THE UNITED KINGDOM ENVIRONMENTAL CHANGE NETWORK

ANNUAL DATA DIGEST 2005

PART 2 – FRESHWATER SITES

Biotechnology and Biological Sciences Research Council
Cyngor Cefn Gwlad Cymru – Countryside Council for Wales
Cynulliad Cenedlaethol Cymru - National Assembly for Wales
Defence Science and Technology Laboratory
Department of Agriculture and Rural Development (Northern Ireland)
Department for Environment, Food and Rural Affairs
English Nature
Environment Agency
Environment and Heritage Service
Forest Research
Natural Environment Research Council
Scottish Environment Protection Agency
Scottish Executive Environment and Rural Affairs Department
Scottish Natural Heritage

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September 2006

Contents

1. Introduction

This digest is one of a series of annual data summaries produced by the Environmental Change Network (ECN), a UK research initiative concerned with the long-term monitoring, analysis and prediction of environmental change. The digest series provides a concise summary of the main features of the data collected by ECN each year. This digest summarises data collected in 2005 from the Freshwater ECN sites, and makes comparisons with the results from previous years. Data from the Terrestrial ECN sites, for which data collection started in 1993, are published in a separate volume.

1.1 The Environmental Change Network

The Environmental Change Network was officially launched in 1992, with most terrestrial sites becoming operational in 1993 and most freshwater sites in 1994. The programme is co-ordinated by the Natural Environment Research Council (NERC) on behalf of a consortium of sponsoring organisations that jointly operate a network of sites, representative of a range of terrestrial and freshwater ecosystems in the UK. Physical, chemical and biological data are collected from each site according to rigorous standard protocols (Sykes and Lane 1996, Sykes, Lane and George 1999) to provide comparable data over a long time span. This standardisation in long term monitoring is the fundamental basis for the programme, with the aim of providing suitable and reliable information for analysis in order to gain insight into the mechanisms of environmental change.

1.2 ECN Sponsors

The ECN sponsoring consortium brings together organisations having a central role in the UK environment. Present consortium members are:

Biotechnology and Biological Sciences Research Council
Cyngor Cefn Gwlad Cymru – Countryside Council for Wales
Cynulliad Cenedlaethol Cymru - National Assembly for Wales
Defence Science and Technology Laboratory
Department of Agriculture and Rural Development (Northern Ireland)
Department for Environment, Food and Rural Affairs
English Nature
Environment Agency
Environment and Heritage Service
Forest Research
Natural Environment Research Council
Scottish Environment Protection Agency
Scottish Executive Environment and Rural Affairs Department
Scottish Natural Heritage

The following research organisations are also involved in ECN monitoring:

UK Acid Waters Monitoring Network
Agricultural Development Advisory Service
Centre for Ecology and Hydrology
Freshwater Fisheries Laboratory
Institute of Grassland and Environmental Research
Rothamsted Research
The Macaulay Institute

1.3 ECN Organisation

The day to day running of ECN is managed by the Central Co-ordination Unit (CCU), based at the Centre for Ecology and Hydrology's Lancaster Research Station. The CCU comprises Dr. Terry Parr (Co-ordinator), John Adamson (Operations Manager), Mike Morecroft (Science Co-ordinator), Andy Scott (Statistician), Mandy Lane (Data Centre Manager), Susannah Rennie (Data Manager), Lynne Irvine (Data Manager), Lorna Sherrin (Data Manager) and Andrew Sier (Scientific Liaison Officer). Further information on ECN can be obtained either from the internet (www.ecn.ac.uk) or from the CCU.

Centre for Ecology and Hydrology
Lancaster Environment Centre
Library Avenue
Bailrigg
Lancaster
LA1 4AP
Tel: 01524 595800 E-mail: ecnccu@ceh.ac.uk

1.4 ECN Freshwater Sites

There are currently forty-five freshwater sites within the ECN network (sixteen lake sites and twenty-nine river sites).

Sponsoring Organisation	Site Name	ECN Site Code
EA-North-West	Eden (Cumbria)	R01
EA-North-East	Esk	R02
	Coquet	R03
EA-South-West	Exe	R04
	Frome	R08
EA-Midlands	Lathkill	R06
	Bradgate Brook	R09
EA-Welsh	Wye	R05
EA-Anglian	Cringle	R07

	Bure	R10
	Upton Broad	L01
	Hickling Broad	L02
	Wroxham Broad	L03
EA-Thames	Coln	R23
	Lambourn	R24
EA-Southern	Eden (Kent)	R25
AWMN	Old Lodge	R11
	Scoat Tarn	L07
	Llyn Llagi	L08
	Lochnagar	L09
CCW/NAW	Nant Teyrn	R29
CEH	Windermere	L04
	Esthwaite	L05
	Loch Leven	L06
	Troutbeck	R22
DOENI	Faughen	R19
	Garvary	R20
	Owenkillew River	R28
DANI	Bush	R21
	Lough Neagh	L16
	Lough Erne	L17
SEERAD	Birnie Burn	R27
SEPA West	Stinchar	R12
	Lower Clyde	R13
	Loch Lomond	L10
	Cree	R18
	Loch Dee	L15
SEPA North	Allt a Mharcaidh	R14
	Spey	R15
	Ewe	R26
	Loch Davan	L13
	Loch Kinord	L14
SEPA East	Tweed	R16
	Eden (Fife)	R17
	Loch Katrine	L12

1.5 The ECN Database

All data and meta-data generated through the ECN terrestrial and freshwater monitoring protocols are held within an integrated database at the ECN CCU, CEH Lancaster. The ECN website

(www.ecn.ac.uk) provides direct dynamic links to this database, allowing users to generate their own summary data tables and graphs, and download datasets to their local machine.

ECN's data access policy aims to disseminate as much data as possible to the wider user community for the benefit of environmental change research, policy and public information. ECN's sponsors have agreed that summary data from the ECN database should be made openly available (subject to some conditions of use), and this is achieved through published documents and increasingly through the website's dynamic database interface. Access to raw data at the resolutions originally collected is more closely monitored; raw data may be applied for through a form on the website, and is made available under licence, subject to the authorisation of the data originators.

1.6 Aim and Content of this Report

The main aims of this report are:

1. to enable those involved in ECN to get an overview of the main data sets held by ECN and to "eye-ball" patterns of change (e.g. emerging trends or extreme values) that might form the basis for further analysis.
2. to form part of the "data audit" trail enabling site managers and sponsors to see gaps, and possibly errors, in the data currently held by the CCU and to help identify actions required to address these.

This report does not aim to provide an interpreted summary and synthesis of ECN's data for immediate use by public and policy audiences. Hence, the data are presented without interpretation or comment. A complete analysis and interpretation of the data is beyond the scope of this report. However, scientific papers based on these data are now being published regularly. An up-to-date list of these papers can be accessed through the ECN web pages in the section on "Publications and Data Use at ECN Sites" - at http://www.ecn.ac.uk/PRU/pru.asp. Some interpreted data products in the form of regularly updated indicators of climate change and water quality can also be viewed on the ECN web pages.

Most of the gaps in the data will be filled as the data are supplied to the CCU and validated. Gaps in previous years arise for a variety of reasons including instrument failure, and validation and data transfer issues. In some cases specific measurements have not been made at some sites for operational reasons.

2. Data Summaries

Data summaries are presented in the following tables on a site by site basis, lakes followed by rivers in alphabetical order within each type. Summaries are presented in the following series of sections:-

Section 1 – Discharge or Depth Profile

For rivers, monthly averages for the current year and annual means since the start of ECN are presented; as well as a time series graph of flow.

Section 2 - Water Chemistry

Summary statistics for the current year and annual means since the start of ECN are presented for each determinand. Chemical analyses are performed at a number of different laboratories and detection limits vary both from site to site and over time, as methods alter. Information on these limits is collected and stored in the ECN database. If no values for a particular measurement are below the detection limit calculation of summary statistics is straightforward. When values below the detection limit occur summary statistics are compiled twice, firstly from data in which values below the detection limit are set to zero and secondly with such values set to the detection limit. Means and standard deviations for the current year are reported as a range, while time series means are reported as averages of the two extremes.

The sets of measurements made for ECN at lake and river sites are similar but not identical. In particular total organic carbon and particulate organic carbon are not required for rivers, and biological oxygen demand and a number of metal determinations are not required for lakes. ECN specifies both a recommended and minimum frequency for sampling. For the majority of determinands the recommended frequency is weekly for rivers and fortnightly for lakes while the minimum frequency is monthly for rivers and quarterly for lakes. The number of samples taken at each site is presented as a percentage of the recommended number (N%).

Section 3 – Macro-invertebrates

Recording of macro-invertebrates is summarised as a species list.

Section 4 – Aquatic macrophytes

Recording of aquatic macrophytes is summarised as a species list.

Section 5 – Phytoplankton

Recording of phytoplankton is summarised as quarterly means for the current year and a time series graph of chlorophyll a levels since the start of ECN in 1994. River sites only record chlorophyll a levels.

2.1 Esthwaite Water

Cumbria, England (Lat 54° 22'N; Long 2° 59'W)
Sponsor: Natural Environment Research Council

Esthwaite Water is a natural lake situated in a glacial valley and is generally agreed to be the most productive or eutrophic lake in the English Lake District. It lies approximately 65 m AOD, has an area of 1 km^2 and a maximum depth of 15.5 m. The average retention time is 90 days. The catchment area is 17.1 km^2 and the hills are composed geologically of Bannisdale slates and grits. The surrounding land is used chiefly for agricultural purposes and forestry. The lake is a Grade 1 SSSI and has been a designated "Ramsar" site since November 1991.The diverse aquatic invertebrate fauna includes a number of species with restricted distributions in Britain, one of which is the flatworm, *Bdellocephala punctata*. The slender naiad (*Najas flexilis*), listed as Nationally Scarce, has been found in Esthwaite Water. Esthwaite waterweed (*Hydrilla verticillata*) was discovered at Esthwaite Water in 1914 by W H Pearsall; this species is known only from this location in Britain although it was last seen in 1941. Artificial enrichment of the lake occurs by input from the Hawkshead Sewage Treatment Works (which has operated a continuous programme of phosphate-stripping since 1989) and by effluents from the fish farm which is situated towards the south of the lake. The lake undergoes summer stratification with oxygen depletion regularly below 7 m and sometimes as shallow as 5 m. The phytoplankton tends to be dominated by diatoms in spring and by cyanobacteria for much of the summer.

2.1.1 Spot sampled chemistry data

a) summary for 2005 - Esthwaite Water

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Esthwaite Water

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	10.91	11.71	10.39	11.96	11.5	11.57	12.14	11.93	11.87	11.78	11.72	
pH	pH	7.27	7.23	7.3	7.45	7.48	7.63	7.56	7.66	7.52	7.58	7.58	
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres	2.196	2.262	2.66	2.415	2.304	1.919	2.44	2.646	2.33	2.312	2.285	
Conductivity	µs/cm	112.6	103.2	113.4	108.3	107.6	104.1	99.28	102.2	98.5	101.3		
Dissolved Oxygen	mg/l	10.38	9.906	10.61	10.41	10.25	10.33	10.72	10.5	10.34	10.71	10.78	
Ammonium: NH4-N	mg/l	0.062	0.054	0.058	0.052	0.028	0.024	0.04	0.034	0.028	0.03	0.016	
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l	0.429	0.678	0.786	0.657	0.678	0.439	0.32	0.419	0.487	0.38	0.477	
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	19.94	20.17	20.12	20.37	21.78	23.12	22.2	22.59	23.45	25.83	22.39	
Chloride	mg/l	10.21	11.32	11.27	11.4	10.3	10.64	10.09	9.307	10.03	9.619		
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l				0.039	0.039	0.034	0.038	0.033	0.03	0.029	0.031	
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.004	0.005	0.004	0.006	0.009	0.008	0.052	0.006	0.005	0.005	0.005	
Silicate: SiO2	mg/l	1.139	1.6	1.477	1.391	1.643	1.658	1.676	1.143	1.378	1.34	1.356	
Sulphate: S04-S	mg/l	6.882	7.104	7.943	7.248	6.332	6.128	5.661	5.757	0.562	0.666		
Sodium - dissolved	mg/l	5.831	6.016	7.133	6.171	6.247	6.399	5.778	5.678	5.937	6.464		
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.888	0.939	1.114	1.246	0.986	0.971	0.875	0.945	0.973	0.965		
Potassium - total	mg/l												
Calcium - dissolved	mg/l	9.938	10.12	10.76	9.898	10.16	10.19	9.698	9.378	10.39	11.12		
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	1.3	1.293	1.4	1.321	1.353	1.366	1.303	1.241	1.353	1.438		
Magnesium - total	mg/l												
Aluminium - total	µg/l									21.72	17.79	11.55	
Aluminium - labile	µg/l									7.128	8.683		
Manganese - dissolved	µg/l									21.65	17.97	6.479	
Manganese - total	µg/l									74.37	49.05	39.13	
Iron - dissolved	µg/l									31.65	27.46		
Iron - total	µg/l									98.08	80.85		
Lead - dissolved	µg/l									0.081	0.076	0.057	
Lead - total	µg/l									0.295	0.331	0.298	
Arsenic - total	µg/l											0.447	

2.1.2 Freshwater Invertebrates, species list - Esthwaite Water

Agraylea multipunctata
Asellus aquaticus
Ceratopogonidae
Chironomidae
Cladocera
Cloeon dipterum
Corixidae
Crangonyx pseudogracilis
Dina lineata
Dugesia
Dytiscidae
Erpobdella testacea
Gammarus pulex
Glossiphonia complanata
Helobdella stagnalis
Hippeutis complanatus
Limnephilidae
Limnephilus lunatus
Limnephilus marmoratus
Lumbriculidae
Lymnaea peregra
Naididae
Ostracoda
Pericoma
Potamonectes depressus
Sigara distincta
Sigara dorsalis
Sigara falleni
Sphaeriidae
Theromyzon tessulatum
Tipula
Tubificidae

2.1.3 Freshwater Macrophytes, species list - Esthwaite Water

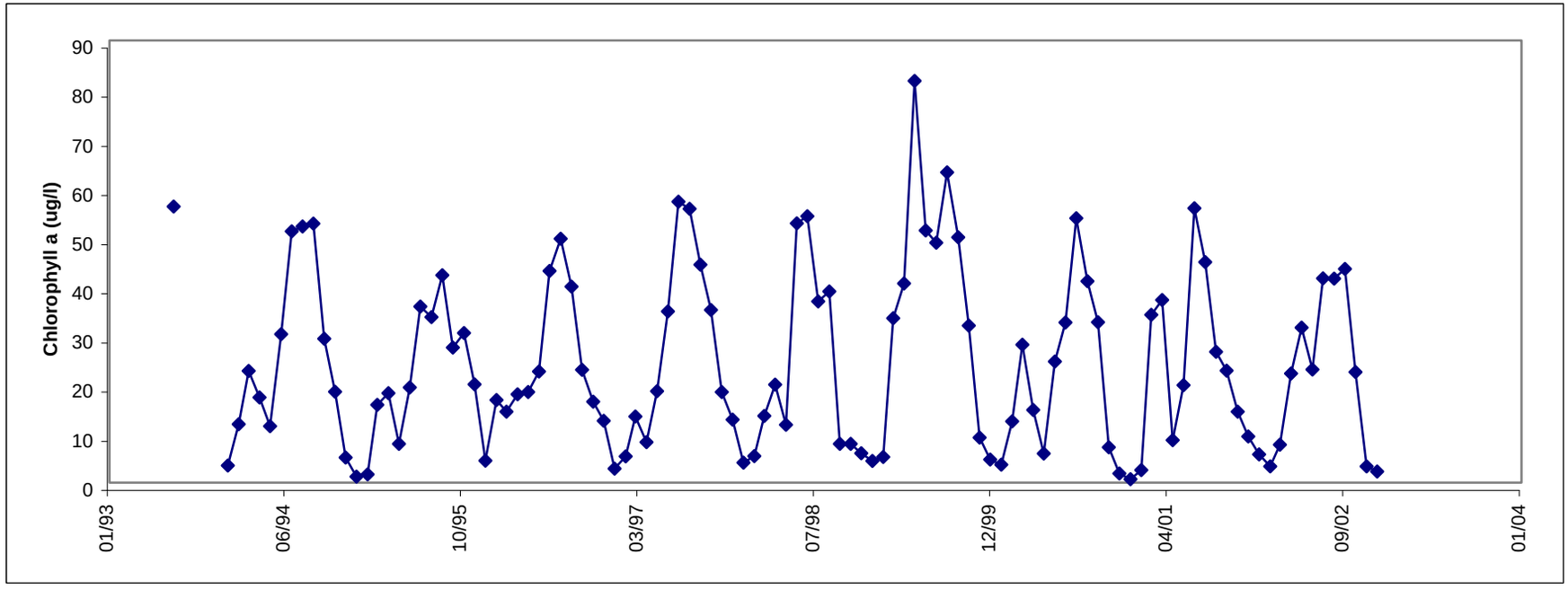
No data submitted to the ECN database

2.1.4 Phytoplankton - Esthwaite Water

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.2 Hickling Broad

Norfolk, England (Lat 52°44'N; Long 1°13'E)
Sponsor: Environment Agency, Anglian Region

Hickling Broad is the largest of the lakes that make up the Norfolk Broads, and is a result of extensive peat digging in the 12th and 14th centuries followed by flooding due to a rise in sea-level. The broad has an area of 141.1 ha, and an approximate mean depth of 1.3 m. It lies close to sea level in the valley of the River Thune and is connected to the river by an artificial channel approximately 0.7 km long. The broad is subject to a small tidal variation in water height and is brackish. It is part of a National Nature reserve, owned and managed by the Norfolk Wildlife Trust. The broad is surrounded by extensive areas of reed bed and grazing marsh, although parts of the catchment have been deep-drained for arable cultivation. Geologically, the area is underlain by Quaternary deposits of Norwich Crag, with glacial till and outwash deposits at the surface. The broad is used extensively for recreational activities - sailing, windsurfing, tourist cruisers and angling. The broad is not subject to any point sources of nutrient input and has maintained a substantial aquatic macrophyte population in recent years, although there have been signs of eutrophication. At times it has suffered extensive fish kills due to the presence of the alga, *Prymnesium parvum*.

2.2.1 Spot sampled chemistry data

a) summary for 2005 - Hickling Broad

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Hickling Broad

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.2.2 Freshwater Invertebrates, species list - Hickling Broad

No data submitted to the ECN database

2.2.3 Freshwater Macrophytes, species list - Hickling Broad

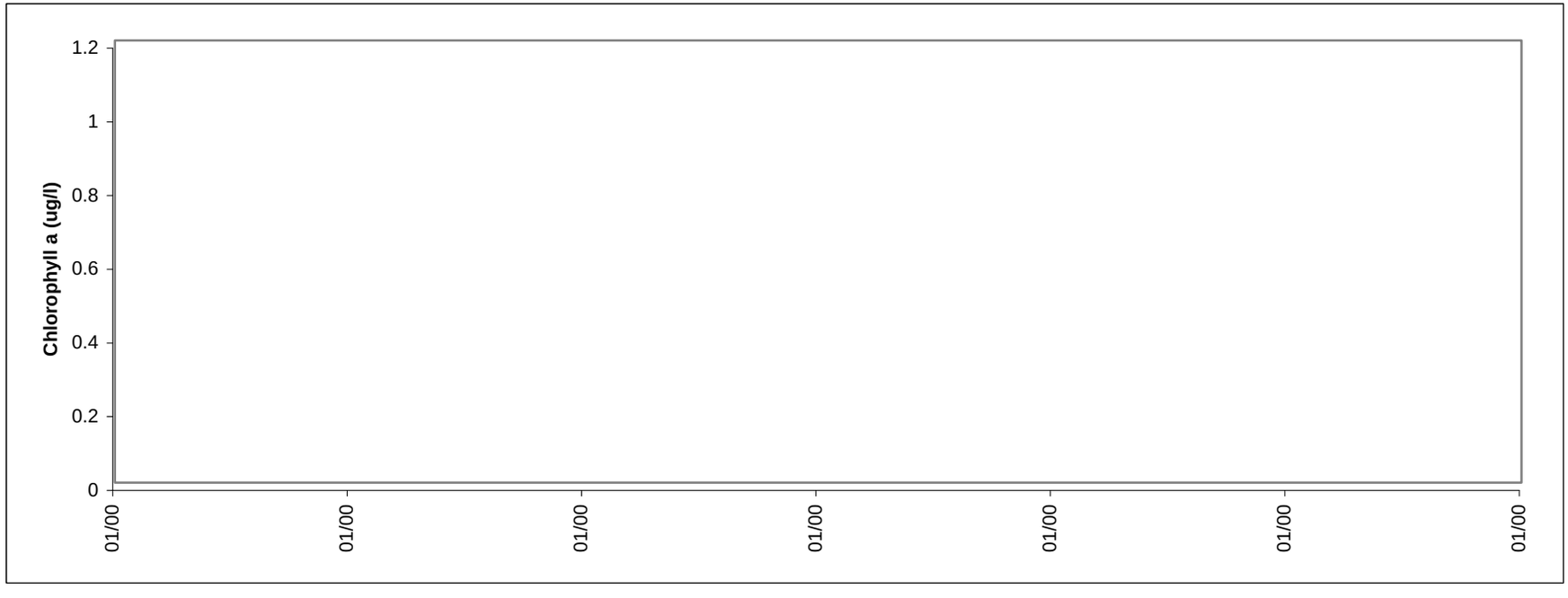
No data submitted to the ECN database

2.2.4 Phytoplankton - Hickling Broad

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.3 Llyn Llagi

Snowdonia, Wales (Lat 53°01'N; Long 4°01'W)
Sponsor: Department of the Environment, Transport and the Regions (through the Acid Waters Monitoring Network)

Llyn Llagi occupies a north-facing corrie in the central area of the Snowdonia region of North Wales. The lake lies at 380m above sea level (a.s.l.) beneath a steep backwall and comprises a deep, almost circular basin (maximum depth 16.5 m) bordered by an extensive, shallow (1 m deep) rim. The lake covers an area of 5.7 ha and the primary inflow constitutes the outflow stream from Llyn yr Adar. The lake drains towards the north-west to the Nanmor valley. The catchment (157 ha) consists primarily of Ordivician slates and shales of the Glanarfon series. The backwall is composed of a large doleritic intrusion with small intrusions of fine microgranites and volcanic tuff. The catchment soils are mainly stagnopodsols and gleys, interspersed with blanket peats. The vegetation is characterised by *Calluna vulgaris* (heather), *Molinia caerulea* (purple moor-grass) and *Eriophorum* spp (cotton grass), and the catchment is grazed at a low intensity by sheep. The lake and much of the catchment lie within a designated Site of Special Scientific Interest (SSSI). Llyn Llagi is an Acid Waters Monitoring Network (AWMN) site, classified as having high acid deposition.

2.3.1 Spot sampled chemistry data

a) summary for 2005 - Llyn Llagi

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C	11.833	4.5	16.5	6.429	3
pH	pH	5.75	5.57	5.92	0.19	4
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Secci disk	metres					0
Conductivity	µs/cm	27	23	35	5.4772	4
Dissolved Oxygen	mg/l					0
Ammonium: NH4-N	mg/l					0
Total Nitrogen	mg/l	0.315	0.27	0.42	0.0705	4
Nitrate: NO3-N	mg/l	0.06	0.03	0.08	0.0245	4
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	0.2525	-0.09	0.89	0.4381	4
Chloride	mg/l	6.4	4.7	9.2	1.9647	4
Total organic Carbon	mg/l	3.035	1.78	4.23	1.0793	4
Particulate organic Carbon	mg/l					0
Total Phosphorous	mg/l	0.0155	0.01	0.023	0.0066	4
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.0105	0.002	0.016	0.0065	4
Silicate: SiO2	mg/l	0.1275	0.05	0.21	0.0896	4
Sulphate: S04-S	mg/l	1.925	1.7	2.2	0.2217	4
Sodium - dissolved	mg/l	3.4	2.8	4.4	0.6928	4
Sodium - total	mg/l					0
Potassium - dissolved	mg/l	0.1063	0.025	0.19	0.0685	4
Potassium - total	mg/l					0
Calcium - dissolved	mg/l	0.8575	0.72	0.98	0.1103	4
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	0.4925	0.43	0.63	0.0925	4
Magnesium - total	mg/l					0
Aluminium - total	µg/l	106.5	43	224	81.0699	4
Aluminium - labile	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l	72	20	147	55.1906	4
Iron - dissolved	µg/l					0
Iron - total	µg/l	118	75	173	40.8982	4
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Llyn Llagi

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		2					7	11.37	10.13	9.65	11.3	11.83
pH	pH	5.23	5.6	5.53	5.52	5.52	5.62	5.59	6.05	5.72	5.8	5.86	5.75
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm	23.93	32	24.5	25.25	22.75	27.75	26	14.5	27	25.65	25	27
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l			0.25	0.228	0.415	0.073	0.01	0.255	0.291	0.34	0.373	0.315
Nitrate: NO3-N	mg/l	0.092	0.108	0.248	0.094	0.118	0.124	0.051	0.051	0.062	0.052	0.09	0.06
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	0.265	0.353	0.318	0.32	0.16	0.295	0.363	1.1	0.68	0.728	0.833	0.253
Chloride	mg/l	4.825	7.225	5.75	5.925	6.95	7.45	5.1	3.8	7.475	5.9	5.475	6.4
Total organic Carbon	mg/l	2.495	2.4	2.425	3.25	2.633	3.055	3.338	3.9	3.2	3.09	3.54	3.035
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l			0.004	0.005	0.004	0.015	0.005	0.009	0.009	0.015	0.016	0.016
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.014	0.004	0.003	0.003	0.002	0.003	0.004	0.003	0.002	0.003	0.008	0.011
Silicate: SiO2	mg/l	0.185	0.235	0.226	0.201	0.226	0.201	0.225	0.037	0.093	0.273	0.135	0.128
Sulphate: S04-S	mg/l	2.65	2.8	3.275	2.55	2.375	2.375	1.975	1.833	1.925	2.05	1.775	1.925
Sodium - dissolved	mg/l	2.925	4.1	3.525	3.425	3.65	4.075	3.025	2.6	4	3.575	2.85	3.4
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.363	0.15	0.125	0.13	0.125	0.163	0.133	0.13	0.155	0.138	0.105	0.106
Potassium - total	mg/l												
Calcium - dissolved	mg/l	0.77	1.055	1.108	0.938	0.9	0.983	0.75	0.753	0.86	0.905	0.818	0.858
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	0.4	0.575	0.575	0.5	0.525	0.575	0.5	0.4	0.555	0.513	0.44	0.493
Magnesium - total	mg/l												
Aluminium - total	µg/l	50	67.5	31.25	25	25	60	63.25	74.33	67	58	53.5	106.5
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	51	55.38	30.13	40.5	36.75	26.25	30.25	23	41.75	57.75	69.25	72
Iron - dissolved	µg/l												
Iron - total	µg/l	115.6	62.5	65.63	96.25	87.5	77.5	90.5	97.67	96.75	103.5	127.3	118
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.3.2 Freshwater Invertebrates, species list - Llyn Llagi

Chironomidae
Chloroperla torrentium
Cyrnus
Leptophlebiidae
Limnephilidae
Mystacides
Oligochaeta
Oulimnius tuberculatus
Oxyethira
Pisidium
Polycentropodidae
Tinodes waeneri

2.3.3 Freshwater Macrophytes, species list - Llyn Llagi

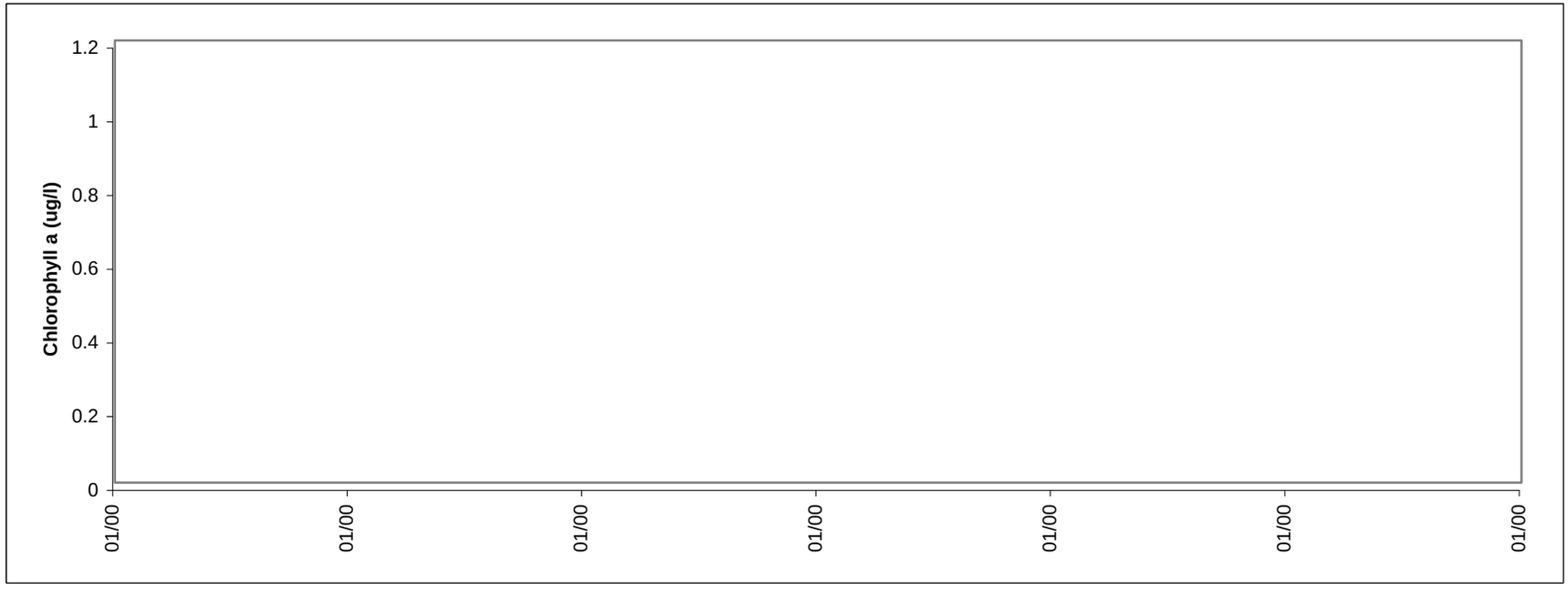
No data submitted to the ECN database

2.3.4 Phytoplankton - Llyn Llagi

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.4 Loch Davan

Grampian Region, Scotland (Lat 57°06'N; Long 2°55'W)
Sponsor: Scottish Environment Protection Agency, North Region

Lochs Davan and Kinord are situated adjacent to each other in an area of the River Dee catchment known as the Muir of Dinnet. The Muir of Dinnet (area 2 287 ha) is an SSSI and a Natural Nature Reserve designated because of its value as a habitat for flora and fauna, and important geomorphological features. The Muir forms the south-western corner of the Howe of Cromar, a wide saucer-shaped plain at the foot of the Grampian Mountains. The landscape of the area was moulded by gravel and meltwater in the post-glacial era, and Lochs Kinord and Davan are kettleholes (ice depressions), surrounded by fluvio-glacial hummocks, ridges and hollows. Loch Kinord (area 79.0 ha) is oligotrophic whereas Loch Davan (31.1 ha) is mesotrophic with recent research suggesting a transition towards eutrophication. The difference in trophic status reflects the higher proportion of agricultural land use in the Davan catchment

2.4.1 Spot sampled chemistry data

a) summary for 2005 - Loch Davan

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Loch Davan

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C			5.7			13	9.5	12.17	9.5			
pH	pH			6.84			7.5	7.57	7.77	7.31			
Suspended Solids: Dry weight	mg/l			2			2.333	2	2	3.5			
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm			136			154	140	150.6	140.8			
Dissolved Oxygen	mg/l			10.93			9.62	11.57	9.14	10.1			
Ammonium: NH4-N	mg/l			0.088			0.064	0.035	0.076	0.063			
Total Nitrogen	mg/l							1.79	1.347	1.817			
Nitrate: NO3-N	mg/l							1.363		1.115			
Nitrite: N02-N	mg/l			0.009			0.013	0.013	0.018	0.012			
Alkalinity (CaCo3)	mg/l			13.3			27.2	26.36	28.2	26.6			
Chloride	mg/l			23.6			19	20.75	19.4	15.75			
Total organic Carbon	mg/l			5.1			7.3		6.733	6.833			
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l			0.021			0.05	0.033	0.06				
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l			0.016			0.003	0.004	0.014	0.044			
Silicate: SiO2	mg/l			3.954				4.415	6.11	6.695			
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l			11.72			10.67		11.64	9.685			
Sodium - total	mg/l							10.6	11.46	9.855			
Potassium - dissolved	mg/l								1.972	1.665			
Potassium - total	mg/l			1.658			1.18	1.798	2.026	1.75			
Calcium - dissolved	mg/l								12.25	10.64			
Calcium - total	mg/l			8.38			10.82	13.21	12.2	11.01			
Magnesium - dissolved	mg/l								4.149	3.205			
Magnesium - total	mg/l			3.22			2.393	4.21	4.085	3.335			
Aluminium - total	µg/l			98.6			91.67	144.4	112.1	252			
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l			65.59			56.1	78.68	127.2	144.3			
Iron - dissolved	µg/l												
Iron - total	µg/l			231			355.7	318.3	438.7	531.8			
Lead - dissolved	µg/l												
Lead - total	µg/l							2.783	2.31	1.183			
Arsenic - total	µg/l							0.983	0.378	0.34			

2.4.2 Freshwater Invertebrates, species list - Loch Davan

No data submitted to the ECN database

2.4.3 Freshwater Macrophytes, species list - Loch Davan

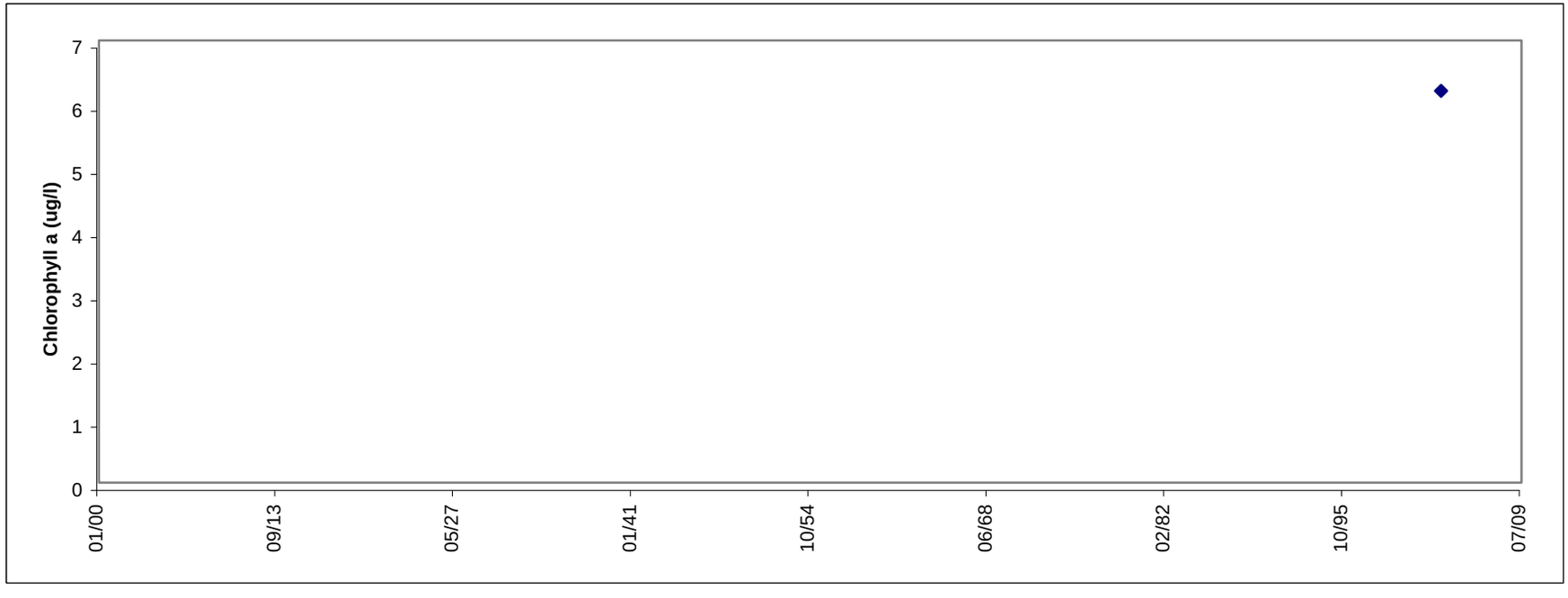
No data submitted to the ECN database

2.4.4 Phytoplankton - Loch Davan

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.5 Loch Dee

Dumfries & Galloway Region, Scotland (Lat 55°05'N; Long 4°23'W)
Sponsor: Scottish Environment Protection Agency, West Region

Loch Dee forms the headwaters of the River Dee and has a surface area of 1 km^2, with a total catchment area of 15.6km^2. It has three principal sub-catchments, the Dargall Lane, the White Laggan and the Black Laggan Burns (30% planted with Sitka spruce), and the Green Burn (67% planted with Sitka spruce). It has highly variable annual rainfall, a predominant feature being dry periods in spring and summer. Average rainfall is moderately acidic (pH 4.6 - 4.9) and its chemistry is dominated by salts of marine origin, mainly Na^+, Cl^- and SO_4^{2-}-S; for most samples the concentration ratios between the ions match those of sea water. The topography and land use affect the flows in the sub-catchments, giving a wide dynamic range of flows in the main tributaries. The Dargall Lane is steep and peaty, whereas the other two sub-catchments are afforested. As with many of the catchments in the Galloway area the geology comprises igneous rocks such as granite, with thin overlying soils giving poor neutralising and buffering capacities.

2.5.1 Spot sampled chemistry data

a) summary for 2005 - Loch Dee

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Loch Dee

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C							8.1		12.12	11.26		
pH	pH							5.8	5.7	5.6	5.99		
Suspended Solids: Dry weight	mg/l									1.512	2.478		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm							41.53	31.16	34.9	35.24		
Dissolved Oxygen	mg/l							12.4		10.58	10.9		
Ammonium: NH4-N	mg/l							0.021	0.023	0.02	0.031		
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l							0.165	0.258	0.177	0.102		
Nitrite: N02-N	mg/l							0.005	0.005	0.006	0.006		
Alkalinity (CaCo3)	mg/l							3.724	1.892	1.013	1.285		
Chloride	mg/l							8.483	5.744	6.76	7.346		
Total organic Carbon	mg/l							4.6	3.877	4.297	7		
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l							0.01	0.009	0.006	0.008		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l							0.003	0.003	0.004	0.004		
Silicate: SiO2	mg/l							2.157	1.665	1.454	1.609		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l							4.355	3.303	3.742	3.637		
Potassium - dissolved	mg/l												
Potassium - total	mg/l							0.293	0.336	0.308	0.352		
Calcium - dissolved	mg/l												
Calcium - total	mg/l							0.906	0.959	0.885	0.996		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l							0.745	0.666	0.679	0.747		
Aluminium - total	µg/l							120.3	120.5	123.9	134.1		
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l								24	15			
Iron - dissolved	µg/l												
Iron - total	µg/l								130	75			
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.5.2 Freshwater Invertebrates, species list - Loch Dee

No data submitted to the ECN database

2.5.3 Freshwater Macrophytes, species list - Loch Dee

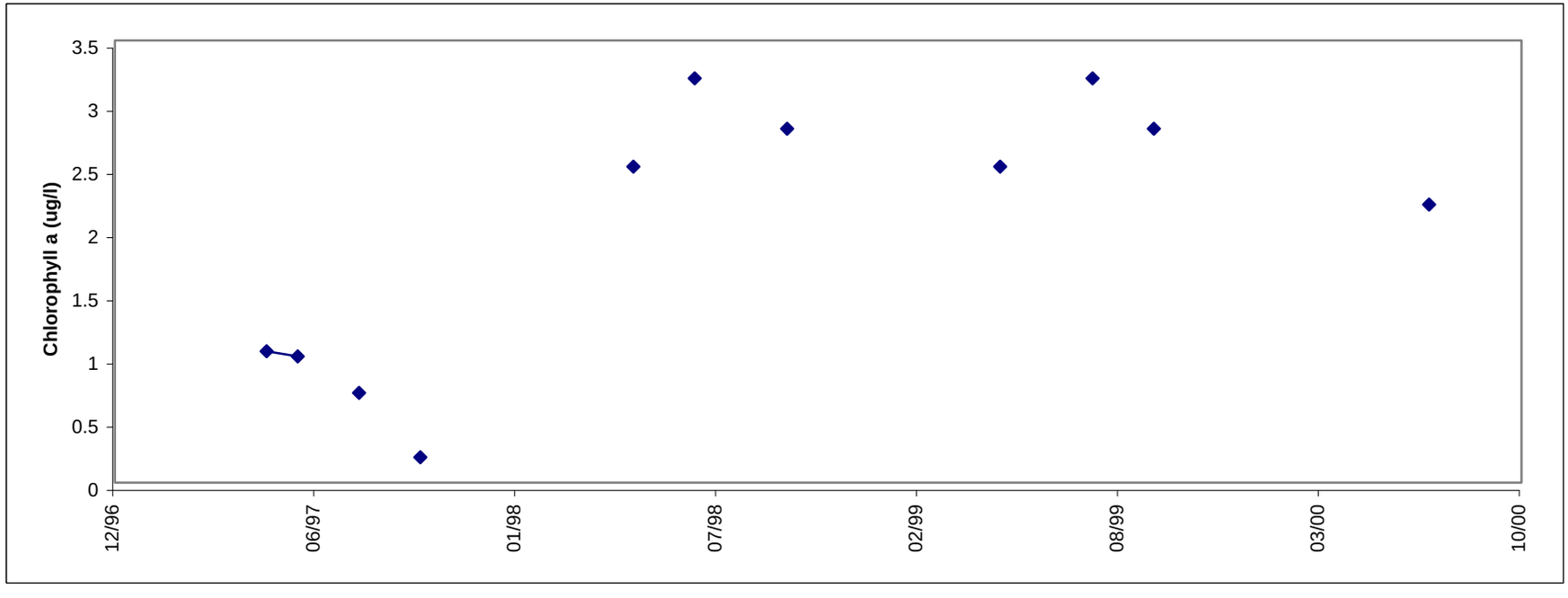
No data submitted to the ECN database

2.5.4 Phytoplankton - Loch Dee

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.6 Loch Katrine

Central Region, Scotland (Lat 56°14'N; Long 4°26'W)
Sponsor: Scottish Environment Protection Agency, East Region

Loch Katrine lies within the catchment of the River Teith, a major tributary of the River Forth. The loch forms part of the water supply system to the city of Glasgow and the loch and the whole of its catchment is owned by the West of Scotland Water Authority which controls all activities within the area. Water from two neighbouring lochs, Loch Arklet and Finglas Reservoir, is piped to Loch Katrine and water for Glasgow is moved 24 miles through underground aquaducts to Milngavie Reservoir on the outskirts of the city. Loch Katrine lies at an altitude of 116 m a.s.l. (at top water level) and at its deepest point is over 140 m deep. It has a capacity to store 64.6 million litres of extremely high quality water. The loch is bounded at its southern end by a low dam and the surrounding hills rise to over 700 m on the northern and southern shores. The bed of the loch shelves away very steeply and only at its western end are there large areas of shallower water away from the shoreline. Vegetation in the catchment is grazed by sheep and red deer and consists mainly of rough heather and grassland with forested areas to the east. Being part of the Trossachs it is a very popular tourist area during the summer.

2.6.1 Spot sampled chemistry data

a) summary for 2005 - Loch Katrine

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Loch Katrine

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	10.93	9.175	8.45	9.75	8.625	10.5	9.475	9.32	8.1			
pH	pH	6.42	6.42	6.45		6.5	6.54	6.55	6.44	6.41	6.47		
Suspended Solids: Dry weight	mg/l	1.167	2.375	1.65	1.775	1	1.233	1.225	0.66	0.667	1		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres	5.267	3.975	5.375	4.913	5.175	5.05	5.433	5.02	5.2	4.45		
Conductivity	µs/cm	31.67	61.5	33.6		36.25	38.15	31.73	28.75	28.37	27.7		
Dissolved Oxygen	mg/l	10.85	10.02	11.1	11.2	11.35	10.7	11.08	10.9	11.27			
Ammonium: NH4-N	mg/l	0.014	0.016	0.038	0.035	0.024	0.031	0.01	0.012	0.033	0.015		
Total Nitrogen	mg/l	0.927	0.662	0.841	0.205	0.163	0.114	0.038	0.087	0.133	0.537		
Nitrate: NO3-N	mg/l	0.11	0.127	0.186	0.206	0.16	0.114	0.038	0.087	0.133	0.094		
Nitrite: N02-N	mg/l	0.02	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.001	0.001		
Alkalinity (CaCo3)	mg/l	1.583	1.245	1.448		1.73	2	1.61	1.692	2.4	2.058		
Chloride	mg/l	6.073	5.24	5.743	6.083	5.595	6.067	6.575	6.366	5.173	4.702		
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l	0.002	0.003	0.002	0.012	0.003	0.004	0.005	0.004	0.01	0.004		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.002	0.002	0.001			0.003	0.001	0.002	0.003	0.001		
Silicate: SiO2	mg/l	0.563	0.508	0.571	0.466	0.563	0.536	0.612	0.613	0.723	0.683		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l	3.933	2.963	3.75									
Sodium - total	mg/l				3.265	3.258	3.12	3.483	3.56	4.463	2.78		
Potassium - dissolved	mg/l	0.313	0.335	0.61									
Potassium - total	mg/l				0.345	0.358	0.4	0.305	0.344	0.413	0.283		
Calcium - dissolved	mg/l	1.153	1.595	1.638									
Calcium - total	mg/l				1.685	1.62	1.69	1.595	1.542	1.547	1.628		
Magnesium - dissolved	mg/l	0.623	0.616	0.658									
Magnesium - total	mg/l				0.643	0.623	0.637	0.568	0.622	0.597	0.593		
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l				25	25	25	10	14.01	20			
Iron - dissolved	µg/l												
Iron - total	µg/l	216.7	77.5	122.5	102.5	175	60	60	60	83.33			
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.6.2 Freshwater Invertebrates, species list - Loch Katrine

No data submitted to the ECN database

2.6.3 Freshwater Macrophytes, species list - Loch Katrine

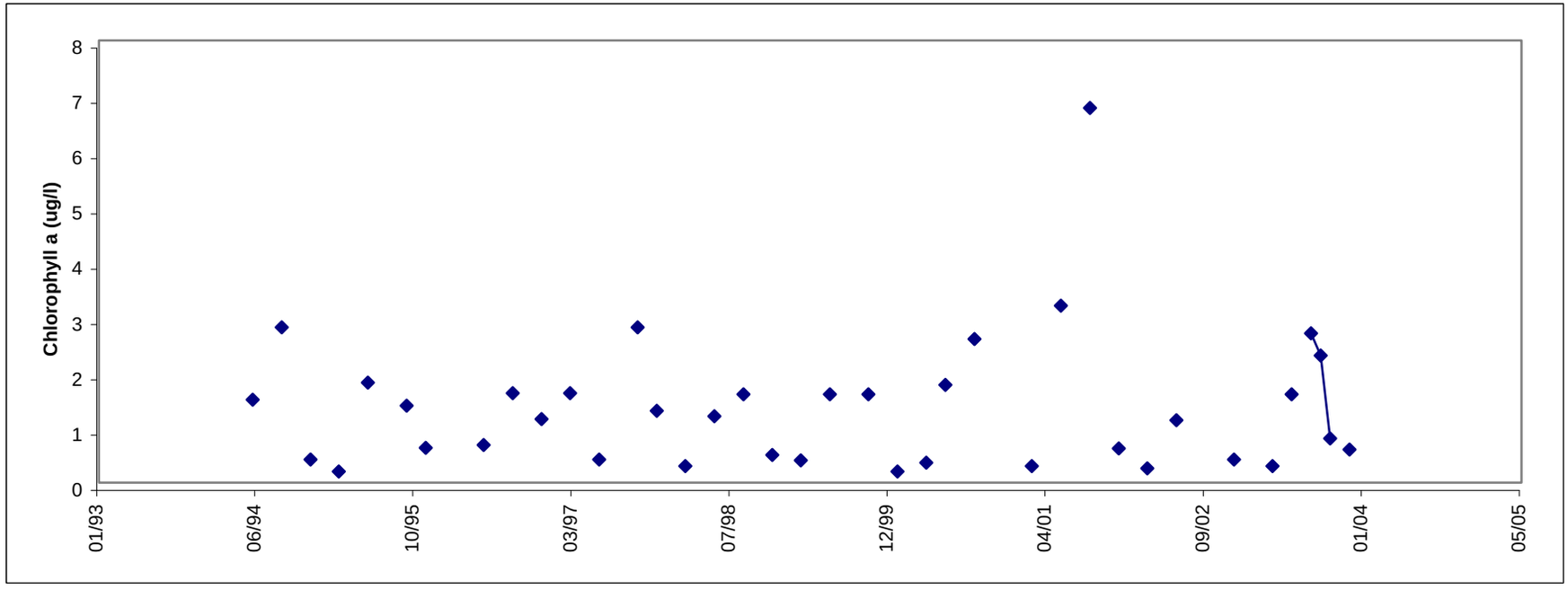
No data submitted to the ECN database

2.6.4 Phytoplankton - Loch Katrine

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.7 Loch Kinord

Grampian Region, Scotland (Lat 57°05'N; Long 2°55'W)
Sponsor: Scottish Environment Protection Agency, North Region

Lochs Kinord and Davan are situated adjacent to each other in an area of the River Dee catchment known as the Muir of Dinnet (see description of Loch Davan above). Loch Kinord (area 79.0 ha) is oligotrophic whereas Loch Davan (31.1 ha) is mesotrophic and the difference in trophic status reflects the higher proportion of agricultural land use in the Davan catchment. Loch Kinord possesses a rich aquatic flora, and a full range of hydroseral plant communities ranging from emergent fens dominated by sedges, to bog myrtle scrub, fen carr and birch woodland. It also has a rich invertebrate fauna and is an important site for aquatic beetles. About 80 species of birds breed within the SSSI and the lochs are important refuges for passage and wintering wildfowl, particularly greylag geese and wigeon. Since the early 1980's, introduced ospreys have colonised the area, and both lochs are important rearing and feeding grounds for young otters. Pollen preserved in the sediments of Loch Kinord record an almost complete sequence of Devensian late-glacial and Flandrian vegetation history so that these two lochs are important reference sites for reconstructing changing environmental conditions in north-east Scotland since the last ice-sheet melted.

2.7.1 Spot sampled chemistry data

a) summary for 2005 - Loch Kinord

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Loch Kinord

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C			5.8			13.67	9.667	13	9.375	12.17		
pH	pH			6.84			7.1	7.05	7.3	7.19	7.06		
Suspended Solids: Dry weight	mg/l			2			2.333	1.333	1.667	1.5	2		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm			134.4			97.67	95.5	102.5	89.25	90.97		
Dissolved Oxygen	mg/l			11.92			9.73	11.29	9.733	11.57	11.19		
Ammonium: NH4-N	mg/l			0.035			0.023	0.021	0.043	0.028	0.038		
Total Nitrogen	mg/l							0.364	0.844	0.223	0.29		
Nitrate: NO3-N	mg/l							0.115		0.058	0.03		
Nitrite: N02-N	mg/l			0.003			0.002	0.003	0.008	0.004	0.005		
Alkalinity (CaCo3)	mg/l			15.05			9.947	7.988	15.2	9.165	10.38		
Chloride	mg/l			22			17.67	17.5	17.83	15	16.5		
Total organic Carbon	mg/l			5.25			5		3.7	5.428	5.7		
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l			0.012			0.02	0.033	0.03		0.006		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l			0.006			0.004	0.003	0.006	0.01	0.007		
Silicate: SiO2	mg/l			3.768				6.355	7.663	7.25	3.72		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l			9.83			5.75		11.5	5.803	9.043		
Sodium - total	mg/l							8.73	11.42	8.085	9.347		
Potassium - dissolved	mg/l								1.603	0.666	0.991		
Potassium - total	mg/l			0.928			0.417	0.97	1.673	0.688	1.084		
Calcium - dissolved	mg/l								5.264	4.098	4.687		
Calcium - total	mg/l			3.484			2.92	4.578	5.392	4.203	4.803		
Magnesium - dissolved	mg/l								2.643	2.173	2.499		
Magnesium - total	mg/l			2.498			4.2	2.706	2.69	2.2	2.64		
Aluminium - total	µg/l			39.93			64.23	50.43	55.83	36.23	36.6		
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l			60.95			89.6	135.5	76.93	120.2	53.08		
Iron - dissolved	µg/l												
Iron - total	µg/l			222.3			241.3	329.8	204	195.8	228.3		
Lead - dissolved	µg/l												
Lead - total	µg/l							0.93	0.877	0.747	0.177		
Arsenic - total	µg/l							0.893	0.192	0.207	0.264		

2.7.2 Freshwater Invertebrates, species list - Loch Kinord

No data submitted to the ECN database

2.7.3 Freshwater Macrophytes, species list - Loch Kinord

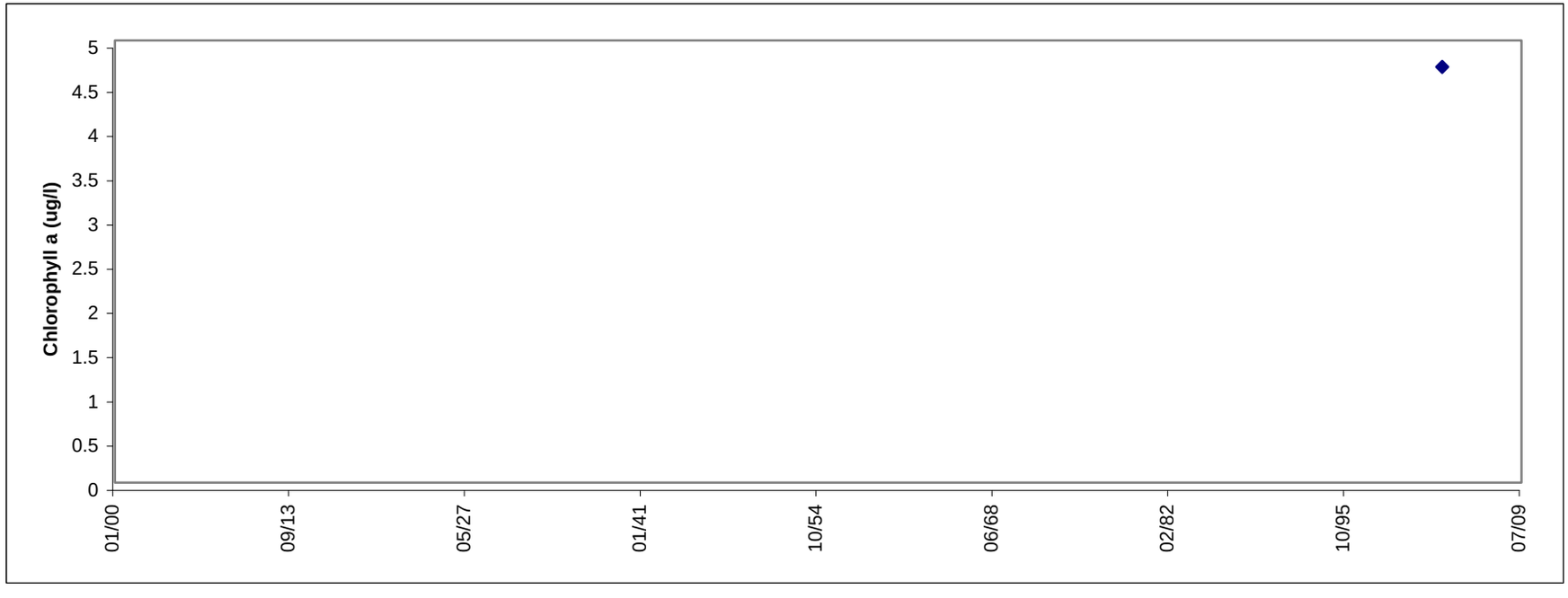
No data submitted to the ECN database

2.7.4 Phytoplankton - Loch Kinord

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.8 Loch Leven

Tayside, Scotland (Lat 56° 12'N; Long 3° 23'W)
Sponsor: Natural Environment Research Council

The loch covers 13.3 km^2 and lies at 106 m a.s.l. The catchment has a maximum altitude of 497 m a.s.l. and its area of 145 km^2 comprises mainly arable crops (38.6%) and improved pasture (31.5%), but also upland moor (11.6%), coniferous woodland (3.8%), heathland (3.5%), rough grazing (3.5%), and suburban/rural development (2.2%) with the remainder (5.3%) being deciduous woodland, bog, bare ground, and inland water. Poultry rearing units of relatively small area are also significant. High phytoplankton biomass is a major feature; this is due firstly to photosynthesis-promoting features (i) a moderate depth - mean 3.9m, (ii) a clear water (little peat-staining) with >5m Secchi readings at low chlorophyll levels, and (iii) a rich supply of nutrients, and secondly because flushing rates are moderate, rarely > 0.2 lake volumes per month. However, a major determinant of the amounts of phytoplankton seen per unit of total phosphorus loading is the *Daphnia* population densities. Depending very much on the highly capricious, 'oceanic' weather regime in this part of the world, the loch stratifies intermittently and then mainly in two deep kettle-holes which extend down to a depth of approximately 25m.

The dense algal blooms threaten the world-famous trout fishery, although probably not the fish populations *per se*; they have almost certainly contributed to declines in macrophyte abundance and species richness and thus to the diversity of invertebrates associated with the wide spectra of physical and chemical conditions provided by such macrophytes. Special concern has been expressed over macrophyte losses in relation to the wildfowl populations on the basis of which the loch is designated a 'Ramsar' site and a National Nature Reserve. Deterioration in water quality has also had a negative effect on local tourist and paper-making industries.

2.8.1 Spot sampled chemistry data

a) summary for 2005 - Loch Leven

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C	10.825	3.8	20.9	7.332	4
pH	pH	8.63	7.74	9.29	0.8	3
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Secci disk	metres					0
Conductivity	µs/cm	252.6667	228	276	24.0278	3
Dissolved Oxygen	mg/l	11.44	11.44	11.44	0	1
Ammonium: NH4-N	mg/l	0.044	0.003	0.129	0.0574	4
Total Nitrogen	mg/l					0
Nitrate: NO3-N	mg/l	0.7975	0.04	1.64	0.8456	4
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	137.6	110.2	161.8	21.1471	4
Chloride	mg/l	15.8	10	18.6	3.9158	4
Total organic Carbon	mg/l					0
Particulate organic Carbon	mg/l					0
Total Phosphorous	mg/l	0.0755	0.051	0.1	0.0346	2
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l					0
Silicate: SiO2	mg/l	2.43	0.01	4.85	3.4224	2
Sulphate: S04-S	mg/l	9.5625	6.95	11.6	2.0221	4
Sodium - dissolved	mg/l	10.05	9.3	10.4	0.5066	4
Sodium - total	mg/l					0
Potassium - dissolved	mg/l	1.645	1.4	1.94	0.2237	4
Potassium - total	mg/l					0
Calcium - dissolved	mg/l	22.675	20.8	24.5	1.8007	4
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	6.0725	5.46	6.62	0.5254	4
Magnesium - total	mg/l					0
Aluminium - total	µg/l					0
Aluminium - labile	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l					0
Iron - dissolved	µg/l					0
Iron - total	µg/l	63.075	21.9	147	56.7232	4
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Loch Leven

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.425			9.5	10.1	10.85	9.275	9.85	9.65	10.95	9.35	10.83
pH	pH	7.8		8.23	8.19	8.2	8.09	8	8.17	8.37	8.55	8.76	8.63
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm	255.3			254	298	249.8	248.5	253	241.7	237	246	252.7
Dissolved Oxygen	mg/l	11.59				10.35	10.95	11.48	11.1	11.45	10.83	10.55	11.44
Ammonium: NH4-N	mg/l					0.027	0.075	0.043	0.084	0.047	0.017	0.011	0.044
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l	0.11		1.538	1.605	1.025	0.933	1.253	1.333	1.097	1.064		0.798
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l							96.45	146.8	133.8	156.4	110	137.6
Chloride	mg/l					21.79	20.05	20.79	20.05	17.93	18.18		15.8
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l	0.086		0.051	0.042	0.049	0.075	0.049	0.062	0.04	0.068	0.064	0.076
Particulate Phosphorous	mg/l	0.067		0.022	0.022	0.031	0.052	0.029	0.034	0.022	0.04	0.039	
Phosphate (soluble reactive): P04-P	mg/l	0.007		0.02	0.006	0.005	0.007	0.003	0.009	0.006	0.01	0.008	
Silicate: SiO2	mg/l	4.703		1.26	2.778	2.705	6.275	6.293	5.928	1.643	1.708	2.085	2.43
Sulphate: S04-S	mg/l					15.63	13.54	15.9	13.3	11.63	11.84		9.563
Sodium - dissolved	mg/l							10.71	10.25	10.81	11.16		10.05
Sodium - total	mg/l												
Potassium - dissolved	mg/l							1.57	2.007	1.86	2.22		1.645
Potassium - total	mg/l												
Calcium - dissolved	mg/l							23.34	23.11	27.94	26.66		22.68
Calcium - total	mg/l												
Magnesium - dissolved	mg/l							6.338	6.813	7.007	7.753		6.073
Magnesium - total	mg/l												
Aluminium - total	µg/l					26.75	22	42.4	82.87	11.99	30.26	100.2	
Aluminium - labile	µg/l											7.685	
Manganese - dissolved	µg/l											9.02	
Manganese - total	µg/l					81.15	164.4	43.33	102.9	83.7	84.2	90.43	
Iron - dissolved	µg/l												
Iron - total	µg/l					80.5	171.4	55.93	60.33	45	43.5	111	63.08
Lead - dissolved	µg/l					3.875	1.193	0.733	0.53	0.101	0.041	0.053	
Lead - total	µg/l					4.865	2.71	2.303	0.848	0.366	0.735	0.806	
Arsenic - total	µg/l											1.47	

2.8.2 Freshwater Invertebrates, species list - Loch Leven

Agraylea multipunctata
Anabolia nervosa
Asellus aquaticus
Caenis luctuosa
Ceratopogonidae
Chironomidae
Cloeon simile
Copepoda
Corixidae
Diura bicaudata
Ecdyonurus
Enchytraeidae
Erpobdella octoculata
Gammarus pulex
Glossiphonia complanata
Haliplus confinis
Haliplus
Helobdella stagnalis
Hydracarina
Lumbriculidae
Lymnaea peregra
Micronecta poweri
Naididae
Ostracoda
Piscicola geometra
Polycelis
Potamonectes depressus
Sigara falleni
Sphaeriidae
Theromyzon tessulatum
Tipula
Tubificidae
Valvata piscinalis

2.8.3 Freshwater Macrophytes, species list - Loch Leven

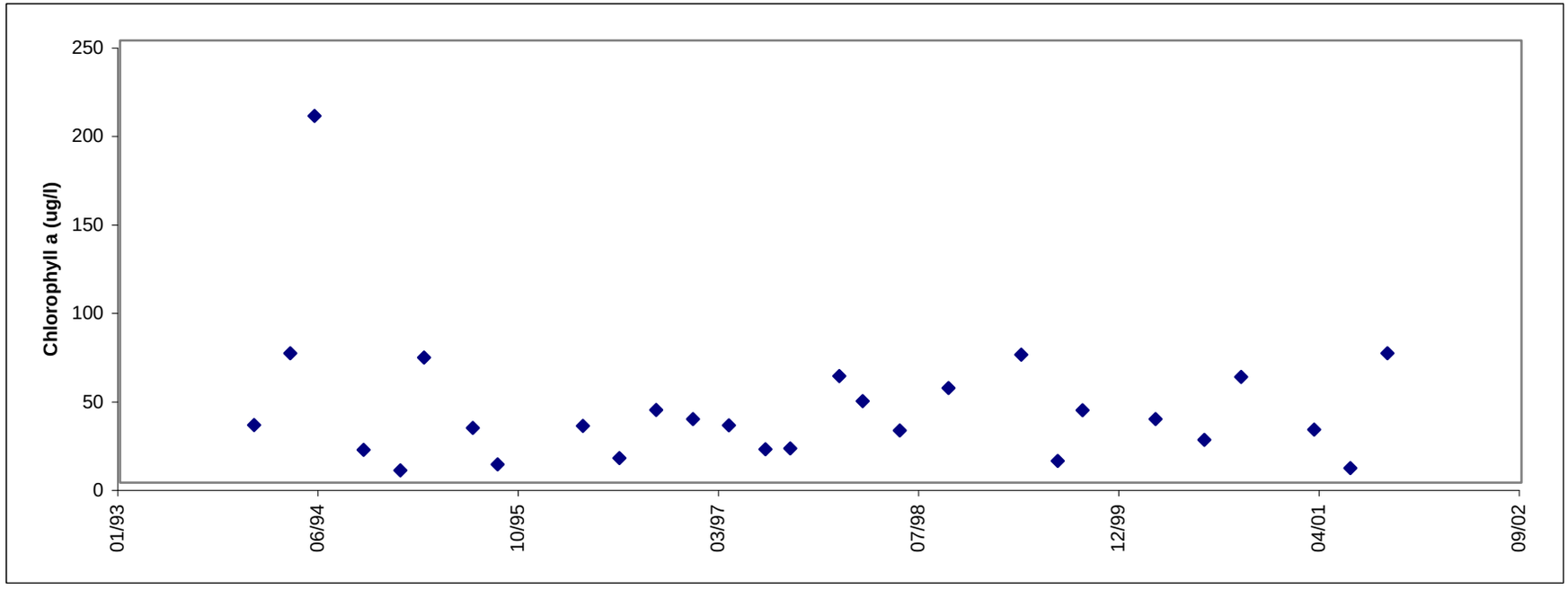
Callitriche hermaphroditica
Chara aspera
Chara contraria
Elodea canadensis
Enteromorpha
Nitella opaca
Potamogeton pectinatus
Potamogeton perfoliatus
Potamogeton pusillus

2.8.4 Phytoplankton - Loch Leven

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.9 Loch Lomond

Strathclyde Region, Scotland (Lat 56°13'N; Long 4°41'W)
Sponsor: Scottish Environment Protection Agency, West Region

The Loch Lomond basin is of glacial origin, formed by an ice sheet moving southward from the Ben Lui area and depositing eroded material in the southern-most part around Balloch, thus ensuring that the loch was freshwater rather than marine. It is the largest (by surface area) body of freshwater in Britain, with a surface area of 71 km^2. The natural catchment area is ten times greater, at 781km^2. The two main feeder rivers are the River Falloch at the northern-most point, with a mean flow of 6.8 cumecs, and the River Endrick entering on the south-eastern side of the loch, with a mean flow of 7.8 cumecs. They have markedly different catchments - that of the Falloch is mountainous with a catchment area of 80 km^2, whilst the Endrick has a typical lowland rural catchment of 220 km^2. There are distinct differences in the chemistry of the two rivers, reflecting the differences in the geology of their catchments. The Highland Boundary fault cuts across the lower part of Loch Lomond, but there is also a narrow physical restriction halfway down the length of the loch. As a result, the water chemistry and topography of the Northern and Southern Basins are quite different and there is an ECN sampling site in each.

2.9.1 Spot sampled chemistry data

a) summary for 2005 - Loch Lomond

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Loch Lomond

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.857	11.91	10.13	11.86	10.44	9.571	14.6	11.33	12	13.43		
pH	pH	6.67	6.6	6.79	6.88	6.25	6.26	6.66	6.69	6.5	6.92		
Suspended Solids: Dry weight	mg/l					1.2	2.167	2.6	2	1	1.143		
Ash-free dry weight	mg/l												
Turbidity	NIU	0.85	0.83										
Secci disk	metres	5.013	4.611	4.786	4.333	3.875	4.25	3.85	4.5	3.643	3.643		
Conductivity	µs/cm					46.8	47	50.4	45.75	52.43	48		
Dissolved Oxygen	mg/l	9.3	10.2	10.86	10.5	10.32	10.88	10.36	10.83	10.59	10.3		
Ammonium: NH4-N	mg/l	0.042	0.06	0.03	0.048	0.026	0.037	0.038	0.028	0.031	0.069		
Total Nitrogen	mg/l		1.4	0.385		0.234	0.514	0.75	0.397	0.37			
Nitrate: NO3-N	mg/l	0.176	0.347	0.272	0.268	0.239	0.244	0.158	0.17	0.18	0.084		
Nitrite: N02-N	mg/l	0.006	0.007	0.006	0.005	0.01	0.01	0.005	0.005	0.005	0.005		
Alkalinity (CaCo3)	mg/l	8.73	6.999	6.031	8.333	4.416	6.25	7.75	6.64		6.864		
Chloride	mg/l	8.6	5.437	7.275	8.25	7.889	8.286	9.443	7.603	8.35	10.64		
Total organic Carbon	mg/l	3	3.445	3.518	3.235	3.353		4.167	4.6	2.917	5.166		
Particulate organic Carbon	mg/l	0.5											
Total Phosphorous	mg/l	0.01	0.008	0.006	0.011	0.008	0.007	0.009	0.004	0.008	0.008		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.004	0.007	0.006	0.002	0.004	0.004	0.002	0.002	0.004	0.003		
Silicate: SiO2	mg/l		0.431	0.493	0.605	0.724	0.443	0.408	0.55		0.4		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l	4.68	4.233	3.965	4.184	4.27	4.289	4.67	4.01	4.303	4.304		
Potassium - dissolved	mg/l												
Potassium - total	mg/l	0.408	0.369	0.358	0.336	0.395	0.423	0.465	0.41	0.45	0.553		
Calcium - dissolved	mg/l												
Calcium - total	mg/l	2.86	2.533	2.505	2.704	2.835	2.546	2.9	2.42	2.529	2.889		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l	0.832	0.802	0.755	0.864	0.873	0.8	0.915	0.76	0.766	0.828		
Aluminium - total	µg/l	15	7.857	30.22		34.03	37.85	30.19	30.64	48.46			
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	13.33	17.22	15	15	20	17.5	18.75	15	7.667			
Iron - dissolved	µg/l												
Iron - total	µg/l	77.5	68.89	41.88	56	62.5	63.33	41.25	70	96			
Lead - dissolved	µg/l								0.54				
Lead - total	µg/l					1.957	2.023	5.965	0.703	0.463	0.666		
Arsenic - total	µg/l												

2.9.2 Freshwater Invertebrates, species list - Loch Lomond

Agapetus fuscipes
Ancylus fluviatilis
Apatania wallengreni
Asellus aquaticus
Athripsodes bilineatus
Athripsodes cinereus
Athripsodes
Caenis luctuosa
Caenis
Centroptilum luteolum
Ceraclea annulicornis
Ceratopogonidae
Chironomidae
Cloeon dipterum
Crangonyx pseudogracilis
Diptera
Dytiscidae
Ecdyonurus dispar
Ecdyonurus
Enchytraeidae
Ephemera danica
Ephemerella ignita
Gammarus pulex
Glossiphonia heteroclita
Helobdella stagnalis
Hydracarina
Hydroptila
Lepidostoma hirtum
Leuctra fusca
Leuctra geniculata
Limnephilidae
Limnius volckmari
Lumbricidae
Lumbriculidae
Lumbriculus variegatus
Lymnaea peregra
Mystacides azurea
Mystacides nigra
Naididae
Nemoura avicularis
Oecetis testacea
Oreodytes septentrionalis
Oulimnius tuberculatus
Oulimnius
Physa fontinalis
Planaria torva
Plectrocnemia conspersa
Polycelis
Polycentropus flavomaculatus
Potamonectes depressus
Riolus subviolaceus
Sericostoma personatum
Simuliidae
Tipulidae
Tubificidae

2.9.3 Freshwater Macrophytes, species list - Loch Lomond

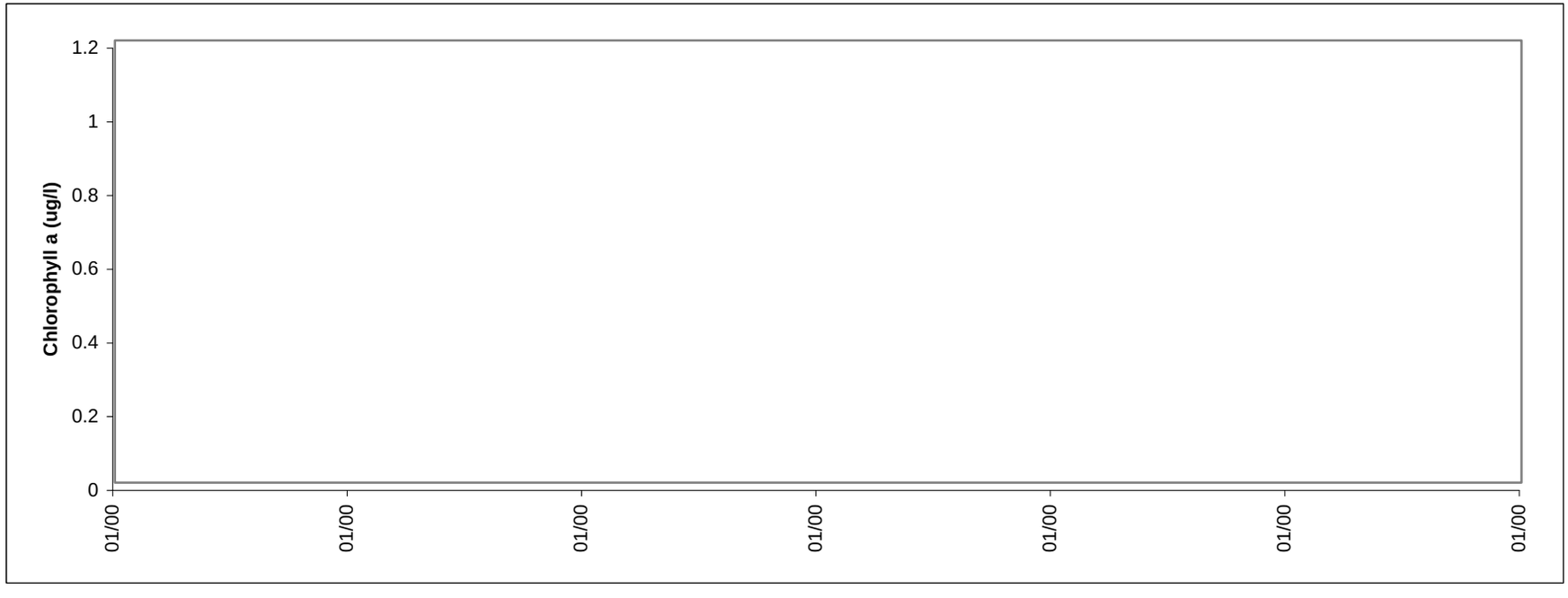
Agrostis stolonifera
Caltha palustris
Cladophora glomerata
Elodea canadensis
Elodea nuttallii
Equisetum fluviatile
Filipendula ulmaria
Fontinalis antipyretica
Galium palustre
Hydrocotyle vulgaris
Iris pseudacorus
Isoetes lacustris
Juncus articulatus
Juncus bufonius
Littorella uniflora
Lysimachia
Lysimachia thyrsiflora
Mentha aquatica
Myosotis scorpioides
Phalaris arundinacea
Potamogeton perfoliatus
Ranunculus flammula

2.9.4 Phytoplankton - Loch Lomond

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.10 Lochnagar

Grampian, Scotland (Lat 56°58'N; Long 3°14'W)
Sponsor: Department of the Environment, Transport and the Regions (through the Acid Waters Monitoring Network)

Lochnagar lies at an altitude of 785 m a.s.l. in the centre of the granite massif which comprises much of Balmoral Forest. Lochnagar is a corrie loch and lies below a north-east facing, steep backwall which rises to the summit of the same name. The loch is 9.8 ha in area with its deepest point at 24 m, and drains north-east into a tributary of the River Dee. Snow-melt comprises a major input to the loch which freezes regularly each winter. The precipitous catchment (91.9 ha) is composed of biotite granite, overlain in places by blanket peat, but dominated by bare rock with extensive fields of large boulders and coarse screes. The sparse moorland vegetation of the catchment is dominated by a community of stunted *Calluna vulgaris* (heather) and *Vaccinium myrtillus* (bilberry). The catchment is above the limit for summer sheep grazing in the region, and there is no evidence for any land-use change or active land management. Lochnagar is an Acid Waters Monitoring Network (AWMN) site, classified as having moderate acid deposition.

2.10.1 Spot sampled chemistry data

a) summary for 2005 - Lochnagar

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					0
pH	pH	5.57	5.47	5.72	0.11	4
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Secci disk	metres					0
Conductivity	µs/cm	19	18	20	0.8165	4
Dissolved Oxygen	mg/l					0
Ammonium: NH4-N	mg/l					0
Total Nitrogen	mg/l	0.218	0.01	0.329	0.1438	4
Nitrate: NO3-N	mg/l	0.1693	0.018	0.249	0.1049	4
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	0.1125	0.05	0.2	0.0629	4
Chloride	mg/l	2.9	2.6	3.6	0.4761	4
Total organic Carbon	mg/l	1.475	1.4	1.5	0.05	4
Particulate organic Carbon	mg/l					0
Total Phosphorous	mg/l	0.0035	0.003	0.005	0.001	4
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.0013	0.001	0.002	0.0005	4
Silicate: SiO2	mg/l	1.02	0.73	1.21	0.2058	4
Sulphate: S04-S	mg/l	2	1.8	2.3	0.216	4
Sodium - dissolved	mg/l	1.925	1.8	2.2	0.1893	4
Sodium - total	mg/l					0
Potassium - dissolved	mg/l	0.1725	0.14	0.2	0.025	4
Potassium - total	mg/l					0
Calcium - dissolved	mg/l	0.4725	0.45	0.49	0.0206	4
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	0.3375	0.31	0.37	0.025	4
Magnesium - total	mg/l					0
Aluminium - total	µg/l	20.75	8	30	10.2429	4
Aluminium - labile	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l	5.5	2	8	2.6458	4
Iron - dissolved	µg/l					0
Iron - total	µg/l	9	5	17	5.4772	4
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Lochnagar

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	6.4	5.525	12.7									
pH	pH	5.29	5.25	5.17	5.3	5.32	5.38	5.43	5.41	5.42	5.47	5.51	5.57
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm	23.5	22.25	24.25	21.75	23	20.25	18.75	19.75	18.25	20.5	19.75	19
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l			0.437	0.291	0.355	0.302	0.313	0.295	0.213	0.35	0.28	0.218
Nitrate: NO3-N	mg/l	0.301	0.245	0.382	0.252	0.214	0.235	0.21	0.298	0.277	0.328	0.266	0.169
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	-0.04	0.238	-0.08	-0.08	-0.1	-0.03	0.013	-0.03	-0.04	0.013	0.05	0.113
Chloride	mg/l	3.525	3.025	3.425	3.1	3.275	3.175	2.825	2.2	2.525	2.875	2.55	2.9
Total organic Carbon	mg/l	0.75	1.875	1.1	1.7	1.375	1.4	1.4	1.85	1.425	0.75	1.725	1.475
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l			0.003	0.003	0.003	0.004	0.003	0.004	0.007	0.004	0.005	0.004
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.002	0.002	0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.002	0.001	0.001
Silicate: SiO2	mg/l	1.025	1	1	0.975	1.025	1	0.975	1.025	1.155	1.115	1.01	1.02
Sulphate: S04-S	mg/l	2.725	2.375	2.8	2.625	2.55	2.325	2.125	2.175	2.1	2.275	2.1	2
Sodium - dissolved	mg/l	2.3	2.15	2.3	2.075	2.1	2.075	1.95	1.725	1.625	1.925	1.725	1.925
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.275	0.175	0.223	0.218	0.245	0.19	0.173	0.175	0.183	0.21	0.163	0.173
Potassium - total	mg/l												
Calcium - dissolved	mg/l	0.573	0.54	0.675	0.525	0.53	0.523	0.453	0.453	0.435	0.575	0.488	0.473
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	0.4	0.35	0.4	0.425	0.375	0.4	0.375	0.325	0.313	0.4	0.343	0.338
Magnesium - total	mg/l												
Aluminium - total	µg/l	75	82.5	31.25	48.75	25	90	31.5	45.75	32.75	16.75	25	20.75
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	1.5	1.5	8.125	7.75	8	8.5	5.75	5.75	4.5	9.75	6	5.5
Iron - dissolved	µg/l												
Iron - total	µg/l	7.5	7.5	13.13	18.75	15	9.375	14.63	7.5	9.875	9	8.25	9
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.10.2 Freshwater Invertebrates, species list - Lochnagar

Capnia
Chironomidae
Chloroperla torrentium
Limnephilidae
Oligochaeta
Polycentropus

2.10.3 Freshwater Macrophytes, species list - Lochnagar

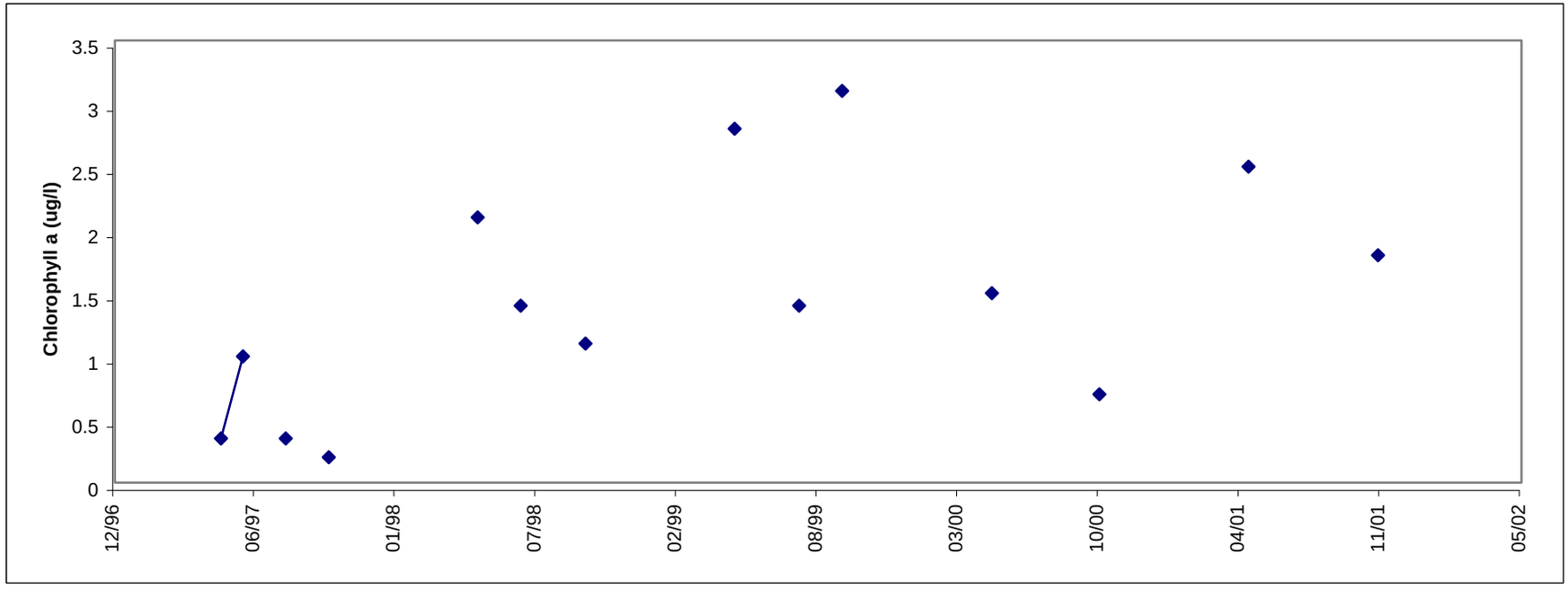
No data submitted to the ECN database

2.10.4 Phytoplankton - Lochnagar

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.11 Lough Erne

Northern Ireland (Lat 54°29N; Long 7°51W)
Sponsor: *Department of Agriculture and Rural Development (Northern Ireland)*

Lough Erne is the collective name given to Upper Lough Erne (34.5 km2) and Lower Lough Erne (109.5 km2), which are connected by the River Erne in County Fermanagh, Northern Ireland. The Upper Lough and the shallower regions of Lower Lough Erne present an example of a flooded drumlin landscape which has created an intricate mosaic of land and water. As a consequence of differences in depth and area, the water retention time of the Upper Lough is less than one month while that of the Lower Lough is four months. Passing from the shallow Upper Lough (mean depth 2.3m) and through Lower Lough Erne (mean depth 11.9m), phytoplankton abundance is reduced and algal composition alters, as do nutrient and temperature cycles. Phosphorus concentrations (100 mg P l-1) in the Upper Lough create eutrophic conditions, with high summer chlorophyll a concentrations, but phytoplankton abundance in the deep open water of the Lower Lough is more typical of a mesotrophic water body despite comparatively high phosphorus concentrations (60 mg P l-1). The paucity of phytoplankton in this region is attributed to a high back-ground light attenuation from the peat-stained water and the greater depth of the mixed water zone (>35m). The lake supports a fish population dominated by a recent introduction, the roach, as well as pike, perch, bream, trout and the pollan (Coregonus autumnalis pollan Thompson). The Zebra Mussel (Dreissena polymorpha Pallas) is a recent introduction (1996) which now has only a limited distribution in the Lower Lough. As this species expands its range and abundance throughout the Erne system, it may impact significantly on the lake ecology. Water monitoring is undertaken at the deepest portion of Lower Lough Erne with limited samples taken along a gradient towards the main river inflow of the lake.

2.11.1 Spot sampled chemistry data

a) summary for 2005 - Lough Erne

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Lough Erne

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH	7.84	7.96	7.81	7.91	7.61	7.67						
Suspended Solids: Dry weight	mg/l	2.339			3.009	3.525	3.692						
Ash-free dry weight	mg/l	1.135			0.7	1.389	2.466						
Turbidity	NIU												
Secci disk	metres	2.1	2.081	1.956	2.104	1.711	2.265						
Conductivity	µs/cm	218.4	209.3	228.3	227.4	226.5	235						
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l	0.029	0.055	0.051	0.021	0.075	0.015						
Total Nitrogen	mg/l	1.507	1.592	2.484	2.281	2.203							
Nitrate: NO3-N	mg/l	0.467	0.541	1.253	0.91	0.814	0.606						
Nitrite: N02-N	mg/l			0.012									
Alkalinity (CaCo3)	mg/l			76.63	83.17	77							
Chloride	mg/l			15.16	15.8	15.16							
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l	0.053	0.063	0.06	0.063	0.076	0.068						
Particulate Phosphorous	mg/l	0.014	0.018	0.013	0.015	0.021	0.015						
Phosphate (soluble reactive): P04-P	mg/l	0.026	0.028	0.031	0.03	0.032	0.035						
Silicate: SiO2	mg/l	0.715	1.058	1.34	1.196	1.455	0.962						
Sulphate: S04-S	mg/l			5.698	4.437	3.69							
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.11.2 Freshwater Invertebrates, species list - Lough Erne

No data submitted to the ECN database

2.11.3 Freshwater Macrophytes, species list - Lough Erne

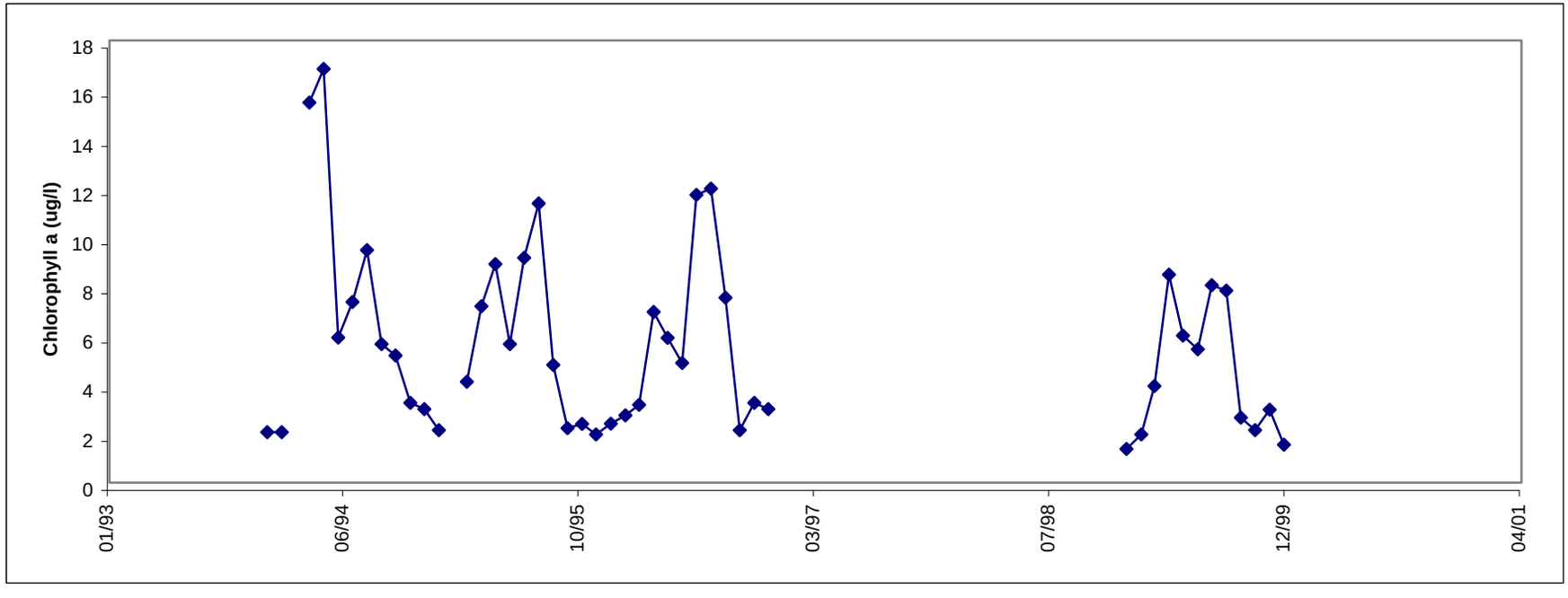
No data submitted to the ECN database

2.11.4 Phytoplankton - Lough Erne

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.12 Lough Neagh

Northern Ireland (Lat 54°37N; Long 6°24W)
Sponsor: *Department of Agriculture and Rural Development (Northern Ireland)*

Lough Neagh covers 386 km2 and is by far the largest area of freshwater in the British Isles. Situated in north-east Ireland, it has a drainage basin of 4450 km2, which is shared between Northern Ireland (91%) and the Republic of Ireland (9%). The average water retention time is 15 months. Although large in area, the lake is relatively shallow with a mean depth of 8.9m (max. 25 m). This, combined with its great size and a mild and windy oceanic climate, ensures that the water column is generally well mixed. The lake supports commercial fisheries for eels, pollan (*Coregonus autumnalis pollan* Thompson), perch and trout of which the eel fishery is the most significant, with an annual catch in the region of 600 t. Lough Neagh is hypertrophic with a mean annual total phosphorus concentration of 160 mg P l-1. Attempts to lower P concentrations in the lough by curtailing point sources of P have been unsuccessful due to increasing inputs from diffuse sources. Levels of P in the lough support large phytoplankton populations with annual chlorophyll *a* concentrations typically in excess of 60 mg l-1. The dominant alga is the cyanophyte *Planktothrix agardhii* (Komarek) Anagnostides and the phytoplankton is now less diverse than in the late 1960s when regular monitoring began. Since then there has been regular monitoring of the plankton, lake and river nutrient concentrations, which have been used to produce nutrient budgets for the lake.

2.12.1 Spot sampled chemistry data

a) summary for 2005 - Lough Neagh

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Lough Neagh

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH	8.22	8.3	8.49	8.3								
Suspended Solids: Dry weight	mg/l	7.535	6.687		8.534								
Ash-free dry weight	mg/l	1.819	2.873		1.925								
Turbidity	NIU												
Secci disk	metres	1.142	1.3	1.039	1.093								
Conductivity	µs/cm	283.7	294.5	296.3	284.3								
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l	0.032	0.024	0.094	0.033								
Total Nitrogen	mg/l	1.804	1.572	2.182	1.946								
Nitrate: NO3-N	mg/l	0.407	0.412	0.834	0.576								
Nitrite: N02-N	mg/l			0.023	0.013								
Alkalinity (CaCo3)	mg/l	99.59	99.2	102.5	103.7								
Chloride	mg/l	18.74	21.01	20.39	21.84								
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l	0.107	0.121	0.144	0.164								
Particulate Phosphorous	mg/l	0.04	0.039	0.051	0.06								
Phosphate (soluble reactive): P04-P	mg/l	0.053	0.059	0.075	0.084								
Silicate: SiO2	mg/l	2.024	2.458	2.066	2.296								
Sulphate: S04-S	mg/l	4.852	4.835	6.601	6.614								
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.12.2 Freshwater Invertebrates, species list - Lough Neagh

No data submitted to the ECN database

2.12.3 Freshwater Macrophytes, species list - Lough Neagh

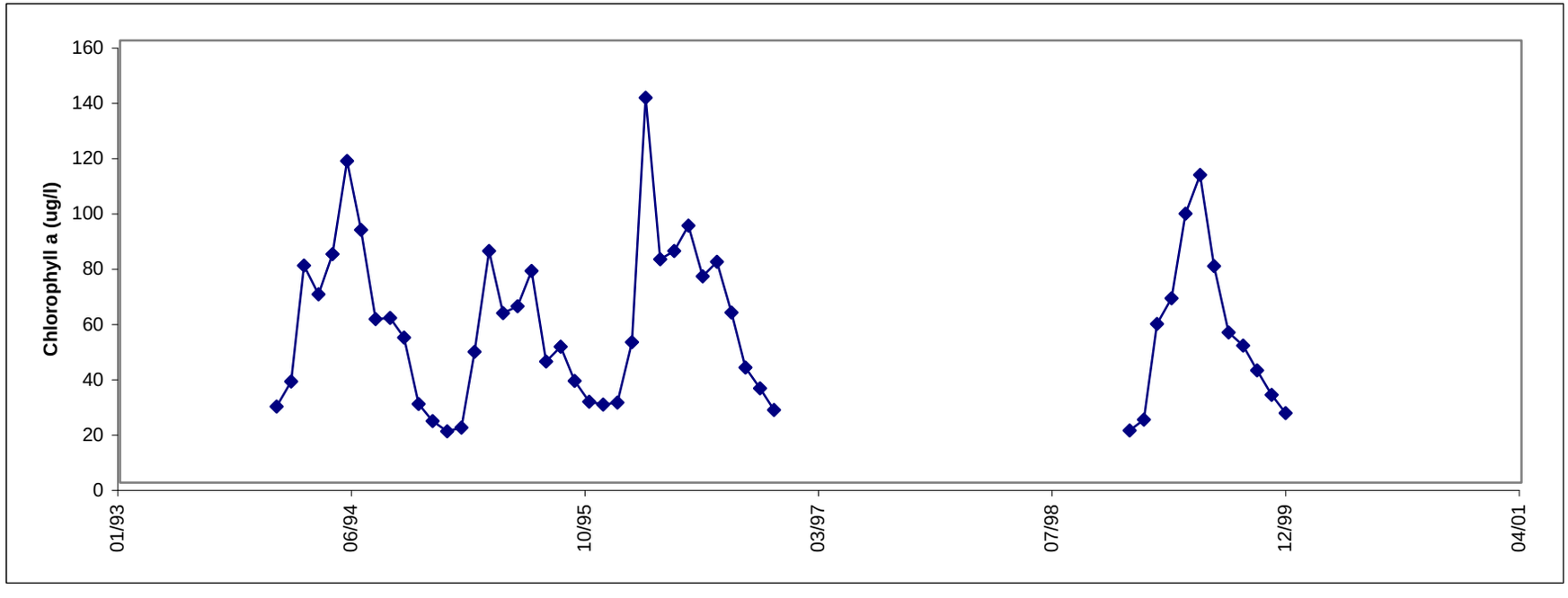
No data submitted to the ECN database

2.12.4 Phytoplankton - Lough Neagh

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.13 Scoat Tarn

Cumbria, England (Lat 54°29'N; Long 3°18'W)
Sponsor: Department of the Environment, Transport and the Regions (through the Acid Waters Monitoring Network)

Scoat Tarn in the English Lake District is a typical mountain corrie lake, being small and deep with an area of 5.2 ha and a maximum depth of 20 m. The lake lies in a west-facing valley at an altitude of 602 m a.s.l. and drains into Wastwater *via* the Nether Beck. The catchment comprises a small corrie (95 ha) with steeply sloping walls and three summits in excess of 825 m. The bedrock is Ordivician tuff (undifferentiated) of the Borrowdale Volcanic series and the local soils are mainly shallow, peaty rankers. The eastern slopes are mainly of rock and boulders while those to the north are less steep and are covered in rough grass and *Sphagnum* moss. Land use is confined to low intensity sheep grazing. Scoat Tarn is an Acid Waters Monitoring Network (AWMN) site, classified as having high acid deposition.

2.13.1 Spot sampled chemistry data

a) summary for 2005 - Scoat Tarn

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					0
pH	pH	5.12	4.94	5.31	0.17	4
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Secci disk	metres					0
Conductivity	µs/cm	33	26	45	8.756	4
Dissolved Oxygen	mg/l					0
Ammonium: NH4-N	mg/l					0
Total Nitrogen	mg/l	0.3165	0.228	0.432	0.0959	4
Nitrate: NO3-N	mg/l	0.2018	0.13	0.307	0.0775	4
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	-0.325	-0.55	-0.15	0.1848	4
Chloride	mg/l	6.35	5.1	8.7	1.6743	4
Total organic Carbon	mg/l	1.25	0.7	1.5	0.3697	4
Particulate organic Carbon	mg/l					0
Total Phosphorous	mg/l	0.0048	0.003	0.01	0.0035	4
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.0023	0.001	0.006	0.0025	4
Silicate: SiO2	mg/l	0.5175	0.3	0.74	0.2066	4
Sulphate: S04-S	mg/l	2.225	2.2	2.3	0.05	4
Sodium - dissolved	mg/l	3.4	2.8	4.1	0.6055	4
Sodium - total	mg/l					0
Potassium - dissolved	mg/l	0.2175	0.18	0.28	0.0435	4
Potassium - total	mg/l					0
Calcium - dissolved	mg/l	0.5175	0.42	0.63	0.0922	4
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	0.515	0.42	0.67	0.1201	4
Magnesium - total	mg/l					0
Aluminium - total	µg/l	52.75	27	82	22.6771	4
Aluminium - labile	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l	13.25	9	18	4.0311	4
Iron - dissolved	µg/l					0
Iron - total	µg/l	3.75	1	7	2.7538	4
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Scoat Tarn

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	7.55	6.9	8.2	3	15	8.733						
pH	pH	5.09	5.03	5.04	5.07	5.02	5.07	5.08		5.06	5.22	5.15	5.12
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm	31.5	35.5	32.25	32.25	31.75	30.75	29.25		28.75	26.5	26.75	33
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l			0.488	0.31	0.419	0.321	0.302		0.221	0.284	0.153	0.317
Nitrate: NO3-N	mg/l	0.207	0.364	0.462	0.255	0.256	0.252	0.199		0.24	0.216	0.197	0.202
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	-0.31	-0.19	-0.4	-0.35	-0.43	-0.36	-0.3		-0.39	-0.19	-0.29	-0.33
Chloride	mg/l	5.625	6.375	5.1	6.175	6.175	6.025	5.55		5.3	4.775	4.825	6.35
Total organic Carbon	mg/l	1.25	1.175	1.325	0.975	1.825	1.175	1.25		1.55	1.35	1.125	1.25
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l			0.003	0.003	0.005	0.004	0.003		0.008	0.006	0.005	0.005
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.002	0.002	0.003	0.003	0.003	0.003	0.003		0.002	0.001	0.002	0.002
Silicate: SiO2	mg/l	0.55	0.575	0.6	0.55	0.625	0.525	0.475		0.66	0.643	0.638	0.518
Sulphate: S04-S	mg/l	3	2.775	2.925	2.875	2.875	2.525	2.375		2.375	2.475	2.4	2.225
Sodium - dissolved	mg/l	3.325	3.7	3.25	3.525	3.425	3.375	3.2		2.85	2.825	2.625	3.4
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.35	0.319	0.26	0.248	0.27	0.22	0.23		0.243	0.238	0.198	0.218
Potassium - total	mg/l												
Calcium - dissolved	mg/l	0.555	0.635	0.62	0.445	0.565	0.523	0.473		0.468	0.535	0.458	0.518
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	0.5	0.6	0.525	0.6	0.5	0.5	0.475		0.473	0.485	0.433	0.515
Magnesium - total	mg/l												
Aluminium - total	µg/l	92.5	155	126.3	85	80	130	66		52.75	34.75	40	52.75
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	1.5	1.5	13.88	17.75	16	17.5	12.5		11.5	12	10.25	13.25
Iron - dissolved	µg/l												
Iron - total	µg/l	7.5	7.5	11.25	15	18.75	9.375	7.5		6.125	5.25	4.75	3.75
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.13.2 Freshwater Invertebrates, species list - Scoat Tarn

Amphinemura sulcicollis
Chironomidae
Cyrnus
Leuctra inermis

2.13.3 Freshwater Macrophytes, species list - Scoat Tarn

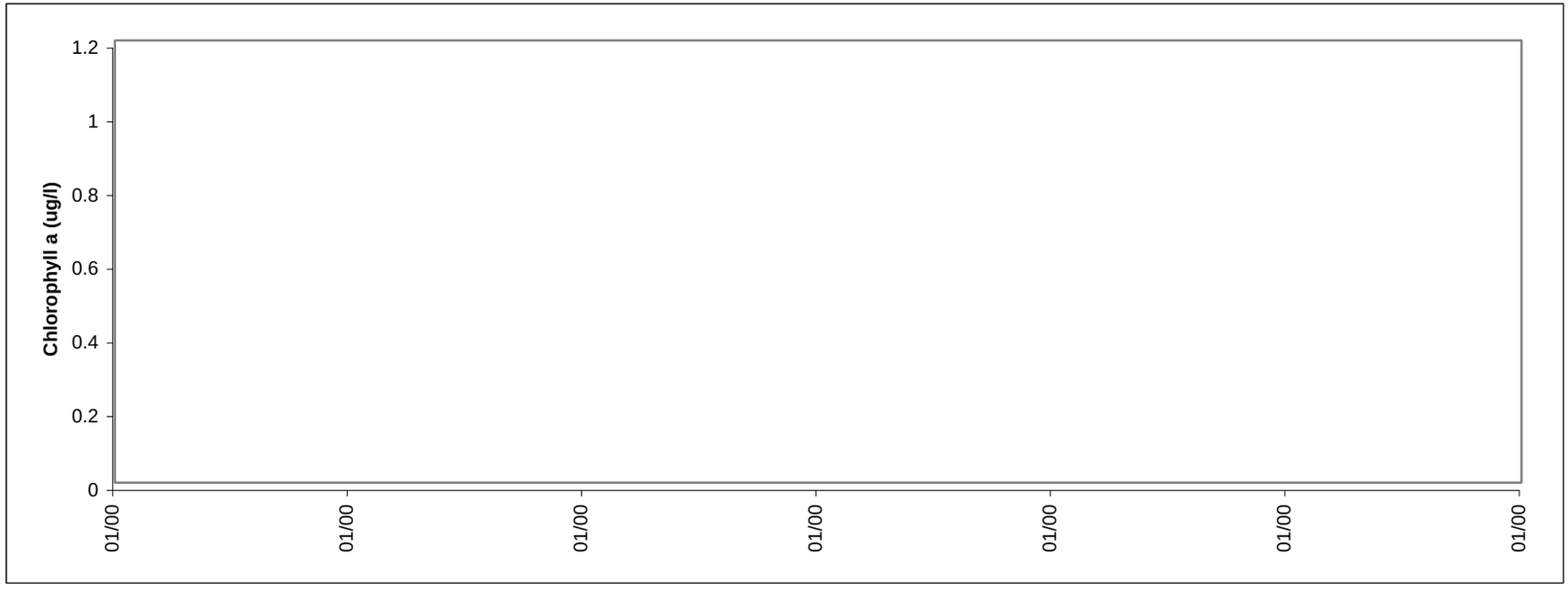
No data submitted to the ECN database

2.13.4 Phytoplankton - Scoat Tarn

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.14 Upton Broad

Norfolk, England (Lat 52°39'N; Long 1°32'E)
Sponsor: Environment Agency, Anglian Region

Upton Broad is a shallow lowland lake, formed by the flooding of peat diggings, which were abandoned in the 14th century. It has an area of 6.9 ha and an approximate mean depth of 0.8m. The broad lies in the valley of the River Bure at an elevation of less than 10m above Ordnance Datum (AOD), but is isolated from the river system and is groundwater fed, with some drainage from surrounding land. Geologically, the area is underlain by Quaternary deposits of Norwich Crag, with glacial till and outwash deposits at the surface. The broad forms part of the Upton Broad and Marshes Site of Special Scientific Interest (SSSI). It is considered to have been relatively unaffected by the eutrophication that has damaged most of the lakes in the region, and supports a population of the nationally rare aquatic macrophyte *Najas marina*. The broad is surrounded by a band of alder carr (wet woodland). To the north of the broad are drained grazing marshes which form part of the Broads Environmentally Sensitive Area, and to the south the catchment is given over to more intensive arable agriculture. The broad is used for angling by a private club; there is no other public access.

2.14.1 Spot sampled chemistry data

a) summary for 2005 - Upton Broad

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Upton Broad

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.14.2 Freshwater Invertebrates, species list - Upton Broad

No data submitted to the ECN database

2.14.3 Freshwater Macrophytes, species list - Upton Broad

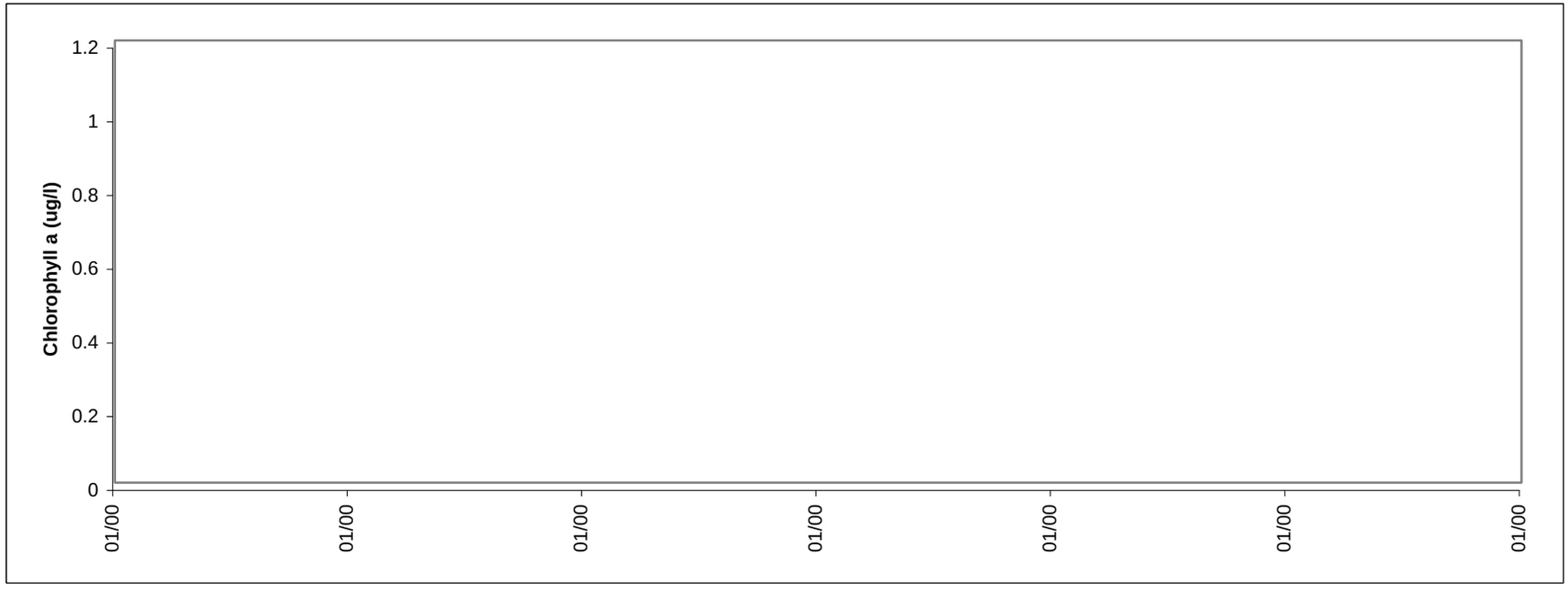
No data submitted to the ECN database

2.14.4 Phytoplankton - Upton Broad

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.15 Windermere

Cumbria, England (54º 24'N; Lat 2º 57'W)
Sponsor: Natural Environment Research Council

Windermere lies in the north-west corner of England in the English Lake District, an area of great natural beauty. The dominant geological structure of the Lake District is that of a dome of Paleozoic rocks formed by uplift in the Tertiary. This uplift produced a radial drainage pattern which was enhanced during the Pleistocene glaciation, with the major lakes occupying bedrock basins in steep-sided, flat-floored valleys. Windermere is the largest natural lake in England having a surface area of 14.8 km^2 at an altitude of only 40 m AOD. It is divided by a shallow sill into two basins; the North Basin has a surface area of 8 km^2 and maximum depth of 64 m and the South Basin has a surface area of 6.7 km^2 and maximum depth of 42 m. The North basin of Windermere, which is the ECN sampling site, has a catchment of 180 km^2 which drains into the lake *via* two main rivers, several small tarns (lakes) and several streams. The catchment is mainly hill land, grazed by sheep throughout the year but also used intensively for recreational purposes. The villages in the valleys are major tourist destinations with consequent increases in the sewage input to the lake. Over the past 50 years levels of dissolved reactive phosphorus in the lake have more than doubled, reaching their highest levels in the 1980's. The effluent discharged into the North Basin of Windermere from the main sewage works is now phosphate-stripped in an effort to reduce the nutrient loading to the lake.

The lake is itself designated as SSSI; it is a source of potable water, a major recreational facility and a specialised fishery for charr (*Salvelinus alpinus*). The Freshwater Biological Association, and latterly the Institute of Freshwater Ecology, have maintained a laboratory on the shore of Windermere for over 50 years and in consequence there is a large body of scientific literature based on Windermere and other Lake District lakes.

2.15.1 Spot sampled chemistry data

a) summary for 2005 - Windermere

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Windermere

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	10.61	11.47	10.32	8.338	11.43	11.27	11.3	11.15	11.47	11.86	11.7	
pH	pH	7.12	7.16	7.27	7.45	7.2	7.39	7.5	7.43	7.44	7.7	7.41	
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres	4.516	4.738	4.777	4.992	5.465	4.073	4.037	4.963	3.9	3.78	4.058	
Conductivity	µs/cm	67.3	69.91	72.25	70.36	68.84	65.7	64.85	65.06	63.35			
Dissolved Oxygen	mg/l	10.67	9.982	10.59	10.1	10.49	10.82	11.01	10.63	10.68	10.97	10.68	
Ammonium: NH4-N	mg/l	0.004	0.017	0.052	0.027	0.054	0.054	0.137	0.01	0.006	0.009	0.008	
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l	0.5	0.36	0.614	0.467	0.506	0.465	0.322	0.403	0.372	0.289	0.396	
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	10.83	11.13	10.59	10.57	11.22	12.03	11.83	11.91	12.28	13.6	12.55	
Chloride	mg/l	7.569	8.104	7.675	7.984	7.246	7.308	7.305	6.58	6.55	6.604		
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l				0.116	0.114	0.118	0.128	0.013	0.013	0.014	0.014	
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.036	0.031	0.028	0.02	0.029	0.037	0.031	0.004	0.003	0.003	0.002	
Silicate: SiO2	mg/l	1.138	0.975	0.995	0.627	0.977	1.162	1.068	1.113	0.971	0.902	1.019	
Sulphate: S04-S	mg/l	5.28	5.101	5.324	4.902	4.376	4.757	3.921	4.061	0.412	0.437		
Sodium - dissolved	mg/l	4.51	4.745	4.713	4.359	4.75	4.453	4.31	4.177	4.204	4.515		
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.527	0.603	0.56	0.723	0.569	0.519	0.451	0.487	0.472	0.498		
Potassium - total	mg/l												
Calcium - dissolved	mg/l	5.743	5.877	6.076	5.581	5.482	5.527	5.462	5.311	5.731	6.251		
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	0.911	0.957	0.939	0.895	0.94	0.944	0.908	0.872	0.913	1.007		
Magnesium - total	mg/l												
Aluminium - total	µg/l									19.79	12.64	9.54	
Aluminium - labile	µg/l									6.615	7.417		
Manganese - dissolved	µg/l									0.697	1.197	5.688	
Manganese - total	µg/l									13.02	10.3	13.75	
Iron - dissolved	µg/l									8.452	10.19		
Iron - total	µg/l									23.01	27.6		
Lead - dissolved	µg/l									0.056	0.054	0.037	
Lead - total	µg/l									0.223	0.268	0.22	
Arsenic - total	µg/l											0.594	

2.15.2 Freshwater Invertebrates, species list - Windermere

Agraylea multipunctata
Asellus aquaticus
Athripsodes cinereus
Athripsodes
Caenis horaria
Caenis luctuosa
Centroptilum luteolum
Ceratopogonidae
Chironomidae
Cloeon simile
Corixidae
Crangonyx pseudogracilis
Dendrocoelum lacteum
Dugesia
Ephemerella ignita
Erpobdella octoculata
Gammarus pulex
Helobdella stagnalis
Hydracarina
Hydroptila
Lepidostoma hirtum
Lumbricidae
Lumbriculidae
Naididae
Nematoda
Orectochilus villosus
Ostracoda
Oulimnius troglodytes
Oulimnius tuberculatus
Oulimnius
Oxyethira
Physa fontinalis
Polycelis
Polycentropus flavomaculatus
Potamonectes depressus
Sericostoma personatum
Setodes argentipunctellus
Sigara dorsalis
Theromyzon tessulatum
Tinodes waeneri
Tipulidae
Tubificidae

2.15.3 Freshwater Macrophytes, species list - Windermere

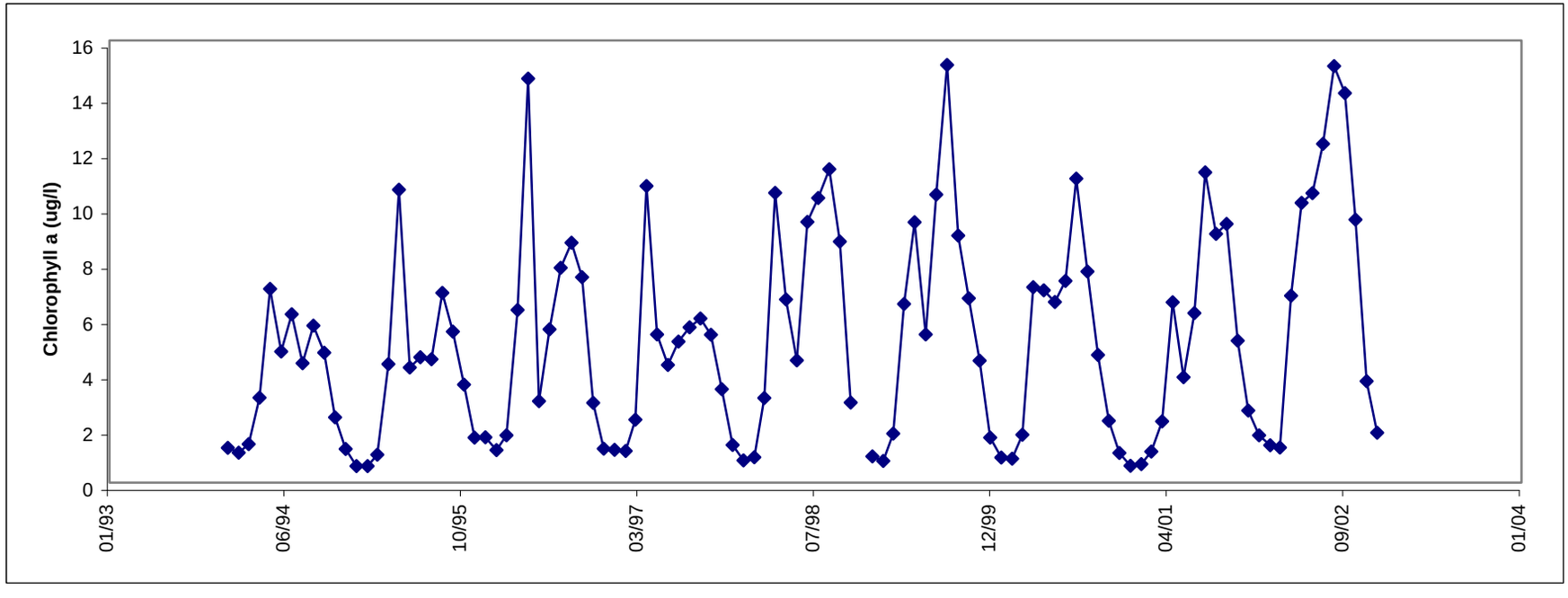
No data submitted to the ECN database

2.15.4 Phytoplankton - Windermere

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.16 Wroxham Broad

Norfolk, England (Lat 52°41'N; Long 1°25'E)
Sponsor: Environment Agency, Anglian Region

Wroxham Broad is a shallow, lowland lake formed from the flooding of mediaeval peat diggings which were abandoned in the 14th century. The broad has an area of 34.4 ha and an average depth of 1.3 m. It is located in the middle reach of the River Bure, close to the upper tidal limit, at an elevation of less than 10 m AOD. The broad lies on the west side of the river, to which it has two navigable openings. It is separated from the river channel by a narrow, tree-covered bank. The broad has been subject to serious eutrophication, largely as a result of the discharge of treated sewage effluent to the River Bure. Since 1986 a programme of phosphorus removal has been in operation at the major sewage treatment works affecting the river, and this stretch of river is now designated a Sensitive Area under the Urban Waste Water Treatment Directive. The low gradients of the area and seasonally low flows of recent years have meant that the flushing rate of the broad is slow, although exact retention times are unknown. The surrounding catchment is underlain by Quaternary deposits of Norwich Crag, with chalk at depth, and superficial glacial till and outwash deposits. The area is subject to intensive agricultural activity, although surrounding the broad itself there are small areas of alder carr (wet woodland). The broad is used extensively for recreational purposes, particularly in the summer months.

2.16.1 Spot sampled chemistry data

a) summary for 2005 - Wroxham Broad

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Secci disk	metres					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Total organic Carbon	mg/l					
Particulate organic Carbon	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Wroxham Broad

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Secci disk	metres												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Total organic Carbon	mg/l												
Particulate organic Carbon	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.16.2 Freshwater Invertebrates, species list - Wroxham Broad

No data submitted to the ECN database

2.16.3 Freshwater Macrophytes, species list - Wroxham Broad

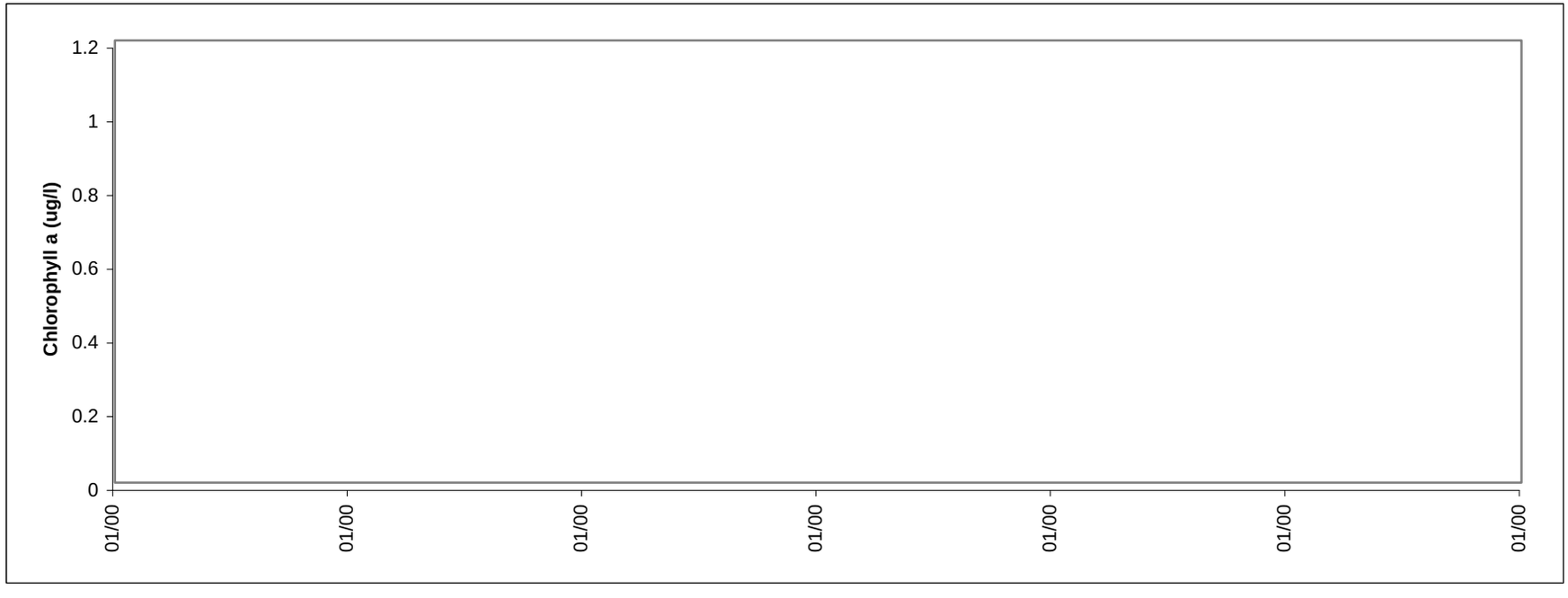
No data submitted to the ECN database

2.16.4 Phytoplankton - Wroxham Broad

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

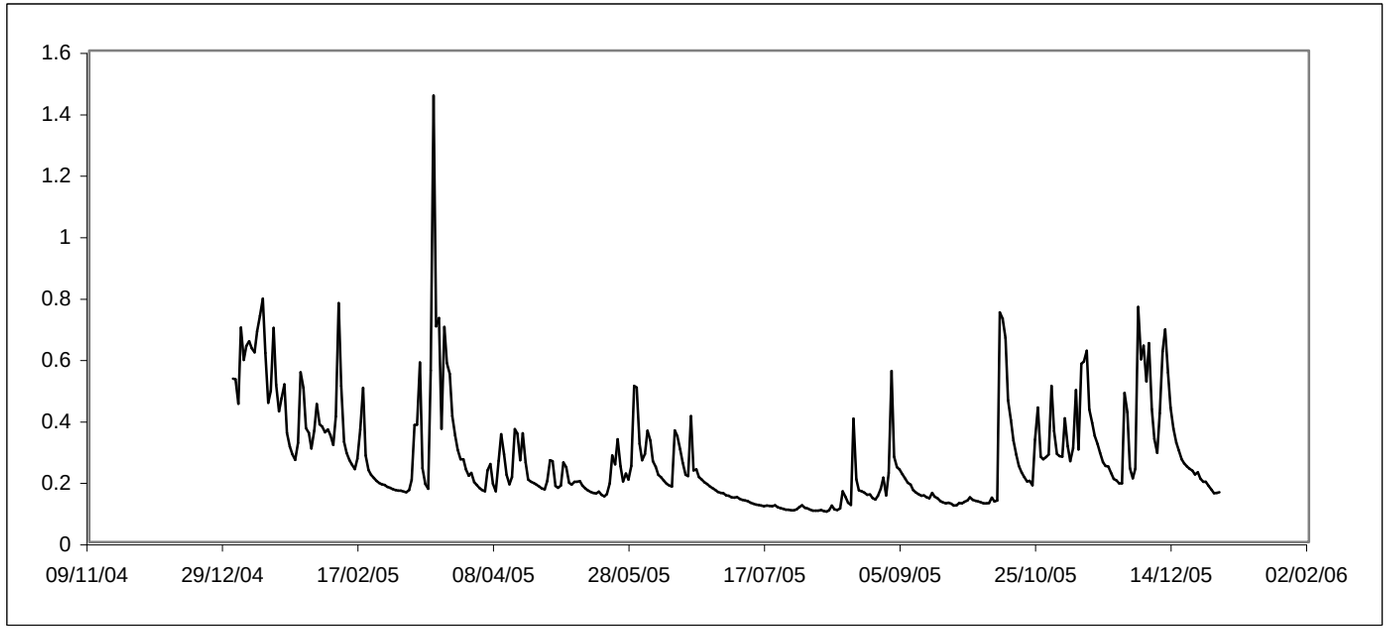


2.17 Allt a'Mharcaidh

Highland Region, Scotland (Lat 57°07'N; Long 3°51'W)
Sponsor: Scottish Environment Protection Agency, North Region

Allt a'Mharcaidh is a stream site on the western flank of the Cairngorm Mountains. The catchment area is 998 ha and it drains to the River Feshie, a tributary of the River Spey. The catchment rises from 325 m at the sampling site to 1111 m and is covered by alpine and peaty podsols (60%) and blanket peat (40%). The underlying geology is intrusive biotite-granite of the Lower Old Red Sandstone age. Vegetation is characterised by a heather/fescue grass mixture (90%) with native pinewoods (2%) interspersed along the lowest reaches. The catchment comprises part of the Cairngorm National Nature Reserve and land-use is confined to deer grazing. The stream gradient is steep and exposed bedrock, rapids and waterfalls and large boulders characterise the monitored channel section. Allt a'Mharcaidh is also an Acid Waters Monitoring Network (AWMN) site, classified as having moderate acid deposition.

2.17.1 Discharge - Allt a' Mharcaidh



Current year statistics

Mean	0.28
Max	9.85
Min	0
Std. dev	0.26
N%	99.9

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.51	0.32	0.37	0.23	0.23	0.24	0.12	0.15	0.17	0.29	0.33	0.36

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
										0.33	0.28

2.17.2 Spot sampled chemistry data

a) summary for 2005 - Allt a' Mharcaidh

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Allt a' Mharcaidh

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		6.4	7.591	6.95	6.65	6.563	6.85	6.409	7.375	7.545		
pH	pH		6.47	6.46	6.39	6.46	6.53	6.58	6.56	6.56	6.76		
Suspended Solids: Dry weight	mg/l		1.727	1.6	1.3	1.091	1.182	1.273	1.546	1.583	1.091		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm		24.64	26.36	24.9	24.25	26.55	24.18	23.15	25.58	28.56		
Dissolved Oxygen	mg/l		11.92	12.23	11.05	11.63	11.63	11.68	11.92	11.82	11.53		
Ammonium: NH4-N	mg/l		0.005	0.02	0.026	0.014	0.014	0.012	0.007	0.004	0.008		
Total Nitrogen	mg/l							0.195	0.115	0.417	0.326		
Nitrate: NO3-N	mg/l		0.141	0.102	0.104	0.07	0.066	0.061	0.021	0.041	0.043		
Nitrite: N02-N	mg/l		0.003	0.003	0.002	0.002	0.002	0.003	0.005	0.004	0.011		
Alkalinity (CaCo3)	mg/l		2.315	2.529	2.49	1.886	2.296	2.186	2.836	2.417	3.231		
Chloride	mg/l		3.636	3.25	3.125	3.273	3.455	3.2	3.018	4.4	3.333		
Biological Oxygen demand	mg/l							0.4	0.34		0.333		
Total Phosphorous	mg/l		0.01	0.013	0.002	0.011	0.014	0.013	0.011		0.003		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l		0.002	0.007	0.004	0.005	0.003	0.002	0.003	0.007	0.009		
Silicate: SiO2	mg/l		2.705	2.799	2.845		3.087	4.139	6.08	5.574	6.514		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l		2.986	3.236	2.973	4.655	2.35		3.383	3.236	2.866		
Sodium - total	mg/l							3.208	3.273	3.365	3.373		
Potassium - dissolved	mg/l								0.34	0.384	0.342		
Potassium - total	mg/l		0.247	0.33	0.233	4.176	0.38	0.229	0.341	0.545	0.347		
Calcium - dissolved	mg/l								1.216	0.948	1.067		
Calcium - total	mg/l		0.605	0.739	0.741	1.623	0.38	1.072	1.141	1.107	1.118		
Magnesium - dissolved	mg/l								0.372	0.356	0.509		
Magnesium - total	mg/l		0.422	0.391	0.405	0.485	0.2	0.462	0.371	0.379	0.58		
Aluminium - total	µg/l		86.64	68.29	94.93	91.7	103.4	118.1	121.6	101.7	67.33		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l		3.095	3.452	3.095	0.977	0.88	0.79	1.1	0.524	0.353		
Manganese - dissolved	µg/l												
Manganese - total	µg/l		1.65	1.273	1.455	2.75	1.526	2.476	6.007	5.817	12.04		
Iron - dissolved	µg/l												
Iron - total	µg/l		21.8	18.54	21.68	27.05	29.27	30.64	47.45	25.75	16.6		
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l		4.84	4.84	4.84	4.84	4.174	0.682	0.742	0.386	0.197		
Nickel - dissolved	µg/l												
Nickel - total	µg/l		0.815	0.815	0.815	0.497	0.422	0.589	0.606	0.593	0.188		
Mercury - dissolved	µg/l												
Mercury - total	µg/l		0.049	0.049	0.049	0.079	0.08	0.035	0.047	0.029			
Copper - dissolved	µg/l		1.444	0.203	0.203	0.428	0.374	0.418	1.144	0.371	0.212		
Copper - total	µg/l							1.179	1.337	0.531	0.521		
Zinc - dissolved	µg/l		1.887	0.718	0.494	0.854	1.208	1.855	6.19	3.434	0.765		
Zinc - total	µg/l				0.844	1.113	0.978	3.276	6.376	5.541	2.674		
Cadmium - dissolved	µg/l		0.022	0.022	0.022	0.667	0.152	0.178	0.106	0.098	0.06		
Cadmium - total	µg/l							0.214	0.104	0.108	0.038		
Lead - dissolved	µg/l												
Lead - total	µg/l							0.694	0.27	0.173	0.114		
Arsenic - total	µg/l							0.543	0.265	0.249	0.157		

2.17.3 Freshwater Invertebrates, species list - Allt a' Mharcaidh

No data submitted to the ECN database

2.17.4 Freshwater Macrophytes, species list - Allt a' Mharcaidh

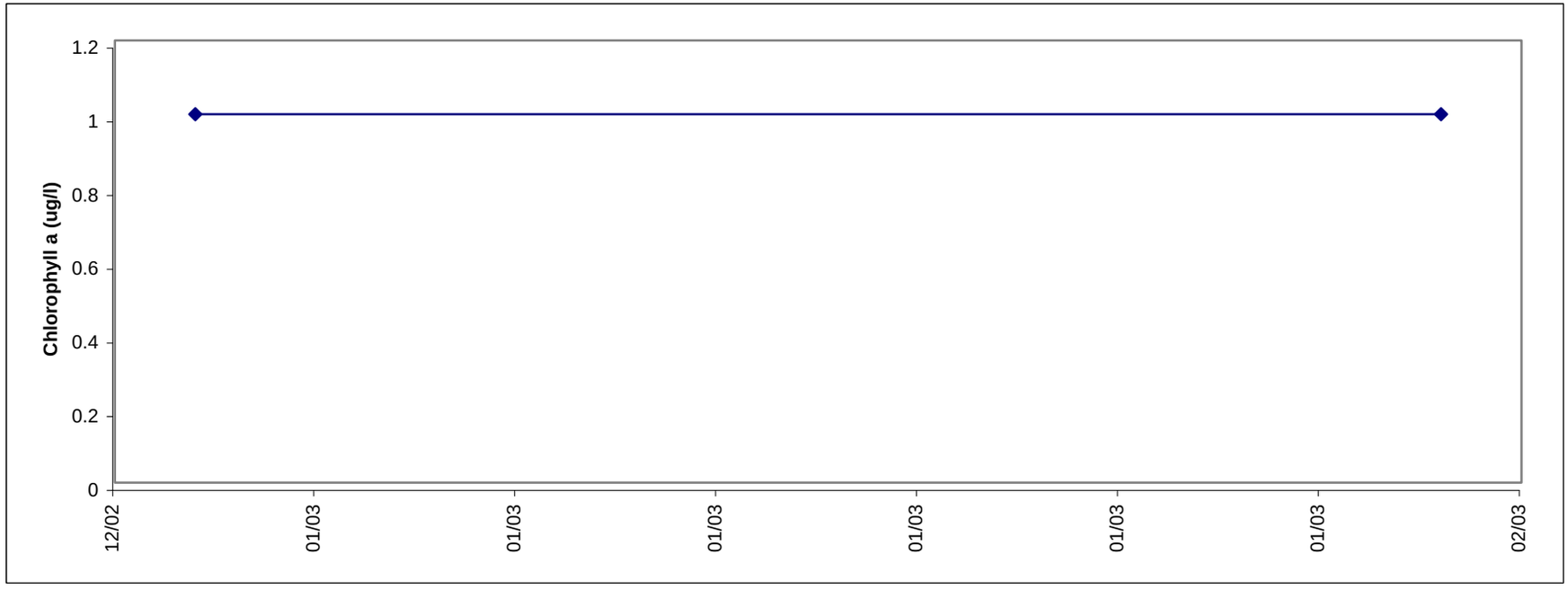
No data submitted to the ECN database

2.17.5 Phytoplankton - Allt a' Mharcaidh

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.18 Birnie Burn

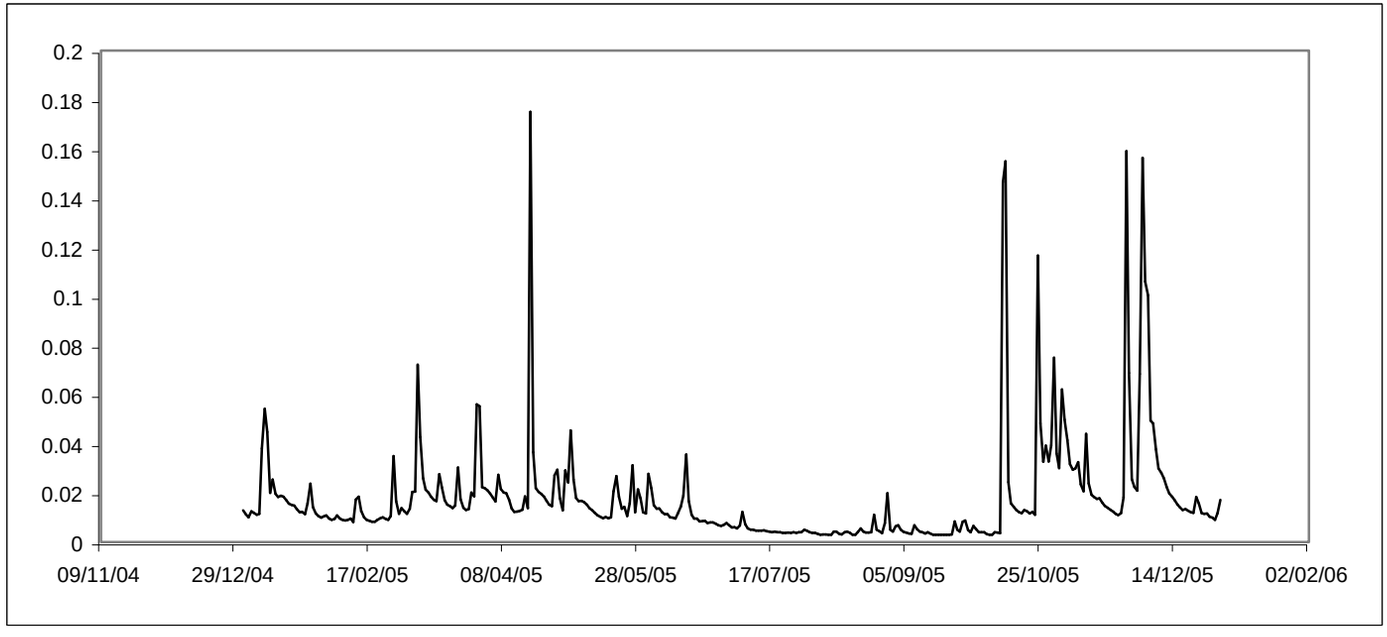
Grampian, Scotland (Lat 56°54'N; Long 2°33'W)
Sponsor: Scottish Executive Environment and Rural Affairs Department (through the Macaulay Institute).

The ECN freshwater sampling site, Birnie Burn is co-located with the Macaulay Institute's terrestrial site at Glensaugh. Glensaugh Research station is located 35 miles south west of Aberdeen, NE Scotland. (NGR NO 671783) on the edge of the Grampian hills and covers over 1100 hectares. There is a small amount of woodland (5ha) and some short term and permanent grassland (150ha) but the dominant cover is semi-natural vegetation which accounts for the remaining area.

The Birnie Burn drains a small upland catchment of 0.8 km2 located toward the northern boundary of the research station. The highest hills in the catchment are to the North where they reach an altitude of around 450m. The ECN sampling point and gauging station are located less than 1km south of the stream source at an altitude of 240m a.s.l. The soils and the vegetation within the catchment area can be broadly classified into three zones. The upper zone (>400m a.s.l.) is characterised by hill peats developed on gentle slopes and covered by peat mosses (Sphagnum sp) and cotton grass (Eriophurum vaginatum). The middle zone (350-400m a.s.l.) features freely drained podzols that have developed in thin glacial till on the steeper slopes. The dominant vegetation types in this zone are heather (Calluna vulgaris), blaeberry (Vaccinium myrtillus) and wavy hair grass (Deschampsia flexuasa). The lower zone (220-350m a.s.l.) has freely draining iron podzols developed on thin glacial tills on steep heather and blaeberry covered slopes.

The hydrology of the Birnie Burn is typical of upland headwaters in general, in that a combination of steep slopes and thin soils allows precipitation to be delivered rapidly to the stream resulting in quite a flashy run-off regime. The stream channel is narrow (generally less than 1m) during base-flow conditions and depths vary from 10-20cm along some shallow riffled sections reaches to deeper pools of up to 80cm.

2.18.1 Discharge - Birnie Burn



Current year statistics

Mean	0.02
Max	0.58
Min	0
Std. dev	0.03
N%	99.2

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.02	0.01	0.02	0.02	0.02	0.01	0	0	0	0.03	0.03	0.03

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.01	0.02	0.02

2.18.2 Spot sampled chemistry data

a) summary for 2005 - Birnie Burn

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	9.13	4.9	14.6	2.729	23
pH	pH	7.01	5.29	7.62	0.35	49
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Conductivity	µs/cm	67.7804	41.5	117.94	13.2449	49
Dissolved Oxygen	mg/l	10.4896	9.55	11.55	0.5443	23
Ammonium: NH4-N	mg/l	0.0103	0.003	0.1	0.0217	50
Total Nitrogen	mg/l	0.5674	0.29	4.2	0.7433	27
Nitrate: NO3-N	mg/l	0.164	0.1	0.3	0.0618	50
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	13.8522	5	39	6.7073	46
Chloride	mg/l	6.7024	0.1	8.43	1.3254	49
Biological Oxygen demand	mg/l	1.5167	0.3	2.4	0.7292	15
Total Phosphorous	mg/l	0.05	0.05	0.05	0	28
Particulate Phosphorous	mg/l	0.05	0.05	0.05	0	26
Phosphate (soluble reactive): P04-P	mg/l	0.0031	0.001	0.023	0.0049	50
Silicate: SiO2	mg/l					0
Sulphate: S04-S	mg/l	1.5933	0.9	1.99	0.2787	49
Sodium - dissolved	mg/l	6.2198	4.33	7.29	0.6716	50
Sodium - total	mg/l	6.5786	4.35	7.3	0.693	28
Potassium - dissolved	mg/l	0.403	0.05	1.02	0.1815	50
Potassium - total	mg/l	0.4686	0.2	1.18	0.2221	28
Calcium - dissolved	mg/l	4.1986	2.18	6.58	1.2075	50
Calcium - total	mg/l	4.8743	2.19	6.62	1.3573	28
Magnesium - dissolved	mg/l	1.3386	0.71	1.88	0.2783	50
Magnesium - total	mg/l	1.4929	0.95	1.89	0.2751	28
Aluminium - total	µg/l	96.1852	39	277	60.9021	27
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	0.2277	0.015	0.5	0.2398	35
Tin - total	µg/l					0
Manganese - dissolved	µg/l	15.9957	4	37.1	7.8435	46
Manganese - total	µg/l	26.3333	11	36	10.025	9
Iron - dissolved	µg/l	218.34	106	513	104.0303	50
Iron - total	µg/l	296.75	107	569	120.7862	28
Vanadium - dissolved	µg/l	0.5203	0.01	1	0.23	35
Vanadium - total	µg/l					0
Nickel - dissolved	µg/l	0.4564	0.003	1	0.2116	34
Nickel - total	µg/l					0
Mercury - dissolved	µg/l	9.9886	0.025	25	12.3054	33
Mercury - total	µg/l					0
Copper - dissolved	µg/l	1.7125	1	10	1.9046	48
Copper - total	µg/l	1.04	1	2	0.2	25
Zinc - dissolved	µg/l	4.0667	0.5	20	4.1865	48
Zinc - total	µg/l	4.8636	0.5	11	4.4673	22
Cadmium - dissolved	µg/l	0.0935	0.002	0.3	0.0968	35
Cadmium - total	µg/l					0
Lead - dissolved	µg/l	0.2333	0.003	1.5	0.3526	35
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Birnie Burn

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C												9.13
pH	pH												7.01
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm												67.78
Dissolved Oxygen	mg/l												10.49
Ammonium: NH4-N	mg/l												0.01
Total Nitrogen	mg/l												0.567
Nitrate: NO3-N	mg/l												0.164
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												13.85
Chloride	mg/l												6.702
Biological Oxygen demand	mg/l												1.517
Total Phosphorous	mg/l												0.05
Particulate Phosphorous	mg/l												0.05
Phosphate (soluble reactive): P04-P	mg/l												0.003
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												1.593
Sodium - dissolved	mg/l												6.22
Sodium - total	mg/l												6.579
Potassium - dissolved	mg/l												0.403
Potassium - total	mg/l												0.469
Calcium - dissolved	mg/l												4.199
Calcium - total	mg/l												4.874
Magnesium - dissolved	mg/l												1.339
Magnesium - total	mg/l												1.493
Aluminium - total	µg/l												96.19
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												0.228
Tin - total	µg/l												
Manganese - dissolved	µg/l												16
Manganese - total	µg/l												26.33
Iron - dissolved	µg/l												218.3
Iron - total	µg/l												296.8
Vanadium - dissolved	µg/l												0.52
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												0.456
Nickel - total	µg/l												
Mercury - dissolved	µg/l												9.989
Mercury - total	µg/l												
Copper - dissolved	µg/l												1.713
Copper - total	µg/l												1.04
Zinc - dissolved	µg/l												4.067
Zinc - total	µg/l												4.864
Cadmium - dissolved	µg/l												0.094
Cadmium - total	µg/l												
Lead - dissolved	µg/l												0.233
Lead - total	µg/l												
Arsenic - total	µg/l												

2.18.3 Freshwater Invertebrates, species list - Birnie Burn

No data submitted to the ECN database

2.18.4 Freshwater Macrophytes, species list - Birnie Burn

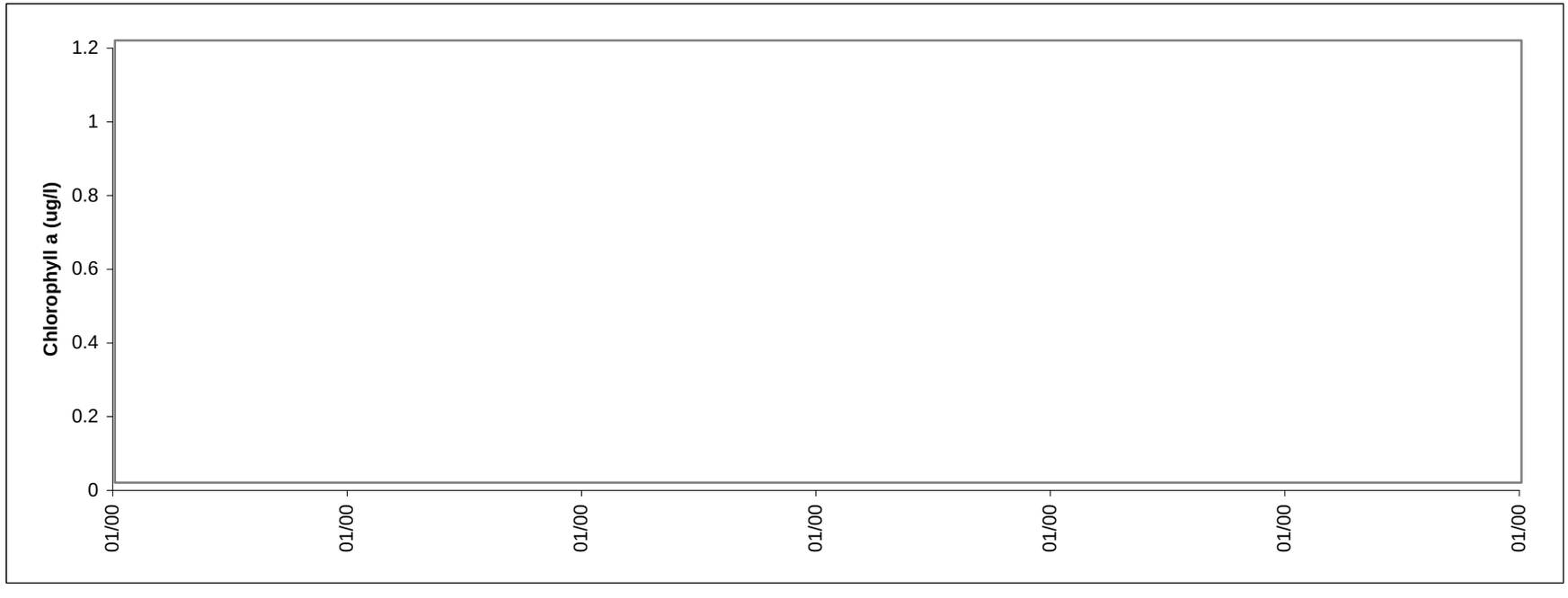
No data submitted to the ECN database

2.18.5 Phytoplankton - Birnie Burn

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.19 Bradgate Brook

Leicestershire, England (Lat 52°41'N; Long 1°14'W)
Sponsor: Environment Agency, Midlands Region

Bradgate Brook is located in the Charnwood Forest area of Leicestershire, important for its Precambrian granitic rocks. The brook flows through the ancient parkland of Bradgate Park and into Cropston Reservoir. The park is managed as a deer park, has never been agriculturally "improved" and is designated an SSSI. However it was bequeathed to the people of Leicester for their enjoyment and there are public access pressures on the site. There are no discharges to or abstractions from the brook, which supports an invertebrate community of regional importance, including a population of native crayfish.

2.19.1 Discharge - Bradgate Brook

No data submitted to the ECN database

Current year statistics

Mean	0
Max	0
Min	0
Std. dev	0
N%	58.9

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.06	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
						0.21	0.17			0.08	

2.19.2 Spot sampled chemistry data

a) summary for 2005 - Bradgate Brook

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Bradgate Brook

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	9.923	11.42	7.846	11.67	10.25	9.782	11.19	10.84	11.02	11.79		
pH	pH	8.05	8.17	7.98	8.13	8.11	8.1	8.12	8.18	8	8.2		
Suspended Solids: Dry weight	mg/l	7.462	3.25	4.808	4.417	4.636	8.364	6.667	15.61	6.45	3.958		
Ash-free dry weight	mg/l												
Turbidity	NIU	11	3	6.93	4.93	4.31	9.64	9.07	6.09	5.04	3.46		
Conductivity	µs/cm	421.5	493.3	522	477.6	437.9	429.1	386.7	411.9	412.6	463.2		
Dissolved Oxygen	mg/l	11.05	10.03	10.98	10	11.53			11.34	11.62	10.84		
Ammonium: NH4-N	mg/l	0.027	0.041	0.036	0.036	0.024	0.028	0.034	0.041	0.059	0.026		
Total Nitrogen	mg/l	2.624	2.46	4.314	2.615	3.211	2.602	2.408	2.274	2.492	2.319		
Nitrate: NO3-N	mg/l	3.1		3.98	2.593	3.2	4.212			2.472	2.307		
Nitrite: N02-N	mg/l	0.02		0.021	0.022	0.011	0.018			0.02	0.014		
Alkalinity (CaCo3)	mg/l	124.5	143.5	129.7	155.7	132.7	74.6			139.1	161.2		
Chloride	mg/l	32.62	48	64.51	43.05	38.32	32.75	33.17	36.32	33.56	35.1		
Biological Oxygen demand	mg/l	1.885	1.667	2.142	1.417	1.292	1.291	1.298		2.026	1.265		
Total Phosphorous	mg/l									0.105	0.167		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.043		0.064	0.076	0.046	0.069			0.069	0.18		
Silicate: SiO2	mg/l	6.95		12.94	11.47	11.2	11.9	10.78	10.09	9.077	9.047		
Sulphate: S04-S	mg/l	47.4		49.23	45.77	45.47	42.65	39.15	38.24	39.05	49.75		
Sodium - dissolved	mg/l	19.5		29.01	21.84	19.75	17.4	16.93	18.74	17.5	18.6		
Sodium - total	mg/l												
Potassium - dissolved	mg/l	3.235		3.646	3.078	2.822	2.937	2.973	3.142	2.907	3.08		
Potassium - total	mg/l												
Calcium - dissolved	mg/l	42.85		56.84	56.95	50.3	52.28	46.34	47.87	47.95	55.99		
Calcium - total	mg/l									49.45	56.03		
Magnesium - dissolved	mg/l	13.7		20.4	21.1	17.9	18.85	16.36	17.18	17.24	19.9		
Magnesium - total	mg/l									17.79	19.93		
Aluminium - total	µg/l	661.5		220	167.8	191.5	479.9	278.7	328.3	168.9	109.2		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l										1.25		
Tin - total	µg/l	0.5		1.25	35.73	1.25	1.25	1.25	1.25	1.25	1.25		
Manganese - dissolved	µg/l										22.69		
Manganese - total	µg/l	67		51.26	39.83	27.75	35.72	34.14	52.23	39.27	34.15		
Iron - dissolved	µg/l										53.32		
Iron - total	µg/l	483		244	221.1	217.3	293.5	319.8	391.2	272.9	168.8		
Vanadium - dissolved	µg/l										1.148		
Vanadium - total	µg/l	1.62		1.353	1.631	1.373	1.503	1.304	2.212	1.316	1.303		
Nickel - dissolved	µg/l									2.5	2.708		
Nickel - total	µg/l	1.572	2.5	2.5	2.5	2.5	2.826	2.5	2.5	2.5	2.5		
Mercury - dissolved	µg/l										0.005		
Mercury - total	µg/l										0.012		
Copper - dissolved	µg/l									1.886	1.513		
Copper - total	µg/l	2.907	2.074	2.231	1.782	2.382	2.538	2.425	3.414	2.079	1.631		
Zinc - dissolved	µg/l									2.5	2.929		
Zinc - total	µg/l	8.697	2.725	5.412	3.626	5.806	7.337	4.858	8.503	3.744	3.649		
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.065	0.05	0.088		
Cadmium - total	µg/l									0.05	0.05		
Lead - dissolved	µg/l									0.2	0.225		
Lead - total	µg/l	1.079	0.438	0.844	0.711	0.682	1.571	0.785	1.681	0.514	0.446		
Arsenic - total	µg/l										1.751		

2.19.3 Freshwater Invertebrates, species list - Bradgate Brook

Agapetus
Ancylus fluviatilis
Armiger crista
Asellus aquaticus
Athripsodes bilineatus
Athripsodes
Baetis muticus
Baetis rhodani
Baetis vernus
Baetis Scambus Group
Caenis rivulorum
Caenis Luctuosa Group
Ceratopogonidae
Chelifera Group
Chironomidae
Chrysops
Dicranota
Ecdyonurus
Elmis aenea
Ephemera danica
Ephemerella ignita
Erpobdella octoculata
Erpobdellidae
Gammarus pulex
Glossiphonia complanata
Goera pilosa
Helobdella stagnalis
Hemerodromia Group
Hydracarina
Hydraena gracilis
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Isoperla grammatica
Ithytrichia
Lepidostoma hirtum
Leuctra fusca
Leuctra hippopus
Leuctra
Limnephilidae
Limnephilus
Lumbricidae
Lumbriculidae
Mystacides
Naididae
Nematoda
Nemoura avicularis
Orectochilus villosus
Oulimnius tuberculatus
Oulimnius
Paraleptophlebia submarginata
Peripsychoda fusca
Pisidium
Platambus maculatus
Polycentropus flavomaculatus
Potamopyrgus jenkinsi
Psychoda
Psychomyia pusilla
Ptychoptera
Rhithrogena
Rhyacophila
Sericostoma personatum
Silo pallipes
Silo
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Ornatum Group
Tabanus Group
Trocheta subviridis
Tubificidae

2.19.4 Freshwater Macrophytes, species list - Bradgate Brook

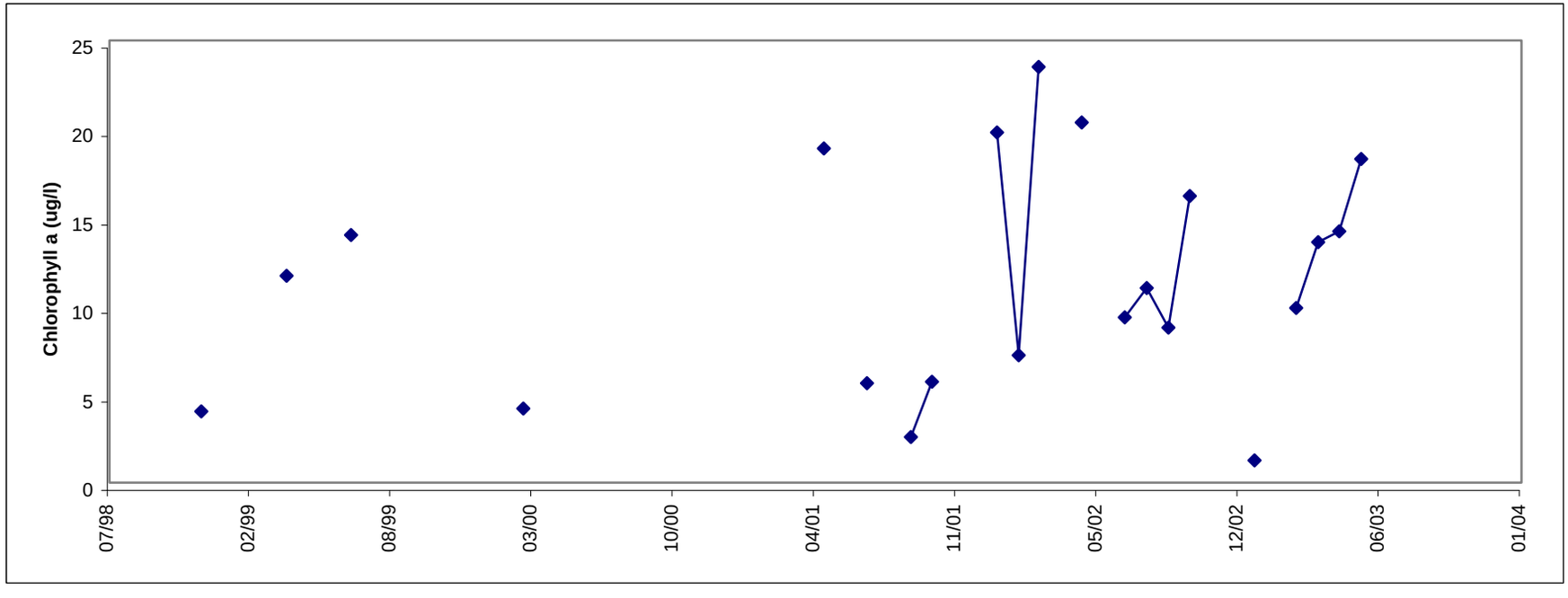
No data submitted to the ECN database

2.19.5 Phytoplankton - Bradgate Brook

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.20 Bure

Norfolk, England (Lat 52°43'N; Long 1°21'E)
Sponsor: Environment Agency, Anglian Region

The Bure is one of the major rivers flowing through the Norfolk Broads. The sampling site at Horstead Mill is in its middle reaches, approximately 40km from the source of the river, at the limit of navigation, and at an elevation of less than10 m. Here the river is 17 -20 m wide and up to 4 m deep with a predominantly silty substrate. The surrounding catchment is underlain by Quaternary deposits of Norwich Crag with chalk at depth and superficial glacial till and outwash deposits. Land use in the catchment is predominantly agricultural, especially arable. Due to problems with eutrophication of the Broads, there has been a programme of phosphate stripping at the major sewage treatment works on the Bure since 1986. Invertebrate monitoring takes place downstream of the Mill where the river is divided into two channels and there is a riffle area of gravel, pebbles and sand and areas of emergent plants (*Sparganium erectum, Glyceria sp.)* at the margins. Macrophyte and diatom monitoring takes place between 0.5-1 km upstream of the Mill at a semi -natural stretch of river away from man -made structures. The substrate is predominantly silty. There is a diverse submerged pl ant community, including a good cover of *Elodea nuttallii*. Several marginal and emergent species are also present.

2.20.1 Discharge - Bure

No data submitted to the ECN database

Current year statistics

Mean	2.76
Max	19.9
Min	0.02
Std. dev	0.94
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.47	3.34	3.73	3.11	2.93	2.39	2.4	1.95	1.95	2.39	3.35	3.15

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
										2.86	2.76

2.20.2 Spot sampled chemistry data

a) summary for 2005 - Bure

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Bure

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l												
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.20.3 Freshwater Invertebrates, species list - Bure

Ancylus fluviatilis
Anisus vortex
Asellus aquaticus
Athripsodes albifrons
Athripsodes cinereus
Athripsodes
Baetis vernus
Baetis Scambus Group
Bithynia leachii
Bithynia tentaculata
Caenis Luctuosa Group
Calopteryx splendens
Ceratopogonidae
Chironomidae
Crangonyx pseudogracilis
Dicranota
Dugesia Polychroa Group
Elmis aenea
Ephemera danica
Ephemera
Ephemerella ignita
Ephydridae
Erpobdella octoculata
Gammarus pulex
Gerris lacustris
Glossiphonia complanata
Goera pilosa
Gyraulus albus
Gyrinus substriatus
Haliplus fluviatilis
Haliplus lineatocollis
Haliplus
Hydracarina
Hydropsyche pellucidula
Hydroptila
Lepidostoma hirtum
Limnephilus lunatus
Limnephilus rhombicus
Limnephilus
Limnius volckmari
Lumbriculidae
Lymnaea peregra
Lymnaea stagnalis
Micronecta
Notonecta glauca
Notonecta maculata
Notonecta
Orectochilus villosus
Oulimnius tuberculatus
Oulimnius
Phryganeidae
Pisidium
Planorbis carinatus
Platambus maculatus
Polycelis Nigra Group
Polycentropus flavomaculatus
Potamonectes depressus
Potamophylax Cingulatus Group
Potamopyrgus jenkinsi
Sericostoma personatum
Sigara dorsalis
Simulium erythrocephalum
Sphaerium
Theodoxus fluviatilis
Tipula (Yamatotipula) Montium Group
Valvata cristata
Valvata piscinalis

2.20.4 Freshwater Macrophytes, species list - Bure

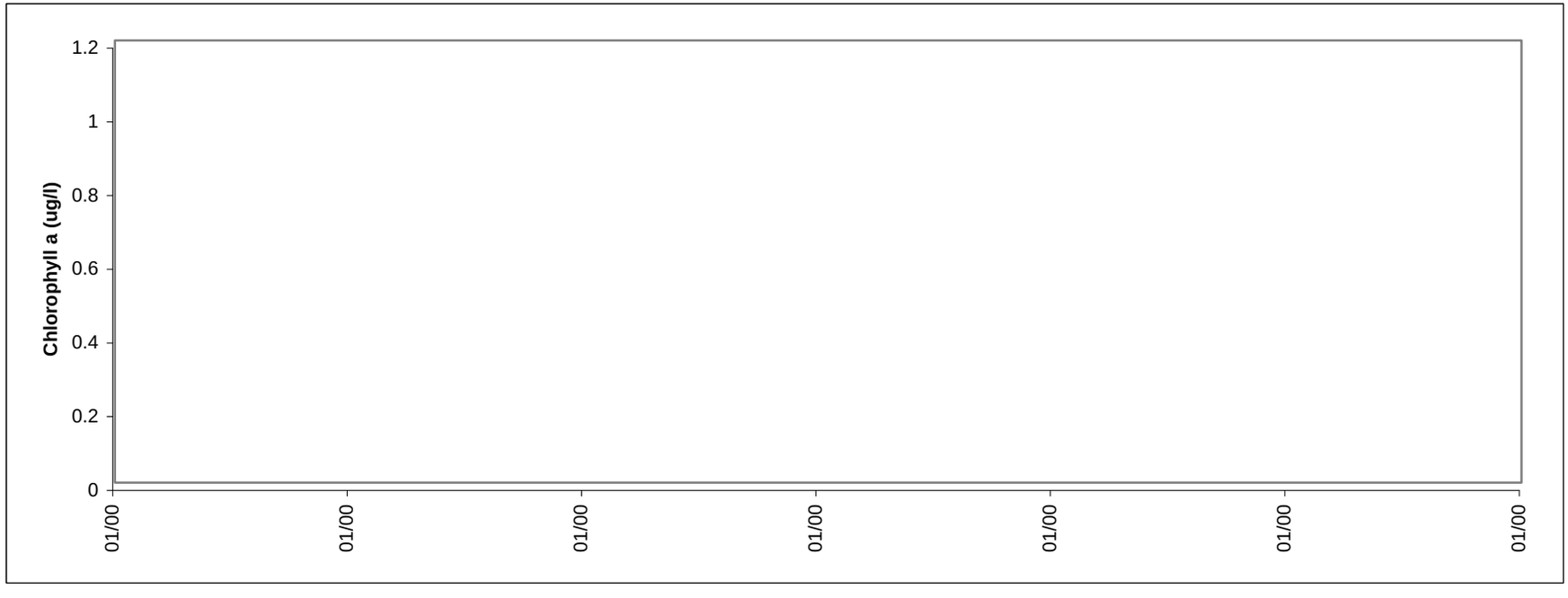
No data submitted to the ECN database

2.20.5 Phytoplankton - Bure

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.21 Bush

Northern Ireland (Lat 55°12N; Long 6°31W)
Sponsor: *Department of Agriculture and Rural Development (Northern Ireland)*

The River Bush enters the Atlantic Ocean close to the Giants Causeway on the North Antrim coast of Northern Ireland. Rising in the Antrim hills at 480 m OD, for must of its length the river flows through a fertile valley devoted to grassland-based agriculture with limited arable cropping. The underlying geology is basalt and the water is slightly alkaline with magnesium making an unusually large contribution to total hardness. The river supports indigenous stocks of Atlantic salmon and brown trout, but it is the salmon population which is of the greater interest. Bush salmon have been the focus of long term studies on salmon ecology and on the techniques suitable for managing salmon populations. A fish-trap on the river at Bushmills, some 3.5 km from the sea, enables ascending adult fish and returning juvenile salmon smolts to intercepted, counted and sampled. This work has been ongoing since 1973 and is accompanied by annual assessments of fry survival in the main spawning areas of the river. In addition to the river being part of the UK ECN network, the river is an International Council for the Exploration of the Sea (ICES) index river which integrates the results with other salmon research programmes in the North-East Atlantic.

2.21.1 Discharge - Bush

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
6.33	6.22	4.81									

2.21.2 Spot sampled chemistry data

a) summary for 2005 - Bush

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Bush

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	11.68	10.72	9.586	10.75	9.809							
pH	pH	8.08	7.93	7.91	8.02	7.83							
Suspended Solids: Dry weight	mg/l	5.014	7.401	7.164	6.712	7.138							
Ash-free dry weight	mg/l	3.113	4.586	4.424	4.115	4.177							
Turbidity	NIU												
Conductivity	µs/cm	329.2	309.3	322.4	318.3	314.1							
Dissolved Oxygen	mg/l	10.27	10.85	11.18	11.6	11.59							
Ammonium: NH4-N	mg/l	0.057	0.129	0.109	0.073	0.096							
Total Nitrogen	mg/l	3.086	3.121	3.811	4.162	4.588							
Nitrate: NO3-N	mg/l	1.79	1.93	2.827	2.767	3.191							
Nitrite: N02-N	mg/l	0.037	0.035	0.039	0.036	0.047							
Alkalinity (CaCo3)	mg/l	117.7	100.4	109.8	117.1	95.57							
Chloride	mg/l	23.73	24.99	24.51	27.05	25.82							
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l	0.153	0.163	0.151	0.164	0.166							
Particulate Phosphorous	mg/l	0.024	0.035	0.029	0.032	0.034							
Phosphate (soluble reactive): P04-P	mg/l	0.093	0.091	0.095	0.103	0.097							
Silicate: SiO2	mg/l	6.592	7.127	7.036	7.511	7.678							
Sulphate: S04-S	mg/l	14.24	15.57	17.1	17.11	14.57							
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l												
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.21.3 Freshwater Invertebrates, species list - Bush

No data submitted to the ECN database

2.21.4 Freshwater Macrophytes, species list - Bush

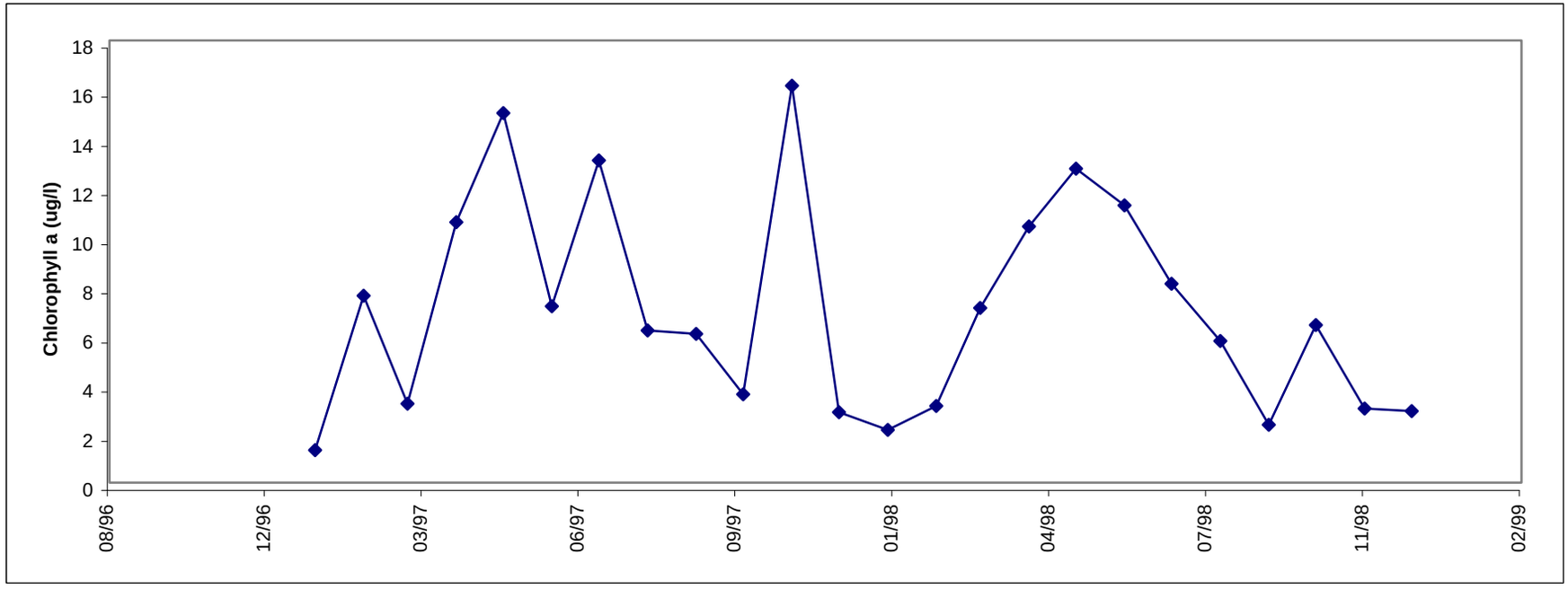
No data submitted to the ECN database

2.21.5 Phytoplankton - Bush

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



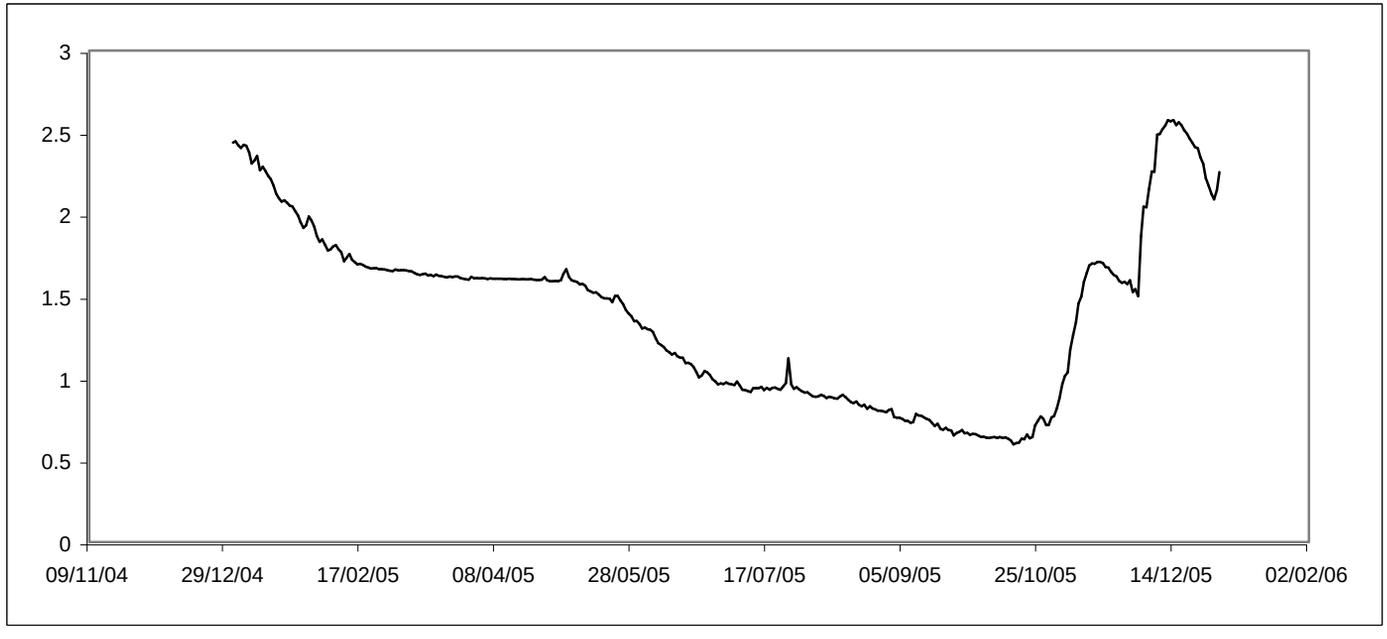
2.22 Coln

Gloucestershire, England (Lat 51°41'N; Long 1°42'W)
Sponsor: Environment Agency, Thames Region

The Coln rises at an altitude of about 200 m AOD near Sevenhampton in Gloucestershsire and flows from the limestone Cotswold Hills in a south-easterly direction to Lechlade, where it joins the River Thames at an altitude of about 75m AOD. There are no major tributaries. The sampling site is located in Lechlade about 70m above the confluence with the Thames. The source of the river is in the Inferior Oolite aquifer in which it flows for the first few kilometers, but most of the river runs on the Great Oolite aquifer. Both limestone aquifers are sources for water abstraction; a total of 55 Ml per day are consented from the catchment. The river crosses Oxford Clay before running into the Thames. The catchment is mostly rural, with farming as the main industry. The upper catchment is mainly grazing land, and there are large areas of deciduous woodland in the south-west. The upper two-thirds of the catchment is within the Cotswold Area of Outstanding Natural Beauty (AONB), and around Fairford the river has been designated as a Nitrate-sensitive area.

There are no large conurbations on the upper catchment, although Cheltenham, from where surface water drains into the limestone above the river's source, has a population of over 100,000. The Coln catchment supports a population of around 9,000. The main sewage inputs to the river are from works at Andoversford, Bibury and Fairford. Bibury trout farm has the largest discharge into the river, although most of this is 'on-line' through fish-ponds. The river has been subject to various enhancement schemes to improve ecology and fisheries. Water quality was recorded as 'good to fair' in the 1995 General Quality Assessment survey. The biological quality of the river is very good supporting a brown trout (*Salmo trutta*) fishery with good spawning beds. Natural populations of grayling (*Thymallus thymallus*) also exist. Native crayfish (*Austropotamobius pallipes*) have been recorded but not since 1991; populations of the introduced American signal crayfish (*Pacifastacus* leniusculus) are also present. Several pollution-sensitive caddisfly and mayfly families have been found, along with true-bugs, beetles and snails.

2.22.1 Discharge - Coln



Current year statistics

Mean	1.4
Max	2.63
Min	0.55
Std. dev	0.54
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.18	1.73	1.63	1.6	1.51	1.13	0.95	0.86	0.72	0.66	1.47	2.32

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
				2.4	2.44	2.48	2.31	2.37	1.73	2.12	1.4

2.22.2 Spot sampled chemistry data

a) summary for 2005 - Coln

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	14.064	6.5	20.2	4.067	14
pH	pH	8.04	6.45	8.55	0.5	14
Suspended Solids: Dry weight	mg/l	6.9857	1.5	14.7	3.5392	14
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Conductivity	µs/cm	507.2857	487	532	14.2744	14
Dissolved Oxygen	mg/l	11.0557	8.69	13.7	1.5217	14
Ammonium: NH4-N	mg/l	0.0302	0.03	0.033	0.0008	14
Total Nitrogen	mg/l	5.96	5.07	8.18	0.9891	14
Nitrate: NO3-N	mg/l	5.9414	5.06	8.16	0.9878	14
Nitrite: N02-N	mg/l	0.0181	0.012	0.022	0.0031	14
Alkalinity (CaCo3)	mg/l	211.6429	198	233	9.4511	14
Chloride	mg/l	18.2643	17.4	19.3	0.5444	14
Biological Oxygen demand	mg/l	1.0407	0.5	1.77	0.4765	14
Total Phosphorous	mg/l					0
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l					0
Silicate: SiO2	mg/l	5.2879	1.78	7.15	1.4657	14
Sulphate: S04-S	mg/l	41.2143	33	46	3.4681	14
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	9.5929	8.4	10.3	0.521	14
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	1.8971	1.56	2.52	0.3272	14
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	103.1143	94.6	113	4.674	14
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	5.8186	3.59	6.34	0.702	14
Aluminium - total	µg/l	77.7857	50	139	29.5926	14
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	2.5	2.5	2.5	0	14
Tin - total	µg/l	2.5	2.5	2.5	0	14
Manganese - dissolved	µg/l	25	25	25	0	14
Manganese - total	µg/l	25	25	25	0	14
Iron - dissolved	µg/l	25	25	25	0	14
Iron - total	µg/l	128.5	71	289	60.0932	14
Vanadium - dissolved	µg/l	2	2	2	0	14
Vanadium - total	µg/l	2	2	2	0	14
Nickel - dissolved	µg/l	5	5	5	0	14
Nickel - total	µg/l	5	5	5	0	14
Mercury - dissolved	µg/l	0.05	0.05	0.05	0	14
Mercury - total	µg/l	0.05	0.05	0.05	0	14
Copper - dissolved	µg/l	0.9929	0.5	1.7	0.3245	14
Copper - total	µg/l	1.1143	0.5	1.5	0.2685	14
Zinc - dissolved	µg/l	5.0714	5	6	0.2673	14
Zinc - total	µg/l	5	5	5	0	14
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	14
Cadmium - total	µg/l	0.05	0.05	0.05	0	14
Lead - dissolved	µg/l	2	2	2	0	14
Lead - total	µg/l	2	2	2	0	14
Arsenic - total	µg/l	5	5	5	0	14

b) annual means since start of ECN - Coln

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C					10.63	9.985	11		12.36	12.72	10.94	14.06
pH	pH					8.12	8.13	8.08		8.21	8.06	8.22	8.04
Suspended Solids: Dry weight	mg/l					8.325	9.067	10.65		8.35	7.233	7.033	6.986
Ash-free dry weight	mg/l							7.028		20	20		
Turbidity	NIU					4.74	2.78	4.13					
Conductivity	µs/cm					534.5	528.4	524.2		501.8	493.5	508.1	507.3
Dissolved Oxygen	mg/l					10.65	11.07	10.92		11.41	10.59	10.78	11.06
Ammonium: NH4-N	mg/l					0.018	0.024	0.036		0.039	0.035	0.022	0.03
Total Nitrogen	mg/l					8.183	8.344	7.941		6.94	6.564	6.735	5.96
Nitrate: NO3-N	mg/l					7.756	8.318	7.906		6.8	6.536	7.217	5.941
Nitrite: N02-N	mg/l					0.026	0.027	0.026		0.024	0.028	0.022	0.018
Alkalinity (CaCo3)	mg/l					230.6	223.8	221.4		212.1	207.2	216.8	211.6
Chloride	mg/l					22.25	21.32	20.42		17.69	17.4	18.28	18.26
Biological Oxygen demand	mg/l					1.083	0.808	0.873		1.433	1.625	1.619	1.041
Total Phosphorous	mg/l							0.076		0.005	0.145		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l					0.09	0.079	0.072		0.073	0.101		
Silicate: SiO2	mg/l					5.6	5.51	5.446		5.416	4.865	4.853	5.288
Sulphate: S04-S	mg/l					44.78	37.84	36.18		31.49	38.83	38.17	41.21
Sodium - dissolved	mg/l							9		8.525			
Sodium - total	mg/l					10.35	9.5	8.818		8.5	8.608	8.925	9.593
Potassium - dissolved	mg/l									1.794			
Potassium - total	mg/l					1.858	1.725	1.682		1.824	1.982	1.75	1.897
Calcium - dissolved	mg/l							105.2		105.6			
Calcium - total	mg/l					111.5	109	107.9		106.8	104.7	107.3	103.1
Magnesium - dissolved	mg/l							5.48		5.828			
Magnesium - total	mg/l					5.998	5.833	5.482		5.806	6.084	5.753	5.819
Aluminium - total	µg/l					64.38	82.08	91.82		95.92	91.09	85.83	77.79
Aluminium - labile	µg/l												
Tin - dissolved	µg/l							1		2.5	2.5	1.875	2.5
Tin - total	µg/l					1.071	1	1		2.5	2.5	1.875	2.5
Manganese - dissolved	µg/l							25		25	25	25	25
Manganese - total	µg/l					12.5	13.33	25		25	25	25	25
Iron - dissolved	µg/l							15		25	25	25	25
Iron - total	µg/l					120	123.3	140.5		136.8	123.2	101.7	128.5
Vanadium - dissolved	µg/l							2		2	2	2.667	2
Vanadium - total	µg/l					1.25	1.417	2		2	2	2.667	2
Nickel - dissolved	µg/l							2.5		5	5	3.333	5
Nickel - total	µg/l					2.375	2.708	2.5		5	5	3.333	5
Mercury - dissolved	µg/l							0.05		0.05	0.05	0.048	0.05
Mercury - total	µg/l					0.011	0.026	0.05		0.05	0.05	0.05	0.05
Copper - dissolved	µg/l					1.228	1.49	1.091		2.5	2.627	2.275	0.993
Copper - total	µg/l					1.611	1.775	1.682		2.525	2.527	1.875	1.114
Zinc - dissolved	µg/l							5.2		5.427	5.055	4.225	5.071
Zinc - total	µg/l					5.321	6.167	4.091		7.058	6.582	3.825	5
Cadmium - dissolved	µg/l							0.1		0.05	0.054	0.059	0.05
Cadmium - total	µg/l					0.065	0.067	0.073		0.054	0.064	0.05	0.05
Lead - dissolved	µg/l							0.5		2	2	1.583	2
Lead - total	µg/l					0.538	0.6	0.673		2.008	2	1.417	2
Arsenic - total	µg/l							5		5	5.417	5	5

2.22.3 Freshwater Invertebrates, species list - Coln

Acroloxus lacustris
Ancylus fluviatilis
Anisus vortex
Antocha vitripennis
Asellus aquaticus
Atherix ibis
Athripsodes albifrons
Athripsodes cinereus
Athripsodes
Baetis rhodani
Baetis Scambus Group
Brachycentrus subnubilus
Caenis rivulorum
Caenis Luctuosa Group
Calopteryx splendens
Centroptilum luteolum
Ceratopogonidae
Chironomidae
Clinocerinae
Crangonyx pseudogracilis
Dendrocoelum lacteum
Dicranota
Dugesia tigrina
Elmis aenea
Ephemera danica
Ephemera vulgata
Ephemera
Ephemerella ignita
Ephydridae
Erpobdella octoculata
Esolus parallelepipedus
Gammarus pulex
Goera pilosa
Helobdella stagnalis
Hydracarina
Hydropsyche pellucidula
Hydroptila
Lepidostoma hirtum
Leuctra fusca
Leuctra geniculata
Limnephilidae
Limnius volckmari
Lumbriculidae
Lype
Micronecta
Naididae
Nematoda
Orectochilus villosus
Oulimnius tuberculatus
Oulimnius
Pacifastacus leniusculus
Pericoma Trivialis Group
Pisidium
Potamonectes depressus
Potamophylax cingulatus
Potamophylax Cingulatus Group
Potamopyrgus jenkinsi
Sericostoma personatum
Sialis lutaria
Silo pallipes
Silo
Theodoxus fluviatilis
Tipula (Yamatotipula) Montium Group
Tubificidae

2.22.4 Freshwater Macrophytes, species list - Coln

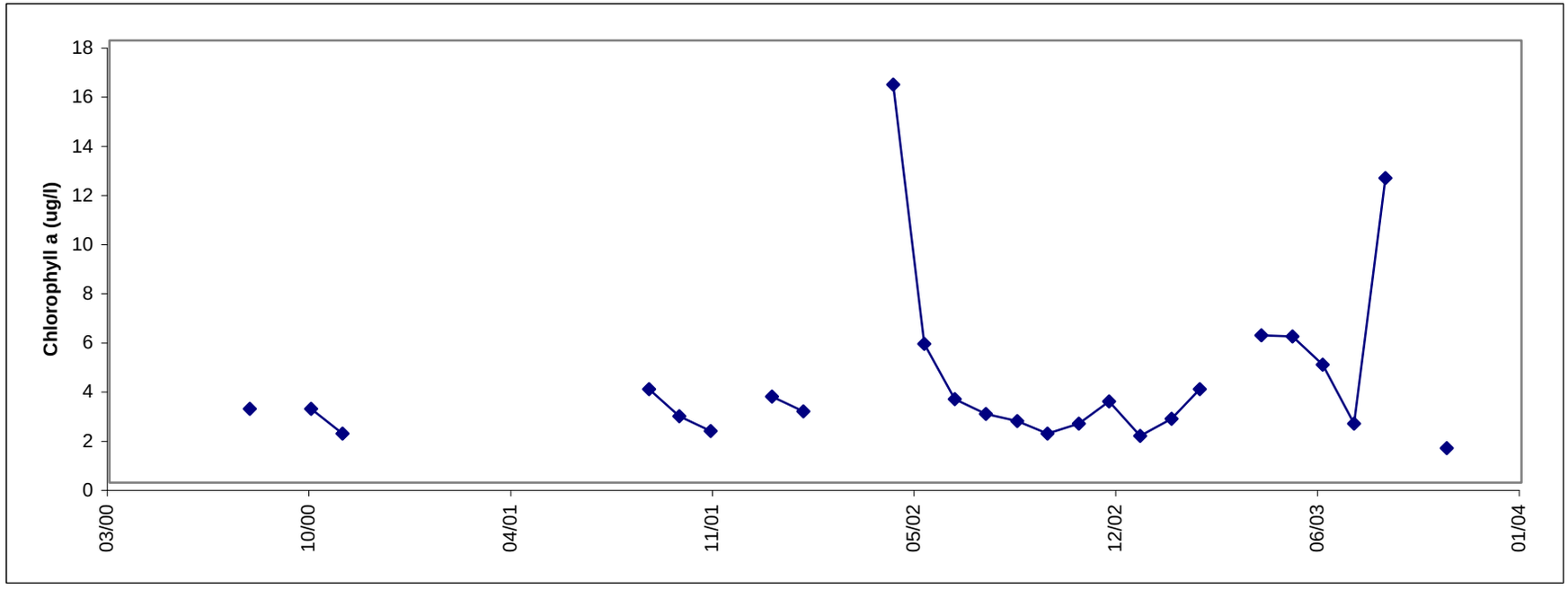
No data submitted to the ECN database

2.22.5 Phytoplankton - Coln

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

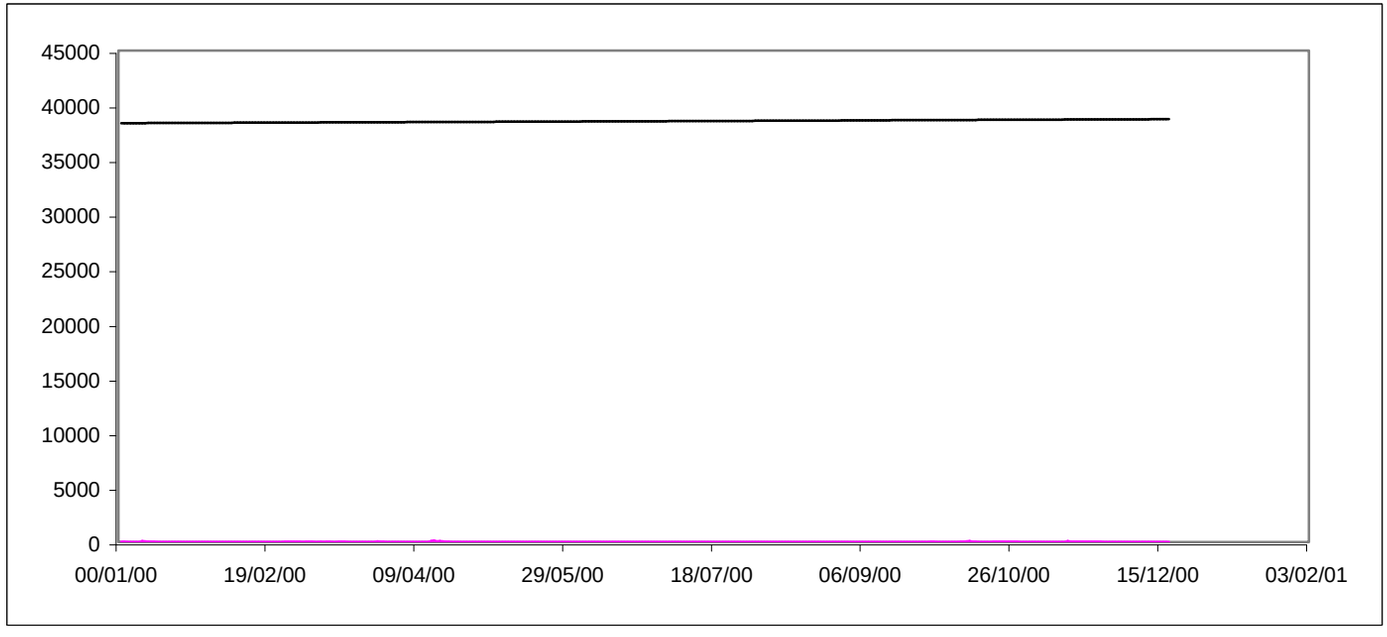


2.23 Coquet

Northumberland, England (Lat 55°21'N; Long 1°38'W)
Sponsor: Environment Agency, North-East Region

The River Coquet rises at Coquet Head on the Scottish border and flows generally eastward, draining the southern flanks of the Cheviot Hills, finally discharging to the North Sea at Amble. The Warkworth Dam marks the tidal limit. The Coquet is an excellent, clean river system of high conservation and ecological value and designated as an SSSI as part of the National Programme of 27 river SSSI's. Bankside habitats range from woodland-fringed lower river and wooded lowlands through hay meadows, herb-rich valleys and the gravel haughs of lower Coquetdale to the upper moorlands of the Cheviots. This relatively undisturbed environment provides excellent habitats for wildlife including a number of protected species. Within the Coquet catchment there are 10 other SSSI's which directly influence or are influenced by the water environment. The principal protected habitats are hay meadows, woodland and the estuary. The main river supports a healthy and diverse invertebrate fauna of mayflies, stoneflies, caddis flies and other taxa which are sensitive to pollution. Their presence indicates the absence of chronic pollution. Although the habitat and water quality are suitable for crayfish, they have never been found by the Environment Agency, even though they were reliably reported as being present at Thropton and Felton in 1981. The ECN site on the Coquet is at Warkworth, approximately 2 km upstream of the tidal limit.

2.23.1 Discharge - Coquet



Current year statistics

Mean	9.72
Max	213.44
Min	1.12
Std. dev	15.88
N%	96.4

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14.9	8.45	15.63	20.02	5.04	2.62	2.64	1.64	2.48	12.69	16.77	10.73

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
7.44	6.92	6.61	6.73	11.75	8.17	11.88	10.36	11	4.81	9.1	9.72

2.23.2 Spot sampled chemistry data

a) summary for 2005 - Coquet

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	10	2.4	20.7	5.776	13
pH	pH	8.07	7.6	8.8	0.37	17
Suspended Solids: Dry weight	mg/l	12	2	53	15.6525	19
Ash-free dry weight	mg/l	31.5	24	39	10.6066	2
Turbidity	NIU					0
Conductivity	µs/cm	280.6471	124	630	117.41	17
Dissolved Oxygen	mg/l	10.8383	8.14	13	1.6676	12
Ammonium: NH4-N	mg/l	0.0668	0.015	0.134	0.0435	12
Total Nitrogen	mg/l					0
Nitrate: NO3-N	mg/l	1.4098	0.426	3.65	0.8475	12
Nitrite: N02-N	mg/l	0.0072	0.002	0.026	0.0072	12
Alkalinity (CaCo3)	mg/l	94.745	36.8	130	32.0809	19
Chloride	mg/l	26.7857	14	159	32.3453	19
Biological Oxygen demand	mg/l	2.2789	0.8	5.8	1.5583	19
Total Phosphorous	mg/l	0.0453	0.013	0.091	0.0238	12
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.02	0.01	0.049	0.0145	12
Silicate: SiO2	mg/l	4.5958	0.3	7.03	2.6501	12
Sulphate: S04-S	mg/l	11.3263	3.5	32.4	6.8112	19
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	14.76	7.5	22.7	5.1154	12
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	2.7017	1.75	4.72	1.0129	12
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	34.7583	21.6	47.8	9.1975	12
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	9.6975	5.13	14.9	3.1301	12
Aluminium - total	µg/l	339.0105	28.8	1660	390.9065	19
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	12
Tin - total	µg/l	1.25	1.25	1.25	0	12
Manganese - dissolved	µg/l	45.5895	5	593	132.8522	19
Manganese - total	µg/l	58.7632	12.9	321	72.3486	19
Iron - dissolved	µg/l	160.0737	39.5	483	129.0255	19
Iron - total	µg/l	505.8947	109	1820	497.9383	19
Vanadium - dissolved	µg/l	0.77	0.5	1.41	0.3459	12
Vanadium - total	µg/l	0.91	0.5	2.7	0.7393	12
Nickel - dissolved	µg/l	2.7167	2.5	5.1	0.7506	12
Nickel - total	µg/l	2.815	2.5	6.28	1.0912	12
Mercury - dissolved	µg/l	0.005	0.005	0.005	0	12
Mercury - total	µg/l	0.0133	0.005	0.064	0.0169	12
Copper - dissolved	µg/l	2.6292	1.15	4.3	1.0107	12
Copper - total	µg/l	3.0958	1.14	11.4	2.8764	12
Zinc - dissolved	µg/l	5.8567	2.5	20.2	4.925	12
Zinc - total	µg/l	8.3175	2.5	34.9	9.2132	12
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	12
Cadmium - total	µg/l					0
Lead - dissolved	µg/l	0.3073	0.2	0.582	0.1607	12
Lead - total	µg/l	1.0759	0.2	3.96	1.1878	12
Arsenic - total	µg/l	0.5	0.5	0.5	0	12

b) annual means since start of ECN - Coquet

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	9.823	11.01	8.8	9.475	10.84	9.3	8.821	10.8	7.722	9.496	9.117	10
pH	pH	7.96	8.09	8.23	8.15	8.22	7.86	7.87	7.97	8	7.7	7.99	8.07
Suspended Solids: Dry weight	mg/l	5.308	3.308	2.542	12.57	5.5	18.58	38.31	29.85	21.56	5.81	30.63	12
Ash-free dry weight	mg/l												31.5
Turbidity	NIU	4.61	3.43	2.23	12.02	5.83	16.22	30.71	17.72	10.88			
Conductivity	µs/cm	320.5	329.8	359.9	312	310.1	261	272	276.6	262.4	321.6	279.1	280.6
Dissolved Oxygen	mg/l	10.94	10.93	11.69	11.56	11.02	11.37	11.29	10.76	10.31	11.27	11.37	10.84
Ammonium: NH4-N	mg/l	0.073	0.038	0.032	0.043	0.026	0.042	0.05	0.068	0.073	0.06	0.022	0.067
Total Nitrogen	mg/l	0.75	0.948	1.108	1.127								
Nitrate: NO3-N	mg/l	0.968	1.14	1.099	1.699	1.456	1.238	1.489	1.507	1.04	1.098	1.415	1.41
Nitrite: N02-N	mg/l	0.008	0.01	0.01	0.013	0.009	0.015	0.018	0.023	0.01	0.008	0.004	0.007
Alkalinity (CaCo3)	mg/l	103.2	105.5	107.6	100.9	105.7	90.38	96.55	101.2	89.58	114.7	106.9	94.75
Chloride	mg/l	21.62	20.41	22.7	24.21	21.29	19.77	18.34	16.91	16.49	19.84	17.83	26.79
Biological Oxygen demand	mg/l	1.8	1.258	1.625	2.086	1.442					1.56	1.975	2.279
Total Phosphorous	mg/l			0.087	0.188	0.099	0.052	0.058	0.09	0.044	0.294	0.102	0.045
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.022	0.028	0.034	0.095	0.038	0.043	0.137	0.082	0.033	0.032	0.025	0.02
Silicate: SiO2	mg/l	4.434	4.124	3.456	3.835	5.025	4.338	5.176	4.771	4.01	4.423	5.528	4.596
Sulphate: S04-S	mg/l	11.52	12.79	11.35	7.963	7.395	6.842	6.254	7.267	11.17	40.09	20.7	11.33
Sodium - dissolved	mg/l											12.79	
Sodium - total	mg/l	19.5	18.82	20.66	13.36	12.31	11.68	10.52	9.924	11.52	16.11		14.76
Potassium - dissolved	mg/l												
Potassium - total	mg/l	2.205	2.199	2.493	2.245	2.102	2.386	2.46	2.653	2.323	2.378	2.038	2.702
Calcium - dissolved	mg/l												
Calcium - total	mg/l	35.38	34.38	35.53	34.89	38.38	33.35	33.45	33.61	34.15	36.81	34.86	34.76
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l	10.5	11.09	11.06	10.27	10.34	8.904	8.663	8.833	9.332	11.13	9.346	9.698
Aluminium - total	µg/l	210.4	100.8	83.16	137	174.7	441.3	751.5	439.8	449.4	150.4	258.4	339
Aluminium - labile	µg/l												
Tin - dissolved	µg/l										1.25	1.25	1.25
Tin - total	µg/l	2.139	1.188	1.25	1.427	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Manganese - dissolved	µg/l			16.36	25.45	32.73	33.33	18.93	21.55	19.35	21.84	24.83	45.59
Manganese - total	µg/l	40.91	34.38	24.18	55.62	49.2	65.04	94.32	73.01	48.37	39.28	44	58.76
Iron - dissolved	µg/l			143.2	180.9	152	200.7	291.1	217	225.2	118.6	190.8	160.1
Iron - total	µg/l	304.1	233.8	181.4	640.3	460	700.3	1112	749.2	692.5	274.9	430	505.9
Vanadium - dissolved	µg/l			0.5	0.5	0.5	0.5	0.645	0.683	0.5	0.543	0.5	0.77
Vanadium - total	µg/l	0.5	0.5	0.5	0.964	0.801	1.048	1.479	1.387	0.724	0.649	0.549	0.91
Nickel - dissolved	µg/l			0.5	0.808	1.419	2.5	2.5	2.5	2.5	2.5	2.5	2.717
Nickel - total	µg/l	1.383	0.684	0.725	0.918	1.888	2.5	2.5	2.5	2.5	2.5	2.5	2.815
Mercury - dissolved	µg/l			0.018	0.01	0.01	0.007	0.046	0.091	0.019	0.009	0.005	0.005
Mercury - total	µg/l	0.072	0.024	0.011	0.011	0.009	0.007	0.055	0.095	0.058	0.008	0.008	0.013
Copper - dissolved	µg/l	1.91	1.234	1.149	1.406	1.542	1.346	3.205	1.475	1.539	1.521	2.083	2.629
Copper - total	µg/l			1.554	1.979	1.932	2.088	3.843	2.063	1.946	1.963	2.365	3.096
Zinc - dissolved	µg/l	11	6.364	2.5	3.227	2.899	2.5	4.999	4.066	2.817	3.941	3.097	5.857
Zinc - total	µg/l	15.33	6.111	4.421	6.267	5.601	6.844	10.05	7.653	4.571	6.793	5.713	8.318
Cadmium - dissolved	µg/l	0.058	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium - total	µg/l	0.081	0.05	0.05	0.05	0.05	0.05	0.059	0.042	0.02	0.025	0.015	
Lead - dissolved	µg/l			0.5	0.652	0.375	0.226	0.385	0.335	0.226	0.223	0.233	0.307
Lead - total	µg/l	0.973	0.567	0.75	1.299	1.156	1.279	2.16	1.751	0.834	0.642	0.661	1.076
Arsenic - total	µg/l			0.63	0.679	0.5	0.585	0.625	0.76	0.5	0.5	0.5	0.5

2.23.3 Freshwater Invertebrates, species list - Coquet

Agapetus
Ancylus fluviatilis
Antocha vitripennis
Asellus aquaticus
Atherix ibis
Atherix marginata
Athripsodes cinereus
Baetis muticus
Baetis rhodani
Baetis Scambus Group
Caenis rivulorum
Caenis Luctuosa Group
Ceratopogonidae
Chironomidae
Dicranota
Dugesia Polychroa Group
Ecdyonurus
Elmis aenea
Elodes
Enchytraeidae
Ephemera danica
Ephemerella ignita
Erpobdella octoculata
Erpobdellidae
Esolus parallelepipedus
Gammarus pulex
Glossiphonia complanata
Glossosoma
Gyraulus albus
Halesus radiatus
Helobdella stagnalis
Hemerodromia Group
Heptagenia sulphurea
Hexatoma
Hydracarina
Hydraena gracilis
Hydropsyche contubernalis
Hydropsyche pellucidula
Hydropsyche siltalai
Hydroptila
Ithytrichia
Lepidostoma hirtum
Lepidostomatidae
Leuctra fusca
Leuctra geniculata
Limnius volckmari
Limnophora
Lumbriculidae
Lymnaea peregra
Mystacides nigra
Mystacides
Naididae
Nematoda
Oreodytes septentrionalis
Ostracoda
Oulimnius tuberculatus
Oulimnius
Paraleptophlebia submarginata
Pericoma exquisita
Perlodes microcephala
Pisidium
Planorbis carinatus
Planorbis
Polycelis felina
Polycelis Nigra Group
Potamonectes depressus
Potamophylax latipennis
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhithrogena
Rhyacophila dorsalis
Rhyacophila
Sericostoma personatum
Simulium
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Argyreatum Group
Simulium (Simulium) Ornatum Group
Simulium (Wilhelmia)
Sphaerium
Tipula (Yamatotipula) Montium Group
Tubificidae

2.23.4 Freshwater Macrophytes, species list - Coquet

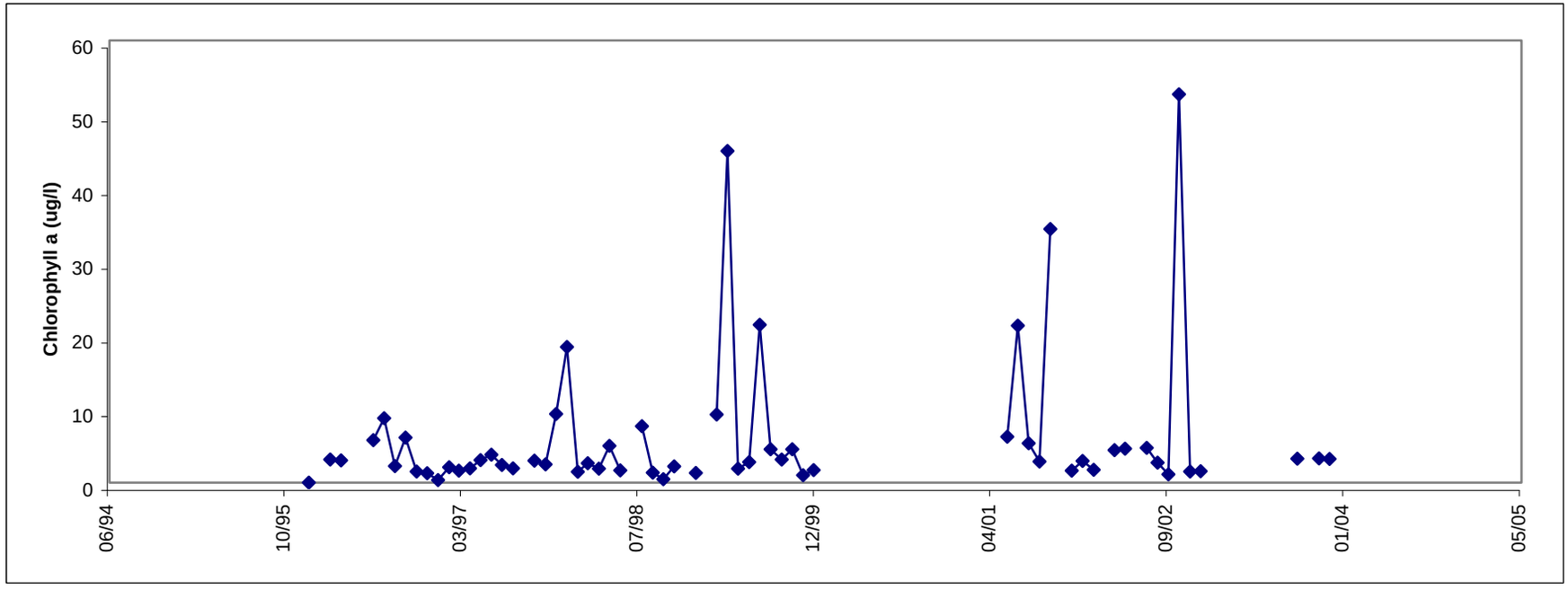
No data submitted to the ECN database

2.23.5 Phytoplankton - Coquet

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.24 Cree

Dumfries & Galloway Region, Scotland (Lat 54°57'N; Long 4°28'W)
Sponsor: Scottish Environment Protection Agency, West Region

The River Cree has a catchment area of 515.7 km^2, much of which is afforested, and a total river length of 57.5 km. It has become one of the most acidic catchments in SW Scotland, with pH values as low as 5.0 being recorded occasionally. This raises concerns about its ability to meet the EC requirements for freshwater fisheries and about the survival of the salmon fishery. There are many sewage effluent discharges entering the river along its course, most of which have small flow rates; the largest discharge is from Newton Stewart. In the early 1980's, large stretches of the river were subject to excessive weed growth, believed to be due to the aerial application of fertilisers over large tracts of forest. The mean pH at Newton Stewart is 6.5, with lower mean pH levels upstream.

2.24.1 Discharge - Cree

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	13.89				16.03	19.36	12.44	17.56	11.29		

2.24.2 Spot sampled chemistry data

a) summary for 2005 - Cree

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Cree

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		12.54	9.708	11.65	10.42	8.25	11.54	10.45	12.78	12.48		
pH	pH		6.65	6.54	6.78	6.55	6.7	6.39	6.41	6.36	6.66		
Suspended Solids: Dry weight	mg/l		1.875	3.25	1.364	1.833	1.875	3.706	1.867	2.118	1.647		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm		78.33	83.5	90.18	79	84.6	64.6	58.62	71.35	85.36		
Dissolved Oxygen	mg/l		11.14	11.77	10.83	10.67	11.83	12.34	11.55	11.08	10.48		
Ammonium: NH4-N	mg/l		0.047	0.038	0.034	0.057	0.031	0.022	0.02	0.021	0.02		
Total Nitrogen	mg/l		0.951				0.71	0.587	0.559	0.606	1.79		
Nitrate: NO3-N	mg/l		0.392	0.506	0.588	0.539	0.487	0.384	0.324	0.439	0.303		
Nitrite: N02-N	mg/l		0.004	0.005	0.009	0.021	0.013	0.006	0.005	0.005	0.005		
Alkalinity (CaCo3)	mg/l						6	6.38	4.959	6.732	9.845		
Chloride	mg/l		11.65	15.02	14.36	10.98	14.15	11.89	10.32	11.73	13.42		
Biological Oxygen demand	mg/l		1.658	1.908	1.65	2.033	1.82	1.84	1.417	1.6	1.253		
Total Phosphorous	mg/l		0.022				0.023	0.02	0.012	0.022	0.017		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l		0.007	0.006	0.006	0.011	0.009	0.008	0.008	0.014	0.007		
Silicate: SiO2	mg/l		2.308	2.617	2.423	2.617	2.65	2.5	2.7		3.84		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l		6.689										
Sodium - total	mg/l			7.097	8.026	7.021	8.188	5.48	6.1		6.687		
Potassium - dissolved	mg/l		0.651										
Potassium - total	mg/l			0.679	0.761	0.657	0.678	0.8	0.5		0.709		
Calcium - dissolved	mg/l		4.568										
Calcium - total	mg/l							2.62	3		2.737		
Magnesium - dissolved	mg/l		1.718										
Magnesium - total	mg/l							1.24	1.42		1.547		
Aluminium - total	µg/l		87.5	135.1	99.83	122	121.7				138.5		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l		51.67	54	34.27	55.58	67.5	30			54		
Iron - dissolved	µg/l												
Iron - total	µg/l		319.3	379.8	338.6	475.1	267.5	620	280		508		
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l								0.055		0.41		
Nickel - dissolved	µg/l						3.725	3.272	1.279	1.387	0.882		
Nickel - total	µg/l		1.833				5.76	5.059	2.159	1.574	1.114		
Mercury - dissolved	µg/l												
Mercury - total	µg/l										0.005		
Copper - dissolved	µg/l		0.818				0.705	0.884	0.806	0.889	0.775		
Copper - total	µg/l			1.583	1.35	2.5	1.061	0.973	1.096	1.033	1.341		
Zinc - dissolved	µg/l		7.7				13.33	7.487	4.546	6.074	5.034		
Zinc - total	µg/l			8.875	5.773	7.542	12.36	9.961	6.56	7.7	7.048		
Cadmium - dissolved	µg/l						0.01	0.039	0.023	0.027	0.018		
Cadmium - total	µg/l			0.113	0.055	0.058	0.076	0.054	0.044	0.035	0.03		
Lead - dissolved	µg/l						0.625	0.413	0.309	0.389	0.224		
Lead - total	µg/l			1.208	1	1.792	1.376	1.007	0.943	0.897	0.626		
Arsenic - total	µg/l												

2.24.3 Freshwater Invertebrates, species list - Cree

No data submitted to the ECN database

2.24.4 Freshwater Macrophytes, species list - Cree

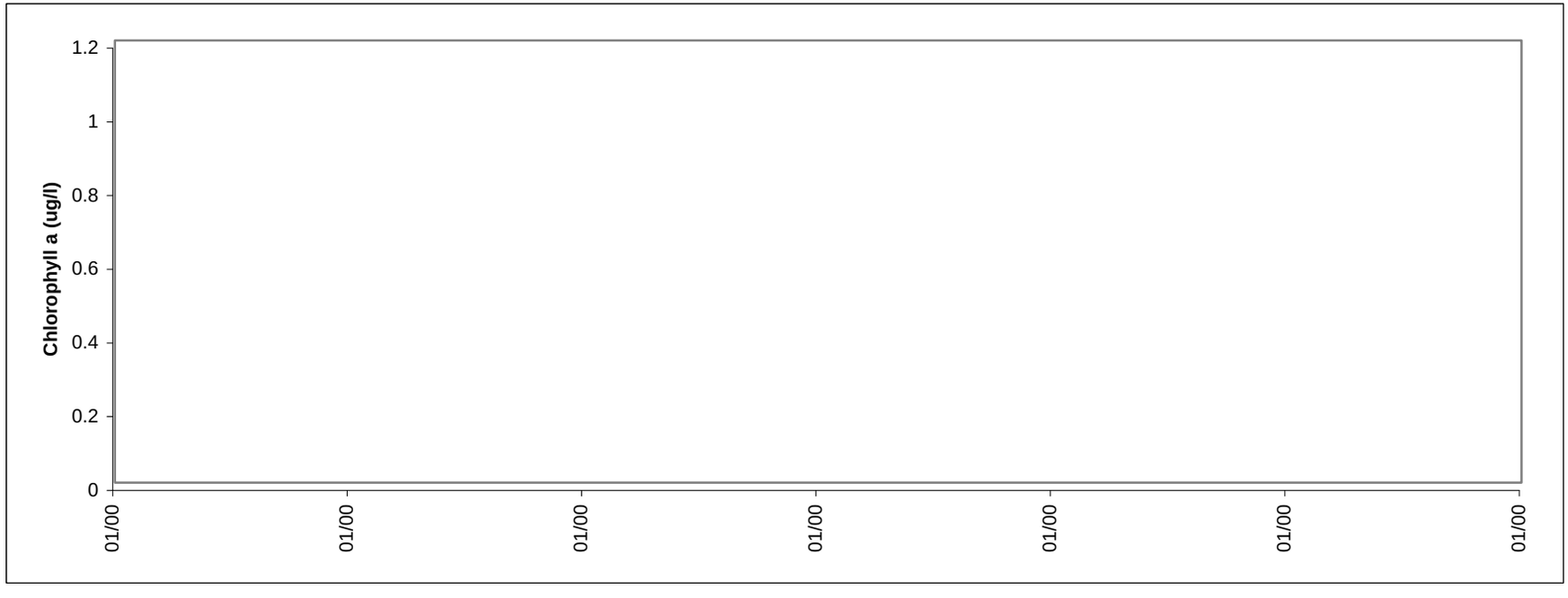
No data submitted to the ECN database

2.24.5 Phytoplankton - Cree

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.25 Cringle Brook

Lincolnshire, England (Lat 52°50'N; Long 0°38'W)
Sponsor: Environment Agency, Anglian Region

Cringle Brook is a tributary of the River Witham, south of Grantham. It is a spring-fed limestone stream, 12 km in length. It has one small tributary, Wyville Brook, flowing into an impounded section comprising two small ornamental lakes whose total area is around 750 m^2. The ECN sampling site is situated in the lower reaches of the Cringle, downstream of the impounded section, where the Brook is 5-7 m wide and 10-50 cm deep, flowing over a sand/gravel substratum with a small content of cobbles and infrequent sections of limestone pavement. This stretch is surrounded by a private golf-course, the river channel and adjacent river corridor being generally unmanaged, with extensive bankside tree-cover and no engineering works (eg weed-cutting, dredging or re-profiling) undertaken. The upstream impoundment maintains a year-round flow of little variation, and also buffers the downstream section against mild enrichment by a village sewage treatment works at Skillington and a sewage pumping station at Stoke Rochford. The Brook consequently supports a stream fauna of very high diversity, including a resident population of Native Crayfish *(Austropotamobius pallipes)* and also sustains a rich aquatic flora.

2.25.1 Discharge - Cringle

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0.38	0.26	0.14	0.2	0.36	0.36	0.36	0.5				

2.25.2 Spot sampled chemistry data

a) summary for 2005 - Cringle

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Cringle

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l												
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.25.3 Freshwater Invertebrates, species list - Cringle

Acroloxus lacustris
Agraylea multipunctata
Ancylus fluviatilis
Anisus vortex
Antocha vitripennis
Armiger crista
Asellus aquaticus
Athripsodes albifrons
Athripsodes aterrimus
Athripsodes cinereus
Athripsodes
Austropotamobius pallipes
Baetis rhodani
Baetis vernus
Baetis Scambus Group
Caenis horaria
Caenis Luctuosa Group
Centroptilum luteolum
Ceratopogonidae
Chironomidae
Cladocera
Clinocerinae
Cloeon dipterum
Copepoda
Corixa panzeri
Crangonyx pseudogracilis
Dicranota
Elmis aenea
Elodes
Ephemera danica
Ephemera
Ephemerella ignita
Erpobdella octoculata
Erpobdellidae
Gammarus pulex
Glossiphonia complanata
Glossiphonia heteroclita
Glossiphoniidae
Goera pilosa
Gyraulus albus
Habrophlebia fusca
Haliplus
Helobdella stagnalis
Hemerodromia Group
Hydracarina
Hydridae
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Ilybius
Ithytrichia
Lepidostoma hirtum
Leuctra fusca
Limnephilidae
Limnius volckmari
Limnophila (Eloeophila)
Limnophora
Lumbricidae
Lumbriculidae
Lymnaea peregra
Lymnaea
Lype
Micronecta
Molanna angustata
Mystacides azurea
Mystacides longicornis
Naididae
Orectochilus villosus
Ostracoda
Oulimnius tuberculatus
Oulimnius
Oxycera
Oxyethira
Paraleptophlebia submarginata
Pericoma fallax
Pericoma neglecta
Pericoma pulchra
Pericoma
Pericoma Trivialis Group
Peripsychoda fusca
Physa fontinalis
Piscicola geometra
Pisidium
Planorbis carinatus
Planorbis
Platambus maculatus
Polycelis felina
Polycelis Nigra Group
Polycentropodidae
Polycentropus flavomaculatus
Potamonectes depressus
Potamopyrgus jenkinsi
Procloeon bifidum
Psychoda
Rhyacophila dorsalis
Rhyacophila
Riolus subviolaceus
Scirtidae
Sericostoma personatum
Sialis lutaria
Sigara dorsalis
Silo nigricornis
Simulium (Eusimulium) Aureum Group
Simulium (Nevermannia) Angustitarse Group
Simulium (Simulium) Ornatum Group
Sphaerium
Theromyzon tessulatum
Tinodes
Tipula (Yamatotipula) Montium Group
Tubificidae
Valvata piscinalis

2.25.4 Freshwater Macrophytes, species list - Cringle

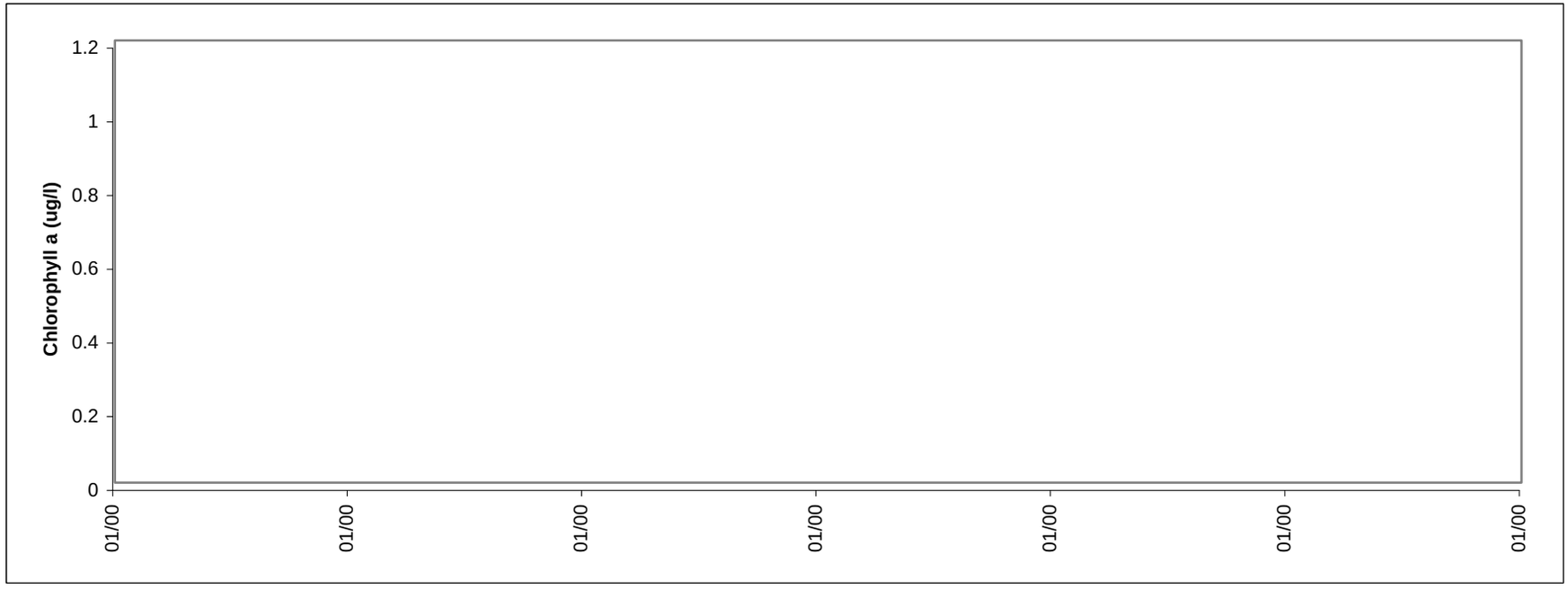
No data submitted to the ECN database

2.25.5 Phytoplankton - Cringle

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



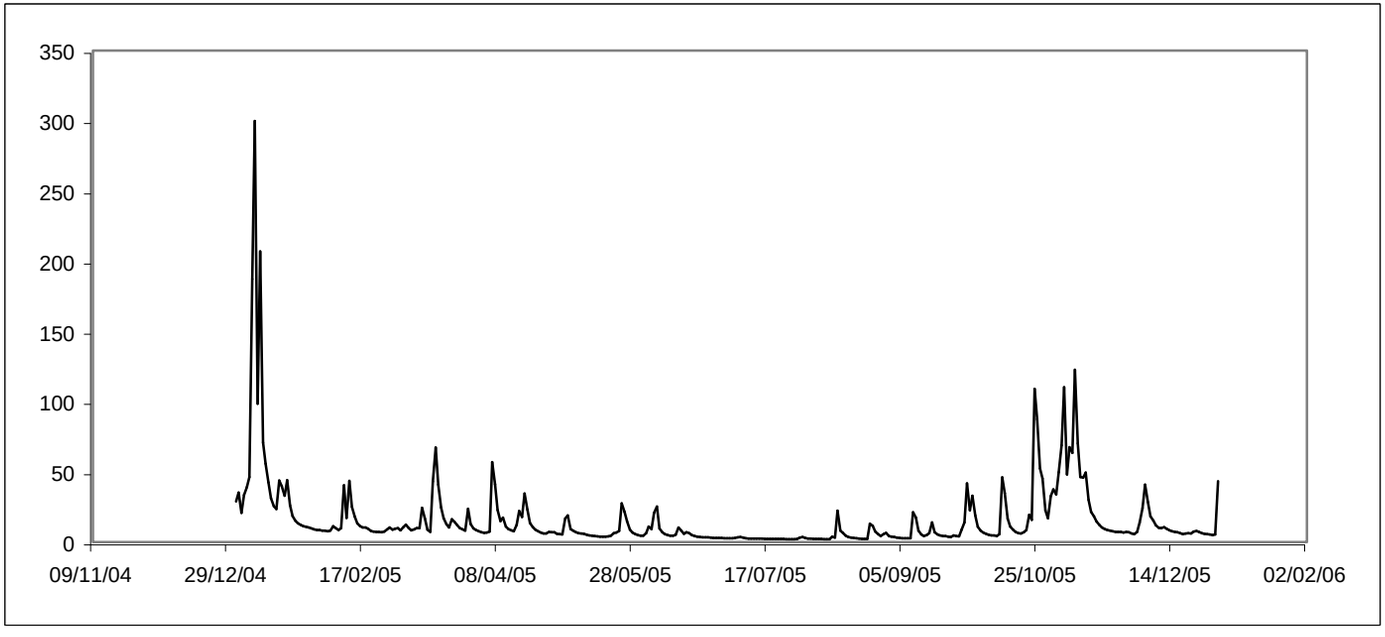
2.26 Eden (Cumbria)

Cumbria, England (Lat 54° 39'N; Long 2°37'W)
Sponsor: Environment Agency, North-West Region

The river rises south of Kirkby Stephen on the Cumbria /Yorkshire border and flows northwards to Carlisle before discharging to the Solway Firth. The Pennines form a barrier to the east and the principal tributaries come from the west. The catchment is largely rural, with farming the main industry. There are significant settlements on the upper part of the river at Kirkby Stephen and Appleby-in-Westmorland. Water quality in the upper reaches is mostly classified in General Quality Assessment (GQA) Class A, very good quality, apart from the stretch from the Belah to Eamont confluences which is Class B (good quality). Drinking water is abstracted to supply the city of Carlisle. The river is excellent for salmon fishing and also supports a sea trout run. Many other species of fish are also found, eg brown trout, grayling, chub, dace, eel, minnow, loach, river-, sea-, and brook lamprey, stickleback and bullhead. Otters and native crayfish are also found in the Eden catchment. The Eden at Temple Sowerby is within the "River Eden and Tributaries" Site of Special Scientific Interest (SSSI), and the proposed Special Area of Conservation (SAC) under the EC Habitats and Species Directive.

The sampling site is in an upland farming area at an altitude of about 100 m a.s.l.. The surrounding countryside is hilly, with some woodlands, rising to the bare slopes of the Pennine hills to the east. These have been mined for lead and silver in historic times, and gypsum is still extracted. The underlying bedrock is Permo-Triassic Penrith Sandstone, with smaller tributaries of the Eden draining from the surrounding Carboniferous Limestone. The market town of Appleby, with a population of about 3000, is roughly 9 miles away by road. Its primary influence on the river is the discharge from the Sewage Treatment Works 16 km upstream which currently has secondary treatment of the wastewaters it receives, including a significant amount of trade discharge from the commercial dairy which serves the local farming community.

2.26.1 Discharge - Eden (Cumbria)



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Current year statistics

Mean	15.81
Max	390.6
Min	1.94
Std. dev	28.74
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50.06	12.56	16	14.04	8.01	6.62	2.55	4.82	7.98	22.6	32.39	11.66

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
17.39	13.3	8.72	12.19	16.86	16.33	20.41	11.45	18.27	9.78	17.27	15.81

2.26.2 Spot sampled chemistry data

a) summary for 2005 - Eden (Cumbria)

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	10.246	3.5	17.6	5.11	13
pH	pH	8.1	7.7	8.4	0.2	13
Suspended Solids: Dry weight	mg/l	5.1154	1.5	24	6.0833	13
Ash-free dry weight	mg/l	10	10	10	0	12
Turbidity	NIU	4.76	1.3	24	6.23	13
Conductivity	µs/cm	376.3846	241	447	56.0276	13
Dissolved Oxygen	mg/l	10.9615	7.9	12.9	1.4431	13
Ammonium: NH4-N	mg/l	0.0542	0.015	0.25	0.0758	13
Total Nitrogen	mg/l	2.0162	1.28	2.72	0.4945	13
Nitrate: NO3-N	mg/l	2.0046	1.27	2.71	0.4952	13
Nitrite: N02-N	mg/l	0.0097	0.006	0.02	0.0035	13
Alkalinity (CaCo3)	mg/l	170	111	191	21.9507	13
Chloride	mg/l	17.6615	13.9	28.8	4.4968	13
Biological Oxygen demand	mg/l	1.2788	0.5	3.2	0.6852	13
Total Phosphorous	mg/l	0.0454	0.02	0.12	0.0247	13
Particulate Phosphorous	mg/l	0.055	0.03	0.12	0.0436	4
Phosphate (soluble reactive): P04-P	mg/l	0.0401	0.003	0.25	0.0654	13
Silicate: SiO2	mg/l	3.1246	1.78	5.03	1.1204	13
Sulphate: S04-S	mg/l	26.3623	9.51	63.5	13.863	13
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	9.4454	7.43	13.5	1.97	13
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	1.9738	1.46	2.33	0.2445	13
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	63.4846	40.4	77.1	10.1074	13
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	10.4623	5.45	13.4	2.6167	13
Aluminium - total	µg/l	83.6231	10.1	433	117.4911	13
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	12
Tin - total	µg/l	1.25	1.25	1.25	0	13
Manganese - dissolved	µg/l	9.2846	5	19.3	5.8826	13
Manganese - total	µg/l	22.6769	5	39.4	10.0924	13
Iron - dissolved	µg/l	62.7231	15	219	57.0505	13
Iron - total	µg/l	171.5846	44.6	712	178.3037	13
Vanadium - dissolved	µg/l	0.6833	0.5	1.08	0.271	12
Vanadium - total	µg/l	0.5385	0.5	1	0.1387	13
Nickel - dissolved	µg/l	2.5	2.5	2.5	0	13
Nickel - total	µg/l	2.5	2.5	2.5	0	13
Mercury - dissolved	µg/l	0.0096	0.005	0.03	0.0083	13
Mercury - total	µg/l	0.005	0.005	0.005	0	13
Copper - dissolved	µg/l	1.3308	0.77	2.51	0.4383	13
Copper - total	µg/l	1.01	1.01	1.01	0	1
Zinc - dissolved	µg/l	2.7115	2.5	5.25	0.7627	13
Zinc - total	µg/l	3.2954	2.5	8.46	1.9681	13
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	13
Cadmium - total	µg/l	0.05	0.05	0.05	0	13
Lead - dissolved	µg/l	0.65	0.2	1.17	0.3258	13
Lead - total	µg/l	2.9438	0.95	7.3	2.1679	13
Arsenic - total	µg/l	0.5	0.5	0.5	0	13

b) annual means since start of ECN - Eden (Cumbria)

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		10.53	10.64	11.01	9.827	9.692	9.938		9.423	9.769	9.936	10.25
pH	pH		8.13	8.16	8.19	8.21	8.15	8.1		7.94	7.97	8.08	8.1
Suspended Solids: Dry weight	mg/l		4.115	2.958	3.962	6.083	8.667	8.769		7.333	7.039	6.909	5.115
Ash-free dry weight	mg/l		5.539	5	5.769	5	8.167	8.539		11.58	12.38	10	10
Turbidity	NIU		3.75	2.33			8.7	7.76		8.1	6.96	3.72	4.76
Conductivity	µs/cm		445.1	452.9	383.7	370	380.8	371.4		376.8		372.2	376.4
Dissolved Oxygen	mg/l		11.11	11.46	10.96	11.83	11.53	11.5		11.78	11.47	11.42	10.96
Ammonium: NH4-N	mg/l		0.043	0.035			0.041	0.038		0.025	0.026	0.021	0.054
Total Nitrogen	mg/l				2.19	2.368		0.32		2.056	1.979	2.204	2.016
Nitrate: NO3-N	mg/l		1.945	2.167	2.173	2.352	1.916	1.995			1.966	2.191	2.005
Nitrite: N02-N	mg/l		0.023	0.022	0.017	0.016	0.015	0.013			0.012	0.01	0.01
Alkalinity (CaCo3)	mg/l		137.6	140.4	136.4	147.7	145.2	147.9		151.3	145.5	173.5	170
Chloride	mg/l		27.17	30.47	20.02	14.93	16.44	15.74		13.69	15.24	13.55	17.66
Biological Oxygen demand	mg/l		1.731	1.542	1.346	1.375	1.16	0.984		1.273	1.617	1.433	1.279
Total Phosphorous	mg/l		0.102	0.119	0.083	0.037	0.055	0.058		0.074		0.045	0.045
Particulate Phosphorous	mg/l							0.069		0.075	0.058	0.055	0.055
Phosphate (soluble reactive): P04-P	mg/l		0.073	0.114	0.058	0.026				0.022	0.015	0.02	0.04
Silicate: SiO2	mg/l		2.463	2.081	2.373	3.211	1.227	1.365			2.395	3.283	3.125
Sulphate: S04-S	mg/l		11.61	11.72	28.23	20.71	9.145	6.659			28.16	24.72	26.36
Sodium - dissolved	mg/l												
Sodium - total	mg/l		14.45	16.15	10.76	7.887	8.38	8.131		7.746	8.273	7.693	9.445
Potassium - dissolved	mg/l												
Potassium - total	mg/l		3.438	4.07	2.814	1.84	1.938	1.92		1.792	1.724	1.63	1.974
Calcium - dissolved	mg/l							0.05					
Calcium - total	mg/l		59.23	59.45	55.12	58.94	60.43	57.78		58.89	55.26	59.8	63.48
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l		9.849	10.58	8.979	8.298	9.562	7.895		8.651	9.505	9.466	10.46
Aluminium - total	µg/l		54.84	30.55	84.62	117.3	110.7	131.3		117.8	113	65.65	83.62
Aluminium - labile	µg/l												
Tin - dissolved	µg/l									1.25	1.25	1.25	1.25
Tin - total	µg/l		0.5	1.25	1.25	1.25	1.25	1.25		1.25	1.25	1.25	1.25
Manganese - dissolved	µg/l									5.527	6.377	12.28	9.285
Manganese - total	µg/l		20.85	21.62	19.69	20.86	22.3	23.98		18.33	19.73	25.21	22.68
Iron - dissolved	µg/l									100.9	80.05	89.69	62.72
Iron - total	µg/l		104.6	82.2	220.8	253.4	198	253		226.5	212.9	186.5	171.6
Vanadium - dissolved	µg/l									0.547	0.54	0.5	0.683
Vanadium - total	µg/l		0.5	0.606	0.5	0.558	0.63	0.5		0.576	0.5	0.5	0.539
Nickel - dissolved	µg/l									2.5	2.5	2.5	2.5
Nickel - total	µg/l		2.692	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5
Mercury - dissolved	µg/l									0.005	0.006	0.005	0.01
Mercury - total	µg/l		0.034	0.016	0.018	0.016	0.012	0.01		0.005	0.034	0.014	0.005
Copper - dissolved	µg/l				1.223	1.092	0.914	1.11		1.124	1.237	1.136	1.331
Copper - total	µg/l				1.521	1.359	1.093	1.361		1.326	1.403	1.218	1.01
Zinc - dissolved	µg/l							3.93		2.5	2.744	2.5	2.712
Zinc - total	µg/l		6.54	2.922	3.409	3.783	3.953	4.163		3.084	3.755	2.737	3.295
Cadmium - dissolved	µg/l									0.05	0.05	0.05	0.05
Cadmium - total	µg/l		0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05
Lead - dissolved	µg/l									0.946	0.815	1.826	0.65
Lead - total	µg/l		1.897	1.665	3.258	3.728	2.847	3.055		3.198	2.935	5.451	2.944
Arsenic - total	µg/l		0.5	0.535	0.568	0.562	0.5	0.5		0.5	0.5	0.5	0.5

2.26.3 Freshwater Invertebrates, species list - Eden (Cumbria)

Agapetus
Anabolia nervosa
Ancylus fluviatilis
Antocha vitripennis
Armiger crista
Asellus aquaticus
Atherix ibis
Athripsodes albifrons
Athripsodes
Baetis muticus
Baetis rhodani
Baetis Scambus Group
Brachycentrus subnubilus
Brachyptera risi
Caenis rivulorum
Ceratopogonidae
Chironomidae
Chloroperla torrentium
Clinocerinae
Dicranota
Dugesia Polychroa Group
Ecdyonurus
Elmis aenea
Enchytraeidae
Ephemera danica
Ephemera
Ephemerella ignita
Erpobdella octoculata
Esolus parallelepipedus
Gammarus pulex
Glossiphonia complanata
Glossosoma
Halesus digitatus
Halesus radiatus
Haliplus lineatocollis
Helobdella stagnalis
Hemerodromia Group
Heptagenia sulphurea
Hydracarina
Hydraena gracilis
Hydridae
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Isoperla grammatica
Ithytrichia
Lepidostoma hirtum
Lepidostomatidae
Leuctra fusca
Leuctra geniculata
Leuctra inermis
Leuctra
Limnius volckmari
Limnophora
Lumbricidae
Lumbriculidae
Lymnaea auricularia
Lymnaea palustris
Lymnaea peregra
Lymnaea
Naididae
Nematoda
Nemoura avicularis
Orectochilus villosus
Oreodytes sanmarkii
Oreodytes septentrionalis
Oulimnius tuberculatus
Oulimnius
Paraleptophlebia submarginata
Perlodes microcephala
Pisidium
Planorbis
Platambus maculatus
Polycelis felina
Polycentropus flavomaculatus
Potamopyrgus jenkinsi
Protonemura praecox
Psychomyia pusilla
Rhithrogena
Rhyacophila dorsalis
Rhyacophila
Riolus subviolaceus
Sericostoma personatum
Simulium equinum
Simulium reptans
Simulium
Simulium (Simulium) Argyreatum Group
Simulium (Simulium) Ornatum Group
Simulium (Wilhelmia)
Taeniopteryx nebulosa
Theromyzon tessulatum
Tipula (Yamatotipula) Montium Group
Tubificidae

2.26.4 Freshwater Macrophytes, species list - Eden (Cumbria)

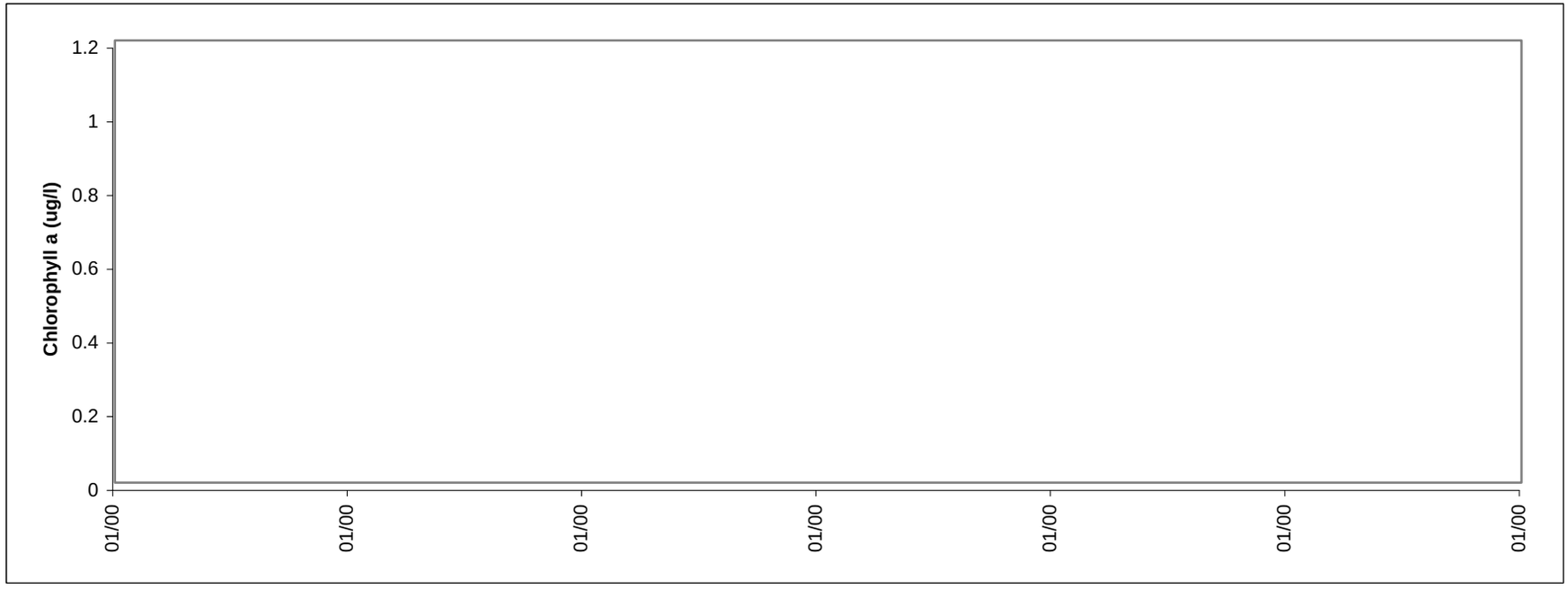
Agrostis stolonifera
Carex sp.
Cladophora
Eleocharis palustris
Enteromorpha
Fontinalis antipyretica
Hildenbrandia rivularis
Juncus
Phalaris arundinacea
Ranunculus
Ranunculus fluitans
Rhynchostegium riparioides
Sparganium erectum
Zannichellia palustris

2.26.5 Phytoplankton - Eden (Cumbria)

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.27 Eden (Fife)

Fife Region, Scotland (Lat 56°20'N; Long 2°56'W)
Sponsor: Scottish Environment Protection Agency, East Region

The River Eden drains some 400 km^2 of north Fife, 307 km^2 of which lie upstream of the ECN site at Kemback. The river rises at around 220 m AOD and the catchment is predominantly low-lying. The major land use in the area is arable farming and approximately 76% of the catchment is prime agricultural land with very fertile soils or imperfectly drained brown forest and alluvial typ es. Underlying geology comprises Devonian and Carboniferous strata, the former including the most productive aquifer in Scotland, the Knox Pulpit formation. Water is abstracted from groundwater, the river and its tributaries for irrigating crops. The Balma lcolm area of the catchment is a designated Nitrate Vulnerable Zone under the EEC Nitrate Directive. Although treated sewage is discharged to the river from several small communities and from the town of Cupar, the effect of diffuse inputs from agriculture is believed to be critical to river water quality. There is a modest salmon run to the river and otters are present. The river enters the sea 4 km to the north of St Andrews and its estuary forms the Eden Estuary Local Nature Reserve - an important overwintering site for wildfowl and waders.

2.27.1 Discharge - Eden (Fife)

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
3.83	3.18	3.15	2.96	4.93	3.84	5.21	3.98	5.8	2.55		

2.27.2 Spot sampled chemistry data

a) summary for 2005 - Eden (Fife)

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Eden (Fife)

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.645	11.44	9.7						9.454	9.85		
pH	pH	7.97	8.07	8.05	7.67	7.63	7.93	7.66	7.72	7.98	7.98		
Suspended Solids: Dry weight	mg/l	6.109	3.6	5.675	9.46	13.83		36.89	7.449	14.07	4.117		
Ash-free dry weight	mg/l						7.627						
Turbidity	NIU												
Conductivity	µs/cm	471.2	470.3	462.4	440.8	454.1	444.5	440.1	478.5	363.6	415.5		
Dissolved Oxygen	mg/l	11.81	10.53	11.36	10.71	10.97	11.4	10.6	11.15	10.85	10.3		
Ammonium: NH4-N	mg/l	0.101	0.104	0.103	0.175	0.098	0.094	0.098	0.087	0.06	0.074		
Total Nitrogen	mg/l		8.483	9.039	10.06	7.788	8.159	9.422	7.588	7.63	10.73		
Nitrate: NO3-N	mg/l	7.604	7.613	7.83	7.948			7.366	6.64	6.186	6.65		
Nitrite: N02-N	mg/l	0.062	0.042	0.038	0.044	0.035	0.035	1.392	0.044	0.037	0.059		
Alkalinity (CaCo3)	mg/l	117.7	124.8	114.3	119.1	114.6	121.7	121	126.7	110.1	133.8		
Chloride	mg/l	38.03	37.11	35.43	35.92	37	30.89	31.92	31.92	29.63	31.66		
Biological Oxygen demand	mg/l	1.846	1.743	1.652	1.486	1.95	1.446	1.946	1.464	1.654	1.49		
Total Phosphorous	mg/l	0.329	0.349	0.364	0.323	0.478	0.334	0.523	0.362	0.193	0.222		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.222	0.286	0.302	0.32	0.224	0.235	0.276	0.238	0.114	0.19		
Silicate: SiO2	mg/l				8.872	10.65	10.79	9.571	9.826	10.29	9.043		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l								20.6	16.27	17.16		
Potassium - dissolved	mg/l												
Potassium - total	mg/l								3.22	2.822	3.297		
Calcium - dissolved	mg/l												
Calcium - total	mg/l				47.83	45.79	47.35	46.97	47.44	42.88	50.47		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l				16.48	15.18	16.31	14.86	16.76	14.48	18.85		
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l				25	349.2	292.7	1013	380	696.2			
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l	1.005	0.588	0.862	1.106	1.947	1.056	1.681	1.067	2.45	2.033		
Mercury - dissolved	µg/l												
Mercury - total	µg/l	0.03	0.031	0.03	0.05	0.05	0.05	0.008	0.008	0.006	0.004		
Copper - dissolved	µg/l	3.946	5.49	3.591									
Copper - total	µg/l				4.818	7.642	4.442	4.184	3.361	3.352	2.143		
Zinc - dissolved	µg/l	5.82	12.45	3.215									
Zinc - total	µg/l				6.563	9.358	6.332	6.748	4.831	7.505	3.788		
Cadmium - dissolved	µg/l	0.095	0.07	0.06									
Cadmium - total	µg/l					0.074	0.05	0.061	0.042	0.027	0.028		
Lead - dissolved	µg/l												
Lead - total	µg/l	1.312	0.97	1.207	1.76	1.207	0.974	2.17	1.286	1.298	0.478		
Arsenic - total	µg/l		1.75	2.408	5	5	5	0.727	0.632	0.619	1.37		

2.27.3 Freshwater Invertebrates, species list - Eden (Fife)

No data submitted to the ECN database

2.27.4 Freshwater Macrophytes, species list - Eden (Fife)

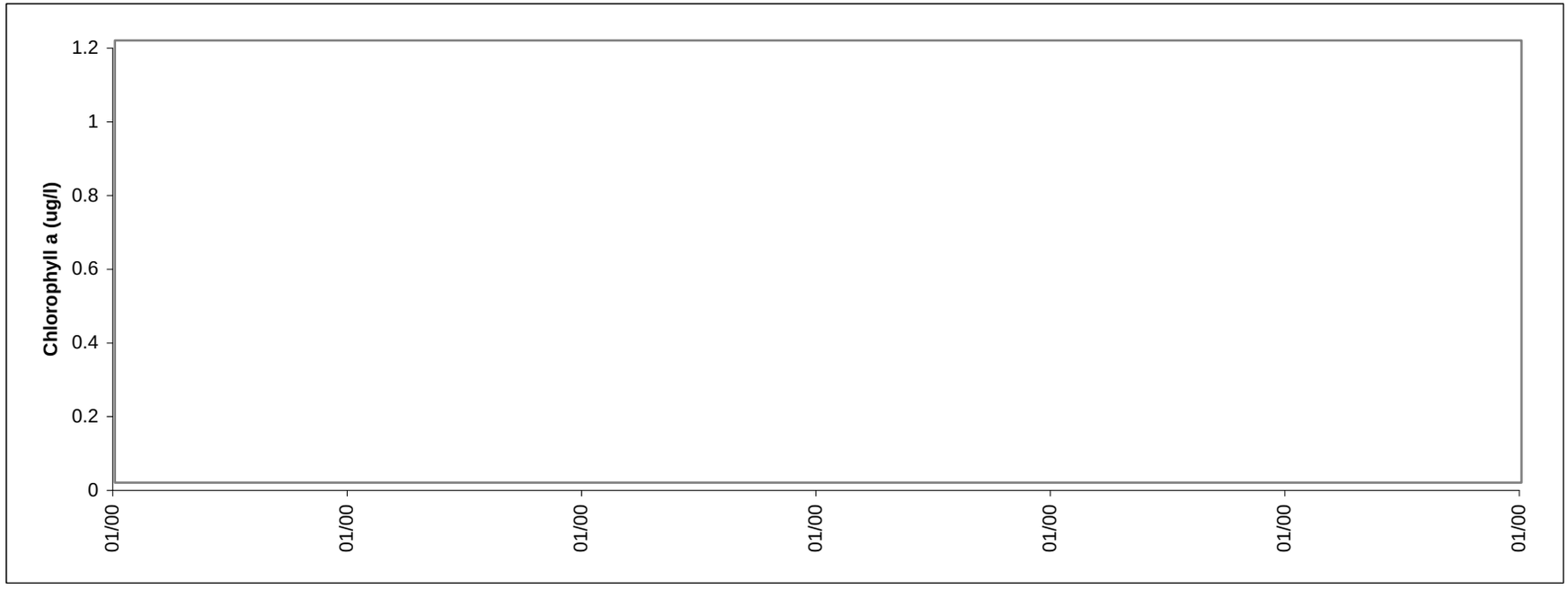
No data submitted to the ECN database

2.27.5 Phytoplankton - Eden (Fife)

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.28 Eden (Kent)

Kent, England (Lat 51°10'N; Long 0°10'E)
Sponsor: Environment Agency, Southern Region

The Eden is a tributary of the River Medway in Kent. It rises south of Caterham and flows eastward through Wealden clay to join the R. Medway near Penshurst. Its main tributaries are the Gibbs Brook, Eden Vale Stream, Eden Brook, and the Felbridge Water. The Eden catchment is largely rural and agricultural although much of the dairy farming which predominated previously has now declined and has been replaced by mixed farming. The sampling point (NGR: TQ 520438) is east of Penshurst in a flat valley surrounded by agricultural land which is not wooded, and is upsteam of a sluice where the river is slow flowing. There is no industry in the area.

Water quality in the Eden is mainly classified as General Quality Assessment (GQA) Class C, although the headwaters near Oxted are Class D. The river receives treated sewage effluent from two Southern Water Services Limited Sewage Treatment Works, serving Edenbridge and Oxted repectively; the stretches receiving these effluents are both subject to EC Urban Water Treatment "Sensitive Waters" investigations. There are other, much smaller private sewage treatment works throughout the catchment. The river and its tributaries support coarse fisheries. Average flows at Penshurst range from 3.909 cumecs in January to 0.485 cumecs in July.

2.28.1 Discharge - Eden (Kent)

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005

2.28.2 Spot sampled chemistry data

a) summary for 2005 - Eden (Kent)

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	11.123	2.27	20.16	6.624	12
pH	pH	7.61	7.19	8.64	0.45	12
Suspended Solids: Dry weight	mg/l	13.45	6.4	22.5	4.324	12
Ash-free dry weight	mg/l	10	10	10	0	12
Turbidity	NIU					0
Conductivity	µs/cm	479.75	51	580	140.1182	12
Dissolved Oxygen	mg/l	9.945	5.27	13.2	2.6535	12
Ammonium: NH4-N	mg/l	0.0354	0.015	0.065	0.0181	12
Total Nitrogen	mg/l	4.4167	0.65	8.38	2.4616	12
Nitrate: NO3-N	mg/l	4.3847	0.646	8.31	2.448	12
Nitrite: N02-N	mg/l	0.0309	0.002	0.082	0.0236	12
Alkalinity (CaCo3)	mg/l					0
Chloride	mg/l	52.5333	9.8	64.8	15.0453	12
Biological Oxygen demand	mg/l	2.4975	1.08	4.86	1.3337	12
Total Phosphorous	mg/l	1.0438	0.01	2.34	0.5971	12
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.8978	0.01	1.99	0.5371	12
Silicate: SiO2	mg/l	6.9933	0.1	12.5	4.727	12
Sulphate: S04-S	mg/l	64	56	73	5.2049	12
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	45.1417	31.2	62.6	10.809	12
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	8.3425	5.2	11.8	2.0439	12
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	58.7333	53.2	62.1	2.8665	12
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	6.4825	5.62	7.57	0.5769	12
Aluminium - total	µg/l	200.0613	0.198	380	120.7311	12
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	12
Tin - total	µg/l	1.25	1.25	1.25	0	12
Manganese - dissolved	µg/l	55.0833	17	87	18.7057	12
Manganese - total	µg/l	95.75	59	179	37.6494	12
Iron - dissolved	µg/l	55.5833	15	110	29.4725	12
Iron - total	µg/l	461.6667	253	978	207.2369	12
Vanadium - dissolved	µg/l	1.575	1	3.2	0.8833	12
Vanadium - total	µg/l	1.7833	1	3.4	0.8932	12
Nickel - dissolved	µg/l	2.5	2.5	2.5	0	12
Nickel - total	µg/l	2.7333	2.5	5.3	0.8083	12
Mercury - dissolved	µg/l	0.005	0.005	0.005	0	12
Mercury - total	µg/l	0.0092	0.005	0.02	0.0067	12
Copper - dissolved	µg/l	3.3833	2.3	5.2	0.7408	12
Copper - total	µg/l	4.3667	2.7	12.4	2.6071	12
Zinc - dissolved	µg/l	4	2.5	17.5	4.338	12
Zinc - total	µg/l	8.25	2.5	23	6.1187	12
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	12
Cadmium - total	µg/l	0.05	0.05	0.05	0	12
Lead - dissolved	µg/l	1.1	1	2.2	0.3464	12
Lead - total	µg/l	1	1	1	0	12
Arsenic - total	µg/l	1.6833	0.5	3.1	0.9124	12

b) annual means since start of ECN - Eden (Kent)

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C					11.08	12.23	12.34	13.3	14.37	13.7	11.88	11.12
pH	pH					7.8	7.86	7.75	7.59	7.49	7.61	7.55	7.61
Suspended Solids: Dry weight	mg/l					21.12	15.2	27.87	26.88	23.15	19.97	19.34	13.45
Ash-free dry weight	mg/l									14.43	12.18	15.31	10
Turbidity	NIU					23.92	17.9	35.57	34.22	26.68			
Conductivity	µs/cm					452.3	474.4	404.8	421.6	416.5	489.5	453.4	479.8
Dissolved Oxygen	mg/l								80.77	74.03	78.96	9.408	9.945
Ammonium: NH4-N	mg/l					0.078	0.081	0.114	0.116	0.093	0.053	0.046	0.035
Total Nitrogen	mg/l						4.783	5.145	5.177	5.078	4.582	4.676	4.417
Nitrate: NO3-N	mg/l					5.313	4.877	5.091	5.107	5.034	4.541	4.641	4.385
Nitrite: N02-N	mg/l					0.045	0.044	0.054	0.07	0.045	0.039	0.034	0.031
Alkalinity (CaCo3)	mg/l					99.58	104.4	93	107.7	104.6	118.3		
Chloride	mg/l					42.58	46.53	36.47	37.84	39.63	50.3	46.52	52.53
Biological Oxygen demand	mg/l					2.117	2.117	2.392	2.27	2.463	3.073	2.5	2.498
Total Phosphorous	mg/l					1.01	0.673	0.783	0.816	0.805	1.33	1.246	1.044
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l					0.969	1.02	0.692	0.652	1.055	0.993	0.993	0.898
Silicate: SiO2	mg/l					6.038	6.039	6.984	7.577	7.06	6.496	6.058	6.993
Sulphate: S04-S	mg/l					57.92	63.75	52	52.5	53.38	61.09	57	64
Sodium - dissolved	mg/l							27.64	29.37	36.72			
Sodium - total	mg/l					32.48	35.55	27.32	28.03	29.38	43.37	37.74	45.14
Potassium - dissolved	mg/l							6.85	6.47	7.035			
Potassium - total	mg/l					7.128	7.609	6.368	6.43	6.27	8.834	7.82	8.343
Calcium - dissolved	mg/l						57.6			58.99			
Calcium - total	mg/l					57.03	60.3	52.32	58.37	54.33	57.92	56.27	58.73
Magnesium - dissolved	mg/l						6.215	5.386					
Magnesium - total	mg/l					6.394	6.446	5.578	5.504	5.625	5.843	5.803	6.483
Aluminium - total	µg/l					457.5	384.5	611.1	882.4	255.4	343.7	348.4	200.1
Aluminium - labile	µg/l							26.25	100.6	28.85			
Tin - dissolved	µg/l					1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Tin - total	µg/l					1.5	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Manganese - dissolved	µg/l					45.42	54.27	45.08	66.5	67.62	72.36	50.25	55.08
Manganese - total	µg/l					82.5	79.55	85.58	103	85.38	123.1	91.06	95.75
Iron - dissolved	µg/l					132.5	105.3	121.2	159.7	101.6	57.45	82.69	55.58
Iron - total	µg/l					762.5	574.7	959.3	978.4	652	613	587.2	461.7
Vanadium - dissolved	µg/l					1.583	1.25	1.333	1.5	1.308	2.191	1.238	1.575
Vanadium - total	µg/l					2.25	1.917	1.917	3	2.125	2.627	1.794	1.783
Nickel - dissolved	µg/l					4.625	2.5	2.5	2.5	2.5	2.5	2.681	2.5
Nickel - total	µg/l					4.917	2.708	3.583	2.5	2.5	2.5	3.113	2.733
Mercury - dissolved	µg/l					0.005	0.005	0.005	0.005	0.009	0.04	0.011	0.005
Mercury - total	µg/l					0.013	0.007	0.011	0.012	0.014	0.02	0.01	0.009
Copper - dissolved	µg/l					4.008	4.1	4.009	3.9	4.208	3.95	3.784	3.383
Copper - total	µg/l					5.067	4.675	5.279	4.92	6.588	4.396	4.313	4.367
Zinc - dissolved	µg/l					6.858	31.38	7.192	9.99	6.4	5.7	6.288	4
Zinc - total	µg/l					12.9	10.26	12.29	16.79	15.74	8.318	8.781	8.25
Cadmium - dissolved	µg/l					0.054	0.05	0.05	0.05	0.059	0.05	0.05	0.05
Cadmium - total	µg/l					0.079	0.054	0.073	0.058	0.066	0.05	0.05	0.05
Lead - dissolved	µg/l					1.167	1	1	1	1	1	1	1.1
Lead - total	µg/l					1.833	1.617	2.292	1.95	1.713	1.136	1.225	1
Arsenic - total	µg/l					1.517	1.442	1.55	1.68	1.088	2.255	1.613	1.683

2.28.3 Freshwater Invertebrates, species list - Eden (Kent)

Ancylus fluviatilis
Anodonta anatina
Anodonta
Antocha vitripennis
Aphelocheirus aestivalis
Asellus aquaticus
Athripsodes
Baetis buceratus
Baetis Scambus Group
Bithynia leachii
Bithynia tentaculata
Caenis Luctuosa Group
Calopteryx splendens
Ceratopogonidae
Chironomidae
Dicranota
Dugesia tigrina
Dugesia Polychroa Group
Elmis aenea
Ephemera
Ephemerella ignita
Erpobdella octoculata
Erpobdella testacea
Erpobdellidae
Gammarus pulex
Glossiphonia complanata
Glossoscolecidae
Gyraulus albus
Helobdella stagnalis
Hemiclepsis marginata
Hydracarina
Hydraena riparia
Hydridae
Hydropsyche angustipennis
Hydropsyche contubernalis
Hydropsyche pellucidula
Hydropsyche
Hydroptila
Laccobius
Limnephilus lunatus
Limnius volckmari
Limnophora
Lumbricidae
Lumbriculidae
Lymnaea auricularia
Lype
Naididae
Nematoda
Neureclipsis bimaculata
Oulimnius tuberculatus
Oulimnius
Pisidium
Polycentropus flavomaculatus
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhyacophila dorsalis
Rhyacophila
Simulium equinum
Simulium erythrocephalum
Simulium lineatum
Simulium
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Ornatum Group
Simulium (Wilhelmia)
Sphaerium
Tipula (Yamatotipula) Montium Group
Tubificidae
Unio tumidus
Valvata piscinalis

2.28.4 Freshwater Macrophytes, species list - Eden (Kent)

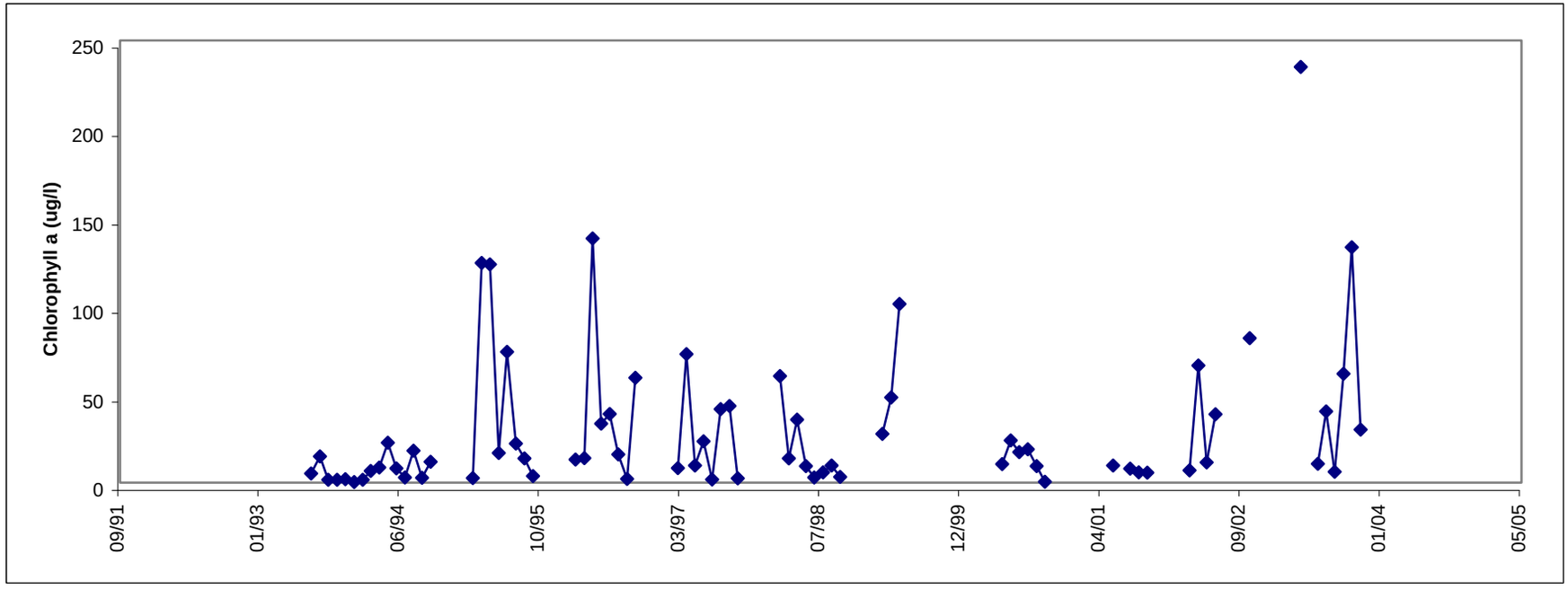
Alnus
Bidens tripartita
Butomus umbellatus
Carex sp.
Cladophora
Enteromorpha
Epilobium hirsutum
Glyceria maxima
Juncus effusus
Juncus inflexus
Lemna minor
Lemna polyrhiza
Lycopus europaeus
Lythrum salicaria
Myriophyllum spicatum
Nuphar lutea
Nymphoides peltata
Oenanthe crocata
Phalaris arundinacea
Polygonum hydropiper
Ranunculus scleratus
Salix
Scrophularia auriculata
Sparganium emersum
Sparganium erectum
Stachys palustris
Typha latifolia
Vaucheria

2.28.5 Phytoplankton - Eden (Kent)

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.29 Esk

North Yorkshire, England (Lat 54°28'N; Long 0°38'W)
Sponsor: Environment Agency, North-East Region

The River Esk rises on the uplands of the North York Moors National Park and is the only major river in the county of Yorkshire which drains directly into the North Sea. The catchment is sparsely populated and without the pressures of industrialisation and urbanisation which affect other rivers in the Region. Open moorland characterises much of the catchment and is an important habitat for a wide variety of wildlife. Within the Esk valley there are six Sites of Special Scientific Interest (SSSI), two of which extend south and cross the boundary of the Derwent catchment.

The source of the Esk is upstream of Westerdale, where a series of becks known as the Esklets merge to form the River Esk. Many of these moorland streams are affected by natural "flushes" of acidity, as well as iron run-off from natural ironstone strata and old mineral workings, making some of these becks an ochreous-orange colour after periods of rainfall. The combination of the two factors restricts the invertebrate fauna in these head-streams. The majority of the River Esk downstream of the Esklets has very good water quality, with a diverse invertebrate fauna dominated by mayflies, stoneflies, caddis-flies and other pollution-sensitive groups. This good water quality is also very important in sustaining other species such as salmon, sea trout, dippers and otters. The ECN site is at Briggswath, approximately 2 km upstream of the tidal limit. At this point the river is approximately 15 m wide, and in normal summer flows depths vary between 20 - 30 cm.

2.29.1 Discharge - Esk

No data submitted to the ECN database

Current year statistics

Mean	4.6
Max	141.94
Min	0
Std. dev	6.85
N%	99

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.98	6.64	10.57	7.07	2.54	1.35	3.45	1.5	1.63	3.31	6.34	6.21

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4.35	4.19	3.88	4.03	7.89	6.18	7.95	6.24	4.66	2.98	6.35	4.6

2.29.2 Spot sampled chemistry data

a) summary for 2005 - Esk

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	11.358	4.3	22.4	5.374	12
pH	pH	7.6	7.2	8.5	0.34	12
Suspended Solids: Dry weight	mg/l	12.75	3	56	14.9674	12
Ash-free dry weight	mg/l	27	24	30	4.2426	2
Turbidity	NIU					0
Conductivity	µs/cm	209.0833	135	502	96.5764	12
Dissolved Oxygen	mg/l	10.5242	8.4	13	1.3551	12
Ammonium: NH4-N	mg/l	0.0493	0.015	0.123	0.0323	12
Total Nitrogen	mg/l					0
Nitrate: NO3-N	mg/l	0.9183	0.516	1.37	0.2887	12
Nitrite: N02-N	mg/l	0.0041	0.002	0.021	0.0055	12
Alkalinity (CaCo3)	mg/l	43.0333	21	64.2	12.8707	12
Chloride	mg/l	25.175	21.4	27.7	1.8984	12
Biological Oxygen demand	mg/l	1.6667	0.9	2.4	0.4849	12
Total Phosphorous	mg/l	0.0392	0.01	0.12	0.0326	12
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.011	0.01	0.022	0.0035	12
Silicate: SiO2	mg/l	7.1775	3.06	9.2	1.753	12
Sulphate: S04-S	mg/l	7.4917	4	9.3	1.509	12
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	15.0583	12	16.9	1.6812	12
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	2.0475	1.74	2.51	0.2731	12
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	18.7442	9.23	24.5	4.6356	12
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	4.8125	2.82	6.24	1.0126	12
Aluminium - total	µg/l	398.2583	86.5	1360	373.955	12
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	12
Tin - total	µg/l	1.25	1.25	1.25	0	12
Manganese - dissolved	µg/l	40.3	25.5	66.6	11.0904	12
Manganese - total	µg/l	57.8333	32.8	140	27.9358	12
Iron - dissolved	µg/l	491.75	263	917	223.7962	12
Iron - total	µg/l	1075.25	515	2800	648.2153	12
Vanadium - dissolved	µg/l	0.5	0.5	0.5	0	12
Vanadium - total	µg/l	0.7625	0.5	2.69	0.6668	12
Nickel - dissolved	µg/l	2.74	2.5	5.38	0.8314	12
Nickel - total	µg/l	3.2217	2.5	8.23	1.788	12
Mercury - dissolved	µg/l	0.0088	0.005	0.026	0.0073	12
Mercury - total	µg/l	0.0063	0.005	0.013	0.0031	12
Copper - dissolved	µg/l	1.7441	0.769	3.88	0.9534	12
Copper - total	µg/l	1.8775	1.12	3.2	0.6769	12
Zinc - dissolved	µg/l	8.3417	2.5	19.6	6.1843	12
Zinc - total	µg/l	11.9533	6.38	39.1	9.5939	12
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	12
Cadmium - total	µg/l					0
Lead - dissolved	µg/l	0.4338	0.2	1.62	0.4374	12
Lead - total	µg/l	1.3779	0.447	5.17	1.289	12
Arsenic - total	µg/l	0.5	0.5	0.5	0	12

b) annual means since start of ECN - Esk

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.754	9.15	10.27	10.31	8.3	9.967	11	9.25	9.446	8.908	9.95	11.36
pH	pH	7.56	7.08	7.5	7.53	7.42	7.57	7.56	7.71	7.93	7.69	7.2	7.6
Suspended Solids: Dry weight	mg/l	4.5	11.6	9.167	23.29	18.93	2.333	25.08	26.2	14.41	7.615	13.08	12.75
Ash-free dry weight	mg/l										22	34	27
Turbidity	NIU	7.2	8.89	8.03	23.32	19.3	6.8	27.19	10.07	17.9			
Conductivity	µs/cm	234.8	234.6	255.8	245.9	217.6	228.5	207.5	218.8	221.8	209.5	168	209.1
Dissolved Oxygen	mg/l	10.83	10.94	10.16	9.906	10.69	10.22	9.938	9.957	10.88	10.61	10.97	10.52
Ammonium: NH4-N	mg/l	0.07	0.066	0.074	0.063	0.049	0.024	0.058	0.064	0.061	0.044	0.036	0.049
Total Nitrogen	mg/l	0.961	1.263	1.382	1.346								
Nitrate: NO3-N	mg/l	0.951	1.252	1.37	1.32	1.529	1.169	1.205	1.105	1.208	1.006	0.895	0.918
Nitrite: N02-N	mg/l	0.012	0.011	0.011	0.012	0.013	0.011	0.016	0.015	0.009	0.008	0.003	0.004
Alkalinity (CaCo3)	mg/l	36.5	41.43	39.58	41.36	32.04	45.78	33.07	38.69	44.95	45.34	42.4	43.03
Chloride	mg/l	28.54	29.53	32.55	30.41	30.14	28.9	24.45	27.92	23.67	25.65	19.48	25.18
Biological Oxygen demand	mg/l	1.196	1.81	2.117	1.867	1.679					1.9	1.75	1.667
Total Phosphorous	mg/l					0.996		0.043	0.057	0.106	0.053	0.097	0.039
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.032	0.025	0.026	0.044		0.029	0.039	0.062	0.046	0.026	0.013	0.011
Silicate: SiO2	mg/l	6.924	6.322	7.048	6.973	7.376	6.606	7.547	7.814	7.08	7.15	6.668	7.178
Sulphate: S04-S	mg/l	7.363	8.314	8.876	8.378	7.512	9.235	7.959	8.379	17.8	27.32	14.95	7.492
Sodium - dissolved	mg/l											12.83	
Sodium - total	mg/l	32.96	17.35	18.79	17.82	17.16	17.67	14.56	16.91	15.15	16.26		15.06
Potassium - dissolved	mg/l												
Potassium - total	mg/l	2.585	2.335	2.366	2.481	2.229	2.303	2.105	2.232	2.249	2.268	1.945	2.048
Calcium - dissolved	mg/l												
Calcium - total	mg/l	22.15	20.22	20.92	21.55	18.72	21.48	17.87	19.64	19.85	21.82	14.25	18.74
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l	6.131	5.485	5.586	5.742	5.155	5.716	5.075	5.185	5.172	5.656	4.032	4.813
Aluminium - total	µg/l	260.4	325.9	330.5	565.7	538.6	210.5	515.3	490.8	362.4	264.4	530.2	398.3
Aluminium - labile	µg/l												
Tin - dissolved	µg/l										1.25	1.25	1.25
Tin - total	µg/l	1.406	1.25	1.25	1.368	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Manganese - dissolved	µg/l							36.74	48.14	28.6	36.78	38.66	40.3
Manganese - total	µg/l	60.75	67.56	64.28	59.58	53.39	36.91	52.28	65.14	50.8	50.05	54.08	57.83
Iron - dissolved	µg/l	315.1	279.6	231.8	300.4	411.4	294.7	420.7	439.6	399.5	355.4	460.3	491.8
Iron - total	µg/l	596.5	718.5	645.4	1145	1220	589.2	1157	1088	976.5	747.2	1069	1075
Vanadium - dissolved	µg/l							0.5	0.5	0.5	0.5	0.5	0.5
Vanadium - total	µg/l	2.5	0.5	0.5	1.057	0.75	0.5	1.003	0.89	0.728	0.561	0.828	0.763
Nickel - dissolved	µg/l			3.544			2.77	2.755	2.5	2.5	2.5	2.731	2.74
Nickel - total	µg/l	5.068	4.104	4.226	4.321	4.555	2.801	3.909	3.515	2.911	3.023	3.918	3.222
Mercury - dissolved	µg/l			0.012			0.005	0.005	0.048	0.09	0.005	0.005	0.009
Mercury - total	µg/l	0.057	0.023	0.014			0.009	0.008	0.007	0.091	0.024	0.008	0.006
Copper - dissolved	µg/l	1.4	0.871	1.044			1.115	1.324	1.141	1.175	1.093	1.9	1.744
Copper - total	µg/l	3.026	1	2.074	2.758	1.938	1.426	1.971	1.734	1.719	1.477	2.377	1.878
Zinc - dissolved	µg/l	12	11.4	8.325			4.644	6.654	5.727	6.742	9.098	8.7	8.342
Zinc - total	µg/l	13.75	19.5	23.32	12.75	14.84	9.079	12.66	10.05	11.67	13.45	16.76	11.95
Cadmium - dissolved	µg/l	0.05	0.05	0.05			0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cadmium - total	µg/l	0.045	0.05	0.064	0.058	0.056	0.05	0.05	0.057	0.037	0.044	0.045	
Lead - dissolved	µg/l			0.5			0.2	0.403	0.375	0.322	0.257	0.458	0.434
Lead - total	µg/l	0.788	0.962	7.599	1.695	1.312	0.498	1.848	1.467	1.291	0.777	1.583	1.378
Arsenic - total	µg/l			0.546			0.5	0.583	0.655	0.549	0.5	0.5	0.5

2.29.3 Freshwater Invertebrates, species list - Esk

Amphinemura standfussi
Antocha vitripennis
Asellus aquaticus
Baetis muticus
Baetis rhodani
Baetis
Baetis Scambus Group
Caenis rivulorum
Chironomidae
Chloroperla torrentium
Clinocerinae
Crangonyx pseudogracilis
Dicranota
Ecdyonurus
Elmis aenea
Ephemerella ignita
Erpobdella octoculata
Gammarus pulex
Glossosoma
Halesus radiatus
Hemerodromia Group
Heptagenia sulphurea
Heptageniidae
Hexatoma
Hydracarina
Hydraena gracilis
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Isoperla grammatica
Lepidostoma hirtum
Leuctra fusca
Leuctra geniculata
Leuctra hippopus
Leuctra inermis
Leuctra
Limnius volckmari
Lumbricidae
Lumbriculidae
Naididae
Nematoda
Nematomorpha
Nemoura avicularis
Nemoura Cambrica Group
Odontocerum albicorne
Orectochilus villosus
Oulimnius tuberculatus
Oulimnius
Paraleptophlebia submarginata
Polycelis Nigra Group
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhithrogena
Rhyacophila dorsalis
Rhyacophila
Sericostoma personatum
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Argyreatum Group
Simulium (Wilhelmia)
Taeniopteryx nebulosa
Tipula (Yamatotipula) Montium Group
Tubificidae

2.29.4 Freshwater Macrophytes, species list - Esk

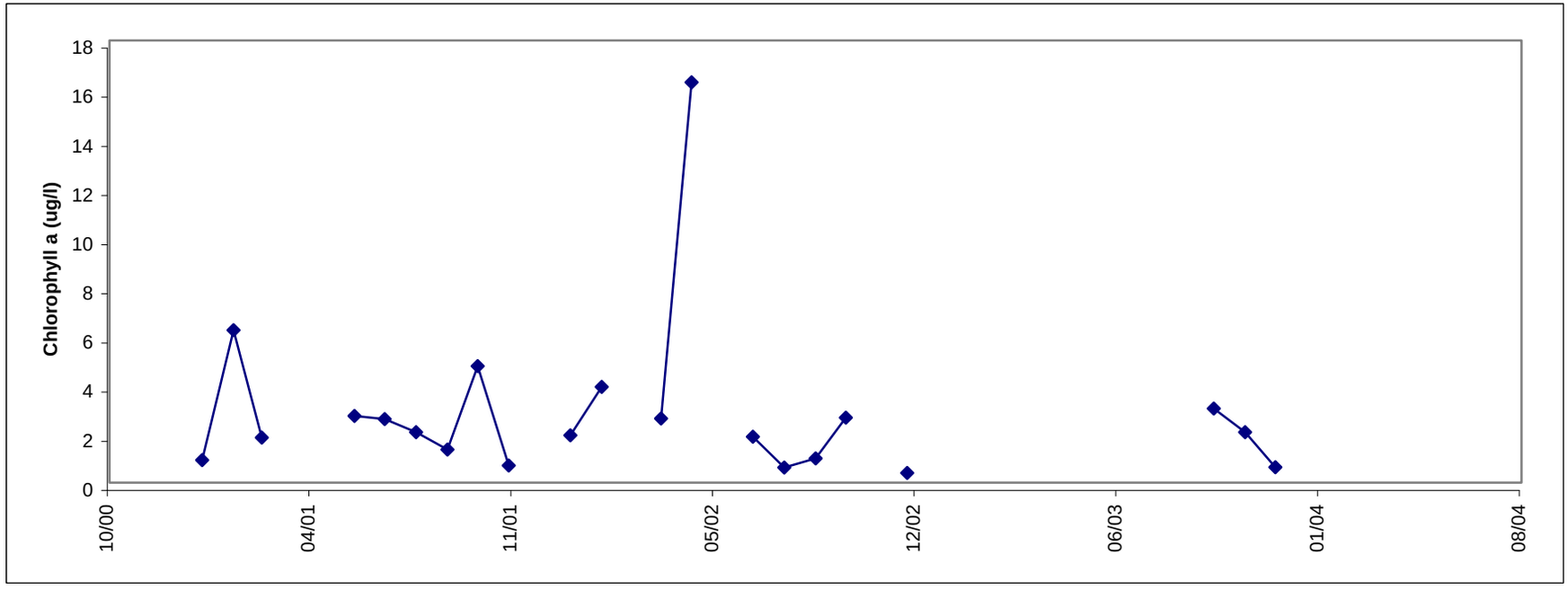
No data submitted to the ECN database

2.29.5 Phytoplankton - Esk

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

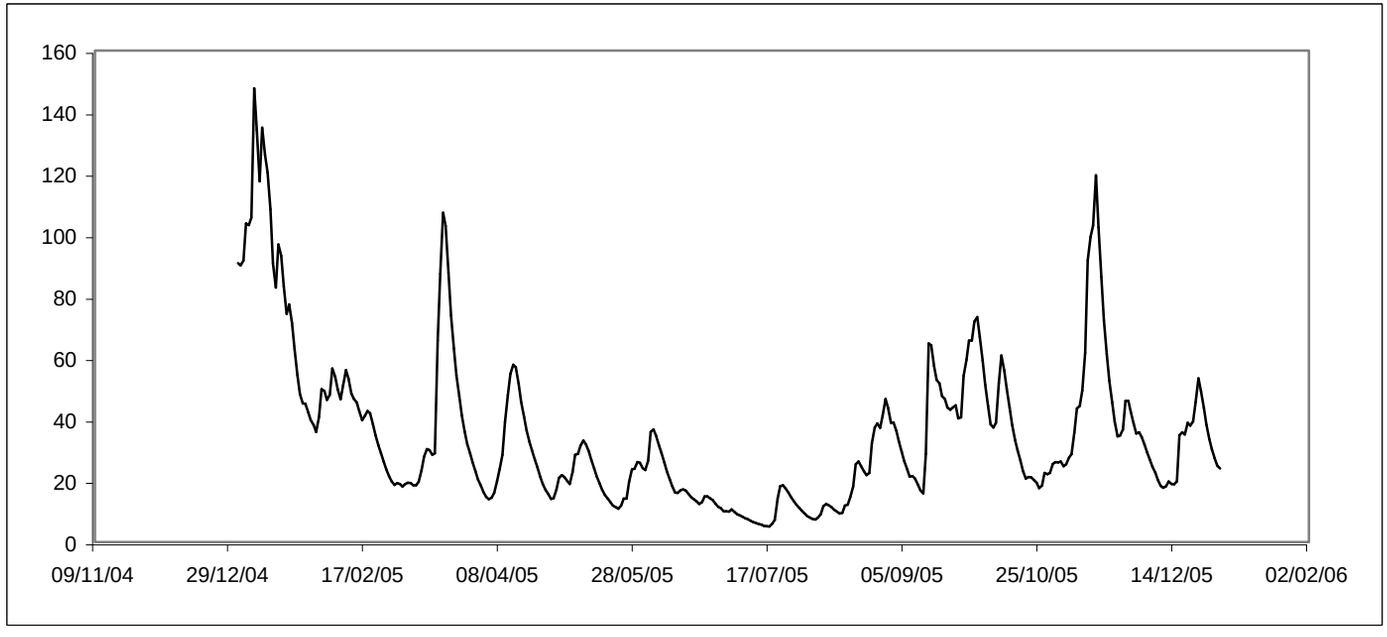


2.30 Ewe

Highland Region, Scotland (Lat 57°45'N; Long 5°36'W)
Sponsor: Scottish Environment Protection Agency, North Region

The River Ewe, in Wester Ross, is a short stretch of river running north-westwards out of Loch Maree into the sea at Poolewe. The large upland catchment (441 km^2), which includes Loch Maree and Loch Ewe, is mainly peaty moorland managed prdominantly for deer grazing, with some hill sheep farming but negligible arable farming. It is well known for its populations of feral goats. Land rises to over 900 m on a number of mountains including Slioch and Ben Eighe. Average annual catchment rainfall is 2272 mm and long-term average flow at the Poolewe gauging station is 29.64 cumecs. The Ewe catchment is as close to pristine as is possible on the Scottish mainland and, unusually for this part of Scotland, it has no discharges from intensive fish farming. Parts of the catchment are of national scenic and conservation interest and have been designated as a National Nature Reserve (NNR) and Nati onal Scenic Area (NSA). There are large areas of deer forest and protected woodlands of Scots pine (*Pinus sylvestris*) and native oak (*Quercus petraea*). There is one small-scale hydroelectric scheme on a tributary flowing into Loch Maree; two further small schemes are proposed. The River Ewe and Loch Maree are important for their salmonid fisheries but the decline of the trout fishery in Loch Maree is a well -recorded phenomenon which is under investigation by the Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD); it is regarded as indicative of such declines generally on the west coast of Scotland.

2.30.1 Discharge - Ewe



Current year statistics

Mean	35.35
Max	156.27
Min	4.84
Std. dev	25.65
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
83.74	41.12	39.85	28.29	21.15	19.12	9.83	20.73	40.54	37.12	52.66	30.58

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
31.61	31.16	21.19	27.01	34.34	34.66	31.01	24.33	24.03	21.22	36.1	35.35

2.30.2 Spot sampled chemistry data

a) summary for 2005 - Ewe

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Ewe

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C										11.15		
pH	pH									6.6	6.68		
Suspended Solids: Dry weight	mg/l									1.06	1.089		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm									42.18	45.53		
Dissolved Oxygen	mg/l									10.91	11.04		
Ammonium: NH4-N	mg/l									0.01	0.008		
Total Nitrogen	mg/l									0.2	0.317		
Nitrate: NO3-N	mg/l									0.025	0.284		
Nitrite: N02-N	mg/l									0.001	0.003		
Alkalinity (CaCo3)	mg/l									2.172	2.736		
Chloride	mg/l									10.56	10.57		
Biological Oxygen demand	mg/l									0.651	0.291		
Total Phosphorous	mg/l									0.004	0.004		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l									0.005	0.004		
Silicate: SiO2	mg/l									0.776	0.758		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l									6.127	5.44		
Potassium - dissolved	mg/l												
Potassium - total	mg/l									0.478	0.415		
Calcium - dissolved	mg/l												
Calcium - total	mg/l									1.333	1.4		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l									0.816	0.892		
Aluminium - total	µg/l									50.18	45.84		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l									0.525	0.476		
Manganese - dissolved	µg/l												
Manganese - total	µg/l									2.305	8.614		
Iron - dissolved	µg/l												
Iron - total	µg/l									27.18	22.36		
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l									0.335	0.274		
Nickel - dissolved	µg/l												
Nickel - total	µg/l									0.292	0.727		
Mercury - dissolved	µg/l												
Mercury - total	µg/l									0.017			
Copper - dissolved	µg/l												
Copper - total	µg/l									0.194	0.31		
Zinc - dissolved	µg/l												
Zinc - total	µg/l									1.043	1.531		
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l									0.091	0.083		
Lead - dissolved	µg/l												
Lead - total	µg/l									0.077	0.085		
Arsenic - total	µg/l												

2.30.3 Freshwater Invertebrates, species list - Ewe

No data submitted to the ECN database

2.30.4 Freshwater Macrophytes, species list - Ewe

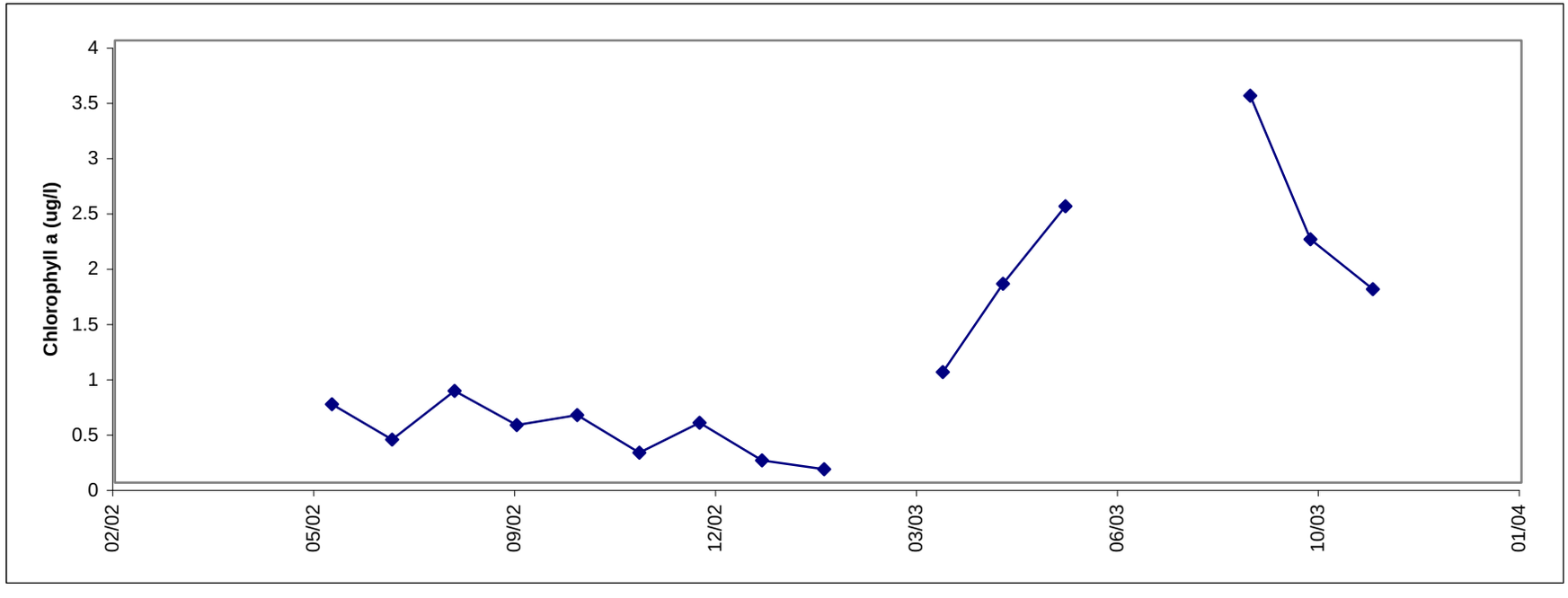
No data submitted to the ECN database

2.30.5 Phytoplankton - Ewe

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

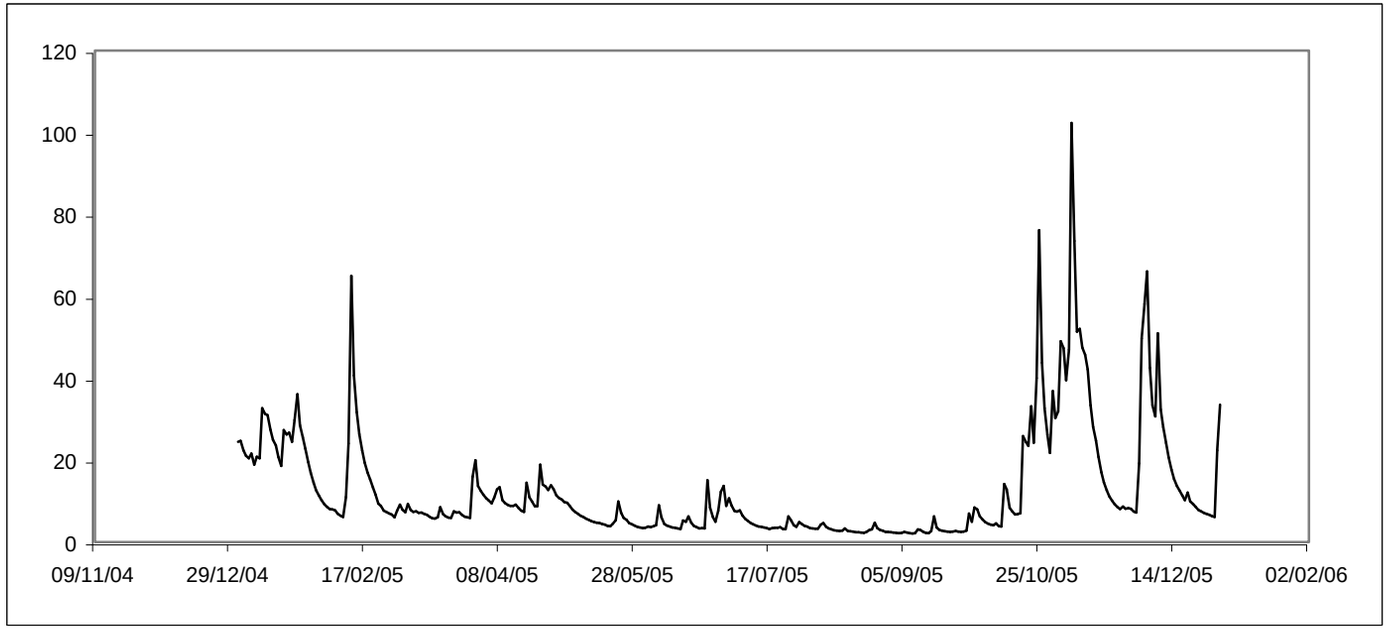


2.31 Exe

Devon, England (Lat 50°48'N; Long 3°31'W)
Sponsor: Environment Agency, South-West Region

The ECN site is at Thorverton weir on the River Exe which drains the Exmoor National Park and is situated above the City of Exeter and the more industrialised sub-catchment of the River Culm. Most of the catchment is populated by isolated farmsteads, hamlets, villages and small towns. The only major urban area upstream of this site is Tiverton. The River Exe rises at a level of 450 m AOD in the wet moorland of Exmoor, then passes through steep-sided valleys with extensive broad-leaved woodland. Further east, tributaries run off the Brendon Hills with the River Haddeo and the major water resource of Wimbleball Reservoir. Further south of these tributaries, towards Tiverton, the floodplain opens out and rolling farmland replaces woodland. The farmland in the catchment of Thorverton weir supports sheep, cattle and dairy farming. All stretches of river above Thorverton weir, except the Riverton canal, have water of good or very good quality suitable for all fish species. The average rainfall for the Exe catchment as a whole is 1097 mm, with a maximum of 2018 mm on Exmoor. Analysis of the flow record at Thorverton shows a mean daily flow of 15.887 cumecs and the river has a relatively 'flashy' flow regime compared with the rest of England.

2.31.1 Discharge - Exe



Current year statistics

Mean	12.41
Max	178.02
Min	2.02
Std. dev	14.06
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
23.47	15.07	7.93	11.05	5.88	5.56	5.04	3.02	2.88	18.09	29.19	21.98

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
22.17	16.01		14.39	21.53			14.33	20.74	10.7	14.12	12.41

2.31.2 Spot sampled chemistry data

a) summary for 2005 - Exe

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	10.971	4.5	17	4.293	13
pH	pH	7.51	7.2	7.8	0.17	13
Suspended Solids: Dry weight	mg/l	8.8692	1.5	35.7	9.6552	13
Ash-free dry weight	mg/l	11.4615	10	29	5.2697	13
Turbidity	NIU					0
Conductivity	µs/cm	154.6429	113	185	19.9638	14
Dissolved Oxygen	mg/l	10.64	8.57	12.5	1.1515	13
Ammonium: NH4-N	mg/l	0.0461	0.015	0.14	0.0371	14
Total Nitrogen	mg/l	2.5179	1.69	3.16	0.4211	14
Nitrate: NO3-N	mg/l	2.4943	1.68	3.15	0.4217	14
Nitrite: N02-N	mg/l	0.0218	0.005	0.07	0.0179	14
Alkalinity (CaCo3)	mg/l					0
Chloride	mg/l	15.75	11.9	19.5	1.848	14
Biological Oxygen demand	mg/l	1.4015	0.5	3.21	0.8761	13
Total Phosphorous	mg/l	0.1125	0.05	0.22	0.0618	12
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.0686	0.02	0.18	0.0433	14
Silicate: SiO2	mg/l	4.295	3.14	5.55	0.7078	14
Sulphate: S04-S	mg/l	7.3571	5	11	2.8449	14
Sodium - dissolved	mg/l	9.1636	7.6	11	1.0491	11
Sodium - total	mg/l	9.1286	6.6	10.4	1.0964	14
Potassium - dissolved	mg/l	2.1445	1.54	3.1	0.5108	11
Potassium - total	mg/l	2.1114	1.52	3.19	0.5319	14
Calcium - dissolved	mg/l	16.5357	12.3	21.1	2.4994	14
Calcium - total	mg/l	14.2333	11.7	17.9	3.2517	3
Magnesium - dissolved	mg/l	3.9657	2.75	5.13	0.6489	14
Magnesium - total	mg/l	3.3933	2.79	4.03	0.6207	3
Aluminium - total	µg/l	141.295	0.13	580	148.1263	14
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	14
Tin - total	µg/l	1.25	1.25	1.25	0	14
Manganese - dissolved	µg/l	8.4286	5	15	4.2375	14
Manganese - total	µg/l	28.2143	5	67	18.7993	14
Iron - dissolved	µg/l	104.2857	38	187	50.8685	14
Iron - total	µg/l	336	84	1080	268.9881	14
Vanadium - dissolved	µg/l	1	1	1	0	14
Vanadium - total	µg/l	1	1	1	0	14
Nickel - dissolved	µg/l	2.5	2.5	2.5	0	14
Nickel - total	µg/l	2.5	2.5	2.5	0	14
Mercury - dissolved	µg/l	0.0062	0.005	0.02	0.0042	13
Mercury - total	µg/l	0.005	0.005	0.005	0	13
Copper - dissolved	µg/l	1.1857	0.5	2.4	0.6237	14
Copper - total	µg/l	1.3929	0.5	3.4	0.8827	14
Zinc - dissolved	µg/l	2.8571	2.5	7.5	1.3363	14
Zinc - total	µg/l	3.1857	2.5	8.6	1.8161	14
Cadmium - dissolved	µg/l	0.0089	0.005	0.02	0.0053	14
Cadmium - total	µg/l	0.0146	0.005	0.04	0.0115	14
Lead - dissolved	µg/l	1	1	1	0	14
Lead - total	µg/l	1	1	1	0	14
Arsenic - total	µg/l	0.6154	0.5	1.4	0.2882	13

b) annual means since start of ECN - Exe

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	11.32	11.97	10.09	9.692	9.608	10.7	10.61	11.63	10.89	9.467	12.23	10.97
pH	pH	7.78	7.82	7.81	7.74	7.69	7.79	7.8	7.62	7.68	7.71	7.71	7.51
Suspended Solids: Dry weight	mg/l	6.332	16.76	5.756	21.13	8.225	4.25	9.631	4.136	16.58	4.742	7.342	8.869
Ash-free dry weight	mg/l										11	11.67	11.46
Turbidity	NIU					7.04	4.43	8.03	3.53	13.48			
Conductivity	µs/cm	157	164.5	182.6	163.8	143.2	161	142.8	168.5	150.3	164.8	153.3	154.6
Dissolved Oxygen	mg/l	10.94	10.84	11.43	11.32	11.23	11.12	11.02	10.47	10.72	10.99	10.71	10.64
Ammonium: NH4-N	mg/l	0.032	0.045	0.04	0.055	0.036	0.038	0.041	0.046	0.048	0.059	0.035	0.046
Total Nitrogen	mg/l			3.516	3.037	2.558	2.473	2.227	2.296	2.575	2.623	2.496	2.518
Nitrate: NO3-N	mg/l	2.326	2.44	3.494	3.015	2.539	2.454	2.235	2.266	2.55	2.598	2.473	2.494
Nitrite: N02-N	mg/l			0.022	0.022	0.012	0.018	0.018	0.026	0.024	0.02	0.019	0.022
Alkalinity (CaCo3)	mg/l	40.32	38.46	40.04	37.77	32	39.5	36.5	45.55	40.96			
Chloride	mg/l	15.4	15.42	16.92	15.5	14.78	15.07	13.35	15.12	14.41	16.55	15.76	15.75
Biological Oxygen demand	mg/l	1.416	1.7	1.728	1.715	1.358	1.525	1.408	1.436	1.618	2.075	1.45	1.402
Total Phosphorous	mg/l			0.178	0.158	0.077	0.107	0.1	0.156	0.125	0.127	0.117	0.113
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.089	0.115	0.129	0.096	0.045	0.072	0.055	0.117	0.076	0.089	0.082	0.069
Silicate: SiO2	mg/l	3.612	3.408	3.544	3.821	4.153	4.021	4.203	3.556	3.89	3.852	3.956	4.295
Sulphate: S04-S	mg/l	3.885	4.095	4.927	4.013	2.693	3.563	2.338	12.82	7.818	8.917	7.667	7.357
Sodium - dissolved	mg/l			13.5	11.03	8.45	9.953	8.142	10.72	8.691	9.4	8.192	9.164
Sodium - total	mg/l	10.76	11.42		10.97	8.717	9.525	8.146	10.8	8.7	9.408	8.958	9.129
Potassium - dissolved	mg/l			2	2.044	1.708	1.927	1.828	2.052	1.951	1.98	1.77	2.145
Potassium - total	mg/l	1.784	1.946		2.093	1.828	1.964	1.755	2.094	1.971	2.003	1.943	2.111
Calcium - dissolved	mg/l						17.5	14.98	17.93	16.35	17.6	14.66	16.54
Calcium - total	mg/l	16.52	16.46		16.58	14.83	17.36	15.19	18.02	16.29	17.76		14.23
Magnesium - dissolved	mg/l			3.85	3.997	3.639	4.083	3.542	4.24	3.817	4.194	3.587	3.966
Magnesium - total	mg/l	3.928	3.912		4.115	3.973	4.159	3.58	4.29	3.849	4.243		3.393
Aluminium - total	µg/l	127.6		115	360.4	165.8	100.9	149	75.36	235.7	80	133.2	141.3
Aluminium - labile	µg/l												
Tin - dissolved	µg/l								1.25	1.25	1.271	1.25	1.25
Tin - total	µg/l			1.25	1.25	1.396	2.125	1.409	1.25	1.25	1.271	1.25	1.25
Manganese - dissolved	µg/l					9.75	13.75	9.25	13.56	8	10.67	6.75	8.429
Manganese - total	µg/l	29.12	51.96	26.96	57	26.5	24	20.67	26.22	42.82	25.58	32.67	28.21
Iron - dissolved	µg/l					65	69.5	49	81.11	74.45	68.08	77.58	104.3
Iron - total	µg/l	322.5	241.7	308.3	714.2	270	247.8	167.7	195.1	468.9	191.4	314.7	336
Vanadium - dissolved	µg/l					1	1	1	1	1	1	1	1
Vanadium - total	µg/l	0.5	1	1	1.083	1	1	1	1	1.091	1	1	1
Nickel - dissolved	µg/l					2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Nickel - total	µg/l	1.14	2.731	2.5	3.423	2.5	2.5	2.5	2.5	2.827	2.5	2.5	2.5
Mercury - dissolved	µg/l					0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006
Mercury - total	µg/l			0.005	0.006	0.005	0.005	0.005	0.008	0.007	0.021	0.006	0.005
Copper - dissolved	µg/l	1.083	1.25	1.25	1.596	1.108	1.3	1.083	1.327	1.318	1.517	1.175	1.186
Copper - total	µg/l					1.817	1.833	2.2	2.046	1.664	1.863	1.392	1.393
Zinc - dissolved	µg/l	3.5	7.5	6.46	5.731	6.167	2.233	2.617	3.373	2.627	2.483	2.5	2.857
Zinc - total	µg/l					7.25	3.842	6.318	5.491	5.009	3.533	3.925	3.186
Cadmium - dissolved	µg/l	0.1	0.142	0.05	0.05	0.014	0.016	0.013	0.033	0.036	0.036	0.028	0.009
Cadmium - total	µg/l					0.025	0.025	0.018	0.054	0.04	0.036	0.033	0.015
Lead - dissolved	µg/l					0.113	0.075	0.279	0.105	0.15	0.921	1	1
Lead - total	µg/l			0.54	1.469	0.567	0.471	0.555	0.5	0.946	0.933	1.183	1
Arsenic - total	µg/l			0.7	0.942	0.5	0.65	0.95	0.567	0.818	0.55	0.7	0.615

2.31.3 Freshwater Invertebrates, species list - Exe

Agapetus
Ancylus fluviatilis
Antocha vitripennis
Armiger crista
Asellus aquaticus
Atherix ibis
Atherix marginata
Athripsodes albifrons
Athripsodes cinereus
Athripsodes
Baetis muticus
Baetis rhodani
Baetis vernus
Baetis
Baetis Scambus Group
Brachycentrus subnubilus
Caenis rivulorum
Caenis Luctuosa Group
Ceratopogonidae
Cheumatopsyche lepida
Chironomidae
Chloroperla torrentium
Clinocerinae
Dicranota
Dina lineata
Ecdyonurus
Elmis aenea
Enchytraeidae
Ephemerella ignita
Erpobdella octoculata
Erpobdellidae
Esolus parallelepipedus
Gammarus pulex
Glossiphonia complanata
Glossosoma
Goera pilosa
Helobdella stagnalis
Heptagenia sulphurea
Hydracarina
Hydraena gracilis
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Lepidostoma hirtum
Leuctra fusca
Leuctra geniculata
Limnius volckmari
Lumbricidae
Lumbriculidae
Naididae
Nematoda
Oecetis notata
Orectochilus villosus
Oulimnius tuberculatus
Oulimnius
Pericoma fallax
Perlodes microcephala
Pisidium
Polycentropus flavomaculatus
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhithrogena
Rhyacophila dorsalis
Rhyacophila
Sericostoma personatum
Simulium equinum
Simulium reptans
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Ornatum Group
Simulium (Wilhelmia)
Tabanus Group
Trocheta bykowskii
Tubificidae

2.31.4 Freshwater Macrophytes, species list - Exe

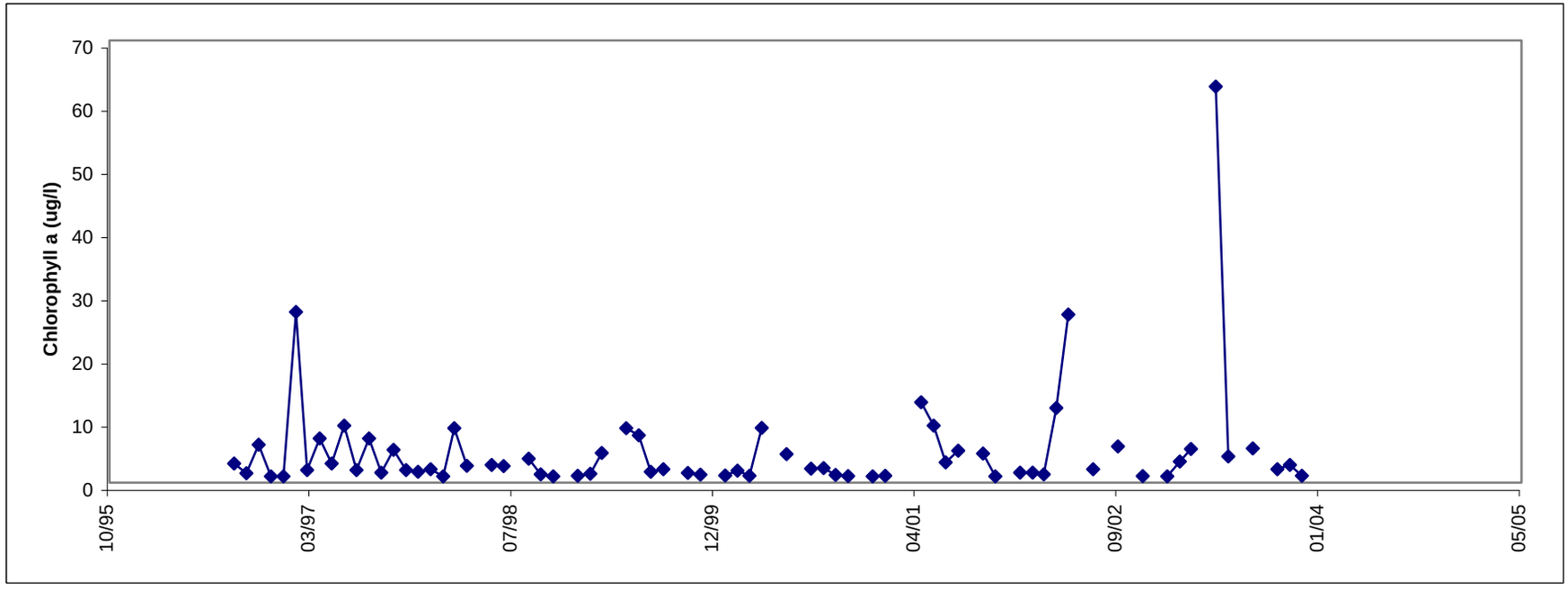
No data submitted to the ECN database

2.31.5 Phytoplankton - Exe

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.32 Faughan

County Londonderry, Northern Ireland (Lat 55°01'N; Long 7°15'W)
Sponsor: Environment and Heritage Service (Northern Ireland)

Rising on the north-western slopes of the Sperrin Mountains above Claudy, the Faughan flows in a general north-westerly direction, augmented by numerous tributaries and eventually discharging to Lough Foyle. There are no significant urban influences until the river flows through the Drumahoe industrial estate. Approximately 40km long, the river has a catchment area of just under 300km^2. The River Flow Gauging Station at Drumahoe records flow for more than 5% of the catchment upstream of the ECN site located at Mobuoy Bridge.

The geology of the upper reach consists predominantly of thin deposits of peat overlying schists and quartzite from the upper Dalradian period. This results in a typically 'flashy' runoff characteristic. Further downstream, the lithology changes to boulder clay (till) with significant deposits of sands, gravels and alluvium in the river plain. The underlying solid geology varies to include grits and slates with a thin band of Dungiven Limestone. The steep valley slopes and upper reaches have little capacity to store and transmit groundwater, while the lower reach and river plain may be classified as moderately permeable solid aquifers. In particular, the sand and gravel deposits, overlying fractured grits and slates, are vulnerable to surface impacts and form an important source of base river flows.

The river is a renowned salmon and sea trout fishery with approximately 20 km of prime angling water which includes the tidal stretch downstream of Campsie. It also supports a significant brown trout fishery in its upper reaches and tributaries. In 1996, 13,000 salmon were recorded entering the system. The River Faughan is designated salmonid under the Freshwater Fish Directive and its chemical quality is good to fairly good. Biological quality is highly variable due to intermittent localised pollution.

2.32.1 Discharge - Faughan

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005

2.32.2 Spot sampled chemistry data

a) summary for 2005 - Faughan

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Faughan

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		10.54	8.792	9.591	9.542	11.04	9.833	8.875	9.333	10.25	9.071	
pH	pH		7.63	7.33	7.3	7.29	7.45	7.57	7.52	7.46	7.69	7.54	
Suspended Solids: Dry weight	mg/l		3.833	5	17.36	20.79	3.417	8.333	2.833	15.42	4.333	6	
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm		205.7	199	210.3	206.3	226.5	200.9	196.8	201.8	213.8	183.4	
Dissolved Oxygen	mg/l		10.55	10.53	10.13	10.6	10.31	10.62	10.67	11.57	9.95	10.8	
Ammonium: NH4-N	mg/l		0.077	0.041	0.036	0.082	0.068	0.054	0.056	0.05	0.035	0.035	
Total Nitrogen	mg/l		1.717	2.302	2.259	2.796	2.26	1.849	1.792	1.922	1.839	1.918	
Nitrate: NO3-N	mg/l		1.147	1.509	1.698	2.007	1.762	1.282	1.346	1.302	1.299	1.333	
Nitrite: N02-N	mg/l		0.012	0.012	0.02	0.013	0.012	0.012	0.018	0.01	0.014	0.01	
Alkalinity (CaCo3)	mg/l		53.08	46.58	50.42	51	55.42	51.75	65.67	56.64	60.5	44.57	
Chloride	mg/l		19.17	17.42	19.75	16.58	20.58	19	17.92	16.83	20.42	20.14	
Biological Oxygen demand	mg/l		1.825	1.842	1.8	2.008	1.633	1.85	1.808	2.108	1.467	1.529	
Total Phosphorous	mg/l		0.091	0.09	0.097	0.132	0.066	0.074	0.055	0.092	0.048	0.054	
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l		0.064	0.047	0.034	0.042	0.042	0.034	0.038	0.029	0.024	0.026	
Silicate: SiO2	mg/l		3.879	4.286	4.184	3.879	3.785	3.623	4.322	4.148	3.628	3.151	
Sulphate: S04-S	mg/l		9.625	10	9.158	7.5	7.5	7.5	7.5	7.5	7.5	7.5	
Sodium - dissolved	mg/l		11.75	10.39	11.46	10.53	11.83	10.71	11	10.33	11.54	11.33	
Sodium - total	mg/l												
Potassium - dissolved	mg/l		1.842	1.833	1.758	2.133	2.088	1.893	1.931	2.003	1.933	1.986	
Potassium - total	mg/l												
Calcium - dissolved	mg/l		24.37	22.37	22.64	27.34	24.48	21.8	22.77	20.19	23.43	19.13	
Calcium - total	mg/l												
Magnesium - dissolved	mg/l		4.033	3.918	4.292	5.433	4.625	3.958	3.933	3.41	4.353	3.563	
Magnesium - total	mg/l												
Aluminium - total	µg/l		301.7	168.6	178.2	311.8	254.7	184.8	98.15	583.1	78.52	158	
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Manganese - dissolved	µg/l												
Manganese - total	µg/l		50	218.3	77.92	121.7	50	58	67	175.8	74.15	61.46	
Iron - dissolved	µg/l												
Iron - total	µg/l		806.7	435.8	528.1	1397	567	704.6	684.3	1352	696.8	526.9	
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l		2	2	2	2	2.175	2	2	2.225	2	2	
Nickel - dissolved	µg/l												
Nickel - total	µg/l		0.792	1.15	1.3	1.892	1.5	1.35	1.267	2.317	1.242	1.3	
Mercury - dissolved	µg/l												
Mercury - total	µg/l		0.129	0.063	0.05	0.05	0.05	0.064	0.048	0.038	0.026	0.025	
Copper - dissolved	µg/l		1.775	2.8	2.508	3.333	2.667	2.856	2.296	3.008	3.376	4.96	
Copper - total	µg/l												
Zinc - dissolved	µg/l		7.5	4.975	4.683	3	3.358	3	3	5.995	2.841	5.4	
Zinc - total	µg/l												
Cadmium - dissolved	µg/l		0.05	0.05	0.05	0.054	0.05	0.06	0.062	0.05	0.05	0.05	
Cadmium - total	µg/l												
Lead - dissolved	µg/l				0.217	0.275	0.217	0.287	0.273	0.261	0.35	0.2	
Lead - total	µg/l				0.577	0.95	0.583	0.663	0.3	1.326	0.281	0.561	
Arsenic - total	µg/l								2.5	2.5	2.5	2.5	

2.32.3 Freshwater Invertebrates, species list - Faughan

No data submitted to the ECN database

2.32.4 Freshwater Macrophytes, species list - Faughan

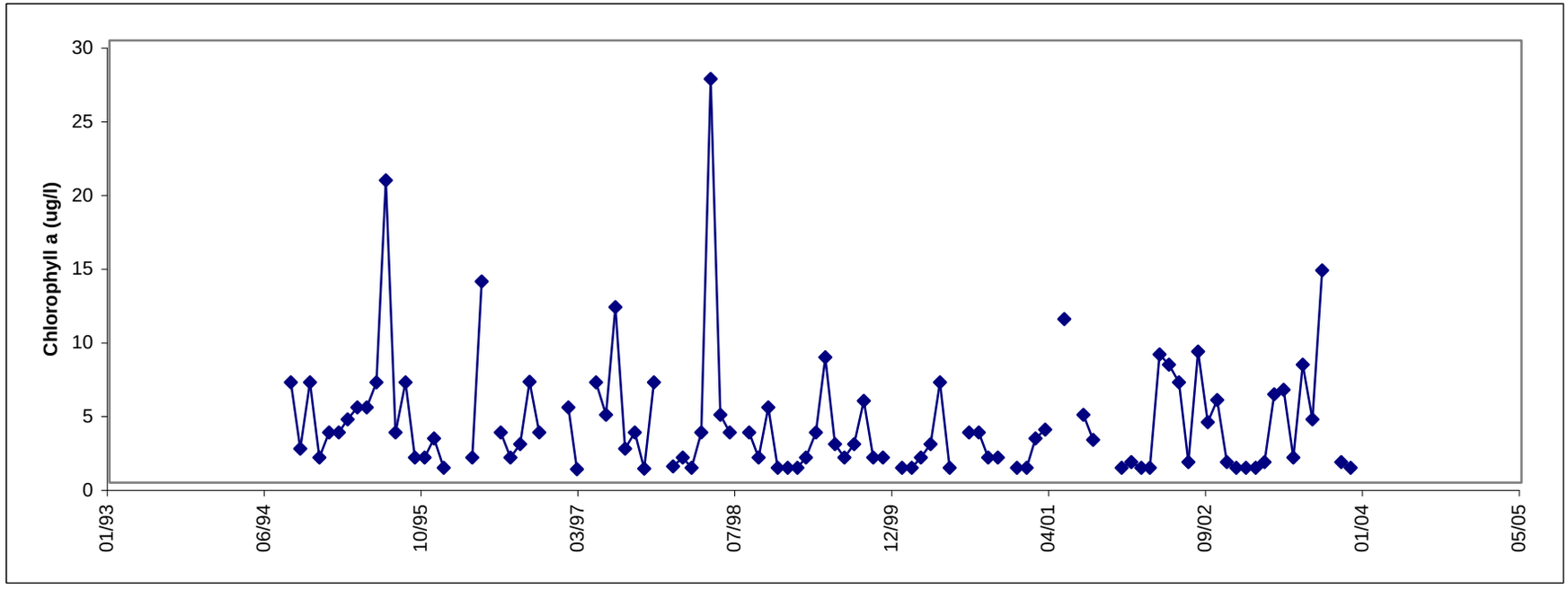
No data submitted to the ECN database

2.32.5 Phytoplankton - Faughan

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

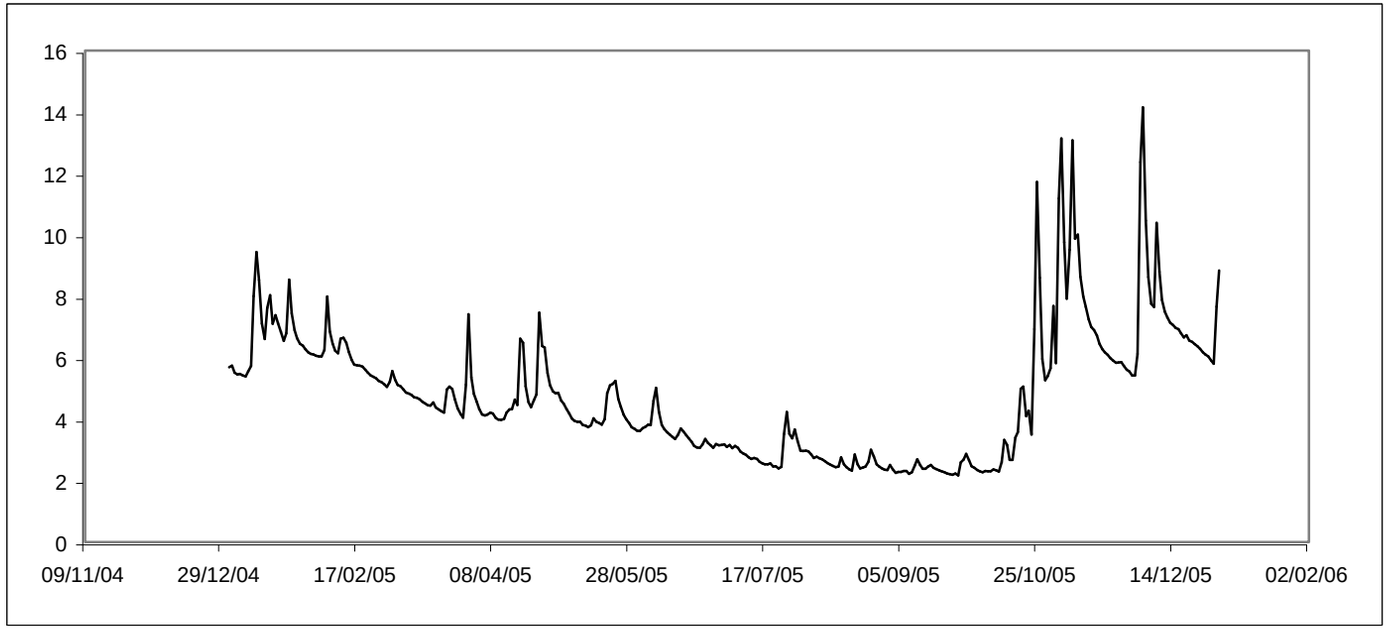


2.34 Frome

Dorset, England (Lat 50°41'N; Long 2°09'W)
Sponsor: Environment Agency, South-West Region

The River Frome is essentially a rural catchment of high amenity and ecological value. The upper part of the catchment lies within the Dorset AONB and is characterised by steep-sided valleys. The only large urban area within the catchment is Dorchester (population 15,104). In the upper reaches the river depends on springs and groundwater levels for flows. Many of the steams are winterbournes and the streams cease to flow in summer or are perched where the river goes underground for part of its length. All stretches of river above Holme Bridge have water of good or very good quality suitable for all fish species. Land use in the catchment is typically permanent grassland with dairying or stock rearing, with some cereals and natural wetland habitats. The majority of the upper reaches lies on chalk which produces the high groundwater component of flow. The lower reaches are dominated by sands, gravels and clays. Rainfall in the catchment varies between 850-1100 mm a year. Much of the flow depends on groundwater and the river responds slowly to rainfall events.

2.34.1 Discharge - Frome



Current year statistics

Mean	4.76
Max	15.9
Min	2.12
Std. dev	2.14
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.71	5.96	4.83	4.83	4.21	3.55	2.95	2.59	2.39	4.07	7.49	7.61

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
8.97	7.54	6.35	5.81	7.57	6.96	8.75	7.89	8.1	6.4	6.13	4.76

2.34.2 Spot sampled chemistry data

a) summary for 2005 - Frome

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	11.863	4.49	17.66	4.232	12
pH	pH	8.09	7.62	8.6	0.28	12
Suspended Solids: Dry weight	mg/l	7.925	1.5	42.2	11.2728	12
Ash-free dry weight	mg/l	11.5	10	28	5.1962	12
Turbidity	NIU					0
Conductivity	µs/cm	472.5	341	500	42.822	12
Dissolved Oxygen	mg/l	10.9275	8.27	14	1.8809	12
Ammonium: NH4-N	mg/l	0.0221	0.015	0.07	0.0162	12
Total Nitrogen	mg/l	5.5725	4.26	6.85	0.8236	12
Nitrate: NO3-N	mg/l	5.5467	4.22	6.83	0.8262	12
Nitrite: N02-N	mg/l	0.0175	0.01	0.03	0.0087	12
Alkalinity (CaCo3)	mg/l					0
Chloride	mg/l	25.2167	24	26.2	0.7284	12
Biological Oxygen demand	mg/l	1.1	0.5	2.23	0.5468	12
Total Phosphorous	mg/l	0.148	0.08	0.35	0.075	10
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.11	0.06	0.19	0.0384	12
Silicate: SiO2	mg/l	7.4317	2.17	10.2	2.8955	12
Sulphate: S04-S	mg/l	23.5	20	26	1.7321	12
Sodium - dissolved	mg/l	13.4333	12.4	14.4	0.6679	12
Sodium - total	mg/l	13.4167	12.4	14.4	0.7043	12
Potassium - dissolved	mg/l	2.3508	1.76	4.73	0.801	12
Potassium - total	mg/l	2.365	1.67	4.75	0.8201	12
Calcium - dissolved	mg/l	94.4083	59.5	103	11.282	12
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	2.7317	2.65	2.83	0.0616	12
Magnesium - total	mg/l					0
Aluminium - total	µg/l	83.5933	0.12	443	117.1009	12
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.25	1.25	1.25	0	12
Tin - total	µg/l	1.25	1.25	1.25	0	12
Manganese - dissolved	µg/l	11.75	5	31	6.956	12
Manganese - total	µg/l	20.6667	5	59	13.6337	12
Iron - dissolved	µg/l	93.75	15	269	78.9927	12
Iron - total	µg/l	376.5833	184	1280	298.8513	12
Vanadium - dissolved	µg/l	1	1	1	0	12
Vanadium - total	µg/l	1	1	1	0	12
Nickel - dissolved	µg/l	3	2.5	5.7	1.1709	12
Nickel - total	µg/l	3.1917	2.5	7.2	1.6323	12
Mercury - dissolved	µg/l	0.0067	0.005	0.02	0.0044	12
Mercury - total	µg/l	0.0104	0.005	0.03	0.0101	12
Copper - dissolved	µg/l	1.1	0.5	2.6	0.524	12
Copper - total	µg/l	1.5583	1	4.4	0.9209	12
Zinc - dissolved	µg/l	4.675	2.5	11.3	3.0155	12
Zinc - total	µg/l	9.25	2.5	25.1	7.7199	12
Cadmium - dissolved	µg/l	0.0121	0.005	0.03	0.0084	12
Cadmium - total	µg/l	0.0329	0.005	0.12	0.0315	12
Lead - dissolved	µg/l	1	1	1	0	12
Lead - total	µg/l	1.1333	1	2.6	0.4619	12
Arsenic - total	µg/l	0.5	0.5	0.5	0	12

b) annual means since start of ECN - Frome

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	11.76	11.92	10.66	11.79	12.33	12.86	11.21	11.8	12.03	12.06	12.7	11.86
pH	pH	8.15	8.13	8.12	8.19	8.22	8.2	8.1	7.92	7.7	8.02	7.96	8.09
Suspended Solids: Dry weight	mg/l	9.825	13.41	12.97	10.46	8.225	9.708	11.71	10.57	18.66	10.45	12.58	7.925
Ash-free dry weight	mg/l										10	12.25	11.5
Turbidity	NIU					5.76	8.38	9.23	9.58	15.79			
Conductivity	µs/cm			473	466	473.6	471.8	459.6	462.7	446.2	476.8	446.5	472.5
Dissolved Oxygen	mg/l	11.81	10.58	10.22	11.16	11.39	10.51	10.39	10.47	10.06	10.49	10.22	10.93
Ammonium: NH4-N	mg/l	0.048	0.044	0.046	0.035	0.027	0.035	0.043	0.033	0.056	0.039	0.037	0.022
Total Nitrogen	mg/l	5.281	5.221	5.308	5.24	5.376	5.129	5.466	5.584	5.418	5.989	5.492	5.573
Nitrate: NO3-N	mg/l	5.246	5.183	5.275	5.206	5.34	5.101	5.435	5.547	5.38	5.955	5.464	5.547
Nitrite: N02-N	mg/l	0.036	0.038	0.033	0.034	0.026	0.029	0.031	0.03	0.038	0.027	0.022	0.018
Alkalinity (CaCo3)	mg/l			196.8	195.6	197.1	195	189.8	195.9	188.3			
Chloride	mg/l	25.16	24.96	25.62	25.25	24.45	24.68	24.24	24.83	25.13	25.81	24.58	25.22
Biological Oxygen demand	mg/l	1.772	1.725	1.562	1.427	1.517	1.3	1.371	1.38	1.392	1.446	1.333	1.1
Total Phosphorous	mg/l			0.25	0.262	0.2	0.215	0.196	0.215	0.182	0.141	0.16	0.148
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.128	0.141	0.172	0.183	0.15	0.161	0.136	0.144	0.118	0.097	0.097	0.11
Silicate: SiO2	mg/l	7.555	7.046	7.512	7.465	7.429	7.453	7.802	7.33	8.241	7.011	7.903	7.432
Sulphate: S04-S	mg/l	6.558	6.901	7.395	7.579	8.173	7.877	7.042	22.9	21.83	23.33	22.17	23.5
Sodium - dissolved	mg/l			14.5	13.82	13.31	13.28	12.76	13.5	13.03	13.32	12.87	13.43
Sodium - total	mg/l	13.7	13.73	14.28	13.93	13.78	13.35	12.75	13.5	12.9	13.43	12.77	13.42
Potassium - dissolved	mg/l			2.517	2.395	2.19	2.123	2.245	2.35	2.652	2.325	2.468	2.351
Potassium - total	mg/l	2.39	2.269	2.236	2.32	2.274	2.174	2.255	2.351	2.648	2.33	2.472	2.365
Calcium - dissolved	mg/l						96.94	91.84	95.1	90.35	97.95	90.31	94.41
Calcium - total	mg/l	89.15	88.96	90.56	94.13	95.54	95.25	92.41	95.85	90.95	98.78		
Magnesium - dissolved	mg/l			2.8	2.706	2.749	2.641	2.551	2.692	2.583	2.658	2.569	2.732
Magnesium - total	mg/l	2.69	2.665	2.62	2.683	2.988	2.659	2.586	2.677	2.586	2.688		
Aluminium - total	µg/l			71.67	449.1	106.6	149.2	143.2	136.1	245.2	97.42	189.5	83.59
Aluminium - labile	µg/l												
Tin - dissolved	µg/l								1.25	1.271	1.25	1.25	1.25
Tin - total	µg/l			1.25	1.25	1.25	1.479	1.729	1.25	1.271	1.25	1.25	1.25
Manganese - dissolved	µg/l					13	12.25	17	15	12.83	14.25	9.75	11.75
Manganese - total	µg/l	26.3	29.23	28.08	34.33	23	32	25.75	26.17	25	21.33	21.17	20.67
Iron - dissolved	µg/l					46.25	53.75	87	49.67	101.8	71.25	84.75	93.75
Iron - total	µg/l	362	385.8	388	502.7	330	502.3	474.8	408	572.4	355.8	491.8	376.6
Vanadium - dissolved	µg/l					1	1	1	1	1	1	1	1
Vanadium - total	µg/l			1	1.083	1.083	1.167	1	1.1	1.167	1	1.108	1
Nickel - dissolved	µg/l					3.833	2.5	2.5	2.5	2.5	2.5	2.5	3
Nickel - total	µg/l	4.375	8.212	7.96	10.8	4.925	2.5	2.5	2.5	2.775	2.5	2.792	3.192
Mercury - dissolved	µg/l					0.005	0.005	0.005	0.008	0.014	0.008	0.006	0.007
Mercury - total	µg/l	0.062	0.024	0.011	0.005	0.005	0.005	0.005	0.009	0.023	0.016	0.083	0.01
Copper - dissolved	µg/l	1.895	1.315	1.569	1.25	1.836	1.317	1.325	1.14	1.408	1.496	1.192	1.1
Copper - total	µg/l					2.333	1.967	1.823	1.6	2.133	1.642	1.667	1.558
Zinc - dissolved	µg/l	12.89	12.28	19.19	9.267	9.182	5.983	7.675	8.13	8.55	8.483	5.675	4.675
Zinc - total	µg/l					21.67	13.7	13.79	13.27	18.03	16.22	12.7	9.25
Cadmium - dissolved	µg/l	0.1	0.154	0.056	0.053	0.02	0.016	0.018	0.015	0.04	0.038	0.03	0.012
Cadmium - total	µg/l					0.04	0.063	0.045	0.052	0.058	0.044	0.053	0.033
Lead - dissolved	µg/l					0.182	0.554	0.092	0.14	0.129	1	1	1
Lead - total	µg/l	0.994	1.127	1.104	1.687	0.958	1.958	1.054	1.08	1.342	1	1.125	1.133
Arsenic - total	µg/l	0.456	1.341	0.608	0.607	0.5	0.5	0.5	0.5	0.575	0.5	0.5	0.5

2.34.3 Freshwater Invertebrates, species list - Frome

Ancylus fluviatilis
Anisus vortex
Antocha vitripennis
Aphelocheirus aestivalis
Asellus aquaticus
Athripsodes cinereus
Athripsodes
Baetis atrebatinus
Baetis buceratus
Baetis Scambus Group
Bithynia leachii
Bithynia tentaculata
Brachycentrus subnubilus
Brychius elevatus
Caenis Luctuosa Group
Calopteryx
Chironomidae
Dugesia tigrina
Dugesia Polychroa Group
Elmis aenea
Enchytraeidae
Ephemera danica
Ephemera
Ephemerella ignita
Erpobdella octoculata
Erpobdellidae
Gammarus pulex
Gerris lacustris
Glossiphonia complanata
Glossiphonia heteroclita
Glossoscolecidae
Goera pilosa
Gyraulus albus
Helobdella stagnalis
Heptagenia sulphurea
Hydracarina
Hydrometra stagnorum
Hydropsyche contubernalis
Hydropsyche pellucidula
Hydroptila
Ithytrichia
Lepidostoma hirtum
Leuctra geniculata
Limnius volckmari
Lumbriculidae
Lymnaea peregra
Mystacides azurea
Naididae
Nematoda
Ostracoda
Oulimnius tuberculatus
Oulimnius
Physa fontinalis
Pisidium
Planorbis carinatus
Polycelis Nigra Group
Polycentropus flavomaculatus
Potamonectes depressus
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhyacophila dorsalis
Sericostoma personatum
Sialis lutaria
Sigara dorsalis
Sigara falleni
Simulium (Simulium) Ornatum Group
Simulium (Wilhelmia)
Sphaerium
Stictotarsus duodecimpustulatus
Theodoxus fluviatilis
Tipula
Tubificidae
Valvata cristata
Valvata piscinalis
Ylodes conspersus

2.34.4 Freshwater Macrophytes, species list - Frome

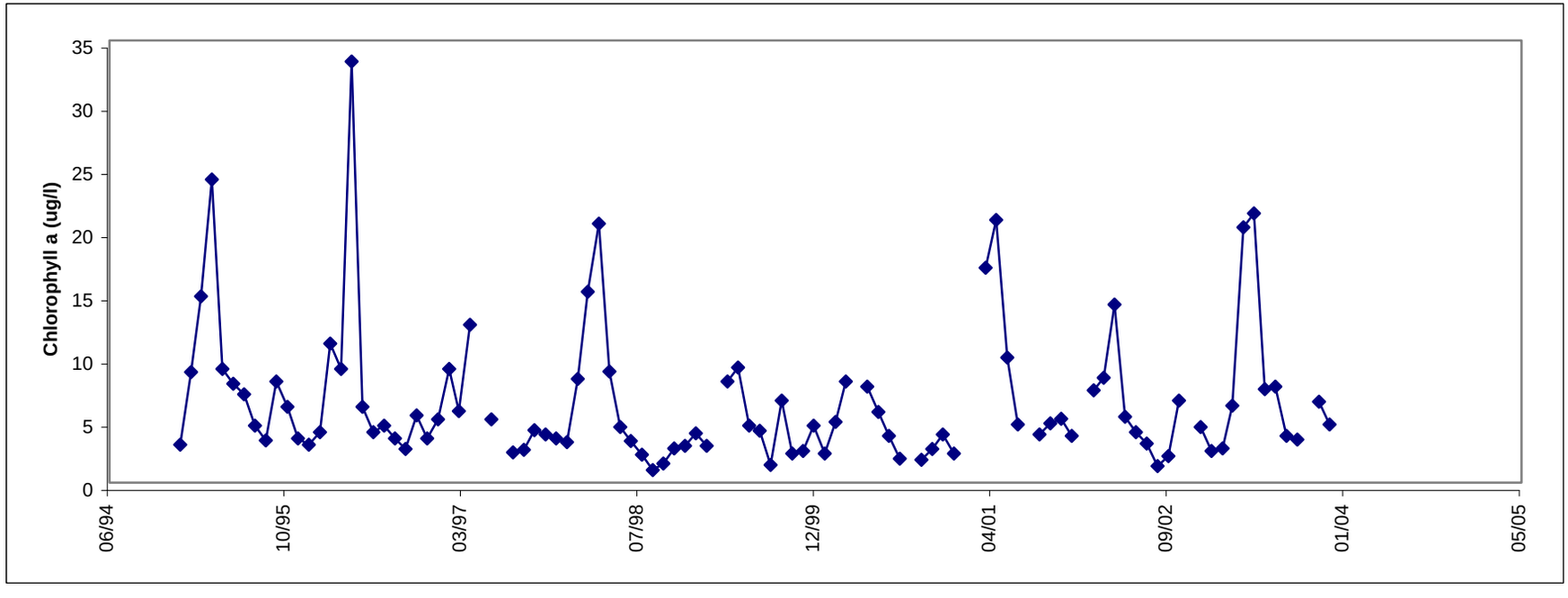
No data submitted to the ECN database

2.34.5 Phytoplankton - Frome

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.35 Garvary

County Fermanagh, Northern Ireland (Lat 54°31'N; Long 7°59'W)
Sponsor: Environment and Heritage Service (Northern Ireland)

Located to the north of Lower Lough Erne, the Garvary River has its source in the outflows from Loughs Vearty and Tullyasiddagh. It flows in a general south-easterly direction, augmented by the Crossowen River and the outflow from Lough Scolban, and eventually discharges to Lower Lough Erne. Approximately 7 km long, the river has a catchment area of 35.5 km^2 of which around 5% is lake surface. At the ECN site, the river is 2.5 - 3 m wide and 30 cm deep with a few holding pools around 60 cm deep.

The drift geology of the catchment consists mainly of peat and bedrock at or near the surface which some glacial till and small amounts of sand and gravel. The solid geology is mainly mica schist of the Moinian period. In its upper reaches, the river flows though moorland and peat bog. Soils in the catchment are peats and gleys with poor drainage capacity, supporting a vegetation cover of rough pasture, bracken and heather. The upper part of the catchment supports low intensity sheep grazing, while downstream the land use is predominantly improved grassland.

Although the river has not been designated under the Freshwater Fish Directive it has excellent water quality both chemically and biologically, and it is a very important nursery area with high densities of juvenile trout and salmon. Its banks have many trees (mainly alder, willow and hazel) which provide adequate shading for the juvenile fish. The river is not suitable for angling and does not have stocks of takable fish. Wildlife found in the river corridor include mallard and dragonflies.

2.35.1 Discharge - Garvary

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005

2.35.2 Spot sampled chemistry data

a) summary for 2005 - Garvary

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Garvary

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C		10.83	9.167	9.75	9.25	10.92	10.17	9.083	9.5	10.17	9.25	
pH	pH		7.37	7.17	7.05	7.16	7.16	7.51	7.38	7.22	8.11	7.44	
Suspended Solids: Dry weight	mg/l		2.5	2.75	2.067	2.25	2.583	1.636	2.083	2	2.75	2.083	
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm		95.33	80.33	92.08	78.58	104.3	94.58	82.58	85.42	97.58	84.25	
Dissolved Oxygen	mg/l		10.67	10.93	10.77	10.8	10.83	10.86	11.13	10.73	10.51	10.51	
Ammonium: NH4-N	mg/l		0.038	0.015	0.012	0.008	0.018	0.028	0.026	0.021	0.016	0.013	
Total Nitrogen	mg/l		0.49	0.592	0.565	0.546	0.497	0.427	0.509	0.513	0.572	0.538	
Nitrate: NO3-N	mg/l		0.067	0.084	0.057	0.085	0.052	0.054	0.064	0.058	0.08	0.052	
Nitrite: N02-N	mg/l		0.004	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.001	
Alkalinity (CaCo3)	mg/l		15.55	10.27	12.14	10.39	10.82	11.97	18.82	16.34	17.7	14.56	
Chloride	mg/l		14.67	11.92	15.33	12.33	20.5	16.58	11.17	13.83	16.08	14.5	
Biological Oxygen demand	mg/l		1.567	1.583	1.467	1.15	1.342	1.067	1.3	1.783	1.517	1.342	
Total Phosphorous	mg/l		0.019	0.015	0.016	0.021	0.017	0.017	0.014	0.018	0.018	0.015	
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l		0.013	0.003	0.003	0.002	0.003	0.004	0.004	0.005	0.004	0.006	
Silicate: SiO2	mg/l		1.558	1.262	0.913	0.703	1.13	0.852	0.924	1.033	1.509	0.614	
Sulphate: S04-S	mg/l		6.958	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	
Sodium - dissolved	mg/l		9.458	7.358	8.908	7.483	11.21	9.5	7.067	7.875	8.942	8.342	
Sodium - total	mg/l												
Potassium - dissolved	mg/l		0.792	0.579	0.688	0.693	0.767	0.69	0.636	0.689	0.812	0.731	
Potassium - total	mg/l												
Calcium - dissolved	mg/l		8.075	4.458	5.167	5.525	4.875	4.832	5.408	4.37	6.263	4.532	
Calcium - total	mg/l												
Magnesium - dissolved	mg/l		2.133	1.536	1.897	2.142	1.961	1.725	1.567	1.55	2.07	1.625	
Magnesium - total	mg/l												
Aluminium - total	µg/l		290	120.4	69.43	79	86.57	64.33	70.58	79.09	62.58	82.25	
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Manganese - dissolved	µg/l												
Manganese - total	µg/l		60	167.5	50	77.5	50	50	50	50	65.38	34.66	
Iron - dissolved	µg/l												
Iron - total	µg/l		1029	449.2	401.8	1108	560.5	546	601.6	551	753.8	545.3	
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l		2	2	2	2	2	2	2	2	2	2	
Nickel - dissolved	µg/l												
Nickel - total	µg/l		0.5	0.5	0.717	0.5	0.867	0.5	0.658	0.55	0.683	0.5	
Mercury - dissolved	µg/l												
Mercury - total	µg/l		0.127	0.063	0.05	0.05	0.05	0.05	0.05	0.044	0.027	0.028	
Copper - dissolved	µg/l		0.5	1.167	0.808	0.942	0.783	1.114	1.202	1.323	2.286	2.222	
Copper - total	µg/l												
Zinc - dissolved	µg/l		7.5	3.75	3.555	3	3	3	3	3.606	2.555	3.63	
Zinc - total	µg/l												
Cadmium - dissolved	µg/l		0.05	0.05	0.05	0.05	0.05	0.05	0.085	0.05	0.05	0.056	
Cadmium - total	µg/l												
Lead - dissolved	µg/l				0.2	0.217	0.2	0.2	0.261	0.2	0.2	0.2	
Lead - total	µg/l				0.228	0.225	0.267	0.242	0.287	0.269	0.25	0.243	
Arsenic - total	µg/l								2.5	2.5	2.5	2.5	

2.35.3 Freshwater Invertebrates, species list - Garvary

Agapetus
Ancylus fluviatilis
Baetis muticus
Baetis rhodani
Chelifera Group
Chironomidae
Chloroperla torrentium
Ecdyonurus
Elmis aenea
Ephemerella ignita
Erpobdellidae
Esolus parallelepipedus
Gammarus duebeni
Gerris
Glossosoma
Glossosomatidae
Hemerodromia Group
Heptagenia sulphurea
Heptageniidae
Hydracarina
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Isoperla grammatica
Ithytrichia
Lepidostoma hirtum
Leuctra fusca
Leuctra hippopus
Leuctra inermis
Limnephilidae
Limnius volckmari
Lumbricidae
Lumbriculidae
Lymnaea
Pisidium
Polycentropus flavomaculatus
Potamophylax cingulatus
Potamophylax Cingulatus Group
Potamopyrgus jenkinsi
Protonemura meyeri
Rhithrogena
Rhyacophila dorsalis
Rhyacophila
Sericostoma personatum
Silo nigricornis
Silo pallipes
Silo
Simulium
Simulium (Nevermannia) Cryophilum Group
Simulium (Simulium) Argyreatum Group
Simulium (Simulium) Ornatum Group
Theromyzon tessulatum
Tubificidae

2.35.4 Freshwater Macrophytes, species list - Garvary

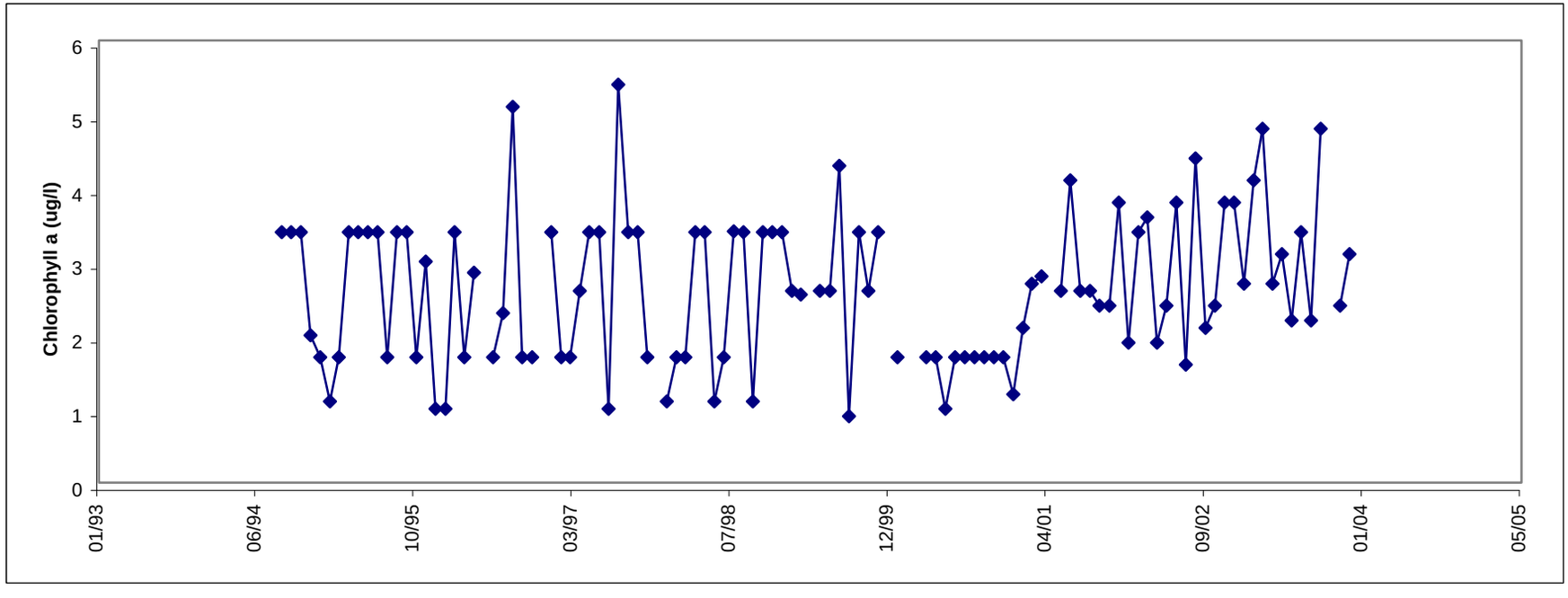
Calliergon cuspidatum
Callitriche
Chiloscyphus polyanthos
Cladophora glomerata
Fissidens
Fontinalis antipyretica
Hildenbrandia
Pellia endiviifolia
Rhynchostegium riparioides
Riccardia
Scapania

2.35.5 Phytoplankton - Garvary

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.36 Lambourn

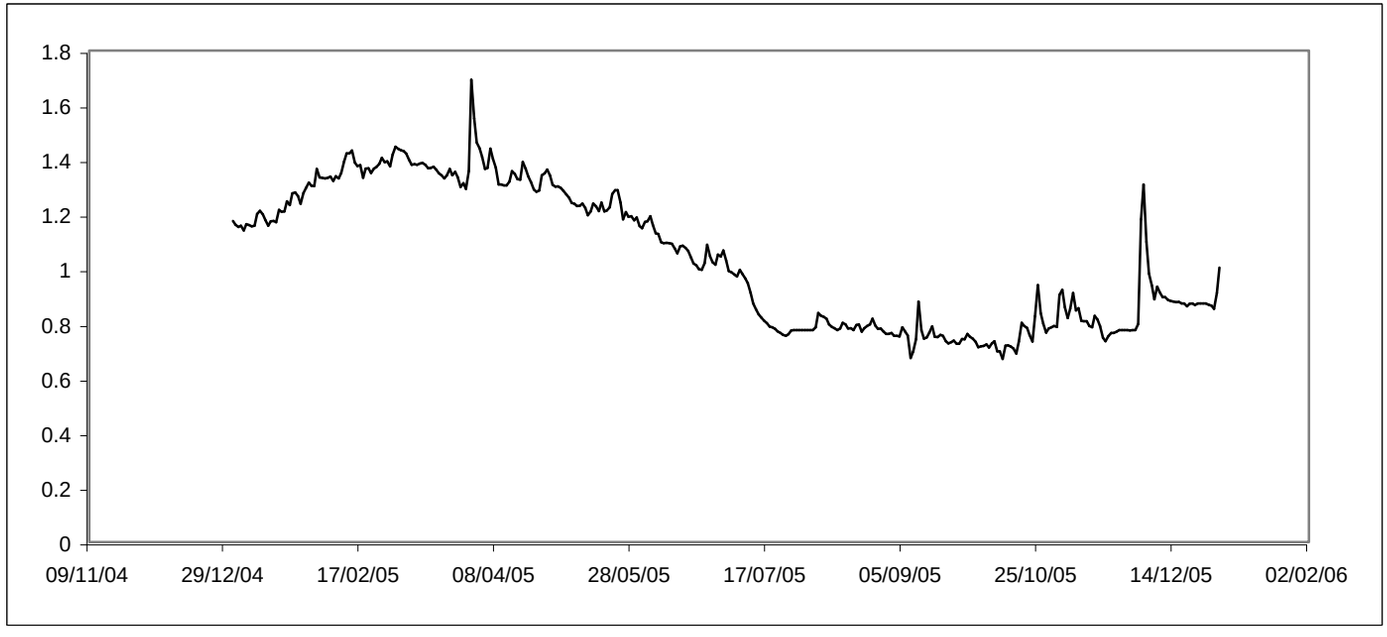
Berkshire, England (Lat 51°24'N; Long 1°18'W)
Sponsor: Environment Agency, Thames Region

The River Lambourn rises near the village of Lambourn in the chalk of the Berkshire Downs at an altitude of about 152 m AOD . It is 26 km long and flows through the Kennet Valley in a south-easterly direction to Newbury where it joins the River Kennet at an altitude of about 85 m AOD. There is one important tributary, the Winterbourne Stream, which flows into the Lambourn from the north-east, just upstream of Newbury. The sampling site is located in Newbury, about 400 m above the confluence with the Kennet, where flow ranges from 1.15 - 4.05 cumecs.

The catchment is mostly rural, with mixed farming as the main industry, and there are extensive decidous woodlands on the catchment boundary. The river forms part of the proposed Kennet and Lambourn floodplain Special Area of Conservation (SAC) under the European Community Habitats Directive. Most of the river is a Site of Special Scientific Interest (SSSI). There are no large conurbations on the upper catchment but the river flows through Newbury, a town with a population of about 35 000, which provides inputs of surface water run-off. Ten kilometres from the source, the river receives input from East Shefford sewage works; the only other significant input is from Lambourn Trout Farm. Water quality in the Lambourn is good; the river is classified as General Quality Assessment (GQA) biological class 'b' and chemical class 'A'.

The river corridor is notable for reed beds and willow stands and the floodplain provides important feeding grounds for snipe (*Gallionago gallinago*) and water rail (*Rallus aquaticus*). There are good, extensive gravel spawning areas for salmonids; the river supports one of the best and most productive fisheries for brown trout (*Salmo trutta*) in the area, with natural populations of grayling (*Thymallus thymallus*) also present. The Lambourn is in the top 10% for England and Wales for the number of macro-invertebrate families recorded during the GQA survey; five nationally rare species of invertebrates are found in the river. Native crayfish (*Austropotamobius pallipes*) have not been recorded in recent years, although they are present downstream in the Kennet; however introduced American signal crayfish (*Pacifastacus **leniusculus***) are present.

2.36.1 Discharge - Lambourn



Current year statistics

Mean	1.04
Max	1.76
Min	0.55
Std. dev	0.25
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.21	1.37	1.39	1.35	1.23	1.08	0.86	0.79	0.75	0.75	0.81	0.92

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
				1.65	2.02	2.57	2.99	1.77	2.09	1.37	1.04

2.36.2 Spot sampled chemistry data

a) summary for 2005 - Lambourn

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	10.554	4.9	15.5	3.484	13
pH	pH	7.98	7.86	8.19	0.11	13
Suspended Solids: Dry weight	mg/l	3.0154	1.5	5.3	1.3434	13
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Conductivity	µs/cm					0
Dissolved Oxygen	mg/l	10.9238	9.24	12.5	1.0856	13
Ammonium: NH4-N	mg/l	0.0302	0.03	0.032	0.0006	13
Total Nitrogen	mg/l	7.0431	6.48	7.9	0.4436	13
Nitrate: NO3-N	mg/l	7.0223	6.47	7.88	0.4408	13
Nitrite: N02-N	mg/l	0.0205	0.011	0.036	0.0083	13
Alkalinity (CaCo3)	mg/l					0
Chloride	mg/l					0
Biological Oxygen demand	mg/l	1.0469	0.5	1.78	0.4908	13
Total Phosphorous	mg/l					0
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l					0
Silicate: SiO2	mg/l					0
Sulphate: S04-S	mg/l					0
Sodium - dissolved	mg/l					0
Sodium - total	mg/l					0
Potassium - dissolved	mg/l					0
Potassium - total	mg/l					0
Calcium - dissolved	mg/l					0
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l					0
Aluminium - total	µg/l					0
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l					0
Tin - total	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l					0
Iron - dissolved	µg/l					0
Iron - total	µg/l					0
Vanadium - dissolved	µg/l					0
Vanadium - total	µg/l					0
Nickel - dissolved	µg/l					0
Nickel - total	µg/l					0
Mercury - dissolved	µg/l					0
Mercury - total	µg/l					0
Copper - dissolved	µg/l	1.0846	0.5	1.7	0.414	13
Copper - total	µg/l					0
Zinc - dissolved	µg/l					0
Zinc - total	µg/l	8.1538	5	24.5	5.877	13
Cadmium - dissolved	µg/l					0
Cadmium - total	µg/l					0
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Lambourn

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C					10.16	10.64	10.5	10.4	10.44	10.56	11.16	10.55
pH	pH					8.01	7.95	8.03	7.93	7.92	7.92	7.91	7.98
Suspended Solids: Dry weight	mg/l					4.746	7.292	4.91	7.325	7.123	4.175	3.955	3.015
Ash-free dry weight	mg/l							3.391	12.79	20	20	10	
Turbidity	NIU					2.4	1.61	1.8					
Conductivity	µs/cm					505	519.3	502.4	525.3	509.1	507.5	528	
Dissolved Oxygen	mg/l					10.77	11.19	10.67	10.46	10.91	10.98	10.79	10.92
Ammonium: NH4-N	mg/l					0.02	0.019	0.021	0.033	0.048	0.033	0.021	0.03
Total Nitrogen	mg/l					6.342	6.758	6.086	7.958	7.08	7.458	6.935	7.043
Nitrate: NO3-N	mg/l					6.36	6.8	6.062	7.938	7.125	7.433	6.922	7.022
Nitrite: N02-N	mg/l					0.057	0.021	0.021	0.021	0.027	0.024	0.027	0.021
Alkalinity (CaCo3)	mg/l					249	249.7	242.6	236.1	233.3	237.1	226.7	
Chloride	mg/l					18.42	19.39	18.38	20.78	18.14	17.93	17.27	
Biological Oxygen demand	mg/l					0.967	0.667	0.773	1.208	1.6	1.675	1.318	1.047
Total Phosphorous	mg/l							0.127	0.136	0.005			
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l					0.134	0.125	0.099	0.128	0.112			
Silicate: SiO2	mg/l					16.26	16.06	16.18	13.88	16.39	15.68	15.9	
Sulphate: S04-S	mg/l					12.4	15.79	14.55	17.83	13.31	17.08	16.45	
Sodium - dissolved	mg/l							9.4	11.02	9.017			
Sodium - total	mg/l					9.6	10.44	9	11.01	8.854	8.408	8.3	
Potassium - dissolved	mg/l								1.826	1.693			
Potassium - total	mg/l					1.68	1.689	1.55	1.837	1.679	1.64	1.443	
Calcium - dissolved	mg/l							110.2	114.1	113			
Calcium - total	mg/l					111.3	113.8	111.7	115.8	114.2	114.7	112.3	
Magnesium - dissolved	mg/l							1.72	1.717	1.626			
Magnesium - total	mg/l					1.763	1.778	1.725	1.773	1.604	1.682	1.68	
Aluminium - total	µg/l					11	34.44	36.25	105	44.46	33.25	24.73	
Aluminium - labile	µg/l												
Tin - dissolved	µg/l							1	1.75	2.5	2.5	1.818	
Tin - total	µg/l					1.1	1.063	1	1.75	2.5	2.5	1.818	
Manganese - dissolved	µg/l							25	25	25	25	25	
Manganese - total	µg/l					5	18.33	25	29.01	25	25	25	
Iron - dissolved	µg/l							15	25	25	25	25	
Iron - total	µg/l					38	64.44	67.5	94.12	70.23	48.42	28.18	
Vanadium - dissolved	µg/l							2	2	2	2	2.909	
Vanadium - total	µg/l					1	1.667	2	2	2	2	2.909	
Nickel - dissolved	µg/l							3	3.75	5	5	3.182	
Nickel - total	µg/l					2.5	2.5	2.708	3.75	5	5	3.182	
Mercury - dissolved	µg/l							0.05	0.05	0.05	0.05	0.05	
Mercury - total	µg/l					0.005	0.035	0.05	0.05	0.05	0.05	0.05	
Copper - dissolved	µg/l					1.3		1.34	1.962	6.3	2.6	2.346	1.085
Copper - total	µg/l					1.79	1.556	2.058	2.268	2.5	2.992	1.818	
Zinc - dissolved	µg/l							6.6	7.744	10.48	5.883	4.136	
Zinc - total	µg/l					5.7	4.111	7.083	9.472	5.554	6.367	3.864	8.154
Cadmium - dissolved	µg/l							0.14	0.075	0.05	0.05	0.05	
Cadmium - total	µg/l					0.05	0.05	0.188	0.075	0.05	0.055	0.05	
Lead - dissolved	µg/l							0.5	0.917	2.377	2	1.546	
Lead - total	µg/l					0.671	0.689	0.717	1.562	2	2	1.546	
Arsenic - total	µg/l							5	5	5	5	5	

2.36.3 Freshwater Invertebrates, species list - Lambourn

Acroloxus lacustris
Agapetus
Ancylus fluviatilis
Antocha vitripennis
Asellus aquaticus
Athripsodes albifrons
Athripsodes
Baetis muticus
Baetis niger
Baetis rhodani
Baetis vernus
Baetis Scambus Group
Caenis rivulorum
Centroptilum luteolum
Centroptilum pennulatum
Ceratopogonidae
Chironomidae
Crangonyx pseudogracilis
Dendrocoelum lacteum
Dicranota
Elmis aenea
Ephemera danica
Ephemerella ignita
Gammarus pulex
Halesus digitatus
Halesus radiatus
Hemerodromia Group
Heptagenia sulphurea
Hydracarina
Hydraena
Hydropsyche pellucidula
Hydroptila
Ithytrichia
Leuctra fusca
Limnephilidae
Limnephilus lunatus
Limnius volckmari
Limnophora
Lumbricidae
Lumbriculidae
Lype
Mystacides azurea
Naididae
Oecetis testacea
Oulimnius tuberculatus
Oulimnius
Oxyethira
Pacifastacus leniusculus
Paraleptophlebia submarginata
Pilaria
Pisidium
Polycentropus flavomaculatus
Polycentropus irroratus
Potamopyrgus jenkinsi
Psychomyia pusilla
Rhyacophila dorsalis
Rhyacophila
Sialis lutaria
Silo nigricornis
Silo pallipes
Silo
Simulium (Nevermannia) Angustitarse Group
Simulium (Simulium) Ornatum Group
Tubificidae

2.36.4 Freshwater Macrophytes, species list - Lambourn

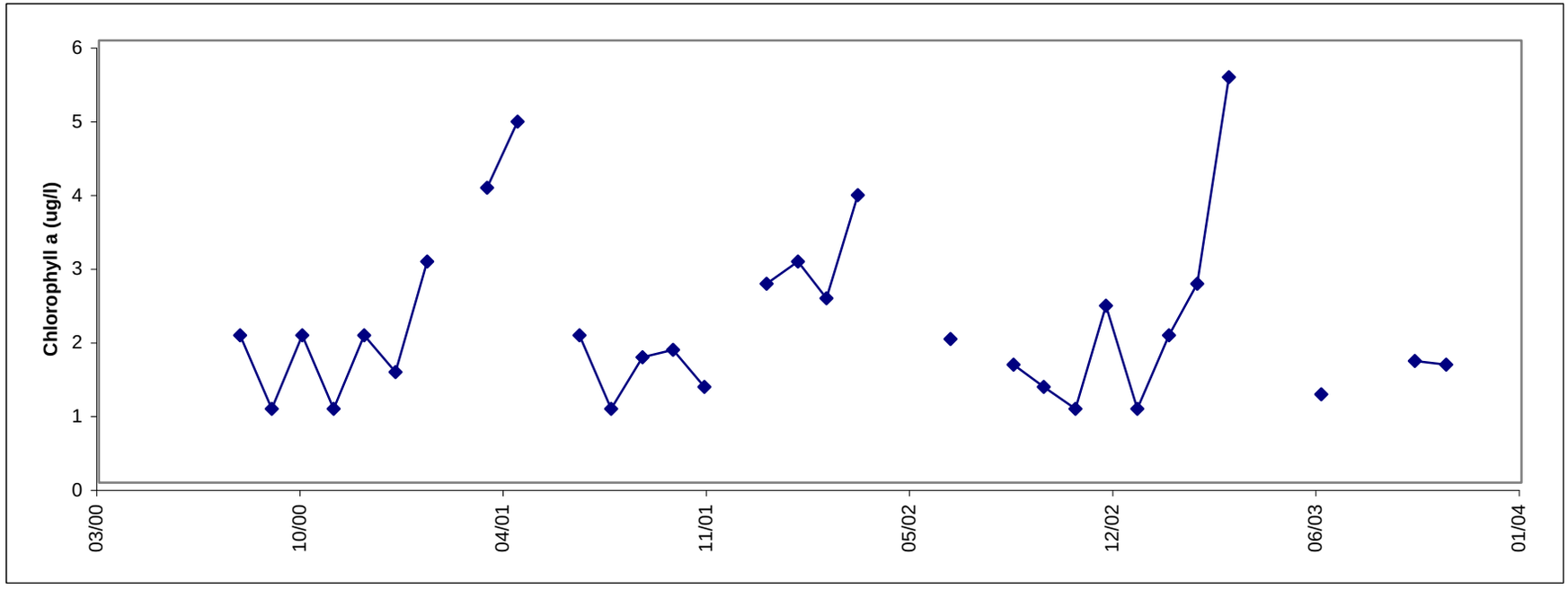
No data submitted to the ECN database

2.36.5 Phytoplankton - Lambourn

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.37 Lathkill

Derbyshire, England (Lat 53°11'N; Long 1°40'W)
Sponsor: Environment Agency, Midlands Region

The River Lathkill is located in the Peak District National Park and is designated as SSSI. It is the only river in Britain which rises in, as well as flows through, limestone for its entire length. The upper parts are a winterbourne, and in summer the stream issues from bubble springs lower down the valley. Downstream there are alternately moderately flowing gravelly sections and silted pools, some formed by natural tufa dams, others artificially. In the pools there are abundant submerged plants including species of *Veronica*, *Ranunculus*, *Potamogeton* and *Callitriche*, while faster sections are carpeted with bryophytes, some of which are nationally rare (eg *Cratoneuron commutatum*).

There are no direct discharges to the river but the Knotlow cave system has recently been contaminated with sewage effluent and there is concern that this may eventually wash into the river. There are two licensed abstractions of water for fish-rearing purposes and there are concerns over low flows which may affect water quality and the biota; in the summer of 1996 the lower 2 km of the river dried up completely. There was a suspected outbreak of crayfish plague in 1993 and c rayfish have not been present in the invertebrate samples since that time.

2.37.1 Discharge - Lathkill

No data submitted to the ECN database

Current year statistics

Mean	1.02
Max	7.79
Min	0.15
Std. dev	0.93
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.67	1.55	1.14	1.02	0.78	0.53	0.37	0.32	0.24	1.17	1.98	1.56

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
					0.97	1.72	1.5	1.96	1.1	1.38	1.02

2.37.2 Spot sampled chemistry data

a) summary for 2005 - Lathkill

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Lathkill

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.769	10.42	10.36	8.923	9.583	9.227	9.8	10.41	9.213	11.02		
pH	pH	8.22	8.23	8.24	8.2	8.26	8.26	8.22	8.23	8.06	8.04		
Suspended Solids: Dry weight	mg/l	3.167	3.792	2.5		2.071	3.875	5.125	3.125	2.333	2.846		
Ash-free dry weight	mg/l												
Turbidity	NIU	0.95	1.82	0.67		1.07	1.63	2.33	0.88	0.7	1.85		
Conductivity	µs/cm	516.9	509.2	516.7		536.7	535	534.2	522.6	530.3	521.3		
Dissolved Oxygen	mg/l	11.58	11.08	11.47	10.65	11.42			12.32	11.87	10.8		
Ammonium: NH4-N	mg/l	0.02	0.019	0.019	0.064	0.017	0.018	0.035	0.015	0.017	0.019		
Total Nitrogen	mg/l	4.018	3.622	4.33	7.018	5.87	5.346	4.783	4.469	4.823	4.451		
Nitrate: NO3-N	mg/l	4.041	3.612	6.19		5.326	6.049			4.403	4.442		
Nitrite: N02-N	mg/l	0.006	0.01	0.003		0.009	0.005			0.009	0.01		
Alkalinity (CaCo3)	mg/l	223.8	213.3	194.9	198.4	215.4	224			246.4	236.6		
Chloride	mg/l	27.08	29.92	32.89	34.55	28.67	28.46	26.19	27.08	24.57	31.95		
Biological Oxygen demand	mg/l	0.808	1.318	1.455	0.962	0.833	1.136	1.23		0.716	1.055		
Total Phosphorous	mg/l									0.185	0.039		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.028	0.028	0.022	0.454	0.018	0.024			0.026	0.022		
Silicate: SiO2	mg/l	4.505	4.843	4.5		5.18	4.381	4.294	4.21	4.16	3.583		
Sulphate: S04-S	mg/l	26.75	25.51	27.43		25.93	23.63	22.97	22.89	21.42	21.16		
Sodium - dissolved	mg/l	11.29	12.05	12.67		11.2	12.25	11.71	12.13	11.83	12.66		
Sodium - total	mg/l												
Potassium - dissolved	mg/l	1.36	1.293	1.463		1.44	1.427	1.483	1.298	1.29	1.353		
Potassium - total	mg/l												
Calcium - dissolved	mg/l	103.2	98.3	103	101.8	103.7	104.4	107.2	105	106.3	99.54		
Calcium - total	mg/l									108.2	102.1		
Magnesium - dissolved	mg/l	4.871	6.72	4.747	5.645	5.703	5.506	5.078	5.823	5.388	6.513		
Magnesium - total	mg/l									5.138	6.381		
Aluminium - total	µg/l	9.575	12.82	8.5		5	14.82	10.91	5.442	8.4	6.575		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l										1.25		
Tin - total	µg/l	0.5	0.5	1		1.25	1.25	1.25	1.25	1.25	1.25		
Manganese - dissolved	µg/l										5		
Manganese - total	µg/l	5	5	5		5	5	6.933	5	7.683	5		
Iron - dissolved	µg/l										15		
Iron - total	µg/l	13.24	24.61	15		20.37	17.88	25.48	15	16.76	15		
Vanadium - dissolved	µg/l										0.5		
Vanadium - total	µg/l	0.673	0.626	0.5		0.5	0.823	0.5	0.5	0.5	0.5		
Nickel - dissolved	µg/l									2.5	2.5		
Nickel - total	µg/l	1.424	2.5	2.5		2.5	3.327	3.128	2.5	2.5	2.5		
Mercury - dissolved	µg/l										0.006		
Mercury - total	µg/l										0.007		
Copper - dissolved	µg/l									1.317	1.272		
Copper - total	µg/l	2.426	1.453	1.29		1.813	1.433	1.266	1.138	1.251	1.541		
Zinc - dissolved	µg/l									30.57	24.7		
Zinc - total	µg/l	29.93	24.25	21.91	28.76	31.13	31.16	33.44	30.12	34.35	27.8		
Cadmium - dissolved	µg/l	0.36	0.453	0.341		0.308	0.23	0.312	0.21	0.231	0.14		
Cadmium - total	µg/l									0.278	0.199		
Lead - dissolved	µg/l									3.072	1.579		
Lead - total	µg/l	8.513	8.623	8.607		8.457	6.566	9.572	4.659	5.899	3.958		
Arsenic - total	µg/l										0.5		

2.37.3 Freshwater Invertebrates, species list - Lathkill

Agapetus
Amphinemura sulcicollis
Ancylus fluviatilis
Anisus vortex
Antocha vitripennis
Asellus meridianus
Athripsodes albifrons
Baetis rhodani
Caenis rivulorum
Centroptilum luteolum
Centroptilum pennulatum
Chaetopteryx villosa
Chelifera Group
Chironomidae
Cladocera
Clinocerinae
Cloeon dipterum
Crenobia alpina
Dendrocoelum lacteum
Dinocras cephalotes
Drusus annulatus
Elmis aenea
Elodes
Ephemera danica
Ephemerella ignita
Erpobdella octoculata
Esolus parallelepipedus
Gammarus pulex
Glossiphonia complanata
Gyraulus albus
Haliplus obliquus
Hemerodromia Group
Hydraena riparia
Hydropsyche instabilis
Hydropsyche siltalai
Hydroptila
Ithytrichia
Lepidostoma hirtum
Leuctra fusca
Leuctra geniculata
Limnephilidae
Limnephilus lunatus
Limnephilus
Limnius volckmari
Limnophora
Lumbricidae
Lumbriculidae
Lymnaea peregra
Lype
Melampophylax mucoreus
Metalype fragilis
Mystacides azurea
Naididae
Nematomorpha
Nemoura avicularis
Orectochilus villosus
Ostracoda
Oulimnius tuberculatus
Oxycera
Pericoma blandula
Pericoma diversa
Pericoma exquisita
Pericoma neglecta
Pisidium
Planorbis
Platambus maculatus
Polycentropus flavomaculatus
Polycentropus
Potamophylax Cingulatus Group
Potamopyrgus jenkinsi
Protonemura meyeri
Psychomyiidae (Incl. Ecnomidae)
Rhyacophila munda
Riolus subviolaceus
Sericostoma personatum
Sialis lutaria
Silo nigricornis
Simulium (Eusimulium) Aureum Group
Simulium (Simulium) Ornatum Group
Theromyzon tessulatum
Tinodes unicolor
Tinodes waeneri
Tubificidae

2.37.4 Freshwater Macrophytes, species list - Lathkill

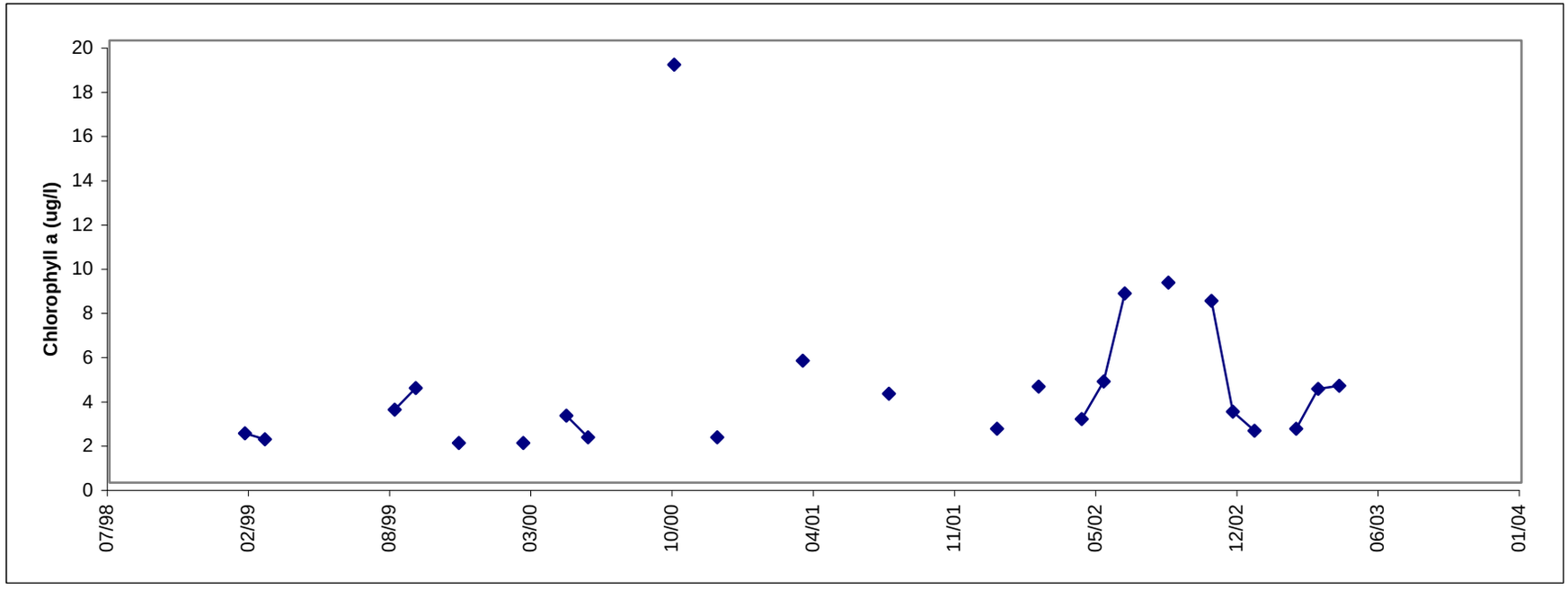
No data submitted to the ECN database

2.37.5 Phytoplankton - Lathkill

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.38 Lower Clyde

Strathclyde Region, Scotland (Lat 55°51'N; Long 4°14'W)
Sponsor: Scottish Environment Protection Agency, West Region

The catchment area of the River Clyde is about 2000 km^2 and the river changes in character a great deal in its 121 km journey to the tidal weir in Glasgow. In its upper reaches, it is used to fill the Daer reservoir which supplies drinking water to much of South Lanarkshire; there is also sheep farming and commercial afforestation in this part of the catchment. The river is joined by tributaries of various sizes and quality reflecting the land uses of their catchments; there is much opencast coal mining in some, whilst others are urban or agricultural. The Clyde passes through a fertile valley in its middle reaches where there is extensive market gardening, fruit growing and garden centres. In its lower reaches the river receives a considerable amount of treated sewage effluent from large regional sewage works. The river is quite sluggish in its flow because of the flat landscape. As a result of this and the BOD of the effluents, their is serious oxygen depletion in the lower reaches during the summer months. The ECN sampling site is situated in the lowest reach, where average flow is 41 cumecs.

2.38.1 Discharge - Lower Clyde

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
					66.97	70.42	45.92	67.01	28.02		

2.38.2 Spot sampled chemistry data

a) summary for 2005 - Lower Clyde

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Lower Clyde

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	8.875	10.33	11	11.08	9.313	9.923	10.66	9.929	10.35	11.26		
pH	pH	7.46	7.5	7.5	7.69	7.32	7.57	7.54	7.51	7.58	7.71		
Suspended Solids: Dry weight	mg/l	8	15.92	38.38	5.75	7.786	13.32	11.05	26.87	16.02	6.842		
Ash-free dry weight	mg/l												
Turbidity	NIU		6.22								2.65		
Conductivity	µs/cm	320.7	426.2	436.7	460	316.7	362.4	345.3	368.1	370.3	487.1		
Dissolved Oxygen	mg/l	8.708	8.425	8.464	8.707	9.558	8.7	9.762	9.657	9.931	8.347		
Ammonium: NH4-N	mg/l	1.23	1.942	1.81	1.139	0.846	0.75	0.506	0.7	0.497	0.758		
Total Nitrogen	mg/l		4.335	2.891	2.665	1.997	2.688	2.654	2.958	2.554	3.562		
Nitrate: NO3-N	mg/l	1.636	1.465	1.951	1.898	2.056	1.657	1.748	1.811	1.687	2.105		
Nitrite: N02-N	mg/l	0.125	0.172	0.131	0.147	0.088	0.094	0.088	0.099	0.065	0.11		
Alkalinity (CaCo3)	mg/l	80.53	88.78	83.61	90.65	80.8	82.82	76.95	76.27	76.17	96.84		
Chloride	mg/l	40.57	55.05	46.44	53.67	31.1	44.8	38.73	40.73	56.43	85.17		
Biological Oxygen demand	mg/l	4.215	2.932	3.916	2.924	2.45	2.228	2.347	3.165	2.533	2.408		
Total Phosphorous	mg/l	0.16	1.318	0.589	0.839	0.517	1.053	0.518	0.606	0.331	0.601		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.63	0.607	0.608	0.591	0.388	0.424	0.448	0.51	0.299	0.451		
Silicate: SiO2	mg/l		2.724	4.483	5.267	5.961	8.142	7.91	3.829	6.86	5.66		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l	29.03	38.57	57.76	36.1	21.92	24.12	28.84	30.49	26.02	56.61		
Potassium - dissolved	mg/l												
Potassium - total	mg/l	4.147	4.492	4.82	4.444	3.629	3.248	4.029	3.783	3.807	5.838		
Calcium - dissolved	mg/l												
Calcium - total	mg/l	30.23	34.1	37.61	44.23	31.46	29.46	30.66	33.52	30.8	36.54		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l	9.267	10.93	11.96	10.96	9.2	8.16	9.363	10.14	9.81	14.19		
Aluminium - total	µg/l		93.42	376.2	119.7	332.9	190.4	383.9	136	165.8	125.5		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	96.67	160	140	85	155.6	82	86.88	73.64	202.1	108.8		
Iron - dissolved	µg/l												
Iron - total	µg/l	556.7	1266	1150	502.5	495.6	638	956.9	622.9	974.3	503.4		
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l				1.27	1.684	1.363	1.827	1.097	1.276	1.297		
Nickel - dissolved	µg/l		2.48	2.462	2.857	3.447	3.915	3.788	2.922	2.302	1.888		
Nickel - total	µg/l	6.5	6.696	4.795	3.697	4.847	10.29	9.521	5.741	3.845	2.54		
Mercury - dissolved	µg/l												
Mercury - total	µg/l	0.018	0.085	0.021	0.014	0.015	0.012	0.007	0.008	0.02	0.005		
Copper - dissolved	µg/l		1.858	1.764	2.146	2.429	2.429	1.981	1.912	2.347	2.035		
Copper - total	µg/l	3.167	5.135	4.991	3.677	3.558	3.804	2.918	4.085	3.86	3.092		
Zinc - dissolved	µg/l		5.771	6.381	6.452	7.373	6.434	5.939	6.403	5.876	6.817		
Zinc - total	µg/l	10	17.79	17.36	11.99	13.67	15.57	16.62	18.52	13.5	11.35		
Cadmium - dissolved	µg/l		0.03	0.038	0.02	0.019	0.04	0.017	0.014	0.017	0.026		
Cadmium - total	µg/l	0.393	0.079	0.085	0.051	0.074	0.039	0.034	0.082	0.045	0.07		
Lead - dissolved	µg/l		0.678	0.357	0.539	0.608	0.532	0.449	0.417	0.508	0.252		
Lead - total	µg/l	9.5	7.299	7.194	2.051	2.372	3.31	2.74	5.393	2.798	1.567		
Arsenic - total	µg/l												

2.38.3 Freshwater Invertebrates, species list - Lower Clyde

Asellus aquaticus
Asellus meridianus
Bithynia tentaculata
Chironomidae
Crangonyx pseudogracilis
Dendrocoelum lacteum
Dugesia
Dytiscidae
Enchytraeidae
Erpobdella octoculata
Erpobdella testacea
Gammarus duebeni
Gammarus pulex
Glossiphonia complanata
Glossiphonia heteroclita
Helobdella stagnalis
Hippeutis complanatus
Hydracarina
Lumbriculidae
Lymnaea peregra
Naididae
Phryganea grandis
Physa fontinalis
Planaria torva
Polycelis
Sphaeriidae
Sphaerium
Theromyzon tessulatum
Tubificidae
Valvata cristata
Valvata

2.38.4 Freshwater Macrophytes, species list - Lower Clyde

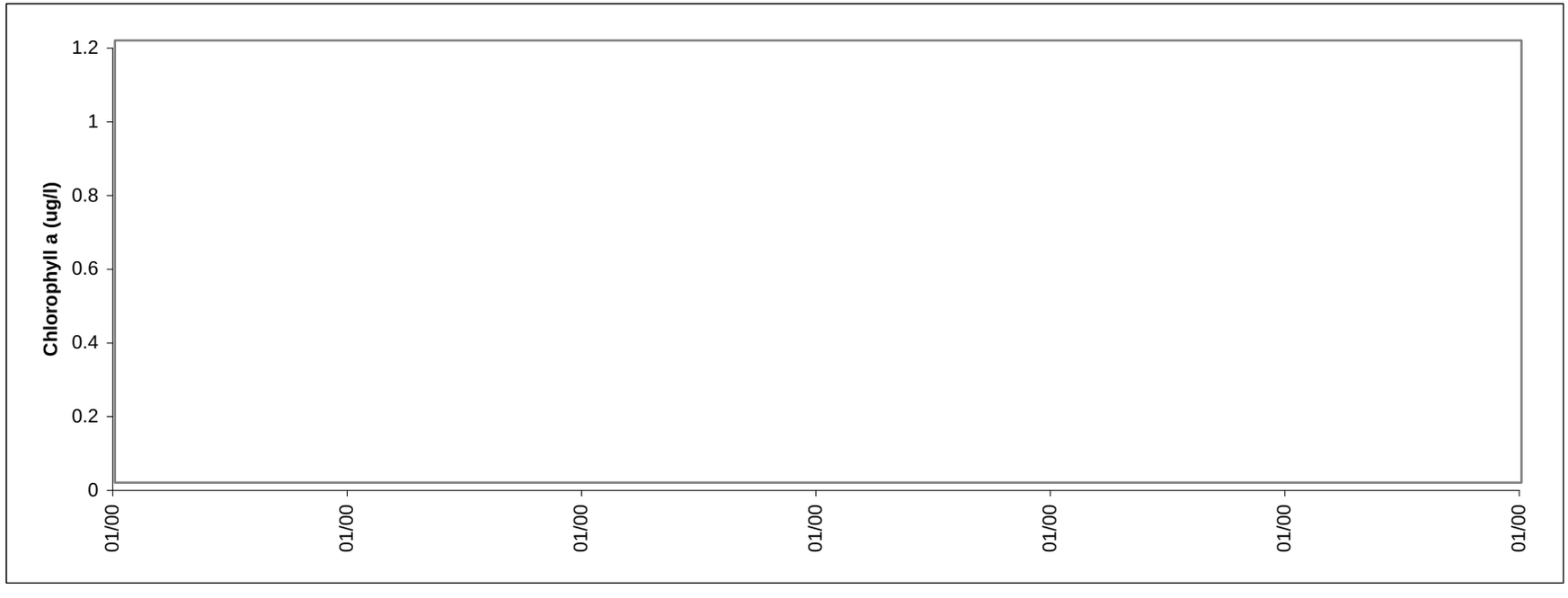
No data submitted to the ECN database

2.38.5 Phytoplankton - Lower Clyde

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

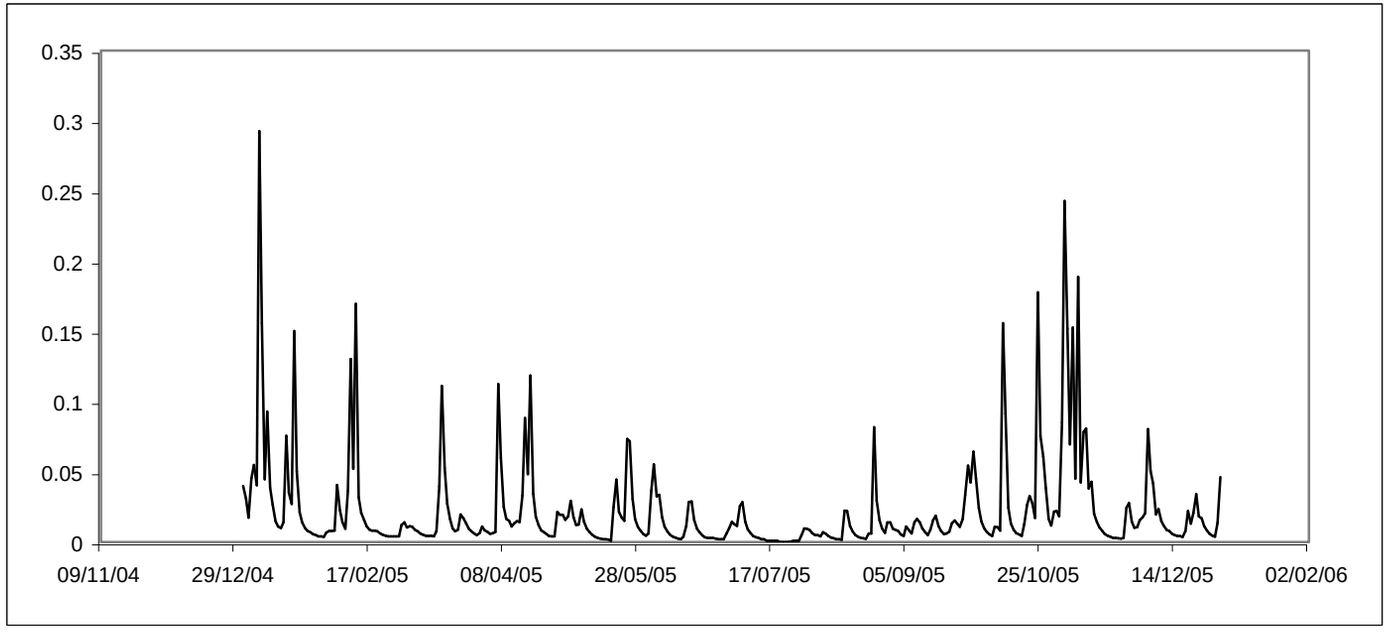


2.39 Nant Teyrn

Snowdon NNR, Wales (Lat 53°04'N; Long 4°01'W)
Sponsor: Countryside Council for Wales and National Assembly for Wales

Nant Teyrn is a small upland stream on Yr Wyddfa/Snowdon NNR. This ECN freshwater site is co-located with the Yr Wyddfa/Snowdon terrestrial site which has been in existence since 1997. The site is on the out flow from Llyn Teyrn. The geology of the catchment is nearly all highly acidic rhyolite and dolerite with a small amount of bedded pyroclastics. Although this is a new site some of the water chemistry data is available since 1997 with discharge data collected from the weir since 2000.

2.39.1 Discharge - Nant Teyrn



Current year statistics

Mean	0.02
Max	0.67
Min	0
Std. dev	0.04
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.04	0.02	0.02	0.03	0.02	0.01	0.01	0.01	0.02	0.03	0.05	0.02

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
							0.02	0.02	0.02	0.02	0.02

2.39.2 Spot sampled chemistry data

a) summary for 2005 - Nant Teyrn

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Nant Teyrn

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l												
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.39.3 Freshwater Invertebrates, species list - Nant Teyrn

No data submitted to the ECN database

2.39.4 Freshwater Macrophytes, species list - Nant Teyrn

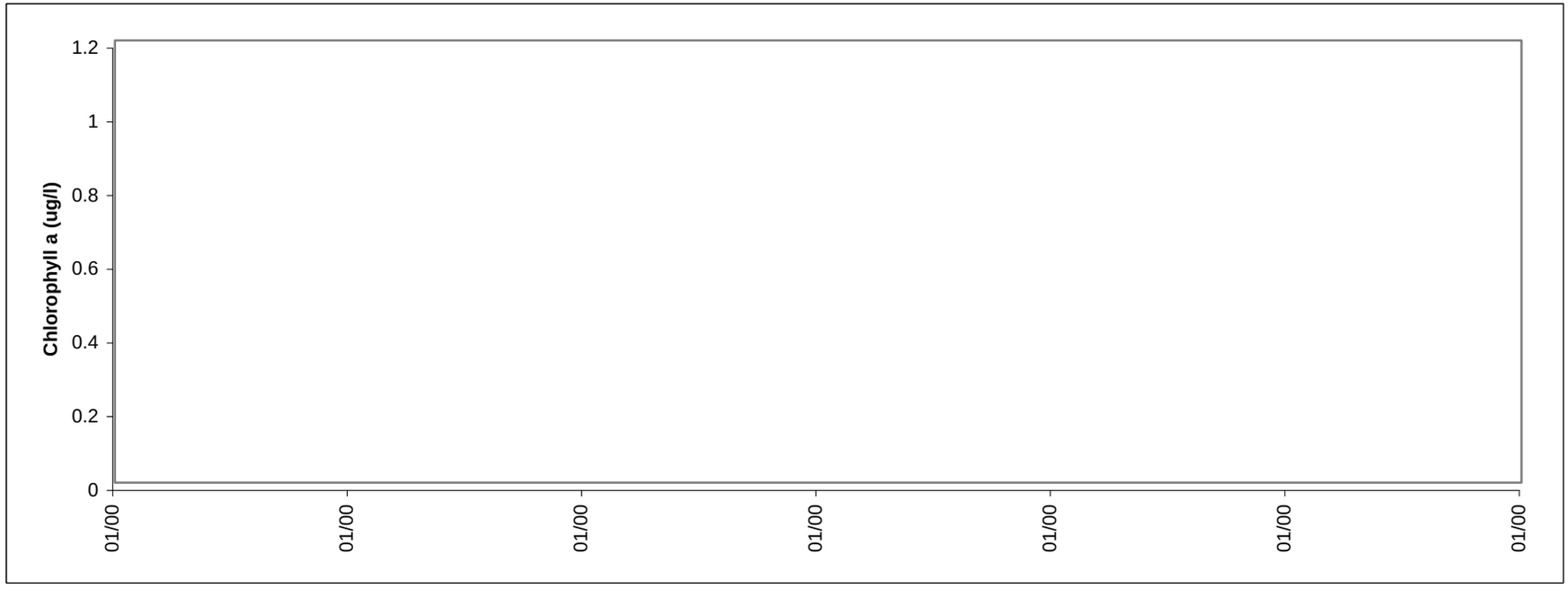
No data submitted to the ECN database

2.39.5 Phytoplankton - Nant Teyrn

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.40 Old Lodge

West Sussex, England (Lat 51°03'N; Long 0°05'E)
Sponsor: Department of the Environment, Transport and the Regions (through the Acid Waters Monitoring Network)

Old Lodge is a stream site within a catchment of 240 ha in Ashdown Forest, SE England. The altitude of the catchment ranges between 94 m and 198 m. The underlying geology comprises Ashdown sands (Hastings beds) and the catchment soils are typically podsolic. Approximately 15% of the catchment is deciduous woodland, principally around the sampling site. Conifers occupy less than 5% of the catchment, with the remainder classified as heathland vegetation dominated by *Calluna vulgaris* and *Erica cinerea* (bell heather), with abundant stands of *Pteridium aquilinum* (bracken). There has been no land-use disturbance in the catchment for the past 200 years, although severe wind-throw affected many trees after the storms of October 1987. Old Lodge is also an Acid Waters Monitoring Network (AWMN) site, classified as having moderate-to-high acid deposition. The catchment has been the focus of research into the relationship of acid stream chemistry and biological, particularly invertebrate, populations.

2.40.1 Discharge - Old Lodge

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005

2.40.2 Spot sampled chemistry data

a) summary for 2005 - Old Lodge

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C					0
pH	pH	5.16	4.9	5.79	0.23	12
Suspended Solids: Dry weight	mg/l					0
Ash-free dry weight	mg/l					0
Turbidity	NIU					0
Conductivity	µs/cm	92	54	108	13.6715	12
Dissolved Oxygen	mg/l					0
Ammonium: NH4-N	mg/l					0
Total Nitrogen	mg/l	0.4315	0.01	1.091	0.2587	12
Nitrate: NO3-N	mg/l	0.0986	0.018	0.213	0.074	12
Nitrite: N02-N	mg/l					0
Alkalinity (CaCo3)	mg/l	0	-0.55	1.5	0.5629	12
Chloride	mg/l	19.5167	10.9	31.5	4.9067	12
Biological Oxygen demand	mg/l					0
Total Phosphorous	mg/l	0.0092	0.003	0.016	0.0039	12
Particulate Phosphorous	mg/l					0
Phosphate (soluble reactive): P04-P	mg/l	0.0017	0.001	0.006	0.0014	12
Silicate: SiO2	mg/l	2.345	1.07	4.08	0.9546	12
Sulphate: S04-S	mg/l	7.6417	1.4	12.2	3.7235	12
Sodium - dissolved	mg/l	10.2333	6.8	14.1	1.8598	12
Sodium - total	mg/l					0
Potassium - dissolved	mg/l	0.8583	0.3	2.48	0.5584	12
Potassium - total	mg/l					0
Calcium - dissolved	mg/l	2.845	1.95	3.42	0.4217	12
Calcium - total	mg/l					0
Magnesium - dissolved	mg/l	1.5725	1.21	1.91	0.1745	12
Magnesium - total	mg/l					0
Aluminium - total	µg/l	95.3333	51	130	28.8455	12
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l					0
Tin - total	µg/l					0
Manganese - dissolved	µg/l					0
Manganese - total	µg/l	247.3333	39	444	109.7057	12
Iron - dissolved	µg/l					0
Iron - total	µg/l	307.25	96	1482	395.2999	12
Vanadium - dissolved	µg/l					0
Vanadium - total	µg/l					0
Nickel - dissolved	µg/l					0
Nickel - total	µg/l					0
Mercury - dissolved	µg/l					0
Mercury - total	µg/l					0
Copper - dissolved	µg/l	1.6667	1	8	2.0151	12
Copper - total	µg/l					0
Zinc - dissolved	µg/l					0
Zinc - total	µg/l					0
Cadmium - dissolved	µg/l					0
Cadmium - total	µg/l					0
Lead - dissolved	µg/l					0
Lead - total	µg/l					0
Arsenic - total	µg/l					0

b) annual means since start of ECN - Old Lodge

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	10.1	10.24	10.37	10.63	9.408	10.07	10.03	10.33	10.71	14.5		
pH	pH	4.66	4.62	4.6	4.57	4.63	4.83	4.9	5.13	5.05	5.13	5	5.16
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm	87.5	112.7	108.3	102.2	90.42	90.75	84.25	84.18	86.5	92.75	97.08	92
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l			0.364	0.41	0.493	0.337	0.68	0.663	0.574	0.354	0.273	0.432
Nitrate: NO3-N	mg/l	0.057	0.095	0.144	0.121	0.113	0.089	0.105	0.099	0.271	0.108	0.115	0.099
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l	-1.28	-1.3	-1.4	-1.59	-1.33	-0.76	-0.58	-0.03	-0.18	-0.41	-0.4	0
Chloride	mg/l	17.39	20.52	19.51	19.43	18.63	18.5	17.87	17.08	17.87	18.44	19.8	19.52
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l			0.007	0.006	0.006	0.006	0.009	0.019	0.018	0.019	0.012	0.009
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.003	0.002	0.003	0.004	0.003	0.003	0.003	0.006	0.008	0.005	0.002	0.002
Silicate: SiO2	mg/l	1.542	1.908	1.883	1.892	1.75	2.033	1.475	1.7	1.933	1.873	1.814	2.345
Sulphate: S04-S	mg/l	8.867	11.64	12.1	10.05	8.792	8.558	8.067	6.664	6.783	9.783	9.75	7.642
Sodium - dissolved	mg/l	9.225	11.38	10.68	9.858	9.833	9.667	9.358	9.446	9.367	10.47	9.542	10.23
Sodium - total	mg/l												
Potassium - dissolved	mg/l	0.683	0.75	1.019	0.849	0.662	0.604	0.797	0.764	0.791	0.913	0.8	0.858
Potassium - total	mg/l												
Calcium - dissolved	mg/l	2.437	3.103	2.995	2.651	2.533	2.763	2.795	2.661	2.698	3.069	2.951	2.845
Calcium - total	mg/l												
Magnesium - dissolved	mg/l	1.342	1.775	1.775	1.55	1.408	1.542	1.75	1.346	1.483	1.653	1.593	1.573
Magnesium - total	mg/l												
Aluminium - total	µg/l	217.5	207.5	218.3	237.5	239.6	364.6	277.8	251.4	195.8	106.7	119.8	95.33
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	224.3	365	314.6	264.3	248	237.6	223.3	263.6	238.2	264.8	254.7	247.3
Iron - dissolved	µg/l												
Iron - total	µg/l	449.2	362.5	254.6	348.3	562.1	237.9	583.3	984.8	2323	318.8	154.3	307.3
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l									1.111	1.083	1	1.667
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.40.3 Freshwater Invertebrates, species list - Old Lodge

Ceratopogonidae
Chironomidae
Leuctra nigra
Nemoura
Nemurella picteti
Pisidium
Plectrocnemia
Simuliidae
Velia

2.40.4 Freshwater Macrophytes, species list - Old Lodge

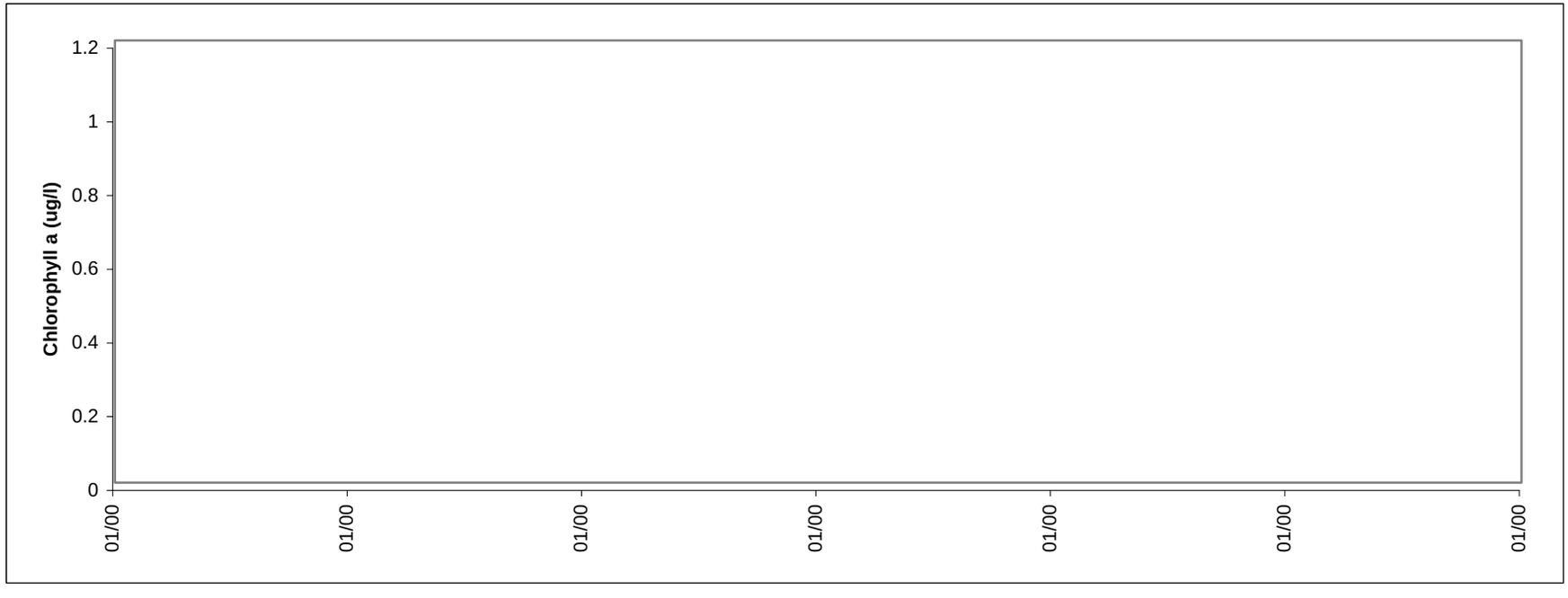
No data submitted to the ECN database

2.40.5 Phytoplankton - Old Lodge

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.41 Owenkillew River

Northern Ireland (Lat 54°25'N; Long 7°01'W)
Sponsor: Environment and Heritage Service (Northern Ireland)

Monitoring began at Owenkillew River in 2004.

2.41.1 Discharge - Owenkillew River

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005

2.41.2 Spot sampled chemistry data

a) summary for 2005 - Owenkillew River

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Owenkillew River

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C												
pH	pH												
Suspended Solids: Dry weight	mg/l												
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm												
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l												
Total Nitrogen	mg/l												
Nitrate: NO3-N	mg/l												
Nitrite: N02-N	mg/l												
Alkalinity (CaCo3)	mg/l												
Chloride	mg/l												
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l												
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l												
Silicate: SiO2	mg/l												
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l												
Iron - total	µg/l												
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l												
Nickel - dissolved	µg/l												
Nickel - total	µg/l												
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l												
Copper - total	µg/l												
Zinc - dissolved	µg/l												
Zinc - total	µg/l												
Cadmium - dissolved	µg/l												
Cadmium - total	µg/l												
Lead - dissolved	µg/l												
Lead - total	µg/l												
Arsenic - total	µg/l												

2.41.3 Freshwater Invertebrates, species list - Owenkillew River

Anabolia nervosa
Ancylus fluviatilis
Athripsodes bilineatus
Baetis muticus
Baetis rhodani
Baetis Scambus Group
Beraeodes minutus
Caenis rivulorum
Calopteryx splendens
Chelifera Group
Chironomidae
Chloroperla torrentium
Clinocerinae
Cloeon simile
Cyrnus trimaculatus
Dicranota
Ecdyonurus
Elmis aenea
Enchytraeidae
Ephemerella ignita
Esolus parallelepipedus
Gerris lacustris
Glossosoma
Goera pilosa
Halesus radiatus
Helobdella stagnalis
Hemerodromia Group
Heptagenia sulphurea
Hydracarina
Hydraena gracilis
Hydrometra
Hydropsyche pellucidula
Hydropsyche siltalai
Hydropsyche
Hydroptila
Isoperla grammatica
Ithytrichia
Lepidostoma hirtum
Leptophlebia vespertina
Leuctra fusca
Leuctra
Limnephilidae
Limnius volckmari
Limnophila (Eloeophila)
Lumbricidae
Lumbriculidae
Lymnaea peregra
Lymnaea
Naididae
Nematoda
Nemoura cinerea
Orectochilus villosus
Oreodytes sanmarkii
Oulimnius tuberculatus
Oulimnius
Paraleptophlebia cincta
Paraleptophlebia
Phagocata vitta
Plectrocnemia conspersa
Polycentropus flavomaculatus
Potamopyrgus jenkinsi
Protonemura meyeri
Pyrrhosoma nymphula
Rhithrogena
Rhyacophila dorsalis
Rhyacophila munda
Rhyacophila
Sericostoma personatum
Simulium reptans
Simulium
Simulium (Eusimulium) Aureum Group
Simulium (Nevermannia) Cryophilum Group
Simulium (Simulium) Argyreatum Group
Simulium (Simulium) Ornatum Group
Tubificidae

2.41.4 Freshwater Macrophytes, species list - Owenkillew River

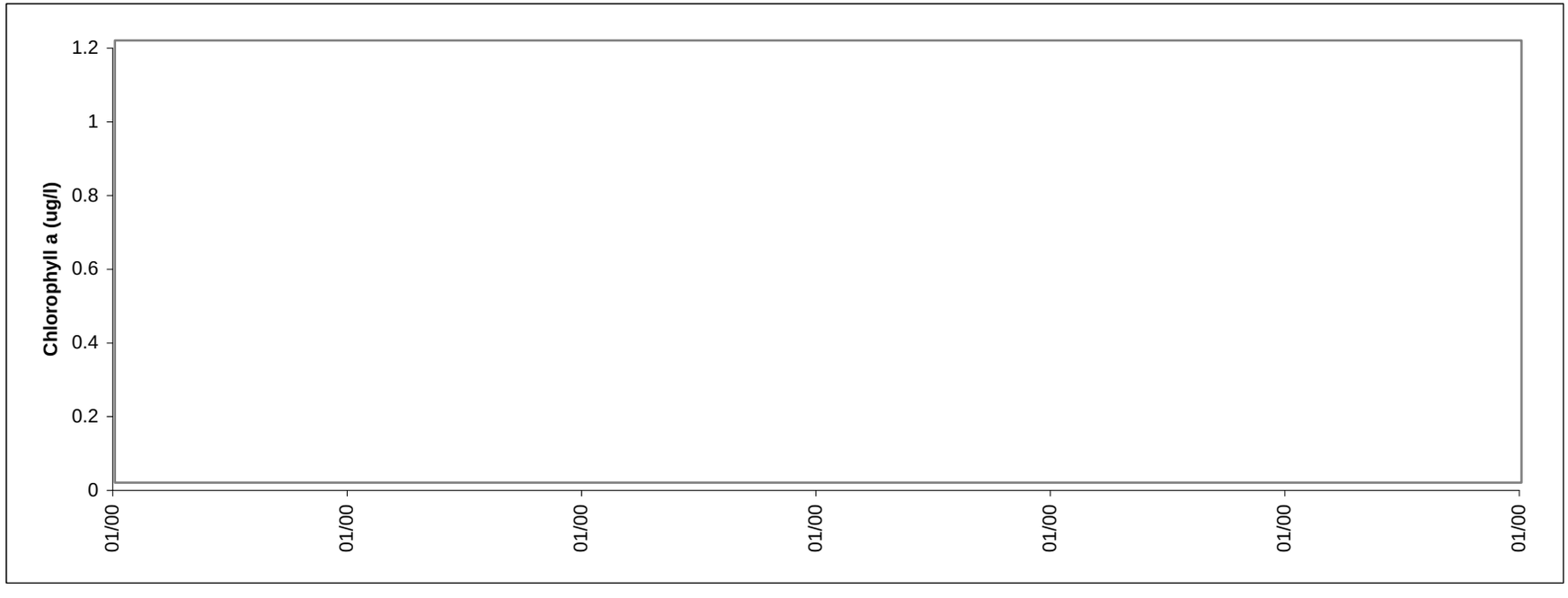
Amblystegium riparium
Brachythecium plumosum
Brachythecium rivulare
Calliergon cuspidatum
Callitriche
Callitriche hamulata
Chiloscyphus polyanthos
Cinclidotus fontinaloides
Cladophora glomerata
Conocephalum conicum
Equisetum palustre
Fontinalis antipyretica
Fontinalis squamosa
Hygrohypnum
Impatiens glandulifera
Juncus articulatus
Marchantia polymorpha
Orthotrichum
Pellia endiviifolia
Phalaris arundinacea
Racomitrium
Ranunculus penicillatus var. penicillatus
Rhynchostegium riparioides
Scapania undulata
Schistidium

2.41.5 Phytoplankton - Owenkillew River

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



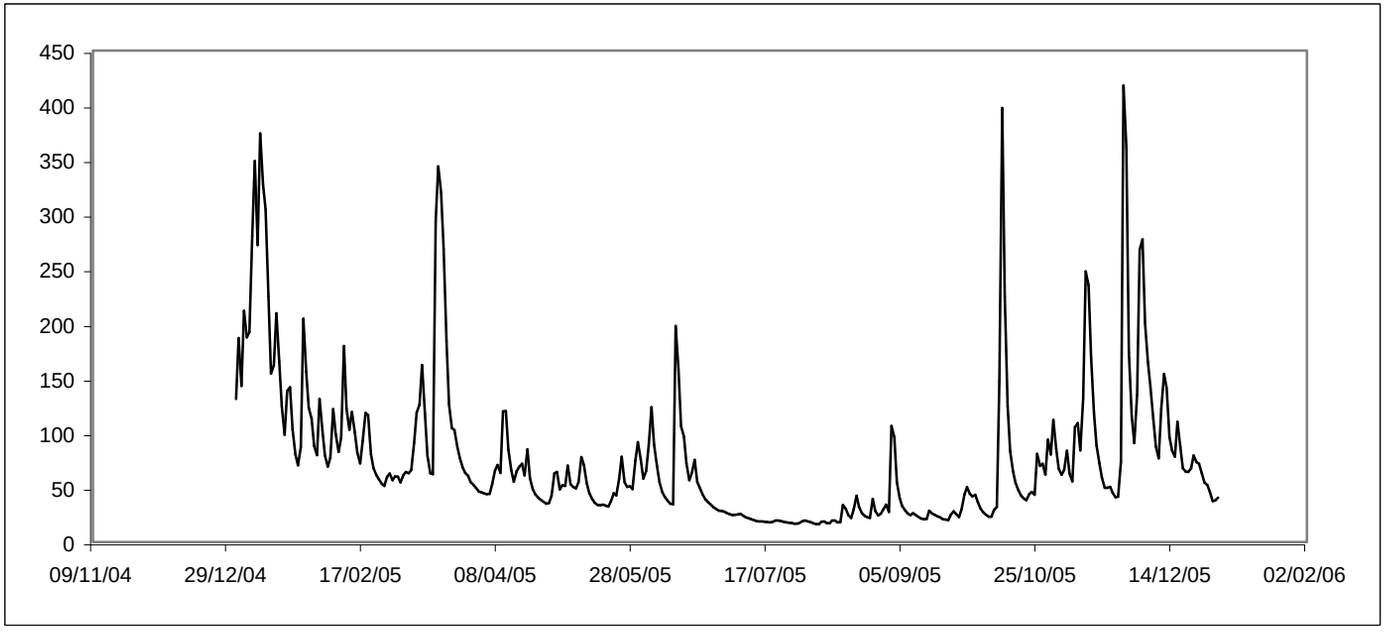
2.42 Spey

Grampian Region, Scotland (Lat 57°37'N; Long 3°06'W)
Sponsor: Scottish Environment Protection Agency, North Region

The River Spey rises in the high ground of the Grampian Mountains and flows in a north easterly direction towards the Moray Firth. It drains a relatively large catchment of 3008 km^2 with a stream network of 36 400 km, of which the main river comprises 157 km. The upper part of the catchment is characterised by its mountain wilderness regions, sheep farming and tourism, whilst in the lower catchment these are complemented by the distilling industry, cattle and arable farming, and related industries. There is restricted commercial forestry on the narrow valley bottoms and steep-sided hills of the upper catchment, but as the valley floor widens it becomes much more extensive (16% of total catchment land use). Most of the Spey catchment is underlain by metamorphic rocks of the Cambrian Period and these are intruded at a number of places by granite plutons and are overlain at the northern end of the catchment by Devonian sandstone. For most of its length the River Spey flows through a wide alluvial plain composed of silts, sand and waterborne pebbles.

The catchment is of great conservation value with 27 designated Sites of Special Scientific Interest (SSSI) including various woodland, wetland and montane habitats, fossil sites, and various geomorphological features. The river itself is designated an SSSI at the Insh Marshes, at the lower section downstream of Fochabers for its unique active braided channel and associated habitats, and at Spey Bay which is of prime importance for its geomorphology. The River Spey is renowned for its salmon fishing with an estimated input into the local economy of £6 million per annum (Scottish Tourist Board 1989). The salmon fishery is the subject of much research and fisheries management activity.

2.42.1 Discharge - Spey



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Current year statistics

Mean	77.01
Max	673.69
Min	15.84
Std. dev	70.93
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
176.89	89.78	113.12	59.38	52.48	64.85	20.69	24.39	33.54	73.55	113.74	101.8

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
69.95			57.58	73.66	77.34	86.92	62.91	80.55	44.06	77.43	77.01

2.42.2 Spot sampled chemistry data

a) summary for 2005 - Spey

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Spey

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	^{o}C		10.09	8.542	9.792	9	9.273	9.55	9.125	10.76	9.435		
pH	pH		7.31	7.36	7.35	7.45	7.37	7.32	7.45	7.53	7.51		
Suspended Solids: Dry weight	mg/l		3.909	20.25	69	2.167	2.546	11.64	5.917	6.368	3.375		
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm		78.45	86.25	80.25	77.24	78.91	78.36	85.92	79.05	94.52		
Dissolved Oxygen	mg/l		11.71	12.62	11.02	10.89	11.54	11.24	11.61	11.51	12.06		
Ammonium: NH4-N	mg/l		0.016	0.027	0.032	0.02	0.019	0.015	0.013	0.011	0.018		
Total Nitrogen	mg/l							0.522	0.492	0.41	0.586		
Nitrate: NO3-N	mg/l		0.253					0.333	0.36	0.285	0.287		
Nitrite: N02-N	mg/l		0.006	0.004	0.007	0.005	0.004	0.006	0.005	0.005	0.011		
Alkalinity (CaCo3)	mg/l		18.27	19.75	18.71	17.58	16.9	14.95	18.62	17.69	19.34		
Chloride	mg/l		10.36	11.67	9.9	9.083	11.45	10	10.88	11.29	11.18		
Biological Oxygen demand	mg/l		0.864	0.992	1.175	0.783	0.673	1.118	0.688		0.691		
Total Phosphorous	mg/l		0.023	0.03	0.026	0.019	0.031	0.032	0.027		0.016		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l		0.006	0.016	0.016	0.011	0.012	0.016	0.011	0.015	0.019		
Silicate: SiO2	mg/l		2.425	2.371	2.352			3.821	5.542	5.285	4.318		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l		6.419	7.015	6.646	6.382	6.672		7.982	7.346	7.025		
Sodium - total	mg/l							6.663	7.683	7.447	6.664		
Potassium - dissolved	mg/l								1.1	1.139	1.105		
Potassium - total	mg/l		0.855	1.266	1.346	0.839	1.225	1.206	1.157	1.291	1.097		
Calcium - dissolved	mg/l								7.379	6.292	6.988		
Calcium - total	mg/l		6.57	5.628	5.429	10.12	5.698	6.213	7.397	6.543	6.927		
Magnesium - dissolved	mg/l								1.61	1.484	1.898		
Magnesium - total	mg/l		1.815	1.601	1.312	1.767	1.167	1.666	1.675	1.664	1.875		
Aluminium - total	µg/l		122.7	794.6	303.1	99.41	317.7	400	279.3	429.1	122.9		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l		3.586	3.396	3.095	1.061	1.748	1.194	1.1	0.621	0.49		
Manganese - dissolved	µg/l												
Manganese - total	µg/l		21.09	28.27	83.61	13.04	85.02	41.31	39.69	52.8	46.08		
Iron - dissolved	µg/l												
Iron - total	µg/l		225.2	886.5	2291	236.1	374	525.3	343.5	348.2	258.9		
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l		4.84	4.84	4.84	7.038	13.14	1.398	1.103	0.991	0.514		
Nickel - dissolved	µg/l				0.745	0.794	2.115	0.35					
Nickel - total	µg/l		0.815	1.32	1.914	4.453	2.772	1.792	1.347	1.323	1.479		
Mercury - dissolved	µg/l												
Mercury - total	µg/l		0.049	0.069	0.049	0.125	0.096	0.023	0.053	0.032	0.002		
Copper - dissolved	µg/l		0.966	1.161	1.091	1.711	2.028	1.382	1.804	1.466	1.509		
Copper - total	µg/l				3.526	2.165	7.976	3.24	2.226	3.262	2.388		
Zinc - dissolved	µg/l		0.87	1.164	1.467	1.226	1.516	4.318	3.398	2.605	2.226		
Zinc - total	µg/l				5.095	1.715	10.58	9.258	6.451	7.256	5.712		
Cadmium - dissolved	µg/l		0.038	0.03	0.022	0.185	0.124	0.17	0.1	0.078	0.065		
Cadmium - total	µg/l				0.053	0.328	0.272	0.188	0.136	0.078	0.055		
Lead - dissolved	µg/l				0.251	0.347	0.228	0.16					
Lead - total	µg/l				3.031	0.387	2.692	1.257	0.396	0.733	0.35		
Arsenic - total	µg/l				0.684	4.246	4.36	0.903	0.287	0.366	0.167		

2.42.3 Freshwater Invertebrates, species list - Spey

No data submitted to the ECN database

2.42.4 Freshwater Macrophytes, species list - Spey

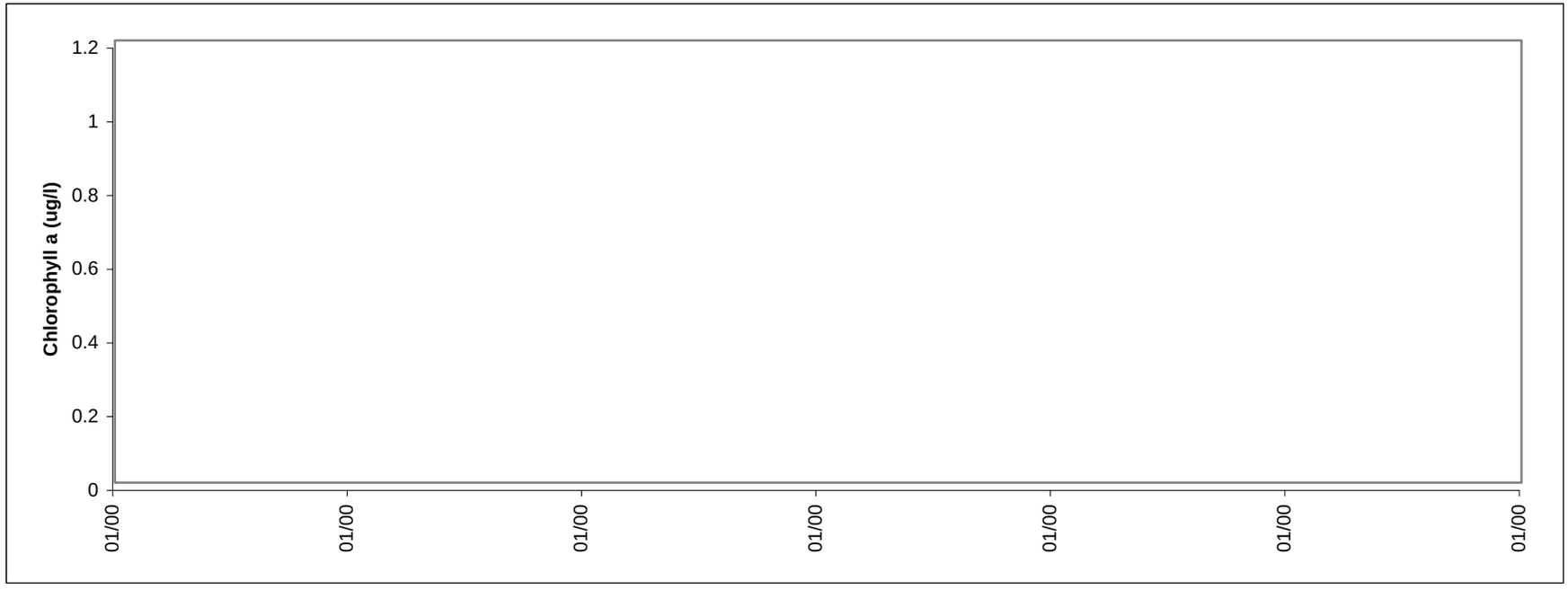
No data submitted to the ECN database

2.42.5 Phytoplankton - Spey

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.43 Stinchar

Strathclyde Region, Scotland (Lat 55°06'N; Long 5°00'W)
Sponsor: Scottish Environment Protection Agency, West Region

The River Stinchar is situated in South Ayrshire. It rises close to Loch Doon and flows for 46 km before entering the Firth of Clyde at Ballantrae. It has a catchment area of 340 km^2 and its average flow is 11.2 cumecs. The catchment is largely rural, with only a few small and scattered communities. Farming is mostly dairy cattle and sheep rearing, and there have been some pollution problems associated with the latter, in particular through spillages of sheep dip chemicals.

The upper part of the catchment is extensively forested with conifers for commercial use. The granitic geology and the maturity of the trees have resulted in low pH values at the uppermost routine sampling point. Part of the flow of the upper reaches of the river is diverted by an aqueduct to feed water into the Loch Braden water supply reservoir. The ECN site is situated in the lowest reach of the river where the acidity has been buffered by the base cations in the lower part of the catchment.

2.43.1 Discharge - Stinchar

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
					11.23	12.49	9.01	11.11	6.42		

2.43.2 Spot sampled chemistry data

a) summary for 2005 - Stinchar

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Stinchar

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	10.64	11.63	10.08	9.778	8.789	9.333	9.12	10.55	9.929	12.71		
pH	pH	7.69	7.56	7.62	7.45	7.21	7.2	7.22	7.29	7.24	7.65		
Suspended Solids: Dry weight	mg/l	3.143	5.75	3.688	3.167	4.539	5.211	5.368	4.727	11.48	4.059		
Ash-free dry weight	mg/l												
Turbidity	NIU		2.5								3.3		
Conductivity	µs/cm	120.5	276.6	172.5	130.8	117.8	127.8	112.5	115.1	106.4	144.8		
Dissolved Oxygen	mg/l	12.16	10.86	11.76	10.46	10.53	11.75	11.36	11.4	10.97	11.24		
Ammonium: NH4-N	mg/l	0.034	0.083	0.039	0.04	0.032	0.026	0.053	0.021	0.053	0.038		
Total Nitrogen	mg/l		0.986	0.964	0.84	0.427	0.932	0.963	0.746	0.898	0.836		
Nitrate: NO3-N	mg/l	0.481	0.593	0.896	0.843	0.788	0.536	0.662	0.608	0.541	0.193		
Nitrite: N02-N	mg/l	0.007	0.012	0.014	0.009	0.008	0.01	0.024	0.01	0.007	0.005		
Alkalinity (CaCo3)	mg/l	32.93	42.25	30.94	29.73	29.94	32.06	24	29.17	26.41	37.44		
Chloride	mg/l	13.5	37.11	14.39	21.63	11.94	16.67	16.26	13.12	14.54	16.46		
Biological Oxygen demand	mg/l	1.185	1.62	2.136	2.114	2.089	1.443	1.805	1.466	1.639	1.579		
Total Phosphorous	mg/l	0.048	0.046	0.033	0.032	0.027	0.027	0.022	0.018	0.037	0.025		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.01	0.011	0.015	0.014	0.015	0.015	0.068	0.013	0.03	0.011		
Silicate: SiO2	mg/l		1.247	1.551	3.033	3.041	3.893	4.169	2.514	2.85	2.359		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l	8.467	14.49	14.44	14.11	8.21	8.5	8.367	9.049	8.539	10.53		
Potassium - dissolved	mg/l												
Potassium - total	mg/l	1.02	1.233	1.101	1.203	0.902	0.8	0.858	1.001	0.951	1.214		
Calcium - dissolved	mg/l												
Calcium - total	mg/l	8.52	9.853	10.1	10.37	8.828	6.943	7.518	9.288	8.183	10.8		
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l	3.867	5.053	5.355	5.913	4.52	3.512	3.683	4.785	4.089	5.521		
Aluminium - total	µg/l		40.55	158.7	138.9	108.9	430.9	184.3	200.9	269.9	127.8		
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l	13.33	20.5	38.75	16.88	35.56	33.33	19.17	23	38.92	19.75		
Iron - dissolved	µg/l												
Iron - total	µg/l	253.3	259.7	207.8	303.8	794	602.9	585	533.9	916.2	343.1		
Vanadium - dissolved	µg/l									0.66			
Vanadium - total	µg/l				0.443	2.538	1.904	0.844	0.959	1.181	0.756		
Nickel - dissolved	µg/l						3.568	3.122	1.892	2.077	1.416		
Nickel - total	µg/l	7.875	4.242	1.968	1.894	5.725	8.218	5.371	3.059	3.852	2.26		
Mercury - dissolved	µg/l												
Mercury - total	µg/l	0.004	0.005	0.009	0.011	0.011	0.005	0.009	0.007	0.008	0.005		
Copper - dissolved	µg/l					0.64	1.195	0.957	1.297	1.729	1.313		
Copper - total	µg/l	0.75	1.121	1.66	1.674	1.989	1.71	1.465	1.538	2.185	1.772		
Zinc - dissolved	µg/l		2.4	4.4			2.708	2.625	2.633	2.75	2.22		
Zinc - total	µg/l	2.875	6.782	5.533	3.954	7.199	5.902	3.877	4.203	4.6	5.512		
Cadmium - dissolved	µg/l					0.015	0.02	0.017	0.011	0.012	0.05		
Cadmium - total	µg/l	0.203	0.031	0.044	0.047	0.051	0.015	0.019	0.014	0.026	0.087		
Lead - dissolved	µg/l					0.11	0.213	0.274	0.184	0.271	0.143		
Lead - total	µg/l	15	3.557	0.521	0.504	0.898	0.788	0.532	0.468	0.76	0.58		
Arsenic - total	µg/l												

2.43.3 Freshwater Invertebrates, species list - Stinchar

No data submitted to the ECN database

2.43.4 Freshwater Macrophytes, species list - Stinchar

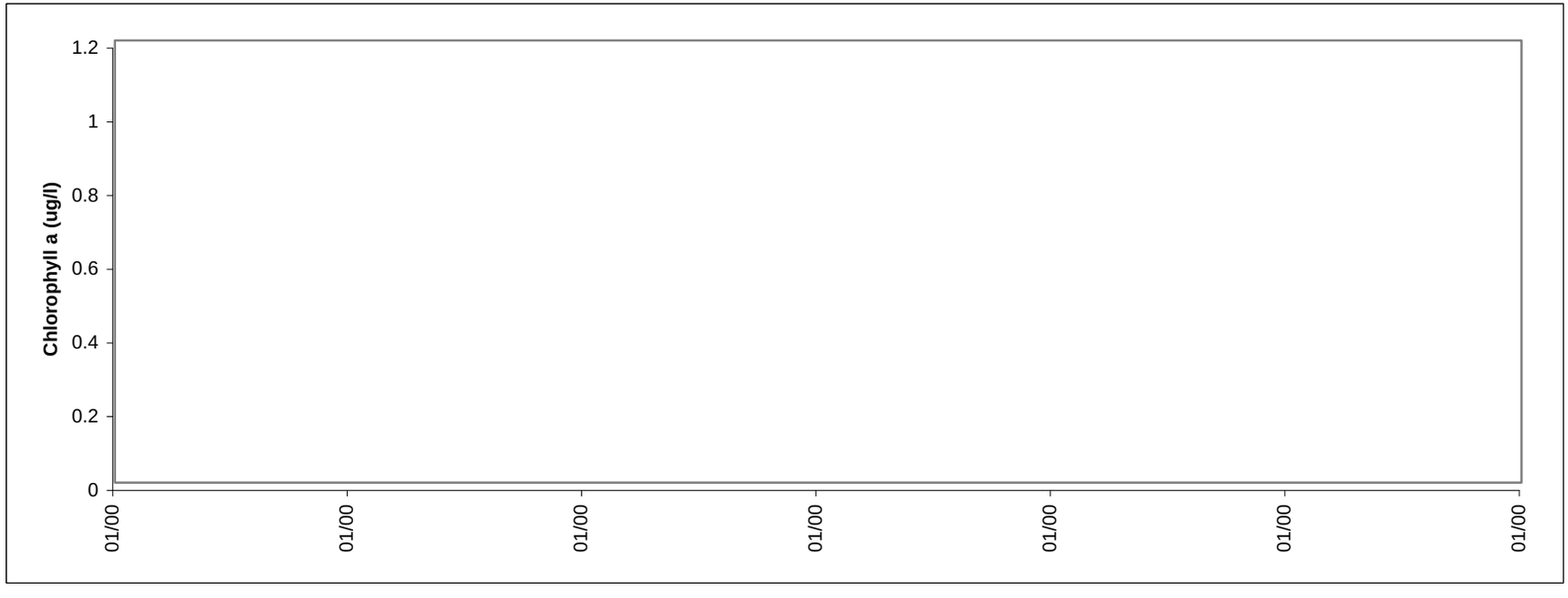
No data submitted to the ECN database

2.43.5 Phytoplankton - Stinchar

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series

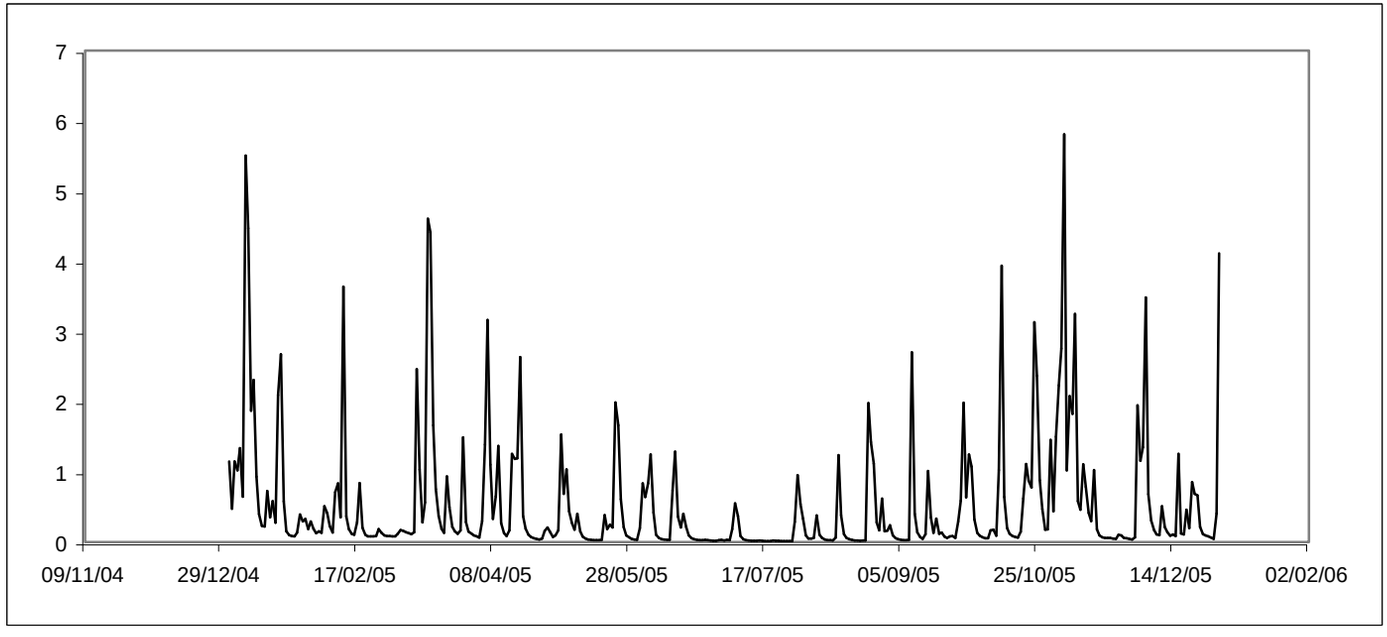


2.44 Trout Beck

Cumbria, England (Lat 54°42'N; Long 2°22'W)
Sponsors: Natural Environment Research Council and English Nature

The Trout Beck is a headwater stream of the Tees which drains Great Dun Fell, Hard Hill and Knock Fell in the North Pennines. The ECN sampling point (National Grid Ref. NY 758 335) is at 535 m altitude and the catchment above this covers 1146 ha, rising to 848 m altitude. The geology is alternating strata of Carboniferous limestones, slates and shales. Blanket peat covers 90% of the catchment with skeletal soils towards the fell tops and small areas of limestone soils and alluvial soils. Vegetation is dominated by heather (*Calluna vulgaris*), cotton grass (*Eriophorum* spp) and *Sphagnum* moss. The catchment lies in Moor House National Nature Reserve which is owned by English Nature. Discharge is measured at a Compound Crump Gauging Station operated by the Environment Agency. The pH of Trout Beck averages 6.2 although there are wide fluctuations associated with the discharge. The site has a long history of ecological research. Trout Beck was the first ECN Freshwater Site with its catchment entirely within an ECN Terrestrial Site.

2.44.1 Discharge - Trout Beck



Current year statistics

Mean	0.52
Max	13.25
Min	0.01
Std. dev	1.11
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.37	0.7	0.57	0.36	0.27	0.12	0.29	0.37	0.68	0.87	0.64

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0.64	0.49	0.42	0.48	0.65	0.59	0.69		0.62	0.5	0.69	0.52

2.44.2 Spot sampled chemistry data

a) summary for 2005 - Trout Beck

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Trout Beck

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C				9.755	6.579	10.12	7.683	11.13	9.117	9.664	8.708	
pH	pH				6.21	6.12	7.02	6.75	7.09	6.72	6.89	6.73	
Suspended Solids: Dry weight	mg/l				2.294	1.605	1.627	1.942	2.36	2.683	1.427	1.808	
Ash-free dry weight	mg/l												
Turbidity	NIU												
Conductivity	µs/cm				85.03	53.11	83.94	69.52	84.72	60.73	98.06	71.13	
Dissolved Oxygen	mg/l												
Ammonium: NH4-N	mg/l				0.025	0.019	0.029	0.012	0.034	0.053	0.053	0.039	
Total Nitrogen	mg/l				0.494	0.413	0.293	0.391	0.393	0.377	0.382	0.366	
Nitrate: NO3-N	mg/l				0.177	0.098	0.091	0.077	0.054	0.062	0.105	0.075	
Nitrite: N02-N	mg/l				0.002	0.003	0.003	0.002	0.003	0.003	0.002	0.001	
Alkalinity (CaCo3)	mg/l				27.27	15.04	25.51	18.78	25.92	20.13	24.09	26.26	
Chloride	mg/l				3.95	4.092	4.825	3.783	3.66	3.564	4.125	3.341	
Biological Oxygen demand	mg/l												
Total Phosphorous	mg/l				0.006	0.01	0.006	0.006	0.009	0.007	0.005	0.011	
Particulate Phosphorous	mg/l				0.003	0.009	0.005	0.002	0.007	0.005	0.003	0.008	
Phosphate (soluble reactive): P04-P	mg/l				0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.003	
Silicate: SiO2	mg/l				1.266	0.883	0.827	0.965	0.705	0.686	0.877	0.83	
Sulphate: S04-S	mg/l				1.384	1.095	1.253	1.041	1.247	1.305	1.926	1.187	
Sodium - dissolved	mg/l				2.795	2.506	3.069	2.901	3.1	3.559	3.113	2.432	
Sodium - total	mg/l												
Potassium - dissolved	mg/l				0.348	0.267	0.38	0.273	0.344	0.328	0.379	0.298	
Potassium - total	mg/l												
Calcium - dissolved	mg/l				12.76	7.836	12.03	9.399	11.73	9.795	13.08	11.58	
Calcium - total	mg/l												
Magnesium - dissolved	mg/l				1.062	0.708	1.015	0.803	0.953	0.809	1.078	0.891	
Magnesium - total	mg/l												
Aluminium - total	µg/l				101.2	123.1	158.6	100.1	76.7	148.4	71.65	70.31	
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l				0.5	0.5	0.737	0.255	0.25	0.25	0.028	0.025	
Manganese - dissolved	µg/l												
Manganese - total	µg/l				45.34	41.16	42.59	69.86	71.4	54.34	27.9	31.26	
Iron - dissolved	µg/l									306.4	263.6	371.2	
Iron - total	µg/l				536.7	581.2	444.8	342.7	241.9	328.8	223	259.5	
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l				0.569	0.5	0.5	0.353	0.375	0.332	0.242	0.27	
Nickel - dissolved	µg/l												
Nickel - total	µg/l				2.148	2.268	1.599	1.422	1.246	0.949	1.236	1.753	
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l				2.779	0.853	0.9	0.458	0.599	0.522	0.821	0.826	
Copper - total	µg/l												
Zinc - dissolved	µg/l				14.8	14.67	13.33	11.14	10.21	10.12	14.82	13.17	
Zinc - total	µg/l												
Cadmium - dissolved	µg/l				0.5	0.5	0.723	0.088	0.315	0.05	0.049	0.048	
Cadmium - total	µg/l												
Lead - dissolved	µg/l				5.312	5.723	4.37	4.887	3.863	6.471	6.159	8.554	
Lead - total	µg/l				6.798	6.58	5.089	6.418	6.043	8.714	7.56	10.13	
Arsenic - total	µg/l												

2.44.3 Freshwater Invertebrates, species list - Trout Beck

Amphinemura sulcicollis
Ancylus fluviatilis
Baetis rhodani
Baetis scambus
Brachycentrus subnubilus
Caenis rivulorum
Chironomidae
Chloroperla torrentium
Crenobia alpina
Dicranota
Dinocras cephalotes
Ecclisopteryx guttulata
Ecdyonurus
Elmis aenea
Empididae
Ephemerella ignita
Esolus parallelepipedus
Helobdella stagnalis
Heptagenia lateralis
Hexatoma
Hydraena gracilis
Hydropsyche siltalai
Hydroptila
Isoperla grammatica
Leuctra fusca
Leuctra inermis
Limnius volckmari
Lumbricidae
Lumbriculidae
Naididae
Nemoura cambrica
Oreodytes davisii
Oulimnius tuberculatus
Perla bipunctata
Perlodes microcephala
Polycentropus flavomaculatus
Protonemura meyeri
Protonemura
Rhithrogena semicolorata
Rhyacophila dorsalis
Simuliidae
Taeniopteryx nebulosa
Tipula
Tubificidae

2.44.4 Freshwater Macrophytes, species list - Trout Beck

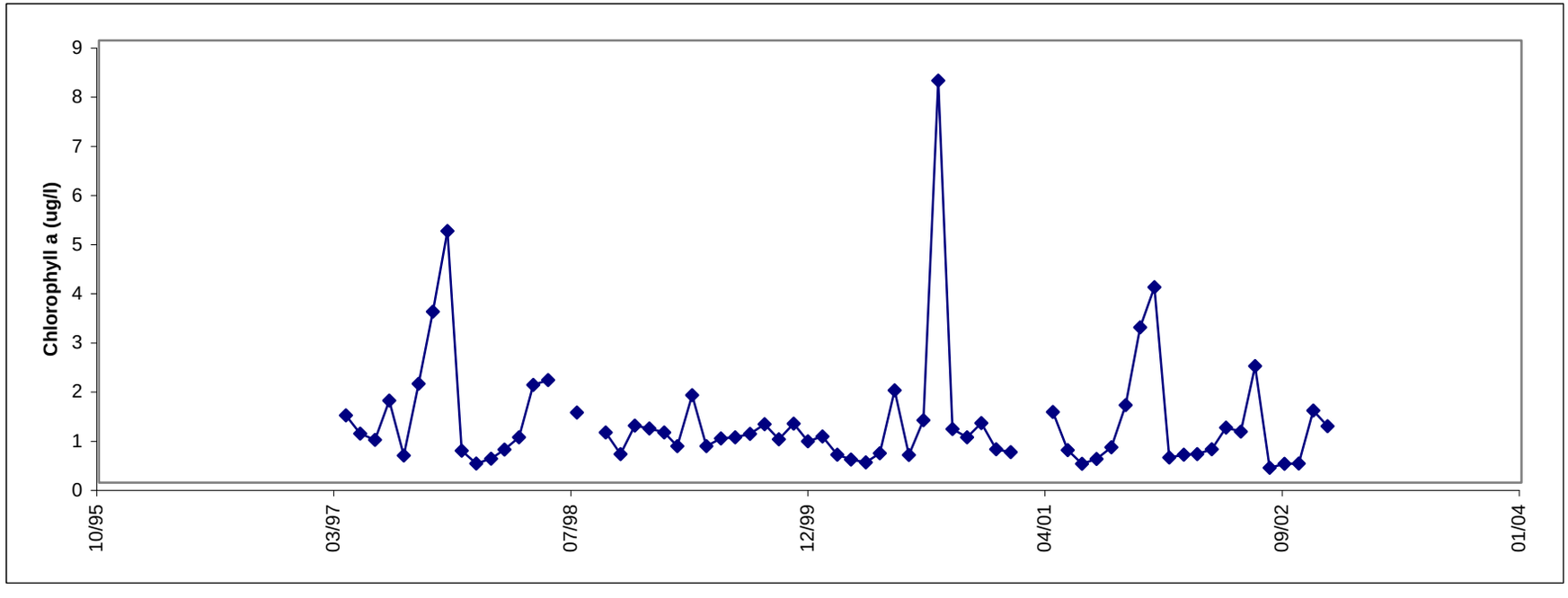
Achillea ptarmica
Agrostis canina
Agrostis stolonifera
Anomobryum filiforme
Bryum pseudotriquetrum
Caltha palustris
Cardamine pratensis
Carex demissa
Carex nigra
Cirsium palustre
Deschampsia cespitosa
Dichodontium pellucidum
Dicranella palustris
Drepanocladus exannulatus
Epilobium anagallidifolium
Epilobium nerterioides
Equisetum palustre
Filamentous alga
Fontinalis antipyretica
Hygrohypnum ochraceum
Juncus acutiflorus
Juncus articulatus
Juncus bulbosus
Juncus effusus
Juncus squarrosus
Montia fontana
Pellia epiphylla
Philonotis fontana
Potentilla erecta
Racomitrium aciculare
Ranunculus flammula
Sagina procumbens
Salix
Schistidium
Stellaria alsine
Verrucaria aethiobola

2.44.5 Phytoplankton - Trout Beck

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.45 Tweed

Borders Region, Scotland (Lat 55°36'N; Long 2°46'W)
Sponsor: Scottish Environment Protection Agency, East Region

This is a stream site located 80 kilometres from the source of the River Tweed, above Galafoot. The catchment area above this site is 150,000 ha. The catchment rises from 92 m at the sampling site to 400 m and is mainly covered by peaty and humus-iron podsols. The underlying geology of the upper Tweed catchment is of shales, mudstones, slates and greywackes. Land cover types for th e entire Tweed catchment are improved grassland (26%), rough grassland (16%), woodland (16%), heather/peatland (10%) and arable (18%) although almost all of the latter is found downstream of this site. The River Tweed has an international reputation both as a salmon river and as an excellent trout water. The Tweed has been designated as SSSI and is recognised as a nationally important example of a relatively nutrient-rich river system showing characteristic hydrological and biological sequences along its le ngth. The upper Tweed has also been designated as a National Scenic Area by Scottish Natural Heritage and there is an Environmentally Sensitive Area designation covering that portion of the catchment in the central Southern Uplands.

2.45.1 Discharge - Tweed

No data submitted to the ECN database

Current year statistics

Mean	
Max	
Min	
Std. dev	
N%	

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
44.25	35.69	31.84	36.59	46.63	41.21	47.54	31.75	18.51			

2.45.2 Spot sampled chemistry data

a) summary for 2005 - Tweed

	Units	Mean	Min	Max	Std Dev	N%
Temperature	^{o}C					
pH	pH					
Suspended Solids: Dry weight	mg/l					
Ash-free dry weight	mg/l					
Turbidity	NIU					
Conductivity	µs/cm					
Dissolved Oxygen	mg/l					
Ammonium: NH4-N	mg/l					
Total Nitrogen	mg/l					
Nitrate: NO3-N	mg/l					
Nitrite: N02-N	mg/l					
Alkalinity (CaCo3)	mg/l					
Chloride	mg/l					
Biological Oxygen demand	mg/l					
Total Phosphorous	mg/l					
Particulate Phosphorous	mg/l					
Phosphate (soluble reactive): P04-P	mg/l					
Silicate: SiO2	mg/l					
Sulphate: S04-S	mg/l					
Sodium - dissolved	mg/l					
Sodium - total	mg/l					
Potassium - dissolved	mg/l					
Potassium - total	mg/l					
Calcium - dissolved	mg/l					
Calcium - total	mg/l					
Magnesium - dissolved	mg/l					
Magnesium - total	mg/l					
Aluminium - total	µg/l					
Aluminium - labile	µg/l					
Tin - dissolved	µg/l					
Tin - total	µg/l					
Manganese - dissolved	µg/l					
Manganese - total	µg/l					
Iron - dissolved	µg/l					
Iron - total	µg/l					
Vanadium - dissolved	µg/l					
Vanadium - total	µg/l					
Nickel - dissolved	µg/l					
Nickel - total	µg/l					
Mercury - dissolved	µg/l					
Mercury - total	µg/l					
Copper - dissolved	µg/l					
Copper - total	µg/l					
Zinc - dissolved	µg/l					
Zinc - total	µg/l					
Cadmium - dissolved	µg/l					
Cadmium - total	µg/l					
Lead - dissolved	µg/l					
Lead - total	µg/l					
Arsenic - total	µg/l					

b) annual means since start of ECN - Tweed

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	9.889	10.28	9.443	11.28	9.927	9.602	9.227	9.36	9.862	7.48		
pH	pH	7.76	7.84	7.83	7.9	7.67	7.76	7.59	7.71	7.74	7.76		
Suspended Solids: Dry weight	mg/l	8.706	2.755	4.318	2.553	7.229	3.614	8.146	7.565	5.516	3.672		
Ash-free dry weight	mg/l		6										
Turbidity	NIU												
Conductivity	µs/cm	144.1	154.9	152.8	150.2	141.2	154.6	144.5	143.7	120.5	130		
Dissolved Oxygen	mg/l	10.91	11.43	11.37	10.84	10.81	11.09	10.8	11.33	11.53	12.41		
Ammonium: NH4-N	mg/l	0.056	0.043	0.028	0.023	0.015	0.026	0.02	0.019	0.02	0.018		
Total Nitrogen	mg/l								1.063				
Nitrate: NO3-N	mg/l	0.97	1.066	1.098	1.023	1.063	0.962	1.022	0.882	0.923	0.975		
Nitrite: N02-N	mg/l	0.015	0.019	0.01	0.008	0.007	0.009	0.006	0.006	0.003	0.004		
Alkalinity (CaCo3)	mg/l	47.62	48.93	51.59	48.18	47.5	47.82	42.29	44.85	45.98	46.62		
Chloride	mg/l	12.61	13.95	13.28	12.38	10.83	13.23	13.13	12.76	10.65	11.62		
Biological Oxygen demand	mg/l	2.264	1.637	1.579	1.282	1.225	1.223	1.359	1.662	1.42	1.36		
Total Phosphorous	mg/l			0.08	0.051	0.035	0.048	0.047	0.051	0.048	0.034		
Particulate Phosphorous	mg/l												
Phosphate (soluble reactive): P04-P	mg/l	0.037	0.043	0.038	0.025	0.021	0.028	0.031	0.028	0.013	0.015		
Silicate: SiO2	mg/l			3.456		4.018	4.551	4.387	4.126	4.693	4.462		
Sulphate: S04-S	mg/l												
Sodium - dissolved	mg/l												
Sodium - total	mg/l												
Potassium - dissolved	mg/l												
Potassium - total	mg/l												
Calcium - dissolved	mg/l												
Calcium - total	mg/l												
Magnesium - dissolved	mg/l												
Magnesium - total	mg/l												
Aluminium - total	µg/l												
Aluminium - labile	µg/l												
Tin - dissolved	µg/l												
Tin - total	µg/l												
Manganese - dissolved	µg/l												
Manganese - total	µg/l												
Iron - dissolved	µg/l			27.91	45.06								
Iron - total	µg/l	278.2	120.4	112.5	150.2								
Vanadium - dissolved	µg/l												
Vanadium - total	µg/l			0.5									
Nickel - dissolved	µg/l			0.597	0.521	0.596	0.775	0.916	0.832	0.795			
Nickel - total	µg/l	1.233	0.82	0.837	0.832	0.874	0.643	1.157	1.038	0.94	0.944		
Mercury - dissolved	µg/l												
Mercury - total	µg/l												
Copper - dissolved	µg/l	3.34	4.532	3.703	4.218	1.776	1.874	1.823	1.34				
Copper - total	µg/l			5.229	7.631	2.594	2.547	2.359	2.087	1.165	1.339		
Zinc - dissolved	µg/l	2.129	1.746	1.983	2.516	1.984	1.706	1.272	1.984	2.238			
Zinc - total	µg/l			3.79	4.305	4.627	2.775	3.213	3.735	2.568	1.876		
Cadmium - dissolved	µg/l	0.052	0.059	0.05	0.055	0.053	0.05	0.023	0.022	0.029			
Cadmium - total	µg/l			0.054	0.081	0.057	0.05	0.027	0.023	0.027	0.016		
Lead - dissolved	µg/l			0.536	0.529	0.515	0.5	0.431	0.368	0.234			
Lead - total	µg/l	2.069	1.15	0.956	0.716	0.873	0.645	0.871	0.883	0.442	0.273		
Arsenic - total	µg/l	0											

2.45.3 Freshwater Invertebrates, species list - Tweed

No data submitted to the ECN database

2.45.4 Freshwater Macrophytes, species list - Tweed

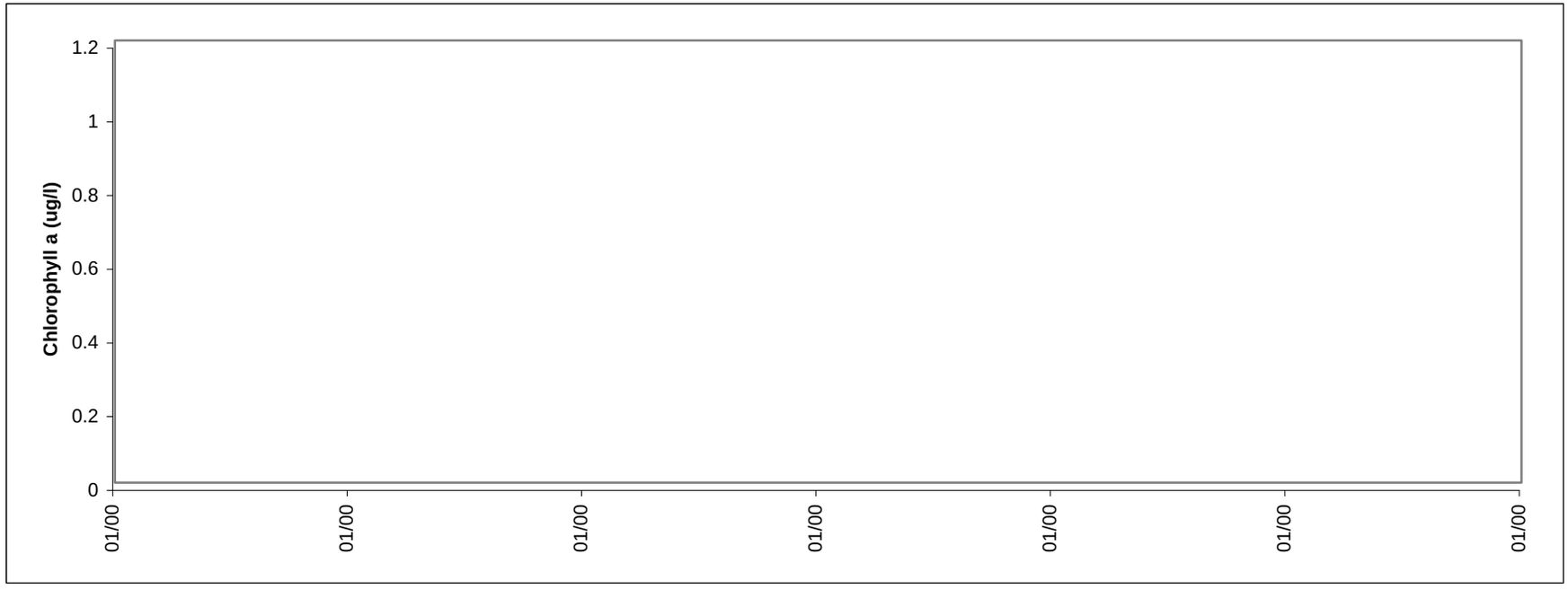
No data submitted to the ECN database

2.45.5 Phytoplankton - Tweed

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



2.46 Wye

Gwent, Wales (Lat 51°47'N; Long 2°40'W)
Sponsor: Environment Agency, Welsh Region

The River Wye is one of the largest rivers in Britain. It rises on the Plynlimon mountains at 741m AOD and flows through several towns including Rhayader, Builth Wells, Hay-on-Wye and Hereford before meeting the Severn Estuary at Chepstow. The total catchment area is 4136 km^2 and the population of 226,000 is centred on the main towns. The River Wye catchment is one of idyllic beauty and unspoilt scenery. The River Wye itself is designated as SSSI and is one of the most important rivers in Britain in nature conservation terms. Much of the lower valley is designated an Area of Outstanding Natural Beauty (AONB).

The surface water in the Wye and its tributaries is mostly unpolluted and thus much of it is suitable as a source of drinking water and for supporting a salmon and trout fishery. Nevertheless, certain rivers and streams in the upper catchment suffer from acidification and localised pollution problems resulting from inadequate sewerage and agricultural sources also exist. The Wye is one of the best-known salmon rivers in England and Wales. Shad and Sea lamprey also migrate into the Wye. The river corridor supports a variety of plant communities, otters (*Lutra lutra*), water voles (*Arvicola terrestris*), several bat species, dippers (*Cinclus cinclus*), sandmartins (*Riparia riparia*), kingfishers (*Alcedo atthis*) and little ringed plovers (*Charadrius dubius*). The biological quality of the river is generally good and supports several rare or scarce species including the mayfly (*Potamanthus luteus)*, the freshwater pearl mussel (*Margaritifera margaritifera*) and the native crayfish. The river also supports several rare species of non-aquatic invertebrates associated with gravel shoals.

2.46.1 Discharge - Wye

No data submitted to the ECN database

Current year statistics

Mean	60.13
Max	539.06
Min	9.29
Std. dev	70
N%	100

Monthly mean flow (cumecs)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
109.78	76.16	44.48	73.13	29.87	16.4	17.56	15.49	13.69	70.56	163.52	93.26

Annual mean flow since start of ECN

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
94.17	73.09	62.69	60.28	104.72	90.91	123.12	84.29	96.68	46.05	73.94	60.13

2.46.2 Spot sampled chemistry data

a) summary for 2005 - Wye

	Units	Mean	Min	Max	Std Dev	N%
Temperature	°C	11.99	3.2	21.7	5.716	26
pH	pH	7.91	7.12	8.75	0.38	26
Suspended Solids: Dry weight	mg/l	11.4231	1.5	90	18.2635	26
Ash-free dry weight	mg/l	9.1154	1.5	88	18.1451	26
Turbidity	NIU					0
Conductivity	µs/cm	266.9615	72	354	73.6687	26
Dissolved Oxygen	mg/l	10.9988	7.6	14.3	1.8187	26
Ammonium: NH4-N	mg/l	0.0479	0.015	0.18	0.0364	26
Total Nitrogen	mg/l					0
Nitrate: NO3-N	mg/l	2.73	1.21	4.25	0.8018	26
Nitrite: N02-N	mg/l	0.0149	0.009	0.05	0.0091	26
Alkalinity (CaCo3)	mg/l	96.45	36	132	29.0917	26
Chloride	mg/l	18.5881	8.44	23.5	3.7432	26
Biological Oxygen demand	mg/l	1.0654	0.5	3.5	0.7058	26
Total Phosphorous	mg/l	0.0563	0.02	0.12	0.0245	19
Particulate Phosphorous	mg/l	0.0381	0.01	0.09	0.02	26
Phosphate (soluble reactive): P04-P	mg/l					0
Silicate: SiO2	mg/l	2.0662	0.1	5.76	1.5665	26
Sulphate: S04-S	mg/l	16.0385	10.1	22.6	3.4495	26
Sodium - dissolved	mg/l					0
Sodium - total	mg/l	10.885	6.48	14.7	2.5234	26
Potassium - dissolved	mg/l					0
Potassium - total	mg/l	2.2754	1.7	3.12	0.4571	26
Calcium - dissolved	mg/l					0
Calcium - total	mg/l	40.3423	17.9	54.7	10.7274	26
Magnesium - dissolved	mg/l					0
Magnesium - total	mg/l	6.0842	2.81	8.98	1.6563	26
Aluminium - total	µg/l	150.2923	20.2	988	215.2082	26
Aluminium - labile	µg/l					0
Tin - dissolved	µg/l	1.3035	1.25	2.64	0.2726	26
Tin - total	µg/l	1.25	1.25	1.25	0	26
Manganese - dissolved	µg/l	10.7888	5	24.4	6.2365	26
Manganese - total	µg/l	30.2788	5	200	37.4265	26
Iron - dissolved	µg/l	63.9885	16.8	195	48.0059	26
Iron - total	µg/l	192.1423	39	1340	266.1843	26
Vanadium - dissolved	µg/l	1	1	1	0	26
Vanadium - total	µg/l	1.0815	1	3.12	0.4158	26
Nickel - dissolved	µg/l	1.6154	1.5	2.5	0.3258	26
Nickel - total	µg/l	1.6154	1.5	2.5	0.3258	26
Mercury - dissolved	µg/l	0.0072	0.004	0.07	0.0132	26
Mercury - total	µg/l	0.0046	0.004	0.02	0.0031	26
Copper - dissolved	µg/l	1.5235	0.5	3.29	0.8434	26
Copper - total	µg/l	1.5046	0.5	5.14	0.903	26
Zinc - dissolved	µg/l	3.5738	1	9.8	1.7081	26
Zinc - total	µg/l	4.8804	1	18.6	3.7839	26
Cadmium - dissolved	µg/l	0.05	0.05	0.05	0	26
Cadmium - total	µg/l	0.0519	0.05	0.1	0.0098	26
Lead - dissolved	µg/l	1	1	1	0	26
Lead - total	µg/l	2.0019	1	9.57	2.2518	26
Arsenic - total	µg/l	0.6523	0.5	3.23	0.5524	26

b) annual means since start of ECN - Wye

	Units	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Temperature	°C	12.04	11.38	9.038	9.914	12.03	12.24	14.07	12.23	12.73	11.66	12.9	11.99
pH	pH	7.91	8.01	7.99	8.02	7.84	8.02	8.19	7.99	8.05	8.11	7.84	7.91
Suspended Solids: Dry weight	mg/l	59.08	15	13.33	33.43	45.7	26.45	13.31	12.37	13.61	7.631	20	11.42
Ash-free dry weight	mg/l										5.132	15.84	9.115
Turbidity	NIU	28.8	9.03	7.88	19.11	25.77	16.88	8.42	9.46	11.13			
Conductivity	µs/cm	260.2	293	296.5	276.8	255.9	284.7	266.6	276.7	287.3	297.7	253.8	267
Dissolved Oxygen	mg/l	11.99	11.98	11.18	11.26	10.9	10.74	10.76			11.1	10.72	11
Ammonium: NH4-N	mg/l	0.049	0.067	0.044	0.063	0.05	0.04	0.031	0.036	0.042	0.029	0.047	0.048
Total Nitrogen	mg/l	1.01	0.767	1.012	0.635		0.471	0.628	1.053	1.112			
Nitrate: NO3-N	mg/l	2.777	2.934	3.795	3.269	3.409	3.643	3.266	3.081	2.759	2.954	2.775	2.73
Nitrite: N02-N	mg/l	0.03	0.028	0.024	0.027	0.025	0.017	0.01	0.025	0.016	0.014	0.018	0.015
Alkalinity (CaCo3)	mg/l	96.55	114.7	113.7	98.36	89.52	109.3	105.4	109	105.5	109.5	96.44	96.45
Chloride	mg/l	19.75	21.95	23	18.38	17.43	18.93	16.78	17.31	18.32	19.48	18.22	18.59
Biological Oxygen demand	mg/l	1.642	1.408	1.442	1.146	1.526	1.477	1.356	1.263	1.512	1.448	1.293	1.065
Total Phosphorous	mg/l	0.115	0.222	0.111	0.099	0.079	0.079	0.053	0.069	0.082	0.087	0.066	0.056
Particulate Phosphorous	mg/l						0.054	0.029	0.053	0.027	0.033	0.034	0.038
Phosphate (soluble reactive): P04-P	mg/l		0.021	0.065	0.037	0.038	0.031	0.018	0.036	0.017			
Silicate: SiO2	mg/l	3.515	3.596	3.414	3.254	1.825	3.715	2.684	4.056	3.034	0.945	1.607	2.066
Sulphate: S04-S	mg/l	16.23	18.24	18.98	17.46	15.63	17.03	16.35	16.68	17.05	17.64	16.41	16.04
Sodium - dissolved	mg/l		11.75	10.6	10.49	9.775	10.57	9.853	9.89	10.93			
Sodium - total	mg/l					10.03	10.5	9.949	10.36	10.96	11.86	10.91	10.89
Potassium - dissolved	mg/l		2.531	1.992	2.169	2.079	2.203	1.902	2.014	2.264	2.198		
Potassium - total	mg/l					2.236	2.33	1.946	2.095	2.326	2.171	2.313	2.275
Calcium - dissolved	mg/l	39.13	44.32	44.18	39.63	38.62	44.76	41.7	41.94	45.29			
Calcium - total	mg/l					39.88	45.56	42.19	45.39	46.35	44.31	40.69	40.34
Magnesium - dissolved	mg/l	5.666	6.61	6.631	6.428	5.55	6.465	6.156	6.215	6.809			
Magnesium - total	mg/l					5.767	6.606	6.24	6.553	6.887	6.904	6.383	6.084
Aluminium - total	µg/l	334.1	123	140.3	167.9	379.6	258.4	117.3	160.9	227.3	127	240.5	150.3
Aluminium - labile	µg/l												
Tin - dissolved	µg/l										1.324	1.574	1.304
Tin - total	µg/l	2.5	1.731	1.25	1.161	1.5	1.716	2.344	1.816	2.575	1.474	1.439	1.25
Manganese - dissolved	µg/l										10.04	10.55	10.79
Manganese - total	µg/l	54.33	34.15	42.88	59.5	97.59	50.59	27.12	23.72	26.16	21.98	53.57	30.28
Iron - dissolved	µg/l						43.05	60.92	48	50.06	47	70.67	63.99
Iron - total	µg/l	297.8	137.8	145.2	281.4	380.5	319.5	158.1	137.5	173.3	134.8	314.1	192.1
Vanadium - dissolved	µg/l										1.225	1.042	1
Vanadium - total	µg/l	2.406	1.223	1.115	1.907	2.074	2.082	1.276	1.093	1.251	1.375	1.198	1.082
Nickel - dissolved	µg/l						1.588	1.5	1.5	1.5	1.588	1.5	1.615
Nickel - total	µg/l	3.083	3.435	2.5	3.329	1.779	1.709	1.5	1.5	1.5	1.588	1.668	1.615
Mercury - dissolved	µg/l										0.005	0.005	0.007
Mercury - total	µg/l	0.01	0.005	0.006	0.011	0.005	0.005	0.005	0.004	0.004	0.006	0.005	0.005
Copper - dissolved	µg/l	1.638	1.085	1.123	1.922	1.337	1.256	1.005	1.228	1.152	1.327	1.383	1.524
Copper - total	µg/l					2.508	1.851	1.228	1.574	1.83	1.352	2.296	1.505
Zinc - dissolved	µg/l		5.367	5.125	4.87	4.326	3.688	3.042	4.167	4.805	5.066	3.549	3.574
Zinc - total	µg/l					10.08	7.675	5.02	5.838	12.25	6.255	9.769	4.88
Cadmium - dissolved	µg/l	0.15	0.094	0.05	0.056	0.05	0.052	0.05	0.05	0.05	0.053	0.05	0.05
Cadmium - total	µg/l					0.056	0.05	0.05	0.05	0.05	0.053	0.067	0.052
Lead - dissolved	µg/l						1	1	1	1	1.059	1.044	1
Lead - total	µg/l	4.283	1.808	3.636	2.824	3.459	2.506	1.229	1.13	2.791	1.502	5.378	2.002
Arsenic - total	µg/l		0.955	0.5	0.5	0.524	0.5	0.5	0.5	0.5	0.529	0.616	0.652

2.46.3 Freshwater Invertebrates, species list - Wye

Ancylus fluviatilis
Antocha vitripennis
Aphelocheirus aestivalis
Asellus aquaticus
Baetis rhodani
Baetis Scambus Group
Bithynia leachii
Bithynia tentaculata
Brachycentrus subnubilus
Caenis pusilla
Caenis Luctuosa Group
Cheumatopsyche lepida
Chironomidae
Chrysops
Cloeon dipterum
Corixidae
Crangonyx pseudogracilis
Dendrocoelum lacteum
Dugesia tigrina
Dugesia Polychroa Group
Elmis aenea
Ephemera danica
Ephemerella ignita
Erpobdella octoculata
Gammarus pulex
Glossiphonia complanata
Glossoscolecidae
Haliplus fluviatilis
Helichus substriatus
Heptagenia sulphurea
Hydracarina
Hydropsyche contubernalis
Hydropsyche pellucidula
Leuctra geniculata
Limnius volckmari
Lumbricidae
Lumbriculidae
Lymnaea peregra
Normandia nitens
Oulimnius troglodytes
Oulimnius tuberculatus
Oulimnius
Physa fontinalis
Physa
Pisidium
Planaria torva
Planorbis
Polycelis Nigra Group
Polycentropus flavomaculatus
Potamanthus luteus
Potamonectes depressus
Procloeon bifidum
Psychomyia pusilla
Sialis lutaria
Sigara dorsalis
Simulium (Simulium) Ornatum Group
Sphaerium
Stictotarsus duodecimpustulatus
Theodoxus fluviatilis
Tubificidae
Valvata piscinalis

2.46.4 Freshwater Macrophytes, species list - Wye

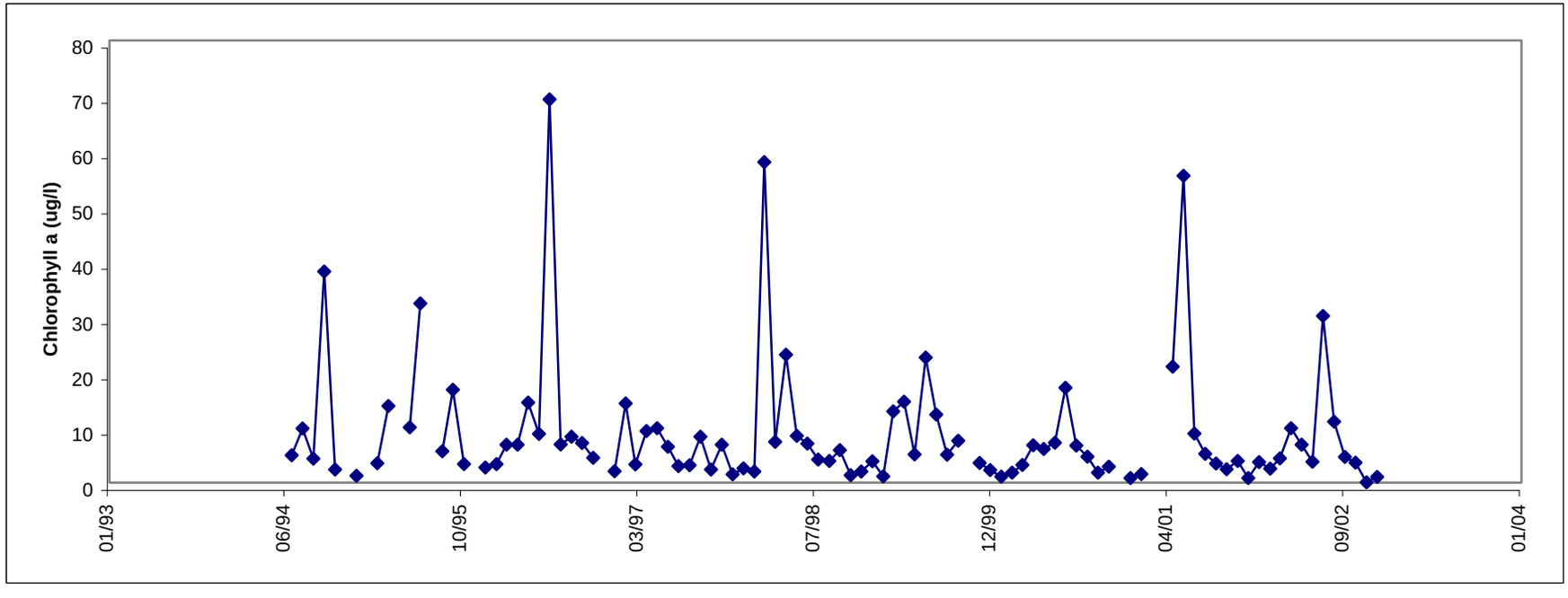
Alisma plantago-aquatica
Amblystegium fluviatile
Apium nodiflorum
Butomus umbellatus
Carex riparia
Cladophora
Elodea nuttallii
Enteromorpha
Filamentous alga
Fissidens
Fontinalis antipyretica
Hildenbrandia rivularis
Lemna minor
Lemna polyrhiza
Mentha aquatica
Myriophyllum spicatum
Pellia endiviifolia
Phalaris arundinacea
Polygonum amphibium
Potamogeton pectinatus
Potamogeton perfoliatus
Potamogeton pusillus
Ranunculus fluitans
Sparganium erectum

2.46.5 Phytoplankton - Wye

Chlorophyll a (µg/l)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Chlorophyll a - time series



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