Plans (RBMPs). The WFD National Technical Coordination Group (NTCG) includes representatives from the DECLG, the Department of Agriculture, Food and the Marine (DAFM – formerly Department of Agriculture, Fisheries and Food (DAFF)), representatives from the five lead LAs for the RBDs, RBD project co-ordinators, and the EPA, and oversees implementation of the RBMPs at a national level.

The relevant public authorities to which this Discussion Document applies includes those detailed in the First Schedule of the Water Policy Regulations, S.I. No. 722 of 2003, namely:

- The EPA;
- The relevant LAs;
- The regional authorities in the area;
- The Regional Fisheries Boards in the area (now Inland Fisheries Ireland);
- The Geological Survey of Ireland;
- Teagasc;
- The Radiological Protection Institute of Ireland;
- The Marine Institute;
- The Central Fisheries Board (now Inland Fisheries Ireland);
- The Electricity Supply Board;
- Waterways Ireland;
- Tourism Ireland;
- The Heritage Council;
- The Health and Safety Authority;
- The Local Government Computer Services Board;
- The Commissioners of Public Works;
- The Minister for Enterprise, Trade and Employment (now the Minister for Enterprise, Trade and Innovation);
- The Minister for Communications, Marine and Natural Resources (now the Minister for Communications, Energy and Natural Resources); and
- The Minister for Agriculture and Food (now the Minister for Agriculture, Food and the Marine).

This Discussion Document[1] is also relevant to:

- The Minister for Environment, Community and Local Government; and

1. Note: This Discussion Document should be read in conjunction with the Literature Review *Management Strategies for the Protection of High Status Water Bodies – A Literature Review* (Irvine and Ní Chuanigh, 2011).

- The Minister for Arts, Heritage and the Gaeltacht (which includes the National Parks and Wildlife Service (NPWS)).

It is recommended that this Discussion Document is made widely available to the above authorities to initiate an extensive discussion on the issues surrounding the protection of high status water bodies.

2 Legal Protection

2.1 Legislation Overview

High status water bodies are protected under several tiers of European and national legislation. The key piece of legislation for the protection of all waters is the WFD (2000/60/EC). An overview of this Directive, with specific reference to the protection of high status water bodies, is provided below.

2.2 The WFD

2.2.1 Overview

The EU WFD (2000/60/EC), which came into force on 22 December 2000, is the most important piece of European water legislation. It aims to promote common approaches, standards and measures for water management on a systematic and comparable basis throughout the EU. It establishes a new, integrated approach to the protection, improvement and sustainable use of Europe's rivers, lakes, transitional waters (estuaries), coastal waters and groundwaters.

The WFD requires that Members States manage their waters on the basis of RBDs. It also requires the production of a RBMP for each RBD. The primary objectives of the WFD are to maintain the 'high' (Box 2.1) or 'good' status of waters where it exists, prevent deterioration in existing status of waters, reduce chemical pollution and to achieve at least 'good status' in relation to all waters by 2015. The mechanism by which this is to be achieved under the WFD is through the adoption and implementation of the RBMPs and Programme of Measures (POMs) for each RBD.

2.2.2 RBMPs

The RBMPs (see http://www.wfdireland.ie) covering the period 2009–2015 aim to protect all waters within the respective districts and, where necessary, improve waters and achieve sustainable water use. Waters include rivers, canals, lakes, reservoirs, groundwaters, protected areas (including wetlands and other water-dependent ecosystems), estuaries (transitional) and coastal waters.

The implementation of the plans aims to bring incremental improvement leading to the majority of waters reaching at least good status by 2027 at the latest, benefiting the whole community by providing long-term sustainable access to and use of those waters. Where waters are currently at less than good status, they must be improved until they reach good status and there must be no deterioration in the existing status of waters. The **no deterioration** objective within the WFD is particularly relevant in the context of the protection of high status water bodies.

The RBMPs include significant background documentation which local and public authorities should become familiar with, and which are available to download from http://www.wfdireland.ie. In particular, Water Management Unit (WMU) Action

Box 2.1. High status of surface waters is defined in Annex V of the WFD:

There are no, or only very minor, anthropogenic alterations to the values of the physico-chemical and hydromorphological quality elements for the surface water body type from those normally associated with that type under undisturbed conditions.

The values of the biological quality elements for the surface water body reflect those normally associated with that type under undisturbed conditions, and show no, or only minor, evidence of distortion.

(Source: Table 1.2, Annex V of the WFD (2000/60/EC))

Plans have been developed for the North Western, Neagh Bann, Shannon, Western, South Eastern and South Western RBDs which provide information on status, objectives and measures compiled for smaller, more manageable, geographical areas than RBDs, but larger geographical areas than water bodies, i.e. grouped water bodies. The Eastern RBD has also published a POMs document, which is illustrated by WMU Action Plans, each of which incorporates a POMs for high status water bodies.

2.2.3 Environmental objectives

Environmental objectives have been set for each surface and ground water body. Objective setting considers the current status of a water body, i.e. whether it is at good status or better and therefore needs to be protected, or whether it is at less than good status and therefore needs restoration and the timescales required for restoration.

The European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272 of 2009) (hereafter referred to as the Surface Waters Regulations), and the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) (hereafter referred to as the Groundwater Regulations) establish the legal basis for setting objectives for Irish waters.

The RBMPs establish four core environmental objectives to be achieved:

1. Prevent deterioration;
2. Restore good status;
3. Reduce chemical pollution; and
4. Achieve water-related protected areas objectives.

Alternative objectives have also been specified in certain circumstances:

- Technical, economic, environmental or recovery constraints (extended deadlines may have been set in some cases);
- The nature and uses of certain artificial or heavily modified waters (alternative objectives set to account for their sustainable use); and
- Proposed new physical modification and sustainable development (alternative objectives may be set for future projects).

Alternative objectives or extended deadlines can be made for one (up to 2021) or two planning cycles (up to 2027) or potentially longer depending on the issues involved. The approach towards extended deadlines has been set out.[2]

For the majority of high status water bodies, the objective is to **Protect** their status, i.e. prevent deterioration. Extended deadlines (see RBMPs[2]) have been established for three high status river water bodies only – one in Mayo (Newport Catchment) and two in Kerry (one in the Currane and one in the Gearhameen Catchments) due to the presence of a non-recruiting freshwater pearl mussel population.

Article 4.1 of the WFD states that "*Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water"*, while **Article 4.5** states that "*No further deterioration occurs in the status of the affected body of water*".

However, **Article 4.6** outlines a situation where a temporary deterioration would not be in breach of the Directive, as a result of natural causes or force majeure which was exceptional and could not reasonably have been foreseen, e.g. extreme flood events or prolonged droughts or accidents occur. All of the following conditions must be met in these circumstances:

(a) *all practicable steps are taken to prevent further deterioration in status and in order not to compromise the achievement of the objectives of this Directive in other bodies of water not affected by those circumstances*;

(b) *the conditions under which circumstances that are exceptional or that could not reasonably have been foreseen may be declared, including the adoption of the appropriate indicators, are stated in the river basin management plan*;

2. http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/

(c) *the measures to be taken under such exceptional circumstances are included in the programme of measures and will not compromise the recovery of the quality of the body of water once the circumstances are over*;

(d) *the effects of the circumstances that are exceptional or that could not reasonably have been foreseen are reviewed annually and, subject to the reasons set out in paragraph 4(a), all practicable measures are taken with the aim of restoring the body of water to its status prior to the effects of those circumstances as soon as reasonably practicable*, and

(e) *a summary of the effects of the circumstances and of such measures taken or to be taken in accordance with paragraphs (a) and (d) are included in the next update of the river basin management plan*.

Article 4.7 of the WFD states:

Member States will not be in breach of this Directive when failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions are met:

(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

(b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;

(c) *the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development;*

(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option; and exemption for activities that prevent the future achievement of good status through restoration activities have been defined.

2.2.3.1 Surface Waters Regulations

The Surface Waters Regulations (S.I. No 272 of 2009) transpose the requirements of Articles 6 and 9 of the WFD into Irish law, to provide measures for the protection of surface waters. These regulations came into effect on 30 July 2009 and have significant implications across a range of existing legislation and address the requirements of the Water Framework, Dangerous Substances and Priority Substances Directives. The Regulations apply to all surface waters.

The Surface Waters Regulations state that "*A surface water body whose status is determined to be high or good (or good ecological potential and good surface water chemical status as the case may be) when classified by the Agency*[3] *in accordance with these Regulations shall not deteriorate in status*".

The Fifth Schedule to the Surface Waters Regulations specifies the criteria for calculating surface water ecological status and ecological potential:

- *Biological quality elements* Ecological Quality Ratios (EQRs) are specified in Table 8;
- Physico-chemical conditions supporting the biological elements are specified in Table 9, *Part A General conditions*;
- Physico-chemical conditions supporting the biological element *Part B Specific Pollutants* are specified in Table 10; and
- *The environmental quality standards for priority substances and certain other pollutants, and priority hazardous substances, to apply for the purpose of assigning chemical status* are specified in Table 11 (priority substances and certain other pollutants) and Table 12 (priority hazardous substances), respectively.

It is worth noting that the standards set for certain key general physico-chemical quality elements have

3. Agency refers to the EPA.

separate high and good status objectives – in particular for phosphate, ammonia and biochemical oxygen demand in the case of rivers. Thus, this sets a higher standard for existing high status rivers than for those whose target status is merely 'Good Status'. This is particularly important in licensing of point source discharges.

Part II of the Surface Water Regulations outlines the duties of public authorities and other persons:

Article 5: *A public authority shall not, in the performance of its functions, undertake those functions in a manner that knowingly causes or allows deterioration in the chemical status or ecological status (or ecological potential as the case may be) of a body of surface water.*

In addition, Article 43 is important in the context of high status water bodies (the identification of progressive and sustained upward trends):

Article 43: *The Agency*[3] *shall, when assessing the monitoring results for the calculation of ecological status and chemical status, identify marked and sustained upward trends in the concentration of pollutants, groups of pollutants or indicators of pollution found in bodies or groups of bodies of surface water, including within-status trends, that would likely result in deterioration in status over time or give rise to non-compliance with a standard or objective established for an individual protected area. The Agency shall cause such bodies or groups of surface water bodies to be identified in river basin management plans and, where appropriate, issue advice to the public authority or authorities concerned on the measures to be taken to address the upward trend identified.*

2.2.4 Monitoring

Water quality monitoring for the purposes of the WFD is conducted via the WFD monitoring programme, established on 22 December 2006, and monitoring is undertaken by the EPA, Inland Fisheries Ireland, the Marine Institute, the Office of Public Works, the NPWS, Waterways Ireland and LAs. The EPA is responsible for assessing these monitoring data and assigning status to Ireland's surface waters and groundwaters. Draft interim status for surface waters and groundwaters has been reported by the EPA in the RBMPs (see http://www.wfdireland.ie). The EPA updates status on an annual basis and makes results available to all authorities via its website. Interim status was reported to the European Commission (EC) as part of the Water Information System for Europe (WISE) reporting mechanism in 2009. This interim status and maps, which became available at the end of 2009, provide a baseline or starting point for the implementation of the WFD from which upward and downward trends in status will be judged by the EC.

Interim groundwater status has been established and is divided into two categories (**good** or **poor**). **Chemical status** and **quantitative status** have been determined for each groundwater body in the country. Monitoring of groundwater has been developed to improve knowledge of groundwater quality and quantity, and the links between groundwater and the ecological health of associated surface water receptors.

Surface water **ecological status** is divided into five classes (high, good, moderate, poor and bad) and is derived from measurements of biological, hydromorphological, physico-chemical elements, and specific pollutants (Fig. 2.1). The measurement of the biological elements includes aquatic flora (macrophytes and phytobenthos), macroinvertebrates and fish. The interim status of all surface water bodies was established in the RBMPs (July 2010).

Surface water interim **chemical status** has also been established and is divided into two classes (pass or fail) and is derived from the monitoring of priority substances and priority hazardous substances, e.g. pesticides and hydrocarbons.

As mentioned, the EPA updates status on an annual basis and released an updated WFD Status Report[4] in June 2011.

2.2.5 POMs

The POMs set out to achieve the objectives of the WFD are detailed in the RBMPs. The plans recognise in relation to the protection of high quality waters that: "*Additional measures may be required in order to*

4. This report can be accessed from http://www.epa.ie/downloads/data/water/Final_Status_Report_20110617c.htm

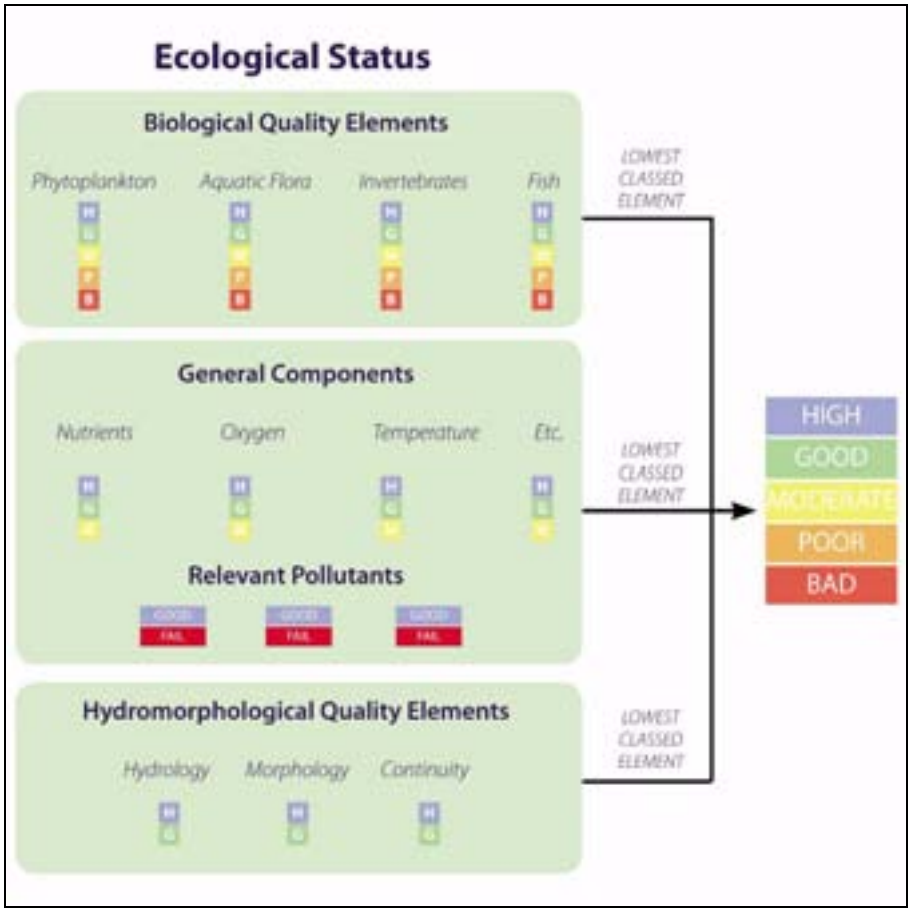


Figure 2.1 Determination of Water Framework Directive ecological status for surface waters.

protect and restore these sensitive areas and in particular to reduce the impacts of development, forestry and farming".

Table 2.1 outlines the key legislative instruments that are incorporated as measures under the RBMPs.

The RBMPs state that a range of other potential measures are being considered but which require further development. Agreed measures in relation to these issues can be introduced through updates of the POMs during the implementation process. Chapter 5 discusses a number of potential management strategies that could be included within future updates of the POMs for the protection of high status water bodies.

Table 2.1. Relevant European Union and national legislation for water quality protection in Ireland.

Directives		Transposing or other relevant Irish Regulations
Umbrella Directive	Water Framework Directive (2000/60/EC)	European Communities (Water Policy) Regulations S.I. No. 722 of 2003, plus amendments S.I. No. 413 of 2005 and S.I. No. 219 of 2008
		The European Communities Environmental Objectives (Surface Waters) Regulations, S.I. No. 272 of 2009
		European Communities Environmental Objectives (Groundwater) Regulations, S.I. No. 9 of 2010
1	Bathing Water Directive (2006/7/EC)	Bathing Water Quality Regulations (S.I. No. 79 of 2008)
2	Birds Directive (79/409/EEC)	European Communities (Natural Habitats) Regulations, S.I. 94 of 1997 as amended in 1998 and 2005
3	Habitats Directive (92/43/EEC)	European Communities (Natural Habitats) Regulations, S.I. 94 of 1997 as amended in 1998 and 2005
		Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. No. 296 of 2009
4	Drinking Waters Directive (98/83/EC)	European Communities (Drinking Water) (No. 2) Regulations, S.I. 278 of 2007 Water Services Act (No. 30 of 2007)
5	Major Accidents and Emergencies Directive (96/82/EC)	European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, S.I. No. 74 of 2006
		Planning and Development Act, No. 30 of 2000 as amended in 2002
6	Environmental Impact Assessment (85/337/EEC) as amended by Directive 2003/35/EC	Planning and Development Act, No. 30 of 2000 as amended in 2002 Planning and Development Regulations 2001
		Planning and Development Regulations, S.I. No 600 of 2001 as amended in 2006–2007
		Environmental Impact Assessment Regulations, S.I. No. 349 of 1989 as amended in 1994–2006
7	Sewage Sludge Directive (86/278/EEC)	Waste Management (Use of Sewage Sludge in Agriculture) Regulations, S.I. 148 of 1998 as amended in 2001
		Waste Management Act (No. 10 of 1996) as amended in 2001
8	Urban Waste Water Treatment Directive (91/271/EEC)	
9	Plant Protection Products Directive EU Regulation (EC) No. 1107/2009	
10	Nitrates Directive (91/676/EEC)	The European Communities (Good Agricultural Practice for Protection of Waters) Regulations, S.I. No. 610 of 2010, plus amendment S.I. No. 125 of 2011
11	Integrated Pollution Prevention Control Directive (2008/1/EC)	

3 High Status Water Bodies – Current Status and Spatial Extent

3.1 Introduction

Article 8 of the WFD requires Member States to ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each RBD. Monitoring programmes in Ireland were put in place by December 2006, and monitoring began in 2007.

Annex V of the WFD required Member States to provide maps to the EC presenting the status of water bodies, resulting from the provisional results of monitoring, by the end of 2009. The maps are to serve as a reference with which to compare maps which will be prepared for 2015 and will allow observation of progress.

Provisional results or **interim status** reported to the EC at the end of 2009, although not used to assess compliance with the WFD, will be used as a key indicator, particularly the percentage of high, good, moderate, poor or bad water bodies in the RBD. Furthermore, the data and maps provided at the end of 2009 provide a **baseline** or starting point for the implementation of the WFD, e.g. answering questions such as: "*what was the status of our waters before the programme of measures required by the WFD was implemented?*". This means that interim status data and maps will be essential for trend analysis, for policy development and for the assessment of policy effectiveness (CIRCA, 2010).

The EPA has reported the results of monitoring for the years 2007–2009 (i.e. the first full 3-year cycle results from the WFD-compliant monitoring programme) to the EC as part of reporting requirements under the WFD. The results from this monitoring and the spatial extent of the high status water body network are described further below.

3.2 High Status Water Bodies (2007–2009)

Nationally, 689 river water bodies (15%), 320 lake water bodies (39%), 15 transitional (estuarine) water bodies (8%) and 29 coastal water bodies (27%) were classified by the EPA as at high status, based on monitoring data from 2007 to 2009.[5] These statistics include water bodies where status has been assigned using the extrapolation method.[6] High status water bodies nationally from this time frame are illustrated in Fig. 3.1, while Table 3.1 details the numbers of high status river, lake, transitional and costal water bodies on an RBD basis. High status water bodies are primarily located in the South Western, Western, Shannon International and North Western International RBDs.

The WFD monitoring programme does not monitor every water body nationally, but rather monitors those water bodies selected as part of a representative network. Therefore, from the 1,937 river water bodies, 222 lake water bodies and 161 transitional and coastal water bodies that are monitored, 176 river (9%), 20 lake (9%) and 22 transitional and costal water bodies (27%) were classified at high status. Table 3.2 provides the number of high status **monitored** water bodies for rivers, lakes, transitional and coastal waters per RBD from 2007 to 2009.

5. Monitoring data from 2007 to 2009 used to determine status have been reported in the following RBMPs: Neagh Bann International, North Western International, South Eastern, Shannon International, South Western and Western RBDs. Monitoring data from 2006 to 2008 to determine status have been reported in the Eastern RBMP. Interim status as reported by the EPA to the EC is based on monitoring data from 2007 to 2009 and will be the status from which Ireland will be judged on trends in 2015.
6. Not all river or lake water bodies are included in the monitoring programme due to logistics and other considerations. Thus, it is necessary to extrapolate status to those water bodies that are not monitored, i.e. via the establishment of a representative network. The extrapolation methodology is described further in documents that can be sourced from: http://www.wfdireland.ie/docs/ 15%20Status/.

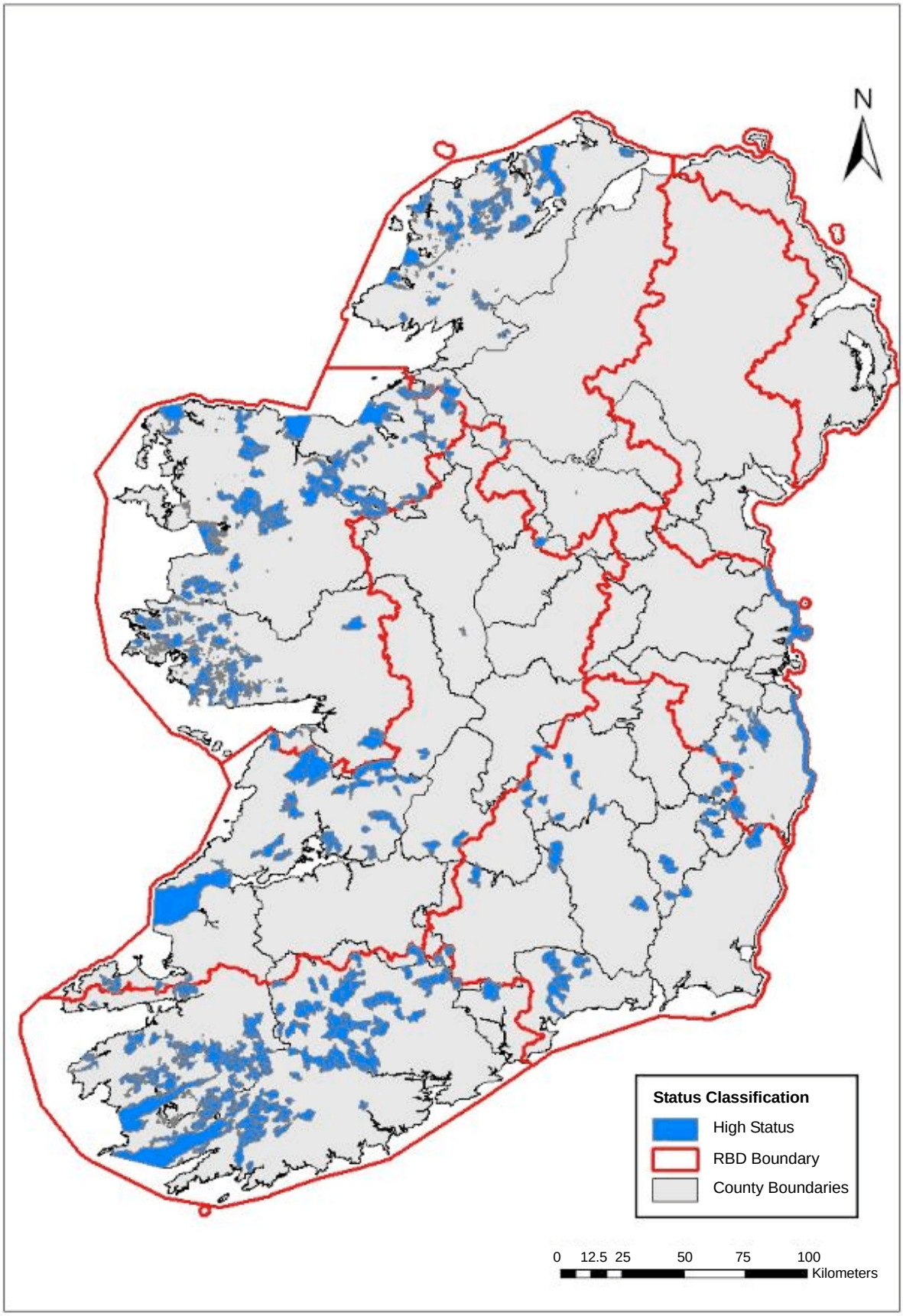


Figure 3.1. High status surface water bodies (river, lake, transitional and coastal) based on Water Framework Directive monitoring data from 2007 to 2009 (data source: EPA). RBD, River Basin District.

Table 3.1. Numbers of high status water bodies in each River Basin District as identified from monitoring conducted between 2007 and 2009 (source: EPA). (Note: These figures include extrapolated monitoring results.)

River Basin District	Rivers	Lakes	Transitional & coastal
Eastern	23	4	3
Neagh Bann	0	0	0
North Western	98	61	11
South Eastern	53	0	0
Shannon	46	16	1
South Western	284	51	9
Western	185	188	20
No. of water bodies at high status	**689**	**320**	**44**
Total no. of water bodies nationally	**4,585**	**817**	**309**
Percentage	**15%**	**39%**	**14%**

Table 3.2. Number of High Status *monitored* water bodies in each River Basin District as identified from monitoring conducted between 2007 and 2009 (source: EPA).

River Basin District	Rivers	Lakes	Transitional & coastal
Eastern	11	0	3
Neagh Bann	0	0	0
North West	22	3	3
South East	13	0	0
Shannon	25	1	1
South West	53	5	4
Western	52	11	11
No. of water bodies at high status	**176**	**20**	**22**
Total no. of water bodies nationally	**4,585**	**817**	**309**
Percentage	**9%**	**9%**	**27%**

In the case of rivers, it is important to note that there are instances where high status sites are located outside of high status river water bodies as illustrated in Fig. 3.2, e.g. a less than high status water body **may** contain a high status site that requires protection. This is as a result of the methodology by which the status of a water body is determined, i.e. the one-out-all-out (OOAO) classification. This classification means at the geographical level that if a water body has more than one monitoring site within it, the site with the lowest status is used to define the status of that water body as a whole. The exception to this rule is if that monitoring point represents an insignificant proportion of the length of a river for example (less than 100 m), then its status can be ignored. High status river sites from the 2007 to 2009 monitoring time frame are listed in Appendix 1. These river sites, 407 in total, are detailed on a county-by-county basis, and are located along 295 rivers across the country. For some counties, this distinction is very important, as they no longer have high status water bodies, but still have a number of high status river sites, e.g. Limerick. This will be discussed further in Section 3.3 below.

3.3 High Status Water Bodies by County (2007–2009)

3.3.1 Rivers

Table 3.3 details three key statistics in relation to high status water bodies on a county-by-county basis:

1. The number of monitored and extrapolated high status river water bodies per county, and nationally;
2. The number of monitored river water bodies at high status per county, and nationally; and
3. The number of monitored river sites at high status per county, and nationally.

All Geographical Information Systems (GIS) layers through which these statistics have been calculated are provided online at: STRIVE 99 Data and Information Products. As detailed above, there are 407 high status river sites located along 295 rivers nationally. Maps for each county can be found online as jpegs at: STRIVE 99 Data and Information Products.

Table 3.3 illustrates that:

- Counties Clare, Cork, Donegal, Galway, Kerry, Mayo, Sligo and Wicklow have the highest numbers of both monitored and extrapolated high status river water bodies in the country;
- Nine counties have no high status monitored water bodies, i.e. Carlow, Dublin, Kildare, Kilkenny, Limerick, Louth, Meath, Monaghan, and Westmeath;
- Four counties have only one high status monitored water body, i.e. Cavan, Laois, Longford and Offaly; and
- Louth and Westmeath have no high status river site or water body remaining as illustrated by monitoring undertaken between 2007 and 2009.

3.3.2 Lakes

Table 3.4 details the number of lake water bodies at high status on a county-by-county basis as determined via EPA classification for the years 2007–2009. Statistics are detailed for both monitored and extrapolated water bodies combined, and monitored water bodies alone. Table 3.4 illustrates that counties Galway (10), Kerry (5), and to a lesser extent Donegal (3) have the highest numbers of monitored high status lake water bodies in the country, while Donegal (57), Galway (165), Kerry (5) and Mayo (19) have the highest number of extrapolated status lake water bodies, i.e. all are located on the western seaboard.

All GIS layers through which these statistics have been calculated are provided online at: STRIVE 99 Data and Information Products.

Table 3.4 illustrates the small number of lake water bodies classified at high status based on monitoring data, i.e. 20, while a much larger number of lakes were classified at high status based on extrapolation. Table 3.5 details the names and locations of lake water bodies classified at high status based on monitoring during the period 2007–2009, and Fig. 3.3 illustrates their locations. The lakes are less than 4 km^2 in area, with most less than 2 km^2 in area. None of Ireland's larger lakes are classified at high status.

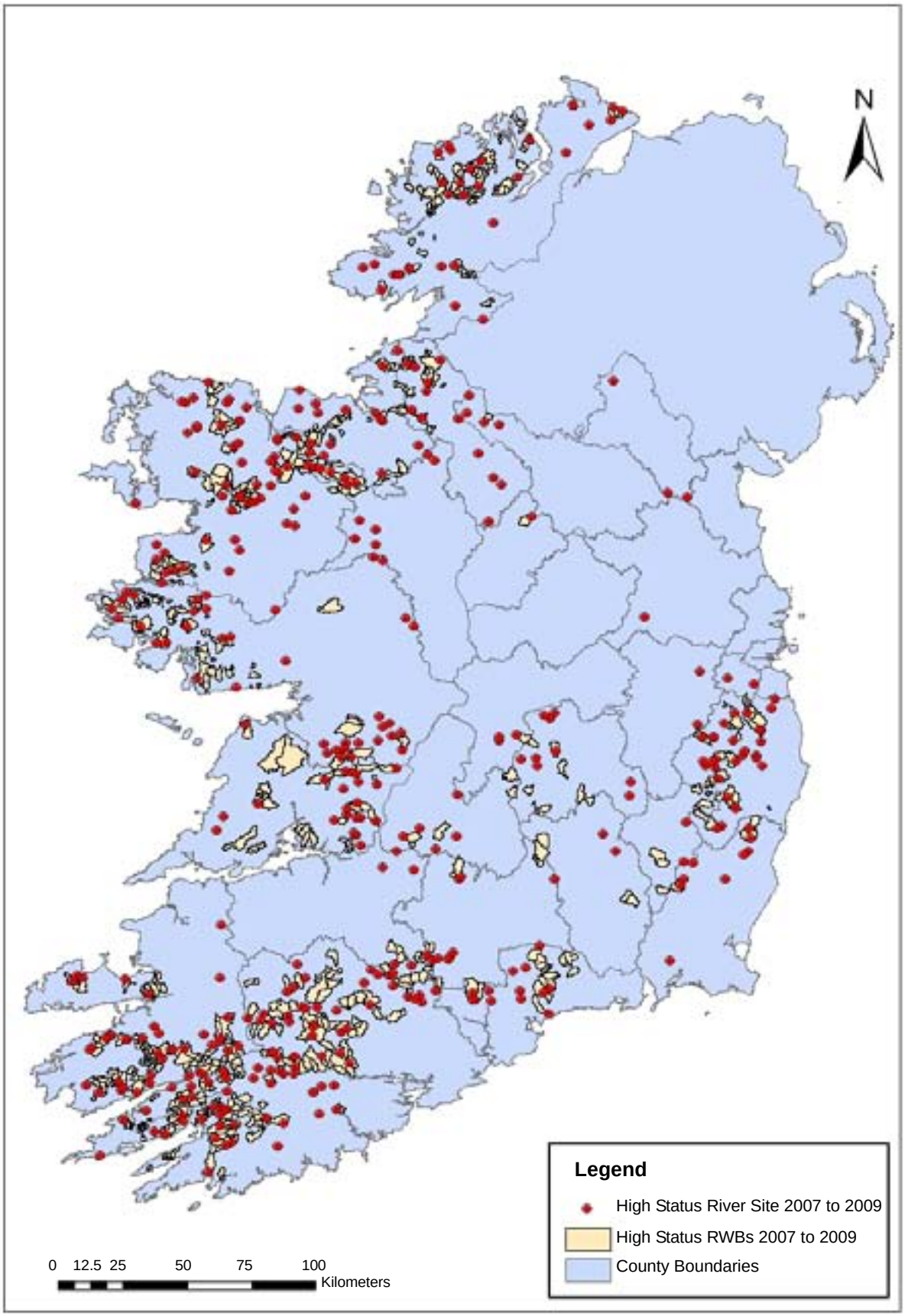


Figure 3.2. High status river water bodies and high status river site locations based on Water Framework Directive monitoring data from 2007 to 2009 (data source: EPA). RWB, river water body.

Table 3.3. Number of river water bodies at high status based on monitored and extrapolated data and number of high status river sites from 2007 to 2009.

	County	Description		
		Monitored & extrapolated water bodies	Monitored water bodies	Monitored sites
1	Carlow	8	0	3
2	Cavan	1	1	5
3	Clare	31	16	24
4	Cork	150	28	77
5	Donegal	83	19	31
6	Dublin[1]	2	**0**	2
7	Galway	71	14	35
8	Kerry	134	27	50
9	Kildare[2]	**0**	**0**	2
10	Kilkenny	5	**0**	3
11	Laois	10	1	9
12	Leitrim	22	8	11
13	Limerick	6	**0**	4
14	Longford	1	1	1
15	Louth	**0**	**0**	**0**
16	Mayo	68	24	54
17	Meath	**0**	**0**	1
18	Monaghan	**0**	**0**	3
19	Offaly	1	1	3
20	Roscommon	2	2	7
21	Sligo	38	7	20
22	Tipperary North[3]	3	2	6
23	Tipperary South	4	2	6
24	Waterford	16	6	13
25	Westmeath	**0**	**0**	**0**
26	Wexford	4	3	8
27	Wicklow	29	14	29
	Total	**689**	**176**	**407**

[1]High status water body and both high status sites are located within South Dublin County Council's functional area.
[2]A small section of the upper Lemonstown River Catchment is located within Kildare, with the majority in Wicklow.
[3]Small sections of two high status water bodies are located within Tipperary North, with the majority in other counties, i.e. Laois and South Tipperary.

Table 3.4. Number of lake water bodies at high status on a county-by-county basis based on monitored and extrapolated Water Framework Directive monitoring data from 2007 to 2009 (source: EPA).

	County	Description	
		Monitored & extrapolated water bodies	Monitored water bodies
1	Carlow	0	0
2	Cavan	5	0
3	Clare	4	0
4	Cork	5	0
5	Donegal	57	**3**
6	Dublin	0	0
7	Galway	165	**10**
8	Kerry	55	**5**
9	Kildare	0	0
10	Kilkenny	0	0
11	Laois	0	0
12	Leitrim	2	0
13	Limerick	0	0
14	Longford	0	0
15	Louth	0	0
16	Mayo	19	**1**
17	Meath	1	0
18	Monaghan	0	0
19	Offaly	0	0
20	Roscommon	1	**1**
21	Sligo	3	0
22	Tipperary North	0	0
23	Tipperary South	0	0
24	Waterford	0	0
25	Westmeath	0	0
26	Wexford	0	0
27	Wicklow	3	0
	Total	**320**	**20**

Table 3.5. Number of lake water bodies at high status on a county-by-county basis based on monitoring data from 2007 to 2009 (source: EPA) (lakes listed alphabetically).

Lake name	Water body code (SEG_CD)	Area (km^2)	River Basin District	County
Agannive	NW_38_665	0.15	North Western	Donegal
Anaserd	WE_31_211	0.82	Western	Galway
Anillaun	WE_30_348	0.67	Western	Galway
Anure	NW_38_83	1.33	North Western	Donegal
Awallia	WE_31_1	1.32	Western	Galway
Bofin	WE_30_335	0.92	Western	Galway
Cloonaghlin	SW_21_443	1.26	South Western	Kerry
Derryclare	WE_31_227	2.23	Western	Galway
Enask	WE_32_333	0.03	Western	Galway
Fadda	WE_32_501	0.47	Western	Galway
Funshinagh	SH_26_701	3.81	Shannon	Roscommon
Guitane	SW_22_172	2.46	South Western	Kerry
Inchiquin	SW_21_452	0.77	South Western	Kerry
Maumwee	WE_30_343	0.27	Western	Galway
Moher	WE_32_406	0.36	Western	Mayo
Muckross	SW_22_184	2.66	South Western	Kerry
Nahasleam	WE_31_208	0.28	Western	Galway
Nambrackkeagh	WE_32_422	0.07	Western	Galway
Upper	SW_22_186	1.67	South Western	Kerry
Veagh Upper	NW_38_80b	1.52	North Western	Donegal
Total area		**23.14**		

3.3.3 Transitional and coastal

Table 3.6 details the number of transitional (estuarine) and coastal water bodies at high status on a county-by-county basis from 2007 to 2009 WFD monitoring results. This is based on data from both monitored and extrapolated water bodies reported together, and also monitored water bodies reported individually. All GIS layers through which these statistics have been calculated are provided online at: STRIVE 99 Data and Information Products.

Table 3.7 details the names and locations of transitional and coastal water bodies at high status based on WFD monitoring data from 2007 to 2009, and Fig. 3.4 illustrates their locations.

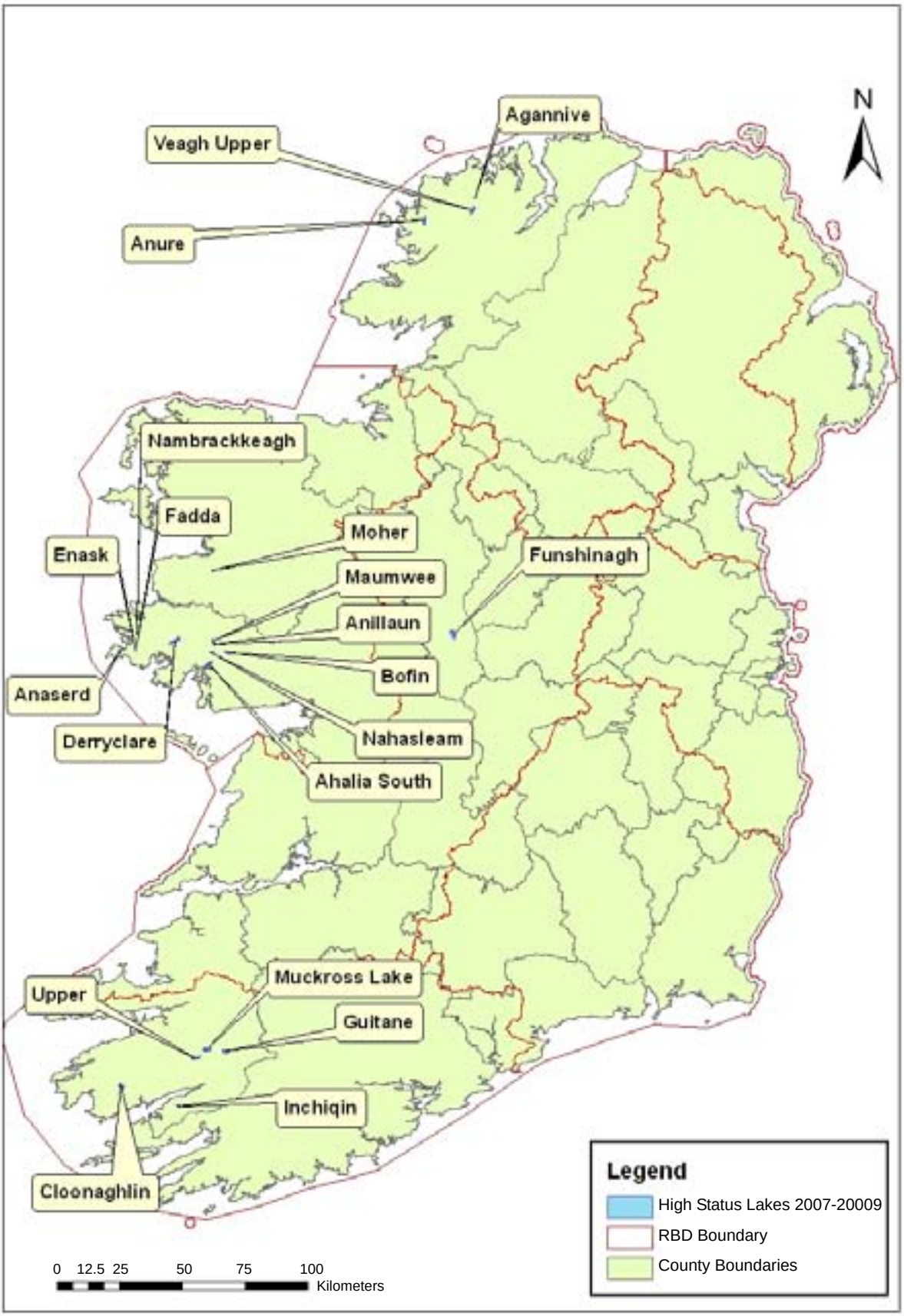


Figure 3.3. High status lakes based on Water Framework Directive monitoring data from 2007 to 2009 (data source: EPA). RBD, River Basin District.

Table 3.6. Number of high status transitional and coastal water bodies, on a county-by-county basis based on monitoring data from 2007 to 2009 (data source: EPA).

	County	Description	
		Monitored & extrapolated water bodies	Monitored water bodies
1	Carlow	0	0
2	Cavan	0	0
3	Clare	1	0
4	Cork	4	1
5	Donegal	11	3
6	Dublin	0	0
7	Galway	9	6
8	Kerry	6	4
9	Kildare	0	0
10	Kilkenny	0	0
11	Laois	0	0
12	Leitrim	0	0
13	Limerick	0	0
14	Longford	0	0
15	Louth	1	1
16	Mayo	6	3
17	Meath	1	1
18	Monaghan	0	0
19	Offaly	0	0
20	Roscommon	0	0
21	Sligo	4	2
22	Tipperary North	0	0
23	Tipperary South	0	0
24	Waterford	0	0
25	Westmeath	0	0
26	Wexford	0	0
27	Wicklow	1	1
	Total	**44**	**22**

Table 3.7. Number of high status transitional and coastal water bodies (N = 22), on a county-by-county basis based on monitoring data from 2007 to 2009 (data source: EPA).

Code (MS_CD)	Name	RBD	OS_LAYER	Category	Area (km^2)
EA_010_0000	Boyne Estuary Plume Zone	Eastern	Coastal	CW O	4.55
EA_020_0000	Northwestern Irish Sea (HA 08)	Eastern	Coastal	CW O	115.04
EA_100_0000	Southwestern Irish Sea – Killiney Bay (HA10)	Eastern	Coastal	CW O	87.28
NW_120_0000	Gweebarra Bay	North Western	Coastal	CW B	34.66
NW_120_0100	Gweebarra Estuary	North Western	Coastal	TW	8.26
NW_220_0000	Lough Swilly	North Western	Coastal	CW B	97.75
SH_060_0000	Mouth of the Shannon (HAs 23;27)	Shannon	Coastal	CW B	334.13
SW_180_0000	Berehaven	South Western	Coastal	CW B	16.33
SW_190_0300	Inner Kenmare River	South Western	Coastal	TW	3.79
SW_190_0000	Outer Kenmare River	South Western	Coastal	CW B	188.76
SW_210_0000	Portmagee Channel	South Western	Coastal	CW B	12.59
WE_200_0200	Camus Bay	Western	Coastal	TW	10.75
WE_350_0300	Furnace Lough	Western	Lake	Loch	1.68
WE_350_0000	Inner Clew Bay	Western	Coastal	CW B	65.17
WE_200_0000	Kilkieran Bay	Western	Coastal	CW B	82.48
WE_310_0000	Killary Harbour	Western	Coastal	CW B	12.69
WE_200_0700	Loch an Aibhinn, Camus Bay	Western	Coastal	Loch	0.543
WE_200_1100	Loch an tSaile, North of Camus Bay	Western	Lake	Loch	0.89
WE_200_0600	Loch Tanai	Western	Lake	Loch	0.09
WE_450_0000	Sligo Bay	Western	Coastal	CW B	81.79
WE_470_0000	Sligo Harbour	Western	Coastal	CW B	8.07
WE_350_0100	Westport Bay	Western	Coastal	TW	15.32

RBD, River Basin District.

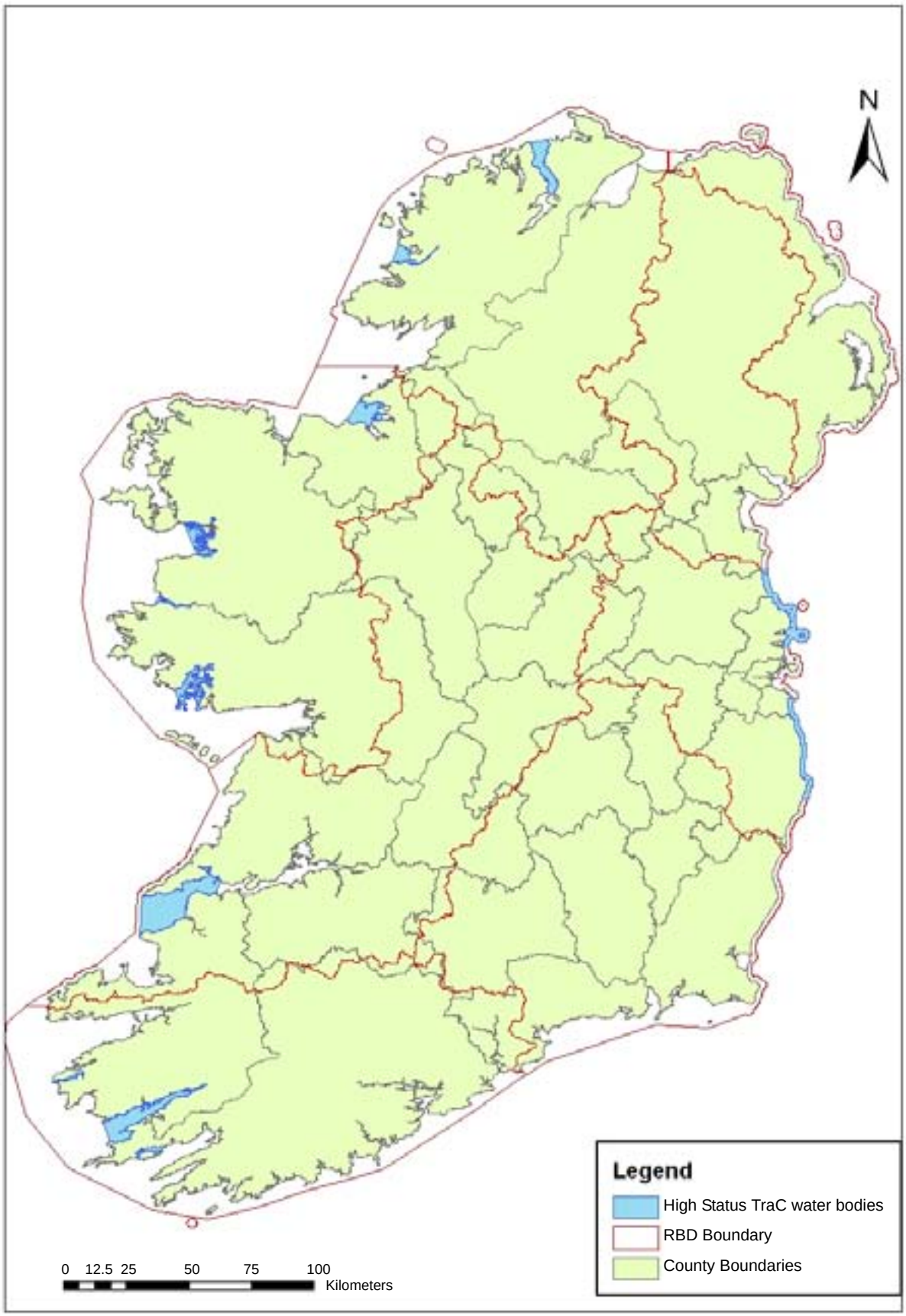


Figure 3.4. High status transitional and coastal waters based on Water Framework Directive monitoring data from 2007 to 2009 (data source: EPA). TraC, transitional and coastal waters; RBD, River Basin District.

Table 3.5 illustrates that counties Donegal, Galway, Kerry, Mayo and Sligo have the highest numbers of monitored, and monitoring plus extrapolated, high status transitional and coastal water bodies in the country. Again this reflects the concentration of high status water bodies on the western seaboard.

3.4 Summary of High Status Surface Water Bodies by County

Table 3.8 summarises the statistics detailed in Section 3.3 for each county by surface water category.

3.5 Decline in High Status Site Numbers

3.5.1 Rivers

A decline in the percentage number of high status river sites (i.e. Q5 and Q4–5 sites based on the macroinvertebrate biological quality element) was noted in all RBDs between 1987 and 2008 (EPA, 2009). The EPA produce tri-annual *Water Quality in Ireland* reports (EPA 2002, 2005, 2008, 2011), and data from the period 1998–2010 from the National Rivers Monitoring programme and, subsequently, the WFD monitoring programme have been reviewed and key statistics outlined in the following tables: 1998–2000 (Table 3.9), 2001–2003 (Table 3.10), 2004–2006 (Table 3.11), and 2007–2009 (Table 3.12). Table 3.13 also provides the results for the year 2010, although data from 2011 and 2012 will be required to ascertain any trend in this 3-year period versus the 2007–2009 period. The period 1998–2000 has been used in this Discussion Document in order to review the decline in high status river sites from that period up to the last period covered by tri-annual reporting, 2007–2009.

The tables show a steady decline in the percentage of high status river sites from 41% in 1998–2000, to 37% in 2001–2003, 31% in 2004–2006, 27% in 2007–2009, and 22% in 2010 (albeit based on 1 year's data).

Table 3.14 compiles the above information and illustrates the numbers of high status river sites on a tri-annual basis in each county between 1998 and 2009, and specifically the loss in high status sites between the years 1998–2000 and 2007–2009.

Notes on Tables 3.9 to 3.14

Tables 3.9–3.14 should be interpreted bearing the following in mind:

- The 2007–2009 numbers of high status sites are reduced not only because of declines, but also because some high status sites were dropped during the rationalisation of the monitoring programme in 2006 (i.e. approx. 89 sites, formerly classified as high status, were no longer included in the monitoring programme) in readiness for the WFD monitoring programme, which began in 2007; and
- The EPA is currently surveying many of these 'dropped' or formerly classified high status macroinvertebrate sites as part of its investigative monitoring programme during the 3-year period 2010–2012. Catchment walk-over investigations are also being undertaken to ascertain the sources of pressures in relation to these sites and their catchments. These sites are listed in Appendix 2, and discussed further in Chapter 4.

Tables 3.9–3.14 illustrate the following key points:

- The percentage of high status monitored sites has decreased from 41% of all sites monitored in the period 1998–2000 to 37% in 2001–2003, and to 31% in 2004–2006. A total of 210 high status river sites declined from high status between the monitoring period 1998–2000 and 2004–2006. Results are based on the monitoring of approximately 1,800 sites in each 3-year period;
- The percentage of high status monitored sites decreased to 27% of all sites monitored in the 2007–2009 time period, although it is noted that the number of sites monitored dropped to around 1,500. Nevertheless, the number of high status sites lost between the 1998–2000 and the 2007–2009 time periods is calculated at 369. By adjusting this figure down by 89 (to allow for high status sites dropped, and assuming that all former high status sites are still at high status until confirmed otherwise), there is still a downward decline in high status river site numbers to approximately 280 from the 1998–2000 time period;
- Counties with greater than 10 high status sites lost in the period 1998–2000 and 2004–2006 are Cavan, Clare, Cork, Donegal, Galway, Leitrim,

Table 3.8. High status surface water body numbers illustrated by county based on Water Framework Directive monitoring data from 2007 to 2009 (data source: EPA).

	County	Description						
		Rivers			Lakes		Transitional & coastal	
		Monitored & extrapolated water bodies	Monitored water bodies	Monitored sites	Monitored & extrapolated water bodies	Monitored water bodies	Monitored & extrapolated water bodies	Monitored Water bodies
1	Carlow	8	**0**	3	0	0	0	0
2	Cavan	1	1	5	5	0	0	0
3	Clare	31	16	24	4	0	1	0
4	Cork	150	28	77	5	0	4	1
5	Donegal	83	19	31	57	3	11	3
6	Dublin	2	**0**	2	0	0	0	0
7	Galway	71	14	35	165	10	9	6
8	Kerry	134	27	50	55	5	6	4
9	Kildare	**0**	**0**	2	0	0	0	0
10	Kilkenny	5	**0**	3	0	0	0	0
11	Laois	10	1	9	0	0	0	0
12	Leitrim	22	8	11	2	0	0	0
13	Limerick	6	**0**	4	0	0	0	0
14	Longford	1	1	1	0	0	0	0
15	Louth	**0**	**0**	**0**	0	0	1	1
16	Mayo	68	24	54	19	1	6	3
17	Meath	**0**	**0**	1	1	0	1	1
18	Monaghan	**0**	**0**	3	0	0	0	0
19	Offaly	1	1	3	0	0	0	0
20	Roscommon	2	2	7	1	1	0	0
21	Sligo	38	7	20	3	0	4	2
22	Tipperary North	3	2	6	0	0	0	0
23	Tipperary South	4	2	6	0	0	0	0
24	Waterford	16	6	13	0	0	0	0
25	Westmeath	**0**	**0**	**0**	0	0	0	0
26	Wexford	4	3	8	0	0	0	0
27	Wicklow	29	14	29	3	0	1	1
Total		**689**	**176**	**407**	**320**	**20**	**44**	**22**

Table 3.9. High status river sites from 1998 to 2000 by number and percentage (data source: EPA).

	1998	1999	2000	Overall
High status	245	246	285	776
No. of sites monitored	573	632	686	1,891
% High status	43%	39%	42%	41%

Table 3.10. High status river sites from 2001 to 2003 by number and percentage (data source: EPA).

	2001	2002	2003	Overall
High status	176	240	271	687
No. of sites monitored	515	588	743	1,846
% Total high status	34%	41%	36%	37%

Table 3.11. Breakdown of high status river sites from 2004 to 2006 by number and percentage (data source: EPA).

	2004	2005	2006	Overall
High status	143	176	249	568
No. of sites monitored	391	656	761	1,808
% Total high status	37%	27%	33%	31%

Table 3.12. Breakdown of high status river sites from 2007 to 2009 by number and percentage (data source: EPA).

	2007	2008	2009	Overall
High status	132	77	199	408
No. of sites monitored	504	382	605	1,491
% Total high status	26%	20%	33%	27%

Table 3.13. High status river sites from 2010 and 2011 by number and percentage (data source: EPA).

	2010/2011
High status	270
No. of sites monitored	987
% Total high status	27%

Table 3.14. Decline in numbers of high status river sites between 1998–2000 and 2007–2009 (data source: EPA) (see Notes on Tables 3.9 to 3.14, p. 24).

	County	Time frame				Time frame	
		1998–2000	2001–2003	2004–2006	±[1]	2007–2009	±[2]
1	Carlow	14	13	6	–8	3	–11
2	**Cavan**	23	20	9	**–14**	5	–18
3	**Clare**	45	31	32	**–13**	24	**–21**
4	**Cork**	87	93	77	**–10**	77	–10
5	**Donegal**	110	91	52	**–58**	31	**–79**
6	Dublin	3	3	4	+1	2	–1
7	**Galway**	49	47	34	**–15**	35	–14
8	Kerry	72	68	72	0	50	**–22**
9	Kildare	4	5	4	0	2	–2
10	Kilkenny	4	4	2	–2	3	–1
11	Laois	18	15	13	–5	9	–9
12	Leitrim	32	26	20	**–12**	11	**–21**
13	Limerick	12	8	9	–3	4	–8
14	Longford	3	5	5	+2	1	–2
15	Louth	7	4	0	–7	0	–7
16	**Mayo**	87	82	74	**–13**	54	**–33**
17	Meath	0	0	0	0	1	+1
18	Monaghan	8	6	4	–4	3	–5
19	Offaly	13	8	11	–2	3	–10
20	Roscommon	14	23	10	–4	7	–7
21	**Sligo**	51	40	31	**–20**	20	**–31**
22	Tipperary North	22	15	18	–4	6	–14
23	Tipperary South	16	18	12	–4	6	–10
24	Waterford	17	19	22	+5	13	–4
25	Westmeath	2	2	0	–2	0	–2
26	Wexford	16	9	12	–4	8	–8
27	Wicklow	48	33	42	–6	29	–19
	Total	**777**	**688**	**575**	**–210**	**407**	**–369**

[1]Difference in numbers between 1998–2000 and 2004–2006.
[2]Difference in numbers between 1998–2000 and 2007–2009.

Mayo and Sligo. However, of the 210 sites lost in this time frame, 27% were lost in Donegal (N = 58);

- Counties Cork, Galway and Kilkenny appear to have stemmed the decline during the recent 2007–2009 sampling period;
- Due to changes in the monitoring programme, it is more difficult to deduce losses between 1998–2000 and 2007–2009. However, the figures illustrated in Table 3.14 for counties Clare, Donegal, Kerry, Leitrim, Mayo and Sligo should be investigated further to ascertain what can be attributed to decline in status and what can be attributed to 'dropped' sites; and
- The majority of high status sites were classified as Q4–5 using the macroinvertebrate quality element. Therefore, Q5 sites, the sites with the highest quality, are now at significant risk of deteriorating.

3.5.2 Lakes

The decline in lakes is uncertain as monitoring of lakes prior to the introduction of the WFD monitoring programme in 2007 was very sporadic and, in the main, focused on those lakes for which there were perceived water quality problems (reviewed in Irvine et al., 2001). Palaeolimnological investigations suggest variable timing for the onset of water quality variables across Irish lakes (Taylor et al., 2006). The decline in lake water quality has, however, been acknowledged since the 1970s.

3.5.3 Transitional and coastal

The decline in transitional and coastal waters is also uncertain, as the monitoring of these areas prior to the introduction of the WFD monitoring programme in 2007 was very sporadic and, in the main, focused on those areas for which there were perceived water quality problems. Prior to the WFD, monitoring of estuaries and coastal waters was conducted by a number of agencies in fulfilment of national legislation and the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic (1992), with little integration towards a national programme, and involved 12 agencies (Irvine et al., 2002; EPA, 2003; Hartnett et al., 2011). In contrast to the WFD focus, there was no requirement to monitor biological elements. This now provides a fundamental difficulty for estimating benchmark conditions in transitional waters (Hartnett et al., 2011).

3.6 Overlap between High Status Sites and Protected Areas

The locations of high status sites were compared spatially with the locations of protected areas on the Register of Protected Areas under the WFD. These included:

- Candidate Special Areas of Conservation (cSACs) designated under the Habitats Directive;
- Freshwater pearl mussel cSAC catchments designated under the Habitats Directive;
- Special Protection Areas (SPAs) designated under the Birds Directive;
- National Heritage Areas (NHAs) and proposed NHAs under the Wildlife Act;
- Shellfish-designated waters designated under the Shellfish Directive;
- Recreational bathing waters designated under the Bathing Water Directive;
- Designated drinking waters under the Drinking Water Directive; and
- Nutrient-sensitive areas under the Urban Waste Water Treatment Directive.

The results of this analysis are detailed in Table 3.15, and key results are illustrated in Figs 3.5–3.8. Some key points include:

- Thirty-five per cent of high status river sites, 85% of lake water bodies and 79% of transitional/coastal water bodies are partially or wholly located within cSACs;
- Eighteen per cent (N = 139) of high status river sites are located within a freshwater-pearl-mussel-designated cSAC catchment;
- Twenty-six per cent of high status river sites and 50% of high status lakes are located within a

Table 3.15. High status surface water sites 2007–2009 and their overlap with protected areas.

	No. of high status river sites (Total no. nationally = 407)	Overlap with high status lake water bodies (N = 20)	Overlap with transitional and coastal water bodies (N = 19)	Protection plan(s) in place?
Natura or other designated areas				
cSACs	139 (35%)	17 (85%)	15 (79%)	Conservation management plans/Conservation objectives
SPAs	27 (7%)	3 (15%)	10 (53%)	
NHAs	3 (<1%)	0 (0%)	1 (5%)	
pNHAs	48 (12%)	17 (85%)	3 (16%)	
Freshwater pearl mussel				
In the catchment of a freshwater pearl mussel sub-basin management plan	74 (18%)	4 (20%)	Not applicable	Freshwater pearl mussel sub-basin management plans
Shellfish-protected areas				
In the catchment of a shellfish-designated area (20 km upstream from a designated area)	104 (26%)	10 (50%)	15 (79%)	Shellfish pollution reduction programmes
Recreational-bathing-protected areas[1]				
	0 (0%)	0 (0%)	11 (58%)	Bathing water profiles
Drinking waters				
RBMP abstraction Surface Water and Groundwater Register (2008)	103[1] out of 342 (30%) river water bodies are identified as containing a drinking water source	1 (5%)	Not applicable	Drinking water source protection plans
Nutrient-sensitive areas under the UWWTD				
	1 (0.2%)	0 (0%)	0 (0%)	
Salmonid-designated waters				
	25 (6%)	0 (0%)	Not applicable	

[1]These statistics are based on numbers of water bodies, not numbers of sites.
cSAC, candidate Special Areas of Conservation; SPA, Special Protection Area; NHA, National Heritage Area; pNHA, Proposed National Heritage Area; RBMP, River Basin Management Plan; UWWTD; Urban Waste Water Treatment Directive.

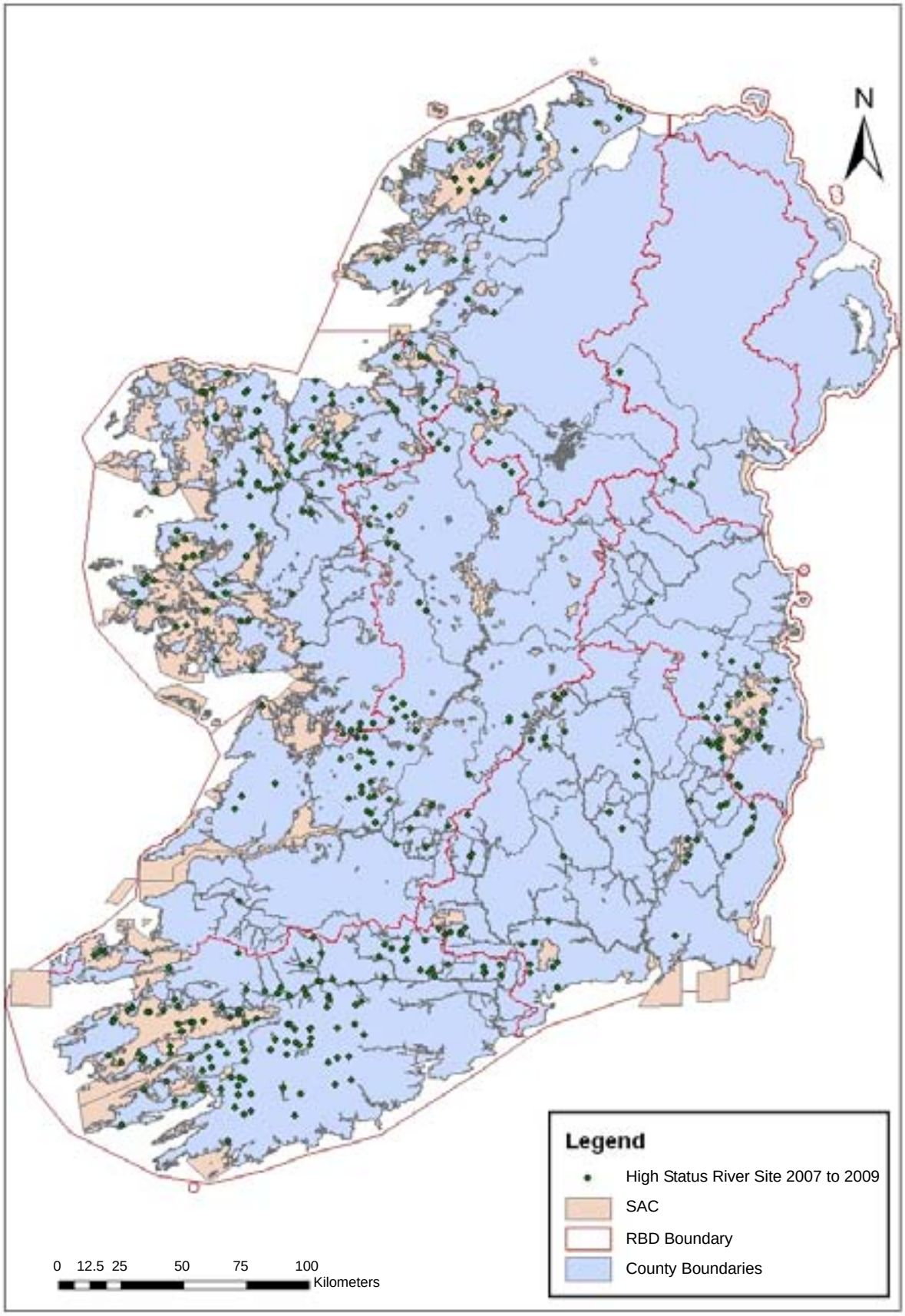


Figure 3.5. High status river sites and candidate Special Areas of Conservation overlap (N = 139). SAC, Special Area of Conservation; RBD, River Basin District.

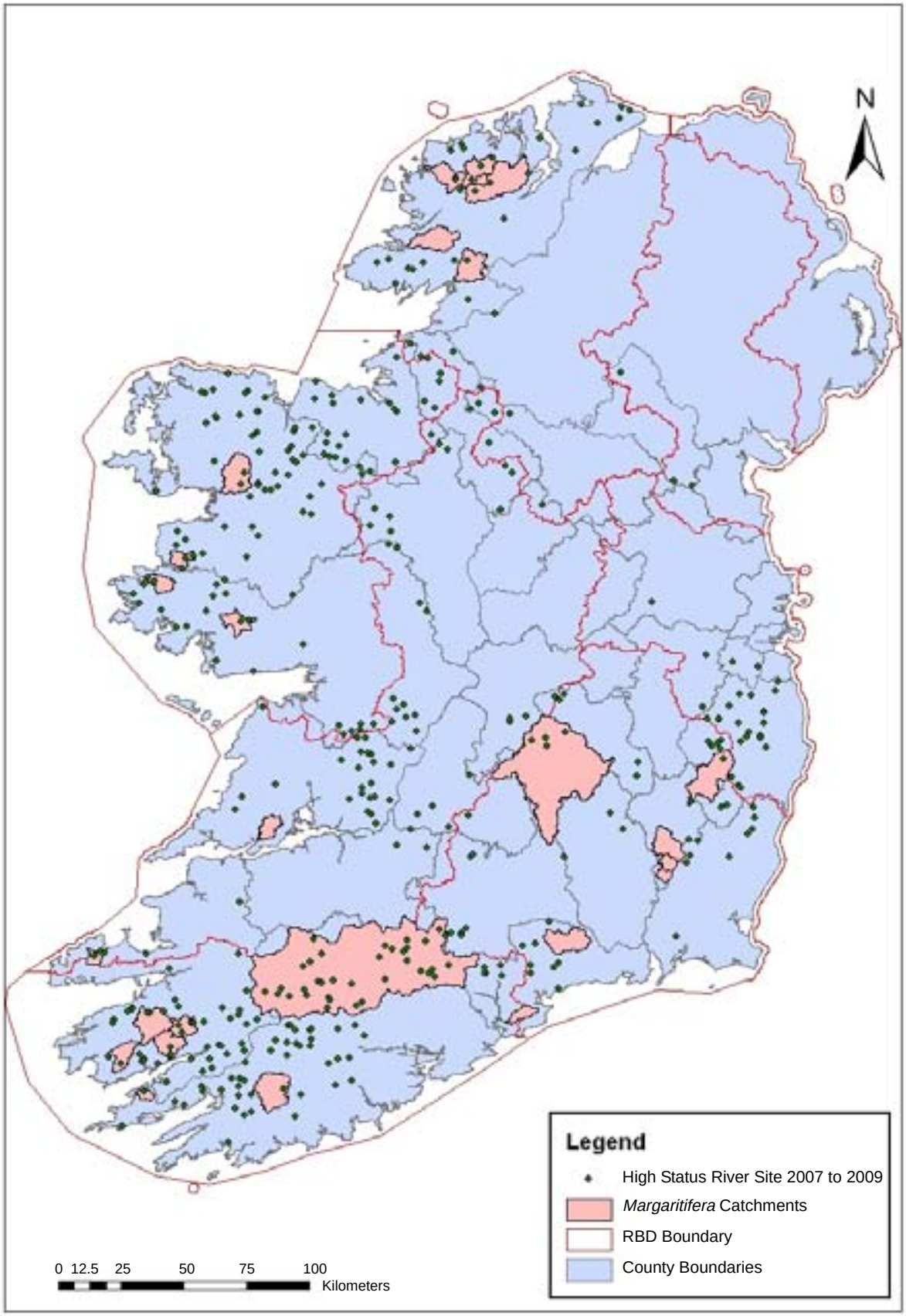


Figure 3.6. High status river sites and freshwater pearl mussel candidate Special Areas of Conservation catchments overlap (N = 74). RBD, River Basin District.

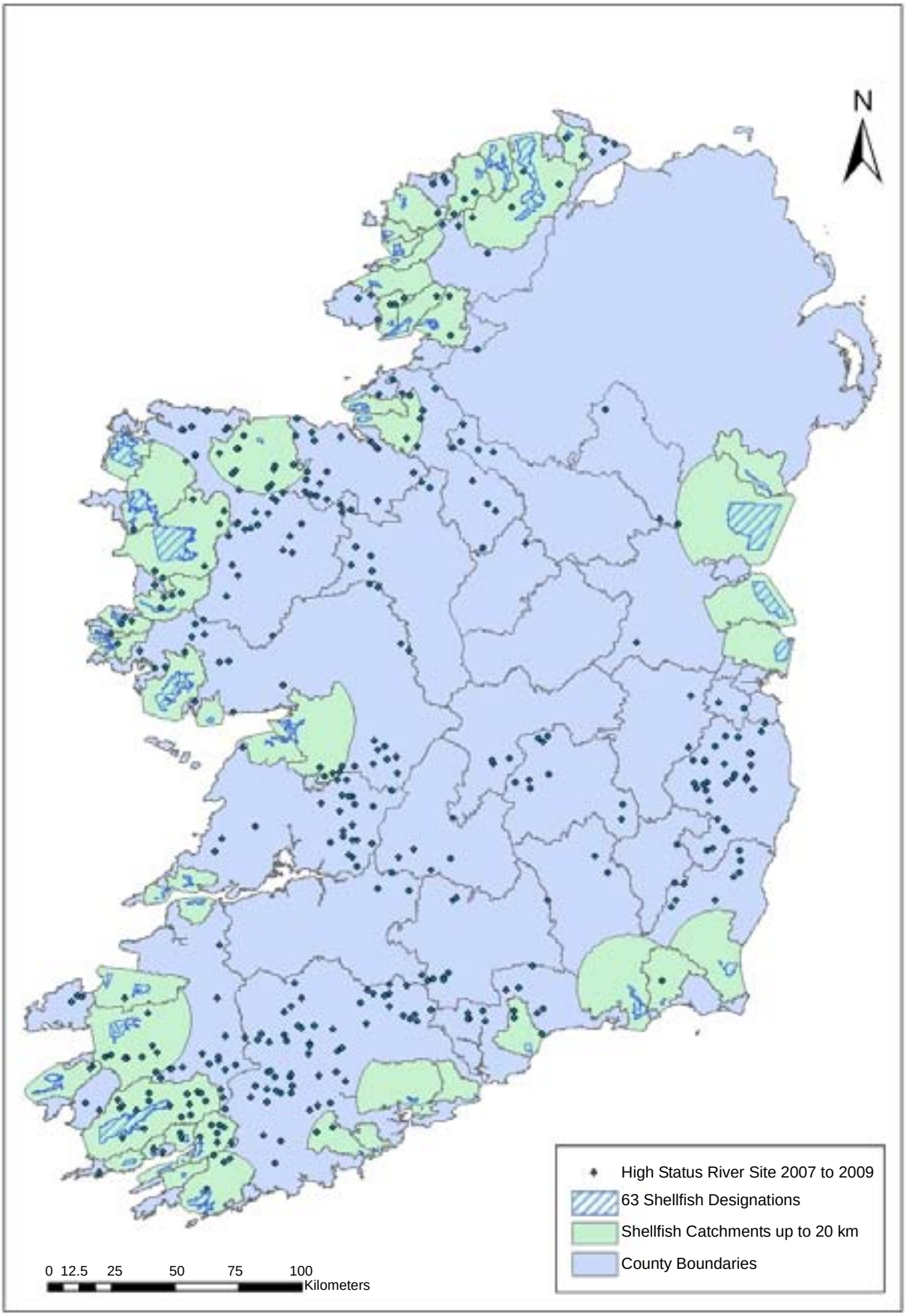


Figure 3.7. High status river sites and shellfish-designated area catchments overlap (N = 104).

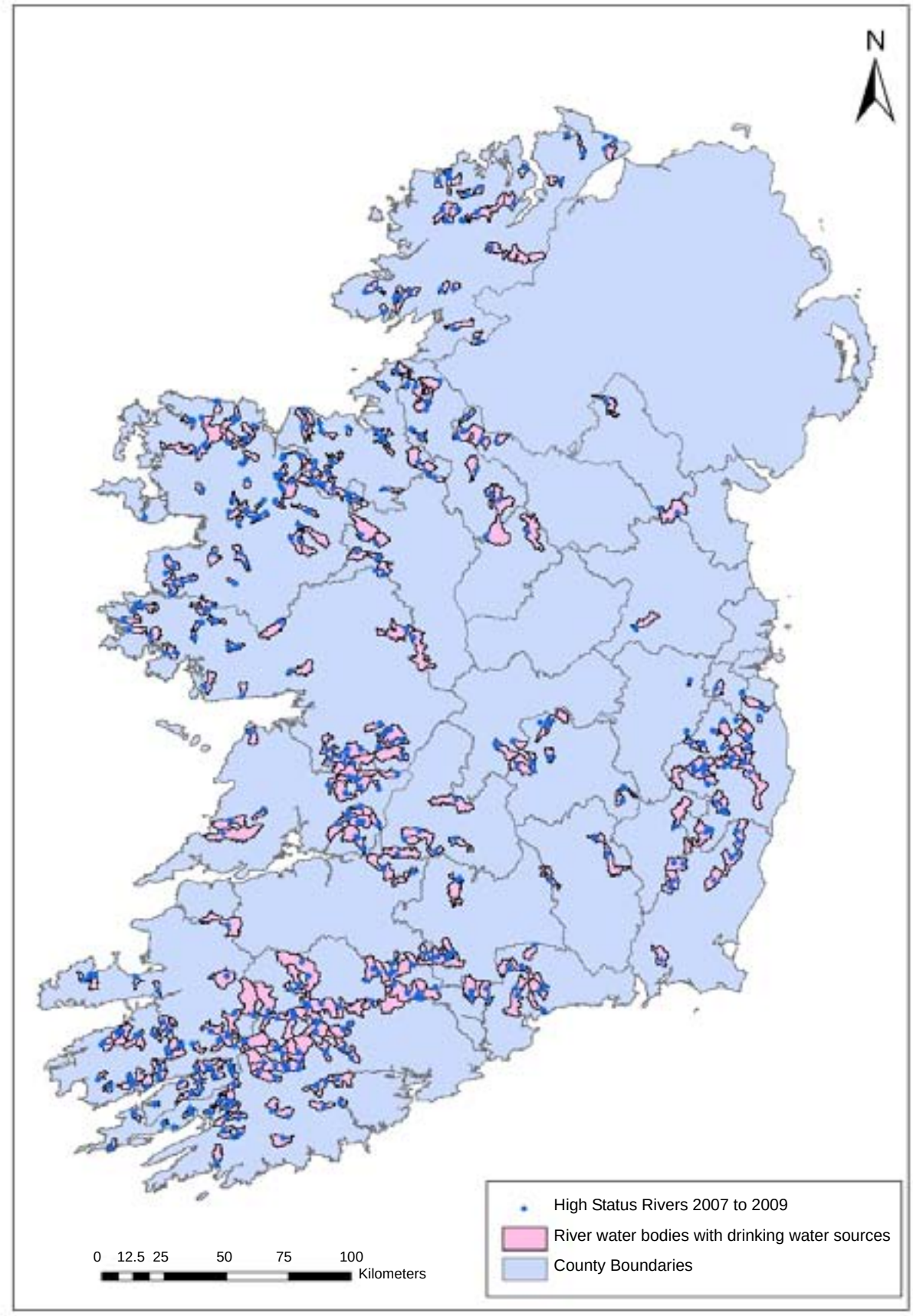


Figure 3.8. High status river water bodies containing high status sites from the period 2007–2009 and their overlap with water bodies identified as drinking-water-protected areas.

catchment delineated for the protection of shellfish-designated areas; and

- Thirty per cent of river water bodies that contain high status sites also contain a drinking water source.

Importantly, the points above illustrate that the protection of high status sites should be better facilitated as a result of the various legislative instruments, management plans or structures in place to protect cSACs, SPAs, NHAs, freshwater pearl mussel catchments, shellfish catchments and drinking water source protection plans; however, a greater extent of high status sites lies outside of these protected areas, and they therefore potentially require additional protection mechanisms over and above existing legislative instruments.

4 Management Strategies

4.1 Introduction

The key legislative protection instruments, or directives and regulations, for the protection of high status water bodies fall under the basic measures to be implemented under the WFD (see Table 2.1). The management and protection strategies proposed below largely reflect actions working within the context of these existing directives and regulations, while also identifying strategies for the implementation of longer-term goals to better effect the implementation of the WFD and the protection of high status sites, e.g. new policies and/or legislation. Further discussions between the statutory authorities tasked with the implementation of the WFD are required in relation to each management strategy proposed to ascertain the potential for applicability, effectiveness, time and resource implications, and administration. These discussions are potentially best achieved through the NTCG, and the establishment of a sub-group on High Status Protection.

The management strategies proposed have been consolidated from a variety of sources during the preparation of this Discussion Document. They include:

- Discussions with representative LAs;
- Discussions held with representative public authorities: the EPA; the Forest Service and Agriculture sections within the DAFM and the NPWS within the Department of Arts, Heritage and the Gaeltacht;
- Discussions held with the Project Steering Committee;
- Protection team experience from over 30 years in the field of aquatic research and catchment management;
- Key findings from the Literature Review (Irvine and Ní Chuanigh, 2011); and
- A review of the Western RBD POMs study *Guidance on Measures under the Habitats Directive and for High Status Sites* (Mayes, 2008).

Wider discussions with local and pubic authorities will be required to develop management strategies presented for discussion in this document, and to assist the EPA in generating guidance in this area. Work currently being undertaken as part of the Interreg IV project *Implementation of Practical Measures in Freshwater Pearl Mussel Catchments* will also assist in this regard, as guidance notes on certain activities are part of deliverables from this project.

Under the WFD, there is a requirement to prevent the deterioration of water quality, and yet there has been a persistent and dramatic decline in the highest status rivers in Ireland. While there is no equivalent monitoring evidence for lakes and transitional or coastal waters, it is likely that significant declines may also have occurred. A series of strategies has been proposed in the sections below in order to address the decline of high status sites and water bodies, but **the most urgent response is needed within local and public authorities until such time as some of the proposed mechanisms are in place**. Strategies presented in this chapter are based on the following five key points:

1. **Planning and development in high status catchments is an environmental issue**
   All planning decisions in high status catchments should be referred to the appropriate environmental departments for assessment within local and public authorities. While it is recognised that this will increase the potential workload for environment staff within local and public authorities, this is nevertheless an essential and short-term requirement until a more streamlined water governance structure is established.

2. **High status catchments provide valuable ecosystem services**
   High status water bodies provide important ecosystem services and public goods, including clean drinking water, possible flood alleviation, peaceful and scenic surroundings, and amenity value and the economic income associated with that. There needs to be an appreciation of the role of ecosystem services within the local and public authorities, which must be carefully balanced with current and future development.

3. **High status catchments have little to no capacity for further intensification**
   The assimilation capacity for nutrients of oligotrophic water bodies is very low, and many are close to or have exceeded their capacity for catchment intensification of land use and development.

   The cause and effect of permitting further development must be understood and the implications of all intensification assessed before it should be permitted. For example, a poorly functioning septic tank may be enough to exceed carrying capacity, or a nitrates derogation can result in higher numbers of animals, more intensive use of fertiliser and a requirement to spread slurry where none has been spread before. High status waters are particularly susceptible to impacts that may be relatively localised.

4. **High status catchments and protected areas require similar protection strategies**
   There is a strong overlap between high status sites, cSACs and shellfish-designated areas. There are current European Court of Justice cases pending against Ireland for lack of protection of protected areas, and future cases may be taken for loss of WFD high status sites.

   It is important that a proactive approach is taken against further declines. Deterioration caused by ongoing intensification may result in large fines against Ireland and greater difficulty, and cost, in remediating problems.

5. **County Development Plans (CDPs) and all plans and policies should reflect the sensitivity of high status water bodies**
   CDPs should be used to plan for the strategic protection of high status sites and water bodies through a catchment management approach. A hierarchy of protection could follow the approach outlined in Section 4.2. Iterations of CDPs can refer to high status catchment protection until such time as plans come up for revision.

Table 4.1 provides a summary of the management strategies proposed as outlined in Sections 4.2–4.11. The order in which the strategies are presented does not imply a prioritisation, unless indicated otherwise in the table. The management strategies will have implications for local and public authorities as follows:

- Staff resourcing;
- Staff training;
- The requirement to implement a GIS-based monitoring and management system;
- The requirement for a nationally agreed policy in relation to high status catchment protection and restoration;
- Reporting and database maintenance; and
- Annual budgets.

4.2 Catchment Delineation and Prioritisation for Protection

As part of the desk study to produce this Discussion Document, a proposal was made and approved by the Project Steering Committee to consolidate the GIS layers of high status sites/water bodies, to delineate catchments for the protection of high status sites/water bodies, and to examine a mechanism through which these high status sites/water bodies could be prioritised for the implementation of protection strategies.

High status sites and water bodies have been identified. These sites/water bodies are the equivalent to those reported by the EPA to the EC covering the monitoring period from 2007 to 2009. All data sets are included in Arc GIS format online at: STRIVE 99 Data

Table 4.1. Summary of management strategies proposed.

No.	Management strategy proposed	Description	Section	Actions & suggested mechanisms for delivery	Prioritisation
1	• Establish high status catchments and delineate in GIS • Categorise catchments based on a tiered system of prioritisation for protection • Validate catchment delineation • Disseminate to all local and public authorities	• Prepare GIS layers for high status catchments and sites • Delineate catchments for high status sites and water bodies • Determine prioritisation of high status catchments for protection strategies and validate • Disseminate high status GIS layers to local and public authorities • Update catchment delineation, prioritisation and disseminate regularly	4.2	• GIS layers of high status sites/water bodies and catchments delineated are delivered with this Discussion Document; however, validation of catchment delineation and prioritisation is required. It is considered that the EPA is best placed to validate the prioritisation of catchments and catchment delineation. Once validation is complete, data sets can be made available to local and public authorities.	• **Priority management strategy**
2	• Consideration of the establishment of a spatial network of high status sites, and potentially designate as protected area • Consideration of the establishment of a restoration policy for former high status water bodies	• Establishment of a national spatial network of high status water bodies to address the unbalanced spatial extents currently within this network of sites. • Consideration of a restoration programme for former high status sites, in particular in RBDs where the numbers of high status sites has seen high rates of decline, and within counties where little or no high status sites remain. The restoration policy will assist in the generation of a more balanced spatial network for high status catchments.	4.3	• NTCG to consider the establishment of a High Status Protection Working Group to debate and develop further the proposed management strategies presented in this Discussion Document. The establishment of such a sub-group is required as a matter of urgency.	• **Priority management strategy**
3	• Consideration of the establishment of an EPA ‘blue dot’ monitoring and enforcement management system for high status sites	• Establishment of a ‘blue dot’ monitoring system to trace investigative monitoring, protection measures, and restoration measures in high status catchments. The ‘blue dot’ system would seek to emulate the approach adopted by the EPA towards seriously polluted sites, whereby a ‘red dot’ system of surveillance of such sites was implemented and enforced.	4.4	• EPA to consider adopting/developing an approach towards high status sites protection/restoration or ‘blue dot’ monitoring and management system, akin to that employed for seriously polluted sites, or the commonly referred to ‘red dot’ system.	• The ‘blue dot’ system and its merits are a matter for discussion for the EPA, and discussions should be initiated on this strategy as soon as possible.

Table 4.1 *contd*

No.	Management strategy proposed	Description	Section	Actions & suggested mechanisms for delivery	Prioritisation
4	• Potential additional measures under the implementation of the WFD	• Table 4.2 details potential additional measures that could be implemented, based on a legislative review gap analysis undertaken as part of the Literature Review stage. The key discussion points for local and public authorities to discuss implications stemming from proposed additional measures, and potential future policy and/or legislative changes are highlighted.	4.5	• It is suggested that such discussions may be facilitated via the NTCG and the proposed High Status Working Group, and that discussions are urgently required in order to stem the decline in high status sites. Policy and/or legislative changes can be introduced either at local level via bye-laws, or at national level via changes in national statutory instruments or new statutory instruments, if required. It would be essential, however, to first ascertain through investigative monitoring, the key pressures that need to be addressed, and the extent of such pressures within high status catchments (see Section 4.6).	• Discussions should be initiated on this strategy as soon as possible via the NTCG.
5	• Assessment of potential impacts	• Small-scale pressures, which can be extensive in nature, will not have been documented through the Article 5 process under the WFD. These small-scale pressures are essential to identify, particularly in high status catchments, due to the greater impact they can exert in these catchments relative to more polluted catchments. • While the EPA is currently conducting investigative monitoring within the catchments of 'dropped' or formerly monitored high status river sites (see Section 4.2 Tier 4 sites), there is currently no co-ordinated effort to conduct similar monitoring of existing high status sites, with the aim of identifying impacts or sources of potential impacts that could lead to the loss of the high status classification for that site, i.e. a preventative monitoring strategy.	4.6	• For Tier 1, 2 and 3 catchments (see Section 4.2), LAs should conduct catchment walk-over risk assessments to identify and verify pressures within these sensitive catchments, over and above those pressures identified through the RBD Article 5 process. These assessments, coupled with data collated as part of Article 5 characterisation and during the POMs studies, together with aerial imagery, will provide a full picture of the types and scale of pressures within these catchments. Coupled with catchment walk-over risk assessments, investigative monitoring employing the SSRS may prove a valuable tool to verify stretches of streams at risk. Annual reporting of such assessments should be made by the LAs to the EPA in order to establish a national perspective of the impacts, and to provide for the analysis of the complementary approaches towards investigative monitoring within high status catchments by the EPA and LAs.	• **Priority management strategy** • Discussions should be initiated on this strategy as soon as possible via the NTCG, with consideration of time and cost implications for LAs.

Table 4.1 *contd*

No.	Management strategy proposed	Description	Section	Actions & suggested mechanisms for delivery	Prioritisation
6	• Planning controls	• Each application for planning/licensing should be screened to see if it is located within the catchment of a high status surface water body or high status river site. • Consideration of the application of an AA-style screening approach could be adopted for high status catchments, to improve the assessment of cumulative impacts within these catchments, and to trigger the requirements for EcIA or EIA. • Each local and public authority should review existing environmental assessment guidelines which they have in place to account for the protection of high status waters, and to 'WFD-proof' such guidelines.	4.7	• Incorporate high status catchments layers within mapping systems of local and public authorities. • Existing triggers for EcIA and EIA should be re-evaluated in conjunction with planning and licensing authorities to consider practical considerations in relation to triggering the requirement for such assessments in high status catchments. An AA-style screening approach to trigger the requirements for EcIA or EIA could be adopted. • Guidance document revisions to be assessed by document authors, or via funding administered through the Local Authority Services National Training Group.	• Discussions should be initiated on these strategies as soon as possible via the NTCG, with consideration of potential legislative implications if required.
7	• Centralised GIS activities spatial database	• A register of activities within high status catchments should be developed, and access should be provided to all local and public authorities. This database would assist with screening for potential impacts from proposed developments, licensing, etc. • A drainage database (in GIS format) should be developed and maintained. The development of a database would, in conjunction with existing GIS layers of rivers, lakes, transitional and coastal waters, provide for an assessment of the sensitivity associated with high status catchments, i.e. the true hydrological setting.	4.8	• Development of an activities database for high status catchments in Ireland (in GIS). • Development of a drainage database in high status catchments for Ireland (in GIS).	• Such an approach requires careful consideration, particularly in relation to hosting and long-term maintenance and updating of such databases. However, recent advances such as the EPA EDEN system, the EPA ENVision system, *WaterMaps* for the WFD, etc., illustrate the importance of centralising data for the water environment. Discussions should be initiated on these strategies as soon as possible via the NTCG.

Table 4.1 ***contd***

No.	Management strategy proposed	Description	Section	Actions & suggested mechanisms for delivery	Prioritisation
8	• Integrated monitoring	• Development of Environmental Quality Standards for the loading of nutrients from rivers to high status lakes and transitional waters aimed at continued protection of their high status.	4.9	• Monitoring of nutrient inputs to high status lakes and estuaries should move to high temporal resolution to enable more accurate estimates of phosphorus loads in high status catchments, e.g. TMDL protocol (see Section 4.9). Adequate flow measurements are also required for this purpose. Initially, this approach could be trialled in selected high status catchments to investigate the approach and evaluate the findings, which in turn can inform policy implementation.	• **Priority management strategy** • EPA to consider strategy proposed for monitoring in high status catchments.
9	• Development of a policy for unregulated activities within high status catchments	• Unregulated activities have led to damaging impacts to high status catchments (see case studies in Chapter 5). Such activities can be identified through catchment walk-over risk assessments via an investigative monitoring approach as proposed in Section 4.6; however, following their identification, a policy towards control of such activities will be required.	4.10	• The proposed sub-group on High Status Protection should debate the development of a policy on unregulated activities as a proposed management strategy to protect high status catchments.	• This policy debate will be informed through investigative monitoring undertaken, and therefore can only be debated following the collation of such data.
10	• Design and implement a public awareness campaign fostering initiatives at local level	• The public should be made aware that it is living within a high status catchment, why these catchments are important, and what type of activities could cause an impact. This can be achieved through school programmes, national campaigns on water quality protection, catchment-based initiatives such as information leaflets, stakeholder meetings and community-based awards.	4.11	• Design and implement a public awareness campaign for high status catchments. The high status campaign should be focused at the catchment level and informed by investigative monitoring findings.	• This public awareness campaign will be informed through investigative monitoring undertaken; however, the structure of an awareness campaign can be debated and agreed prior to the collation of data to inform the campaign.

GIS, Geographical Information Systems; EPA, Environmental Protection Agency; RBD, River Basin District; NTCG, National Technical Coordination Group; WFD, Water Framework Directive; LA, Local Authority; POMs, Programme of Measures; SSRS, Small Streams Risk Score; AA, Appropriate Assessment; EcIA, Ecological Impact Assessment; EIA, Environmental Impact Assessment; TMDL, Total Maximum Daily Load.

and Information Products. It is recommended that all local and public authorities incorporate these GIS layers into their internal electronic mapping, licensing and referral systems to establish alerts when an applicant proposes a development or applies for a licence, etc., within these catchments. These layers will act as a baseline from which future trends in the status of high status sites can be monitored against by Ireland, and by the EC.

High status catchments were delineated using GIS by selecting all water bodies upstream of a high status site or water body, which are hydrologically linked to that site or water body. An example for the Oily catchment, Co. Donegal, is presented in Fig. 4.1. The Oily River High Status Catchment contains three high status sites: two on the Oily River itself and one on the Tullinteane River, a tributary of the Oily River. Delineation of a catchment encompassing these three sites involved the selection of five river water bodies that encompass the Oily River and its tributaries. In the case of the Oily River High Status Catchment, it also discharges into a shellfish-designated area. Therefore, protection of this catchment will contribute to the maintenance of its high status classification, protection of a shellfish-growing area, and protection of a non-designated population of freshwater pearl mussel. A case study for the Oily Catchment in presented in Chapter 5.

Prioritisation of measures for implementation under the RBMPs has been developed by the RBDs, e.g. the Eastern RBD focus on upper catchment measures, and other RBDs' proposed Surface Water Implementation Plans. A mechanism for the prioritisation of high status sites or water bodies was considered within the context of this desk study, and is complementary to the approaches adopted in the RBDs.

A tiered prioritisation for the implementation of management strategies was proposed for high status catchments following discussions with the Project Steering Committee. Prioritisation of high status water bodies and sites for protection was undertaken to provide a strategic approach towards the implementation of management strategies. Each high status surface water body or river site has been classified into one of five tiers, based on the following criteria:

- **Tier 1: High status water bodies, both extrapolated and monitored, located within cSACs**
  Water bodies classified at high status through monitoring or extrapolated status located within cSACs have been afforded the highest priority due to the sensitivity of these catchments.

- **Tier 2: High status monitored water bodies not located within cSACs**
  Water bodies classified at high status through monitoring information, and located outside of cSACs are afforded second priority.

- **Tier 3: High status river sites not located within a high status water body**
  Figure 3.2 illustrated that there are many high status river sites located within water bodies that have been classified at a lower status class. It is important that such sites are protected so as not to allow deterioration. Tier 3 allows for the protection of such sites.

- **Tier 4: High status river sites with no recent monitoring data or 'former' high status sites**
  As mentioned in Section 3.2, the EPA is currently conducting investigative monitoring at formerly classified high status sites which were dropped from the National Monitoring Programme during rationalisation of the monitoring network in 2006, in preparation of a WFD-compliant monitoring programme. These sites number 89, and are listed in Appendix 2, and it is currently not known whether they are still at high status or whether they have deteriorated in status since last monitored. During the 2010–2012 survey period, investigative monitoring will confirm the status of these sites. In the interim, until confirmation is received, catchments have been delineated for these formerly identified high status sites in anticipation of the monitoring results.

- **Tier 5: High status water bodies classified by extrapolation and not located within cSACs**
  The focus for the protection of high status surface water bodies and high status river sites has been

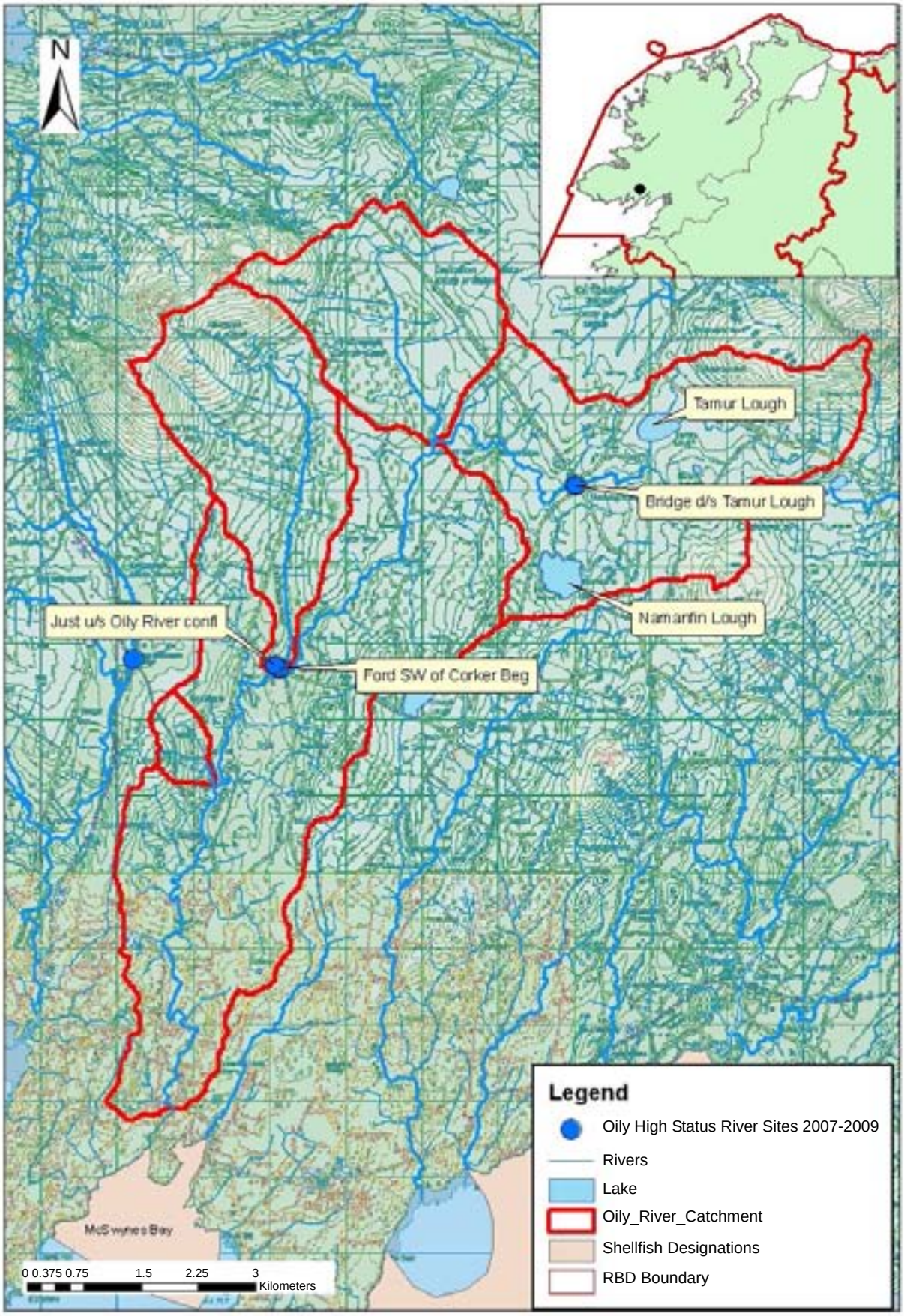


Figure 4.1. Delineated high status catchment for the Oily River, Co. Donegal. RBD, River Basin District.

placed on monitored water bodies and sites in this Discussion Document, i.e. via Tiers 1 through 4 above, and by the EPA through its latest update on WFD status classification. Focus is recommended on these monitored sites/water bodies, for which we are required to report on to the EC. However, as already discussed, there are also water bodies identified at high status through the extrapolation process. For rivers, extrapolated status was assigned based on a cluster analysis, using typology (i.e. water body types have been identified under the WFD to allow comparison across water bodies of similar physical and chemical attributes) and risk assessment results from Article 5 reporting. Unmonitored river water bodies were classified by referencing their nearest most similar monitored river water body within the same cluster and the same RBD. The process to assign extrapolated status requires, inter alia, a reliable risk assessment for meeting WFD environmental objectives, and is likely to have low confidence as a predictor. Catchments have also been delineated for these extrapolated status water bodies, but have been afforded the lowest priority level.

Note: The above tiered structure is suggested as a means to prioritise the protection of high status catchments, but only addresses those water bodies/sites classified at high status between 2007 and 2009, and some additional high status sites from the 2004–2006 monitoring programme that have no recent monitoring. The position in relation to the restoration of former high status river sites pre-2007 is discussed further in Section 4.3.

Catchment delineation has illustrated that high status water bodies are mainly located in small catchments discharging directly to the sea, in the upper sections of sometimes small river catchments, and in the upper sections of some larger river catchments. On rare occasions, high status sites were found located low down in large river catchments, e.g. the Clare River (Claregalway), Co. Galway, and therefore delineation of the entire upstream river catchment was considered to be impractical. Very few rivers have been identified with high status classifications from their source to the sea, e.g. Bundorragha River, Co. Mayo.

All Arc GIS layers for the catchment delineation and prioritisation process undertaken, plus maps illustrating the results for each county, are provided online at: STRIVE 99 Data and Information Products. Figures 4.2 and 4.3 illustrate the results for the

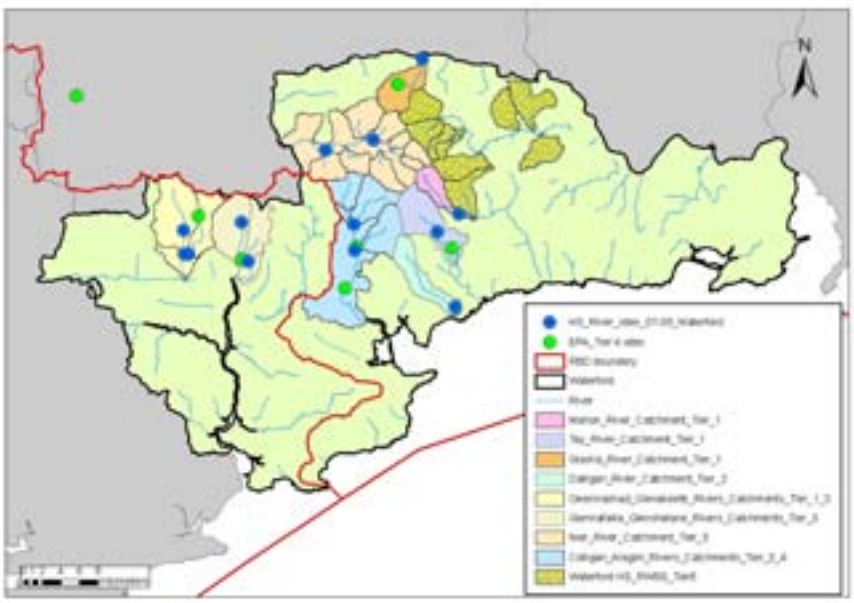


Figure 4.2. High status surface water body and high status river site catchment delineation and prioritisation for Waterford. RBD, River Basin District.

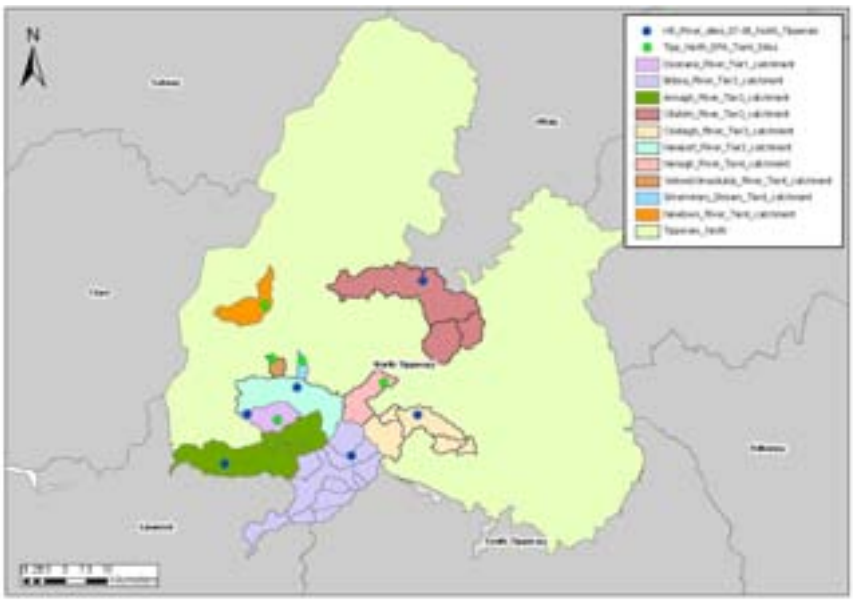


Figure 4.3. High status surface water body and high status river site catchment delineation and prioritisation for Tipperary North.

catchment delineation and prioritisation undertaken for two sample counties.

4.2.1 Management strategies proposed

- Preparation of GIS layers of surface water high status sites/waters;
- Delineation of catchments for high status sites/water bodies;
- Validation of catchments delineated;
- Establishment of tiered prioritisation for catchment protection measures implementation;
- Dissemination of high status and catchment GIS layers to all local and public authorities; and
- Establishment of a mechanism for the regular update of high status sites/water body layers and catchment delineation and prioritisation.

4.3 Establishment of a Spatial Network of High Status Waters

Two management strategies are discussed in this section, which are considered to be linked, i.e. the potential for the creation of a national spatial network for high status sites, and consideration of the establishment of a restoration policy to facilitate a more balanced national spatial network of high status sites.

The Literature Review undertaken as part of this desk study comments that the rationale for a connected network of high quality sites (Amezaga and Santamaría, 2000; Amezaga et al., 2002) applies equally to the WFD (as to the Ramsar Convention) (Hering et al., 2010), fits well with wider considerations of extensification of land use to support conservation objectives (Lütz and Bastian, 2002; Berger et al., 2006; Von Haaren and Reich, 2006), and should be incorporated into RBMPs (Kettunen et al., 2007).[7]

The EU Habitats Directive designates sites on the basis of being representative of habitats in the Member States. The identification of high status sites under the WFD is, in contrast, a reflection of the current status quo. The WFD date for setting status was 2009, which implies that degradation of these sites prior to this date is acceptable. However, for national preservation of aquatic biodiversity, there should be consideration of restoration back to high status sites in order to affect a national and interconnected network of type-specific high status sites, akin to the philosophy of the Habitats Directive.[8] This provides a fundamental challenge for landscape management and interaction with other policies, especially those relating to agriculture and rural development.

7. Irvine and Ní Chuanigh, (2011:9).
8. Irvine and Ní Chuanigh, (2011:11).

Section 3.2 highlighted that the majority of high status water bodies are located in the South Western, Western, Shannon International and North Western International RBDs, i.e. primarily along the western seaboard. This illustrates an unbalanced network of high status water bodies across the country, and in particular raises the question as to whether those RBDs with lower numbers of high status water bodies, i.e. the Neagh Bann, Eastern and South Eastern RBDs, should focus on the protection of remaining high status water bodies, and the restoration of historically identified high status sites, e.g. high status river sites (Tier 4 sites and others). It also raises the question in relation to restoration for those counties with higher losses of high status sites over the past decade or so, e.g. Donegal. While the WFD does not require restoration to high status per se as an objective, the benefit of encouraging a more spatially balanced high status network of sites has been highlighted by multiple peer-reviewed research papers as noted above from the Literature Review. It could also be argued that high status in upper reaches may provide essential dilution water that is needed to achieve good status in the mid and lower catchments where pressures are inevitably greater. Initially, a restoration policy could be debated through the NTCG, or between the DECLG and the EPA, using historical macroinvertebrate Quality Rating results for rivers as a starting point, given that the historical data set for this biological element is readily available.

Given the extent of published information in relation to the importance of headwaters, small water bodies and wetlands for regional biodiversity (see Irvine and Ní Chuanigh, 2011), and for the provision of refugia from which recolonisation of larger water bodies can occur following restoration, it can be argued that those areas of the country that lack such high status waters will be limited or hampered in their efforts towards their achievement of WFD objectives.

Facilitating a wider countryside approach to the protection, or restoration, of a network of high status sites is the European Landscape Convention. Further information on this Convention can be found in the Literature Review (Irvine and Ní Chuanigh, 2011), with examples of interest for Ireland from other European countries.

4.3.1 Management strategies proposed

- Establishment of a National Spatial Network of high status water bodies; and
- Consideration of the establishment of a Restoration Policy for former high status sites in RBDs where the numbers of high status sites have seen a high rate of loss, or for those that have little high status water bodies currently remaining.

4.4 Establishment of a 'Blue Dot' Monitoring System

The EPA has successfully implemented a programme of focused effort to remediate seriously polluted or bad status sites over the last number of years. This programme, commonly referred to as the 'red dot' programme was successful as it provided a focus, and increased the profile of issues in relation to seriously polluted sites, and placed emphasis on their restoration.

Consideration should be given to a programme for monitoring the implementation of proposed protection strategies and/or restoration strategies for high status sites and water bodies, in order to ascertain strategy effectiveness in preventing damage within high status sites or while restoring former high status sites. The programme, while adopting some key elements of the 'red dot' programme, would require a different approach for a number of reasons:

- **Key pressures:** The key pressures involved in serious pollution of sites were generally related to municipal discharges, suspected agricultural activities and industrial discharges. For high status sites, it is expected that pressures will be more diffuse in nature, less intensive than those generally considered, and will require local-level measures to remediate issues; and
- **Scale:** The number of seriously polluted sites of concern was small when compared with the number of high status sites requiring protection.

As the impacts, and importantly the cumulative impacts, of low intensity activities are not well understood (although see Chapter 5 for case studies illustrating some impacts), a closely monitored strategy

implementation is required to inform iterative protection measures. Significant liaison with local and public authorities will be required as investigative monitoring undertaken yields insights to the key pressures, and mechanisms are developed and implemented to reduce or eliminate such pressures, e.g. changes in policy, legislation, etc. It is recommended that a traceable system is implemented in this regard to document outcomes.

4.4.1 Management strategy proposed

- Establishment of a 'blue dot' monitoring and management system to trace investigative monitoring efforts, characterise pressures, document protection measures implemented, and/or restoration measures in high status catchments. The 'blue dot' system would seek to emulate the approach adopted by the EPA towards seriously polluted sites, whereby a 'red dot' system of surveillance of such sites was implemented and managed via liaison with local and public authorities.

4.5 Potential Additional Measures

The Literature Review (Irvine and Ní Chuanigh, 2011) undertaken for the desk study made the following points of note:

1. *The assumption is that compliance with the 11 Directives listed in Annex VI part A of the WFD provides the minimum measures required to meet the environmental objectives for good status. In previous Government discussions of WFD implementation, these were referred to as Basic Measures of Article 11 of the WFD. Supplementary Measures were considered those that were needed in addition to the basic measures to meet the environmental objectives of the Directive, and referred to in Annex VI, part B of the WFD*;

2. *The option to use additional measures to protect aquatic systems over and above those provided by the transposed WFD legislation and the 11 associated Directives remains an option. This is of crucial importance for the protection of high status*;

3. *The high rate of decline of high status sites demonstrates the failure of existing policies to be effective*.

It is important that:

1. There is no fundamental conflict between the objectives of those Directives listed in Annex VI part A of the WFD, and any subsequent amendments, and those of the WFD; and

2. That sufficient attention is paid to water quality objectives and, more so, to cross-compliance with ecological standards.

The Literature Review therefore examined to what extent the legislation specified in Annex VI Part A provides protection of sites that have been identified as high status, and is cross-compliant with the requirements of the WFD. These questions were addressed at three scales:

1. WFD-specific legislation in Ireland and if it is fit for purpose for the protection of high status sites;

2. Protection afforded to high status sites through the Directives listed in Annex VI Part A of the WFD, some of which have been amended since the publication of the Directive; and

3. Potential impacts on high status sites arising from other policies and practices.

The results of this review are summarised in Table 4.2 as potential additional measures that could be implemented, including key comments elicited through discussions with local and public authorities consulted during the project. The table presents key discussion points between local and public authorities to discuss their implications and potential future policy and/or legislative changes. It is suggested that such discussions may be facilitated via the NTCG or the proposed High Status Working Group, and that discussions are urgently required in order to stem the decline in high status sites. Policy and/or legislative changes can be introduced either at the local level via bye-laws, or at a national level via changes in national statutory instruments or new statutory instruments if required. It would be essential however to first ascertain through investigative monitoring, the key

Table 4.2. Potential additional measures for the protection of high status catchments as elicited from the Literature Review (Irvine and Ní Chuanigh, 2011).

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
The Birds (79/409/EEC) and Habitats (92/43/EEC) Directives	1. The clear and striking need for conservation objectives, and management, to be aligned and screened for cross-compliance with WFD objectives provides an incentive to link these plans to WFD objectives for high status sites. In support of this, the RBDs have already compiled extensive action points that cover monitoring to administrative arrangements for WFD measures aligning the Habitats Directive and WFD (Mayes, 2008). 2. Respective agencies need to co-ordinate their ideas and plans to maximise the synergies between the Directives (Birds and Habitats Directive and WFD) and minimise the conflicts. This co-ordination needs to extend to sharing of data and use of compatible, and readily available, IT systems, including GIS. This reinforces the recent recommendations arising from a review of the EPA (DECLG, 2011). 3. The use of Additional Measures, such as those indicated in Annex VI, Part B of the WFD needs to be considered for WFD compliance.	1. Designate high status catchments as protected areas, i.e. establish a spatial network of high status sites.	1. DECLG, EPA and DAHG–NPWS to liaise to further strengthen the co-ordination and implementation of the Birds, Habitats and Water Framework Directives. The key aim should be the harmonisation of the classification and management for favourable conservation and high status water bodies. Discussions should also include consideration of how alien species, other than zebra mussel, impact unfavourably on conservation and high status classifications. 2. Establish a defined strategic link between high status sites and protection nature conservation areas under the Birds and Habitats Directives. The Freshwater Pearl Mussel Regulations provide a notable example of how a species action plan has been backed up with adequate legislation, and effective policies including the monitoring of the effectiveness of measures implemented. 3. Establish additional measures for protected species and habitats, for example Atlantic salmon[1]. 4. Discuss the suitability of adopting the 'Activities Requiring Consent' approach within high status catchments to control unregulated activities. This can, where appropriate, be facilitated through the new Planning and Development Act (2010). 5. Consideration could be given to extending statutory protection under the Habitats Directive to high status water bodies currently not in the cSAC network, and to restoration of water bodies to reach high status in order to provide a more comprehensive and effective network of high quality aquatic habitats, including those that may fall below the reporting size thresholds for the WFD.

Table 4.2 *contd*

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
The Nitrates Directive (91/676/EEC)	1. Lack of consultation between the DAFM and the NPWS and EPA in relation to nitrates derogations in sensitive catchments. 2. The risk from organic fertilisers being spread in high status catchments needs to be quantified, in order to make a well-founded judgement on the extent to which agricultural as a pressure, albeit at low–moderate intensity, may impact high status sites, and requires information on land use at appropriate scales. 3. There is some progress towards data sharing through the liaison between the DAFM and the LAs in relation to inspections and data availability for compliance with the Nitrates Regulations; however, further development of these types of arrangements is required if decisions on land use and protection for high status sites are to be evidence based. 4. Improved storage facilities for slurry do not reduce the net phosphorus content of slurry per se, only the timing of disposal and the temporal risks to surface waters. It might, ironically, in some cases add to the problem in inland waters because winter disposal of slurry can be subject to high flushing rates through surface waters. In Northern Ireland, February has been shown to be a month of high risk of nutrient loads to surface waters (Bob Foy, AFBI, Personal Communication, 2011) and there is likely to be a review by the EC of the closed season for slurry spreading. In light of work by the UK ADAS, consistently high pollution in February and March has been shown; hence, the UK government is reviewing the closed period. 5. Work done by Irvine et al. (2000) associated cattle densities of >1/ha with risk of eutrophication of lakes (ca 30 µg TP/l). Recently, similar values have been reported from Northern Ireland (Bob Foy, AFBI, Personal Communication, 2011). Intensity of grassland farming commensurate with high status water bodies needs to be considerably less. 6. Spreading of waste from a holding to other lands should not be permitted if this might affect protected areas, as defined in Annex IV of the WFD, or high status sites.	1. Zone lands with low stocking rates and larger buffers and provide compensation schemes for farmers. 2. Reinstate banks to prevent erosion – farmers will do this if paid for it. 3. Since agricultural manures were exempted from the Waste Regulations, permits to move manures were no longer required – in addition, while manures are agricultural by-products, their movements do not require registration under the DAFM animal by-products controls, so the whole area of off-site disposal of manures from intensive units provides difficulties in terms of traceability. It was very useful when transporters had to keep records as a condition of permit, but all such requirements are gone – anyone can move the stuff – and the temptation to take in extra fertiliser and perhaps not record same under nitrates is obvious. This is a difficult one – trying to trace imports of manure into sensitive catchments would be dependent on very diligent and honest record keeping under nitrates records and, given the penalties for not having your nitrogen and phosphorus statement below the thresholds, one can see an attraction for unaccounted-for inputs.	1. Nitrates derogation applications to be referred to EPA/NPWS if located within a high status catchment. 2. The DAFM to undertake a risk assessment to quantify the impacts from animal manures in high status catchments. 3. DAFM farm data sets to be made fully available to both the LAs and the EPA in GIS format. This will allow for more targeted local actions to control diffuse pollution from agricultural sources. 4. A review of the closed period for spreading slurry to be undertaken, preferably by Teagasc, and the DAFM to adopt findings in subsequent revisions to the Nitrates Action Plan. 5. The movement of manures between holdings, and between catchments should be fully traceable, through a permitted system. Permit applications should be screened if movement is to a high status catchment, and the LAs concerned notified for their comments/approval. Regulations may be needed to facilitate this system. 6. High status catchment-specific farm plans should be developed that will maintain reduced catchment inputs and should include measures such as: * Maintenance of cattle densities of <1/ha: * Non-enrichment of currently un-enriched soils; * Non-enrichment of identified overly enriched soils; * Soil testing to become mandatory in high status catchments, with farmers required to demonstrate, through soil tests every 3–5 years, the need for application of inorganic fertilisers with a soil phosphorus test, and to deduct phosphorus applied in manure in calculating inorganic loading;

Table 4.2 *contd*

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
	7. Article 16 of the Nitrates Regulations (Table 13) allows for fertilisation of phosphorus of 35, 25, and 15 kg/ha for phosphorus indices of 1, 2 and 3, respectively. This provides for gradual enrichment of soils that are currently un-enriched and, hence, greater net potential for phosphorus emissions to water. 8. The provision that soil tests are required only once every 6 years (see Article 16 (2) (c) Nitrates Regulations) could very easily lead to enhanced loss of phosphorus to water because of interim build-up of soil phosphorus; and phosphorus addition to peatland soils (comprising >20% organic matter) at a rate equivalent to a soil index 3 soil provides a high risk of phosphorus loss, because of low capacity of peat to hold phosphorus. 9. The overall conclusion from the work on buffer strips is that it can be part of the management of riparian zones to mitigate nutrient run-off, but the recommended widths may typically remove 10 m or more of agricultural margin. For low-intensity catchments such as present in the catchments of high status waters, this sort of buffer may not impact much on farm income and could form part of cost-effective agri-environment schemes. 10. The philosophy to maximise production, without sufficient thought to the impact on the environment, prevails, as evidenced by the aspirations for the future of agriculture under the Food Harvest 2020 vision (DAFF, 2010). 11 While the ACP is not designed to investigate effects on high status waters, nor includes any such waters in the programme, it does include, in the Cregduff catchment in south Mayo, a karst region that contains water-dependent cSACs. This, however, is coincidental, as the criteria for the ACP do not include the presence of high status waters, and it is not within the remit of the ACP to identify measures relating to high status water bodies (Phil Jordan, University of Ulster, Personal Communication, 2011). It is difficult to see the feasibility of extrapolating ACP results for protection of high status sites, and no methods of how to do this have been suggested.		* The addition of phosphorus to peatlands soils should be prohibited unless demonstrated to have minimal potential impact. These should apply especially (under the WFD) to protected areas of peatlands or those areas with drainage waters to high status sites; and * No soiled water should be spread unless demonstrated to have no potential to contaminate high status sites, groundwaters and turlough cSACs. 7. The above high status catchment farm agri-environmental scheme should be monitored for its effectiveness to protect high status catchments, and updated as required based on the results of monitoring. 8. Set up an ACP, or supplement the existing ACP, to investigate agricultural pressures within high status catchments. Emphasis should be on the effects of low to moderate intensity activities, and should investigate nutrient concentrations, soil properties and pathways. The focus of the programme should be the establishment of pressure types and scales, and development of practical mitigation measures that can be applied at local level. Potential mitigation measures/ strategies have been published by others that require review for their appropriateness in the Irish context, e.g. COST Action 869 (see Irvine and Ní Chuanigh (2011) for further references).

Table 4.2 *contd*

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
	12. Fundamentally, there is a requirement for maintaining reduced catchment inputs and low levels of potentially impacting activities to protect high status water bodies. This requires low-intensity land use. Mitigation of impact plays its role, but minimising the source of the impact is the most effective measure. 13. For high status and other sensitive water bodies, the current thresholds of risk in the underlying policies and associated Regulations would appear not to be sufficiently stringent, or the general view sufficiently cautious. 14. A range of mitigating measures, such as those found on the COST website (http://www.cost869.alterra.nl), may reduce impact, but essentially a fundamental paradigm shift is required to link the protection of high status water bodies with agricultural practice. Development of agri-environmental fiscal measures provides a useful mechanism for protection.		
The Integrated Pollution Prevention Control Directive	1. While licensing has clearly improved environmental performance of industry and, overall, reduced potentially damaging emissions there are still concerns of under-reporting and a lack of production data in some sectors (Styles and Jones, 2010). 2 Nevertheless, there is an extensive obligatory process for licensed facilities to produce AERs on their performance. Licensing requires consideration of potential impact on cSACs and other protected sites, but there is no special provision for considering impact on high status sites outside that network other than that discharges must comply with legislative requirements.	1. EPA inspections need to be aware of high status catchments and take this into account during the IPPC process, e.g. intensive agriculture, nutrient management plans, and associated spreadlands.	1. AERs should take into consideration potential impact on high status sites. 2. For discharges that may impact high status sites, there should be a responsibility that emission limits **shall not** compromise environmental objectives. 3. Periodic review of licences should account for combined effects from any other discharges to the water body that may impact on high status catchment water quality. 4. The EPA might consider the merit of introducing an AA-type approach to assess combined effects of discharges to high status waters, as is done for discharges to cSACs under the Habitats Directive.

Table 4.2 ***contd***

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
Urban Waste Water Treatment Directive	1. While targets for discharges may be set by ELVs compatible with high status waters, a precautionary approach would minimise loads as far as possible. For this, tertiary nutrient-reduction treatment would be necessary. 2. The Combined Approach in the Waste Water Discharge (Authorisation) Regulations 2007 requires water services authorities to comply with emission limits for the discharge of waste waters to water bodies arising from the stricter of either the Urban Waste Water Regulations (S.I. No. 254 of 2001) or emission limits based on achieving the environmental quality standards. While these are currently defined by the Surface Water Regulations S.I. No. 272 of 2009 and the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. No. 296 of 2009), Article 5 of S.I. No. 254 of 2001 allows for more stringent requirements than those specified in the Regulations, where this is required to ensure that the receiving waters satisfy any other relevant Community Directives. This could be applied to high status sites, but requires a reassessment of the current standards, or possible need to address each high status site on an individual basis rather than the current approach based on river typology. 3. There seems to be nothing to prevent high status water bodies in receipt of waste water discharges from being classified as ‘sensitive’ under the Urban Waste Water Treatment Regulations in order to support sound management. 4. Council Regulation (EC) No. 648/2004 on detergents requires labelling of detergents and the biodegradability of the surfactants they contain, but there is now an intention to amend Regulation (EC) No. 648/2004 by introducing limits on phosphorus compounds in household laundry detergents. This will reduce loads to freshwaters by about 5%.		1. High status water bodies should be designated as sensitive waters under the Urban Waste Water Treatment Regulations (S.I. No. 684 of 2007). 2. All municipal plants whose discharges have the potential to impact high status sites should be licensed with specified monitoring, irrespective of capacity, i.e. a certificate of authorisation is not sufficient. 3. Phosphorus emissions can be reduced through the use of non-phosphorus detergents. Further liaison with the soaps and detergents industry for development of zero or low phosphorus detergents is recommended. This could include public education, especially in parts of the country where high status sites are concentrated.

Table 4.2 *contd*

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
Sewage Sludge Directive	1. The LAs have developed sludge operational management plans for the management of sludge arising from all sources, including WWTPs, septic tanks, industry and agriculture. The allowed phosphorus is as specified in the Nitrates Regulations 2010; hence, they offer no additional protection for high status water bodies. 2. Furthermore, because where sludge is used regularly in agriculture, soil will be analysed at a minimum frequency of once in 10 years – this effectively allows for a build-up of phosphorus. 3. It is not known how effective sludge management is, but the location of spreading from agricultural slurry or domestic tanks is often not known, or recorded. Spreading of slurry and domestic waste comprises a significant risk to ecological quality and public health.		1. The licensing condition, and location of speadlands should be clearly identified and available to the DAFM, LAs and the EPA. 2. Soil testing frequency associated with spreadlands should be increased to every 3–5 years.
Environmental Impact Assessment Directive	1. While an EIA must take account of water, and flora and fauna, including regard to protected areas, there is no specific legislation that requires assessment of potential impact on high status sites. 2. There is a general recognition in the RBMPs of the need for strengthening the statutory basis for integration of water quality objectives with the planning system. The Planning and Development (Amendment) Act (2010) goes some way towards that, and strengthens the link between EIA and the Habitats and Birds Directives, but will require close liaison of LA planning sections with LA water management, as well as bodies such as the EPA. This will necessitate that further consideration is given to screening of proposed projects that might impact high status sites and, where deemed appropriate, that an EIA is carried out. 3. The European Court of Justice (Case C-66/06: nature, location and cumulative effects of certain agri-development projects) ruled that small projects can have significant impacts on important nature sites, and that Ireland uses very high thresholds to select projects for assessment. This has relevance for the protection of high status sites, some of which may be impacted by drainage or land reclamation. In general, it provides for greater 'wider countryside' protection of wetlands that lie outside the cSAC network.		1. EIA needs to incorporate the possibility of impact on a high status water body. 2. Locations of high status sites need to be contained within the LA GIS layers. 3. The EPA should be a statutory consultee, unless provision is provided to ensure appropriate local (and public) authority expertise, so that there is an authoritative and competent opinion provided on all proposed developments that may impact those sites.

Table 4.2 ***contd***

Directive	Key message from the Literature Review	Comments/Suggestions identified through consultation with local and public authorities	Potential additional measures
Bathing Water Directive	1. The main relevance to high status sites is that bacterial contamination reveals a pathway for a contamination source and, therefore, can be concurrent with other pollutants, particularly nutrients. 2. Failure to reach a bathing water standard can indicate sources of pollution, and acts as a check for high status designation.		None suggested.
Drinking Water Directive	1. Water extracted from high status sites would be expected to be low in nutrients and pathogens, therefore, requiring a low level of treatment. 2. High faecal bacteria counts in source water can indicate a source of pollution that may be associated with high nutrient concentrations.		None suggested.
Plant Protection Products Directive	1. Harmful substances are subject to an MAC, listed in Table 11 of the European Communities Environmental Objectives (Surface Waters) Regulations S.I. No. 272 of 2009.		None suggested.
Major Accidents (Seveso) Directive	1. The Major Accidents (Seveso) Directive (96/82/EC) requires provision to be made for emergencies, including unplanned emissions, for major industrial facilities. In Ireland, these would tend to be of potential risk more to coastal than inland sites and not in the vicinity of high status water bodies.		None suggested.

[1]The EPA report on water quality for the period 2007–2009 (EPA, 2010) showed that only 10 of 132 sites surveyed for fish in 2008–2009 were at high status for fish biology, and about 50% were at good status (EPA, 2010).

WFD, Water Framework Directive; RBD, River Basin District; GIS, Geographical Information Systems; EPA, Environmental Protection Agency; DECLG, Department of the Environment, Community and Local Government; DAHG, Department of the Arts, Heritage and the Gaeltacht; NPWS, National Parks and Wildlife Service; cSAC, candidate Special Area of Conservation; DAFM, Department of Agriculture, Food and the Marine; LA, Local authority; AFBI, Agri-Food and Biosciences Institute; total phosphorus; ACP, Agricultural Catchment Programme; AER, Annual Environmental Report; IPPC, Integrated Pollution Prevention Control; AA, Appropriate Assessment; ELV, Emission Limit Value; WWTP, waste water treatment plant; EIA, Environmental Impact Assessment; RBMP, River Basin Management Plan; MAC, maximum allowable concentration.

pressures that need to be addressed, and the extent of such pressures within high status catchments.

Other policies applicable to the protection of high status sites were also reviewed, and these are summarised in Table 4.3, and suggestions for additional measures proposed.

4.6 Assessment of Potential Impacts

The Literature Review has indicated the following:

Under the WFD, the mechanism to effect environmental objectives are the Programmes of Measures (POMs), outlined in Article 11 of the Directive. In order to develop the POMs, it is necessary to identify likely pressures and impacts on water bodies. This was done through the Article 5 Characterisation report (Government of Ireland, 2005), drawing on the methods produced at European level by the IMPRESS working group under the Common Implementation Strategy (European Commission, 2003b). The initial pressure and impact assessment in Ireland was focussed on the risk of water bodies failing to achieve good status. Consideration was not given to risk of failing to meet high status, although all high status sites were deemed to be at risk of failing to meet the environmental objective. Because these water bodies were at high status they did not meet the technical definition of 'risk' in the context of Article 5 (Personal Communication, Martin McGarrigle, EPA). Many high status sites are subject to localised small scale, but extensive, pressures, such as local pollution and drainage. These are not necessarily documented in the Significant Water Management Issues (SWMI) reports done for each River Basin District as part of the drafting of the RBD management reports (http://www.wfdireland.ie). Detailed assessment of potential impact at the site level for many high status water bodies is therefore limited but essential.[9]

In addition, the following points are noted:

Under the WFD, many small water bodies (lakes <1 ha and first-order streams) do not require assessment. First- and second-order streams are located in the headwaters of catchments and comprise the majority (up to 70%) of the Irish national river network. They are particularly vulnerable to localised impacts and many are important for salmonid spawning. The Small Stream Risk Score (SSRS), developed by the Irish EPA and the WRBD can support the POMs for such sites, by providing high spatial resolution data (ShIRBD, 2006).

Site-specific management and techniques such as those contained in the Small Stream Risk Score assessment provide a possible framework to at least identify localised pressures that may impact high status waters. This will require a greater emphasis on specific, and local, rather than generic measures for management. This could include adopting assessment similar to the USEPA TMDLs for individual sites. Small standing waters and headwater streams are important ecological resources and should be included in policies designed for high status waters.[10]

Article 5 of the WFD required the analysis of characteristics and a review of the impact of human activity on the status of surface waters (and groundwaters). The assessment of the impacts of human activities on all waters was undertaken using a combination of impact data (e.g. river Quality Rating impact assessments), and predicted impact assessments (e.g. looking at activities that cause pressures on water bodies). A wide range of pressures were assessed, e.g. abstractions, morphology, point, and diffuse pressures together with the impacts of alien species. All waters were then placed in one of four risk categories on the basis of the assessment:

- 1a – **At risk**;
- 1b – **Probably at risk**;
- 2a – **Probably not at risk**; and
- 2b – **Not at risk**.

'Risk' was related to potentially not meeting the good status objective of the WFD.

Further characterisation was undertaken through POMs studies, which addressed certain pressure categories, e.g. abstractions, morphology, etc., and updated pressure data sets based on data available up to 2008.

9. Irvine and Ní Chuanigh (2011:14).

10. Irvine and Ní Chuanigh (2011:19/20).

Table 4.3. Other policies applicable, and key findings from the Literature Review.

Act/Other plans/ Further areas of legislation	Key comments from the Literature Review
Water Pollution Act	• LAs retain the power to prosecute under the Water Pollution Acts to, inter alia, prosecute for water pollution offences, issue notices or obtain a High Court injunction to effect a cessation of polluting activities and remedy the impact of the pollution, and make bye-laws regulating certain agricultural activities so as to prevent or eliminate pollution of waters, and require farmers to prepare nutrient management plans with the aim of ensuring that nutrients applied to land from chemical fertilisers and organic farm wastes take account of nutrients already available in the soil and are consistent with recommended application rates, crop requirement and the need to avoid water pollution. These powers provide the opportunity to address pollution to high status waters, which could be identified as such in LA CDPs. • During consultations, LAs felt that the bye-law route was onerous and they were not inclined to use this approach to deal with local issues. The preference was for a national approach to be adopted to issues rather than each county instigating its own local policies, which might find strong opposition from local interest groups.
Planning and Development Act	• The Planning and Development (Amendment) Act 2010 amends the Planning Acts of 2000–2009. It better integrates WFD legislation and RBMPs into Development Plans, which must now include objectives for compliance of land use with the relevant RBMPs. In particular the Act provides for "*promotion of compliance with WFD environmental standards*".
Unsewered properties	• The European Court of Justice (Court of Justice ruling on 29 October 2009 against Ireland (C-188/08)), found that, apart from bye-laws in Co. Cavan: Irish legislation does not transpose Articles 4 and 8 of the Waste Directive in so far as domestic waste waters from such on-site treatment systems are concerned; there was insufficient provision for domestic waste water from on-site systems to be recovered or disposed of without endangering human health and without using processes that could harm the environment; a failure to provide for the prohibition of uncontrolled disposal of such waste waters; and inadequate provision for the handling of waste by a public or private waste collector, recovery or disposal in accordance with the provisions of the Directive. • Large parts of some counties in Ireland are unlikely to provide sufficient assimilative capacity for nutrient retention from domestic septic tanks (Donal Daly, EPA, Personal Communication, 2011). Where this is the case, a system of local- or domestic-scale secondary treatment could be used as an alternative, or in addition, to a septic tank. • Authorities have the power to introduce bye-laws to manage septic tank location and management, which could be tailored to suit local soil conditions, as done in Cavan. • Zoned planning through the CDPs can also take the cumulative impacts of one-off housing and small developments into account. In this way, 'risk' zones for high status sites can be integrated into CDPs. • Currently, there is uncertainty among Irish planning authorities of how to calculate or estimate cumulative impacts of developments. For sites designated under the Habitats Directive, this relates specifically to AA, although further guidance on this is required. A similar process is required for high status sites not falling within the cSAC network, but protected through the Planning and Development (Amendment) Act 2010. • The Department of Regional Development in Northern Ireland limited the number of houses that can be built in rural areas through Planning Policy Statement 14 on Sustainable Development in the Countryside 2006 (now superseded by Policy Statement 22). • There is a need for development and testing of alternative small-scale treatment systems to reduce nutrient emissions to water.
Wind farms	• The target for Ireland under Directive 2009/29/EC on the promotion of the use of energy from renewable sources is for Ireland to obtain 16% of its energy from renewable sources by 2016. This has led in the last 5 years to a proliferation of wind farms in upland areas. • Among possible negative impacts are those on water quality, resulting from mobilisation of sediment and altered hydrology. Planning for wind farms, therefore, needs to include EIAs that address potential impacts on water quality and, in the context of this Discussion Document, high status sites. Again an activities-based GIS database would ensure that new proposals for wind farms can be considered in the light of existing developments within high status catchments.

Table 4.3 *contd*

Act/Other plans/ Further areas of legislation	Key comments from the Literature Review
Common Agricultural Policy	• Less than 10% of the CAP budget is spent on organic or agri-environment schemes, although high-value, low-intensity farming focused on local or regional produce has been encouraged in the UK (Cabinet Office, 2002), and furthered with the concept of countryside stewardship. The UK Environmental Stewardship, managed through Natural England, is an agri-environment scheme that provides funding to deliver effective environmental management, and is open to all farmers. (See http://www.naturalengland.org.uk/ourwork/farming/funding/es/default.aspx and also Section 5.2, Case study 4 in Irvine and Ní Chuanigh (2011)). • The last round of CAP reform led to a reduction of payments to the larger farms for reinvestment into rural development programmes. This amounts to 5% of the budget for the period 2007–2012. This money could very easily be targeted in such a way to help protect high status water bodies, as well as to promote rural development. • The CAP is due for further reform in 2013, which is generally thought will lead to further 'greening' of the policy. The opportunities to use this to strengthen protection of high status water bodies, and conservation objectives in general, are obvious. Protection of high status water bodies can be done to complement protection of low-intensity agriculture, which has a fundamental importance for European conservation, and which is associated with most of Europe's valued biotypes (Bignal and McCracken (1996), and see case study on the Burren, Section 5.2 in Irvine and Ní Chuanigh (2011)). • The CAP reform provides a very important opportunity for aligning agriculture objectives with habitat protection, and can capitalise on the availability of funds that can, if there is sufficient political will, support delivery of WFD objectives through the CAP. • While there now appears to be a greater commitment to environmental protection within some sections of the DAFM, the need to operate general schemes with low administrative demands makes focused planning for protection of specific sites (outside the cSAC network) problematic. There is an important need for a serious engagement between the DAFM and the EPA to discuss strategies that can use the CAP, including funding for rural development, to protect high status sites. This is a matter of politics rather than science. • Environmental schemes to enhance biodiversity in Ireland, under REPS, generally failed, and have been criticised by the OECD (2010). There continues to be a loss of biodiversity associated with farming, in Ireland and across Europe (Donald et al., 2006; Pan-European Common Bird Monitoring Scheme, 2011). One of the main problems with agri-environmental schemes has been the lack of data to assess their effectiveness. • Key points made by Finn et al. (2009) provide a number of recommendations for successful (agri-environment) schemes relating to better definition, goals and monitoring. In particular: – The agri-environmental schemes need to demonstrate the additional value over and above normal environmental compliance; – There is a need for a more direct connection between financial and environmental information for cost–benefit analysis; – Poorly designed schemes can lead to poor environmental performance that may take considerable time, and perhaps resources, to correct; and – There is an explicit need for cross-compliance, which is a requirement for EU-subsidised schemes regardless of the targeted sector. • The success of agri-environmental schemes is dependent on the scale and fit-for-purpose of actions. More general prescriptions are likely to be less effect than locally targeted ones. • The only water protection measure in the AEOS is the limiting of animal access to water courses, and provision of drinking troughs. The AEOS funding (DAFF, 2011) is also prioritised for Natura habitats and/or Non-Natura commonage. The AEOS scheme reflects, therefore, two important factors relevant to farming that may affect high status sites. First, there is a low priority for fiscal support for farms outside Natura 2000 sites, meaning that most high status sites are unlikely to benefit from the AEOS unless there is a generally low uptake of the scheme. Second, and more importantly, it reflects the failure of the cSAC management network to protect habitats because of insufficient direct investment into the management of these sites.

Table 4.3 *contd*

Act/Other plans/ Further areas of legislation	Key comments from the Literature Review
	• In the UK, site protection of SSSIs is supported through fiscal compensation related to estimated income loss that results from restrictions on maximum productivity. The prioritisation of Natura 2000 sites has, if it leads to a lower provision of agri-environment schemes outside the Natura 2000 network, the potential to increase pressure on high status sites outside the Natura 2000 network. • The objectives of Food Harvest 2020 include a 50% increase in dairy production. This can only increase the pressure on aquatic resources across the country, with likely further impact on high status sites. The failure to conduct an SEA prior to the adoption of this policy appears to be in breach of the SEA Directive (2001/41/EC), although the DAFM have made a commitment for each section of the policy to undergo SEA prior to adoption. That it is acceptable for an SEA to occur in parallel to policy implementation relies on the argument that plans not foreseen in prior legislation are formally outside the scope of the definition of 'plans and programmes'. This would appear not to be in keeping with the spirit of both the SEA Directive and the WFD. There is, nevertheless, the requirement for AA under Article 6.3 of the Habitats Directive 92/43/EEC (Habitats). Ireland has not yet transposed this requirement for plans (ECJ case C-418/04). • The need to provide for better links between EU agriculture and the objectives of the WFD is summarised by Dworak et al. (2005) in a report endorsed by the EU Water Directors. Key points that can be taken from that report with respect to the protection high status waters in Ireland are: – Measures under Pillar 2 of the CAP offer high potential to support implementation of the WFD, but require dialogue with the DAFM in order to set priorities; – A need to target areas for support, accepting that the expense to restore some areas is disproportionate to the cost. Preventing deterioration of high quality sites is almost certainly a more cost-effective strategy than large-scale restoration of grossly impacted sites. The WFD Article 5 provides important information with which to prioritise sites; and – Owing to high competition for accessing Rural Development budgets, a strong argument is needed if some of those funds are to be directed towards long-term protection of high status water bodies. • There is a range of existing mechanisms through CAP subsidies through less favoured areas grants, agri-environment schemes and through the LEADER programme (Rural Development Axis IV) that can provide a bottom–up approach to WFD implementation and promotion of specific targets (ÖIR-Managementdienste GmbH, 2004). • The reform of the CAP in 2013 provides a major opportunity to better link the objectives of farming and rural development with those of the WFD. There needs to be immediate engagement between the EPA and the DAFM in influencing these decisions and making a strong argument to align rural development and farming objectives to support the protection of sensitive environment, including high status sites identified under the WFD.
Forestry	• Commercial forestry has the potential to impact on water quality, especially when planted in upland areas, which are often prone to soil erosion and have a low capacity to buffer against acidification (Allott et al., 1997; Kelly-Quinn et al., 1997). • High quantities of sediment loads can arise from catchment disturbance associated with forestry (Robinson and Blyth, 1982; Everest et al., 1987; Scoles et al., 1996; Swank et al., 2001). Associated with forest clearance can also be high concentrations of solutes, as classically demonstrated in the Hubbard Brook Catchment in the 1960s (Likens et al., 1971). • In the Burrishoole Catchment (Co. Mayo), concentrations of mean total available dissolved phosphorus increased from about 6 µg/l during pre-clearfelling to 429 µg/l afterwards. It took 4 years for the phosphorus concentrations to return to pre-clearfelling levels, despite the adoption of good practice and use of up to 20-m buffer strips (Rodgers et al., 2010). However, the same study team found no long-term impact on the suspended solid concentrations (Rodgers et al., 2010), indicating the possibilities to mitigate sediment transport using good forestry guidelines. • Many Irish forests that are now mature, or approaching maturity, were planted in landscapes that were unsuited to economically viable forest production. The increasing recognition of the impacts from forestry on water resources has led to the development of a Code of Practice for forestry (Forest Service, 2000a,b; Purser Tarleton Russell Ltd, 2000). Generally, forest management is based on the Code of Practice, although a new Forestry Bill, which will replace the very out of date Forestry Act 1946, has been drafted with the opportunity to ensure that forestry management is better able to protect sensitive habitats.

Table 4.3 *contd*

Act/Other plans/ Further areas of legislation	Key comments from the Literature Review
	• The new and better awareness within the Forest Service is, nevertheless, constrained by insufficient detail of the thresholds for activities commensurate with good status under the WFD. Activity thresholds to prevent impact on high status water bodies are not developed, and may necessitate severe curtailment of current activities and prevention of new planting because of inherent difficulties operating commercial forestry in areas that may impact on high status waters (Eriksson et al., 2011). Many forests that are now mature but not conducive to commercial felling, nevertheless, have the potential to impact water resources even if left alone because of extensive windfall as the stand ages (Tom McDonald, Forest Service, Personal Communication, 2011). Harvesting of existing sites, where there is a risk to impact high status waters, therefore, requires particular care, and likely development of new techniques. • Research into the value of CCF in minimising impacts on water quality is encouraging (Reynolds, 2004). With plans to increase commercial forestry yields in Ireland over the coming years, there is a need to further develop and test alternative forestry techniques under a range of soil conditions. • For new forestry applications, it is important that the location of high status sites downstream of the proposed area are identified. This can be done through the FIPS, and its successor the GIS-supported iFORIS, designed to incorporate forest and site categories with environmental information, felling control and grants administration. While there is an extensive range of information contained in iFORIS, in general, there is a need for greater common use of GIS and information sharing across all sectors of Government and their agencies (DECLG, 2011). • Water-dependent habitats, such as bogs or headwaters, are unlikely to be delineated clearly on old 6" maps, and updated information from NPWS, EPA and RBMP data should be integrated into the iFORIS system. These layers are also needed by LAs so that effective decisions can be made on planning applications that may impact on high status sites. • Additionally, on-site survey prior to granting an application should identify sites with potential high quality aquatic communities, either through the EIA or grant aid process. Currently, management plans are mandatory for grant-aided plantations exceeding 10 ha and are only recommended for smaller plantations. Furthermore, a condition of grant aid is the replanting of felled forests. This is not necessarily in the best interests of aquatic sites that are vulnerable to pressures from forestry. There are recent examples of inappropriate replanting on SAC catchment sites likely to impact high status waters in the absence of the level of investigation required to fully satisfy Article 6 of the Habitats Directive. Obligatory replanting following felling is, however, likely to be repealed in the new Forestry Act. • With respect to rehabilitation of upper catchments, the Forest Service has no role in drainage management. A key area of difficulty with forestry and high status sites, particularly those that need restoration of function, is that the Forest Service grants afforestation/replanting and felling licenses without considering these associated activities. Most viable upland forestry needs draining and fertilisation with phosphorus. Hence, the consequences of licensing are not assessed by the Forest Service and these sites are unlikely to be commercially viable without associated drainage, fertilisation and access through forest roads. All of these pose risks if in the vicinity of high status sites. • The Native Woodland scheme provides grants to support conservation of both existing semi-natural woodland and the establishment of new areas of woodland on greenfield sites (DAFF, 2008, 2011). Element 2 of the scheme is targeted towards sites "*within areas regarded as being particularly sensitive from an environmental, landscape or amenity perspective, sites located immediately adjacent or close to existing designated native woodland sites that create physical connectivity between existing native woodlands and other important habitats*". This could be used to promote native woodland buffer zones to high status waters. • The forestry-environment payments under the CAP are compliant with EU Regulation (EC) No. 1698/2005, and can be used to support rural development, including wetlands (Dworak et al., 2009). Under the Irish Native Woodland scheme, riparian wet woodlands may not be eligible for grant aid owing to the criteria for "*vigorous growth and sustainable long term development*". This appears an anomaly, inconsistent with the Forest Service grant aid for water margins, and highlights again the notion that agricultural schemes that support natural habits must always be geared towards some measure of optional agriculture. Riparian wet woodlands have a potential role in attenuating sediment and nutrient transfer to water bodies which can also be beneficial for mitigating effects of flooding (Williams et al., 2012). • Further development of a Forestry Code of Practice and the Forest and Water Guidelines is required to more closely align them with the objectives of the WFD.

Table 4.3 ***contd***

Act/Other plans/ Further areas of legislation	Key comments from the Literature Review
	• Current AA levels need to be radically improved with regard to their acceptance under Article 6 of the Habitat's Directive, including the assessment of the level of rehabilitation needed to allow a catchment to function sustainably. It would be beneficial if this were extended to potential impacts to high status sites that lie outside the cSAC network, e.g. via independent EIA routes. • For existing catchments with forestry that may impact high status sites, tighter controls may be needed on clear-felling, independent EIAs, and strict controls of coup sizes harvested. • The possibilities for more positive impacts of forestry through restructuring of grants to promote environmentally sensitive forestry should be expanded on further as a potential protection measure within high status catchments. • There is a need for better liaison between the Forest Service, the EPA and LAs, and more comprehensive use of shared GIS to guide planning. • Consideration is needed to the banning of new plantations that may impact high status water bodies and, for maturing forests, harvesting limited sized coups, with strict adherence to best practice guidelines. • There are opportunities for enhancing protection of high status sites through promotion and fiscal support for riparian buffer strips, utilising existing mechanisms allowed through the CAP, and integrating new forest areas within the landscape with the goal to attenuate nutrient mobility.

LA, local authority; CDP, County Development Plan; EPA, Environmental Protection Agency; EIA, Environmental Impact Assessment; GIS, Geographical Information Systems; CAP, Common Agricultural Policy; WFD, Water Framework Directive; DAFM, Department of Agriculture, Food and the Marine; REPS, Rural Environment Protection Scheme; EU, European Union; OECD, Organisation for Economic Co-operation and Development; AEOS, Agri-Environment Options Scheme; SSSI, Special Site of Scientific Importance; CCF, continuous cover forestry; FIPS, Forest Inventory and Planning System; NPWS, National Parks and Wildlife Service; RBMP, River Basin Management Plan; AA, Appropriate Assessment; cSAC, candidate Special Area of Conservation; SEA; Strategic Environmental Assessment.

It must be acknowledged, however, that the Article 5 risk assessments were not required to be 'site specific', while the POMs studies undertaken do contain some site-specific information on certain pressures. Therefore, small-scale pressures, which can be extensive in nature, will not have been documented through this process. These small-scale pressures are essential to identify, particularly in high status catchments, due to the greater impact they can exert in these catchments relative to more polluted catchments.

While the EPA is currently conducting investigative monitoring within the catchments of formerly classified high status river sites (see Section 4.2 Tier 4 sites), there is currently no co-ordinated effort to conduct similar monitoring of existing high status sites, with the aim of identifying impacts or sources of potential impacts which could lead to the loss of the high status classification for that site, i.e. a preventative monitoring strategy. It is, therefore, proposed that for Tier 1, 2 and 3 catchments, LAs should conduct catchment walk-over risk assessments to identify and verify pressures within these sensitive catchments, over and above those pressures identified through the RBDs Article 5 and POMs studies processes. These assessments, coupled with data collated as part of Article 5 characterisation and during the POMs studies, together with aerial imagery (historic imagery, and potential catchment flights to ascertain current conditions), will provide a full picture of the types and scale of pressures within these catchments. Coupled with catchment walk-over risk assessments, investigative monitoring employing the Small Streams Risk Score (SSRS) may prove a valuable tool to verify stretches of streams at risk, or potentially other rapid assessment techniques deemed appropriate.

An example of the above strategy towards catchment walk-over risk assessment was employed as part of the development of the Freshwater Pearl Mussel Sub-Basin Management Plans in 2009 through the North South 2 (NS2) Project (see http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/ for details), and some high status catchments will have already been covered through this process, e.g. the Caragh

Catchment, Co. Kerry. A case study on the Caragh Catchment is presented in Chapter 5 which illustrates how catchment walk-over surveys contributed to the identification of widespread and various pressures in this catchment, and facilitated the development of an action programme for the catchment.

Annual reporting of such assessments should be made by the LAs to the EPA in order to establish a national perspective on the impacts, and to provide for the analysis of the complementary approaches being undertaken by the EPA at present, and proposed above for the LAs.

4.7 Planning/Licensing Control and Assessment of Cumulative Impacts

4.7.1 Planning control

It has been proposed in Section 4.2 that high status catchments and catchment prioritisation data sets should be integrated into each local and public authority mapping system, e.g. the Forest Services iFORIS system, LA Plan Reg systems, etc. The majority of local and public authorities use 'checklists', or prepare, e.g., pre-planning reports when a new application for a development or for licensing of certain activities is received. These checklists should incorporate the following checklist question:

> *Is the application for the development/activity in the catchment of a high status surface water body or high status river site?*

If the development or activity proposed is located within a high status catchment, the development or activity application should be referred to the Environment Department of that organisation for further review of requirements.

An Ecological Impact Assessment (EcIA) should be requested, or an Environmental Impact Assessment (EIA), if appropriate, which should be asked specifically to demonstrate whether the proposed development will/will not have a significant impact on the water quality of the high status catchment, or in combination with other activities within the catchment where the activity is proposed.

To date, the approach towards triggering an EcIA has been associated with proximity to a protected area such as an NHA, thresholds associated with EIA, or location within or adjacent to a Natura 2000 site in the case of an Appropriate Assessment (AA). There are a number of fundamental flaws with this approach in relation to affording protection to high status sites:

- **Proximity** to an NHA, a trigger for an EcIA, does not take into account a catchment-focused approach towards the protection of high status sites. A suggested trigger therefore could be for an EcIA to be requested if the development is located **within** a high status catchment;
- While an EIA must take account of water and flora and fauna, including regard to protected areas, there is no specific legislation that requires assessment of potential impact on high status sites, and thresholds that trigger EIA may not incorporate potential for impacts within high status catchments;
- Location within or adjacent to a Natura 2000 site, a trigger for an AA, is entirely focused on the **qualifying features** (habitats and/or species) for which the site(s) have been designated. The potential impacts to a high status site or within a high status catchment are therefore **not** the focus of such assessments. An AA therefore is **not** considered to address potential impacts within high status catchments, where high status sites and cSACs overlap, except where there is an explicit requirement for high status for a habitat or species, e.g. freshwater pearl mussel.

Existing triggers for EcIA and EIA should therefore be re-evaluated in conjunction with planning and licensing authorities to assess practical considerations in relation to triggering the requirement for such assessments in high status catchments. Cumulative impact assessment results will be critical to the planning or licensing authority's decision whether to grant or refuse an application.

As a starting point for discussions in relation to trigger points for EcIA or EIA, consideration of the application of an AA-style screening approach could be adopted for high status catchments, and to improve the assessment of cumulative impacts within these catchments.

Assessment of cumulative impacts within high status catchments is essential for the protection of high status water bodies and sites. The range of local and public authorities involved in planning control and licensing of activities makes the assessment of cumulative impacts on high status waters from a wide range of activities in combination with existing activities, an onerous one. Nevertheless, and notwithstanding the issues surrounding data availability between local and public authorities at present, authorities have become used to the requirement for AA in relation to Natura 2000 sites over the last number of years. To date, the best example of cumulative impact assessment has come through the Habitats Directive and the requirement for AA under Articles 6.3 and 6.4.

The Department of the Environment, Heritage and Local Government guidelines (DEHLG, 2009) outline the EC's methodological guidance (EC, 2002), promoting a four-stage process to complete the AA, and outline the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

A similar assessment mechanism, which would have the protection of high status waters at its core, would facilitate better assessment of cumulative impacts within high status catchments, and better effect the protection of high status sites. Stage 1 screening, for example, could be conducted in-house within the local or public authority, or requested from the applicant, when it is identified that a proposed activity (e.g. a discharge licence review, a domestic dwelling planning application, a forest felling licence, or a nitrates derogation application) is located within a high status water body/site catchment. Following the outcome of the screening, it could then be elucidated as to whether an EcIA or EIA would be required.

Application of an AA-type screening exercise adapted for the protection of high status catchments is presented in Table 4.4 as a proposed mechanism to effect better the assessment of impacts on high status catchments.

Coupled with the above management strategies, and necessary to its success, will be amendments/ additions to existing local and public authority guidance documents that are referenced to guide protection of the water environment. Therefore, each local and public authority should review existing environmental assessment guidelines that they have in place to account for the protection of high status waters, and to 'WFD-proof' such guidelines.

Examples of guidelines that will require revision include:

- Forestry and Water Guidelines – Forest Service; and
- Environmental Assessment and Construction Guidelines – National Roads Authority.

Guidance documents that do not require updating, for example, include:

- Guidance, Procedures and Training on the Licensing of Discharges to Surface Waters and to Sewer for Local Authorities – as these are based on requirements established in the Surface Water Regulations 2009, which include high status objectives

4.7.2 Forward planning

Each LA should include within its CDP a policy and objectives on the protection of high status waters, e.g.:

- **Policy 1A:** To protect high status water bodies and their catchments within the county, and to prevent deterioration of water quality in high status catchments.
- **Policy 1B:** Projects with potential to give rise to significant adverse direct, indirect or secondary impacts on high status sites as a result of their size or scale, land take, proximity, resource requirements, emissions, transportation requirements, duration of construction, operation, decommissioning or from any other effects shall not be permitted on the basis of this Plan (either individually or in combination with other plans or projects).

Accompanied by this objective, each CDP should include objectives specific to its county's circumstances, e.g. a county with many high status

Table 4.4. Appropriate Assessment (AA) screening process and the potential of this approach if adopted for assessment of activities proposed within high status catchments.

Stage	AA process under Article 6, Habitats Directive	Adaptation for high status catchments
Stage 1	**Screening for AA** Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6.3: 1 Whether a plan or project is directly connected to or necessary for the management of the site; and 2 Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives. If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.	**Screening for high status catchments assessment** Steps within the screening stage can be modified from the AA process for high status catchments by addressing the following questions: 1 Whether a plan or project is directly connected to or necessary for the protection of a high status catchment; and 2 Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a high status catchment in view of its environmental objectives under the WFD. If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (EcIA or EIA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.
Stage 2	This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit a **Natura Impact Statement**, i.e. the report of a targeted professional scientific examination of the plan or project and the relevant Natura 2000 sites, to identify and characterise any possible implications for the site in view of the site's conservation objectives, taking account of in-combination effects. This should provide information to enable the competent authority to carry out the AA. If the assessment is negative, i.e. adverse effects on the integrity of a site cannot be excluded, then the process must proceed to Stage 3, or the plan or project should be abandoned. The AA is carried out by the Competent Authority, and is supported by the Natura Impact Assessment.	Request for an **EcIA** or an **EIA** as appropriate. This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the water quality of a high status catchment, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit an **EcIA** or **EIA**, i.e. the report of a targeted professional scientific examination of the plan or project and the relevant high status catchment, to identify and characterise any possible implications for the site in view of the site's WFD high status objective, taking account of in-combination effects. This should provide information to enable the competent authority to carry out the assessment. If the assessment is negative, i.e. adverse effects on the high status of a catchment cannot be excluded, then the process must consider alternatives, or the plan or project should be abandoned. The Assessment is carried out by the **Competent Authority**[1], and is supported by the EcIA or EIA.

[1]The Competent Authority in this case could be the planning or licensing authority, or potentially the Environmental Protection Agency.
WFD, Water Framework Directive; EcIA, Ecological Impact Assessment; EIA, Environmental Impact Assessment.

water bodies will have different objectives to a county with a small number of such water bodies.

Other plans such as Regional Plans, and Local Area Plans (LAPs), should also incorporate policies and objectives for the protection of high status catchments.

The inclusion of such policies and objectives however will require an effective back-up strategy, such as those suggested under Section 4.7.1, in order for such policies and objectives to be realised.

4.8 Centralised GIS Database – or Activities Database

In order to assess the success or otherwise of maintaining and/or restoring high status water bodies, a register of activities within high status catchments should be maintained. This database should include developments, authorisations, and activities identified through proposed catchment walk-over risk assessments or investigative monitoring in Section 4.6. This register or database should operate in real time, to include proposed activities (not just granted developments or licences), and all local and public authorities should be afforded access.

Various options exist for the hosting of such a system, many of which have been discussed heretofore, including:

- The EPA ENVision mapping system provides one potential location for such a centralised GIS database from which to view activities with the potential to impact on high status catchments. Ideally, this system should be linked with systems operated by all local and public authority systems, and responsibility for the updating and uploading of individual data sets should be assigned to the data set owners, e.g. proposed afforestation applications database to be updated in real time by the Forest Service, or proposals or granted derogations under the Nitrates Regulations to be updated in real time by the DAFM.

- The http://www.wfdireland.ie WaterMaps system also provides another potential location for a centralised GIS database to which local and public authorities could upload data sets on a real-time basis to better effect screening of proposed developments or licensing proposals.

In addition to the development of an activities database, a drainage database would complement and assist in the assessment of water body sensitivity towards impacts.

The number of drains entering a water body is a useful proxy for the level of intensification of that water body catchment, as areas of the highest intensification have the highest density and the most frequent management of drains (based on walk-over survey data, NS2 Project). A register of drains, from the formal LA drainage system to local agriculture and forestry drains, would be of benefit in the assessment of water body assimilation and carrying capacity. As drain mapping will be held by various organisations, and will require updating on a regular basis, a centralised mechanism for maintaining such a register is recommended. It is considered that the EPA, which currently manages the dissemination of water body GIS data sets (e.g. river segments, river, lake, transitional and coastal water bodies), should be responsible for this database, with various agencies filtering their individual drains registers through to the EPA for collation. This database should be updated annually, and should be made available widely via the EPA website.

For those drains that are currently unmapped, e.g. agricultural land drains, these drains will require survey and mapping. The mechanism by which this can be achieved is for consideration by each relevant local and public authority. The database could be built up if there is a requirement for applicants for planning permission or, e.g. afforestation, to provide a drainage map within their applications. The NPWS has considerable drain documentation from widespread NHA and cSAC site surveys. Mapping of drains could also form part of walk-over surveys (see Section 4.6). There may be a requirement for short contracts to place information from various paper sources onto a GIS format.

4.9 Integrated Monitoring and Protection

Consistency across water body classification, especially where water bodies are physically connected, is important for the development of strategies for integrated monitoring and protection.[11]

Analysis presented in the Literature Review suggests a mismatch between the current river nutrient standards and the protection of high status lakes, suggesting that river concentrations at the respective upper boundaries of high and good status are commensurate with a degradation of lake water quality as estimated by the OECD (1982).

A simple modelling exercise was undertaken as part of the Literature Review to illustrate that the process used for establishing the concentrations of phosphorus in rivers appears not to have considered the impact this may have on downstream lakes. However, this likelihood is also accepted by the EPA (Martin McGarrigle, EPA, Personal Communication, 2011), such that lakes receiving water from rivers may need stricter standards than are in the current Surface Water Regulations (S.I. No. 272 of 2009). Loadings from generally low-impacted catchments, such as to the west of Lough Mask in Co. Mayo can have phosphorus loads approximating 0.1 kg/ha/year (Donnelly, 2001). There is, therefore, a strong need to reassess the rationale for phosphorus management entering high quality lakes. A similar mismatch may apply to nutrient loads to transitional waters.

It has been well established that average point sampling in rivers, as done by the EPA and LAs, is not an effective method to estimate total diffuse loads to a river because high concentrations in rivers are strongly skewed with high rainfall events (Lennox et al., 1997; Morgan et al., 2000). There is a strong need to move from monitoring a limited number of individual samples for nutrients over an annual cycle in rivers to measurements at high temporal resolution, or use of validated models, to enable estimates of phosphorus loads. This is used in many US nutrient management programmes, adopting protocols for estimating Total Maximum Daily Loads (TMDLs) as required under Section 303d of the US Clean Water Act 1972 (USEPA, 2008). TMDLs are required for all waters that do not meet water quality standards, and as a management tool to maintain quality standards. The principle of TMDLs is that they represent an assimilative capacity (Havens and Schelske, 2001) of the receiving waters with respect to the specific pollutants and which is compatible with designated use for, e.g., drinking water, fishing and recreation. TMDLs are site specific and must include the total of all point and diffuse loads, incorporate a margin of error, and account for seasonal and spatial variability of load and impact. A TMDL implementation plan is analogous to the WFD POMs, and frequently uses modelling to determine effectiveness of control measures (Ambose et al., 1996; Irvine et al., 2005). Articles 7 and 9 of S.I. No. 272 of 2009 require the review of discharge licenses to support the environmental objectives. A TMDL approach would be useful for determining chemical standards for high status (and other) sites in Ireland, but requires sufficient data, or robust models, on point and diffuse loads. The TMDL approach would also ground-truth the hypothesis that there is no assimilative capacity in high status catchments.

4.9.1 Management strategies proposed

- Development of Environmental Quality Standards for the loading of nutrients from rivers to high status lakes and transitional waters aimed at continued protection of their high status.
- Monitoring of nutrient inputs to high status lakes and estuaries should move to high temporal resolution to enable more accurate estimates of phosphorus loads in high status catchments, e.g. TMDL protocol. Adequate flow measurements are also required for this purpose. Initially, this approach could be trialled in selected catchments to investigate the approach and evaluate the findings, which in turn can inform policy implementation.

4.10 Unregulated Activities

The case studies presented in Chapter 5 highlight numerous instances where unregulated activities have occurred which have led to damaging impacts to high status catchments. Such activities can be identified through catchment walk-over risk assessments via an

11. Irvine and Ní Chuanigh (2011:16–18).

investigative monitoring approach as proposed in Section 4.6; however, following their identification, a policy towards control of such activities will be required. The proposed sub-group on High Status Protection should debate the development of a policy on unregulated activities as a proposed management strategy to protect high status catchments. The approach could mimic or extract from the Activities Requiring Consent (ARC) approach adopted by the NPWS for Natura 2000 sites, where consent is required to undertake certain activities within the Natura 2000 network. For high status sites, this would be predicated upon the establishment of a high status spatial network as proposed in Section 4.3. It is essential to find a means of regulating these activities in water bodies to be maintained at high status. Table 4.5 outlines activities of concern, as extracted from the ARC process.

4.10.1 Management strategy proposed

- Development of a policy for unregulated activities within high status catchments.

4.11 Public Awareness

The European Landscape Convention places a large focus on how the public perceives and evaluates landscapes. This is likely a key factor in securing stakeholder participation in protecting high status water bodies. The designation of 'high status' waters according to purely scientific criteria under the WFD may not inspire a cultural affinity or understanding towards the protection of these waters. A broader approach to the protection of whole landscapes may, however, invoke a high degree of community support. A proposal to introduce a Landscape Ireland Act is intended to introduce new participative approaches for communities for the management of landscapes (Heritage Council, 2010). This could facilitate protection of entire landscapes, including wetlands and small water bodies which are not currently classified under the WFD.[12]

A number of suggestions were put forward by LAs during consultations undertaken as part of this desk study such as:

- The public should be made aware that they is living within a high status catchment, why these catchments are important, and what type of activities could cause an impact;
- Schools should include more information on water protection by way of awareness programmes, e.g. via LA awareness officers, Green Schools and the Green Flag programme;
- In the waste/litter areas, there has been an assortment of national campaigns and other initiatives and funding made available to LAs for awareness, etc. There have been no equivalent national or local campaigns in relation to water quality protection in general;
- Initiatives, such as the Water Environment Community Awards[13] run by the Northern Ireland Environment Agency, or the approach taken by Mayo County Council's Cleaner Community Awards[14], could be adopted to increase public awareness of the location and importance of high status catchment, and to instil pride in maintaining the status of these catchments;
- Catchment information leaflets disseminated to the public, e.g. *Householder Awareness – Improving Water Quality in your local area*[15] *or Landowner Awareness – Improving water quality in your local area*[16], could be adapted specifically for high status catchment issues (once ascertained via investigative monitoring); and
- Stakeholder meetings within high status catchments are effective mechanisms to increase public awareness in relation to water quality issues.

4.11.1 Management strategy proposed

- Design and implement a public awareness campaign fostering initiatives at the local level.

12. Irvine and Ní Chuanigh (2011:11).
13. http://www.northernireland.gov.uk/index/media-centre/news-departments/news-doe/news-archives-doe-nov-2011/news-doe-161111-water-environment-community.htm
14. http://www.mayococo.ie/en/Services/Environment/EducationAwareness/Competitions/CleanerCommunityAwards/
15. http://www.doeni.gov.uk/niea/householder_awareness.pdf
16. http://www.doeni.gov.uk/niea/print/landowner_awareness.pdf

Table 4.5. Currently unregulated activities for which control measures are required.

No.	Activity
1	Reclamation of land, including infilling
2	Use of excavators, rock breakers, bulldozers, back hoes or use of any other hydraulically powered excavation equipment
3	Blasting, drilling, dredging or otherwise removing or disturbing rock, minerals, mud, sand, gravel or other sediment
4	Draining activities relating to turf cutting and/or peat extraction
5	Cutting, uprooting or otherwise removing non-agricultural plants
6	Introduction of plants or animals not found in the area
7	Construction or alteration of tracks, paths, roads, bridges, culverts or access routes
8	Construction, removal or alteration of fences, stone walls, hedgerows, banks or any field boundary other than temporary electric fencing
9	Digging, ploughing, harrowing or otherwise disturbing soil or substrate not previously disturbed
10	Applying inorganic or organic fertiliser, including slurry and farmyard manure, close to sensitive water bodies
11	Applying lime close to sensitive water bodies
12	Storage, burial, disposal or recovery of any materials
13	Burning, topping, clearing scrub or rough vegetation or reseeding of land not previously intensified
14	Removing scrub by any means
15	Agricultural improvement of heath or bog
16	Application of pesticides, including herbicides, within sensitive areas
17	Supplementary feeding of livestock within 30 m of river
18	Significant changes in livestock density (including introduction of grazing), changes in livestock type or grazing season, other than on established reseeded grassland
19	Grazing of livestock between 1 April and 31 October on traditional winterages
20	Changing of agricultural use from hay meadow to any other use
21	Works on, or alterations to, the banks, bed or flow of a drain, watercourse or water body
22	Drainage works including digging, deepening, widening or blocking a drain, watercourse or water body
23	Entry of livestock or machinery into water bodies
24	Water abstraction, sinking of boreholes and wells
25	Felling of trees or removing timber, including dead wood
26	Planting of trees or multi-annual bioenergy crops
27	Developing or allowing the development or operation of recreational/visitor facilities or activities at a commercial scale
28	Off-road recreational use of mechanically propelled vehicles
29	Using or permitting the use of land for car parking
30	Alteration, renovation or removal of buildings, ruins or other structures

4.12 Summary

The administrative procedures for River Basin Management under the European Communities (Water Policy) Regulations (S.I. No. 722 of 2003, and subsequent amendments) rely heavily on an LA lead in implementation of the WFD, but this is hindered through lack of resources and, probably more so, by a widespread fragmentation of water governance.[17]

It is now generally accepted that the administrative arrangements for the WFD in Ireland have not been sufficiently effective for water governance in Ireland which, in common with environmental protection policies in general, are fragmented and in need of a major overhaul (DECLG, 2011). In Schedule 1 of the Surface Water Regulations, S.I. No. 272 of 2009, 23 relevant public bodies are listed. That fragmentation, the working of the River Basin Advisory Councils, and the redirection of focus from specialised River Basin Management project teams to the LAs, which may lack resources and expertise in the area, provide underlying difficulties for the implementation of the WFD, not least those illustrated in Section 4.8, i.e. the lack of a centralised GIS database for damaging activities. The protection of high status sites is one important facet of this, and the continued loss of such sites is evidence of an overall national approach towards water quality protection which has not been effective to date. Furthermore, the Advisory Councils, dissolved for local elections in 2009, have not been reconstituted, in contravention of S.I. No. 413 of 2005 amended Article 16 of S.I. No. 722 of 2003.

Under current governance structures, LAs have a major role in water quality protection. In order to prevent further decline in high status water quality and to restore former high status sites, protocols within LAs need to be agreed and followed. This should start with providing enough information within the data systems of each authority that highlights sensitive catchments, that decisions are taken based on the most up-to-date scientific knowledge, and that where strategies need to be developed in order to better inform LAs (such as GIS layers of high status catchments), they should be done without delay. Finally, where there is no current legislative power to prevent activities that are causing damage, legislation should be introduced as soon as possible.

The document *Better Local Government*[18] (early 1990s) highlighted the lack of expertise in LAs for complex environmental work. While the EPA was set up, LA responsibility for legislation and environmental protection still increased without the weaknesses being addressed within the LA sector. The Literature Review undertaken as part of this desk study has highlighted the over-reliance on LA-led implementation of the WFD, which, to date, has presented issues due to lack of resources, and their inability to co-ordinate the large number of authorities with responsibility for the delivery of the Directive. The Literature Review supports a radical overhaul of water governance in Ireland towards a more regional-style approach, as first envisaged through the RBDs, coupled with a centralised approach towards spatial data management.

Comments from consultations with local and public authorities included:

- The need for more consultations between departments within LAs was identified. A cross-departmental WFD team that would regularly meet to discuss issues was suggested;
- Directors of Service positions change regularly within LAs. Each time a new person is given the role of Director of Service for Environment, that Director has to be brought up to speed with a very complex area of environmental work. Critically, that person may not have any familiarity whatsoever with environmental issues, environmental legislation or high status catchment protection requirements;
- The rate of change or introduction of new legislative instruments, e.g. AA, amendments to the Planning and Development Act, Birds and Natural Habitats Regulations, changes to EIA Regulations, etc., creates a difficult environment within which to operate and maintain knowledge requirements; and

17. Irvine and Ní Chuanigh (2011).

18. http://www.environ.ie/en/Publications/LocalGovernment/Administration/

- Legislation and guidance documentation are required; however, resources are not being secured to ensure effective transition to implementation and enforcement.

While it is not the objective of this desk study nor within the remit of the project to discuss the national issue of water governance, as this has been undertaken elsewhere[19], the above findings from the Literature Review, and comments elucidated from consultations with LAs should be brought to a forum where such issues can be discussed and strategies to deal with them developed.

Key management strategies for the protection of high status sites have been presented in the sections above, and summarised in Table 4.1. The order in which the management strategies are presented does not imply prioritisation, unless otherwise stated, and all are considered to have merit in the cause of stemming the decline of our high status waters. Management strategies include the establishment of a 'blue dot' management or enforcement system by the EPA for high status sites, with annual reporting in relation to these sites required from LAs. The importance of the integration of high status sites/water bodies and delineated high status catchments in GIS format into local and public authority mapping systems is crucial to ensure that warning or referral systems are put in place, adequate assessment of potential impacts from proposed developments can be undertaken, and, critically, screening assessments of cumulative impacts within these catchments can be undertaken. This, however, only deals with regulated activities; therefore a policy on unregulated activities is required as an approach towards controlling damaging activities within high status catchments. Prioritisation of actions is addressed via a proposed five-tiered approach towards catchment protection, which requires validation by the EPA. Policy considerations include the establishment of a national spatial network of high status catchments, consideration of designation of high status sites as protected areas, and the development of a restoration policy for former high status sites. A detailed review of existing legislation conducted as part of the Literature Review phase of the desk study has elucidated gaps in legislation that are considered to have contributed to the decline in high status sites observed in recent years, coupled with a fragmented water governance approach as discussed above. Proposals to address legislative gaps are presented in Table 4.2. Investigative monitoring incorporating catchment walk-over risk assessments, SSRS or other monitoring mechanisms are proposed to assess suspected widespread low-intensity activities that cumulatively are leading to a decline in the numbers of high status river sites.

In summary, the protection of high status sites needs co-ordination at national level and RBD level by all local and public authorities acting jointly together; however, actions will be required at the local level and specific to the high status catchment in question. The NTCG could provide the impetus for the introduction of management strategies, and a High Status Protection Working Group is recommended in order to debate and develop proposed management strategies towards an implementation or action plan. A detailed, real-time database of activities, both active and proposed, within high status catchments is crucial to provide information to inform all screening for potential impacts by local and public authorities and to trigger impact assessments, which may be required of applicants. Policies and objectives within CDPs will provide a focus for protection and restoration of these sensitive catchments.

The case studies presented in Chapter 5 illustrate the widespread and low-intensity impacts that are leading to high status site loss. They are presented to illustrate how the management strategies proposed in this chapter may have prevented such losses from occurring.

19. http://www.environ.ie/en/Publications/Environment/Miscellaneous/FileDownLoad,26491,en.pdf

5 Case Studies

5.1 Introduction

The aim of this chapter is to provide two examples of rivers that traditionally had high status and where some water bodies within the rivers remain in high status and to look at some of the catchment activities that may be contributing to the decline in water quality in these rivers.

The first example, the Caragh River (Co. Kerry) and its tributaries are highly protected within a cSAC that encompasses the river and its surrounding catchment. The second river, the Oily River (Co. Donegal) has no protective designation.

Both of these rivers have living populations of the freshwater pearl mussel (*Margaritifera margaritifera*), and both populations, like most of the populations in Ireland, are in an unfavourable condition. Healthy mussel populations require high status conditions in rivers, so the declining populations in both rivers demonstrate that the water and river bed quality of the rivers have declined over the years since they last had healthy, sustainable, reproducing mussels.

The case studies outline the history of macroinvertebrate assessment (Q-values), and the catchment uses that may be contributing in a cumulative manner to their recent declines.

5.2 Case Study 1 – The Caragh Catchment, Co. Kerry

5.2.1 Caragh River and tributaries, overview

The Caragh Catchment is located in the south-west of Ireland in Co. Kerry. It is completely within the Killarney National Park, Macgillycuddy's Reeks and the Caragh River Catchment cSAC. The Caragh River drains the southern slopes of Macgillicuddy's Reeks and half a dozen small loughs before it enters Lough Caragh. On leaving Lough Caragh, it flows approximately 3.2 km (2 miles) to the tide at Rossbehy Creek on Dingle Bay. The catchment is approximately 127 km². Figure 5.1 provides an overview of the catchment indicating the area covered by the Killarney National Park, Macgillycuddy's Reeks and the Caragh River Catchment cSAC.

5.2.2 High status segments – overview of current and historical distribution

In 2009, an extensive macroinvertebrate survey of the catchment was undertaken by Conservation Services Ltd as part of the development of freshwater pearl mussel sub-basin plans via the NS2 Project. A large number of sites (39) were surveyed in order to assess where in the catchment problems may be occurring that may be reducing the status of the river habitat quality. The sites surveyed and the results are presented in Table 5.1, with comparative historical EPA data where available.

None of the sites surveyed by Conservation Services Ltd in 2009 were found to be at Q5 status, including Blackstones Bridge which was at Q5 during the seven surveys carried out by the EPA from 1990 to 2007. In total, two of the 39 sites could be classified as high status Q4–5, and none at Q5. There are very few sites with historical data, but those sites that have data either deteriorated in recent years or had begun to deteriorate before 1990.

The most upstream site sampled on the main channel of the Caragh River (Site C) merited a Q-rating of Q3–4, indicating significant pollution. Site D, which is c. 2 km downstream of Site C, merited a rating of Q4, indicating an improvement in water quality, but below high status. A rating of Q4 was also recorded at the lowest main channel site sampled at Blackstones Bridge (Site F). The main channel site D has deteriorated by half a Q-rating point since monitored by the EPA in 2007, and the main channel site F has deteriorated a full Q-rating point since monitored by the EPA in 2007, when a pristine or close to pristine Q5 was recorded. The results of the Conservation Services Ltd survey therefore indicate a significant deterioration in the condition of the Caragh River since 2007.

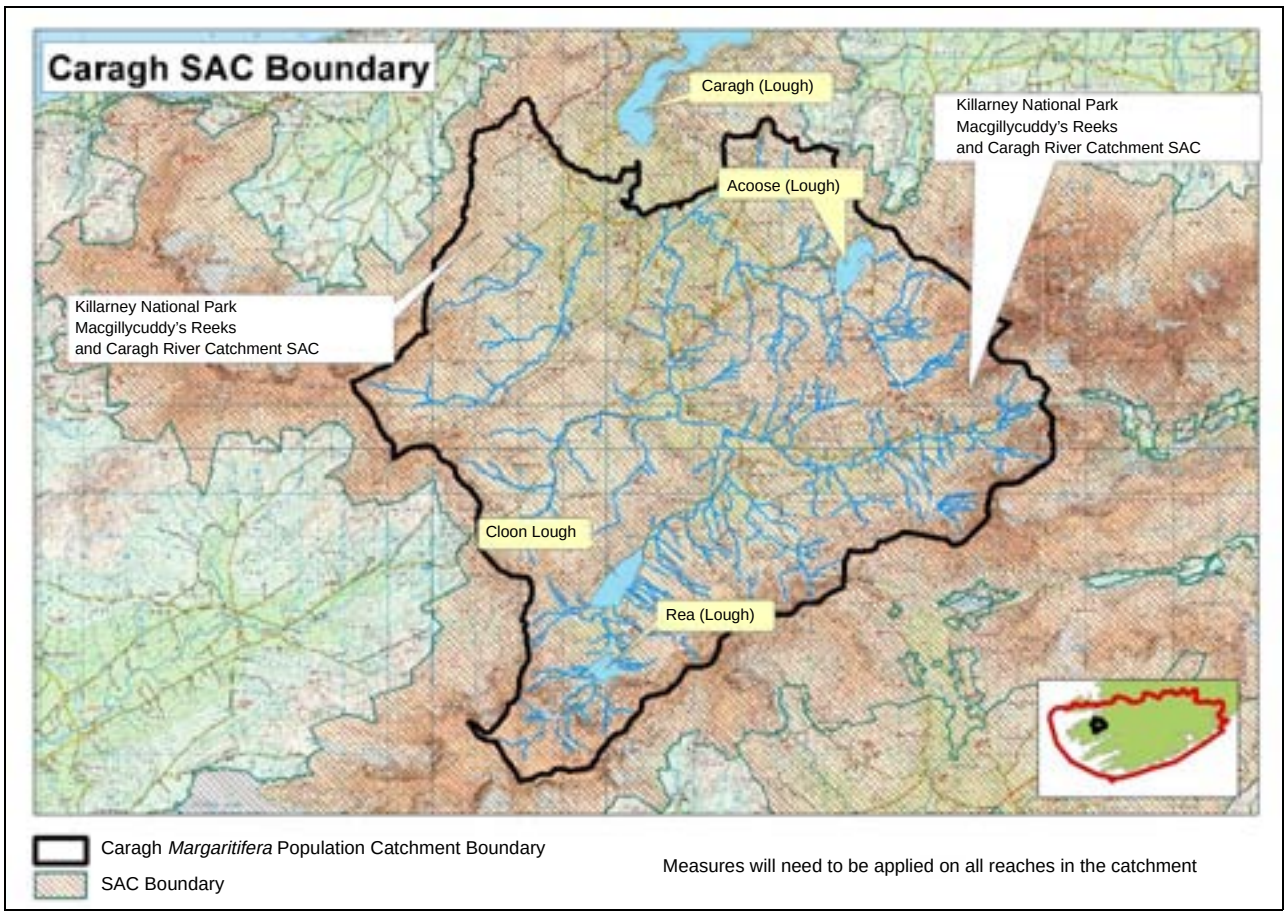


Figure 5.1. Overview of the Caragh Catchment indicating the extent covered by candidate Special Area of Conservation (cSAC) (from draft Caragh freshwater pearl mussel sub-basin catchment plan).

Of the 36 sites assessed on the tributaries of the Caragh River, two merited a rating of Q4–5, four merited a rating of Q4, 13 merited a rating of Q3–4 and 17 merited a rating of Q3. It is therefore concluded that the condition of the tributaries to the Caragh River is predominantly unsatisfactory.

5.2.3 Reasons for the decline

The draft sub-basin management plans for the freshwater pearl mussel assessed the pressures occurring within the catchment that have led to a loss of high status and a decline in the freshwater pearl mussel population. Examples below are from the draft plan.

Based on the Corine land-cover data (2006), which are obtained from aerial imagery http://www.eea.europa.eu/publications/COR0-landcover, the most common Corine land-use type within the Caragh catchment is peat bogs (59.68%). Natural grassland areas make up a further 9.99%.

The main causes of the decline in water and river bed quality are described below.

5.2.3.1 Commonage overgrazing

The impacts on the aquatic environment, caused by overgrazing of lands are increased flashiness and sediment load to rivers, which in turn cause:

- Loss of riparian zone due to overgrazing;
- Excessive bank erosion;
- Sediment deposition in watercourses; and
- Over-widening of channel/braided channels.

Overgrazing is a pressure that has been identified in the Caragh Catchment through the Commonage Framework Plans. These have led to de-stocking

Table 5.1. Q-values (2009 are from draft the Caragh freshwater pearl mussel sub-basin management plan, with EPA data from the Caragh Catchment where available).

EPA site code	CS	Grid reference	EPA data							CS data	EPA data
	site no.		1990	1994	1996	1998	2001	2004	2007	2009	2011
–	A	07091 07890	–	–	–	–	–	–	–	3–4	
22/O04/0200	B	07285 08095	4–5	4	4	4–5	4–5	4–5	4	3–4	4
–	C	07398 08101	–	–	–	–	–	–	–	3–4(t)	
22/C02/0400	D	07215 08159	5	5	4–5	4–5	4–5	4–5	4–5	4	4
–	E	07512 08511	–	–	–	–	–	–	–	3–4	
22/C02/0600	F	07102 08637	5	5	5	5	5	5	5	4	5
–	G	06923 08504	–	–	–	–	–	–	–	4(t)	
22/M02/0100	H	07007 08628	4–5	4–5	4–5	4–5	4–5	4	4–5	4	4
–	1	07113 07899	–	–	–	–	–	–	–	3–4	
–	2	07131 07927	–	–	–	–	–	–	–	3–4	
–	3	07192 07957	–	–	–	–	–	–	–	4–5	
–	4	07246 07991	–	–	–	–	–	–	–	3–4	
–	5	07432 07872	–	–	–	–	–	–	–	4–5	
–	6	07411 07877	–	–	–	–	–	–	–	3–4	
–	7	07348 07914	–	–	–	–	–	–	–	3–4	
–	8	07337 07982	–	–	–	–	–	–	–	3	
–	9	07284 08023	–	–	–	–	–	–	–	3/*	
–	10	07252 08081	–	–	–	–	–	–	–	3	
–	11	07368 08121	–	–	–	–	–	–	–	3	
–	12	07354 08117	–	–	–	–	–	–	–	3	
–	13	07314 08142	–	–	–	–	–	–	–	3	
–	14	07179 08179	–	–	–	–	–	–	–	3	
–	15	07180 08233	–	–	–	–	–	–	–	3–4	
–	16	07149 08236	–	–	–	–	–	–	–	4	
–	17	07126 08296	–	–	–	–	–	–	–	3–4	
–	18	07171 08275	–	–	–	–	–	–	–	3	
–	19	07163 08307	–	–	–	–	–	–	–	3	
–	20	97107 08362	–	–	–	–	–	–	–	3	
–	21	07161 08390	–	–	–	–	–	–	–	3	
–	22	07164 08427	–	–	–	–	–	–	–	3–4(t)	
–	23	07144 08544	–	–	–	–	–	–	–	3	
–	24	07127 08574	–	–	–	–	–	–	–	3–4	
–	25	07443 03535	–	–	–	–	–	–	–	3–4	
–	26	07360 08487	–	–	–	–	–	–	–	4	
–	27	07298 08525	–	–	–	–	–	–	–	3	
–	28	07267 08638	–	–	–	–	–	–	–	3	
–	29	07202 08652	–	–	–	–	–	–	–	3	
–	30	06923 08515	–	–	–	–	–	–	–	3	
–	31	06968 08612	–	–	–	–	–	–	–	3(t)	

CS, Conservation Services Ltd; EPA, Environmental Protection Agency.

Notes:

(t) = Tentative Q-rating due to sub optimal Q-rating conditions.

/*Suffix applied when there is evidence of an impact on the invertebrate fauna from heavy siltation.

EPA data from http:// www.epa.ie/qvalue/webusers/.

proposals implemented by the DAFF (now DAFM). Further de-stocking has taken place in certain areas of the country through NPWS farm plans and modifications to the Rural Environment Protection Scheme (REPS). Figure 5.2 illustrates the spatial extent of commonage areas and indicates the level of damage as recorded in 1999.

This survey indicated that:

- 4,027 ha of the Caragh Catchment area are commonage land. This is 32% of the overall catchment area;
- 161 ha of the commonage land are severely damaged or worse;
- A further 195 ha of the commonage land are moderately to severely damaged; and
- 9% of all commonage land within the catchment is damaged.

5.2.3.2 Agriculture

Agricultural practices that contribute to increases in nutrient or silt to the river can damage the function of sensitive high status rivers. Any practice that leads to exposure of bare ground can increase the fine sediment and nutrient load to the river. The cumulative effects of such practices can have very severe impacts on the river, particularly when they occur in the upper catchment areas, which until very recently have had near natural land use, with little drainage, thus acting as buffers during high rainfall periods, absorbing and percolating water and releasing it to the river in an even manner, and a low nutrient state.

The Caragh Catchment is dominated primarily by peat soils and peaty gleys/peaty podzols with some pockets of gley soils and brown earths/podzolics (Fig. 5.3).

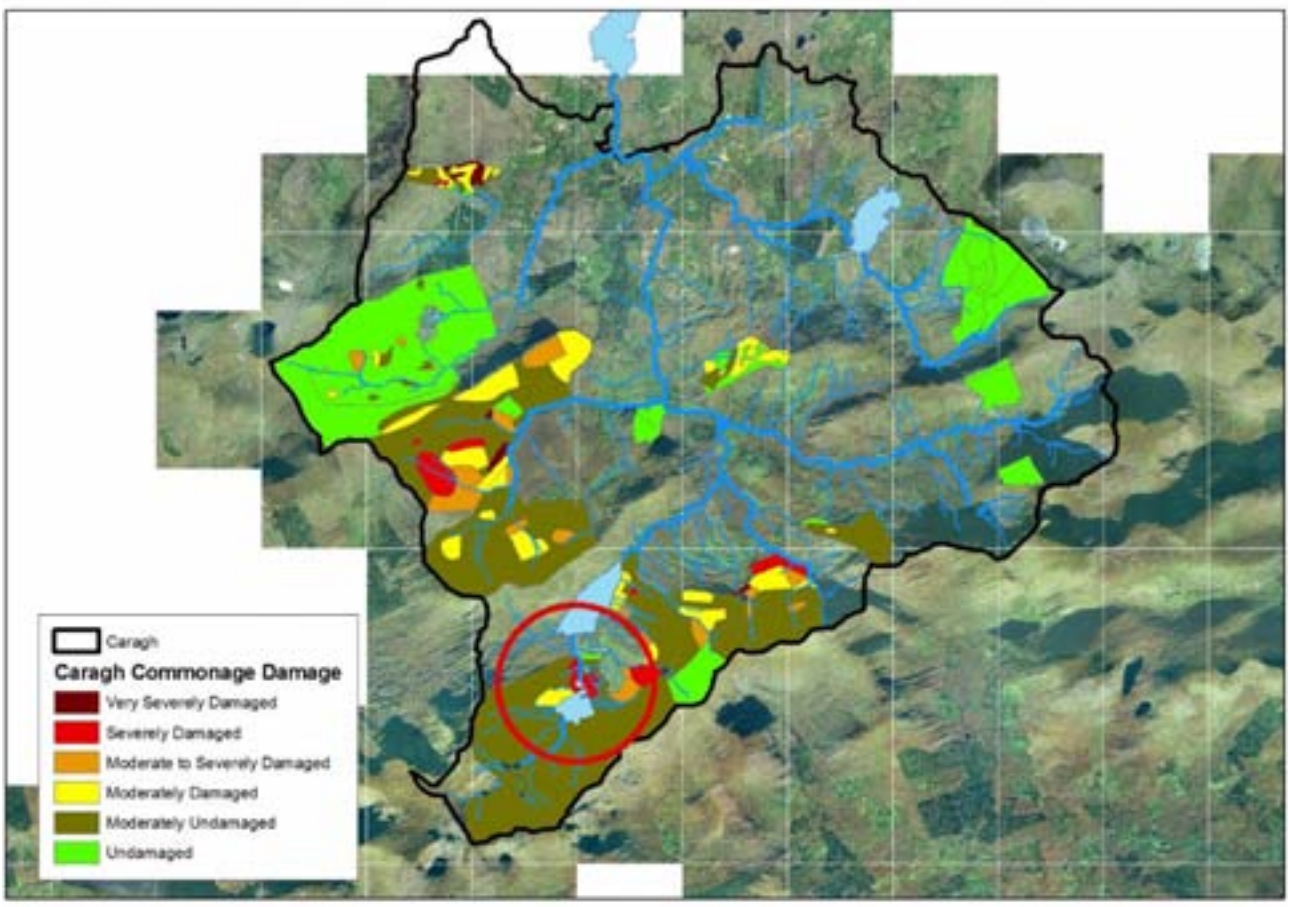


Figure 5.2. Areas of commonage and associated damage (from draft Caragh freshwater pearl mussel sub-basin management plan).

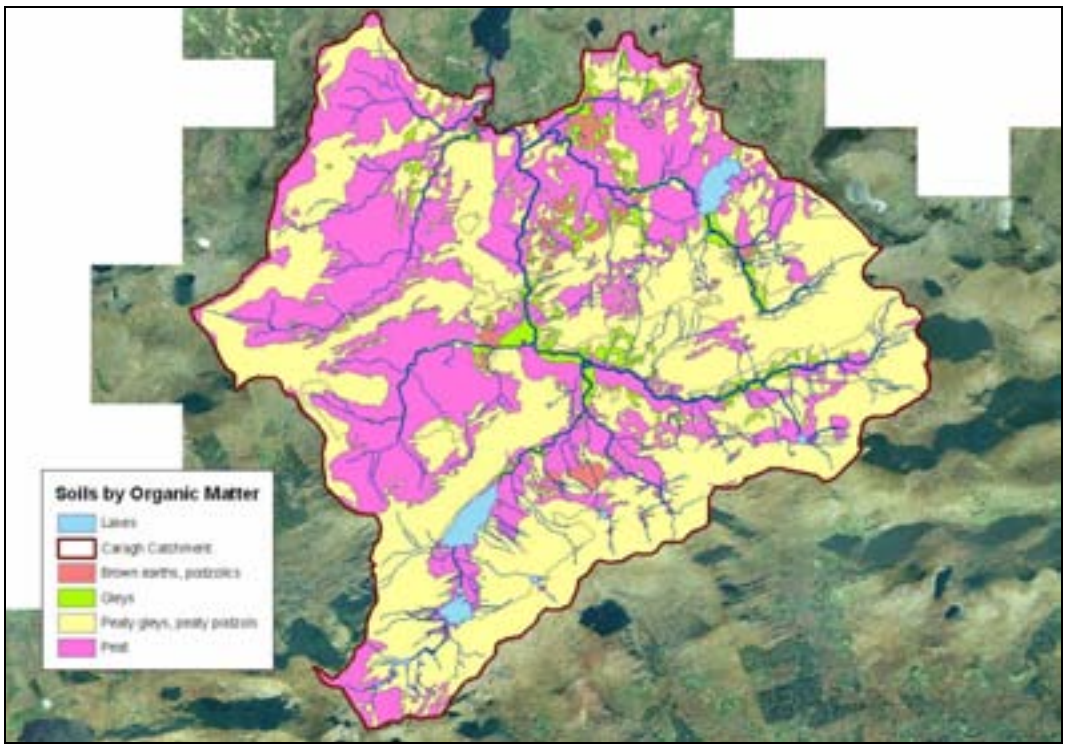


Figure 5.3. Caragh soil organic matter content (from draft Caragh freshwater pearl mussel sub-basin management plan).

Soils have been grouped in accordance with their organic matter content based on the Irish Forest Service soils map (commonly referred to as the Teagasc/EPA soil map layer). Soils that are high in organic matter have low phosphorus retention properties. Livestock unit (lu) density is low indicated by the national livestock unit density data provided by Teagasc, with densities ranging up to 0.7 lu/hectare (Fig. 5.4), indicating that nutrient loss from agriculture is a not generally a significant land-use pressure in the catchment.

However, this protective use of the upper catchment is changing in the Caragh and many other rural catchments. A pressure walk-over survey was undertaken during the NS2 Project, which highlighted a number of areas where bank and site clearance works are a significant pressure throughout the catchment. Stopping points (locations where pressures are evident in the field that were not highlighted through the GIS desk-based assessment are noted as stopping points) where damage was noted are shown in Fig. 5.5. In particular on the Glashawee River (Site 11) near the recorded population of pearl mussels, significant bank and site clearance works were recorded (Plates 5.1 and 5.2). These site clearance works were recent, with initial bank reinforcement and site clearance works for improved grassland recorded in February 2009, and subsequent follow-up investigations and photos taken in June 2009. Further site clearance (Stopping Points 4 and 5, Plate 5.3), land improvement, small-scale sand and gravel abstraction, together with tree felling, were also recorded at the remaining stopping points.

The effect of upper catchment intensification and drainage is to increase the nutrient and sediment loading on sensitive rivers along with increased spate conditions and eroding banks downstream. A common response to the latter is to rock armour the river bank, which makes the river less natural in its function and does not dissipate the energy of the increased water level, only moving the eroding nature of the water further downstream (Plate 5.4). If hard measures continue to be employed the river will become increasingly canalised, with higher sediment and nutrient loadings. This is not consistent with a river in high status and changes to the macroinvertebrate

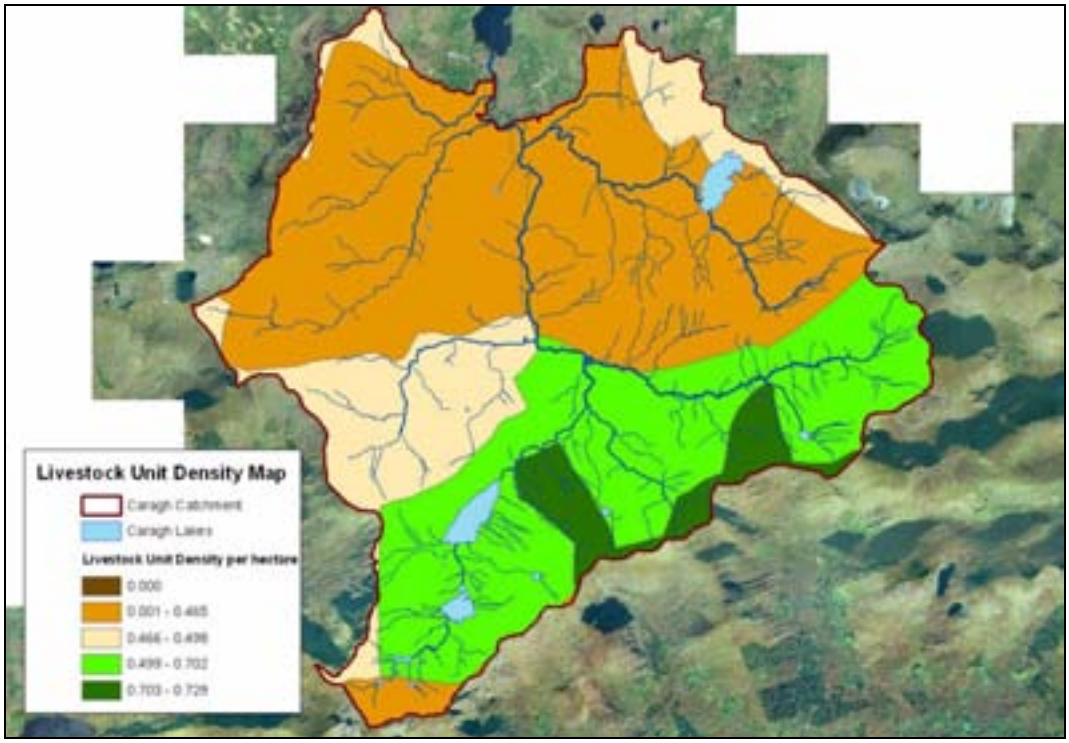


Figure 5.4. Caragh livestock unit density (from draft Caragh freshwater pearl mussel sub-basin management plan).

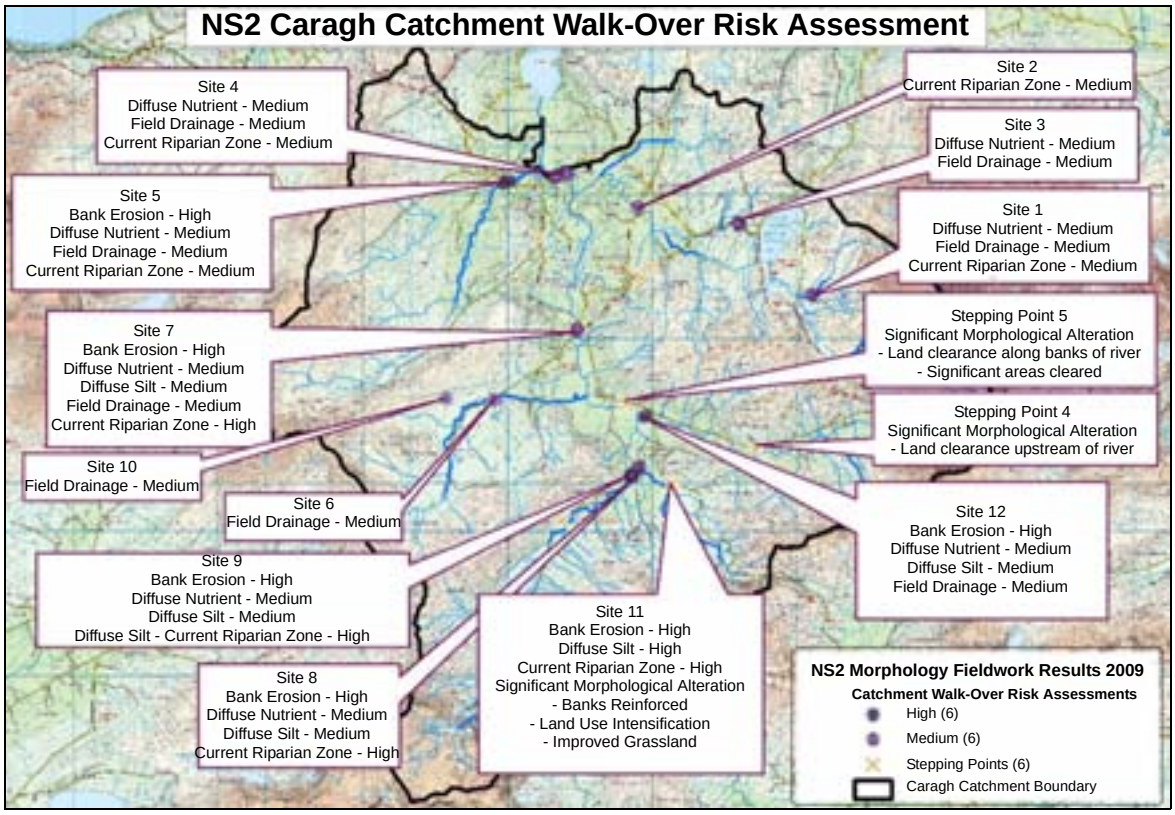


Figure 5.5. Location of stopping points and catchment walk-over risk assessments (from draft Caragh freshwater pearl mussel sub-basin catchment plan).

Site in February 2009.

Site in June 2009.

Plate 5.1. Physical modifications at Glashawee River Site 11, February 2009.

Plate 5.2. Aerial photograph showing extent of intensification and loss of habitat.

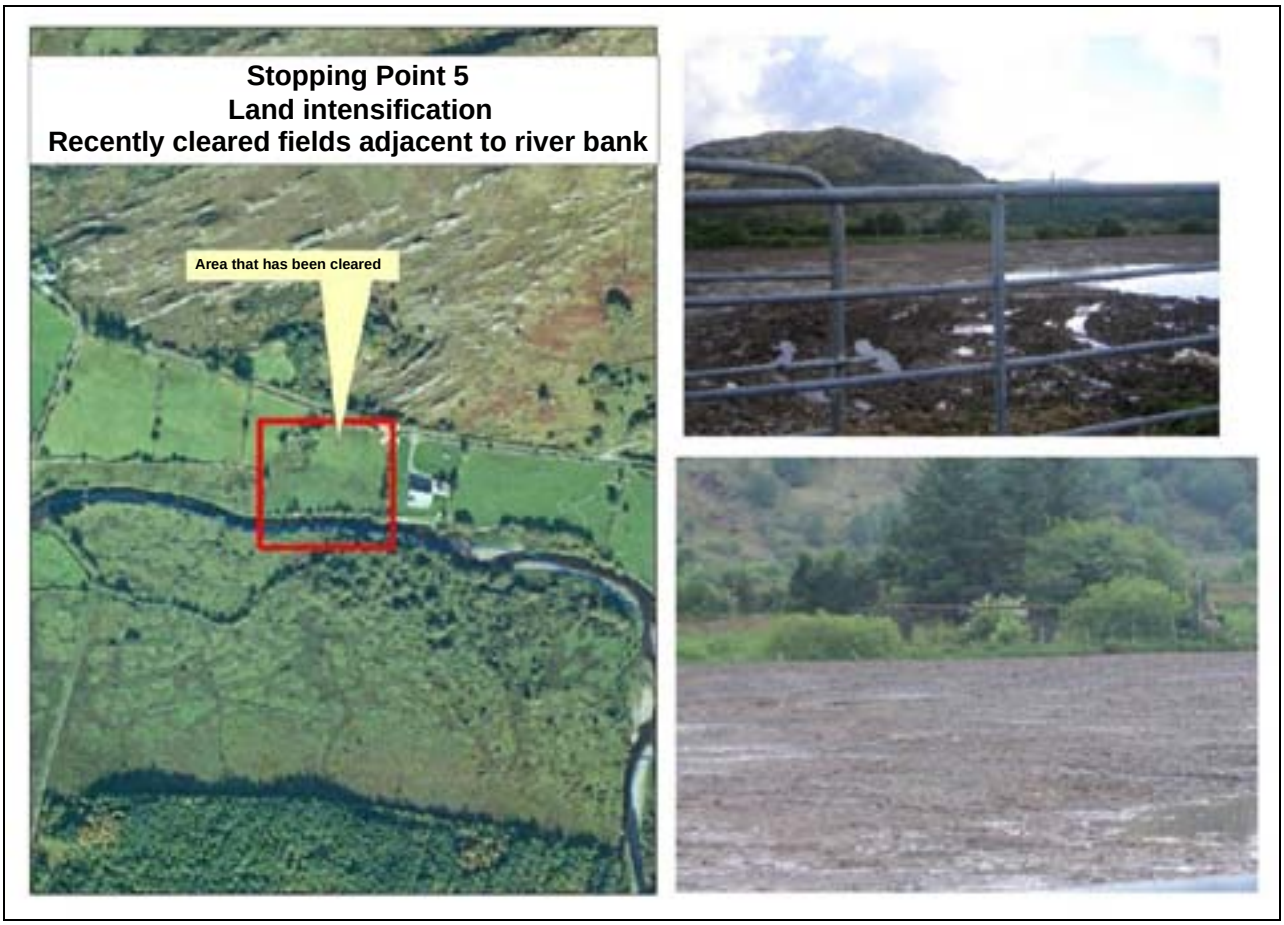


Plate 5.3. Site 5 with land intensification and loss of habitat.

community will reflect the lower quality of the water and river bed over time.

River drainage was also noted in the main inflowing stream (Gearhanagour Stream) to Lough Acoose by Inland Fisheries Ireland (formerly the section know as the South Western Regional Fisheries Board), with extensive river substrate removal. Within the Bridia Valley land improvement, drainage and gravel removal are also significant issues with river bank armouring and flood plain removal also contributing to increased bank erosion downstream. This stretch of the Caragh River is located near Stopping Points 4 and 7. Highly erodible banks were noted at Stopping Point 7 (Plate 5.5).

The pressures in the catchment can be seen to be multiple in nature and cumulative in their manifestation at a river quality level.

5.2.3.3 Forestry

Forestry establishment (including drainage and ground preparation), thinning, roading, harvesting, replanting and all associated management practices are major potential sources of both silt and nutrients, and most planting has been undertaken in the most sensitive part of the system, the upper catchment. Establishment of forests (afforestation) generally involves site preparation, including drainage, which can give rise to erosion and release of silt into rivers or lakes. Afforestation also occasionally involves the use of herbicide. Fertilisation of forestry at establishment stage and subsequently (often aerial fertilisation) has led to release of nutrients into the watercourse. Fertilisation is generally a requirement for nutrient-poor soils such as peat soils (raised bog, blanket bog, fen peat and cutaway peat). Brash left on site during and following harvesting operations can also release nutrients through decomposition, a process that can continue for a significant number of years. A further

(a) Erosion behind older rock armouring.

(b) Erosion causing bank slumping and ongoing sedimentation.

(c) Filamentous algae and silt in the river bed.

Plate 5.4a–c. Downstream damage in the Caragh Catchment from upstream intensification.

Plate 5.5. Erodible banks at Stopping Point 7.

significant contributing factor is the extent of the drainage network in the forested areas. Prior to 1990, forests were established with extensive drainage networks draining directly to surface water courses and lakes, and without the benefit of buffer strips. Recent research related to forestry operations, such as harvesting, indicates that these forest stands, where planted on peat-type soils, pose the greatest threat in terms of sedimentation and nutrient loss.

Recent research in Ireland carried out by the Western RBD in relation to forestry and acidification (http://www.wfdireland.ie) has linked coniferous forest cover on peat soils overlying igneous/metamorphic rock (Granites) and sedimentary rock (Old Red Sandstones) to acidification impacts. Impacts are also observed with coniferous forest stands on podzolic/ lithosolic soils on granite and to a lesser extent on sedimentary rocks. The magnitude of the impact has been found to relate to the size of the forest stand, with impacts being observed above 25% forest cover on the appropriate hydro-geological setting. Impacts may also be confined to the upper catchment areas, where forest stands are generally located and which provide important spawning and nursery areas for salmonids, and may not extend down the catchment due to increased buffering capacity.

The WFD *National Summary Characterisation Report* identified forestry as one of the main pressures that should be addressed in the WFD RBMPs and POMs (http://www.wfdireland.ie). The National Forestry Inventory indicates that the total forest area in Ireland now stands at 10% of the total land area, of which 57% is in public ownership and 43% in private ownership. Conifers comprise 74% of the total stock. An estimated 43% of the total stocked forest estate is on peat soils. A typical forest life cycle for conifer plantations is 40 years and longer in the case of broadleaves. The threat from forestry operations in high status rivers is significant.

Forest stands in the Caragh Catchment are located on the main Caragh River and its tributaries, the Caraghbeg River, Meelagh River and the Owbeg River (Fig. 5.6). These forest areas are Coillte-managed state properties and private forest stands.

Forest species are mainly of the coniferous type, largely Sitka and Norwegian spruce and some Japanese larch. The forest areas include some small areas of broadleaf, including birch, alder and ash.

An analysis of the age structure of the forest stands indicates that about 50% of the forestry was planted prior to 1990. These forest stands were planted without the benefit of the Forest Service guidance documents

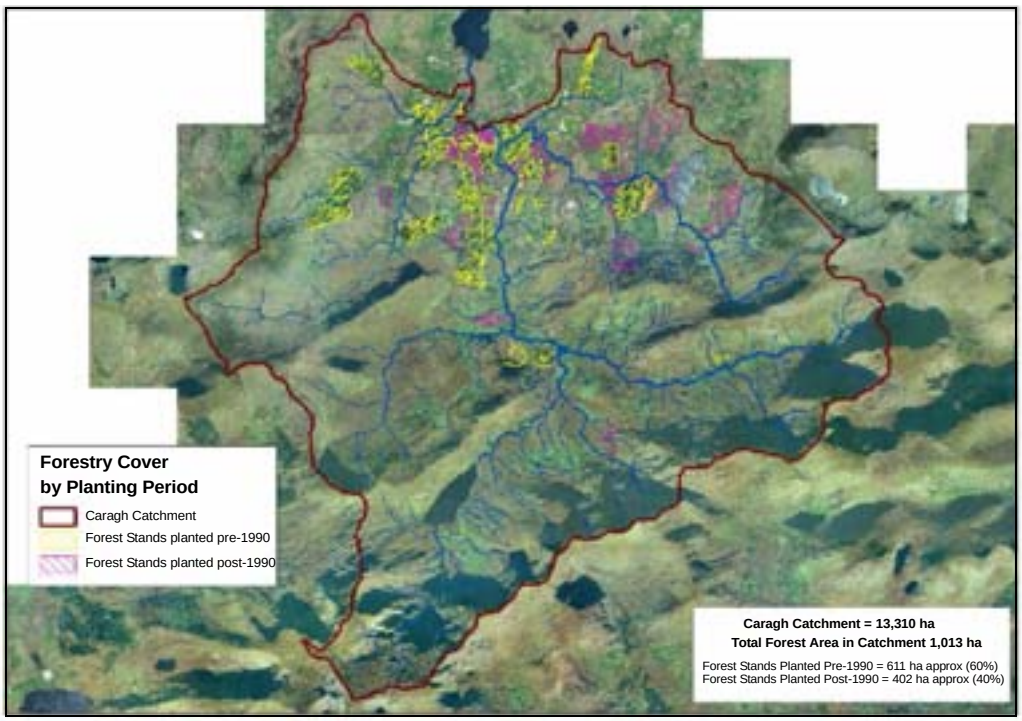


Figure 5.6. Caragh forestry by planting period (from draft Caragh freshwater pearl mussel sub-basin management plan).

and codes of practice. In addition, the national Irish Forest Service soils map indicates that this forestry was largely planted on peat soils and peaty gleys/peaty podzol soils. The afforestation technique used before 1990 generally resulted in significant drainage of the area, direct connectivity of the drainage network to the main watercourses and planting right down to stream edge, and no buffer zones would have been provided.

5.2.3.4 Main pressures from forestry in the Caragh catchment

The main pressures from forest stands identified in the Caragh Catchment are:

- **Nutrient enrichment from ground and aerial fertilisation:** Conifer forest growing on nutrient-poor soils such as peat may require an application of phosphorus fertiliser to achieve the required yield class. Peat soils have poor phosphorus retention properties and hence fertilisation poses a risk of nutrient loss to the receiving waters;
- **Nutrient enrichment from brash decay post-felling:** Brash decay post-clearfelling can potentially release nutrients, both nitrogen and phosphorus;
- **Sediment loss:** Forestry operations associated with harvesting, such as roading and clearfelling can give rise to significant loss of sediment, particularly on highly erodible soil types; and
- **Pesticide use:** Both insecticides and herbicides are used at afforestation and replanting stages for coniferous forestry. Insecticides, such as cypermethrin, are used at re-establishment stage (replanting) on post-clearfelled sites to limit attack of the pine weevil (*Hylobius abietus*), a devastating pest of young conifer stands. Potential exists for losses of insecticide to the aquatic environment.

The above pressures have the potential to impact significantly on the river quality in the Caragh Catchment. The risk is increased due to the direct connectivity of the forest drainage network to the receiving watercourse, lack of vegetated buffer strips, and high potential for phosphorus and nitrogen loss from harvesting operations due to the poor retention capacity of the peat-type soils.

5.2.3.5 *On-site waste water treatment systems*

On-site waste water treatment systems and other small effluent systems can be significant sources of nutrients to rivers, particularly poorly buffered high status streams in nutrient-poor catchments. Losses from such systems typically behave as diffuse nutrient sources, but can act as significant point sources if they are not appropriately designed or are leaking.

Simplified pathway risk maps (Figs 5.7 and 5.8) of the Caragh Catchment were prepared for the pearl mussel sub-basin management plans to assess the potential impact from on-site waste water treatment systems. These are based on the WFD *National Programmes of Measures and Standards Study on On-Site Waste Water Treatment Systems* (http://www.wfdireland.ie). The risk maps take into consideration the aquifer type, vulnerability and subsoil permeability in assessing the pathway risk. Locations of on-site waste water treatment systems have been derived from the An Post GeoDirectory. Most systems are on high risk pathways but should not cause significant problems. For some systems located on extreme pathway risk, in terms of phosphorus and pathogen load to surface waters, some threat exists. This is also borne out by the risk mapping of areas of likelihood of inadequate percolation. These are generalised maps providing an overall indication of likely risk and specific localised conditions need to be taken into account in assessing each on-site system. However, it highlights the need to undertake surveys of on-site systems in the catchment where there is a high likelihood of risk to surface waters, particularly from phosphorus, and how a small number of inadequately performing systems can lower the status of a water body.

5.2.4 *Key pressures to be addressed*

The Caragh Catchment has become more intensively used in recent years and the response of the river to the cumulative effects of this intensification has been a reduction over time in the quality status of its water bodies.

The key issues highlighted by this case study are as follows:

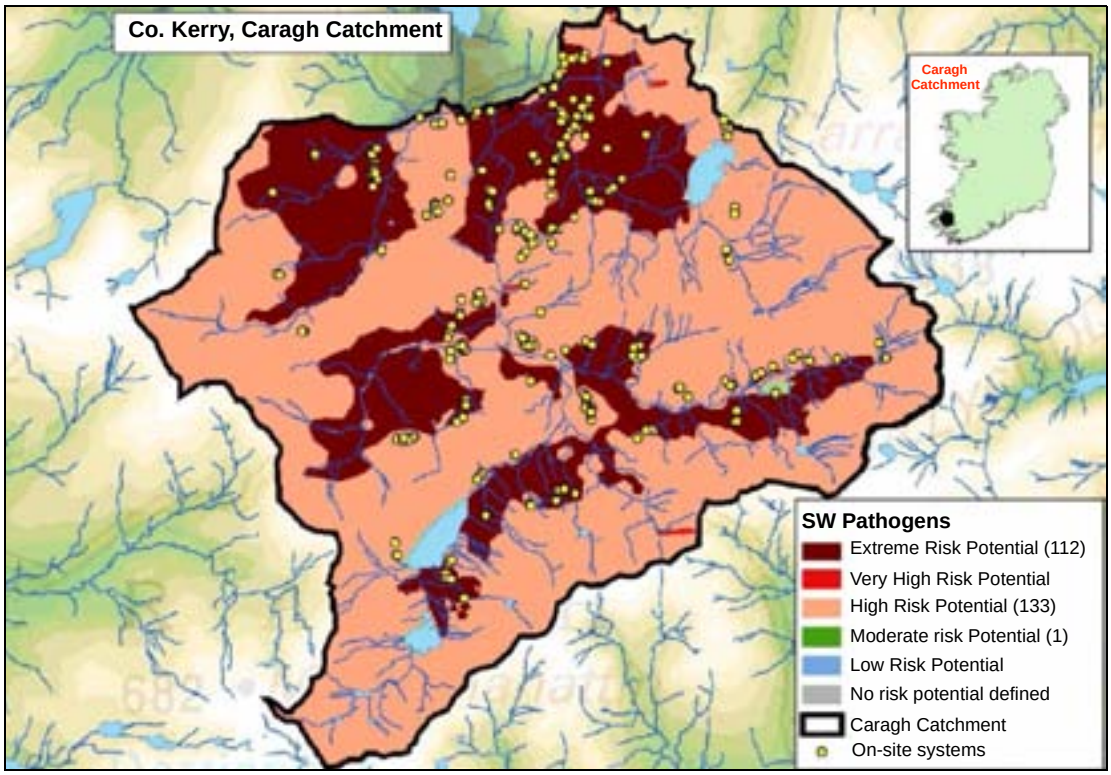


Figure 5.7. Surface water pathway pathogens risk map showing location of on-site waste water treatment systems (from draft Caragh freshwater pearl mussel sub-basin management plan).

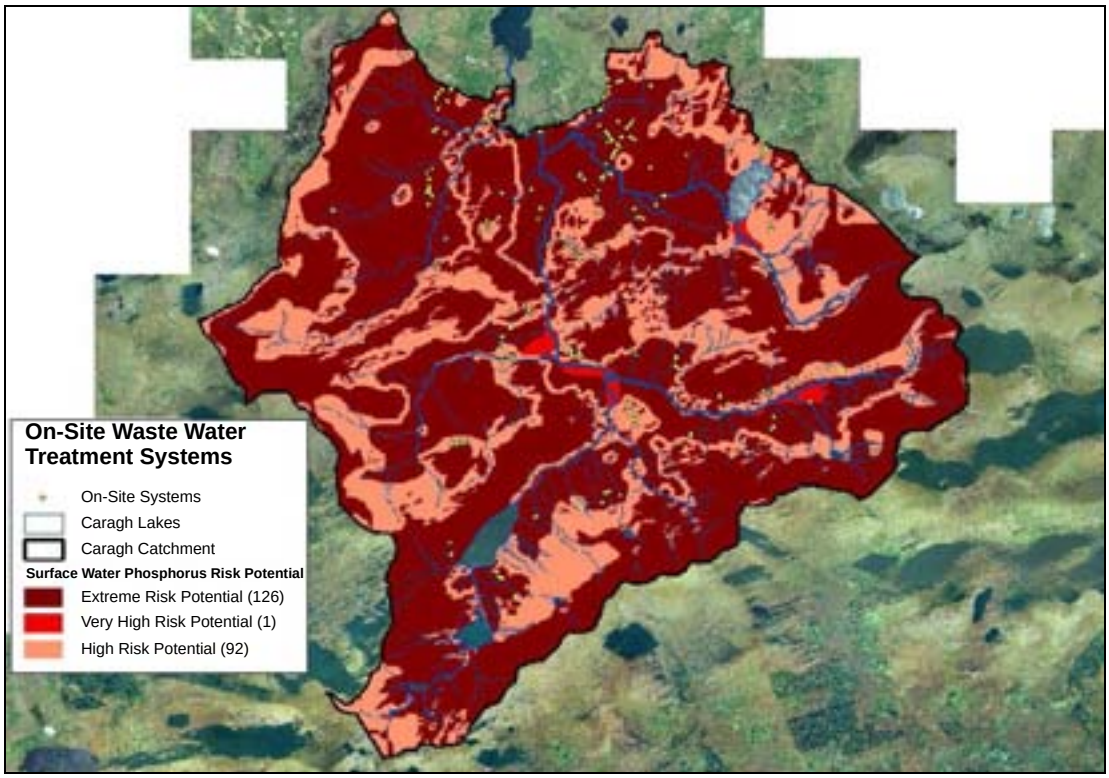


Figure 5.8. Surface water phosphorus pathway risk map showing location on-site waste water treatment systems (from draft Caragh freshwater pearl mussel sub-basin management plan).

- **Agriculture:** Current requirements for farmers to maintain land in agricultural condition for Pillar 1 payments is in direct conflict with the requirement to not carry out activities that are likely to result in negative effects on a species designated for protection within a cSAC. The agricultural damage shown above that has had negative effects in the river downstream is not currently under the control of agricultural regulations, but should have been prevented by the NPWS under the Habitats Regulations. If the catchment were not a cSAC then there would be no regulation of intensification damage, which is the case in most high status river catchments. The anomaly that rewards farmers financially to carry out damaging operations needs to be urgently addressed.

- **On-site waste water treatment systems:** Until recently, there was no legislative requirement to inspect septic tanks and ensure their proper functioning. This was in direct conflict with the requirement to not carry out activities that are likely to result in negative effects on a species designated for protection within a cSAC. The release of excessive phosphorus causing nutrient pollution to the river is damaging to sensitive high status catchments, therefore prioritisation of inspections in these catchments is required.

- **Forestry:** There is a legacy issue where large blocks of non-native coniferous forestry have been planted and are reaching maturity. Some areas may not be able to be felled without serious damage. In a cSAC and high status catchment, such as the Caragh Catchment, it is hoped that through agreement between the landowner, the regulator and the NPWS, the least damaging approach is taken in dealing with the problem, even if it is not the most economical option.

- **Planned developments:** New housing and other planned developments have the capacity to greatly add to the cumulative intensification effects in sensitive river catchments, such as the Caragh Catchment. New developments can cause loss of stable habitats, fine sediment release during clearance works, nutrient release during clearance works, permanent loss of

ecosystem services (water retention) if drainage is required, and a permanent source of nutrients from sewage and phosphate detergent usage. Planned developments need to show that they have been designed so as to not increase any negative cumulative effects on the river habitats, e.g. via the AA route as required under Article 6 of the Habitats Directive for developments within cSACs, or through the request for EcIAs for areas outside of cSACs. A national policy related to a network of high status sites (see Section 4.3), consideration of a restoration policy for former high status sites (see Section 4.3) and GIS data layers of rivers to be maintained or restored to high status (see Section 4.2) would greatly assist in this regard. Such management strategies are required to provide context and direction to LAs and should become a key part of the planning consideration process.

- **Capacity for assimilation:** The Caragh River and its tributaries are long past their assimilation capacity for fine sediment and nutrients. In order to restore high status to formerly higher quality water bodies within the catchment, land-use intensity needs to be reduced at source or mitigated along its pathway. The LA and catchment stakeholders should not use the river as a means of further dilution or assimilation for the foreseeable future.

5.3 Case Study 2 – The Oily Catchment, Co. Donegal – Outside the cSAC Network

5.3.1 Oily River and tributaries, Co. Donegal, overview

The Oily River rises in Mulmosog Mountain as two tributaries, the Corker and Tullinteane Rivers, which join together to form the Oily River at Corker Beg, which flows into the sea at McSwyne's Bay.

While not as much is known about the Oily as the Caragh Catchment, a walk-over survey was undertaken in the summer of 2011. The Oily River also has a freshwater pearl mussel population in unfavourable condition due to poor survival of juvenile mussels, itself caused by a decline in river bed and water quality.

5.3.2 Oily River high status segments – overview of current and historical distribution

Three sites have been assessed by the EPA for macroinvertebrate quality since 1994 (four sites between 1973 and 1990), and the historical results are shown in Table 5.2. The decline is illustrated in Fig. 5.9. All three sites were at Q5 when records began, and have reduced to Q4–5 at two sites and Q4 at one site, and therefore are not in good enough condition to support sustainably reproducing *Margaritifera*, with the Milltown Bridge site reducing from Q5 in 1973 and 1980 to Q4 since 2005, i.e. a loss of high status.

5.3.3 Reasons for decline in the Oily River Catchment

The Oily River Catchment was until recently managed with very low levels of intensity, apart from some older afforestation that is close to maturity.

Recent decline is suspected to be due to cumulative effects of fine sediment and nutrient release into the river from catchment activities from the very top of the catchment above Lough Tamur all the way downstream, as outlined in Fig. 5.10. Freshwater pearl mussel kills (an episode of recent mussel deaths not consistent with natural losses) were noted in three distinct areas. The first was at the location of the bank works at G 8004 8508, while the second was upstream and downstream of the bridge works at Meenybraddan (some shells had clear cattle damage but others had not, silt damage being the most likely cause of death given the severity of the fine silt infiltration in the area). The third kill was below the new bridge and drain at Corker More, which also had severe silt infiltration.

5.3.3.1 Forestry

New afforestation has recently been planted alongside the legacy forestry that is near to maturity, thus now the upper Oily Catchment has as much as 50% coniferous plantation. This is likely to be a significant cumulative effect (Plate 5.6).

5.3.3.2 Peat cutting

There is a large area of peat cutting close to Lake Tamur and the River Oily (Plate 5.7).

Table 5.2. Environmental Protection Agency historical river quality results for the Oily River.

Site	1973	1980	1986	1990	1994	1997	1999	2002	2005	2008	2011
Bridge downstream of Tamur Lough 37O010020	–	–	–	5	4	4–5	–	4	4–5	5	4–5
Ford west of Corker Beg 37O010050	–	5	5	5	5	5	4–5	4–5	4–5	4–5	4–5
Multin's Bridge 37O010100	5	5	5	4–5	–	–	–	–	–	–	–
Bridge at Milltown 37O010200	5	5	4–5	4–5	4–5	4–5	3/0	4–5	4	4	4

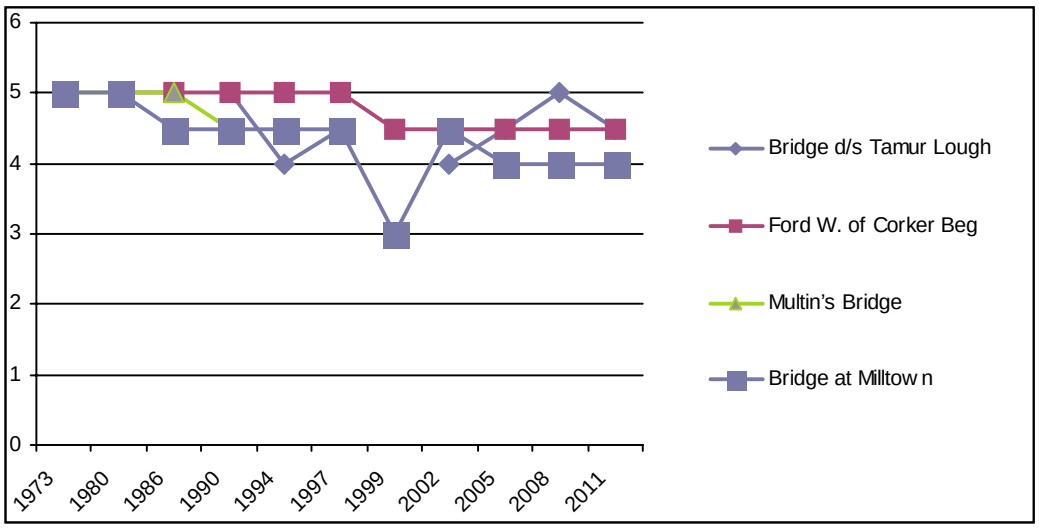


Figure 5.9. Decline of river quality in the Oily Catchment 1973–2011.

5.3.3.3 Agricultural damage

There are large cattle poaching very fragile bog habitat and entering the River Oily to drink. This results in an increase of nutrients and fine solids to the river (Plates 5.8–5.9).

5.3.3.4 Poorly designed and constructed bridges, wind turbine development

There has been some very recent development work in the Oily Catchment, including a widened bridge at Meenybraddan and a new bridge associated with a wind turbine and/or forestry development at Corker More, both over the upper reaches of the Oily River. According to Donegal County Council, the public road bridge rebuilding was carried out by private contractors also as part of the wind farm development downstream.

At Meenybraddan, the bridge repair has been constructed with hard edges at the bank and has exposed slumping peaty banks close to the water, and an additional flat area of crushed rock sloping to the river is nearby (Plates 5.10–5.12). A freshly dug drain follows the roadside down slope directly to the river, and is close to dirty crushed rock and farm waste (Plates 5.13–5.14). A series of developments at Corker More includes young forestry, five wind turbines, a new road, a new bridge and a deep freshly excavated drain (Plates 5.15–5.19). In addition to the above pressures, there were a number of private houses newly built over the last 3 years. These were in remote areas on poorly percolating soils.

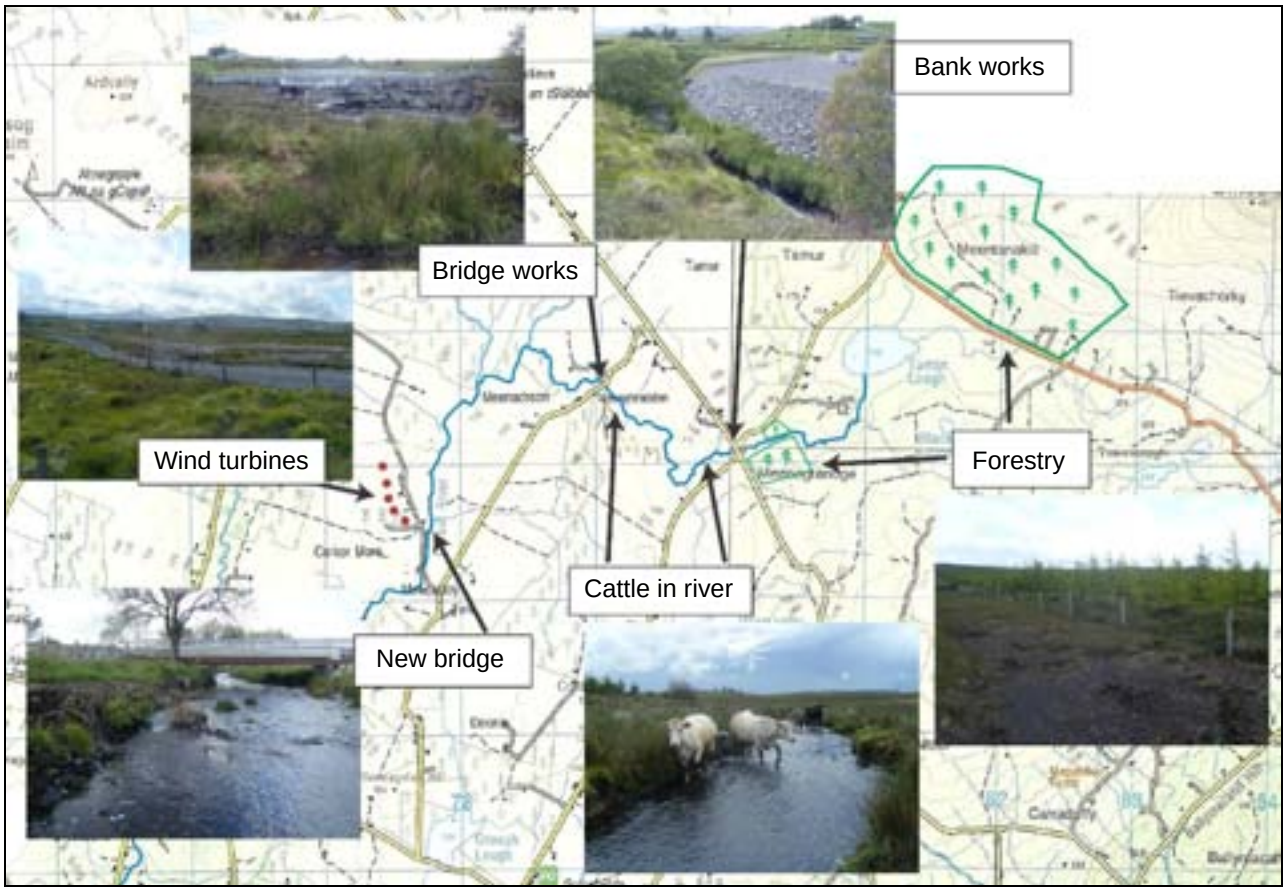


Figure 5.10. Pressures in the Oily Catchment 2011.

Plate 5.6. Old and young forestry makes up a significant amount of the upper Oily Catchment.

Plate 5.7. Peat cutting in the upper Oily Catchment.

Plate 5.8. Cattle poaching damage by the Oily River.

Plate 5.9. Cattle in the Oily River.

Plate 5.10. Hard area beside bank at G 8004 8508. A recent mussel kill was found in this area.

Plate 5.11. Exposed crushed rock at rebuilt upper bridge.

Plate 5.12. Slumping peaty slope to river at bridge construction.

Plate 5.13. Freshly dug drain leading directly to River Oily.

Plate 5.14. Enriched agricultural waste beside open drain at bridge site.

5.3.4 Key pressures to be addressed

The combination of developments that has been undertaken over the last 3 years, where intensification of land use has occurred, along with construction, has led to hard measures and bare, friable peaty slopes at the river's edge. These cumulative pressures are indicative that, without habitat designation, management of fragile catchments does not appear to be specifically highlighted compared with other catchments within the local/public authority system. It must be stressed that with the lack of habitat designation of the catchment, no guidelines or protocols were missed by the LA, as the catchment would not have stood out in any way from other non-designated catchments in the county. Therefore, a specific warning data set within the LA GIS system is needed to highlight the fragility of this high status catchment to prevent further declines.

It is no surprise that the Oily River Catchment is declining in water quality, and it is likely to lose its high status rating. It has already declined from a consistent Q5 in the early years of recording to Q4–5 and to Q4 lower down the river. Unfortunately, Q5 is needed for sustainable pearl mussel function, and this is no longer the situation in the Oily River. Its challenge now is to either maintain the high status water bodies that remain within the catchment, or restore it to its recent level of ecological function.

Plate 5.15. New wind farm development at Corker More.

Plate 5.16. New bridge in Corker More area.

Plate 5.17. Bridge with bank revetment and new drain at Corker More. A recent mussel kill was found in this area.

Plate 5.18. Inadequate silt traps at Corker More.

Plate 5.19. Young forestry and turbines in peaty conditions.

In order for the Oily River to retain its high status segments and possibly restore the former Q5 water quality, there needs to be a policy across all responsible departments to treat it as a highly sensitive river, at least as carefully as those sites that are designated under the Habitats Directive. This includes prevention of further intensification of forestry and agriculture, and blockage of poorly designed drains. Although the bridge damage has been done, large buffer zones in the land above and below the bridges would at least mitigate against bare soil that would be likely to be eroded into the river.

A clear policy is needed on new housing, both at site clearance level and for on-site waste water treatment design. There is no assimilation capacity in this sensitive catchment for intensive land use. Like the Caragh River, the LA and catchment stakeholders should not use the river as a means of dilution or assimilation for the foreseeable future.

The level of intensification of the upper Oily Catchment has made the lower areas of the river more susceptible to erosion damage, due to the lack of capacity for water retention in the upper catchment during periods of high rainfall.

Of key importance in rivers to be maintained or restored to former high status levels is information to the planning authorities and the water/environment departments of local authorities. Clear GIS layers showing the catchment areas contributing to river segments that are to be maintained at high status and

clear guidance as to how this is to be achieved are needed. If this had been available in advance of the works highlighted above, more appropriate mitigation measures could have been implemented.

In order to reverse some of the damage done to the Oily Catchment, some remedial measures could be undertaken, most immediately in blocking drains that are contributing fine sediment to the river.

5.4 Conclusions from the Case Studies

In the past, there seems to have been a general assumption that high status rivers were very clean, and therefore there was some capacity to introduce some degree of nutrient intensification without damage. Indeed, forestry planting and agricultural policy has been to drive towards further intensification, and one-off housing policy has found remote peaty catchments to be acceptable places for new building. Contrary to these assumptions, catchments that were historically in high status are highly sensitive to small levels of intensification. Therefore, a means of flagging highly sensitive catchment zones is urgently required to include within local and public authority mapping systems.

Some remedial works may be needed in high status catchments to block drains and restore water absorption function to prevent flooding and erosion downstream. Measures employed could be similar to those of the draft freshwater pearl mussel sub-basin management plans, such as for the Caragh (NS2, 2010[20]).

In order to assess the success of maintaining and/or restoring high status water bodies, a register of cumulative effects should be maintained such that where planning permission for housing or other development is granted, and where forestry felling or planting licences have been given, a cumulative effects database is updated, preferably in mapping format. A register of drains, from the formal LA drainage system to local agriculture and forestry drains would be of benefit in the assessment of water body assimilation and carrying capacity.

20. See http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

References

Allott, N., Brennan, M., Cooke, D., Reynolds, J.D. and Simon, N., 1997. *A study on the effects of stream hydrology and water quality in forested catchments on fish and invertebrates. Volume 4: Stream Chemistry, Hydrology and Biota, Galway–Mayo Region.* AQUAFOR report. EOLAS Contract HEIC/91/304/A, COFORD, Dublin, Ireland.

Allott, N., Free, G., Irvine, K., Mills, P., Mullins, T.E., Bowman, J.J., Champ, W.S.T., Clabby, K.J. and McGarrigle, M.L., 1998. Land use and aquatic systems in the Republic of Ireland. *In:* Giller, P.S. (Ed.) *Studies in Irish Limnology*. The Marine Institute, Dublin, Ireland. pp. 1–18.

Ambose, R.B., Barnwell, T.O., McCutcheon, S.C. and Williams, J.R., 1996. Computer Models for Water-Quality Analysis. *In:* May, L.W. (Ed) *Water Resources Handbook*. McGraw-Hill, New York, USA.

Amezaga, J.M. and Santamaría, L., 2000. Wetland connectedness and policy fragmentation: steps towards a sustainable European wetland policy. *Physics and Chemistry of the Earth (B)* **25:** 635–640.

Amezaga, J.M., Santamaría, L. and Green, A.J., 2002. Biotic wetland connectivity-supporting a new approach for wetland policy. *Acta Oecologica* **23:** 213–222.

Aroviita, J., Mykrä, H. and Hämäläinen, H., 2009a. River bioassessment and the preservation of threatened species: towards acceptable biological quality criteria. In: *Predictive Models in Assessment of Macroinvertebrates in Boreal Rivers.* Aroviita, J., PhD Thesis, University of Jyvaäskylä, Finland.

Aroviita, J., Mykra, H., Muotka, T. and Hämäläinen, H., 2009b. Influence of geographical extent on typology- and model-based assessments of taxonomic completeness of river macroinvertebrates. *Freshwater Biology* **54:** 1774–1787.

Bartley, P. and Johnston, P., 2005. *Nitrate Responses in Groundwater to Dairy Farming Agriculture. Summary Report.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Berger, G., Kaechele, H. and Pfeffe, H., 2006. The greening of the European common agricultural policy by linking the European-wide obligation of set-aside with voluntary agri-environmental measures on a regional scale. *Environmental Science and Policy* **9:** 509–524.

Bignal, E.M. and McCracken, D.I., 1996. Low-intensity farming systems in the conservation of the countryside. *Journal of Applied Ecology* **33:** 413–424.

Bradley, C.M., Kelly-Quinn, M., Tierney, D., Murray, D.A. and Ashe, P.J., 2003 Preliminary analysis of the longitudinal patterns occurring in macroinvertebrate assemblages in river catchments in Ireland. *Verhandlungen Internationale Vereingung für Limnologie* **28:** 1576–1580.

Cabinet Office, 2002. *Farming and Food. A Sustainable Future.* Report of the Policy Commission on the Future of Farming and Food. Cabinet Office, London, UK.

CIRCA, 2010. Reporting Sheets.

DAFF (Department of Agriculture, Fisheries and Food), 2008. *Native Woodland Scheme.* Department of Agriculture, Fisheries and Food, Dublin, Ireland.

DAFF (Department of Agriculture, Fisheries and Food), 2010. *Harvest 2020. Food Harvest 2020. A Vision for Irish Agri-Food and Fisheries.* Department of Agriculture, Fisheries and Food, Dublin, Ireland.

DAFF (Department of Agriculture, Fisheries and Food), 2011. *Terms and Conditions of the Agri-Environment Options Scheme (AEOS) and the Natura 2000 Scheme.* Introduced by the Minister for Agriculture, Fisheries and Food in implementation of Council Regulation (EC) No. 1698/2005. Department of Agriculture, Fisheries and Food, Dublin, Ireland.

DECLG (Department of the Environment, Community and Local Government), 2011. *A Review of the Environmental Protection Agency (EPA).* A report by the Environment Protection Agency Review Group, May 2011. Department of the Environment, Community and Local Government, Dublin, Ireland.

DEHLG (Department of the Environment, Heritage and Local Government), 2009. *Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Donald, P.F., Sanderson, F.J., Burfield, I.J. and van Bommel, F.P.J., 2006. Further evidence of continent-wide impacts of agricultural intensification on European farmland birds 1990–2000. *Agriculture Ecosystems and Environment* **116:** 189–196.

Donnelly, K., 2001. *The Response of Lough Conn and Lough Mask, Two Irish Western Lakes, to Total Phosphorus Loading, 1995–1999*. PhD, University College Dublin, Ireland.

Dworak, T., Karaczun, Z., Herbke, N., Schlegel, S. and Landgrebe-Trinkunaite, R., 2005. *WFD and Agriculture Linkages at the EU Level.* Final report about Rural Development Programmes. Ecologic,

Berlin, Germany.

Dworak T., Berglund, M., Grandmougin, B., Mattheiss, V. and Holen, S., 2009. *International Review on Payment Schemes for Wet Buffer Strips and other Types of Wet Zones along Privately Owned Land.* Study for RWS-Waterdienst. Ecologic Institute, Berlin/Wien.

EC (European Commission), 2002. *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Office for Official Publications of the European Communities, Luxembourg.

EC (European Commission), 2011. *Our Life Insurance, our Natural Capital: an EU Biodiversity Strategy to 2020.* Communication from the Commission to the European Parliament, The Council, The Economic and Social Committee and The Committee of the Regions. COM(2011) 244 Final. European Commission, Brussels, Belgium.

EPA (Environmental Protection Agency), 2002. *Water Quality in Ireland 1998–2000*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

EPA (Environmental Protection Agency), 2003. *National Environmental Monitoring Programme for Transitional, Coastland Marine Waters.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

EPA (Environmental Protection Agency), 2005. *Water Quality in Ireland 2001–2003*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

EPA (Environmental Protection Agency), 2008. *Water Quality in Ireland 2006–2008*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

EPA (Environmental Protection Agency), 2009. *Water Quality in Ireland 2007–2008: Key Indicators of the Aquatic Environment*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

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

EPA (Environmental Protection Agency), 2011. *Water Quality in Ireland 2007–2009*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

EPA (Environmental Protection Agency), 2012. *Ireland's Environment. An Assessment*. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

ERBD (Eastern River Basin District), 2010. *Eastern River Basin District River Basin Management Plan (2009–2015).* Available at http://www.wfdireland.ie.

Eriksson, L.O., Löfgren, S. and Öhman, K., 2011. Implications for forest management of the EU Water Framework Directive's stream water quality requirements – A modeling approach. *Forest Policy and Economics* **13:** 284–291.

European Commission, 2003b. *Guidance for Analysis of Pressures and Impacts in Accordance with the Water Framework Directive. Common Implementation Working Group 2.1-IMPRESS.* European Commission, Brussels, Belgium.

Everest, F.H., Beschta, R.L., Scrivener, J.C., Koski, K.V., Sedell, J.R. and Ceder-holm, C.J., 1987. Fine Sediments and salmon production: a paradox. In: Salo, E. and Cundy, T. (Eds). *Streamside Management: Forestry and Fisheries Interactions.* Institute of Forest Resources Contribution No. 57, Washington, DC, USA.

Finn, J.A., Bartolini, F., Bourke, D. Kurz, I. and Viaggi, D., 2009. Ex post environmental evaluation of agri-environment schemes using experts' judgements and multicriteria analysis. *Journal of Environmental Planning and Management* **52:** 717–737.

Forest Service, 2000a. *Code of Best Forest Practice – Ireland.* Forest Service, Department of the Marine and Natural Resources, Dublin, Ireland.

Forest Service, 2000b. *Forestry and Water Quality Guidelines.* Forest Service, Department of the Marine and Natural Resources, Dublin, Ireland.

Foy, R.H., Smith, R.V., Jordan, C. and Lennox, S.D., 1995. Upward trend in soluble phosphorus loadings to Lough Neagh despite phosphorus reduction at sewage treatment works. *Water Research* **29:** 1051–1063.

Government of Ireland, 2005. *The Characterisation and Analysis of Ireland's River Basin Districts in accordance with Section 7(2 and 3) of the European Communities (Water Policy) Regulations 2003 (SI 722 of 2003).* Summary Report. Stationery Office, Dublin, Ireland.

Hartnett, M., Wilson, J.G. and Nash, S., 2011. Irish estuaries: Water quality status and monitoring implications under the water framework directive. *Marine Policy* **35:** 810–818.

Havens, K.E. and Schelske, C.L., 2001. The importance of considering biological processes when setting total maximum daily loads (TMDL) for phosphorus in shallow eutrophic lakes. *Environmental Pollution* **113:** 1–9.

Hering, D., Borja, A., Carstensen, J., Carvalho, L., Elliott, M., Feld, C.K., Heiskanen, A.-S., Johnson, R.K., Moe, J., Pont, D., LycheSolheim, A. and van de Bund, W., 2010. The European Water Framework Directive at

the age of 10: A critical review of the achievements with recommendations for the future. *Science of the Total Environment* **408:** 407–4019.

Heritage Council. 2010. *Proposals for Ireland's Landscapes.* Heritage Council, Kilkenny, Ireland.

Irvine, K. and Ní Chuanigh, E., 2011 *Management Strategies for the Protection of High Status Water Bodies. A Literature Review.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Irvine, K., Allott, N., Mills, P. and Free, G., 2000. The use of empirical relationships and nutrient export coefficients for predicting phosphorus concentrations in Irish lakes. *Verhandlungen Internationale Vereingung für Limnologie* **27:** 1127–1131.

Irvine, K., Allott, N., De Eyto, E., Free, G., White, J., Caroni, R., Kennelly, C., Keaney, J., Lennon, C., Kemp, A., Barry, E., Day, S., Mills, P., O'Ríain, G., Quirke, B., Twomey, H. and Sweeney, P., 2001. *Ecological Assessment of Irish Lakes: The Development of a New Methodology Suited to the Needs of the EU Directive for Surface Waters.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Irvine, K., Boelens, R., Fitzsimmons, J., Kemp, A. and Johnston, P., 2002. *Review of Monitoring and Research to Meet Needs of the EU Water Framework Directive.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Irvine, K., Mills, P., Bruen, M., Walley, W., Hartnett, M., Black, A., Tynan, S., Duck, O., Bragg, O., Rowan, J., Wilson, J., Johnston, P. and O'Toole, C., 2005. *Water Framework Directive – The Application of Mathematical Models as Decision-Support Tools.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Jennings, E., Irvine, K., Mills, P., Jordan, P., Jensen, J.-P., Søndergaard, M., Barr, A. and Glasgow, G., 2002. *Eutrophication from Agricultural Sources: Seasonal Patterns and Effects of Phosphorus.* Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

Kavanagh, P. and Bree, T., 2009. Water Framework Directive Programme of Measures: Protection of High Status sites, Forest, Water and On-site wastewater-Treatment Systems. *Biology and Environment* **109B:** 345–364.

Kettunen, M., Terry, A., Tucker, G. and Jones, A., 2007. *Guidance on the Maintenance of Landscape Features of Major Importance for Wild Flora and Fauna – Guidance on the Implementation of Article 3 of the Birds Directive (79/409/EEC) and Article 10 of the Habitats Directive (92/43/EEC).* Institute for European Environmental Policy (IEEP), Brussels, Belgium.

Lennox, S.D., Foy, R.H. and Smith, R.V., 1997. Estimating the contribution from agriculture to the phosphorus load in surface water. *In:* Tunny, H., Carton, O.T., Brookes, P.C. and Johnston, A.E. (Eds) *Phosphorus Loss from Soil to Water.* CAB International, Wallingford, UK. pp. 55–76.

Lennox, S.D., Foy, R.H., Smith, R.V., Unsworth, E.F. and Smyth, D.R., 1998. A comparison of agricultural water pollution incidents in Northern Ireland with those in England and Wales. *Water Research* **32:** 649–656.

Likens, G.E., Bormann, F.H., Pierce, R.S., Eaton, J.S. and Johnson, N.M., 1971. *Biogeochemistry of a Forested Ecosystem.* Springer-Verlag, New York, USA.

Lûtz, M. and Bastian, O., 2002. Implementation of landscape planning and nature conservation in the agricultural landscape – a case study from Saxony. *Agriculture, Ecosystems and Environment* **92:** 159–170.

Kelly-Quinn, M., Tierney, D., Coyle, S. and Bracken, J.J., 1997. *A Study of the Effects of Stream Hydrology and Water Quality in Forested Catchments on Fish and Invertebrates. Stream Chemistry, Hydrology and Biota, Wicklow Region.* AQUAFOR Report. EOLAS Contract HEIC/91/304/A, Volume 3. UCD, Dublin, Ireland.

Mayes, E., 2008. *Water Framework Directive Annex VI Protected Areas: Water Dependent Habitats and Species and High Status Sites. Guidance on Measures under the Habitats Directive and for High Status Sites.* Western River Basin/ESBI, Galway, Ireland.

McGarrigle, M.L., 2009. Characterisation of water bodies in Ireland in relation to agricultural pressures. *Termon: Irish Journal of Agri-Environmental Research* **7:** 35–50.

Meyer, J.L., Strayer, D.L., Wallace, B., Eggert, S.L., Helfman, G. and Leonard, N.E., 2007. The contribution of headwater streams to biodiversity in river networks. *Journal of the American Water Resources Association* **43:** 5–14.

Moorkens, E.A., 2010. Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the republic of Ireland within the framework of the habitats and species directive. *Journal of Conchology* **40:** 339–350.

Moorkens, E.A., 2007. *Rapid Assessment of Rivers with Prior Records of* Margaritifera margaritifera *2008 Survey.* Report for Department of Environment, Heritage and Local Government, Dublin, Ireland.

Moorkens, E.A., 2008. *Rapid Assessment of Rivers with Prior Records of* Margaritifera margaritifera *2008 survey.* Report for Department of Environment, Heritage and Local Government, Dublin, Ireland.

Moorkens, E.A. and Downes, S., 2011. Linking catchment activities with conservation status of freshwater pearl mussel populations as an aid to prioritization of rehabilitation measures in Ireland. *In:* Teagasc Biodiversity Conference Proceedings: *Conserving Farmland Biodiversity: Lessons Learned and Future Prospects*. pp. 38–41.

Morgan, G., Xie, Q. and Devins, M., 2000. Small catchments-NMP ripsey-water quality aspects. *In:* Tunny, H., Carton, O.T., Brookes, P.C. and Johnston, A.E. (Eds) *Phosphorus Loss from Soil to Water*. CAB International, Wallingford, UK. pp. 17–150.

Moss, B., 2008. The Water Framework Directive: Total environment or political compromise? *Science of the Total Environment* **400:** 32–41.

NBIRBD (Neagh Bann International River Basin District), 2010. *Water Matters – Our Plan. Neagh Bann River Basin Management Plan (2009–2015).* Available at http://www.wfdireland.ie.

NS2 (North South 2 Project), 2010. *Freshwater Pearl Mussel Draft Caragh Sub-Basin Management Plan*. Report for Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NWIRBD (North Western International River Basin District), 2010. *Water Matters – Our Plan. North Western River Basin Management Plan (2009–2015).* Available at http://www.wfdireland.ie.

OECD (Organisation for Economic Co-operation and Development), 1982. *Eutrophication of Waters. Monitoring, Assessment and Control*. OECD Publishing, Paris, France.

OECD (Organisation for Economic Co-operation and Development), 2010. *Environmental Performance Reviews – Ireland.* OECD Publishing, Paris, France.

ÖIR-Managementdienste GmbH. 2004. *Methods for and Success of mainstreaming Leader Innovations and Approach into Rural Development Programmes*. Final Report. Available at http://www.europa.eu.int/comm./agriculture/eval/reports/leder/full.pdf.

Pan-European Common Bird Monitoring Scheme (PECBMS), 2011. *Trends of Common Birds in Europe*. 2011 Update. Available at http://www.ebcc.info/index.php?ID=457.

Purser Tarleton Russell Ltd., 2000. *Guidelines for Forest Harvesting and the Environment.* Report prepared for the Forest Service, Department of the Marine and Natural Resources. Purser Tarleton Russell Ltd., Dublin, Ireland.

Raven, J.A., Andrews, M. and Quigg, A., 2005. The evolution of oligotrophy: implications for the breeding of crop plants for low input agricultural systems. *Annals Applied Biology* **146:** 261–280.

Reynolds, B., 2004. Continuous cover forestry: possible implications for surface water acidification in the UK uplands. *Hydrology and Earth System Sciences* **8:** 306–313.

Robinson, M. and Blyth, K., 1982. The effect of forestry drainage operations on upland sediment yields: a case study. *Earth Surface Processes and Landforms* **7:** 85–90.

Rodgers, M., O'Connor, M., Healy, M.G., O'Driscoll, C., Asam, Zaki-ul-Zaman, Nieminen, M., Poole, R., Mûller, M. and Xiao, L., 2010. Phosphorus release from forest harvesting on an upland blanket peat catchment. *Forest Ecology and Management* **260:** 2241–2248.

Ross, E.D., 2004. *A Pilot Project to Develop a Monitoring Protocol for the Freshwater Pearl Mussel* Margaritifera margaritifera *(L.) in the Caragh River, County Kerry, Ireland*. Report for the National Parks and Wildlife Service, Dublin, Ireland.

Ross, E.D., 2006. *Report on Searches for Juvenile* Margaritifera margaritifera *(L.) in the Caragh River, Co. Kerry.* Report for the National Parks and Wildlife Service, Dublin, Ireland.

Scoles, S., Anderson, S., Turton, D. and Miller, E., 1996. *Forestry and Water Quality: a Review of Watershed Research in the Ouachita Mountains.* Circular E-932, Water Quality Series. Stillwater, Oklahoma Cooperative Extension Service, Division of Agricultural Sciences and Natural Resources, Oklahoma State University: Oklahoma State, USA.

Secretariet of the Convention of Biological Diversity, 2001. *Handbook of the Convention of Biological Diversity.* Earthscan, London, UK.

Swank, W.T., Vose, J.M. and Elliott, K.J., 2001. Long-term hydrologic and water quality responses following commercial clearcutting of mixed hardwoods on a southern Appalachian catchment. *Forest Ecology and Management* **143:** 163–178.

SERBD (South Eastern River Basin District), 2010. *Water Matters – Our Plan. South Eastern River Basin Management Plan (2009-2015).* Available at http://www.wfdireland.ie.

ShIRBD, 2006. *Small Streams Risk Score.* Final Report. Shannon River Basin District, Limerick, Ireland. Available at http://www.shannonrbd.com/pdf/ShIRBD_SSRS_Summary220906.pdf.

ShIRBD (Shannon International River Basin District), 2010. *Water Matters – Our Plan. Shannon River Basin Management Plan (2009–2015).* Available at http://www.wfdireland.ie.

Styles, D. and Jones, M.B., 2010. *Emissions from IPPC Industry: Quantifying Pollution Trends and Regulatory Effectiveness.* Environmental Research Centre Report. Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland.

SWRBD (South Western River Basin District), 2010.

Water Matters – Our Plan. South Western River Basin Management Plan (2009–2015). Available at http://www.wfdireland.ie.

Taylor, D., Dalton, C., Leira, M., Jordan, P., Chen, G., León-Vintro, L., Irvine, K., Bennion, H. and Nolan, T., 2006. Recent histories of six productive lakes in the Irish Ecoregion based on multiproxy palaeolimnological evidence. *Hydrobiologia* **571:** 237–259.

USEPA, 2008. *Handbook for Developing Watershed TMDLs (Draft).* USEPA, Washington, DC, USA.

Von Haaren, C. and Reich, M., 2006. The German way to greenways and habitat networks. *Landscape and Urban Planning* **76:** 7–22.

Williams, L., Harrison, S. and O'Hagan, A.M., 2012. *The Use of Wetlands for Flood Attenuation*. An Taisce, Dublin, Ireland.

WRBD (Western River Basin District), 2010. *Water Matters – Our Plan. Western River Basin Management Plan (2009–2015)*. Available at http://www.wfdireland.ie.

Glossary and Acronyms

AA	Appropriate Assessment for Natura 2000 sites as required under the Habitats Directive.
Acidification (artificial)	The rough canopies of mature evergreen forests are efficient scavengers of particulate and gaseous contaminants in polluted air. This results in a more acidic deposition under the forest canopies than in open land. Chemical processes at the roots of trees, evergreens in particular, further acidify the soil and soil water in forest catchments. When the forests are located on poorly buffered soils, these processes can lead to a significant acidification of the run-off water and consequent damage to associated streams and lakes.
ACP	Agricultural Catchment Programme
ARC	Activities Requiring Consent
AFBI	Agri-Food and Biosciences Institute
Artificial water body	A body of surface water created by human activity.
Biodiversity	Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.
CDP	County Development Plan
Coastal waters	That area of surface water on the landward side of a line, every point of which is at a distance of 1 nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.
cSAC	Candidate Special Area of Conservation
DAFF	Department of Agriculture, Fisheries and Food
DAFM	Department of Agriculture, Food and the Marine
DAHG	Department of Arts, Heritage and the Gaeltacht
DCENR	Department of Communications, Energy and Natural Resources
DECLG	Department of the Environment, Community and Local Government
DEHLG	Department of the Environment, Heritage and Local Government
DETE	Department of Enterprise, Trade and Employment
Diffuse sources (of pollution)	Non-point sources primarily associated with run-off and other discharges related to different land uses such as agriculture and forestry, from septic tanks associated with rural dwellings and from the land spreading of industrial, municipal and agricultural wastes.
EC	European Commission

EcIA	Ecological Impact Assessment
Ecological status	An expression of the structure and functioning of aquatic ecosystems associated with surface waters. Such waters are classified as being of good ecological status when they meet the requirements of the Water Framework Directive.
Ecology	The study of the relationships among organisms and between those organisms and their non-living environment.
Ecosystem	A community of interdependent organisms together with the environment they inhabit and with which they interact; community and environment being distinct from adjacent communities and environments.
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EQR	Ecological Quality Ratio
EU	European Union
Eutrophic	Having high primary productivity, the result of high nutrient content.
Eutrophication	The process of enrichment of water by nutrients (principally phosphorus and nitrogen). The nutrients accelerate plant growth, disturbing the balance of aquatic plants and animals and affecting water quality.
GIS	Geographical Information Systems
Good status	A collective term used to refer to the status achieved by a surface water body when both its ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at least good.
Groundwater	All water that is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. This zone is commonly referred to as an aquifer, which is a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow a significant flow of groundwater or the abstraction of significant quantities of groundwater.
GSI	Geological Survey of Ireland
Heavily modified water body	A water body that has been changed substantially in character as a result of physical alterations by human activity.
HSE	Health Service Executive
Hydromorphology	A study of the quantity and dynamics of water flow within a water body that has variations in its width, depth, structure and substrate of bed and riparian zone.
Inland Fisheries Ireland	State agency responsible for inland fisheries and sea angling.
Inland surface waters	All standing or flowing water on the surface of the land (such as reservoirs, lakes, rivers) on the landward side of the baseline from which the breadth of territorial waters is measured.

Invasive alien species	Invasive alien species are non-native plants or animals that successfully establish themselves in aquatic and fringing habitats and damage natural flora and fauna.
LA	Local authority
LAP	Local Area Plan
Leachate	The liquid containing dissolved and suspended contaminants that is formed as percolating water passes through potentially polluting materials. The term is generally associated with landfills.
lu	Livestock unit
Mitigation measures	Measures to avoid, prevent, minimise, reduce or, as fully as possible, offset or compensate for any significant adverse effects on the environment, as a result of implementing a plan or programme.
NAP	National Action Programme
Natura Impact Statement (NIS)	Natura Impact Statement – the statement prepared following Appropriate Assessment for Natura 2000 sites as required under the Habitats Directive
NHA	National Heritage Area
NPWS	National Parks and Wildlife Service
NTCG	National Technical Coordination Group
Oligotrophic	Water bodies that are poorly nourished or unproductive.
On-site system	Septic tank or other system for treating waste water from unsewered properties.
OOAO	One-out-all-out
OPW	The Office of Public Works
Programme of Measures (POMs)	Those actions, defined in detail, which are required to achieve the environmental objectives of the Directive within a river basin district.
Protected area	Water protected by European legislation, including drinking waters, shellfish waters, bathing waters, urban waste water, nutrient-sensitive areas or sites designated as Special Areas of Conservation or Special Protected Areas.
PRP	Pollution Reduction Programme
Quantitative status	An expression of the degree to which a body of groundwater is affected by direct and indirect abstractions. If this complies with Directive requirements the status is good.
RBMP	River Basin Management Plan
REPS	Rural Environment Protection Scheme
River basin	The area of land from which all surface water run-off flows, through a sequence of streams, rivers and lakes into the sea at a single river mouth, estuary or delta.

River Basin District (RBD) & International River Basin District (IRBD)	Administrative area for co-ordinated water management, composed of multiple river basins (or catchments), with cross-border basins (i.e. those covering the territory of more than one Member State) assigned to an international RBD.
SAC	Special Area of Conservation – Site designated according to the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora).
SEA	Strategic Environmental Assessment
Sedimentation	The deposition by settling of a suspended material.
SPA	Special Protection Area – Area designated under the European Directive on the Conservation of Wild Birds.
SSRS	Small Stream Risk Score
Statutory Instrument (SI)	Any order, regulation, rule, scheme or bye-law made in exercise of a power conferred by statute.
Surface water	Inland waters on the land surface (such as reservoirs, lakes, rivers, transitional waters, coastal waters) within a river basin.
SWMI	Significant Water Management Issue
TMDL	Total Maximum Daily Load
Transitional waters	Bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their vicinity to coastal waters, but which are substantially influenced by freshwater flows.
Water body	A coherent subunit in the river basin (district) to which the environmental objectives of the directive must apply. Hence, the main purpose of identifying 'water bodies' is to enable the status to be accurately described and compared to environmental objectives
WFD	Water Framework Directive – The WFD is European legislation that promotes a new approach to water management through river basin planning. It covers inland surface waters, estuarine waters, coastal waters and groundwater.
WISE	Water Information System for Europe
WMU	Water Management Unit – Geographical subunit of a river basin district consisting of a number of water bodies relevant to a particular sub-catchment.

Appendix 1

Table A1.1. High status river sites by county as determined during the 2007–2009 Water Framework Directive monitoring period (rivers (N = 295) with high status sites – Q4–5 and Q5 (N = 407) in Ireland between 2007 and 2009).

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
1	Clody	12C030080	Bridge near Source	286115	155292	4–5	Carlow
2	Clody	12C030200	Ford (Br) 3 km u/s Bunclody	289682	154877	4–5	Carlow
3	Derreen	12D010700	Rathglass Bridge	287089	170322	4–5	Carlow
4	Bellavally Stream	26B320120	Bridge SE of Carty's Bridge	208900	325600	4–5*	Cavan
5	Roo	36R020200	Bridge W of Barran	203133	335566	5	Cavan
6	Shannon (Upper)	26S020200	Metal Bridge S of Tullynafreave	202094	328921	4–5	Cavan
7	Shannon (Upper)	26S020300	Dowra Bridge	199124	326694	4–5	Cavan
8	Swanlinbar	36S010100	Commas Bridge	214898	324800	4–5	Cavan
9	Annageeragh	28A020100	Moyglass Bridge	108007	172392	4.5	Clare
10	Ardcloony	25A030100	Ballycorney Bridge	166965	170671	5	Clare
11	Aughaglanna	28A060700	Bridge u/s Inagh River confl.	121286	177346	4–5	Clare
12	Ayle	25A070400	Bridge u/s Cloghaun River confl.	154346	183526	4.5	Clare
13	Blackwater (Clare)	25B060120	Bridge d/s Killaly's Bridge	159307	165480	4–5	Clare
14	Blackwater (Clare)	25B060250	Bridge SW of Mt St Catherine	161199	161530	4.5	Clare
15	Bleach	25B070190	Bridge u/s Bleach Bridge	157330	195920	4–5	Clare
16	Bow	25B100200	Cloontymweenagh Bridge	167422	185157	5	Clare
17	Broadford	27B020300	Just u/s South Branch confl.	161045	172072	4–5	Clare
18	Broadford	27B020600	Near Graffa Bridge	159231	171945	4–5	Clare
19	Broadford	27B020800	Bridge u/s Doon Lough	155663	173446	4–5	Clare
20	Caher (Clare)	28C010200	Carha Bridge	116316	208235	4–5	Clare
21	Clooneenagh Stream	28C081100	Creegh North Bridge	105305	167360	4–5	Clare
22	Corra	25C090400	Gortaderry Bridge	159503	189303	4–5	Clare
23	Derrainy	25D100200	Bridge at Derrainy	174987	191548	4–5	Clare
24	Drumandoora	25D060500	2nd Bridge u/s Lough Graney	153711	195643	4–5	Clare
25	Graney (Shannon)	25G040025	Caher Bridge	155396	190000	4–5	Clare
26	Graney (Shannon)	25G040100	Aughaderreen Bridge	158150	189587	4.5	Clare
27	Graney (Shannon)	25G040200	Cooleen Bridge	160294	186009	4–5	Clare
28	Mountrice	25M030300	Bridge u/s Blackwater River confl.	158200	166128	4.5	Clare
29	Owenogarney	27O010100	Bridge u/s Ballymacdonnell Bridge	159600	177936	4–5*	Clare
30	Owenogarney	27O010300	Bridge u/s Doon Lough	155626	175773	4–5	Clare
31	Owenogarney	27O010600	Agouleen Bridge I	150820	171250	4–5	Clare

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
32	Rine	27R010200	Bridge W-SW of Commons	147377	186863	4–5	Clare
33	Adrigole	21A010200	Adrigole Bridge	81180	50719	4–5	Cork
34	Allow	18A020100	Raheen Bridge	136531	115606	4–5	Cork
35	Allow	18A020300	John's Bridge	139481	109832	4–5	Cork
36	Araglin (Blackwater)	18A030200	Elizabeth's Bridge	190184	105216	4.5	Cork
37	Araglin (Blackwater)	18A030500	Coolalisheen Bridge	184988	100586	4–5	Cork
38	Awboy	19A030200	Awboy Bridge	134994	79154	4–5	Cork
39	Ballymahane	20B010700	Alcock's Bridge	145182	57347	4.5	Cork
40	Blackwater (Bandon)	20B040800	Blackwater Bridge	131203	53534	4–5	Cork
41	Blackwater (Munster)	18B020200	Nohaval Bridge	117274	94272	4–5	Cork
42	Blackwater (Munster)	18B020750	Ford SW of Dromsicane	126834	92720	4–5	Cork
43	Blackwater (Munster)	18B020900	Colthurst Bridge	132816	95469	4–5	Cork
44	Blackwater (Munster)	18B021000	Ballymaquirk Bridge	138152	98787	4–5	Cork
45	Blackwater (Munster)	18B021200	Roskeen Bridge	144272	98875	4–5	Cork
46	Blackwater (Munster)	18B021400	Longfield's Bridge	151654	97625	4.5	Cork
47	Blackwater (Munster)	18B021900	Killavullen Bridge	164841	99774	4.5	Cork
48	Bride (Lee)	19B040600	Bridge at Crookstown LHS	142645	65936	4–5	Cork
49	Bride (Lee)	19B040610	Bridge at Crookstown RHS	142645	65936	4–5	Cork
50	Bride (Lee)	19B040900	Coolmucky Bridge	146046	67832	5	Cork
51	Bride (Lee)	19B041300	Kilcrea Bridge	150906	68380	4–5	Cork
52	Brinny	20B070100	Brinny Bridge	151672	59131	4–5	Cork
53	Caha	20C010700	Caha Bridge	124342	56018	4–5	Cork
54	Cloghane	21C080300	Knockroe Bridge	60150	41259	4.5	Cork
55	Clyda	18C020070	Athnalacka Bridge	153498	88800	4–5	Cork
56	Clyda	18C020090	Athnaleenta Bridge	155583	90492	4.5	Cork
57	Coomhola	21C030200	Bridge nr Knockanecosduff	103911	60037	4–5	Cork
58	Coomhola	21C030500	Coomhola Bridge	99448	55526	4–5	Cork
59	Dalua	18D010300	Footbridge SW of Liscongill	132477	104581	4.5	Cork
60	Douglas (Araglin)	18D030400	Glansheskin Bridge	183972	103411	4–5	Cork
61	Douglas (Sullane)	19D040700	Bridge u/s Sullane River confl.	121324	75192	4–5	Cork
62	Dripsey	19D060150	Dripsey Bridge (Lower)	146124	79630	4–5	Cork
63	Farahy	18F010300	Ballyguyroe Bridge	167694	111560	4.5	Cork
64	Foherish	19F020100	Bridge N of Curraleigh	126389	80956	4–5	Cork
65	Foherish	19F020300	W of Caherbirrane	129081	79198	4–5	Cork
66	Foherish	19F020600	Carrigaphooca Bridge	129654	73741	4–5	Cork
67	Funshion	18F050100	Ballyaghaderg Bridge	180857	114836	4.5	Cork

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
68	Funshion	18F050500	Glenavuddig Bridge (LHS)	172317	110808	4.5	Cork
69	Funshion	18F050510	Glenavuddig Bridge (RHS)	172317	110808	4.5	Cork
70	Funshion	18F050700	Bealalaboga Bridge	173765	106836	4.5	Cork
71	Funshion	18F050900	Ballynahow Bridge	179256	102997	4–5	Cork
72	Funshion	18F051000	Downing Bridge	182314	101833	4.5	Cork
73	Garrane (Lee)	19G030200	Garrane Bridge	127067	81218	4–5	Cork
74	Glashagloragh (Cork)	20G020400	Inchinattin Bridge	129127	44758	4.5	Cork
75	Glen (Banteer)	18G040100	Glencam Bridge	142197	87895	4–5	Cork
76	Glen (Banteer)	18G040600	Lacka Bridge	142567	92177	4–5	Cork
77	Glen (Banteer)	18G041100	Banteer Bridge	139451	98205	5	Cork
78	Glengarriff	21G030300	Footbridge NW of Glengarriff	91750	56879	4–5	Cork
79	Ilen	20I010100	Moyny Bridge	111517	46628	4–5	Cork
80	Laney	19L010200	Knocknagappul Bridge	135451	79688	4–5	Cork
81	Laney	19L010400	Morris's Bridge	135688	75528	4–5	Cork
82	Laney	19L010500	Laney Bridge	135296	72721	4–5	Cork
83	Leamawaddra	20L010400	Crooked Bridge	102293	34843	4–5	Cork
84	Lee (Cork)	19L030010	Ford u/s Gouganebarra Lake	109447	66391	4–5	Cork
85	Magannagan Stream	21M020100	Mangannagan Bridge	92344	54766	4–5	Cork
86	Mealagh	21M010100	Mealagh Bridge	111820	53322	4–5	Cork
87	Mealagh	21M010200	Bridge SE of Ards More	106464	52915	5	Cork
88	Nad	18N010400	Nad Bridge	142686	91273	4–5	Cork
89	Ogeen	18O010200	Ballintlea Bridge	165136	112981	4–5	Cork
90	Ogeen	18O010400	Labbavacun Bridge	162602	108149	4.5	Cork
91	Owenanare	18O040600	Just u/s Dalua River confl.	135221	106540	4.5	Cork
92	Owenbaun (Rathcool)	18O050900	Bride's Bridge	133484	93229	4–5	Cork
93	Owenbeg (Owvane)	21O030200	Bridge E of Maugha	107136	60147	4–5	Cork
94	Owennashingaun	20O020200	Trawlebane Bridge	104989	48101	4–5	Cork
95	Owennashingaun	20O020700	Inchingerig Bridge	109028	45278	4–5	Cork
96	Owentaraglin	18O091100	Cullen Bridge	123363	95978	4–5	Cork
97	Owentaraglin	18O091200	Bridge u/s Blackwater River confl.	122167	93694	4.5	Cork
98	Ownagappul	21O090200	Slieve Bridge	69006	55038	4.5	Cork
99	Owngar (Cork)	21O040400	Cahermoanteen Bridge	106465	56629	4–5	Cork
100	Owvane (Cork)	21O070200	Cappabo Bridge	108845	59017	4–5	Cork
101	Sheep	18S030400	Kilclooney Bridge	173856	115337	4.5	Cork
102	Sheep	18S030600	O'Brien's Bridge	173809	111789	4.5	Cork

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
103	Shournagh	19S010100	Ballyvodane Bridge	153075	80941	4–5	Cork
104	Shournagh	19S010200	E of Gortdonaghmore	156715	77115	4–5	Cork
105	Sullane	19S020300	Sullane Bridge	126048	74088	4–5	Cork
106	Sullane	19S020400	Linnamilla Bridge	131141	72792	4–5	Cork
107	Toon	19T020200	Bridge S of Lack More	119551	71029	4–5	Cork
108	Toon	19T020700	Second Bridge u/s Lee River confl.	126060	69190	4–5	Cork
109	Trafrask Stream	21T030300	Trafrask Bridge	85145	49578	4–5	Cork
110	Bredagh	40B020200	Moglass Bridge	258225	442594	4–5	Donegal
111	Bridgetown (Donegal)	37B030030	Bridge W Lough Naboy	197925	370530	4–5	Donegal
112	Bullaba	39B010100	600 m u/s Owenwee River	201100	413760	5	Donegal
113	Calabber	38C010300	2 km d/s Calabber Bridge	203369	423980	4–5	Donegal
114	Corabber	37C010100	Bridge u/s Lough Eske	197506	386218	4–5	Donegal
115	Cronaniv Burn	38C060100	Bridge u/s Dunlewy Lough	193109	418649	4–5	Donegal
116	Deele (Donegal)	01D010040	Bridge N of Aughkeely	212377	402836	4–5	Donegal
117	Devlin (Donegal)	38D010080	0.5 km u/s bridge u/s Dunlewy Lough	192884	418619	5	Donegal
118	Eglish	37E040100	Bridge at Meenataggart	192548	386018	4–5	Donegal
119	Fintragh	37F010100	Bridge W of Corrin Lodge	169353	376874	4–5	Donegal
120	Glenna	38G010200	Bedlam Bridge	191063	430012	4–5	Donegal
121	Glennagannon	40G010015	Bridge SW Shones Hill	249822	440795	4–5	Donegal
122	Glenvar	39G040300	Bridge at Milltown	226554	434982	4–5	Donegal
123	Gweebarra	38G020100	Pollglass Bridge	195017	414076	4–5	Donegal
124	Leannan	39L010100	Gartan Bridge	206881	416990	4–5	Donegal
125	Leannan	39L010800	Bridge NNE Bayhill	221996	420893	4–5	Donegal
126	Long Glen	40L010200	Bridge u/s Kinnagoe Bay	262659	446185	4–5	Donegal
127	Lough Agher Stream	38L020200	Bridge 0.6 km u/s Ray River confl.	196067	430825	4.5	Donegal
128	Lough Nastackan Stream	40L030400	Bridge u/s Sea (White Strand)	259088	447485	4–5	Donegal
129	Mill (Donegal)	39M020050	Ford NE of Deehan's Town	240743	430044	4–5	Donegal
130	Oily	37O010020	Bridge d/s Tamur Lough	180011	385073	5	Donegal
131	Oily	37O010050	Ford SW of Corker Beg	176130	382666	4–5	Donegal
132	Owencarrow	38O030300	New Bridge	207803	427068	4–5	Donegal
133	Owenteskiny	37O020300	S of Durlough (roadside)	166513	386721	4–5	Donegal
134	Owenteskiny	37O020600	1 km u/s confl. with Glen River	161870	385355	4–5	Donegal
135	Owenveagh	38O140080	1.2 km u/s Glenveagh Lough	199353	418299	5	Donegal
136	Ray	38R010200	Drumavoghy Bridge	195221	432634	4.5	Donegal
137	Stragar	37S020100	Meentullynagarn Bridge	174211	382791	4–5	Donegal

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
138	Straid	40S010400	1 km d/s Strath's Bridge	243363	448254	4–5	Donegal
139	Tullinteane	37T010400	Just u/s Oily River confl.	176072	382714	4–5	Donegal
140	Waterfoot	36W030700	Letter Bridge	208500	365143	4–5	Donegal
141	Camac	09C020100	Bridge 1 km SW (u/s) of Saggart	303438	226052	4–5	Dublin
142	Owenadoher	09O011100	Bridge NE of Jamestown	313385	224011	4–5	Dublin
143	Ballinlough Stream	25B150050	Bridge S Acres	167848	202290	4.5	Galway
144	Ballinlough Stream	25B150300	Bridge at Ballygowan	173200	204075	4.5	Galway
145	Ballinlough Stream	25B150500	Bridge u/s Cappagh River	176786	205015	4.5	Galway
146	Beagh	29B020100	S Cloghnakeava	146728	200612	4.5	Galway
147	Black (Shrule)	30B020200	Bridge in Shrule	128031	252598	4.5	Galway
148	Cammanagh	30C040100	Bridge u/s Lough Mask	97834	256851	4–5	Galway
149	Cappagh (Galway)	25C030100	Metal Bridge	168182	211277	4.5	Galway
150	Cashla	31C010100	Cashla Bridge	97806	226404	4–5	Galway
151	Clare (Galway)	30C011300	Curraghmore Bridge	132111	232828	4–5	Galway
152	Dawros	32D010100	Tullywee Bridge	72917	258490	4.5	Galway
153	Dawros	32D010200	Dawros Bridge	70180	259745	4–5*	Galway
154	Derryehorraun	32D040200	Just u/s Salt Lough	67132	249373	4–5	Galway
155	Dooghta	30D020100	Ford to W of Dooghta	101405	253056	4–5	Galway
156	Drumkeary Stream	25D110350	Second Bridge u/s Duniry River	169636	207376	4.5	Galway
157	Duniry	25D070400	Just u/s Cappagh River confl.	172204	208956	5	Galway
158	Failmore	30F010100	Teernakill Bridge	96247	252111	4–5	Galway
159	Island	26I030300	Bridge SW Bookalagh	166216	272970	4–5	Galway
160	Island	26I030400	Castlerea Bridge – Ballymoe	169477	271718	4–5	Galway
161	Knocknarebana	29K040100	Bridge W of Tooravoola	155313	201183	4–5	Galway
162	Lough Nabrocky Stream	31N010100	Bridge E of Loughanillaun S	85658	240125	4.5	Galway
163	Owenboliska	31O010200	Bridge in Spiddal	112742	222517	4.5	Galway
164	Owendalulleegh	29O010500	Ford at Tooraglassa	160197	201219	4–5	Galway
165	Owendalulleegh	29O010800	Bridge 750 m N of Scalp	154668	198941	5	Galway
166	Owendalulleegh	29O010900	Ford at Derreen	151724	198386	5	Galway
167	Owendalulleegh	29O011000	Bridge SE Killafeen	148354	197128	4.5	Galway
168	Owengowla	31O020300	Bunnahown Bridge	81826	239769	4–5	Galway
169	Owenriff (Corrib)	30O020070	1 km d/s Lough Agraffard	107289	242061	4–5	Galway
170	Owenriff (Corrib)	30O020100	1 km u/s Oughterard Bridge	110778	242519	4–5	Galway
171	Recess	31R010100	Bunskannive Bridge	93634	246316	4–5	Galway
172	Recess	31R010700	Cloonbeg Bridge	75897	246571	5	Galway
173	Shiven (South)	26S030400	Islandcausk Bridge	178709	249360	4–5	Galway

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
174	Streamstown (Clifden)	32S040200	Bridge SW of Glenbrickeen	64642	253141	4–5	Galway
175	Suck	26S071100	Ballyforan Bridge	181567	246442	4–5	Galway
176	Traheen	32T010100	Traheen Bridge	68756	256850	4–5	Galway
177	Woodford (Galway)	25W010300	Rossmore Bridge	177206	198435	4–5	Galway
178	Ardsheelhane	21A020200	Just u/s Sneem River confl.	69026	67588	4–5	Kerry
179	Behy (Kerry)	22B021000	Ballynakilly Bridge	64433	87860	4–5	Kerry
180	Blackwater (Kerry)	21B030200	1.5 km u/s Blackwater Bridge	79380	69461	5	Kerry
181	Caherlehillan Stream	22C200100	Bridge WSW of Coulagh	57037	83300	4–5	Kerry
182	Caragh	22C020600	Blackstones Bridge	70954	86375	5	Kerry
183	Cleady	21C020300	Cleady Bridge	94319	72220	4–5	Kerry
184	Coomaglaslaw Lough Stream	22C190400	First Bridge d/s Coomaglaslaw Lough	62455	86766	4–5	Kerry
185	Coomeelan Stream	21C140200	Bridge u/s Sheen River confl.	95777	63913	4–5	Kerry
186	Coomnacronia Lough Stream	22C180300	Bridge W of Ballynakilly Bridge	64299	87740	4–5	Kerry
187	Cottoner's (Laune)	22C050100	Bridge NW of Breanlee	76789	86771	4–5	Kerry
188	Crinnagh	22C070200	Cromglen Bridge	92826	82623	4–5	Kerry
189	Croaghane	22C090100	Sheheree Bridge	106386	109862	4–5	Kerry
190	Cruttia Lough Stream	23C110100	Bridge d/s Lough Cruite	49161	108563	4–5	Kerry
191	Cummeragh	21C040600	Dromkeare Bridge	54537	68551	4–5	Kerry
192	Derreendarragh	21D030300	Bridge near Derreendarragh	79543	72590	4–5	Kerry
193	Drumoghty	21D040400	Dawros Bridge	87776	67666	4.5	Kerry
194	Feale	23F010500	Duag Bridge	107185	130582	4–5	Kerry
195	Finglas	23F030400	Bridge d/s Curraduff Bridge	69867	109708	4–5	Kerry
196	Finglas (Laune)	22F030400	Cappagh Bridge	81077	91442	4–5	Kerry
197	Finow	22F040100	Bridge 0.3 km u/s Lough Guitane	103336	83943	5	Kerry
198	Flesk (Kerry)	22F020040	Bridge u/s Clydagh Bridge	113760	83596	4–5	Kerry
199	Flesk (Kerry)	22F020060	Poulgorm Bridge	109582	81735	5	Kerry
200	Flesk (Kerry)	22F020100	Curreal Bridge	106641	85385	5	Kerry
201	Flesk (Kerry)	22F020250	Ford NE of Faghcullia	100247	87972	4–5	Kerry
202	Gaddagh	22G010300	Ford SW of Gortboy	82856	88415	4–5	Kerry
203	Gearhameen	22G030100	Bridge N of Cockow	82407	80967	4–5	Kerry
204	Gearhameen	22G030300	Bridge u/s Owenreagh River confl.	87501	82162	4–5	Kerry
205	Groin	22G080300	Bridge E of White Gate Crossroads	78907	103917	4–5	Kerry
206	Isknagahiny Lough Stream	21I030100	Bridge NW of Caunteens	59762	65805	4–5	Kerry
207	Meelagh	22M020100	Bridge u/s Caragh River confl.	70052	86278	4–5	Kerry
208	Owbeg (Roughty)	21O020500	Ardtully Bridge	98731	73326	4–5	Kerry

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
209	Owenmore (Kerry)	23O030300	Bridge at Boherboy	51285	110745	5	Kerry
210	Owenreagh	22O030100	Bridge E of Graignagreana	84009	78588	4–5	Kerry
211	Owenreagh	22O030400	Bridge u/s Upper Lake	88404	82103	5	Kerry
212	Owenshagh	21O080100	Lauragh Bridge	77844	58522	4.5	Kerry
213	Owneykeagh	22O050400	Bridge u/s Flesk River confl.	106791	86952	4–5	Kerry
214	Owreagh	21O050300	Bridge W of Sneem	68024	66707	4–5	Kerry
215	Quagmire	22Q010400	Annagh Bridge	109629	95047	4–5	Kerry
216	Roughty	21R010020	Bridge NE of Knockanruddig	108779	70951	4–5	Kerry
217	Roughty	21R010060	Inchee Bridge (RHS)	107735	73939	4–5	Kerry
218	Roughty	21R010070	Inchee Bridge (LHS)	107735	73939	4–5	Kerry
219	Roughty	21R010250	Ford d/s Slaheny River confl.	99832	72862	4.5	Kerry
220	Scorid	23S010200	Bridge E of Kilmurry	53318	110144	4–5	Kerry
221	Sheen	21S010100	Releagh Bridge	92320	62907	4–5	Kerry
222	Sheen	21S010600	Bridge nr Dromanassig Waterfall	95233	67977	4.5	Kerry
223	Slaheny	21S020300	Ford NE of Shandrum	101923	69685	4–5	Kerry
224	Sneem	21S030200	Bridge E of Dromtine Lough	67057	69862	4–5	Kerry
225	Sneem	21S030400	Bridge u/s Ardsheelhane River confl.	68914	67532	4–5	Kerry
226	Tahilla	21T010200	Tahilla Bridge	74433	65811	4–5	Kerry
227	Teeromoyle Stream	22T040500	Toon Bridge	56181	82222	4–5	Kerry
228	Lemonstown Stream	09L030600	2nd Bridge u/s Liffey River confl.	291421	208288	4–5	Kildare
229	Morell	09M010300	Morell Bridge (lower)	292675	228879	4–5	Kildare
230	Gowran	14G030020	Bridge E of Freneystown	259800	159235	4–5	Kilkenny
231	Muckalee	15M020100	Bridge N of Cloghpook	254855	165682	4–5	Kilkenny
232	Munster	15M030600	Cappagh Bridge	236133	148542	4–5	Kilkenny
233	Barrow	14B010100	Ford S of Rearyvalley	236128	213025	4.5	Laois
234	Delour	15D010150	Garrafin Bridge	229058	195614	4–5	Laois
235	Delour	15D010400	Derrynaseera Bridge	229478	192448	4–5	Laois
236	Douglas (Laois)	14D030100	Gale's Bridge	265901	186004	4–5	Laois
237	Fushoge	14F030050	Strand Bridge	265441	180437	4–5	Laois
238	Glenlahan	14G020300	Clarahill Bridge	234580	210808	4.5	Laois
239	Gorragh	25G090300	Killart Ho (u/s Clodaigh rv Confl)	232400	212100	4–5	Laois
240	Needleford Stream	15N040200	Needleford Bridge	236650	197980	4–5	Laois
241	Tonet	15T010200	Birchgrove Bridge	223320	194859	4–5	Laois
242	Aghacashlaun	36A030300	Aghlin Bridge	206515	313452	4–5	Leitrim
243	Black (South Leitrim)	26B040300	Bridge u/s Rinn River confl.	210768	286941	4–5	Leitrim
244	Bonet	35B060010	Bridge u/s Glenade Lough	182231	347144	5	Leitrim

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
245	Bonet	35B060100	New Bridge	186973	341274	5	Leitrim
246	Cashel Stream (Bonet)	35C030200	Bridge W of Corratimore	184966	327185	4–5	Leitrim
247	Cloone	26C050100	Wooden Bridge SE of Tooma	215614	301354	4–5	Leitrim
248	Duff	35D050020	Bridge E of Cloontyprughlish	179056	348081	4–5	Leitrim
249	Glenaniff	35G020200	Bridge u/s Lough Melvin	192043	349681	4–5	Leitrim
250	Killanummery	35K030900	Bridge u/s Bonet River confl.	180598	330247	4–5	Leitrim
251	Relagh	26R050400	Bridge u/s Drumroosk Branch confl.	212647	304149	4–5	Leitrim
252	Shanvaus	35S011100	Bridge u/s Bonet River confl.	186433	337773	4.5	Leitrim
253	Behanagh	18B010300	Bridge NW of Carrigeen	186529	119186	5	Limerick
254	Bilboa	25B030080	Bilboa Bridge u/s Blackboy Bridge	181596	151911	4–5	Limerick
255	Funshion	18F050030	Brackbaun Bridge	188956	116822	5	Limerick
256	Mulkear (Limerick)	25M040400	2 km d/s St 0300 (N of Boher at bend)	169578	153093	4.5	Limerick
257	Aghnacliffe Stream	36A060400	1st Bridge u/s Lough Gowna	227350	288747	4–5	Longford
258	Addergoole	34A010600	Bridge u/s Lough Conn	114963	309861	4–5	Mayo
259	Aille (Mayo)	30A020110	Bridge NW of Claureen – E of Killavally	112242	280067	4–5	Mayo
260	Aille (Mayo)	30A020250	Bridge u/s Cloon Lough	114284	276081	4–5	Mayo
261	Altaconey	32A020300	1.5 km d/s Goulaun River	96892	306150	4–5	Mayo
262	Ballinglen	33B010100	Ballinglen Bridge	110246	334211	4–5	Mayo
263	Barroosky	33B080400	0.3 km u/s Glenamoy (end of road)	93087	333218	4–5	Mayo
264	Behy (North Mayo)	34B080400	Behy Bridge	128781	318132	4–5	Mayo
265	Bunanioo	33B090100	Bunanioo Bridge	73722	294193	4–5	Mayo
266	Bundorragha	32B010200	Bridge E of Bundorragha	84182	263413	4–5	Mayo
267	Bunowen (Louisburgh)	32B030050	Bridge N laghta Eighter	85176	275060	5	Mayo
268	Bunowen (Louisburgh)	32B030100	Tully Bridge	81965	277956	4–5	Mayo
269	Burren Stream (Clydagh)	34B130015	Bridge W Derrylahan	114531	297212	5	Mayo
270	Callow Loughs Stream	34C080300	Bridge u/s Yellow River	129356	305629	4–5	Mayo
271	Carrowbeg (Westport)	32C050050	Cloghan Bridge	101084	279825	4–5	Mayo
272	Carrowkeribly Lough Stream	34C070400	Bridge near Ardrass	127707	312002	4–5	Mayo
273	Carrowkeribly Lough Stream	34C070600	Bridge u/s Moy River confl.	126346	310474	4–5	Mayo
274	Carrownisky	32C010020	Glenkeen Bridge	81858	272370	4–5	Mayo
275	Castlebar	34C010020	Bridge near Graffa More	110930	291732	5	Mayo
276	Cloonaghmore	34C030030	Bridge u/s ford SSE Tawnywaddyduff	107128	324369	4–5	Mayo
277	Cloonaghmore	34C030150	Ballintober Bridge	114375	326127	4–5	Mayo
278	Cloonaghmore	34C030270	1.2 km u/s Palmerstown Bridge	116966	331253	4–5	Mayo

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
279	Cloonlavis	34C100300	Bridge u/s Yellow River confl.	135750	285160	4–5	Mayo
280	Clydagh (Castlebar)	34C050030	Bridge NW Ardvarney	114243	296525	5	Mayo
281	Clydagh (Castlebar)	34C050100	Clydagh Bridge	117220	294430	4–5	Mayo
282	Clydagh (Castlebar)	34C050140	Bridge SW Ballyguin	119571	294692	4–5	Mayo
283	Clydagh (Castlebar)	34C050200	Bridge NE Ballyart	122211	296142	4–5	Mayo
284	Crumlin (Lough Cullin)	34C110300	Bridge u/s Lough Cullin	121092	301325	4–5	Mayo
285	Crumpaun	32C030150	N. of Lough Beltra	109004	301432	4–5	Mayo
286	Deel (Crossmolina)	34D010100	Ford E of Ballycarroon House	112102	316034	4–5	Mayo
287	Deel (Crossmolina)	34D010120	Crossmolina Bridge	113770	317650	4–5	Mayo
288	Duvowen	34D030800	Bridge u/s Cloonaghmore River	114125	326062	4–5	Mayo
289	Finny	30F030100	SW of Finny	101024	258646	4.5	Mayo
290	Glenamoy	33G010020	Bridge N Glencarly	96418	334745	4–5	Mayo
291	Glenamoy	33G010050	Bridge SE of Bunalty	92013	333569	4–5	Mayo
292	Glenglassera	33G050100	Bridge near Glenlossera Lodge	102266	341155	4–5	Mayo
293	Glenisland	32G070300	Bridge u/s Lough Beltra	107304	296716	4.5	Mayo
294	Glenlaur	32G020200	400 m d/s Sheefry Bridge	92072	269298	4–5	Mayo
295	Glenree	34G010020	Bridge near Carrownaglogh	136084	319511	4–5	Mayo
296	Glenree	34G010060	0.7 km u/s Brusna River confl.	129030	319334	4–5	Mayo
297	Glensaul	30G010250	0.25 km d/s Bridge in Tourmakeady	109936	267975	4–5	Mayo
298	Glenummera	32G050010	N of Glendavock (w of 88 m bmark)	88486	268260	5	Mayo
299	Glenummera	32G050070	1 km u/s Doo Lough	85340	267585	4–5	Mayo
300	Glore (Mayo)	34G020200	Glore Bridge	135000	291785	4–5	Mayo
301	Keerglen	33K010200	SW of Kilkeerglen	109269	333221	4–5	Mayo
302	Moy	34M020750	At Cuilbaum	126160	300835	4–5	Mayo
303	Owengarve (Sligo)	34O030010	Bridge at Derrynabrock	158793	302104	4–5	Mayo
304	Owengarve (Sligo)	34O030050	Ford NW of Srah Upper	154929	303986	4–5	Mayo
305	Owenmore (Mayo)	33O040050	Bridge SE Srahnakilly	97833	323161	4–5	Mayo
306	Owenmore (Mayo)	33O040250	Ballymonnelly Bridge	93854	321273	4.5	Mayo
307	Pollagh	34P010100	Linban Bridge	132328	285971	4–5	Mayo
308	Sheskin Stream	33S030150	Bridge 1 km u/s Oweniny R	97532	324008	4–5	Mayo
309	Spaddagh	34S030050	Bridge N of Castlesheenaghan	139460	296734	4–5	Mayo
310	Yellow (Foxford)	34Y010100	Ford W of Corlee	132280	308607	5	Mayo
311	Yellow (Foxford)	34Y010400	Bridge u/s Moy River confl.	128236	306728	4–5	Mayo
312	Boyne	07B040800	Inchamore Bridge	271089	250000	4.5	Meath
313	Drumsallagh Stream	06D070070	County Bridge (u/s Magheracloone Branch)	280160	298260	4.5	Monaghan

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
314	Glyde	06G020400	Lagan Bridge	287438	296456	4–5	Monaghan
315	Scotstown	03S020200	Bridge S of Knockballyroney	258876	341359	4–5	Monaghan
316	Breaghmore	25B120080	Just u/s Main River confl.	214777	202270	4–5	Offaly
317	Breaghmore	25B120400	Breaghmore Bridge	214552	203568	4–5	Offaly
318	Camcor	25C020100	Ford u/s Coneyburrow Bridge	221299	204315	4–5	Offaly
319	Anaderryboy	26A030600	Driney Bridge	160675	287389	4–5	Roscommon
320	Feorish (Ballyfarnon)	26F020250	1.2 km d/s Ballyfarnon Bridge	186818	312960	4–5	Roscommon
321	Feorish (Ballyfarnon)	26F020400	Bridge 1.5 km SW of Keadue	189890	310714	4–5	Roscommon
322	Francis	26F050050	Cloonard Bridge	166798	283964	4–5	Roscommon
323	Owenlobnaglaur	34O040200	Bridge S Calveagh Lr	155565	301288	4–5	Roscommon
324	Suck	26S070050	Bridge d/s Lough O'Flynn	159003	280375	4–5	Roscommon
325	Suck	26S070300	Cloondacarra Bridge	167101	278033	4.5	Roscommon
326	Ballysodare	35B050100	Ballysodare Bridge	166847	329027	4–5	Sligo
327	Bellanamean	34B040500	Bridge u/s Eignagh River	140639	309098	4–5	Sligo
328	Duff	35D050250	Brocky Bridge	175221	353206	4–5	Sligo
329	Dunmoran	35D161000	Bridge WNW Longford Demesne	155096	330598	4–5	Sligo
330	Dunneill	35D060050	Bridge E Water Treatment Works	144492	329228	4–5	Sligo
331	Dunneill	35D060100	Bridge NE Dunneill	143741	332461	4–5	Sligo
332	Easky	35E010200	Easky Bridge	137557	337782	4–5	Sligo
333	Eignagh	34E010100	Bridge 1.75 km d/s Lough Talt	141442	313659	5	Sligo
334	Eignagh	34E010300	Bridge u/s Moy River at Cloongoonagh	143097	308108	4–5	Sligo
335	Feorish (Ballyfarnon)	26F020080	Bridge SW Geevagh	183489	316523	4–5	Sligo
336	Finned	35F010100	Bridge ENE of Rathmacurkey	136984	330873	4–5	Sligo
337	Grange (Sligo)	35G040080	Lukes Bridge	169769	347329	4–5	Sligo
338	Lenyvee	34L060300	Bridge ESE Loughannagally	141856	317227	4–5	Sligo
339	Liskeagh	35L021100	Bridge at Clooneagh	169260	305819	4–5	Sligo
340	Moy	34M020100	Bridge SE of Cloonacool	149279	316791	4–5	Sligo
341	Moy	34M020300	Annagh Bridge	146661	312324	4–5	Sligo
342	Owengarve (Sligo)	34O030100	Bridge in Curry	149323	306156	4–5	Sligo
343	Owengarve (Sligo)	34O030200	Dawros Bridge	145310	307417	4–5	Sligo
344	Unshin	35U010500	Ballygrania Bridge	169500	325904	4–5	Sligo
345	Unshin	35U010600	Bridge u/s Ballysodare River	168616	326911	4–5	Sligo
346	Annagh (Tipperary)	25A020200	Charlotte's Bridge	175109	159182	4–5	Tipperary
347	Aughnaglanny	16A050100	Victoria Bridge	199031	148463	4–5	Tipperary
348	Bilboa	25B030010	Bridge in Kilcommon	190189	160111	4–5*	Tipperary

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
349	Burncourt	16B040300	Burncourt Old Bridge	195409	118024	4–5	Tipperary
350	Clodiagh (Tipperary)	16C020040	Gorteenabarna Bridge	198173	165027	4–5	Tipperary
351	Doonane	25D040200	Bridge u/s Newport River confl.	177802	165126	4–5	Tipperary
352	Multeen (East)	16M080300	Clonedarby Bridge	200142	149225	4–5	Tipperary
353	Newport (Tipperary)	25N020060	Bridge nr Glanculloo Old School	183723	168340	4–5	Tipperary
354	Ollatrim	25O010150	Bridge d/s Ollatrim Bridge	198774	180921	4–5	Tipperary
355	Shanbally	16S010100	Caherghaul Bridge	191145	117798	4–5	Tipperary
356	Shanbally	16S010400	Bridge at Shanbally	195178	116996	4–5	Tipperary
357	Tar	16T010030	Bridge NE of Rossrehill	197052	119717	4–5	Tipperary
358	Colligan	17C010090	Scart Bridge (West)	222967	104892	4–5	Waterford
359	Colligan	17C010150	Bridge ESE of Lackandarra	223066	102061	4–5	Waterford
360	Dalligan	17D010300	Ballyvoyle New Bridge	233814	95971	4–5	Waterford
361	Glasha (Waterford)	16G010400	Glen Bridge	230312	122670	4–5	Waterford
362	Glenakeefe	18G060400	Bridge u/s Owennashad River confl.	205194	101657	5	Waterford
363	Glennafallia	18G100040	Bridge NW of Crow Hill	210881	105078	4–5	Waterford
364	Glenshelane	18G110300	Just u/s Glennafallia River confl.	211604	100900	4–5	Waterford
365	Mahon	17M010100	Mahon Bridge	234225	106019	4–5	Waterford
366	Nier	16N010010	Labatt's Bridge	224995	113971	4–5	Waterford
367	Nier	16N010100	Bridge ENE of Ballymacarbry	219897	112873	4–5	Waterford
368	Owennashad	18O080060	Footbridge nr Moneygorm Bridge	204662	104198	4–5	Waterford
369	Owennashad	18O080140	Drumber Bridge	204680	101653	4–5	Waterford
370	Tay	17T010050	Aughnacurra Bridge	231942	104035	4–5	Waterford
371	Askinvillar Stream	12A030200	Askinvillar Bridge	284907	145806	4–5	Wexford
372	Bann	12B010100	Pallis Bridge	311591	168208	4–5	Wexford
373	Bann	12B010200	Bridge at Hollyfort	312177	164156	4–5	Wexford
374	Bann	12B010400	Margerry's Bridge	311485	159358	4–5	Wexford
375	Bann	12B010450	Island Bridge	309475	157659	4–5	Wexford
376	Bann	12B010900	Doran's Bridge	302213	148485	4–5	Wexford
377	Owenduff (Wexford)	13O010180	Mullinderry Bridge	280999	116623	4–5	Wexford
378	Urrin	12U010050	Ballycrystal Bridge	286398	148585	5	Wexford
379	Annalecka Brook	09A010100	Annalecka Bridge	305682	201893	4–5	Wicklow
380	Askanagap Stream	10A060400	Bridge u/s Derry River confl.	305728	176712	4–5	Wicklow
381	Avonbeg	10A040100	Ford nr Barravore	306591	194165	4–5	Wicklow
382	Avonmore	10A050010	Old Bridge	316092	206179	4–5	Wicklow
383	Avonmore	10A050020	Old Bridge	316041	201833	4.5	Wicklow
384	Avonmore	10A050200	Clara Bridge	316871	192098	4–5	Wicklow

Table A1.1 *contd*

No.	River Name	EPA ID	Station location	X	Y	Last Q value	Authority
385	Ballydonnell Brook	09B030100	Ballylow Bridge	306009	212982	5	Wicklow
386	Cloghoge Brook	10C010100	Bridge u/s Annamoe River confl.	315895	206011	4–5	Wicklow
387	Cock Brook	09C040100	Bridge NW of Kilmore	302092	208816	4–5	Wicklow
388	Coolboy Stream	12C070700	Lattin Bridge	301064	168953	4–5	Wicklow
389	Dargle	10D010010	Bridge u/s Tinnehinch Bridge	320394	214724	4–5	Wicklow
390	Derreen	12D010050	Bridge SW of Toorboy	299625	187418	5	Wicklow
391	Derry Water	10D020300	Bridge NW of Moyne	303137	180187	4–5	Wicklow
392	Derry Water	10D020600	Ballinglen Bridge	306604	175870	5	Wicklow
393	Douglas (Liffey)	09D020200	Granamore Bridge	297774	203131	4–5	Wicklow
394	Glencullen	10G020300	2 km u/s Enniskerry Bridge	321413	218176	4–5	Wicklow
395	Glendasan	10G060100	Bridge nr Old Lead Works	309896	198218	4.5	Wicklow
396	Glenealo	10G050100	Ford u/s Upper Lake	309042	196177	4–5	Wicklow
397	Glenealo	10G050400	Just u/s Avonmore R	314368	195611	5	Wicklow
398	Glenmacnass	10G030600	Just u/s Avonmore River confl.	314512	196445	4–5	Wicklow
399	King's (Liffey)	09K010100	Lockstown Bridge	297931	203395	4–5	Wicklow
400	Knickeen	12K010250	Bridge NW of Ballyvoghan	298665	194867	4–5	Wicklow
401	Lemonstown Stream	09L030100	Bridge E of Athgrean	293327	203450	5	Wicklow
402	Liffey	09L010100	2 km NW of Sally Gap	310987	212757	4–5	Wicklow
403	Little Slaney	12L020100	Ford S of Coan	298447	191763	5	Wicklow
404	Little Slaney	12L020400	Ford d/s Rostyduff Bridge	294960	192335	5	Wicklow
405	Shillelagh	12S010500	Bridge u/s Derry River confl.	299015	168068	4–5	Wicklow
406	Slaney	12S020100	Seskin Bridge	297663	193902	4–5	Wicklow
407	Slaney	12S020200	Kelsha Bridge	293976	194242	4–5	Wicklow

Appendix 2

Table A2.1. Former high status sites (pre-2007) currently included under investigative monitoring by the Environmental Protection Agency for the period 2010–2012.

No.	River name	EPA ID	Station location	X	Y	Year last high status	Last Q value
1	Cummirk	01C030100	Cummirk Bridge (Upper)	198086	406366	2004	4–5
2	Black (Borris)	14B061300	Kilcloney Bridge	273109	152749	2006	4–5
3	Killeen	15K010400	Bridge u/s Delour River	228286	196266	2005	4–5
4	Burncourt	16B040100	Glengarra Bridge	193130	118732	2006	4–5
5	Glasha (Waterford)	16G010200	Boola Bridge	227654	119980	2006	4–5
6	Multeen	16M020780	Bridge SW of Annacarty	191814	145111	2006	4–5
7	Multeen (East)	16M080100	Turraheen Bridge	199992	154422	2006	4–5
8	Multeen (East)	16M080400	Black Bridge	198507	144704	2006	4–5
9	Araglin (Colligan)	17A010400	Ballynakill Bridge	223154	102480	2004	4–5
10	Colligan	17C010180	Colligan Bridge	222017	98002	2004	4–5
11	Tay	17T010100	Bridge N of Lemybrien	233504	102342	2004	4–5
12	Blackwater (Munster)	18B021100	1.5 km d/s Ballymaquirk Bridge	139545	99251	2006	4–5
13	Clyda	18C020050	Bridge u/s Ahadallane Bridge	151116	86874	2006	4–5
14	Glen (Banteer)	18G040900	Ford S of Coolroe Beg	140341	94419	2006	4–5
15	Glenakeefe	18G060100	Glenakeefe Bridge	206204	105719	2006	4–5
16	Glennafallia	18G100060	Lyre Bridge, 1.5 km d/s Monavugga River confl.	210857	101124	2006	4–5
17	Lyre	18L020900	Lyre Bridge	152524	92695	2006	4–5
18	Nad	18N010200	Nadbeg Bridge	141262	89855	2006	4–5
19	Owenbaun (Rathcool)	18O050700	Clashatrake Bridge	131459	91630	2006	4–5
20	Owennagloo	18O070500	Ferm Bridge	122933	90847	2006	4–5
21	Rathcool	18R010400	Bridge nr Killeen	135056	91341	2006	4–5
22	Foherish	19F020200	Foherish Bridge	128000	81432	2005	4–5
23	Foherish	19F020400	Garranenagappul Bridge (Clondrohid Bridge)	129521	76042	2005	4–5
24	Lee (Cork)	19L030040	Bridge S of Gortafludig	111634	65872	2005	4–5
25	Sullane	19S020200	Poulnabro Bridge	122646	75600	2005	4–5
26	Bandon	20B020050	Keenrath Bridge	118687	56660	2006	4–5
27	Clodagh	20C030300	Pookeen Bridge	114437	49868	2006	4–5
28	Ilen	20I010020	Castledonovan Bridge	111395	49341	2006	4–5
29	Kilbrittain	20K010100	Maulmane Bridge	150412	48890	2006	4–5
30	Leamawaddra	20L010200	Bridge SW of Derreenard	101990	37974	2006	4–5
31	Owennashingaun	20O020400	Dromore Bridge	106164	45624	2006	4–5

Table A2.1 *contd*

No.	River name	EPA ID	Station location	X	Y	Year last high status	Last Q value
32	Ardsheelhane	21A020100	Coomyanna Bridge	71724	72982	2006	4–5
33	Blackwater (Kerry)	21B030100	Gearha Bridge	78267	72126	2006	5
34	Glengarriff	21G030100	Bridge W of Skehil	89720	58306	2006	5
35	Owbeg (Roughty)	21O020200	Mangerton Bridge	99495	76153	2006	4–5
36	Emlagh	22E010200	Bridge W of Emlagh	64845	103310	2004	4–5
37	Finglas (Laune)	22F030700	Meanus Bridge	80388	93993	2005	4–5
38	Owenreagh	22O030200	Just u/s trib. from Looscaunagh Lough	87629	79496	2004	4–5
39	Brosna	25B090800	Bridge nr Kilcolgan	214922	223732	2005	4–5
40	Clodiagh (Tullamore)	25C060050	Bridge NW of Scarroon	229672	209555	2005	4–5
41	Clodiagh (Tullamore)	25C060300	Gorteen Bridge	234034	217087	2005	4–5
42	Doonane	25D040010	Ford ENE of Toor	181309	164383	2005	4–5
43	Duniry	25D070200	Bridge u/s Ballinasack Bridge	169103	208710	2006	4–5
44	Graney (Shannon)	25G040010	Bridge d/s Lough Ea	152204	189165	2006	4–5
45	Mulkear (Limerick)	25M040100	Dromkeen Bridge	174031	148040	2006	4–5
46	Nenagh	25N010050	Bridge NE of Ballyhane Cross	194017	168812	2005	4–5
47	Newtown	25N030100	Carrigmadden Bridge	179801	178001	2005	4–5
48	Silvermines Village Stream	25S100050	Silvermines Bridge	184254	171486	2005	4–5
49	Yellow (Kilmastulla)	25Y010200	u/s Yellow Bridge & u/s Garryard Stream	180727	171781	2005	4–5
50	Boyle	26B080400	Drum Bridge (Boat House Ford)	181616	303934	2005	4–5
51	Camlin	26C010700	Bridge nr Kiltyreher	216494	277962	2005	4–5
52	Killian	26K010100	Kingstown Bridge	170049	253632	2005	4–5
53	Lung	26L030100	Figh Bridge	159907	289516	2005	4–5
54	Lissydaly Stream	26L100800	Bridge near Aghadiffin	153692	291986	2005	4–5
55	Relagh	26R050700	Bridge S of Edergole	212331	301416	2005	4–5
56	Suck	26S070100	Bridge W of Cloonalis	165281	280859	2005	4–5
57	Suck	26S071000	Mount Talbot Bridge	181202	252992	2005	4–5
58	Crompaun (East)	27C090300	Cappateemore Bridge	155103	161893	2005	4–5
59	Gourna	27G020100	Coolycasey Bridge	151255	166447	2005	5
60	Inch (Clare)	27I010400	Bridge WSW Rathkerry	127372	173823	2004	4–5
61	Mill Brook	27M030900	Black's Bridge	140592	185831	2004	4–5
62	Owenogarney	27O010700	Pollagh Bridge	150042	170246	2005	4–5
63	Owenslieve	27O020600	Bridge u/s Coolderror Bridge (main road)	122541	167134	2004	4–5
64	Doonbeg	28D020400	Goulbourne Bridge	111966	161962	2006	4–5
65	Inagh (Ennistymon)	28I010300	Moananagh Bridge	117037	184914	2006	4–5

Table A2.1 *contd*

No.	River name	EPA ID	Station location	X	Y	Year last high status	Last Q value
66	Boleyneendorrish	29B040100	Bridge NW Knockapollboy	155541	206823	2006	5
67	Boleyneendorrish	29B040300	Kenny's Bridge	151415	205622	2006	4–5
68	Owendalulleegh	29O010700	Ford at Inchamore	156156	199607	2006	4–5
69	Aille (Mayo)	30A020100	Bridge S of Killawullaun	111287	280373	2006	4–5
70	Dooghta	30D020200	Bridge u/s Lough Corrib	103977	252588	2006	4–5
71	Nanny (Tuam)	30N010100	Bridge NW Loughpark	145518	252926	2006	4–5
72	Crumpaun	32C030050	Bridge at Bogadoon	106742	306774	2005	4–5
73	Newport (Mayo)	32N010050	4.5 km u/s Bridge in Newport	101220	295342	2005	4–5
74	Owenglin	32O030200	Bridge SW of Clifden Lodge	67553.7	250463	2002	4–5
75	Muingnakee	33M040100	Bridge u/s Glencullin River confl.	86855	326865	2005	4–5
76	Owenmore (Mayo)	33O040150	1.1 km d/s Bellacorick Bridge	96278	320411	2005	4–5
77	Owenmore (Mayo)	33O040270	SW of Largan	90910	322380	2005	4–5
78	Owenmore (Mayo)	33O040400	At Srahmore 3 km u/s Munhin	83226	323361	2005	4–5
79	Clydagh (Castlebar)	34C050120	Footbridge SE Cloonkesh	118779	294075	2004	4–5
80	Deel (Crossmolina)	34D010200	800 m d/s Crossmolina Bridge	114258	317863	2005	4–5
81	Loughnaminoo Stream	34L040100	Balla: Bridge on Castlebar Road	125374	284813	2005	4–5
82	Manulla	34M010200	Bridge at Ballycarra	120120	284117	2005	4–5
83	Bridgetown (Donegal)	37B030090	0.5 km d/s Rath Bridge	194439	370769	2005	4–5
84	Bunlacky	37B040300	Bunlacky Bridge	177924	376299	2005	4–5
85	Crow	37C030700	Just u/s Glen River confl.	161179	384033	2005	4–5
86	Eanymore Water	37E020150	Bridge SW of Letterbarra	188339	382308	2005	3
87	Eanymore Water	37E020250	Eanymore Bridge	184467	381361	2005	4
88	Eany Water	37E030300	Just d/s Eany Beg/More confl.	184000	381500	2005	4
89	Lowerymore	37L010300	Bridge near Barnesmore Halt	201230	383890	2005	4–5

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil, Pobal agus Rialtais Áitiúil.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail;
- scardadh dramhuisce.

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

Science, Technology, Research and Innovation for the Environment (STRIVE) 2007-2013

The Science, Technology, Research and Innovation for the Environment (STRIVE) programme covers the period 2007 to 2013.

The programme comprises three key measures: Sustainable Development, Cleaner Production and Environmental Technologies, and A Healthy Environment; together with two supporting measures: EPA Environmental Research Centre (ERC) and Capacity & Capability Building. The seven principal thematic areas for the programme are Climate Change; Waste, Resource Management and Chemicals; Water Quality and the Aquatic Environment; Air Quality, Atmospheric Deposition and Noise; Impacts on Biodiversity; Soils and Land-use; and Socio-economic Considerations. In addition, other emerging issues will be addressed as the need arises.

The funding for the programme (approximately €100 million) comes from the Environmental Research Sub-Programme of the National Development Plan (NDP), the Inter-Departmental Committee for the Strategy for Science, Technology and Innovation (IDC-SSTI); and EPA core funding and co-funding by economic sectors.

The EPA has a statutory role to co-ordinate environmental research in Ireland and is organising and administering the STRIVE programme on behalf of the Department of the Environment, Heritage and Local Government.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

ENVIRONMENTAL PROTECTION AGENCY
PO Box 3000, Johnstown Castle Estate, Co. Wexford, Ireland
t 053 916 0600 f 053 916 0699
LoCall 1890 33 55 99
e info@epa.ie w http://www.epa.ie

SSTI
Strategy for Science, Technology and Innovation

Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government