



**THE UNITED KINGDOM
ENVIRONMENTAL CHANGE NETWORK**

ANNUAL DATA DIGEST 2005

PART 1 – TERRESTRIAL 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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Susannah Rennie (NERC/CEH)	Stuart Corbett (DSTL)
Lorna Sherrin (NERC/CEH)	Beverly Dodd (NERC/CEH)
Lynne Irvine (NERC/CEH)	David Hamilton (SEERAD/Macaulay)
Mandy Lane (NERC/CEH)	Simon McMillan (DEFRA/ADAS)
Andy Scott (NERC/CEH)	Michael Morecroft (NERC/CEH)
Terry Parr (NERC/CEH)	Matt Murphy (CCW)
John Adamson (NERC/CEH)	Imogen Pearce (NERC/CEH)
Roy Anderson (DARD(NI))	Tony Scott (BBSRC/IACR)
Chris Andrews (NERC/CEH)	Michele Taylor (NERC/CEH)
John Bater (BBSRC/IACR)	Maddie Thurlow (NERC/CEH)
Deb Beaumont (BBSRC/IGER)	Christine Tilbury (FC)
Sue Benham (FC)	Linda Turner (NERC/CEH)
Rob Brooker (NERC/CEH)	Helen Watson (SEERAD/Macaulay)
Gordon Common (SEERAD/Macaulay)	Mike Whittaker (CCW)
Richard Cooper (SEERAD/Macaulay)	Chris Wood (CCW)

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September 2006

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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 volume summarises ECN data collected in 2005 from the Terrestrial sites, and makes comparisons with the results from previous years. Data from the Freshwater ECN sites, for which data collection started in 1995, 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 not becoming operational until 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: ecncu@ceh.ac.uk

1.4 ECN Terrestrial Sites

There are currently 12 terrestrial ECN sites in operation (Table 1.4.1). Eight sites commenced operation in 1993 with Alice Holt and Porton Down joining in 1994, Y Wyddfa/Snowdon joining in 1995 and the Cairngorms in 1999.

Table 1.4.1 ECN Terrestrial Sites

Site	Site Managers	Sponsor
ALICE HOLT , Surrey	Sue Benham	Forestry Commission
ADAS DRAYTON , Warwickshire	Simon McMillan	Department for Environment, Food and Rural Affairs
CAIRNGORMS , Inverness-shire	Rob Brooker	Scottish Natural Heritage & Natural Environment Research Council
GLENSAUGH , Grampian	David Hamilton	Scottish Executive Environment and Rural Affairs Department (through the Macaulay Institute)
HILLSBOROUGH , Co. Down	Roy Anderson	Department of Agriculture and Rural Development (Northern Ireland)
MOOR HOUSE & UPPER TEESDALE , Cumbria & Durham	John Adamson	Natural Environment Research Council & English Nature

NORTH WYKE , Devon	Deb Beaumont	Biotechnology & Biological Sciences Research Council
PORTON , Wiltshire	Stuart Corbett	Defence Science and Technology Laboratory
ROTHAMSTED , Hertfordshire	Tony Scott & John Bater	Biotechnology & Biological Sciences Research Council
SOURHOPE , Borders	Gordon Common	Scottish Executive Environment and Rural Affairs Department (through the Macaulay Institute)
WYTHAM , Oxfordshire	Michele Taylor	Natural Environment Research Council & Oxford University
Y WYDDFA/SNOWDON , Gwynedd	Matthew Murphy	Countryside Council for Wales/ The National Assembly for Wales

1.5 The ECN Database

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. This is achieved through published documents and increasingly through the ECN website (www.ecn.ac.uk).

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 provides links to this database, allowing users to generate their own summary data tables and graphs, and to download datasets to their local machine.

ECN's sponsors have agreed that summary data from the ECN database should be made openly available (subject to some conditions of use). 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.

In general each section of the report falls into two parts, one describing the data for the current year and its variation over the year, the other making comparisons across time of annual summary statistics. Annual statistics are calculated from monthly values compiled from the measurements made during each month. For variables that are strongly seasonal in nature, for example air temperature, annual values are only given if an estimate is available for each month of the year, since summary statistics produced from incomplete years would be biased. Similarly, for variables measured hourly that exhibit a strong diurnal pattern, monthly summary statistics are calculated only from complete days. The absence of an annual or monthly summary statistic does not therefore necessarily imply that no data was collected for that year or month.

2001 was a particularly difficult year because restrictions arising from the foot and mouth outbreak affected data collection at some sites. With the exception of gaps due to foot and mouth, most of the gaps in the data provided for the year 2001 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. Meteorology

There is much present concern that human activities are inadvertently changing the earth's climate through an enhanced 'greenhouse effect', by continuing emissions of carbon dioxide and other gases that will cause the temperature of the earth's surface to increase. The local impact of these global changes in climate is not yet known. Climatic conditions, particularly temperature and rainfall, probably provide the most important constraint on ecological processes; knowledge of long-term changes in climate therefore provides the starting point for any analysis of changes in ecosystem structure and dynamics at a site. Two forms of meteorological measurements are made at ECN terrestrial sites, standard met office measurements and automated recording using an automatic weather station (AWS). Summary statistics are given for the AWS data.

2.1 Automatic Weather Station

Several ECN sites are geographically remote and this severely restricts the possible frequency of meteorological measurements because these sites cannot be visited consistently at intervals of less than a week. Meteorological data collected at frequent intervals over very long periods are needed both for many ECN purposes and also for environmental research programmes associated with ECN. During the last 20 years there have been considerable advances in the technical development of sensors and data logging devices for automatically measuring and recording meteorological data. Equally important has been the increased reliability of these sensing and logging devices. ECN automatic weather stations (AWS) have therefore been configured to measure and record at hourly intervals a basic set of meteorological variables which will provide information on temporal changes in these variables, aid in the interpretation of other ECN core measurements, and provide data to support other environmental research at ECN sites.

Meteorology (AWS) - Solar radiation (W/m2)

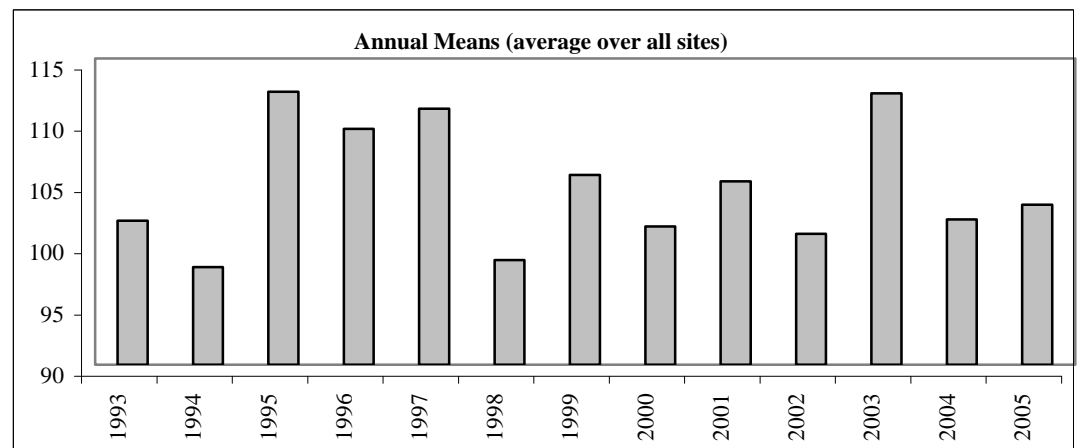
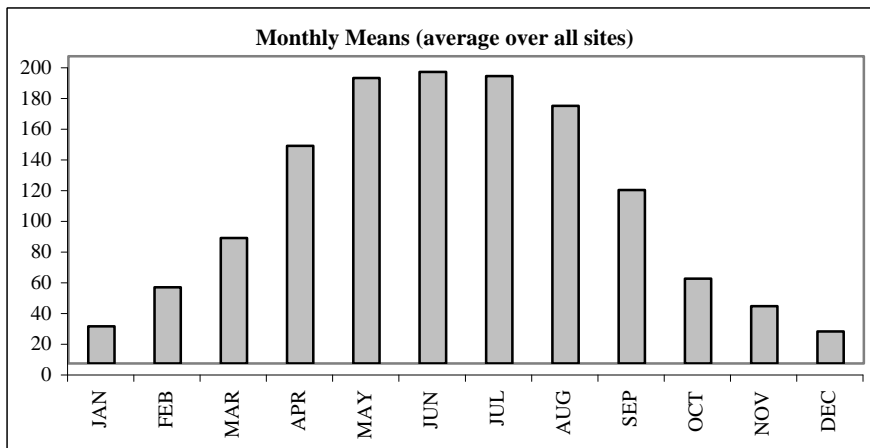
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	30	49	82	140	196	200	183	178	121	63	42	31
CAI	15	39	78	142	146	170	162	126	92	51	22	12
DRA												
GLE	20	57	70	136	184	162	189	139	86	38	25	11
HIL												
MOO	17	50	82	142	188	179	170	164	109	39	34	17
NOR	33	58	90	146	186	196	179	186	119	66	50	24
POR												
ROT	33	51	85	143	189		209	200	138	75	47	30
SNO	18	43	80	120	185	208	210	171	113	50	39	20
SOU	20	46	82	158	187	192	180	151	108	45	32	15
WYT	32	53	85	148	211	213	200	194	130	69	45	27
Average	24	50	82	142	186	190	187	168	113	55	37	21
Std. dev.	7	6	5	10	16	17	16	24	16	13	9	7

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			117	110	113	105	111	103	109	108	118	107	110	110	5
CAI										91	103		88	94	8
DRA	106	112	119	112	113	106	110		110	112	120	111		112	4
GLE			107	95	109	90	97	96	98	89	103	94	93	97	6
HIL		70	81							95	104			88	15
MOO	88	91		94	98	86	94	94	96	91	108	95	99	95	6
NOR				121	111	106	108	107	110	107			111	110	5
POR			123	118	126										
ROT			121	117	119	108	118	109	112	110	127			116	6
SNO					97	87	93	93	97	91	103	94	105	96	6
SOU		101	106	99	106	88	99	97	97	96	109	97	101	100	6
WYT	111	116	124	118	119	111	119	112	117	117	127	115	117	117	5
Average	102	98	112	109	111	99	106	101	105	101	112	102	103		
Std. dev.	12	18	14	11	9	11	10	7	8	10	10	9	10		

9



Meteorology (AWS) - Net radiation (W/m2)

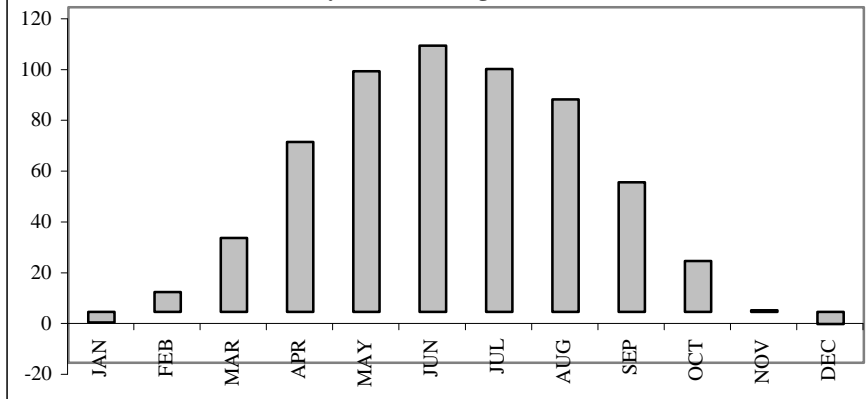
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0	8	19	37	52	57	51	51	33	14	5	1
CAI	-5	-1	27	75	87	107	99	72	43	19	3	-5
DRA												
GLE	-10	1	18	67	95	92	105	72	38	14	-8	-9
HIL												
MOO	-2	10	25	76	103	99	64	70	43	10	0	-4
NOR	-5	8	31	61	97	128	115	119	74	41		-2
POR												
ROT	-2	22	45	70	113	124	102	101	70	31	9	1
SNO	1	6	25	45	76	88	90	67	40	15	0	
SOU	-11	7	42	108	136	146	133	107	66	14	-7	-16
WYT	-3	10	32	63	95	103	101	94	53	23	3	-3
Average	-4	8	29	67	95	105	96	84	51	20	1	-5
Std. dev.	4	6	9	19	22	24	23	21	14	9	5	5

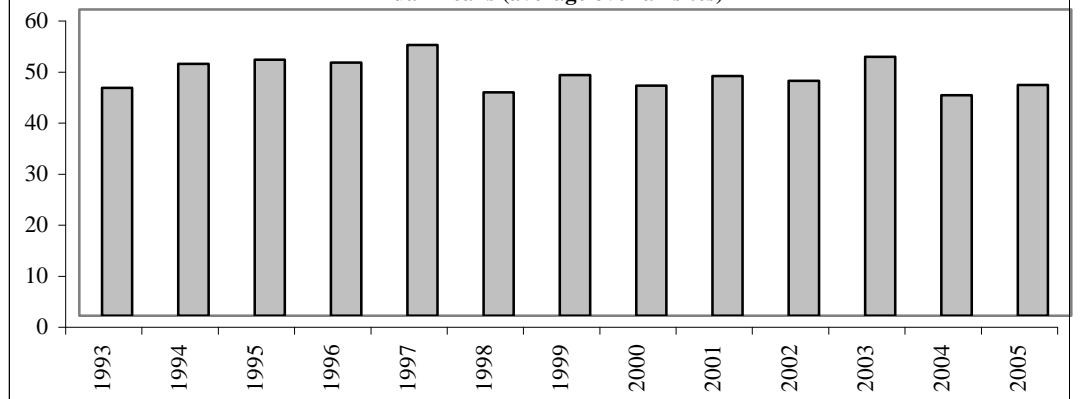
Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			49	45	48	44	50		49		46	26	27	43	9
CAI										39	55		43	46	8
DRA	50	55	60	53	56	53	47		47	53	56	50		53	4
GLE			21	34	39	27	31	36	39	38	39	38	40	35	6
HIL		36	45							42	46			42	5
MOO	40	41	49	44	49	40	45	45	44	43	54	48	41	45	4
NOR				48					52	52				51	2
POR			52	53	58										
ROT		55	58	54	62	51	59	50	55	50	65		57	56	5
SNO					35	29	34	32	29	31	30	33		32	2
SOU		60	67	65	78	55	62	62	60	62	63	59	60	63	6
WYT	43	49	50	51	54	50	50	47	49	50	53	49	48	49	3
Average	45	49	50	50	53	44	47	45	47	46	51	43	45		
Std. dev.	5	9	13	8	13	11	11	10	9	9	11	11	11		

Monthly Means (average over all sites)



Annual Means (average over all sites)



Meteorology (AWS) - Temperature (degC)

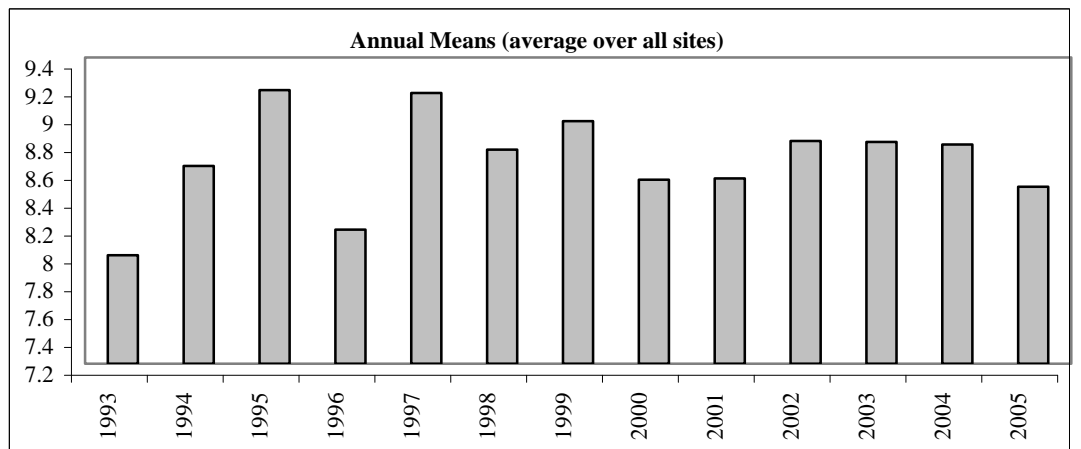
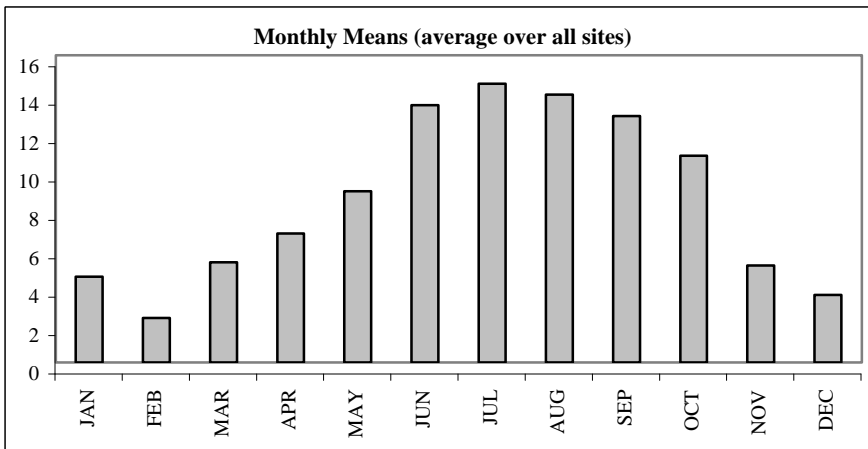
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	6.0	3.8	6.8	8.8	11.4	15.7	16.9	16.1	14.9	13.0	9.6	3.8
CAI	1.1	-0.8	2.5	3.5	5.1	10.0	10.6	10.3	9.4	7.1	2.4	1.7
DRA												
GLE	4.6	2.0	5.0	6.0	8.0	12.3	13.9	12.9	11.4	9.4	4.7	3.9
HIL												
MOO	2.5	0.6	3.1	4.1	6.4	10.9	12.1	11.7	10.5	8.9	2.8	1.8
NOR	6.6	4.0	6.5	8.1	10.5	15.0	16.4	15.4	14.4	12.8	6.1	4.7
POR												
ROT	5.8	3.6	6.7	9.0	11.5	16.1	17.0	16.5	15.4	13.1	4.2	4.0
SNO	4.5	2.3	5.2	5.8	7.9	12.2	13.4	13.0	12.2	10.2	5.5	4.2
SOU	3.5	1.9	4.6	5.8	8.2	12.6	13.7	13.0	12.0	9.5	4.1	3.1
WYT	5.8	3.6	6.6	9.3	11.2	15.7	16.8	16.6	15.3	13.1	6.1	4.5
Average	4.5	2.3	5.2	6.7	8.9	13.4	14.5	13.9	12.8	10.8	5.0	3.5
Std. dev.	1.7	1.5	1.5	2.0	2.2	2.1	2.2	2.2	2.1	2.1	2.0	1.0

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			11.0	10.0	10.6	10.5	10.9	10.6	10.5	11.3	10.9	10.7	10.6	10.7	0.3
CAI										5.1	6.0		5.2	5.4	0.5
DRA	9.6	10.4	10.5	9.2	10.5	10.4	10.8		10.1	10.8	10.4	10.4		10.3	0.5
GLE			7.6	7.0	8.2	7.6	7.6	7.8	7.3	7.8	8.4	7.9	7.8	7.7	0.4
HIL		8.7	9.5							9.6	9.6			9.3	0.4
MOO	5.2	5.6	6.0	5.2	6.5	6.0	6.1	6.0	5.6	6.4	6.5	6.7	6.3	6.0	0.5
NOR				9.0	10.1	10.2	10.3	10.0	9.9	10.3			10.0	10.0	0.4
POR			10.2	8.8	10.2										
ROT		10.2	10.2	8.9	10.3	10.1	10.4	10.1	9.9	10.5	10.4		10.2	10.1	0.4
SNO					7.0	6.7	6.8	6.6	6.7	6.9	7.5	7.9	8.0	7.1	0.6
SOU		6.8	7.3	6.5	7.9	7.3	7.4	7.3	7.3	7.9	8.2	7.7	7.7	7.4	0.5
WYT	9.1	10.1	10.3	8.9	10.3	9.8	10.2	9.9	9.6	10.2	10.1	10.1	10.4	9.9	0.5
Average	8.0	8.6	9.2	8.2	9.1	8.7	8.9	8.5	8.5	8.8	8.8	8.8	8.5		
Std. dev.	2.4	2.0	1.8	1.6	1.6	1.8	1.9	1.8	1.8	2.1	1.8	1.6	1.9		

8



Meteorology (AWS) - Maximum daily temperature (degC)

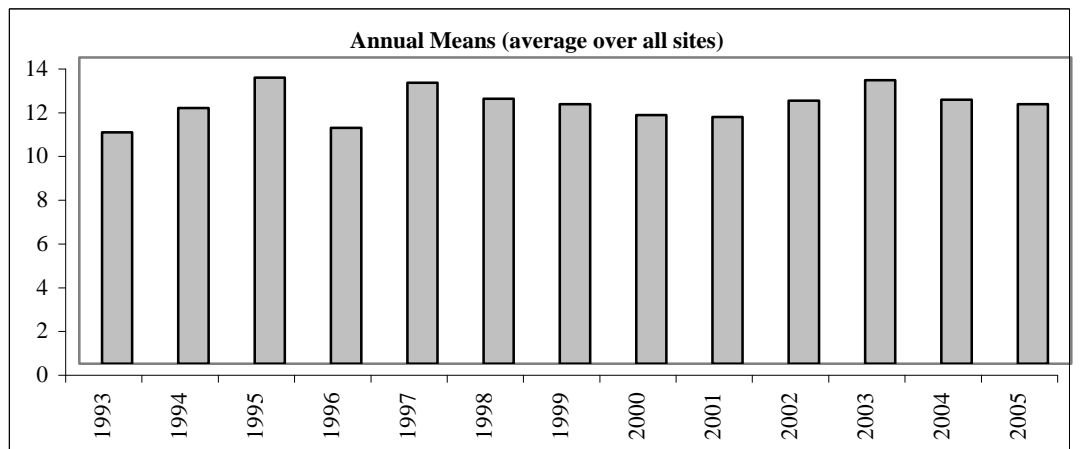
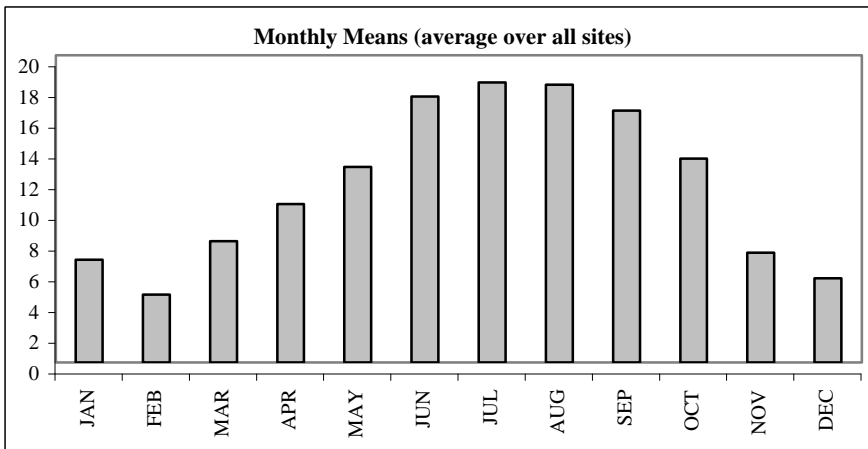
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	8.5	6.5	10.6	13.4	16.3	20.8	21.7	22.1	20.0	16.4		
CAI	3.3	0.5	4.7	7.0	8.5	13.5	13.8	13.2	12.1	9.4	4.6	3.2
DRA												
GLE			7.3	9.4	12.0	15.9	17.9	17.5	15.2	11.5	7.0	5.9
HIL												
MOO	4.5	2.4	5.1	7.4	9.9	14.2	15.5	15.0	13.3	10.9	5.8	3.7
NOR	8.7	6.3	9.6	11.8	14.3	19.1	20.1	19.9	18.2	15.2	9.6	7.2
POR												
ROT	8.4	6.1	10.0	13.2	16.0	21.4	21.5	21.9	20.1	16.4		6.5
SNO	6.1	3.9	7.3	8.0	10.4	14.8	15.6	15.2	14.4	12.2	7.5	5.6
SOU	5.8	3.7	6.8	9.1	11.6	16.0	17.0	16.4	14.8	11.6	6.7	5.0
WYT	8.3	5.9	9.7	13.5	15.6	20.2	21.0	21.6	19.6	16.0	8.9	6.7
Average	6.7	4.4	7.9	10.3	12.7	17.3	18.2	18.1	16.4	13.3	7.1	5.5
Std. dev.	1.9	2.0	2.1	2.5	2.7	2.9	2.8	3.2	2.9	2.6	1.6	1.3

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		13.6	14.8	14.0	14.1	14.3	14.9	14.4	14.4	15.2	15.6	14.6	15.6	14.6	0.6
CAI							8.7	6.8	7.6	7.5	10.6	10.4	7.8	8.5	1.5
DRA	13.6	14.4	15.1	14.2	15.9	14.4	14.8	14.8	14.3	15.0	15.3	14.6		14.7	0.6
GLE		11.2	11.5	8.5	12.1	11.1	10.7	11.0	10.4	11.4	13.0	11.1	12.0	11.1	1.1
HIL		12.1	13.8						10.5	12.9	13.5			12.6	1.3
MOO	8.4	8.2	9.0	7.7	9.3	8.5	8.8	8.6	8.4	9.1	9.7	8.0	9.0	8.7	0.6
NOR			15.9	11.1	14.6	13.3	13.6	13.1	13.3	13.6	14.4	14.0	13.3	13.7	1.2
POR		8.9	14.2	12.6	14.1										
ROT	14.3	13.7	14.2	12.6	14.3	13.9	14.2	13.7	13.4	14.3	14.8	14.4	14.7	14.0	0.6
SNO			11.3	5.7	9.0	8.9	8.7	8.5	8.9	9.2	9.7	9.8	10.1	9.1	1.4
SOU	4.1	9.5	10.1	9.0	11.3	10.7	10.5	9.6	9.9	10.5	11.8	10.3	10.4	9.8	1.9
WYT	12.6	13.7	14.1	12.5	13.9	13.8	13.8	13.3	13.1	13.7	14.2	13.7	13.9	13.6	0.5
Average	10.6	11.7	13.1	10.8	12.8	12.1	11.9	11.4	11.3	12.0	13.0	12.1	11.9		
Std. dev.	4.3	2.4	2.3	2.9	2.3	2.3	2.6	2.9	2.5	2.7	2.2	2.4	2.7		

6



Meteorology (AWS) - Minimum daily temperature (degC)

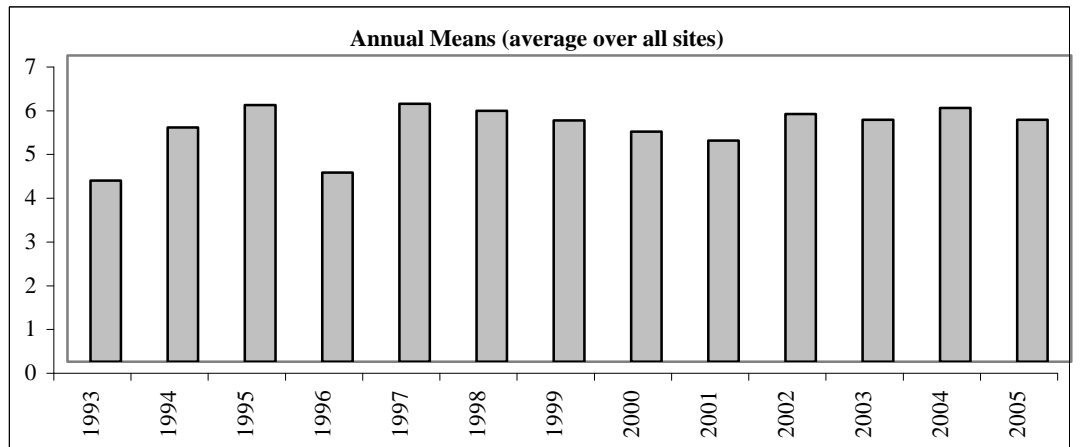
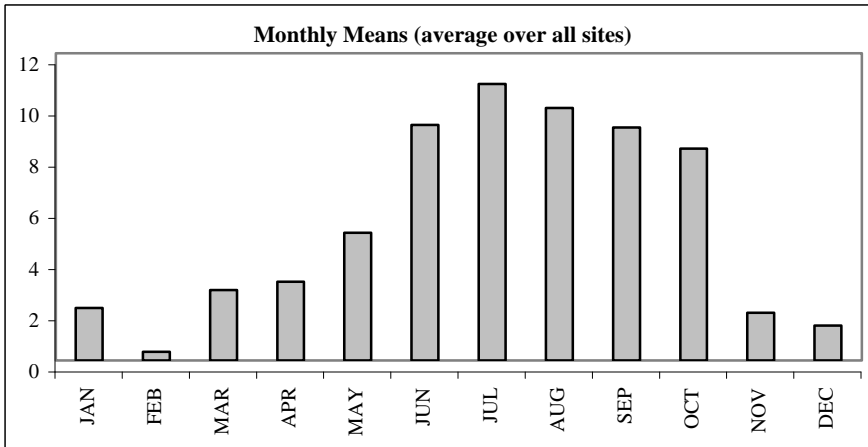
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	3.2	0.9	3.0	3.7	5.8	9.8	11.8	10.3	9.4	9.6		
CAI	-1.0	-2.1	0.8	0.4	2.1	6.8	7.7	7.7	6.9	5.0	0.2	0.0
DRA												
GLE			3.2	2.7	4.5	8.7	10.1	8.9	8.0	7.0	2.3	2.0
HIL												
MOO	0.0	-1.3	0.7	0.5	2.6	6.4	8.2	7.9	7.1	6.4	-0.1	-0.4
NOR	4.1	1.4	3.6	4.2	6.3	10.8	12.7	10.5	9.8	10.1	2.4	1.8
POR												
ROT	3.1	1.1	3.6	4.5	6.6	10.2	12.5	10.9	10.7	10.0		1.3
SNO	2.9	0.9	3.6	3.7	5.5	9.9	11.2	11.0	10.1	8.6	3.6	2.9
SOU	0.9	0.3	2.7	2.7	4.8	9.4	10.3	9.6	8.9	7.4	1.8	1.2
WYT	3.3	1.5	3.8	5.2	6.8	10.9	12.7	11.9	11.1	10.5	2.9	2.2
Average	2.1	0.3	2.8	3.1	5.0	9.2	10.8	9.9	9.1	8.3	1.9	1.4
Std. dev.	1.7	1.3	1.1	1.6	1.6	1.5	1.8	1.4	1.4	1.8	1.3	1.0

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		7.0	6.3	6.0	6.3	6.6	6.7	6.6	6.3	7.3	6.1	6.6	6.8	6.5	0.4
CAI							4.0	2.8	3.2	2.9	4.9	5.0	2.9	3.7	1.0
DRA	5.3	6.1	5.7	5.2	6.5	6.0	6.4	6.8	5.7	6.4	5.1	5.9		5.9	0.6
GLE		5.7	5.1	3.5	5.6	5.3	4.8	4.9	4.6	5.3	6.0	5.0	5.7	5.1	0.7
HIL		6.5	6.5						5.0	6.0	6.0			6.0	0.6
MOO	2.7	2.6	2.5	2.2	3.1	3.3	3.1	3.2	2.4	3.3	2.8	2.6	3.2	2.8	0.4
NOR			7.9	4.7	7.4	6.9	6.8	6.4	6.2	6.9	6.6	8.1	6.5	6.8	0.9
POR		3.3	6.3	5.2	6.6										
ROT	6.8	6.3	6.2	5.0	6.2	6.4	6.4	6.3	6.2	6.7	5.9	6.8	6.8	6.3	0.5
SNO			7.1	1.9	5.1	5.0	5.0	4.8	5.0	5.3	5.6	6.2	6.1	5.2	1.3
SOU	0.2	4.2	4.5	4.1	5.4	5.4	5.3	4.3	4.7	5.3	5.8	5.1	5.0	4.6	1.4
WYT	5.8	6.5	6.6	5.5	6.8	6.9	6.7	6.6	6.3	6.9	6.2	6.8	6.9	6.5	0.4
Average	4.1	5.4	5.9	4.3	5.9	5.7	5.5	5.3	5.1	5.7	5.5	5.8	5.5		
Std. dev.	2.7	1.6	1.4	1.4	1.2	1.2	1.3	1.5	1.3	1.4	1.0	1.5	1.5		

01



Meteorology (AWS) - Wet bulb depression (degC)

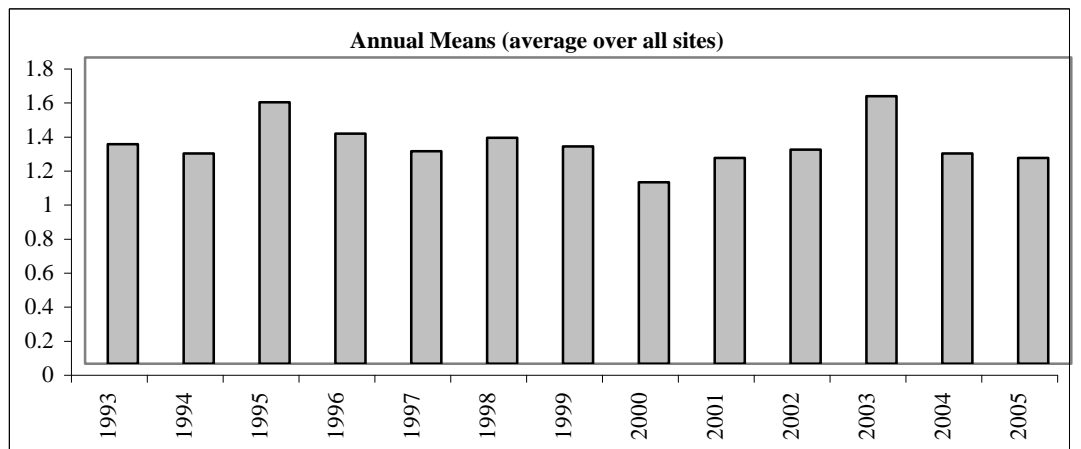
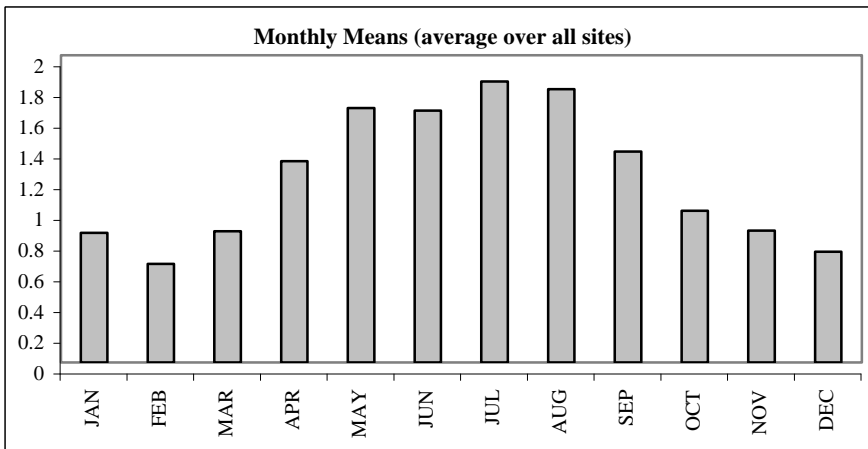
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.7	1.0	1.4	1.8	2.3	2.5	2.6	2.6	1.7	1.1	1.2	0.8
CAI	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.8	0.7	0.5
DRA												
GLE	0.6	0.3	0.5	0.9	1.1	1.1	1.6	1.4	1.1	0.8	1.0	0.8
HIL												
MOO	0.3	0.2	0.3	0.9	1.4	1.4	1.6	1.4	1.2	0.8	0.6	0.4
NOR	0.9	0.0	0.5	1.0	1.7	1.8	1.8	2.0	1.4	1.1	0.8	0.5
POR												
ROT	1.3	1.0	1.3	2.0	2.4	2.1	2.8	3.2	2.2	1.4	0.6	0.6
SNO	1.3	1.0	1.2	1.7	2.1	2.0	2.1	1.7	1.9	1.5	1.6	1.2
SOU	0.6	0.4	0.6	1.1	1.3	1.1	1.2	0.8	0.8	0.3	0.2	0.1
WYT	1.5	1.4	1.6	1.9	2.2	2.3	2.4	2.7	1.7	1.2	1.1	1.6
Average	0.8	0.6	0.9	1.3	1.7	1.6	1.8	1.8	1.4	1.0	0.9	0.7
Std. dev.	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.9	0.5	0.4	0.4	0.4

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			2.0	2.2	1.7	1.6	1.6	1.5	1.7	1.8	2.0	1.5	1.6	1.8	0.2
CAI													0.5		
DRA	1.7	1.7	2.2	1.9	1.8	1.8	1.8		1.8	1.8	2.1	1.6		1.8	0.2
GLE			1.4	1.0	0.7	0.6	0.5	0.4	0.6		1.3	1.0	0.9	0.8	0.4
HIL		0.9	1.2							0.4	1.1			0.9	0.3
MOO	0.9	1.0	1.1	1.1	1.0	0.7	0.8	0.9	0.7	1.0	1.2		0.9	0.9	0.2
NOR				1.5	1.4	2.8	2.1	1.8	0.8	1.3			1.1	1.6	0.6
POR			1.3	0.4	1.2										
ROT		1.4	2.0	1.8	1.8	1.5	1.8	1.2	1.7	1.4	1.8		1.7	1.6	0.2
SNO					0.7	0.3	0.4	0.4	0.8	0.7	1.3	1.5	1.6	0.9	0.5
SOU		1.1	1.1	0.7	0.9				1.1	1.2	1.4	0.8	0.7	1.0	0.2
WYT	1.3	1.4	1.6	1.5	1.3	1.5	1.2	1.3	1.7	1.7	2.2	1.0	1.8	1.5	0.3
Average	1.3	1.2	1.5	1.4	1.2	1.3	1.3	1.1	1.2	1.3	1.6	1.2	1.2		
Std. dev.	0.4	0.3	0.4	0.6	0.4	0.8	0.7	0.5	0.5	0.5	0.4	0.3	0.5		

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Meteorology (AWS) - Relative Humidity (%)

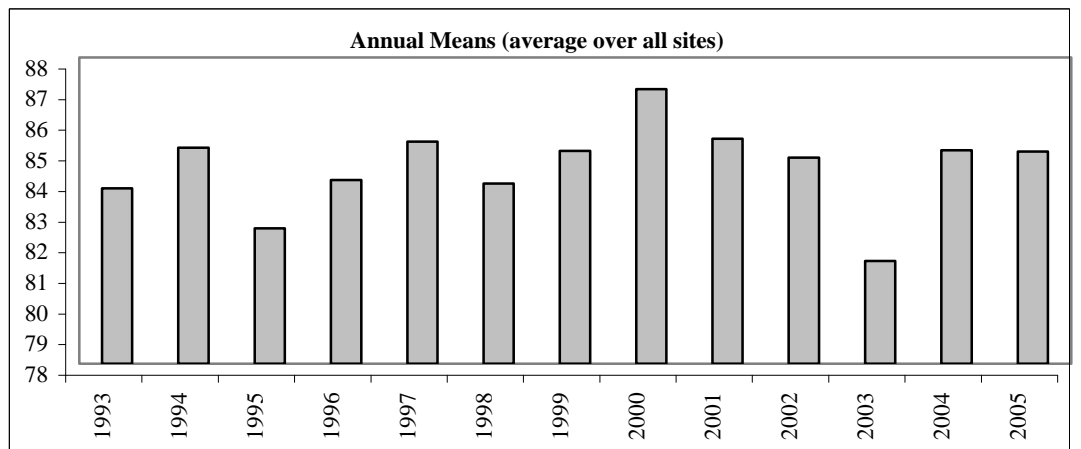
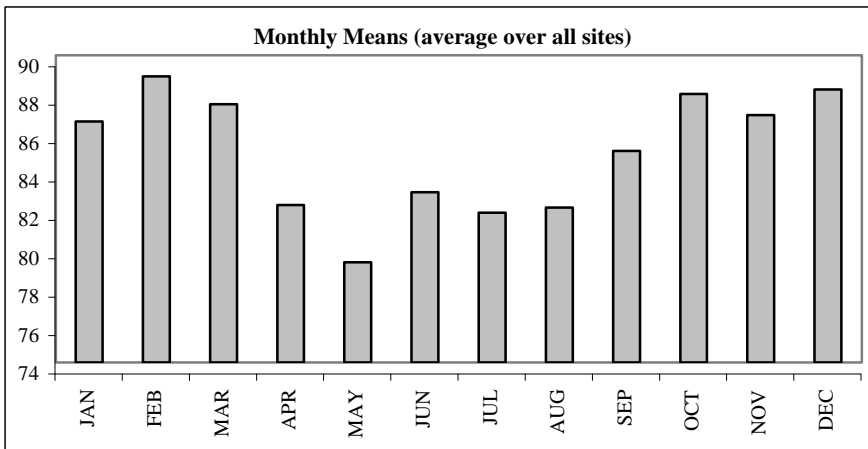
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	89.3	83.9	81.6	78.3	74.0	76.3	77.2	76.8	83.1	87.7	85.6	87.0
CAI	92.9	92.1	92.8	93.2	93.2	94.3	94.5	94.6	94.5	89.0	88.0	90.5
DRA												
GLE	89.4	94.3	92.2	86.8	85.1	87.0	83.1	84.7	86.6	90.0	83.6	86.5
HIL												
MOO	93.9	96.0	95.1	86.0	79.7	83.8	82.2	84.0	85.2	89.8	90.7	93.3
NOR	86.8	100	94.2	86.8	80.2	82.3	83.3	81.0	85.0	87.7	88.9	92.6
POR												
ROT	81.0	82.9	81.3	74.9	73.2	79.4	74.2	70.8	78.4	84.1	90.8	90.5
SNO	78.6	81.5	81.8	74.7	70.9	77.3	76.8	80.7	78.1	80.7	74.4	80.6
SOU	90.2	92.5	91.2	83.5	82.2	87.3	86.5	91.1	91.0	96.1	97.3	99.3
WYT	76.8	76.7	77.0	75.7	74.5	78.1	78.4	75.0	83.3	86.8	82.6	73.8
Average	86.5	88.9	87.5	82.2	79.2	82.9	81.8	82.1	85.0	88.0	86.9	88.2
Std. dev.	5.9	7.4	6.5	6.2	6.6	5.5	5.8	7.1	5.0	4.0	6.0	7.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			78.7	74.0	80.2	81.0	82.0	82.5	80.7	79.2	77.5	83.5	81.7	80.1	2.7
CAI													92.5		
DRA	79.8	80.8	76.2	78.7	80.1	79.6	79.5		79.6	79.1	77.3	81.6		79.3	1.5
GLE			81.5	85.9	91.1	92.7	93.7	94.7	92.1		82.7	86.3	87.4	88.8	4.7
HIL		89.6	86.8							95.8	88.0			90.1	4.0
MOO	87.5	85.6	85.2	84.2	86.5	90.6	90.0	88.3	90.4	85.4	84.4		88.3	87.2	2.3
NOR				81.4	83.0	66.3	73.5	77.5	90.3	84.2			87.4	80.4	7.8
POR			86.1	95.1	86.2										
ROT		84.8	78.6	79.3	80.0	82.6	79.7	86.5	80.5	83.6	80.2		80.1	81.4	2.5
SNO					91.4	96.0	94.9	94.4	89.3	91.3	84.0	80.2	78.0	88.8	6.6
SOU		85.5	86.3	94.2	89.5				85.9	84.2	83.0	89.6	90.7	87.7	3.6
WYT	83.8	84.0	82.3	83.1	84.7	82.5	86.1	85.0	79.2	79.7	75.2	88.6	78.2	82.5	3.6
Average	83.7	85.1	82.4	84.0	85.3	83.9	84.9	87.0	85.3	84.7	81.4	85.0	84.9		
Std. dev.	3.9	2.8	3.9	7.0	4.5	9.3	7.6	6.2	5.3	5.6	4.1	3.8	5.5		

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Meteorology (AWS) - Wind speed (m/s)

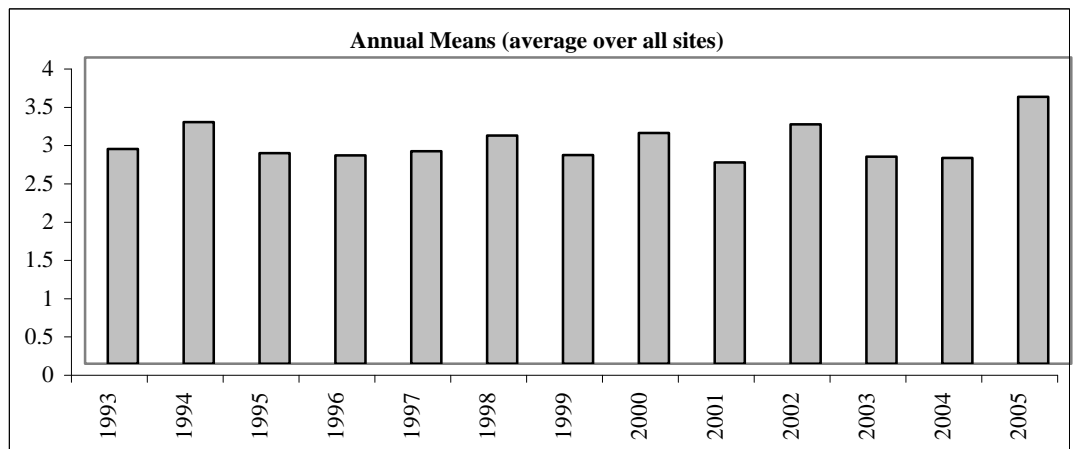
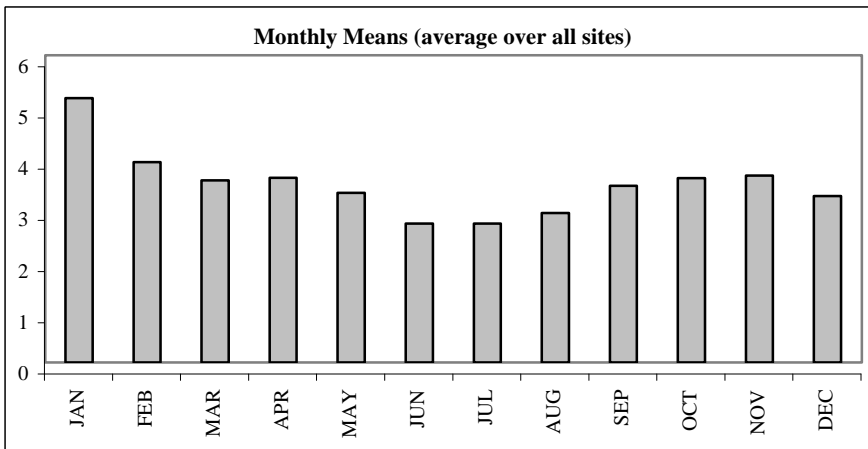
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	1.7	1.1	1.1	1.1	1.3	0.8	0.9	0.7	0.9	1.1	1.5	1.0
CAI	11.9	8.2	7.1	8.6	5.5	6.1	5.9	7.4	10.2	9.6	9.0	7.7
DRA												
GLE	1.3	2.9	2.4	1.8	1.9	1.2	1.6	1.2	0.9	1.5	1.9	1.7
HIL												
MOO	7.4	5.1	4.5	4.6	4.6	3.5	3.3	4.0	4.5	4.3	4.7	3.9
NOR	3.9	2.8	2.9	2.9	2.9	2.4	2.4	2.2	2.3	2.8	2.5	2.2
POR												
ROT	3.9	2.9	2.7	2.4	2.5	1.9	1.9	1.7	1.8	2.1	2.1	2.3
SNO	5.6	4.6	4.0	3.6	4.2	3.2	3.3	3.9	3.7	3.8	4.4	4.3
SOU	7.5	5.1	4.8	5.2	4.6	3.6	3.3	3.5	5.0	4.9	4.5	3.7
WYT	3.3	2.6	2.4	2.4	2.4	1.9	1.8	1.7	1.9	2.4	2.4	2.4
Average	5.2	3.9	3.6	3.6	3.3	2.7	2.7	2.9	3.5	3.6	3.7	3.3
Std. dev.	3.2	2.0	1.7	2.1	1.4	1.5	1.4	1.9	2.8	2.4	2.2	1.9

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.0	1.1	1.1	1.1	0.1
CAI										7.6	4.6		8.1	6.8	1.9
DRA	1.9	1.9	1.7	1.8	1.7	1.7	1.6		1.5	1.6	1.5	1.5		1.7	0.1
GLE			2.4	2.2	1.9	2.4	2.1	1.8	1.9	1.7	1.5	1.4	1.7	1.9	0.4
HIL		2.4	2.4							2.2	2.1			2.3	0.2
MOO	4.2	4.6	4.4	3.9	3.9	4.4		4.3	4.0	4.2	4.1	4.2	4.5	4.2	0.2
NOR				2.9	2.9	3.1	3.0	3.0	2.7	3.0			2.7	2.9	0.1
POR			3.0	2.8	2.9										
ROT		2.7	2.5	2.5	2.4	2.5	2.5	2.5	2.3	2.4	2.2		2.3	2.4	0.1
SNO					4.0	4.5	4.3	4.2	3.8	3.8	3.5	4.0	4.1	4.0	0.3
SOU		4.9	4.8	4.8	4.6	4.7	4.8	4.7	4.3	4.4	4.4	4.5	4.6	4.6	0.2
WYT	2.4	2.5	2.4	2.3	2.3	2.5	2.3	2.4	2.2	2.4	2.1	2.3	2.3	2.3	0.1
Average	2.8	3.2	2.8	2.7	2.8	3.0	2.7	3.0	2.6	3.1	2.7	2.7	3.5		
Std. dev.	1.2	1.3	1.2	1.1	1.1	1.3	1.3	1.3	1.1	1.8	1.3	1.5	2.1		

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Meteorology (AWS) - Total Rainfall (mm)

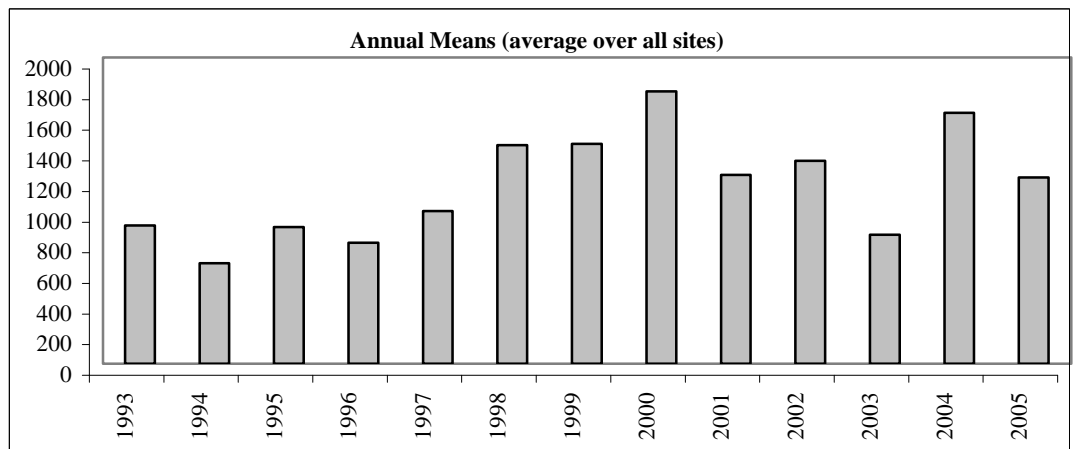
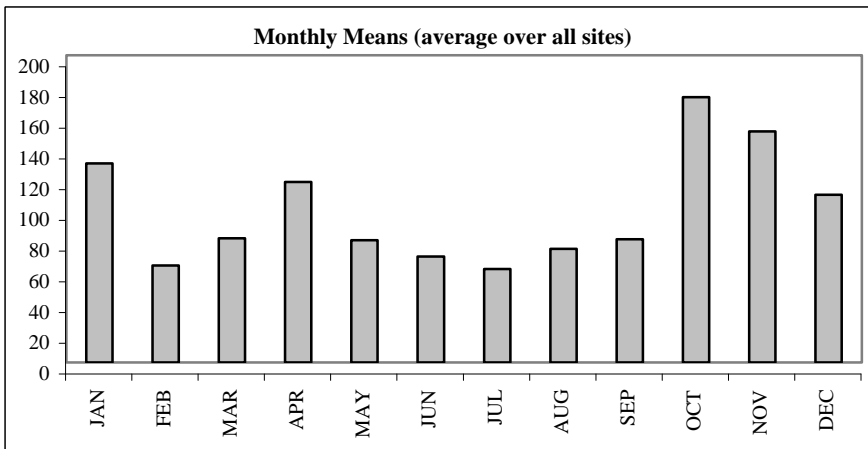
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	43	21	38	38	28	27	66	51	45	114	60	19
CAI	21	4	2	0	14	21	29	38	27	170	71	114
DRA												
GLE	10		54	48	112	32	50	92	59	184	133	111
HIL												
MOO	308	79	198	198	128	81	73	122	121	184	203	148
NOR	108	39	58	88	42	76	56	34	62	133	104	128
POR												
ROT	26	34	40	65	39	32	33	52	56	86	11	51
SNO	526	229	185	387	241	214	141	196	274	476	614	275
SOU	102	80	97	184	77	70	101	54	72	157	118	89
WYT	21	19	55	50	36	68	0	28	6	50	41	47
Average	130	63	81	118	80	69	61	74	80	173	150	109
Std. dev.	165	68	64	114	68	56	39	51	75	115	172	71

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			675	514	653	916	860	1144	956	1018	724	797	549	801	199
CAI										624	316		512	484	156
DRA	612	706	554	392	614	699	715		700	712	487	669		624	107
GLE				731	888			1396	912	1490	640	1257		1045	335
HIL		649	828							1385	986			962	314
MOO	1388		2126	2261			2388	2763	1867	2078	1561	2260	1844	2054	405
NOR				727	875	1291	1315	1301	571	1134			928	1018	285
POR			826	646	790										
ROT		597	608	503	568	762	614	893		918	592		525	658	147
SNO					3334	4404	4016	4737	3234	3326	1935	4128	3758	3652	825
SOU			820	846	581	1071	802	1073	866	1002	604		1199	886	202
WYT	712	670	698	499	661	850	780	923	753	889	570	715	419	703	146
Average	904	655	892	791	996	1428	1436	1779	1232	1325	842	1638	1217		
Std. dev.	422	45	509	570	885	1327	1191	1337	900	778	515	1359	1133		

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Meteorology (AWS) - Soil temperature at 10cm (degC)

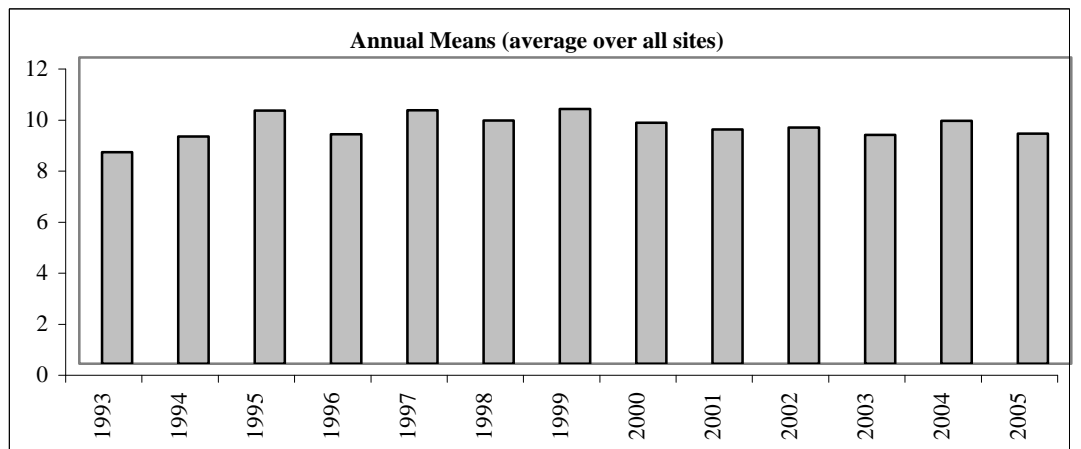
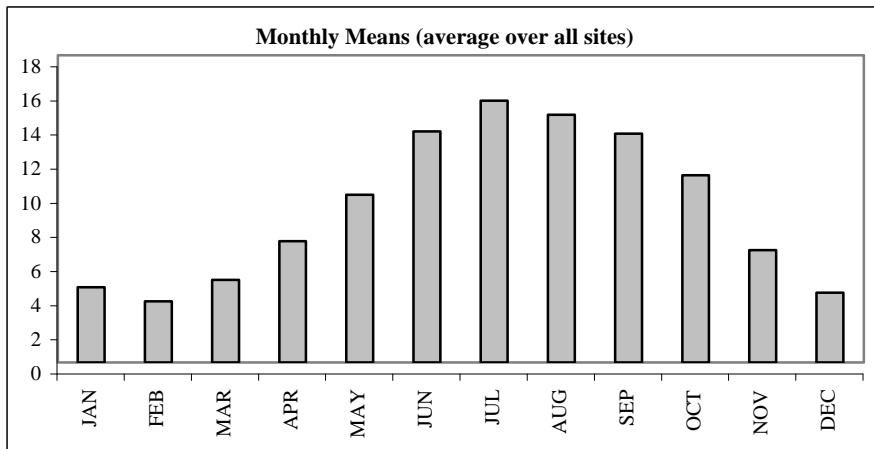
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	6.1	5.8	6.5	9.9	12.9	16.1	17.6	17.3	16.3	13.7	11.5	5.1
CAI	1.7	1.2	2.3	3.8	5.8	9.5	11.5	10.1	9.2	6.5	3.5	1.7
DRA												
GLE	4.6	3.5	4.1	6.2	8.7	11.4	13.2	12.7	11.9	10.0	6.8	4.9
HIL												
MOO	2.3	1.7	3.3	5.1	8.0	12.0	13.6	12.3	10.9	8.9	3.8	2.2
NOR	6.9	5.5	6.7	8.7	11.1	15.2	16.7	16.2	15.2	13.3	8.7	5.9
POR												
ROT	5.1	4.3	5.8	9.0	11.9	15.6	17.8	17.0	15.8	13.0	6.0	4.0
SNO	4.2	2.8	4.5	5.6	8.2	12.1	13.9	13.0	12.3	10.0	6.0	4.2
SOU	3.9	3.2	4.2	6.0	8.7	12.3	14.8	13.9	12.9	10.5	6.1	4.1
WYT	4.9	4.4	6.4	9.6	13.3	17.6	18.9	18.0	16.2	13.0	6.9	4.6
Average	4.4	3.6	4.8	7.1	9.8	13.5	15.3	14.5	13.4	11.0	6.6	4.1
Std. dev.	1.6	1.5	1.5	2.1	2.4	2.5	2.4	2.6	2.4	2.3	2.3	1.3

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			11.6	10.3	11.3	11.4	11.5	11.3	11.2	11.9	11.2	11.5	11.6	11.3	0.4
CAI										5.2	5.6		5.6	5.5	0.2
DRA	10.7	11.4	11.6	10.7	11.6	11.2	11.8		10.9	11.6	11.3	11.4		11.3	0.4
GLE				8.0	9.9	9.3	8.8	8.7	8.4	8.9	8.3	8.1	8.2	8.6	0.6
HIL		9.4	10.2							10.7	10.5			10.2	0.6
MOO	5.9	5.9	6.7	5.9	7.2	6.7	6.8	6.8	6.4	6.9	6.8	7.3	7.0	6.6	0.5
NOR				9.5			11.2	10.7	10.8	10.5			10.8	10.6	0.6
POR															
ROT		10.5	10.9	9.5	10.5	10.1	10.7	10.3	10.2	10.5	10.1		10.4	10.3	0.4
SNO					8.4	8.2	8.2	7.9	7.7	8.3	8.0	7.8	8.1	8.0	0.2
SOU		7.3	8.4	7.5	8.7	8.2	8.7	8.3	7.8	8.3			8.4	8.2	0.5
WYT				10.5	11.8	11.0	12.0	11.6				11.1	11.2	11.3	0.5
Average	8.3	8.9	9.9	9.0	9.9	9.5	10.0	9.4	9.2	9.3	9.0	9.5	9.0		
Std. dev.	3.4	2.3	2.0	1.7	1.7	1.7	1.9	1.8	1.8	2.1	2.1	2.0	2.1		

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Meteorology (AWS) - Soil temperature at 30cm (degC)

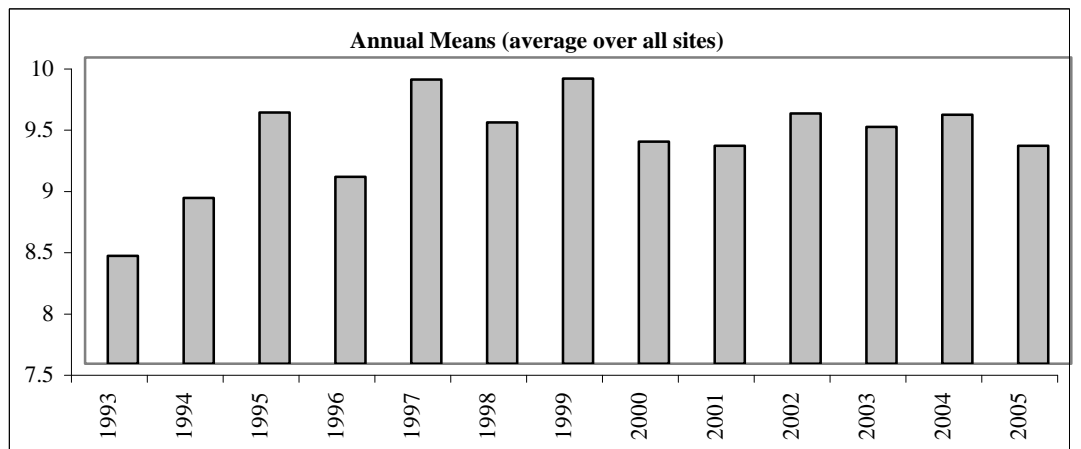
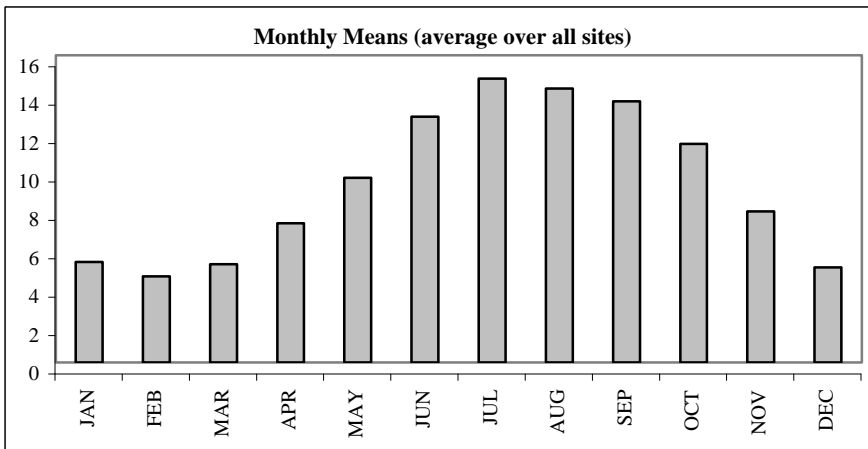
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	6.3	6.0	6.2	9.2	11.9	14.9	16.5	16.5	15.9	13.6	11.9	5.8
CAI	3.2	2.7	4.4	6.0	7.9	12.0	13.5	11.9	10.5	7.9	4.5	3.2
DRA												
GLE	5.4	4.6	4.8	6.4	8.6	11.2	12.9	12.8	12.3	10.5	7.9	5.8
HIL												
MOO	3.2	2.5	3.0	4.8	7.0	10.0	12.0	11.3	10.8	9.0	5.5	2.9
NOR	7.3	6.2	6.5	8.6	10.6	14.1	16.0	15.7	15.0	13.4	9.8	6.6
POR												
ROT	5.8	5.0	5.6	8.6	11.1	14.4	17.1	16.6	16.1	13.5	7.9	5.1
SNO	5.0	3.8	4.7	5.9	8.4	11.5	13.2	12.9	12.8	10.5	7.3	4.9
SOU	5.3	4.5	4.7	6.2	8.2	10.9	13.7	13.0	12.6	10.5	7.5	4.9
WYT	5.6	5.1	6.3	9.7	12.9	16.2	18.2	17.7	16.5	13.5	8.6	5.5
Average	5.2	4.5	5.1	7.2	9.6	12.8	14.8	14.3	13.6	11.4	7.9	5.0
Std. dev.	1.3	1.2	1.1	1.7	1.9	2.0	2.1	2.2	2.2	2.1	2.1	1.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			11.6	10.4	11.2	11.3	11.4	11.2	11.1	11.7	11.0	11.2	11.2	11.2	0.4
CAI										6.9	7.4		7.3	7.2	0.2
DRA	10.7	11.3	11.4	10.6	11.4	11.2	11.9		11.0	11.4	11.2	11.3		11.2	0.4
GLE			8.0	7.7	8.8	8.4	8.3	8.2	7.6	8.8	8.6	8.6	8.6	8.3	0.4
HIL		9.5	10.5							10.5	10.4			10.2	0.5
MOO	6.1	6.0	6.8	6.0	7.1	6.8	6.8	6.7	6.4	6.9	6.8	7.1	6.8	6.6	0.4
NOR				9.9	10.5	10.4	10.9	10.7	10.8	10.5			10.8	10.6	0.3
POR				10.0	11.0										
ROT		10.5	10.7	9.3	10.5	10.3	10.7	10.4	10.3	10.6	10.2		10.6	10.4	0.4
SNO					8.4	8.3	8.3	8.0	7.7	7.9	8.4	8.3	8.4	8.2	0.3
SOU		7.0	7.8	7.0	8.1	7.7	8.2	7.9	7.6	8.5	9.2	9.1	8.5	8.0	0.7
WYT				10.3	11.3	10.8	12.1	11.6	11.2	11.4	11.1	11.3	11.3	11.2	0.5
Average	8.4	8.9	9.6	9.0	9.8	9.5	9.8	9.3	9.3	9.5	9.4	9.5	9.3		
Std. dev.	3.3	2.3	2.0	1.7	1.6	1.7	2.0	1.8	1.9	1.8	1.6	1.7	1.7		

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Meteorology (AWS) - Soil water content (theta probe)

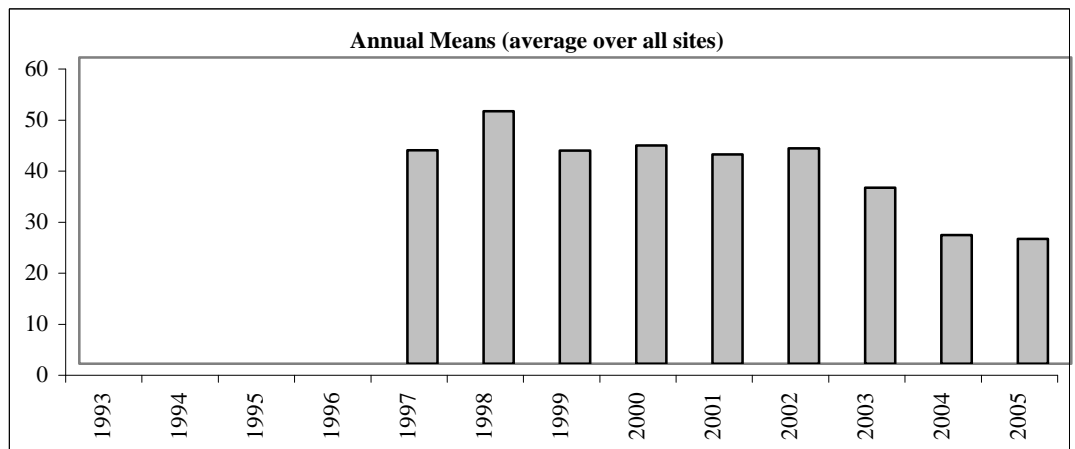
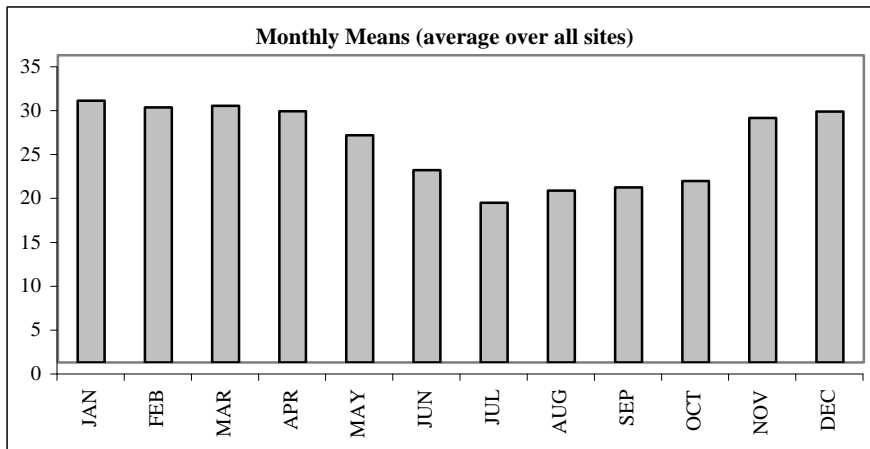
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	54.1	53.9	53.6	53.1	48.0	33.0	25.6	29.3	27.1	30.6	49.3	52.2
CAI	36.0	32.6	31.9	30.8	33.1	33.0	26.6	30.6	30.0	34.6	33.8	32.2
DRA												
GLE	19.2	19.1	19.5	19.3	18.9	18.4	14.6	10.3	11.0	13.8	17.7	18.5
HIL												
MOO												
NOR												
POR												
ROT											31.9	33.8
SNO	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.1	0.0	0.0
SOU	31.2	30.3	32.2	30.3	24.1			24.9	29.3			
WYT	37.4	37.5	37.3	37.2	30.2	24.2	23.3	21.5	21.3	24.4	34.5	34.9
Average	29.8	29.1	29.2	28.6	25.9	21.9	18.2	19.6	20.0	20.7	27.9	28.6
Std. dev.	16.5	16.3	16.1	15.9	14.3	11.8	9.6	10.7	10.6	12.4	15.5	16.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI					41.8	49.5	46.4	46.0	44.2	47.5	40.0	44.2	42.5	44.7	3.0
CAI										34.2	30.4		32.1	32.2	1.9
DRA												32.5			
GLE											16.4	16.5	16.7	16.5	0.2
HIL										96.3	88.9			92.6	5.2
MOO															
NOR															
POR															
ROT															
SNO											1.0	1.0	1.0	0.8	1.0
SOU							49.5	51.3	50.2	51.1	36.1	24.3		43.8	11.1
WYT							29.4	31.0	28.6	22.9	28.8	32.7	30.3	29.1	3.1
Average					41.8	49.5	41.8	42.8	41.0	42.2	34.5	25.2	24.5		
Std. dev.							10.8	10.5	11.2	32.1	27.4	15.0	16.1		

LI



3. Atmospheric Chemistry

ECN sites have used passive diffusion tubes to monitor the atmospheric concentrations of nitrogen dioxide since 1993; monitoring of ammonia was implemented in 1998 and monitoring of sulphur dioxide is to be implemented shortly. The possibility of extending the ECN measurement programme to include other pollutant atmospheric gases, particularly ozone, has been considered and is under continuing review.

3.1 Nitrogen dioxide

Natural and man-made sources emit oxides of nitrogen in approximately equal quantities, but, whilst the former tend to have equal world-wide distribution and are relatively constant over time, the latter are concentrated in or around centres of population. Nitric oxide (NO) and nitrogen dioxide (NO₂) are the most important oxides of nitrogen in urban atmospheres and it is NO₂ that has the more significant health and ecosystem effects. Major sources of NO₂ in urban areas result from fuel combustion in motor vehicles, power generation, heating plants and industrial processes, mostly by oxidation of NO emissions from these sources. NO₂ is a respiratory tract irritant, is toxic at high concentrations, and is involved in the formation of photochemical smog and acid rain. It can also cause direct damage to crops and other vegetation, together with SO₂ and ozone. High concentrations of NO₂ can have an indirect effect on ecosystems by providing an increased nitrogen input and this is important in the context of systems with a low natural nitrogen demand. The method selected for measuring nitrogen dioxide uses passive diffusion tubes; this method is well researched and reliable, though variation between individual tubes requires that they are replicated; the method has a low capital cost, requires no on-site power source and is reasonably inexpensive to operate.

Atmospheric Chemistry - Nitrogen Dioxide (ppb)

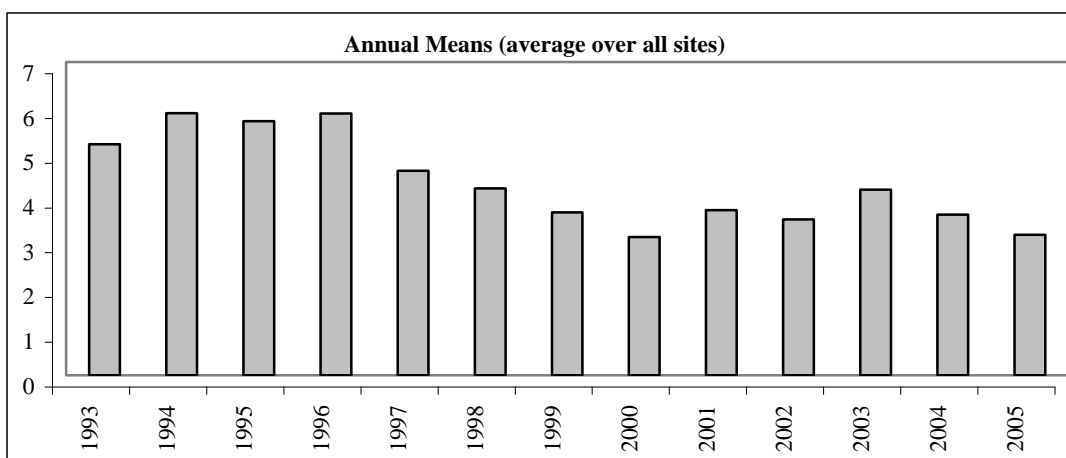
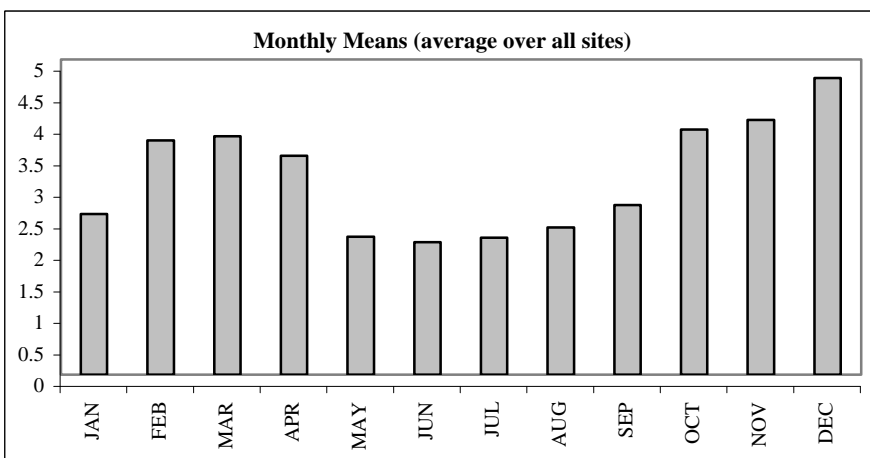
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	3.1	5.0	5.9	4.5	3.3	3.2	4.3	3.3	3.5	4.8	5.1	6.3
CAI	0.7	0.4	0.5	0.6	0.2	0.6	0.3	0.5	0.7	1.6	1.5	1.6
DRA												
GLE	0.4	0.4	0.6	0.5	0.4	0.3	0.3	0.3	0.5	0.7	0.7	0.6
HIL	0.9	2.5	2.9	2.7	1.7	1.5	1.7	3.0	2.4	3.7	4.0	4.3
MOO	1.5	1.3	2.0	1.7	2.1	1.2	1.2	1.1	1.0	2.7	1.6	2.7
NOR	1.8	5.3	3.5	2.2	1.5	1.6	1.7	1.6	2.2	2.9	3.4	3.2
POR	2.4	3.0	4.0	4.5	2.5	2.4	2.3	2.7	2.1	4.0	4.0	5.0
ROT	11.1	14.6	13.8	12.9	8.1	8.0	7.8	8.1	11.8	14.8	15.9	18.8
SNO	1.1	1.7	2.6	2.5	1.4	0.9	0.8	1.3	1.5	2.4	1.2	3.0
SOU	0.3	0.5	0.6	0.6	0.3	0.3	0.4	0.3	0.3	0.6	0.6	0.9
WYT	4.8	6.0	5.2	5.4	2.7	3.0	3.2	3.4	3.5	4.6	6.5	5.4
Average	2.6	3.7	3.8	3.5	2.2	2.1	2.2	2.3	2.7	3.9	4.0	4.7
Std. dev.	3.0	4.0	3.6	3.4	2.1	2.1	2.1	2.2	3.1	3.7	4.2	4.8

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				5.6	5.3	4.1	3.7	3.1	3.9	3.6	4.8	4.1	4.4	4.3	0.8
CAI							0.5	0.5	0.5	0.8	0.9	0.6	0.8	0.7	0.2
DRA	6.5	7.7	7.8	6.9	5.9	6.7	4.7	4.0	5.4	5.0	5.7	4.4		5.9	1.2
GLE	0.6	1.5	0.4	0.5	0.5	0.4	0.3	0.5	0.5	0.6	0.7	0.5	0.5	0.6	0.3
HIL		4.0	2.8	3.2	2.8	2.7	2.5	2.2	2.8	2.1	3.4	2.5	2.6	2.8	0.5
MOO	4.2	3.5	2.9	3.4	3.0	2.1	1.9	1.9	2.1	2.4	3.1	2.8	1.7	2.7	0.8
NOR	3.8	2.9	3.0	3.7	3.0	1.9	1.7	1.6	4.8	2.7	2.6	2.2	2.6	2.8	0.9
POR		6.7	5.3	6.4	5.0	3.9	4.1	3.4	3.6	3.3	4.7	3.8	3.2	4.4	1.2
ROT	12.2	18.8	19.4	19.1	16.6	15.6	15.4	12.3	12.3	12.3	14.1	14.1	12.2	15.0	2.8
SNO					0.4	1.0	1.2	1.1	0.9	2.1	2.5	1.6	1.7	1.4	0.6
SOU	0.6	0.7	0.6	0.5	0.4	0.5	0.3	0.5	0.5	1.0	0.7	0.5	0.5	0.6	0.2
WYT	8.2	6.9	8.9	9.1	7.4	7.0	7.2	5.9	7.1	6.0	6.6	5.9	4.5	7.0	1.3
Average	5.2	5.9	5.7	5.8	4.6	4.2	3.6	3.1	3.7	3.5	4.1	3.6	3.1		
Std. dev.	4.2	5.4	5.9	5.4	4.6	4.4	4.2	3.3	3.5	3.2	3.7	3.7	3.3		

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4. Water Chemistry

Results of chemical analyses from the three water based ECN core measurements, precipitation, soil solution and surface water, are presented in this section.

4.1 Precipitation Chemistry

Research has highlighted the many impacts that the deposition of atmospherically transported pollutants has on ecosystems. The extent and significance of these impacts on physical, chemical and biotic components of ecosystems are likely to be affected by future changes in emissions of pollutants, and make the measurement of the deposition of atmospherically transported material an important activity for ECN. Deposition from the atmosphere has two components - wet deposition consisting of rainfall or snowfall, and dry deposition consisting of gaseous and particulate material. The use of a continuously open funnel (bulk collector) results in the collection of both dry and wet deposition and, although there are advantages to be gained from separating the two sources of input, it was concluded that only bulk deposition would be measured in ECN on the grounds of the considerable additional costs attaching to the separate measurement of the components.

The main source of data on the geographical distribution of deposition in the UK has been the United Kingdom Precipitation Composition Network, operated until recently by the Warren Spring Laboratory on behalf of the Department of the Environment. The methods used by ECN conform to those used at Secondary Sites of the UK Precipitation Composition Monitoring Networks (UKPCMN). This allows results from ECN sites to be linked with the 32 rural UKPCMN sites at which monitoring started in 1986.

The summary statistics for precipitation chemistry data presented here are volume weighted.

Precipitation Chemistry - pH (volume weighted)

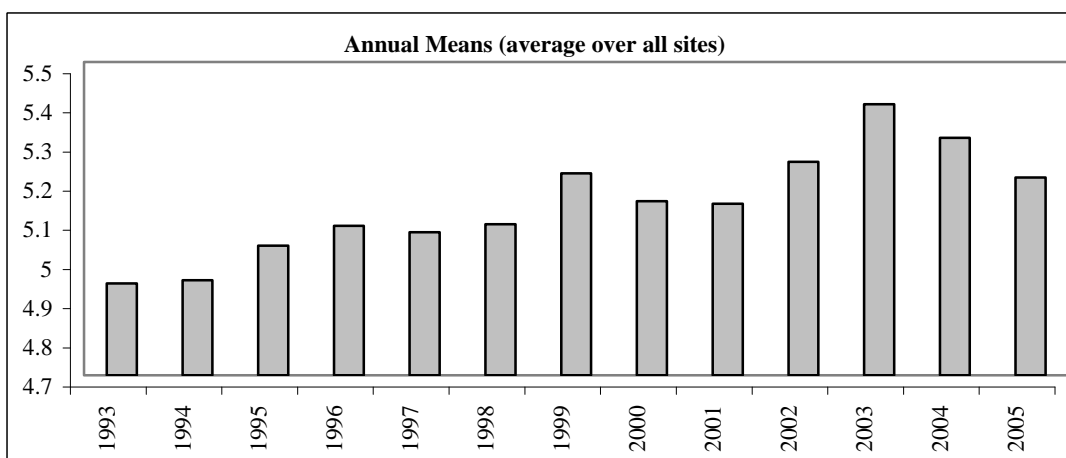
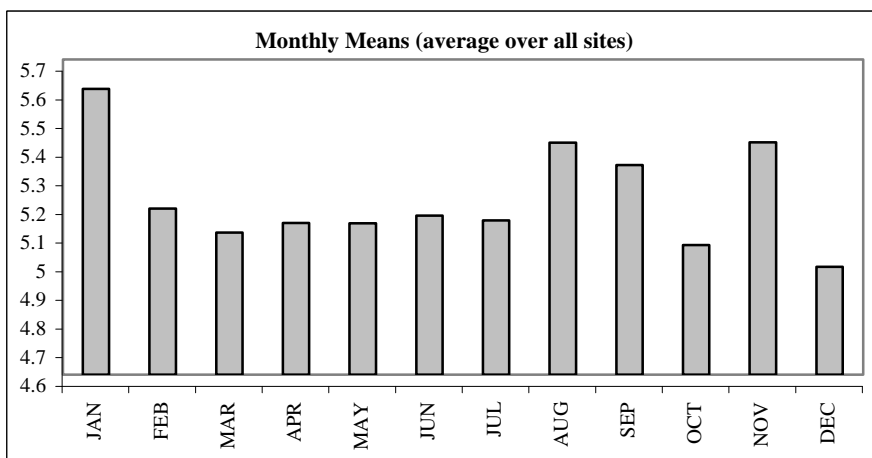
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.9	4.8	4.9	4.9	5.1	4.6	4.9	4.9	5.7	5.0	5.1	4.8
CAI	5.8	5.6	5.1	4.6	5.0	5.2	5.0	5.2	5.2	5.6	5.4	4.7
DRA												
GLE	5.3	4.8	4.7	4.7	4.7	4.6	4.5	6.1	5.2	4.8	4.8	4.6
HIL												
MOO	5.5	5.4	5.4	5.2	5.2	5.6		5.9	5.6	5.0	5.6	5.0
NOR												
POR	5.6	5.0	5.1	5.8	4.9	5.7	6.2	6.1	6.0	4.9	5.7	4.4
ROT	5.1	4.8	5.5	5.2	5.3	5.0	4.8	5.0	4.7	4.9	5.4	4.8
SNO	5.2	5.6	5.2	5.5	5.7	5.4	6.0	5.1	5.0	5.2	5.3	4.8
SOU	7.1	5.1	4.7	4.9	5.2	5.2	4.7	4.9	5.4	4.8	5.9	6.7
WYT	5.9	5.4	5.4	5.4								
Average	5.6	5.2	5.1	5.1	5.1	5.2	5.1	5.4	5.3	5.1	5.4	5.0
Std. dev.	0.6	0.3	0.3	0.4	0.3	0.4	0.6	0.5	0.4	0.2	0.3	0.7

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		4.4	4.6	4.8	4.8	4.8	4.9	4.9	4.8	5.0	5.0	5.2	5.0	4.8	0.2
CAI							4.9	5.2	5.0	5.2	5.3	5.0	5.2	5.1	0.1
DRA	5.1	5.3	5.5	5.7	5.9	5.8	5.8	5.6	5.6	5.5	6.0	5.6		5.6	0.2
GLE	4.9	4.6	4.9	4.7	4.7	4.7	5.0	5.3	4.6	4.8	4.8	4.7	4.9	4.8	0.2
HIL		6.1	5.8	5.3	4.9	5.3	5.4	5.5						5.5	0.4
MOO	5.1	4.8	4.9	5.0	5.1	4.8	5.2	5.1	5.2	5.1	5.3	5.2	5.4	5.1	0.2
NOR	5.4	5.3	5.3	5.3	5.3	5.5	5.5	5.7	6.2	5.6	5.4	5.3		5.5	0.3
POR		5.0	4.9	5.3	5.3	5.3	5.3	5.0	5.6	6.6	7.0	6.7	5.4	5.6	0.7
ROT	4.6	4.6	4.6	4.8	4.9	5.1	5.0	4.5	4.5	4.7	4.9	5.0	5.1	4.8	0.2
SNO					4.9	4.7	5.7	5.0	5.1	5.3	5.4	5.5	5.3	5.2	0.3
SOU	5.1	4.9	4.9	5.0	4.9	4.9	4.9	4.8	4.9	4.9	4.7	4.8	5.4	4.9	0.2
WYT	4.4	4.3	4.8	5.0	5.0	5.0	5.1	5.1	5.0	5.0	5.5	5.3		5.0	0.3
Average	4.9	4.9	5.0	5.1	5.1	5.1	5.2	5.1	5.1	5.2	5.4	5.3	5.2		
Std. dev.	0.4	0.5	0.4	0.3	0.3	0.4	0.3	0.3	0.5	0.5	0.6	0.5	0.2		

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Precipitation Chemistry - Conductivity (microSiemens/l volume weighted)

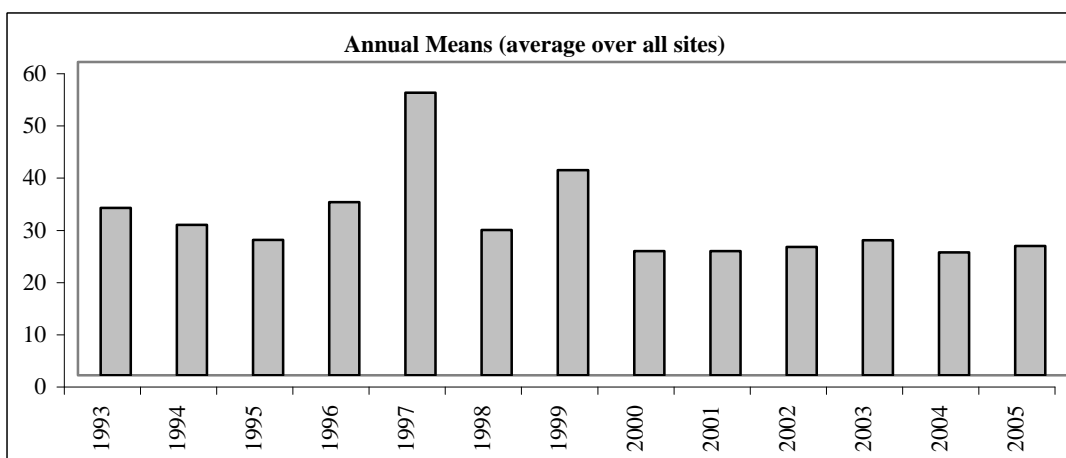
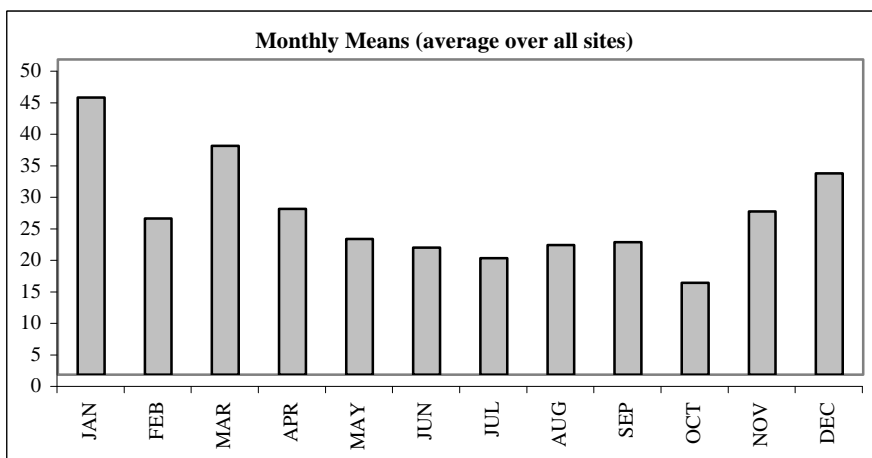
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	33.1	33.6	30.0	27.9	28.9	33.9	12.7	14.6	16.7	15.1	31.4	27.9
CAI	33.9	9.8	48.3	32.0	19.3	7.7	13.9	11.7	19.5	6.6	12.5	37.3
DRA												
GLE	25.4	38.6	47.3	28.9	23.2	26.0	26.3	70.0	24.1	21.1	28.3	35.5
HIL												
MOO	18.6	10.4	20.2	15.0	17.2	11.2		6.3	34.0	15.4	12.2	19.8
NOR												
POR	37.2	23.3	57.2	19.5	23.5	26.3	23.7	19.2	24.4	17.0	25.1	36.6
ROT	38.3	32.7	33.8	38.3	22.7	25.2	21.9	17.0	18.7	12.7	22.0	34.1
SNO	29.0	17.4	26.2	20.3	18.4	18.0	15.8	11.9	18.0	13.4	22.5	21.2
SOU	108	28.5	33.8	23.7	18.9	12.7	15.1	13.6	12.8	15.4	53.1	43.1
WYT	72.6	28.8	29.9	30.9								
Average	44.0	24.8	36.3	26.3	21.5	20.1	18.5	20.5	21.0	14.6	25.9	31.9
Std. dev.	26.6	9.7	11.3	6.9	3.6	8.5	5.0	19.0	6.1	3.8	12.1	7.7

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		22.1	21.6	21.9	22.1	20.9	22.2	19.5	19.6	23.8	36.3	23.6	23.4	23.1	4.4
CAI							145	20.3	19.0	10.5	14.7	13.4	18.9	34.6	48.9
DRA	25.4	31.1	26.2	39.7	42.8	34.9	40.7	20.8	18.9	22.3	23.1	25.8		29.3	8.3
GLE	51.5	40.0	25.6	49.2	33.9	27.8	24.5	33.5	37.0	29.2	32.4	26.9	33.4	34.2	8.5
HIL		28.7	33.3	35.7	288	24.8	47.9	26.9						69.3	96.8
MOO	15.1	20.9	22.8	25.6	19.8	21.4	19.4	15.6	17.9	18.0	16.6	26.1	16.6	19.7	3.6
NOR						22.8	23.7	21.6	25.8	31.7	25.0	29.1		25.7	3.6
POR		30.8	22.5	27.6	24.7	25.9	22.0	26.4	26.1	39.3	38.8	28.3	27.6	28.3	5.6
ROT	27.1	31.5	33.3	36.3	33.5	63.7	64.3	41.7	38.1	27.9	38.1	28.6	24.7	37.6	12.7
SNO					25.1	16.6	16.1	15.8	14.2	20.7	17.1	18.3	20.1	18.2	3.3
SOU	33.4	24.9	23.7	37.6	26.0	24.1	23.6	23.1	24.7	26.4	25.3	19.9	33.6	26.6	5.0
WYT	40.0	29.3	24.5	25.0	25.1	23.4	22.0	20.1	20.2	20.6	17.2	19.3		23.9	6.0
Average	32.1	28.8	25.9	33.2	54.1	27.8	39.3	23.8	23.8	24.6	25.9	23.6	24.8		
Std. dev.	12.7	5.8	4.4	8.8	82.5	12.8	36.2	7.5	7.7	7.6	9.2	5.1	6.4		

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Precipitation Chemistry - Alkalinity (mg/l volume weighted)

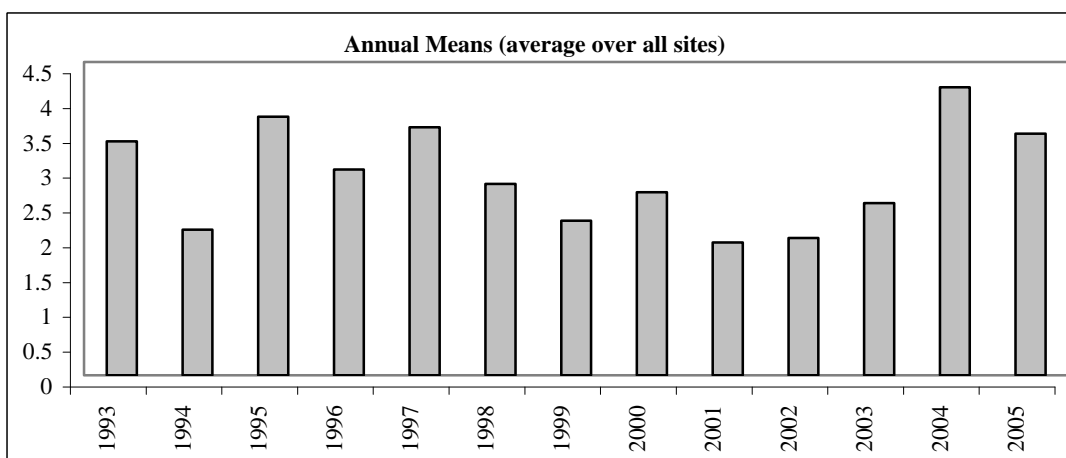
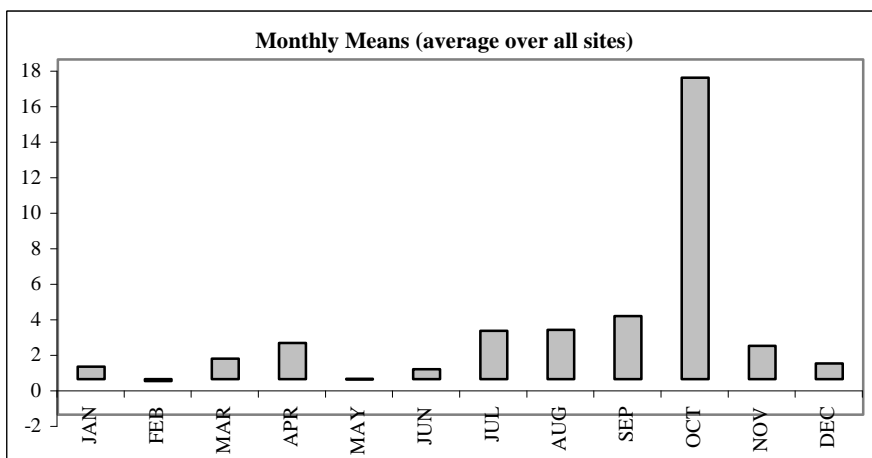
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	-0.4	-0.6	-0.7	-0.3	-0.4	-0.6	-0.4	-0.6	0.2	-0.5	-0.4	-0.2
CAI	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.5	0.0	0.0
DRA												
GLE	0.0	0.0	6.6	0.0	0.0	0.0	0.0	18.1	17.4	45.8	0.0	0.0
HIL												
MOO	0.3	0.0	1.7	0.0	0.6	1.4		1.4	0.8	0.5	0.9	1.8
NOR												
POR			0.0	15.5		2.5	9.1	1.1				
ROT												
SNO	4.3	0.0	-0.4	-0.6	-0.2	0.6	4.5	-0.6	-0.7	-4.0	-0.6	-1.4
SOU	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	59.6	11.3	5.2
WYT			1.9	1.6								
Average	0.7	-0.1	1.1	2.0	0.0	0.6	2.7	2.8	3.6	17.0	1.9	0.9
Std. dev.	1.6	0.2	2.2	5.1	0.3	1.0	3.6	6.3	6.9	25.6	4.2	2.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI					0.0	0.3	0.7	0.2	0.1	-0.2	0.8	-0.1	-0.4	0.2	0.4
CAI							0.0	1.2	0.1	0.3	0.0	0.1	0.1	0.3	0.4
DRA	1.9	6.0	2.8	7.4	10.8	5.6	1.2	0.8	1.5	1.2	5.6	3.0		4.0	3.1
GLE	3.7	0.1	0.1	0.0	0.0	0.1	0.7	4.1	3.5	1.4	0.4	2.6	10.2	2.1	2.9
HIL		4.9	7.5	7.4	13.0	12.8	14.2	11.2						10.1	3.5
MOO	5.4	0.5	2.6	0.8	5.5	1.5	1.7	0.7	0.7	1.2	0.8	7.3	0.7	2.3	2.3
NOR															
POR		0.2	0.5	0.8	1.3	0.8	0.4	4.0	2.9	5.1	7.3	23.1	5.9	4.4	6.4
ROT															
SNO					-0.4	-0.4	-0.2	-0.1	-0.2	-0.1	-0.1	0.2	0.0	-0.1	0.2
SOU	1.9	1.5	0.1	0.8	0.0	0.0	2.2	3.1	4.4	2.0	0.3	0.3	7.8	1.9	2.2
WYT	3.8	1.5	12.4	3.4	1.9	4.0	1.4	1.1	4.1	6.8	7.1	0.7		4.0	3.4
Average	3.4	2.1	3.7	3.0	3.6	2.7	2.2	2.6	1.9	2.0	2.5	4.1	3.5		
Std. dev.	1.5	2.4	4.6	3.2	5.1	4.3	4.3	3.4	1.8	2.4	3.2	7.5	4.4		

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Precipitation Chemistry - Sodium (mg/l volume weighted)

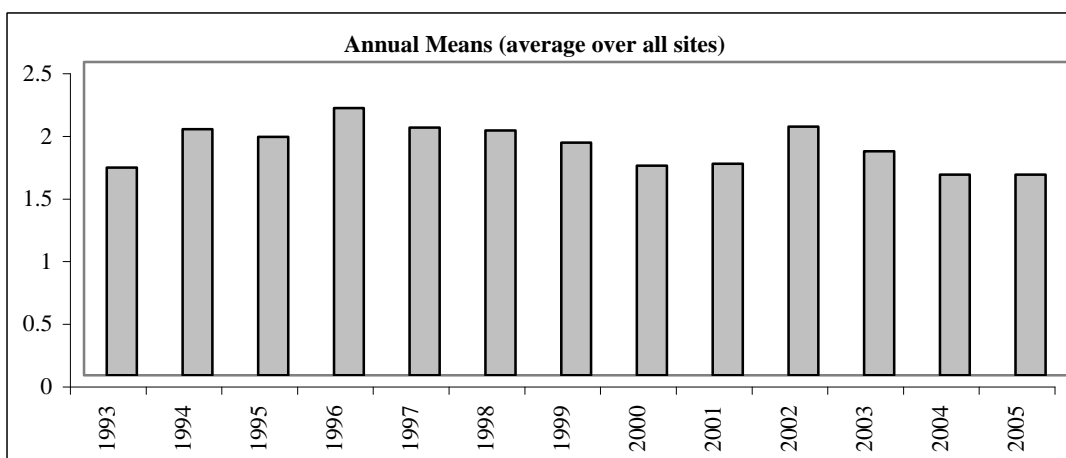
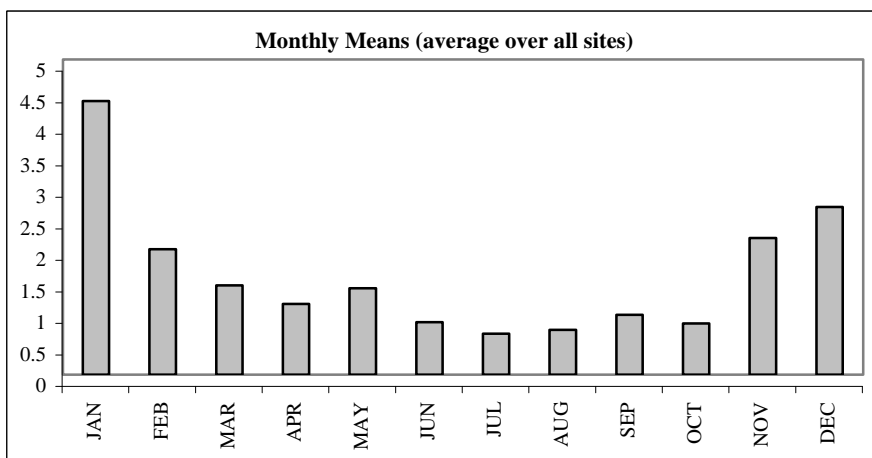
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	3.6	2.4	1.2	0.8	2.1	1.0	0.5	0.5	0.5	0.7	3.4	2.6
CAI	3.8	0.7	0.8	1.7	0.5	0.4		0.3		0.3	0.7	3.8
DRA												
GLE	2.5	3.7	3.2	1.6	1.1	1.1	1.0	1.8	1.4	1.7	2.3	3.0
HIL												
MOO	2.3	0.8	1.0	0.6	1.2	1.0		0.5	0.8	0.7	1.1	1.1
NOR												
POR	10.9		0.6	0.8	1.9	0.8	0.6	0.8	1.4	1.2	3.2	4.3
ROT	4.5	2.7	1.7	1.0	1.8	0.8	0.8	0.6	0.5	0.6	2.0	3.1
SNO	3.6	1.1	1.6	1.4	1.2	0.8	0.4	0.6	1.1	0.7	2.5	1.1
SOU	3.5	2.5	2.2	1.4	1.2	0.7	0.6	0.5	0.9	0.6	2.1	2.3
WYT		2.0	0.6	0.7								
Average	4.3	2.0	1.4	1.1	1.4	0.8	0.7	0.7	0.9	0.8	2.2	2.7
Std. dev.	2.6	1.0	0.8	0.4	0.5	0.2	0.2	0.4	0.3	0.4	0.9	1.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		1.5	1.8	1.7	1.6	1.8	1.4	1.3	1.4	2.0	1.3	1.6	1.5	1.6	0.2
CAI							0.4	1.5	1.4	0.8	1.2	0.5	1.2	1.0	0.5
DRA	0.7	1.2	1.2	1.3	1.4	1.6	1.6	1.1	1.0	1.4	1.2	1.2		1.2	0.3
GLE	2.2	3.0	2.6	3.8	2.4	2.3	2.8	2.4	1.8	2.1	1.9	1.6	2.0	2.4	0.6
HIL		2.0	1.7	2.1	1.9	1.5	2.3	2.0						1.9	0.3
MOO	1.2	1.3	1.7	1.5	1.4	1.5	1.6	1.4	1.9	1.4	1.3	1.5	1.1	1.5	0.2
NOR	3.3	3.0	3.4	3.3	2.8	3.6	3.3	3.2	3.5	4.5	5.1	3.5		3.5	0.6
POR		3.6	1.6	1.5	1.5	1.7	1.5	1.3	2.2	2.7	2.0	2.8	2.2	2.1	0.7
ROT	1.2	1.3	1.5	1.6	1.6	1.9	2.1	1.5	1.3	1.4	1.6	1.2	1.4	1.5	0.3
SNO					3.6	1.9	1.9	1.7	1.5	2.8	1.4	1.7	1.6	2.0	0.7
SOU	2.0	1.8	1.8	3.4	2.4	2.6	2.5	1.8	1.5	1.6	1.9	1.1	1.6	2.0	0.6
WYT	1.1	1.0	1.7	1.1	1.1	1.1	1.0	0.9	1.1	1.1	0.8	0.9		1.1	0.2
Average	1.7	2.0	1.9	2.1	2.0	2.0	1.9	1.7	1.7	2.0	1.8	1.6	1.6		
Std. dev.	0.9	0.9	0.6	1.0	0.8	0.7	0.8	0.6	0.7	1.0	1.2	0.9	0.4		

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Precipitation Chemistry - Potassium (mg/l volume weighted)

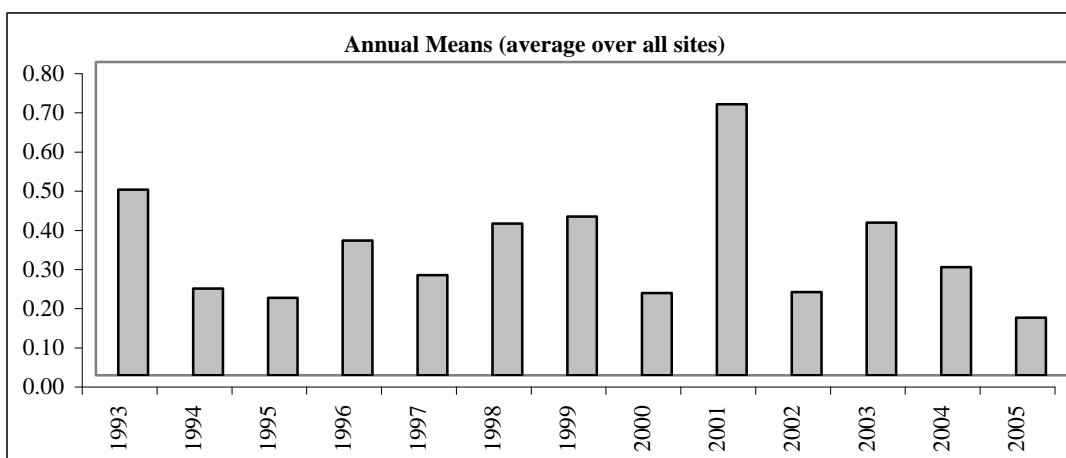
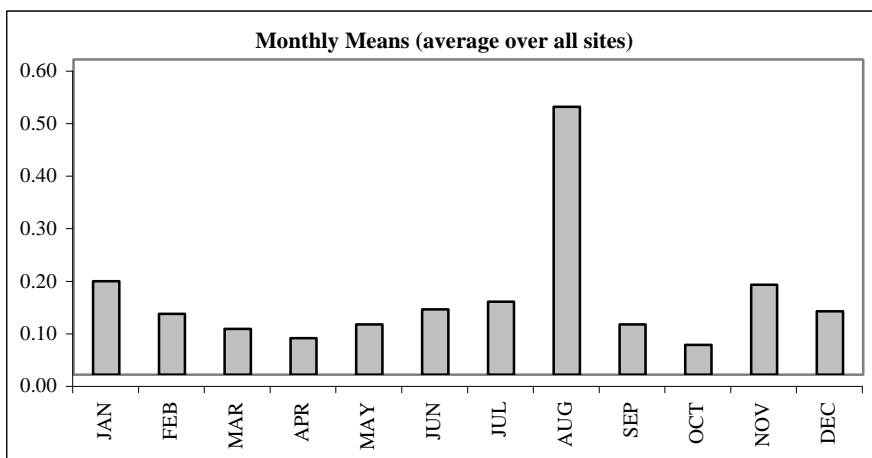
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.23	0.19	0.19	0.14	0.22	0.30	0.08	0.10	0.15	0.08	0.19	0.20
CAI	0.14	0.09	0.09	0.09	0.04	0.03		0.11		0.02	0.02	0.14
DRA												
GLE	0.06	0.12	0.12	0.01	0.04	0.05	0.05	1.69	0.04	0.08	0.05	0.12
HIL												
MOO	0.07	0.03	0.07	0.04	0.05	0.09		0.11	0.06	0.01	0.02	0.02
NOR												
POR	0.52		0.06	0.04	0.11	0.14	0.05	1.81	0.12	0.06	0.11	0.18
ROT	0.16	0.22	0.09	0.08	0.20	0.23	0.06	0.24	0.23	0.08	0.12	0.17
SNO	0.14	0.08	0.07	0.06	0.05	0.11	0.43	0.02	0.06	0.03	0.11	0.05
SOU	0.10	0.10	0.05	0.01	0.07	0.05	0.16	0.00	0.02	0.09	0.74	0.10
WYT		0.09	0.04	0.15								
Average	0.18	0.12	0.09	0.07	0.10	0.12	0.14	0.51	0.10	0.06	0.17	0.12
Std. dev.	0.14	0.06	0.04	0.05	0.07	0.09	0.14	0.72	0.07	0.03	0.22	0.06

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.16	0.15	0.42	0.14	0.15	0.12	0.12	0.11	0.13	0.18	0.16	0.15	0.17	0.08
CAI							0.07	0.53	6.08	0.07	0.13	0.06	0.07	1.00	2.24
DRA	0.06	0.23	0.24	0.82	0.55	0.46	0.24	0.23	0.16	0.11	0.14	0.10		0.28	0.22
GLE	0.58	0.42	0.28	0.36	0.38	0.36	0.32	0.38	0.15	0.09	0.13	0.40	0.23	0.31	0.14
HIL		0.27	0.26	0.19	0.22	0.30	0.24	0.17						0.24	0.05
MOO	0.37	0.07	0.07	0.14	0.15	0.10	0.06	0.03	0.10	0.10	0.06	0.26	0.04	0.12	0.10
NOR	1.32	0.37	0.38	0.60	0.48	0.49	0.71	0.51	0.39	0.55	1.17	1.19		0.68	0.34
POR		0.16	0.06	0.07	0.12	0.18	0.05	0.14	0.20	0.61	0.82	0.24	0.29	0.25	0.24
ROT	0.12	0.11	0.25	0.30	0.35	1.89	2.61	0.19	0.19	0.28	1.46	0.35	0.15	0.63	0.81
SNO					0.11	0.06	0.06	0.07	0.07	0.11	0.06	0.08	0.09	0.08	0.02
SOU	0.73	0.30	0.19	0.44	0.26	0.25	0.36	0.14	0.13	0.21	0.04	0.11	0.16	0.26	0.18
WYT	0.14	0.13	0.08	0.10	0.04	0.02	0.02	0.01	0.04	0.08	0.09	0.09		0.07	0.04
Average	0.47	0.22	0.20	0.34	0.26	0.39	0.41	0.21	0.69	0.21	0.39	0.28	0.15		
Std. dev.	0.45	0.12	0.11	0.24	0.17	0.52	0.72	0.17	1.79	0.19	0.51	0.32	0.08		

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Precipitation Chemistry - Calcium (mg/l volume weighted)

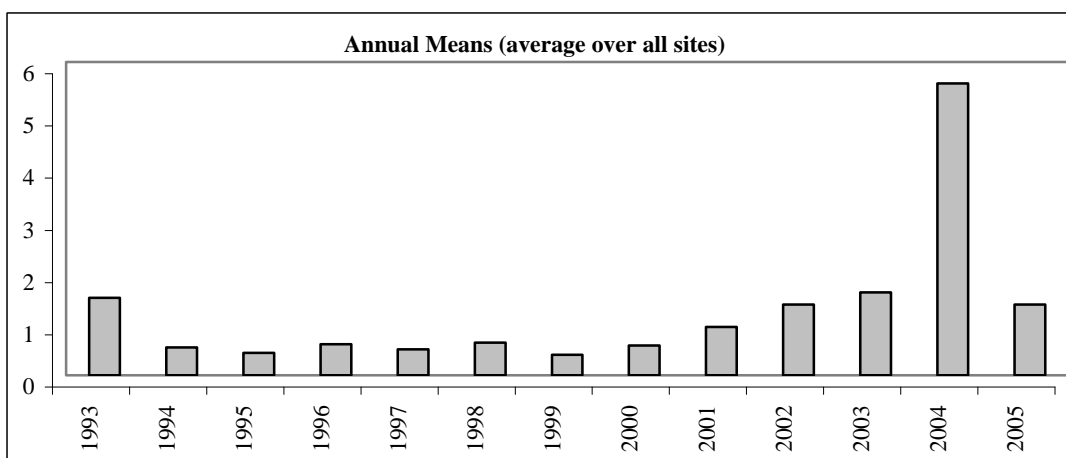
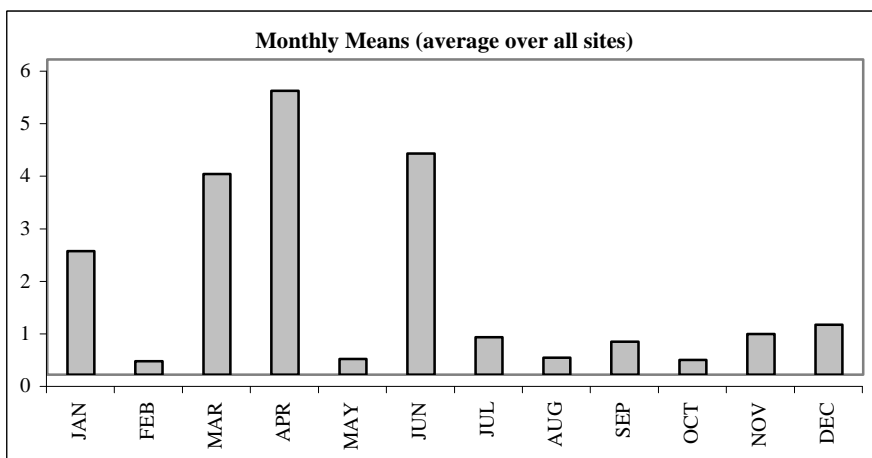
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.4	0.6	0.5	0.5	0.5	1.0	0.3	0.3	1.0	0.0	0.2	0.2
CAI	0.2	0.1	0.3	0.2	0.1	0.1		0.1		0.1	0.0	0.2
DRA												
GLE	0.2	0.2	0.3	0.1	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2
HIL												
MOO	0.2	0.1	0.2	0.2	0.2	1.0		0.2	0.2	0.1	0.1	0.2
NOR												
POR	17.0		31.9	46.4	0.5	30.2	3.2	1.3	2.2	1.4	1.5	2.7
ROT	0.4	0.3	0.3	0.5	0.5	0.8	0.2	0.2	0.3	0.2	0.3	0.3
SNO	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
SOU	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	3.8	3.8
WYT		0.4	0.4	0.5								
Average	2.3	0.3	3.8	5.4	0.3	4.2	0.7	0.3	0.6	0.3	0.8	0.9
Std. dev.	5.5	0.2	9.9	14.5	0.2	9.8	1.1	0.4	0.7	0.4	1.2	1.3

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.7	0.4	0.5	0.5	0.4	0.3	0.4	0.3	0.4	0.5	0.5	0.4	0.4	0.1
CAI							0.1	0.5	0.5	0.2	0.4	0.2	0.1	0.3	0.2
DRA	0.5	0.7	0.5	0.7	0.7	1.9	0.7	0.5	0.5	0.7	0.8	0.4		0.7	0.4
GLE	0.3	0.3	0.3	0.4	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.0
HIL		0.6	0.6	1.1	1.0	1.0	0.9	0.5						0.8	0.2
MOO	1.5	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.3
NOR	1.2	0.8	1.0	0.8	0.6	0.6	0.5	0.9	1.5	1.1	3.6	1.0		1.1	0.8
POR		0.3	0.3	0.9	0.7	0.6	0.4	2.5	5.5	10.4	9.5	57.4	8.5	8.1	16.0
ROT	0.4	0.3	0.4	0.5	0.5	1.2	0.4	0.2	0.3	0.3	0.5	0.3	0.3	0.4	0.2
SNO					0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.0
SOU	0.5	0.4	0.3	0.4	0.4	0.2	0.2	0.2	0.3	0.3	0.2	0.1	1.0	0.4	0.2
WYT	6.1	1.0	0.3	0.6	0.4	0.5	0.5	0.5	0.5	0.8	1.3	0.7		1.1	1.6
Average	1.5	0.5	0.4	0.6	0.5	0.6	0.4	0.6	0.9	1.4	1.6	5.6	1.4		
Std. dev.	2.1	0.3	0.2	0.3	0.3	0.5	0.2	0.6	1.6	3.0	2.8	17.2	2.9		

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Precipitation Chemistry - Magnesium (mg/l volume weighted)

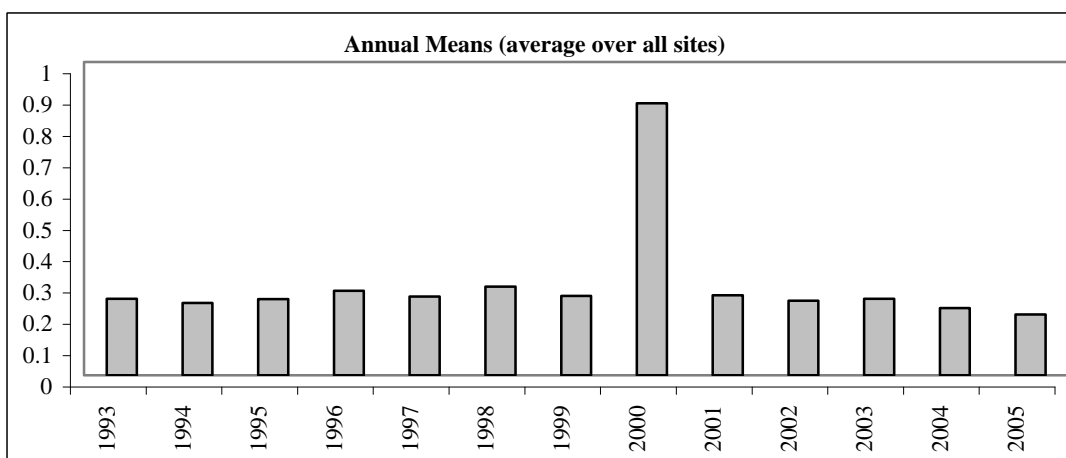
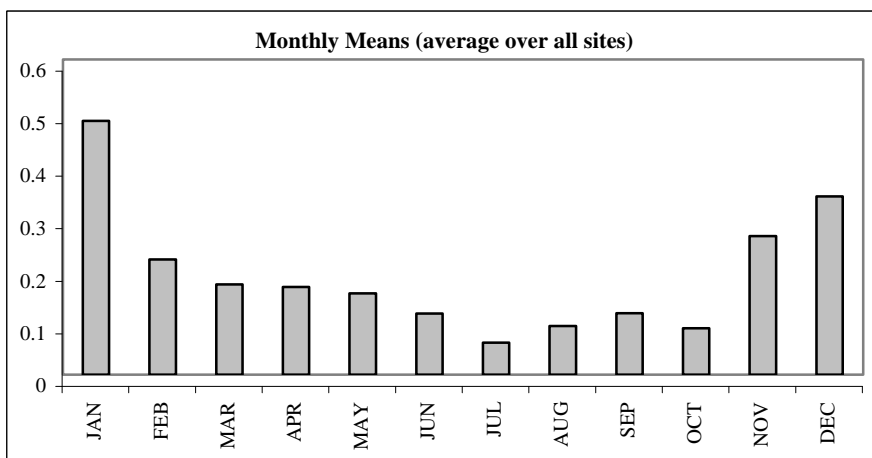
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.4	0.2	0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.1	0.4	0.3
CAI	0.5	0.0	0.2	0.3	0.1	0.1		0.0		0.1	0.1	0.5
DRA												
GLE	0.3	0.5	0.4	0.2	0.1	0.1	0.1	0.3	0.1	0.2	0.3	0.3
HIL												
MOO	0.3	0.1	0.1	0.1	0.1	0.2		0.1	0.1	0.1	0.1	0.1
NOR												
POR	1.1		0.1	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.4	0.5
ROT	0.4	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3
SNO	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1
SOU	0.4	0.3	0.3	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.4	0.4
WYT		0.2	0.1	0.1								
Average	0.5	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.3
Std. dev.	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.0
CAI							0.1	8.3	0.2	0.1	0.2	0.1	0.2	1.3	3.1
DRA	0.2	0.1	0.1	0.2	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2		0.2	0.1
GLE	0.3	0.4	0.3	0.5	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.3	0.1
HIL		0.3	0.3	0.3	0.4	0.5	0.4	0.3						0.4	0.1
MOO	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.0
NOR	0.5	0.4	0.5	0.4	0.3	0.4	0.7	0.4	0.4	0.6	0.9	0.6		0.5	0.2
POR		0.4	0.2	0.2	0.2	0.3	0.2	0.1	1.0	0.3	0.2	0.4	0.3	0.3	0.2
ROT	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.0
SNO					0.4	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1
SOU	0.3	0.2	0.2	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.1	0.2	0.3	0.1
WYT	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.1	0.0
Average	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.9	0.3	0.2	0.2	0.2	0.2		
Std. dev.	0.1	0.1	0.1	0.1	0.1	0.1	0.2	2.3	0.3	0.1	0.2	0.2	0.1		

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Precipitation Chemistry - Iron (mg/l volume weighted)

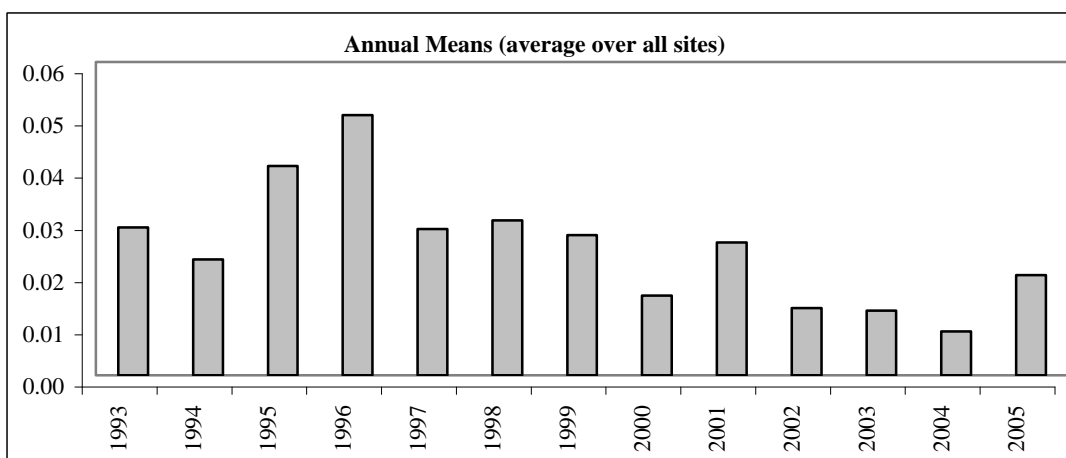
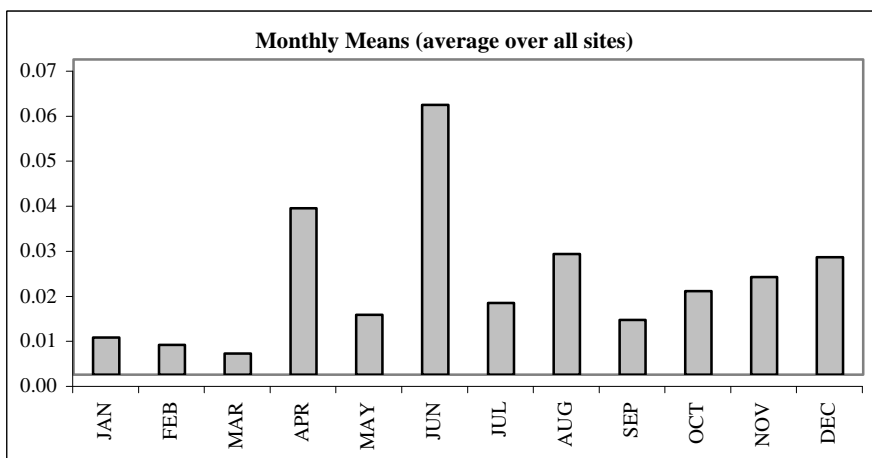
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
CAI			0.00	0.00								
DRA												
GLE	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
HIL												
MOO	0.01	0.00	0.01	0.00	0.01	0.26		0.02	0.00	0.00	0.00	0.00
NOR												
POR	0.00		0.00	0.29	0.06	0.13	0.07	0.13	0.06	0.12	0.12	0.17
ROT	0.04	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.00	0.01	0.01
SNO	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00
SOU	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
WYT		0.00	0.00	0.01								
Average	0.01	0.01	0.00	0.04	0.01	0.06	0.02	0.03	0.01	0.02	0.02	0.03
Std. dev.	0.01	0.01	0.00	0.09	0.02	0.09	0.02	0.04	0.02	0.04	0.04	0.06

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.01
CAI							0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.01
DRA	0.01	0.02	0.19	0.01	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.01		0.03	0.05
GLE	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
HIL		0.05	0.01	0.16	0.08	0.14	0.12							0.09	0.06
MOO	0.07	0.02	0.06	0.08	0.08	0.04	0.03	0.02	0.03	0.02	0.01	0.02	0.02	0.04	0.02
NOR			0.00		0.01	0.02	0.02	0.05						0.02	0.02
POR		0.00	0.05	0.07	0.03	0.04	0.05	0.05	0.08	0.02	0.05	0.02	0.11	0.05	0.03
ROT						0.04	0.04	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.01
SNO					0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
SOU	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01
WYT	0.05	0.05	0.02	0.04	0.04	0.02	0.02	0.01	0.02	0.00	0.01	0.01		0.02	0.02
Average	0.03	0.02	0.04	0.05	0.03	0.03	0.03	0.02	0.03	0.01	0.01	0.01	0.02		
Std. dev.	0.03	0.02	0.06	0.05	0.03	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.04		

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Precipitation Chemistry - Aluminium (mg/l volume weighted)

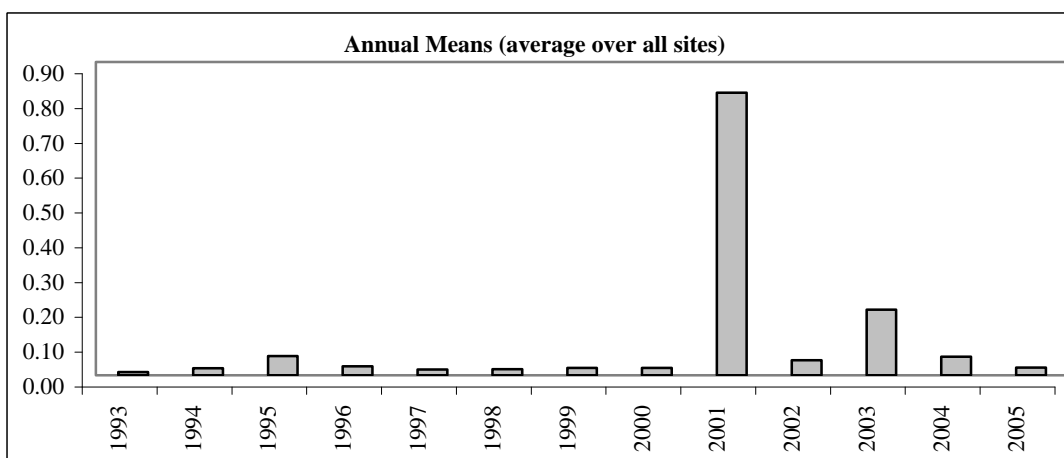
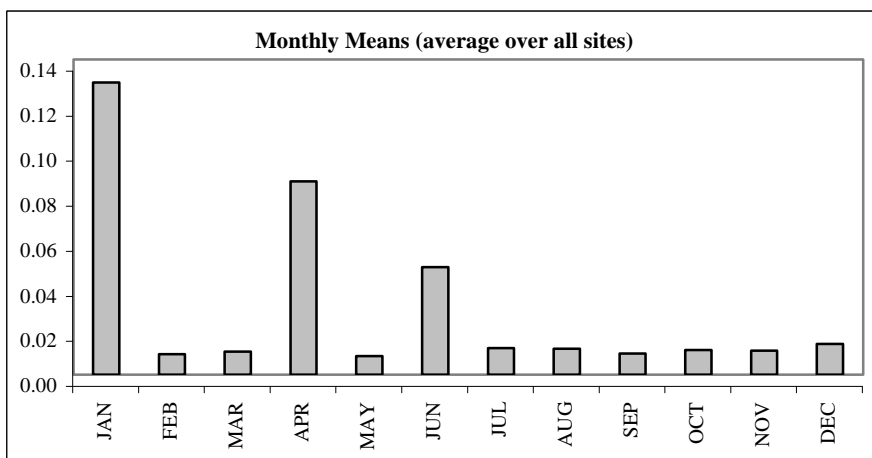
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.00	0.02	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
CAI	0.00		0.02	0.01	0.00	0.00		0.00		0.00	0.01	0.00
DRA												
GLE	0.00	0.00	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00
HIL												
MOO	0.00	0.00	0.00	0.00	0.00	0.04		0.00	0.00	0.00	0.00	0.00
NOR												
POR	1.01		0.00	0.69	0.02	0.16	0.02	0.04	0.03	0.07	0.06	0.10
ROT	0.01	0.01	0.01	0.01	0.01	0.13	0.01	0.00	0.00	0.00	0.00	0.00
SNO	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.00	0.00	0.00
SOU	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.00
WYT		0.00	0.00	0.00								
Average	0.13	0.01	0.01	0.09	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01
Std. dev.	0.33	0.01	0.01	0.21	0.01	0.06	0.01	0.01	0.01	0.02	0.02	0.03

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.11	0.01	0.01	0.01	0.01	0.01	0.03
CAI							0.07	0.06	0.04	0.01	0.01	0.00	0.00	0.03	0.03
DRA	0.01	0.05	0.43	0.01	0.01	0.02	0.01	0.01	0.01	0.02	1.35	0.01		0.16	0.39
GLE	0.02	0.01	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.02	0.01
HIL		0.01	0.01	0.03	0.03	0.05	0.09							0.04	0.03
MOO	0.00	0.04	0.00	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.02
NOR			0.00												
POR		0.00	0.01	0.02	0.01	0.02	0.01	0.04	7.90	0.33	0.44	0.46	0.12	0.78	2.25
ROT						0.03	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
SNO					0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
SOU	0.02	0.02	0.03	0.03	0.04	0.01	0.01	0.04	0.02	0.02	0.02	0.01	0.01	0.02	0.01
WYT	0.00	0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01		0.01	0.01
Average	0.01	0.02	0.06	0.03	0.02	0.02	0.02	0.02	0.81	0.04	0.19	0.05	0.02		
Std. dev.	0.01	0.02	0.14	0.02	0.01	0.01	0.03	0.02	2.49	0.10	0.43	0.14	0.04		

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Precipitation Chemistry - PO4-P (mg/l volume weighted)

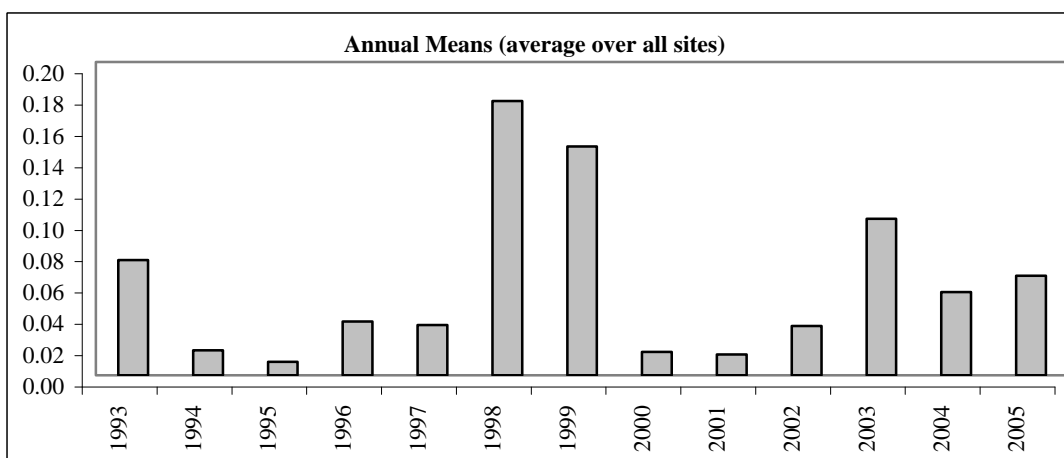
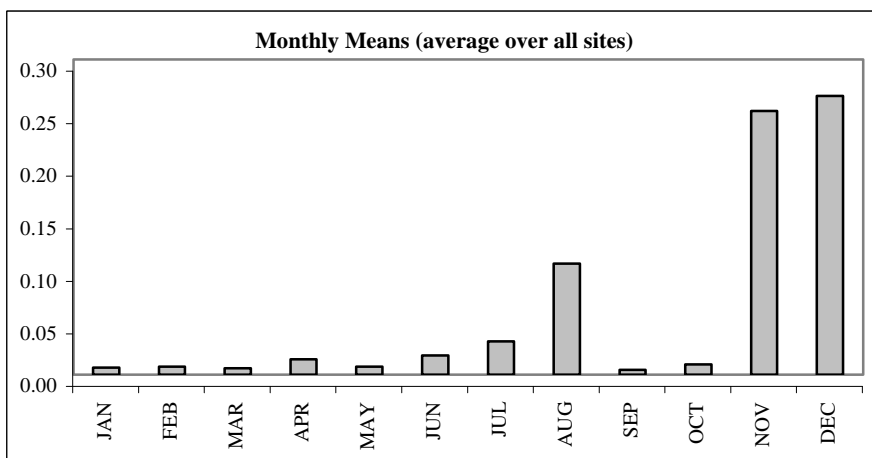
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
CAI	0.00	0.02	0.00	0.03	0.01	0.02	0.01	0.01	0.02	0.00	0.01	
DRA												
GLE	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.81	0.00	0.01	0.00	0.00
HIL												
MOO	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
NOR												
POR	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00			
ROT	0.03	0.04	0.03	0.02	0.03	0.03	0.00	0.01	0.00	0.03	0.02	0.00
SNO	0.01	0.01	0.01	0.00	0.00	0.07	0.19	0.02	0.01	0.01	0.01	0.03
SOU	0.01	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.03	1.72	1.56
WYT		0.00	0.00	0.00								
Average	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.11	0.00	0.01	0.25	0.27
Std. dev.	0.01	0.01	0.01	0.01	0.01	0.02	0.07	0.26	0.01	0.01	0.60	0.58

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.00	0.00	0.02	0.01	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01
CAI							0.03	0.00	0.01	0.00	0.02	0.01	0.01	0.01	0.01
DRA	0.00	0.02	0.01	0.22	0.20	0.01	0.01	0.01	0.01	0.00	0.02	0.05		0.05	0.08
GLE	0.25	0.10	0.02	0.02	0.01	0.04	0.03	0.05	0.01	0.02	0.02	0.10	0.08	0.06	0.07
HIL		0.01	0.00	0.00	0.00	0.01	0.01	0.03						0.01	0.01
MOO	0.16	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.04	0.00	0.00	0.06	0.00	0.02	0.05
NOR	0.02	0.01	0.01	0.00	0.01	0.03	0.01	0.01	0.02	0.02		0.04		0.02	0.01
POR		0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.20	0.22	0.06	0.01	0.04	0.08
ROT	0.02	0.01	0.03	0.02	0.07	1.80	1.61	0.04	0.03	0.03	0.68	0.19	0.02	0.35	0.63
SNO					0.00	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.02	0.01	0.01
SOU	0.06	0.01	0.00	0.06	0.03	0.01	0.01	0.01	0.01	0.06	0.01	0.07	0.37	0.05	0.10
WYT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00		0.00	0.01
Average	0.07	0.02	0.01	0.03	0.03	0.18	0.15	0.01	0.01	0.03	0.10	0.05	0.06		
Std. dev.	0.10	0.03	0.01	0.07	0.06	0.54	0.46	0.02	0.01	0.06	0.21	0.05	0.13		

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Precipitation Chemistry - NO3-N (mg/l volume weighted)

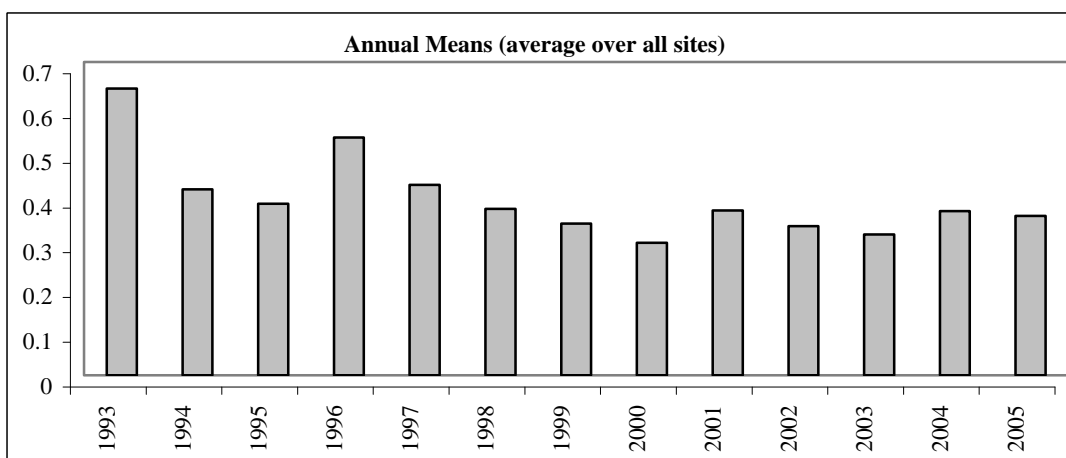
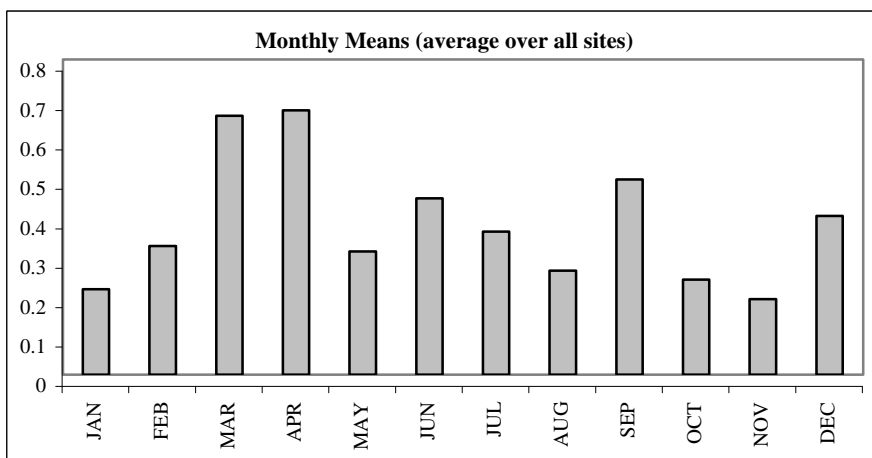
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.4	0.8	0.8	0.8	0.4	0.8	0.3	0.5	0.4	0.2	0.2	0.2
CAI	0.2	0.0	0.4	0.5	0.3	0.1	0.2	0.1	0.3	0.1	0.2	
DRA												
GLE	0.2	0.2	0.8	0.6	0.4	0.5	0.5	0.2	0.6	0.3	0.4	0.4
HIL												
MOO	0.0	0.1	0.3	0.3	0.2	0.1		0.1	0.2	0.3	0.1	0.4
NOR												
POR	0.5	0.5	0.8	0.6	0.3	0.7	0.4	0.4	1.3			
ROT	0.3	0.5	1.0	1.4	0.5	0.9	0.6	0.5	0.6	0.3	0.2	0.5
SNO	0.1	0.1	0.3	0.3	0.2	0.3	0.3	0.1	0.2	0.2	0.0	0.4
SOU	0.1	0.3	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.5
WYT		0.3	1.1	1.1								
Average	0.2	0.3	0.7	0.7	0.3	0.4	0.4	0.3	0.5	0.2	0.2	0.4
Std. dev.	0.2	0.2	0.3	0.4	0.1	0.3	0.1	0.2	0.3	0.1	0.1	0.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.0
CAI							0.3	0.2	0.2	0.1	0.1	0.4	0.2	0.2	0.1
DRA	2.2	0.5	0.5	0.5	0.6	0.8	0.5	0.3	0.4	0.4	0.5	0.8		0.7	0.5
GLE	0.4	0.6	0.5	0.7	0.5	0.4	0.4	0.4	0.7	0.4	0.5	0.4	0.4	0.5	0.1
HIL		0.3	0.4	0.6	0.5	0.3	0.3	0.2						0.4	0.2
MOO	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0
NOR	0.2	0.3	0.3	0.5	0.4	0.2	0.2	0.2	0.4	0.6	0.4	0.2		0.3	0.1
POR		0.4	0.3	0.4	0.4	0.3	0.4	0.5	0.3	0.3	0.3	0.4	0.5	0.4	0.1
ROT	0.4	0.5	0.5	0.7	0.6	0.5	0.5	0.5	0.6	0.5	0.4	0.5	0.6	0.5	0.1
SNO					0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.0
SOU	0.3	0.4	0.3	0.6	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.1
WYT	0.5	0.5	0.4	0.5	0.6	0.4	0.4	0.3	0.4	0.3	0.3	0.4		0.4	0.1
Average	0.6	0.4	0.4	0.5	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.4		
Std. dev.	0.7	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2		

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Precipitation Chemistry - NH4-N (mg/l volume weighted)

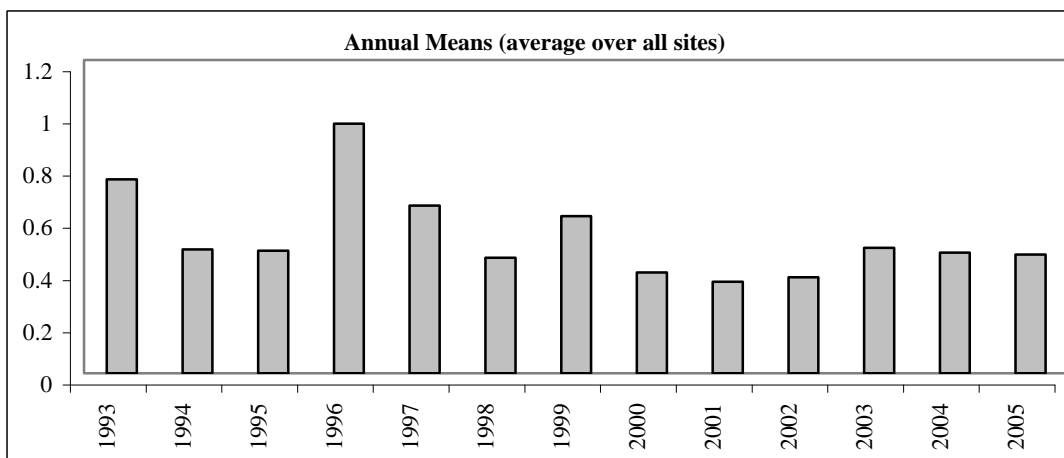
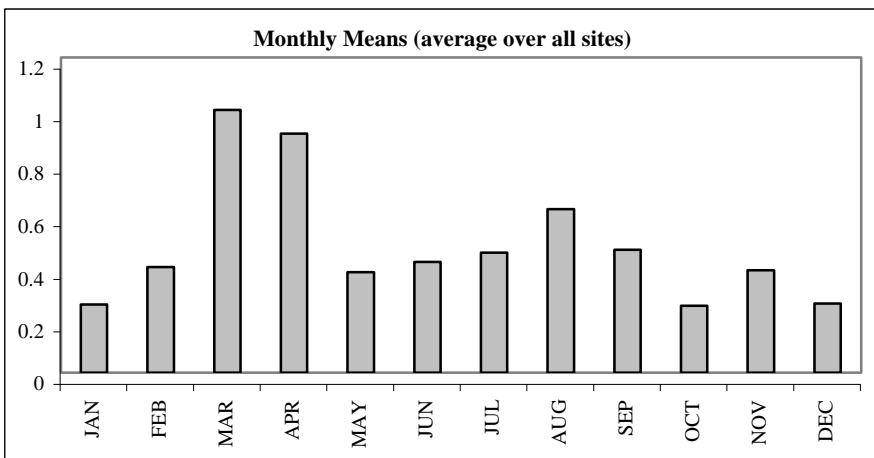
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.3	0.7	1.1	1.2	0.5	0.5	0.2	0.4	0.6	0.2	0.2	0.2
CAI	0.0	0.0	0.5	0.5	0.1	0.1	0.2	0.0	0.1	0.0	0.0	
DRA												
GLE	0.2	0.1	1.2	0.7	0.5	0.5	0.3	3.7	0.8	0.3	0.3	0.2
HIL												
MOO	0.1	0.2	0.6	0.4	0.4	0.3		0.1	0.2	0.4	0.2	0.3
NOR												
POR	0.6	0.8	1.2	0.8	0.5	0.5	0.3	0.3	1.2			
ROT	0.6	0.6	1.5	1.9	0.5	0.7	0.5	0.3	0.6	0.4	0.4	0.4
SNO	0.0	0.2	0.5	0.4	0.2	0.4	1.7	0.1	0.2	0.2	0.1	0.2
SOU	0.2	0.3	0.4	0.5	0.4	0.3	0.1	0.1	0.1	0.3	1.6	0.3
WYT		0.7	2.1	1.9								
Average	0.3	0.4	1.0	0.9	0.4	0.4	0.5	0.6	0.5	0.3	0.4	0.3
Std. dev.	0.2	0.3	0.5	0.6	0.1	0.2	0.5	1.2	0.4	0.1	0.5	0.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.2	0.4	0.5	0.3	0.3	0.5	0.3	0.3	0.2	0.5	0.3	0.4	0.4	0.1
CAI							0.2	0.2	0.1	0.0	0.1	0.2	0.1	0.1	0.1
DRA	0.9	1.0	0.7	2.5	2.4	0.6	0.7	0.5	0.5	0.5	0.7	1.1		1.0	0.7
GLE	1.0	0.6	0.4	1.1	0.4	0.7	0.5	0.8	0.6	0.3	0.5	0.6	0.8	0.6	0.2
HIL		0.6	0.9	1.3	0.9	0.6	1.0	0.6						0.9	0.3
MOO	1.2	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.5	0.3	0.4	0.3
NOR	0.5	0.3	0.3	0.7	0.4	0.3	0.5	0.2	0.2	0.8	1.3	0.1		0.5	0.3
POR		0.4	0.3	0.5	0.4	0.3	0.4	0.4	0.3	0.5	0.2	0.3	0.6	0.4	0.1
ROT	0.5	0.6	0.7	1.2	0.8	0.9	2.2	0.5	0.6	0.5	1.0	0.9	0.7	0.8	0.5
SNO					0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.0
SOU	0.8	0.3	0.3	0.8	0.3	0.3	0.3	0.4	0.2	0.5	0.2	0.4	0.5	0.4	0.2
WYT	0.4	0.6	0.4	0.7	0.6	0.4	0.5	0.3	0.5	0.4	0.5	0.5		0.5	0.1
Average	0.7	0.5	0.5	1.0	0.6	0.4	0.6	0.4	0.4	0.4	0.5	0.5	0.5		
Std. dev.	0.3	0.2	0.2	0.6	0.6	0.2	0.6	0.2	0.2	0.2	0.4	0.3	0.2		

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Precipitation Chemistry - Chloride (mg/l volume weighted)

2005 monthly averages

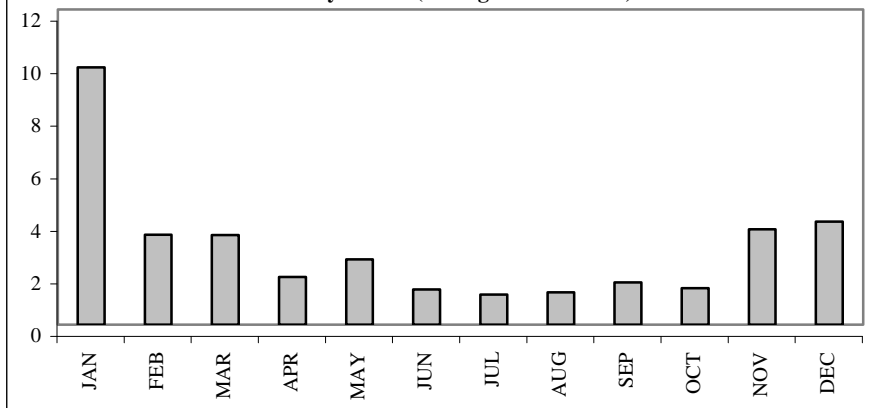
Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	6.4	4.2	1.8	1.4	3.5	1.3	0.7	0.6	0.8	1.3	6.3	4.7
CAI	9.5	0.0	9.0	3.5	3.1	0.1	2.6	1.9	3.9	0.5	1.8	
DRA												
GLE	4.6	6.6	5.9	2.4	1.7	1.8	1.0	2.2	2.1	2.6	4.3	5.2
HIL												
MOO	3.9	1.2	2.1	1.0	2.0	3.0		0.8	1.4	1.2	2.0	1.9
NOR												
POR	33.2	3.3	1.3	1.6	2.9	0.9	1.0	0.8	0.6			
ROT	8.0	4.6	2.4	1.3	3.2	1.6	1.2	1.6	0.4	1.7	2.9	5.0
SNO	6.7	3.0	3.4	2.2	1.7	1.4	0.9	1.2	2.0	1.5	4.9	2.7
SOU	6.1	4.6	3.9	2.1	1.8	0.8	0.6	0.9	1.6	0.9	3.1	4.0
WYT		3.3	1.0	0.8								
Average	9.8	3.4	3.4	1.8	2.5	1.3	1.1	1.2	1.6	1.4	3.6	3.9
Std. dev.	9.0	1.8	2.4	0.8	0.7	0.8	0.6	0.6	1.1	0.6	1.5	1.2

Annual Means

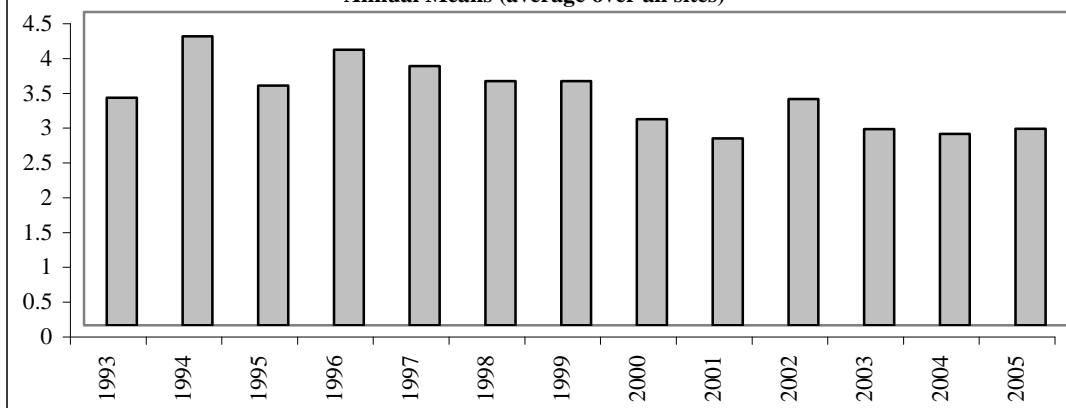
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		2.2	2.9	3.0	3.1	3.4	2.5	2.4	2.3	3.2	2.0	2.7	2.7	2.7	0.4
CAI							4.2	2.9	3.1	1.5	1.9	1.4	2.6	2.5	1.0
DRA	1.7	1.8	2.0	2.5	2.0	2.1	1.9	1.9	1.4	2.0	2.0	1.7		1.9	0.3
GLE	3.5	5.0	4.0	6.0	3.4	3.9	4.4	4.0	3.1	3.8	3.2	2.5	3.4	3.9	0.9
HIL		10.9	4.9	5.9	5.4	3.1	4.3	3.8						5.5	2.6
MOO	2.4	2.2	3.1	2.4	2.4	2.6	2.7	1.7	2.1	2.1	1.8	2.4	2.0	2.3	0.4
NOR	6.7	5.1	6.4	6.3	5.4	6.5	6.7	6.0	6.8	5.8	5.9	5.5		6.1	0.6
POR		6.6	2.9	2.6	2.8	3.2	2.7	1.9	2.8	4.4	3.1	4.6	3.7	3.5	1.2
ROT	2.0	2.4	3.1	3.6	3.4	3.8	3.1	2.1	2.1	3.0	2.9	2.8	2.4	2.8	0.6
SNO					7.0	3.4	3.6	3.2	2.6	5.0	2.6	3.3	3.2	3.8	1.4
SOU	3.8	3.1	2.9	5.2	3.6	4.5	4.1	3.9	1.9	3.0	2.8	1.7	2.6	3.3	1.0
WYT	2.8	2.2	2.2	2.0	2.5	2.0	2.0	1.6	1.4	2.0	2.9	1.6		2.1	0.4
Average	3.3	4.1	3.4	4.0	3.7	3.5	3.5	3.0	2.7	3.3	2.8	2.7	2.8		
Std. dev.	1.7	2.9	1.3	1.7	1.5	1.2	1.4	1.3	1.5	1.4	1.1	1.3	0.6		

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Monthly Means (average over all sites)



Annual Means (average over all sites)



Precipitation Chemistry - SO4-S (mg/l volume weighted)

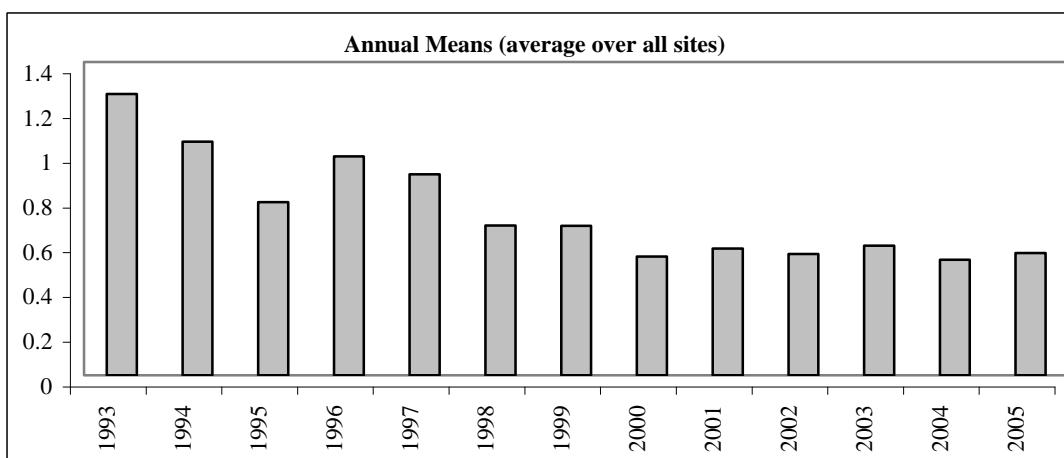
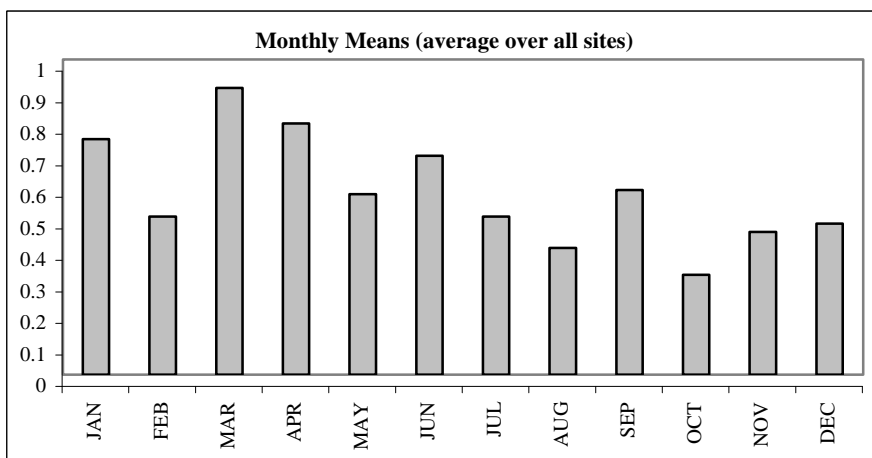
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.8	1.0	1.0	1.0	0.8	0.9	0.3	0.5	0.6	0.3	0.5	0.4
CAI	0.6	0.2	1.1	0.5	0.4	0.2	0.5	0.3	0.3	0.1	0.2	0.6
DRA												
GLE	0.4	0.5	1.0	0.6	0.6	0.6	0.6	0.7	0.7	0.4	0.5	0.4
HIL												
MOO	0.3	0.2	0.6	0.4	0.5	1.2		0.1	0.3	0.3	0.2	0.4
NOR												
POR	2.3	0.6	0.9	0.9	0.5	0.6	0.4	0.4	1.2			
ROT	0.9	0.8	1.2	1.4	0.9	1.0	0.9	0.6	0.8	0.4	0.6	0.6
SNO	0.4	0.2	0.7	0.6	0.4	0.6	0.5	0.2	0.5	0.3	0.4	0.3
SOU	0.4	0.4	0.7	0.5	0.5	0.3	0.3	0.4	0.2	0.3	0.8	0.7
WYT		0.5	1.1	1.2								
Average	0.7	0.5	0.9	0.8	0.6	0.7	0.5	0.4	0.6	0.3	0.5	0.5
Std. dev.	0.6	0.3	0.2	0.3	0.2	0.3	0.2	0.2	0.3	0.1	0.2	0.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.6	0.6	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.1
CAI							0.4	0.4	0.6	0.5	0.3	0.4	0.4	0.4	0.1
DRA	2.3	0.9	1.1	1.2	1.4	0.6	0.6	0.6	0.6	0.6	0.7	0.6		0.9	0.5
GLE	1.2	1.1	0.8	1.3	0.9	0.7	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.8	0.3
HIL		3.3	0.9	1.1	0.9	0.7	1.0	0.6						1.2	0.9
MOO	0.9	0.5	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.5	0.1
NOR	0.7	0.6	0.8	0.9	2.0	0.5	0.5	0.5	0.7	0.6	0.8	0.6		0.8	0.4
POR		0.7	0.5	0.9	0.6	0.6	0.5	0.7	0.5	0.6	0.5	0.8	0.8	0.6	0.1
ROT	1.1	1.0	1.1	1.4	1.0	1.5	1.8	0.7	0.8	0.8	1.3	0.7	0.8	1.1	0.3
SNO					0.5	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.1
SOU	1.1	0.8	0.6	1.0	0.7	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.5	0.6	0.2
WYT	1.4	0.9	0.8	0.7	0.8	0.6	0.6	0.5	0.5	0.5	0.5	0.5		0.7	0.3
Average	1.3	1.0	0.8	1.0	0.9	0.7	0.7	0.5	0.6	0.5	0.6	0.5	0.5		
Std. dev.	0.5	0.8	0.2	0.3	0.4	0.3	0.4	0.1	0.1	0.1	0.3	0.2	0.2		

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Precipitation Chemistry - Dissolved organic carbon (mg/l volume weighted)

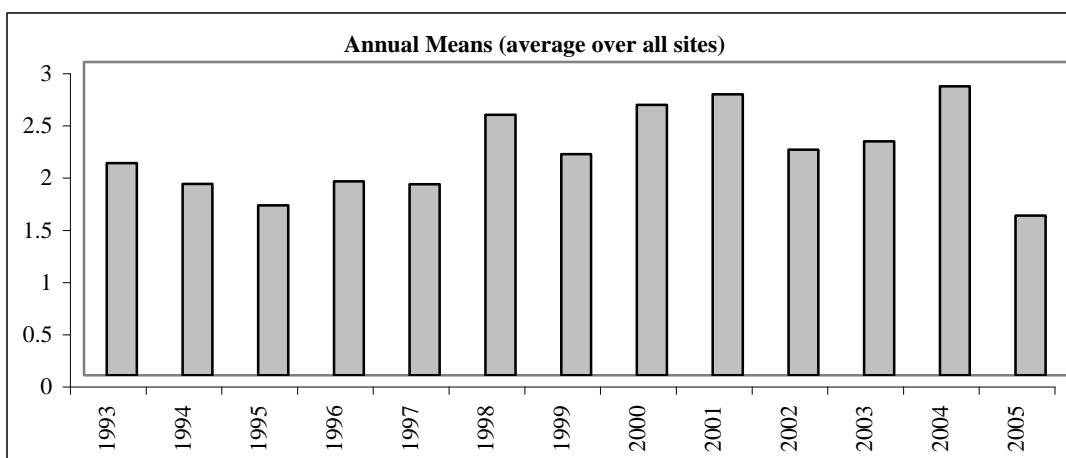
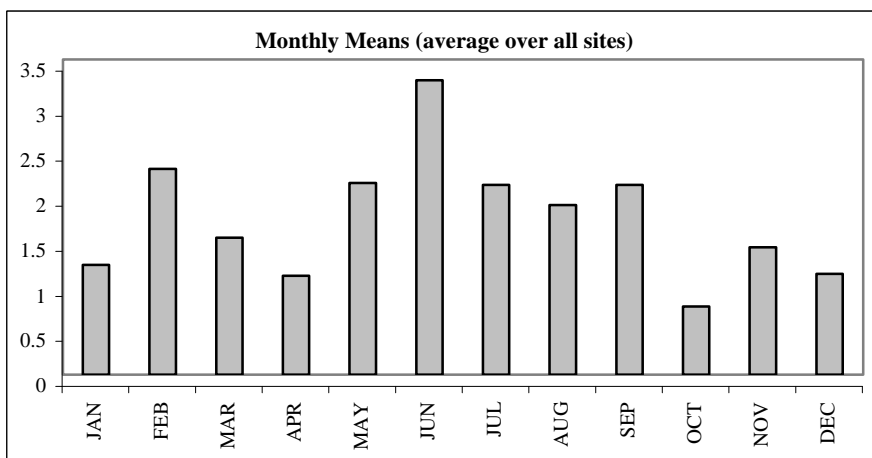
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	1.8	2.7	2.6	2.4	2.1	6.0	1.9	2.6	2.3	0.8	2.4	2.3
CAI	0.0		2.1	0.0	1.2	0.7	1.4	0.6		0.2	0.9	0.0
DRA												
GLE	0.7	1.1	2.2	1.1	6.9	1.3	3.5	5.3	2.3	0.4	1.0	0.8
HIL												
MOO	0.4	0.4	0.8	0.2	1.1	0.8		0.0	1.7	0.7	0.5	0.7
NOR												
POR	3.9	8.1	1.5	1.5	1.4	2.8	1.7	2.7	3.0			
ROT												
SNO	0.5	0.8	0.7	0.9	1.1	2.5	2.1	1.1	1.7	1.2	1.0	1.0
SOU	1.2	1.9	1.1	1.2	1.0	8.8	2.1	0.9	1.6	1.2	2.7	1.8
WYT		0.9	1.1	1.4								
Average	1.2	2.3	1.5	1.1	2.1	3.3	2.1	1.9	2.1	0.8	1.4	1.1
Std. dev.	1.2	2.5	0.7	0.7	2.0	2.8	0.7	1.7	0.5	0.4	0.8	0.7

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI										0.4	3.1	2.9	2.1	2.1	1.2
CAI							1.5		6.1				0.6	2.7	3.0
DRA	1.2	1.8	2.2	2.6	3.1	3.9	3.0	3.9	4.3	5.9	2.1	1.9		3.0	1.3
GLE	1.6	1.6	1.4	1.5	1.1	1.8	2.0	2.5	1.5	1.1	1.2	2.4	2.1	1.7	0.4
HIL						4.6	3.3	4.3						4.1	0.6
MOO	3.2	2.1	1.4	1.2	1.5	3.5	0.5	1.0	0.9	0.7	1.2	1.1	0.7	1.5	0.9
NOR						3.2	4.5	2.3		1.7	1.8			2.7	1.2
POR		1.7	1.7	2.0	2.1	1.5	1.6	3.2	3.1	4.6	6.6	10.2	2.3	3.4	2.6
ROT															
SNO					1.7	1.2	1.5	1.3	1.5	1.6	1.7	1.4	1.1	1.4	0.2
SOU	2.0	1.7	1.1	1.8	1.7	1.1	1.7	2.9	1.5	1.6	1.3	1.2	1.9	1.6	0.5
WYT	2.1	2.2	1.9	1.9	1.6	1.7	1.5	1.9	2.7	1.8	1.2	1.1		1.8	0.4
Average	2.0	1.8	1.6	1.9	1.8	2.5	2.1	2.6	2.7	2.2	2.2	2.8	1.5		
Std. dev.	0.8	0.3	0.4	0.5	0.6	1.3	1.2	1.1	1.8	1.9	1.7	3.1	0.7		

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Precipitation Chemistry - Total N (mg/l volume weighted)

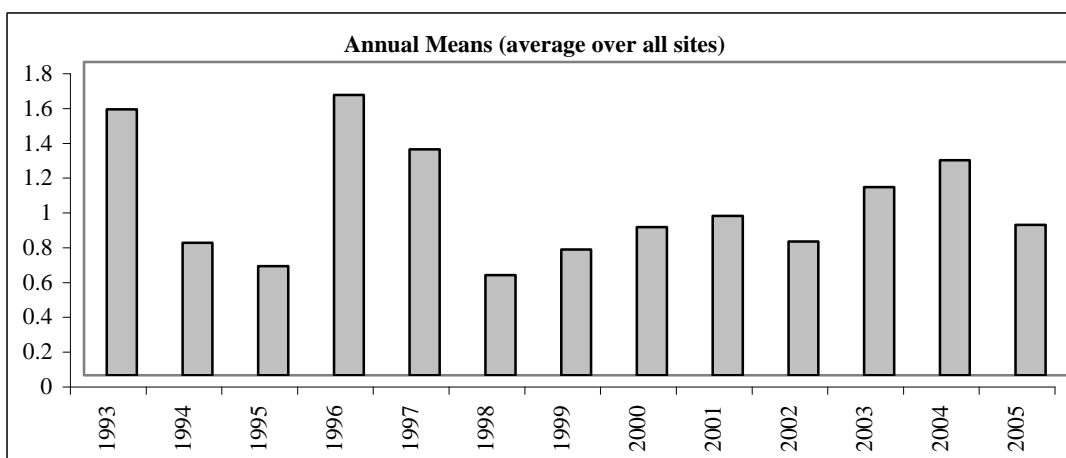
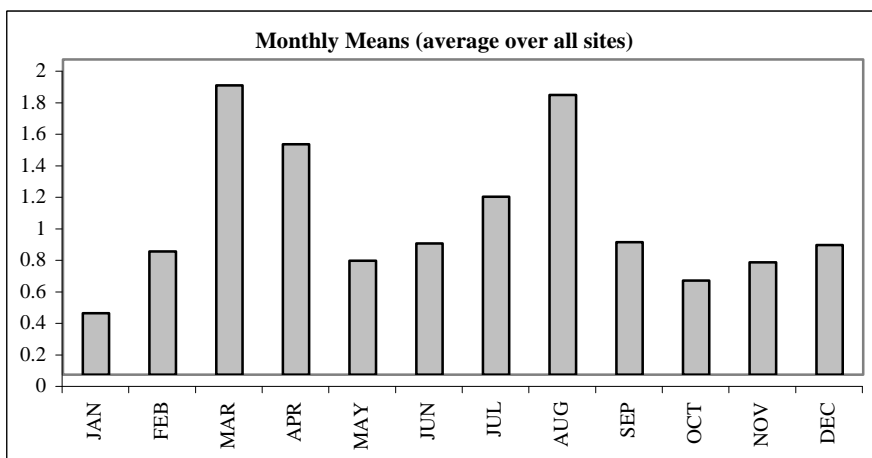
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.8	1.6	1.9	2.1	0.9	1.6	0.5	0.9	1.0	0.4	0.5	0.8
CAI												
DRA												
GLE	0.4	0.4	1.9	1.3	0.9	1.0	1.1	6.5	1.6	0.7	0.7	0.7
HIL												
MOO	0.2	0.3	1.0	0.7	0.7	0.4		0.3	0.5	0.7	0.3	0.7
NOR												
POR												
ROT	0.4	1.3	1.7							0.8	0.7	1.3
SNO	0.2	0.2	0.9	0.5	0.3	0.6	2.4	1.0	0.7	0.3	0.1	0.5
SOU	0.3	0.7	0.8	1.2	0.8	0.5	0.5	0.3	0.4	0.6	1.9	0.8
WYT		1.0	4.7	2.9								
Average	0.4	0.8	1.8	1.5	0.7	0.8	1.1	1.8	0.8	0.6	0.7	0.8
Std. dev.	0.2	0.5	1.2	0.8	0.2	0.4	0.8	2.4	0.4	0.2	0.6	0.2

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI								0.6	0.7	0.6	1.0	0.9	0.9	0.8	0.2
CAI															
DRA		1.4	0.9	3.8	2.9	0.9	0.8	0.9	1.1	1.0	1.3	2.6		1.6	1.0
GLE						0.1		1.3	1.4	0.8	1.0	1.5	1.5	1.1	0.5
HIL															
MOO	2.5	0.3	0.4	0.4	0.6	0.5	0.5	0.5	0.7	0.5	0.4	1.1	0.5	0.7	0.6
NOR					1.6						0.5	0.4		0.9	0.7
POR															
ROT								1.6	1.4	1.1	3.6	2.0	0.9	1.8	1.0
SNO					0.4	0.5	0.7	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.1
SOU								0.6	0.7	1.0	0.6	1.0	0.9	0.8	0.2
WYT	0.6	0.6	0.6	0.6	1.0	0.9	0.9	0.7	0.9	0.9	0.9	1.1		0.8	0.2
Average	1.5	0.8	0.6	1.6	1.3	0.6	0.7	0.9	0.9	0.8	1.1	1.2	0.9		
Std. dev.	1.4	0.5	0.3	1.9	1.0	0.3	0.2	0.4	0.4	0.2	1.0	0.7	0.4		

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4.2 Soil Solution Chemistry

Soil solution chemistry is likely to be affected by physical and chemical changes in the environment and itself to have important effects on ecosystem processes. Soil temperature and moisture status, for example, strongly influence the microbial activity in soil which controls nutrient release into the soil. In turn, soil solution nutrient status has a major influence on plant productivity and thus on animal productivity.

The commonly used non-destructive methods of soil solution sampling can be divided into zero tension methods and suction methods. Zero tension methods use a volume of soil contained in such a way that water percolating through the soil drains into a collecting vessel. These methods are suitable for leaching studies, where the objective is to quantify nutrients being lost from the soil. Suction methods involve the insertion into the soil of a porous-walled sampler which is evacuated so that water is drawn into it. Suction samplers collect water whether or not it is percolating through the soil and were termed 'artificial roots' by early researchers. For the purposes of ECN, it has been thought most appropriate to sample water that equates approximately with that which is available to plants, and accordingly suction sampling is being used.

Ceramic suction samplers have been criticised because the chemical composition of the soil solution can be modified by contact with the ceramic material, and for this reason samplers manufactured from PTFE and quartz are specified. The small size of these samplers makes them suitable for installation in the wide variety of soils encountered at ECN sites; larger and more intrusive types of sampler would result in hydrological disruption and aeration of peat soils, and would be impossible to install at the base of shallow soils, in stony soils and in soils containing tree roots.

Twelve samplers are installed at each ECN site, six in the A soil horizon and six at the base of the B horizon, within a 6m by 6m plot. Where these horizons do not exist (e.g. in peat soils) depths of 10cm and 50cm are used. Summary statistics are reported separately for the two levels of sampler, which are referred to as shallow and deep, and values are pooled over the six samplers at each level.

Soil Solution shallow samplers - pH

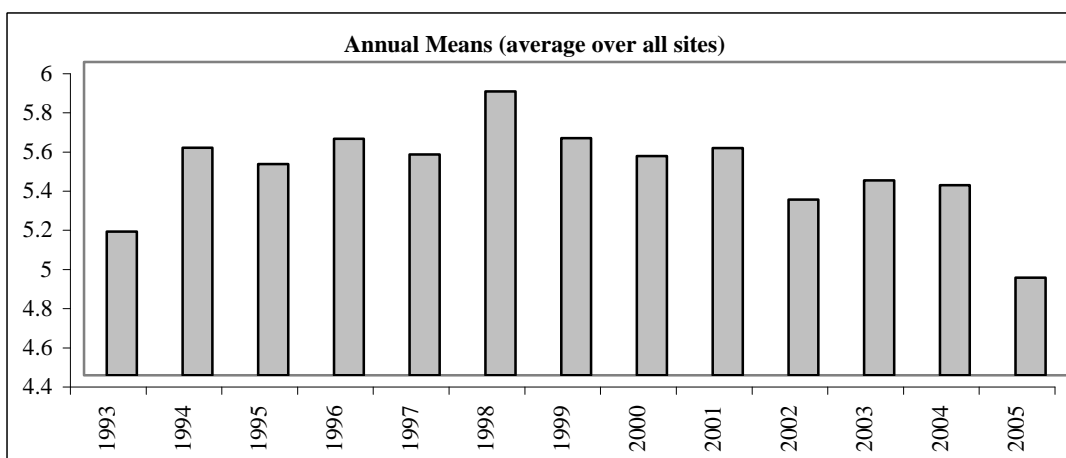
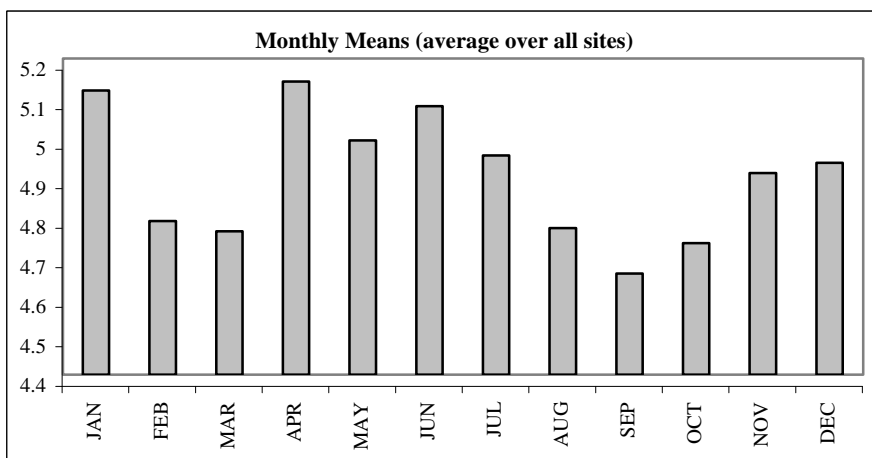
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.2	4.1	4.1	4.1	4.1	4.1					4.4	4.3
CAI		4.7	4.6	4.5	5.3	5.5	5.4	5.1	4.7	5.1	5.2	5.4
DRA												
GLE	4.1	4.0	3.9	3.9	4.0	4.1	4.2	3.9	3.9	4.0	4.0	4.1
HIL												
MOO	4.3	4.3	4.3	4.4	4.4	4.4	4.3	4.3	4.2	4.2	4.3	4.3
NOR												
POR												
ROT	6.0	6.0	6.2	6.5	6.4	6.6					6.1	6.2
SNO	6.0	6.2	6.1	6.3	6.5	6.6	6.6	6.4	6.2	6.2	6.2	6.1
SOU	4.3	4.2	4.1	4.2	4.2	4.3	4.3	4.3	4.3	4.2	4.2	4.2
WYT	6.9			7.3								
Average	5.1	4.8	4.8	5.1	5.0	5.1	5.0	4.8	4.7	4.7	4.9	4.9
Std. dev.	1.0	0.9	0.9	1.2	1.0	1.1	0.9	0.9	0.8	0.8	0.9	0.9

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		4.3	4.4	4.3	4.1	4.2	4.2	4.3	4.6	4.5	4.6	4.3	4.2	4.3	0.2
CAI							5.2	5.0	5.1	4.9	4.6	5.2	5.0	5.0	0.2
DRA		6.8	5.7	5.3	5.9	6.4	6.4	6.4	7.1	5.5	6.1	6.1		6.2	0.5
GLE	4.1	4.0	4.1	4.1	4.2	4.3	4.2	4.2	4.3	4.2	4.2	4.0	4.0	4.1	0.1
HIL		6.9	6.8	6.5	6.4	6.8	7.2	7.2						6.8	0.3
MOO	4.1	4.1	4.0	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.2	4.4	4.3	4.2	0.1
NOR	6.3	6.3	6.5	6.4	6.1	6.7	6.0	6.2	6.3	6.1	6.1	6.3		6.3	0.2
POR				8.1	8.0	7.8								8.0	0.2
ROT		6.2	6.2	6.1	6.0	6.3	6.3	5.8	6.0	6.0	6.4	6.2	6.3	6.1	0.2
SNO					6.0	6.2	6.2	6.0	6.3	6.2	6.3	6.3	6.3	6.2	0.1
SOU	4.2	4.0	4.2	4.1	4.4	4.4	4.3	4.2	4.4	4.2	4.1	4.1	4.2	4.2	0.1
WYT	7.0	7.5	7.3	6.9		7.1	7.4	7.2	7.3	7.1	7.2	7.0		7.2	0.2
Average	5.1	5.6	5.5	5.6	5.5	5.8	5.6	5.5	5.6	5.3	5.4	5.4	4.9		
Std. dev.	1.4	1.4	1.3	1.4	1.3	1.3	1.2	1.2	1.2	1.0	1.2	1.1	1.0		

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Soil Solution shallow samplers - Conductivity (microSiemens/l)

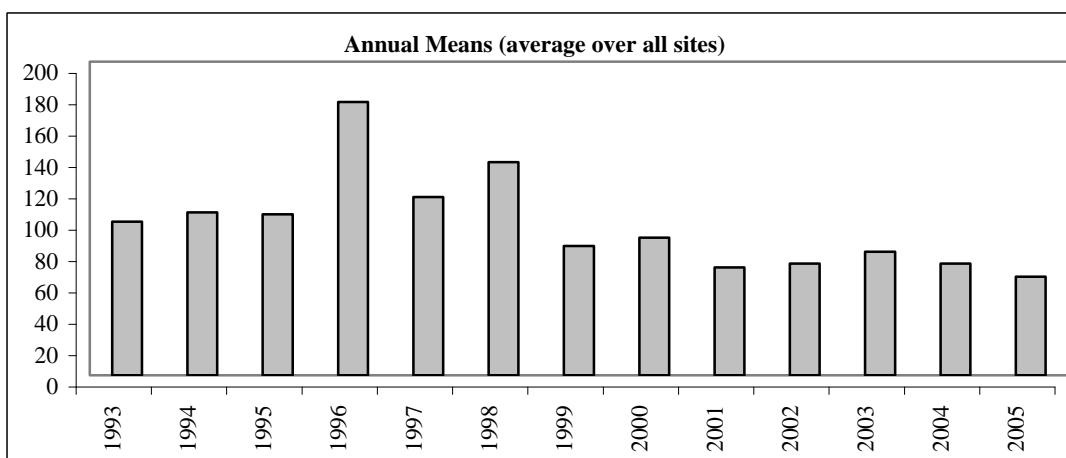
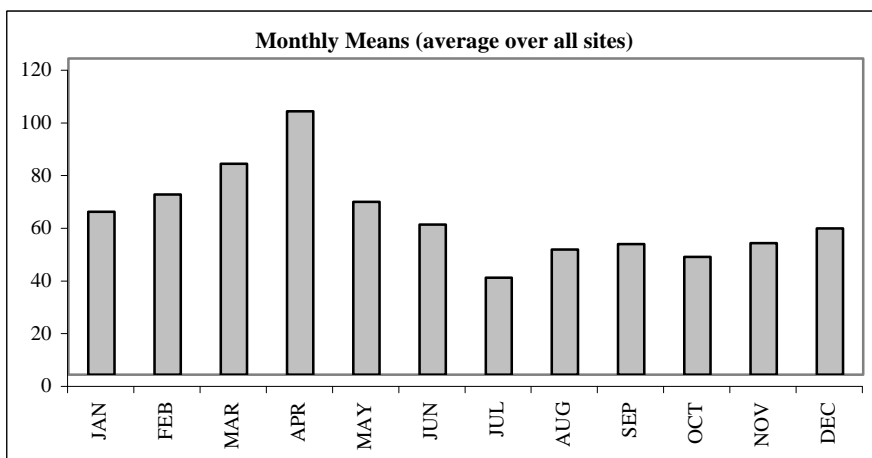
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	134	160	182	190	182	165					86	107
CAI		39	42	41	43	25	20	23	23	22	24	31
DRA												
GLE	64	75	103	100	73	62	60	105	93	79	68	64
HIL												
MOO	35	39	39	36	36	38	42	46	44	42	37	35
NOR												
POR												
ROT	47	62	65	69	52	42					47	51
SNO	39	40	54	34	23	25	24	22	46	33	31	42
SOU	53	63	75	64	50	43	38	42	41	48	56	58
WYT				266								
Average	62	68	80	100	66	57	37	47	50	45	50	56
Std. dev.	34	40	46	79	49	46	14	30	23	19	20	24

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		100	86	85	120	146	78	92	81	88	102	112	151	103	24
CAI							24	24	22	26	36	22	30	26	5
DRA		123	172	449	165	169	72	135	136	120	109	118		161	100
GLE	69	81	69	70	55	44	52	51	53	61	53	63	79	61	11
HIL		189	154	298	218	229	179	213						212	46
MOO	44	51	79	56	49	43	47	39	37	37	58	39	39	48	12
NOR						171	88	76	86	63	87	83		94	35
POR				261	256	277								265	11
ROT		57	58	53	69	57	57	59	54	56	65	43	54	57	6
SNO					29	25	32	22	21	43	27	26	34	29	7
SOU	96	81	60	91	62	47	52	48	46	55	68	47	53	62	17
WYT	182	148	143	206		287	225	208	152	163	182	161		187	43
Average	98	104	103	174	114	136	83	88	69	71	79	71	63		
Std. dev.	60	47	46	139	81	99	63	69	45	42	45	46	42		

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Soil Solution shallow samplers - Alkalinity (mg/l)

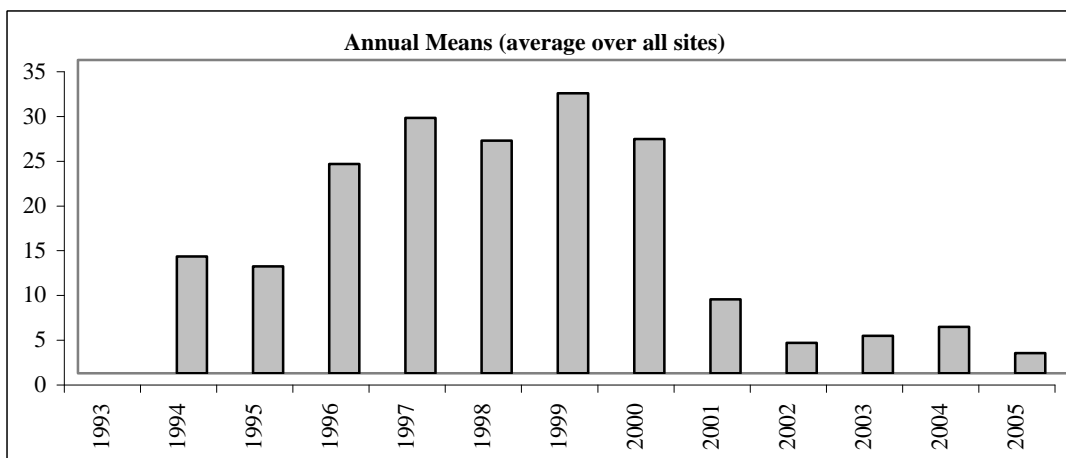
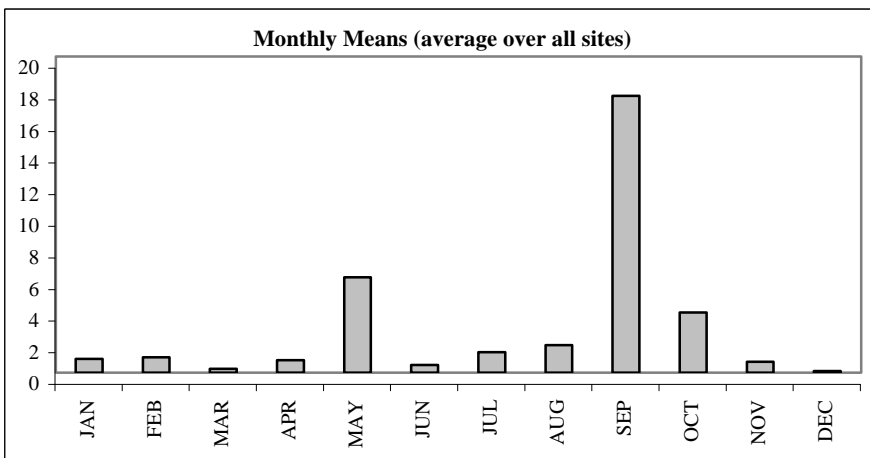
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI												
CAI			0.0			0.6						
DRA												
GLE	0.7	1.6	0.7	0.0	1.2	0.0	0.0	0.0	37.5	9.2	0.0	0.0
HIL												
MOO												
NOR												
POR												
ROT												
SNO	1.9	1.3	0.3	1.3	3.0		3.9	2.8	2.6	1.7	1.7	0.3
SOU	0.0	0.0	0.0	1.1	13.9	0.8	0.0	2.4	12.4	0.5	0.4	0.0
WYT												
Average	0.9	1.0	0.2	0.8	6.0	0.5	1.3	1.7	17.5	3.8	0.7	0.1
Std. dev.	0.8	0.7	0.3	0.6	5.6	0.3	1.8	1.2	14.7	3.9	0.7	0.2

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI						0.0	0.0	0.0	0.0	0.8	-1.4	-0.9		-0.2	0.7
CAI								2.7	1.3	0.1	0.0		0.3	0.9	1.1
DRA									25.0		9.7	21.2		18.6	8.0
GLE	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.2	2.4	2.0	1.7	0.1	4.2	1.1	1.5
HIL		54.7	52.1	48.5	85.6	130	156	145						96.0	46.8
MOO	0.0	0.0	0.0							0.0					
NOR												5.5			
POR				61.8											
ROT		12.0	7.5	6.6											
SNO						1.1	2.4	3.4	2.9	2.8	3.8	4.4	1.9	2.8	1.0
SOU	0.0	0.0	0.0	0.0	0.0	0.3	1.3	3.7	2.4	1.8	0.0	0.9	2.6	1.0	1.3
WYT	0.0	11.6				24.9	27.2	24.6	23.7	16.4	15.5			18.0	9.1
Average	0.0	13.0	11.9	23.4	28.5	26.0	31.3	26.2	8.3	3.4	4.2	5.2	2.3		
Std. dev.	0.0	21.2	22.7	29.5	49.4	51.7	61.9	53.3	11.1	5.8	6.2	8.2	1.6		

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Soil Solution shallow samplers - Sodium (mg/l)

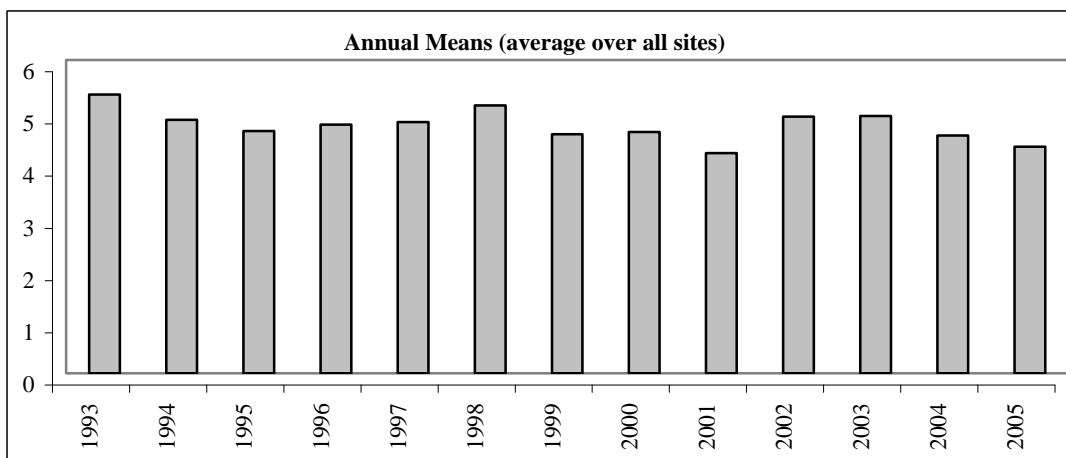
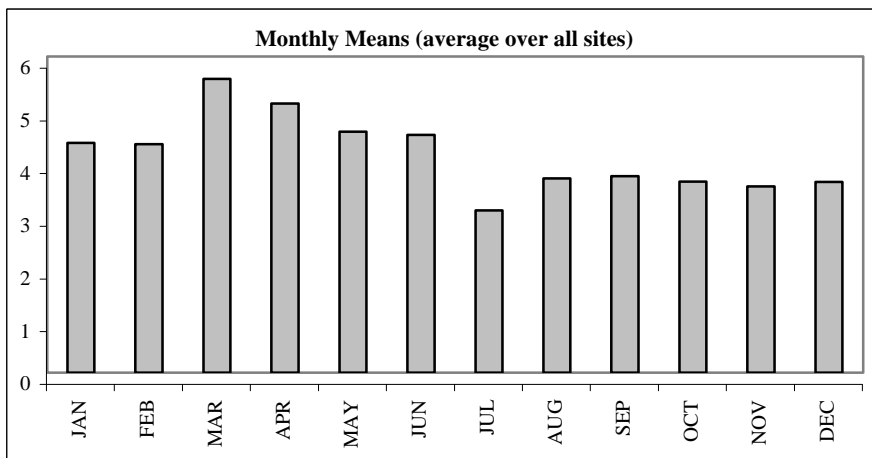
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	9.1	9.7	10.2	9.7	10.0	9.8						
CAI		1.9										
DRA												
GLE	4.8	4.6	6.0	6.1	4.8	4.6	4.5	6.8	6.2	5.8	4.6	4.6
HIL												
MOO	2.4	2.6	2.6	2.6	2.6	2.6	3.0	3.1	3.0	2.8	2.7	2.3
NOR												
POR												
ROT	3.8	4.6	5.0	4.8	4.2	4.4					3.7	4.1
SNO	2.4	3.2	5.0	3.7	2.3	2.5	2.0	1.9	2.6	2.5	2.8	3.1
SOU	3.7	3.7	4.5	3.7	3.6	3.2	2.9	2.9	3.1	3.4	3.8	4.0
WYT												
Average	4.4	4.3	5.6	5.1	4.6	4.5	3.1	3.7	3.7	3.6	3.5	3.6
Std. dev.	2.3	2.4	2.3	2.3	2.6	2.5	0.9	1.9	1.4	1.3	0.7	0.8

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		5.2	4.7	6.0	9.1	7.9	5.4	5.7	4.7	5.4	5.9	6.8	9.8	6.4	1.7
CAI							0.4	3.2	2.6	2.8	4.0	2.5	1.9	2.5	1.1
DRA		2.8			3.9	2.5	2.4	3.6	2.6	4.6	2.3	3.3		3.1	0.8
GLE	4.2	6.5	6.3	6.9	6.1	4.7	5.6	4.8	4.7	4.4	4.4	5.0	5.3	5.3	0.9
HIL		1.3	1.7	2.1	1.7	1.9	3.0	2.5						2.0	0.6
MOO	2.8	2.7	3.4	3.0	2.8	2.5	2.9	2.8	2.7	2.8	3.2	2.8	2.7	2.9	0.2
NOR	6.8	6.2	4.7	4.2	4.8	9.8	7.5	6.8	6.8	9.4	9.2	8.0		7.0	1.9
POR				3.4		3.1									
ROT		5.3	5.3	5.2	6.4	5.8	5.5	5.4	4.6	4.3	4.7	3.9	4.3	5.1	0.7
SNO					2.5	3.4	3.1	2.7	2.4	3.9	2.7	2.4	2.8	2.9	0.5
SOU	5.8	6.5	5.3	7.3	6.0	4.4	5.3	4.5	3.6	3.6	4.6	3.5	3.5	4.9	1.2
WYT	7.1	7.3	5.6			10.4	9.3	8.9	7.2	8.0	8.2	7.4		7.9	1.3
Average	5.3	4.9	4.6	4.8	4.8	5.1	4.6	4.6	4.2	4.9	4.9	4.6	4.3		
Std. dev.	1.8	2.1	1.5	1.9	2.3	3.0	2.5	2.0	1.7	2.2	2.3	2.1	2.6		

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Soil Solution shallow samplers - Potassium (mg/l)

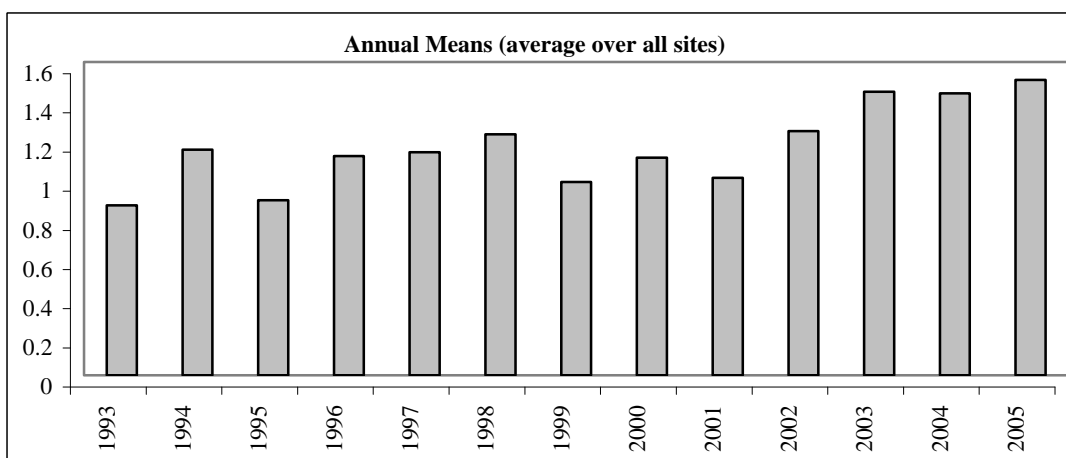
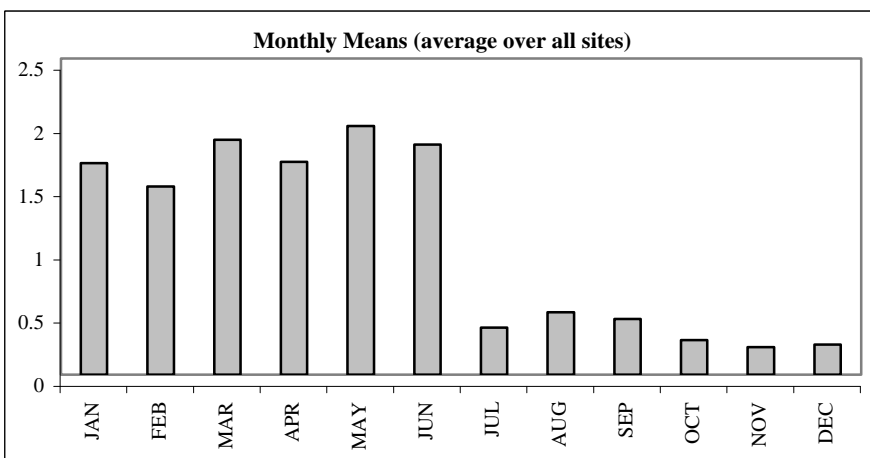
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	8.2	8.5	8.8	7.9	9.6	9.2						
CAI		0.1										
DRA												
GLE	0.6	0.6	0.9	0.9	0.8	0.7	0.6	1.7	1.6	1.0	0.6	0.5
HIL												
MOO	0.4	0.3	0.3	0.3	0.4	0.3	0.4	0.2	0.1	0.1	0.1	0.0
NOR												
POR												
ROT	0.2	0.0	0.0	0.0	0.0	0.2					0.1	0.1
SNO	0.3	0.3	0.5	0.3	0.4	0.2	0.2	0.0	0.0	0.0	0.1	0.1
SOU	0.4	0.6	0.6	0.7	0.6	0.4	0.3	0.1	0.1	0.1	0.3	0.4
WYT												
Average	1.7	1.5	1.9	1.7	2.0	1.8	0.4	0.5	0.4	0.3	0.2	0.2
Std. dev.	2.9	2.9	3.1	2.8	3.4	3.3	0.2	0.7	0.7	0.4	0.2	0.2

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		4.4	2.9	3.1	3.5	4.7	2.6	4.7	3.7	3.5	4.4	7.3	8.7	4.5	1.8
CAI							0.5	1.6	0.4	0.5	3.4	0.1	0.1	1.0	1.2
DRA		0.6			3.7	0.7	0.3	0.7	1.1	2.4	0.8	1.0		1.3	1.1
GLE	0.7	0.5	0.5	1.4	0.5	0.5	1.0	0.5	0.5	0.6	0.6	0.5	0.9	0.7	0.3
HIL		0.1	0.2	0.2	0.2	0.3	0.2	0.1						0.2	0.1
MOO	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1
NOR	0.3	1.0	0.5	0.8	0.6	0.9	0.6	0.5	0.3	0.5	0.5	0.9		0.6	0.2
POR				0.9		0.4									
ROT		0.2	0.2	0.2	0.2	0.3	0.5	0.2	0.2	0.3	0.2	0.3	0.1	0.2	0.1
SNO					0.3	0.3	0.8	0.3	0.2	1.0	0.5	0.2	0.2	0.4	0.3
SOU	1.2	1.5	1.2	2.3	1.1	1.7	0.9	0.5	0.6	0.7	1.0	0.7	0.4	1.1	0.5
WYT	2.0	1.8	1.5			3.9	3.5	3.2	3.1	2.9	3.1	3.4		2.8	0.8
Average	0.9	1.2	0.9	1.1	1.1	1.2	1.0	1.1	1.0	1.2	1.4	1.4	1.5		
Std. dev.	0.7	1.3	0.9	1.1	1.4	1.6	1.1	1.5	1.3	1.2	1.6	2.3	3.2		

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Soil Solution shallow samplers - Calcium (mg/l)

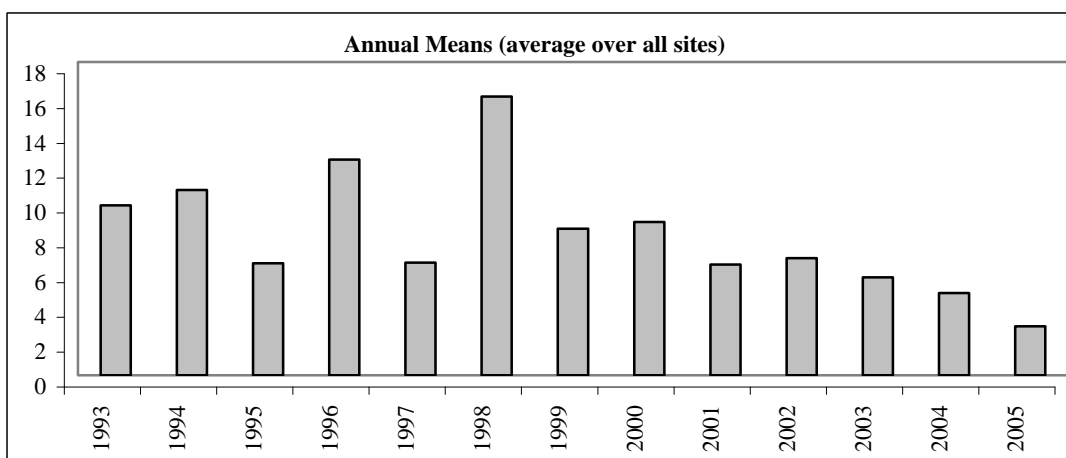
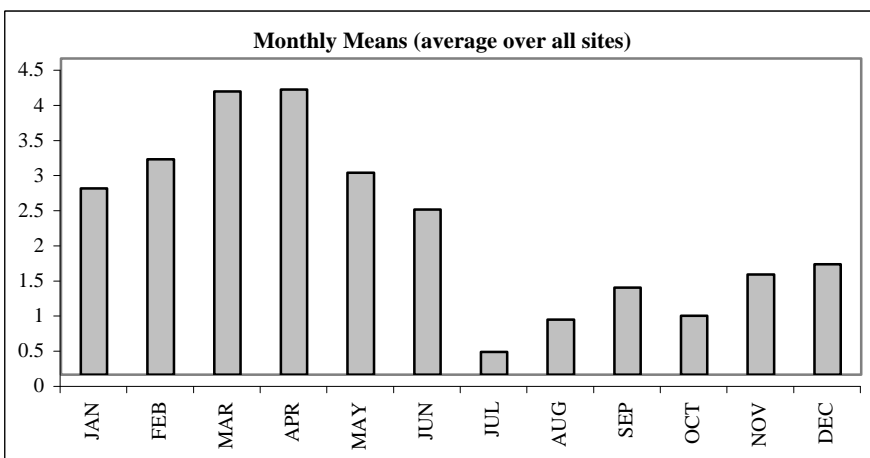
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	7.8	11.8	12.8	13.7	10.8	9.0						
CAI		0.4										
DRA												
GLE	0.8	0.4	0.5	0.5	0.4	0.4	0.2	0.8	0.5	0.5	0.3	0.2
HIL												
MOO	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.3
NOR												
POR												
ROT	4.8	6.0	6.8	7.7	4.9	3.0					4.3	5.4
SNO	1.6	1.9	3.0	1.5	0.3	0.9	0.2	1.5	3.4	1.9	1.6	1.3
SOU	0.6	0.7	0.8	0.7	0.5	0.5	0.4	0.4	0.5	0.6	0.5	0.6
WYT												
Average	2.6	3.1	4.0	4.1	2.9	2.4	0.3	0.8	1.2	0.8	1.4	1.6
Std. dev.	2.8	4.0	4.5	5.0	3.9	3.1	0.1	0.5	1.3	0.6	1.5	2.0

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		3.6	3.7	4.4	13.3	10.2	3.5	3.5	4.1	3.6	4.4	3.8	11.0	5.8	3.5
CAI							0.3	0.9	0.8	0.5	0.8	0.8	0.4	0.6	0.2
DRA		14.4			4.4	28.9	15.3	23.0	23.9	30.3	19.5	12.9		19.2	8.3
GLE	0.4	0.4	0.3	0.3	0.3	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.5	0.3	0.1
HIL		27.9	18.6	31.6	23.8	26.7	24.7	32.3						26.5	4.7
MOO	0.7	0.5	0.9	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.7	1.1	0.3	0.6	0.2
NOR	22.7	22.3	10.0	7.7	7.8	22.6	13.0	8.0	9.5	3.5	4.7	4.0		11.3	7.3
POR				49.0		46.4									
ROT		5.3	5.0	4.0	5.8	5.1	5.7	4.4	4.3	5.9	6.4	3.0	5.4	5.0	0.9
SNO					1.4	1.3	2.1	1.2	1.3	2.6	1.1	1.2	1.6	1.5	0.5
SOU	1.3	1.2	0.9	1.5	0.9	0.8	0.9	0.7	0.5	0.8	0.7	0.5	0.6	0.9	0.3
WYT	23.7	20.1	12.0			33.5	26.4	22.2	18.2	19.4	17.8	19.7		21.3	5.8
Average	9.8	10.6	6.4	12.4	6.5	16.0	8.4	8.8	6.4	6.7	5.6	4.7	2.8		
Std. dev.	12.3	10.7	6.5	18.0	7.8	16.3	9.9	11.5	8.4	10.1	7.2	6.5	4.0		

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Soil Solution shallow samplers - Magnesium (mg/l)

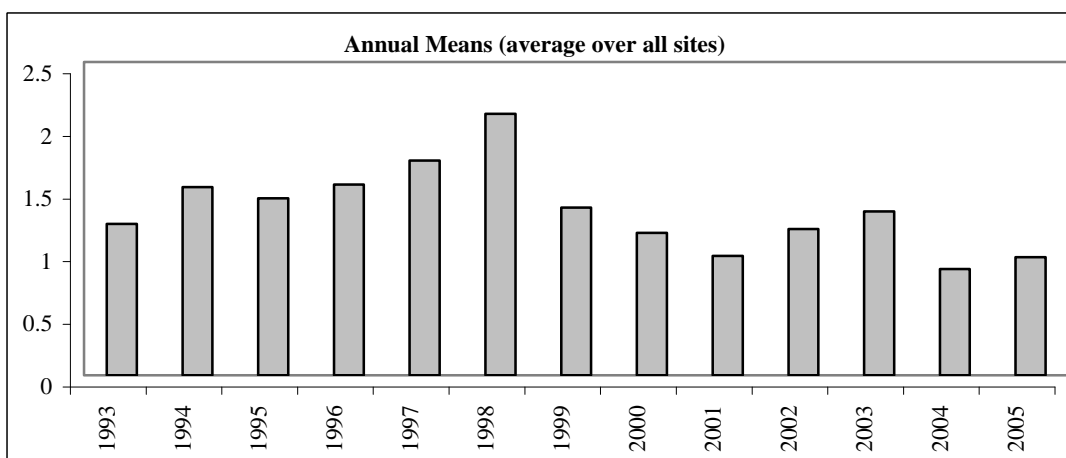
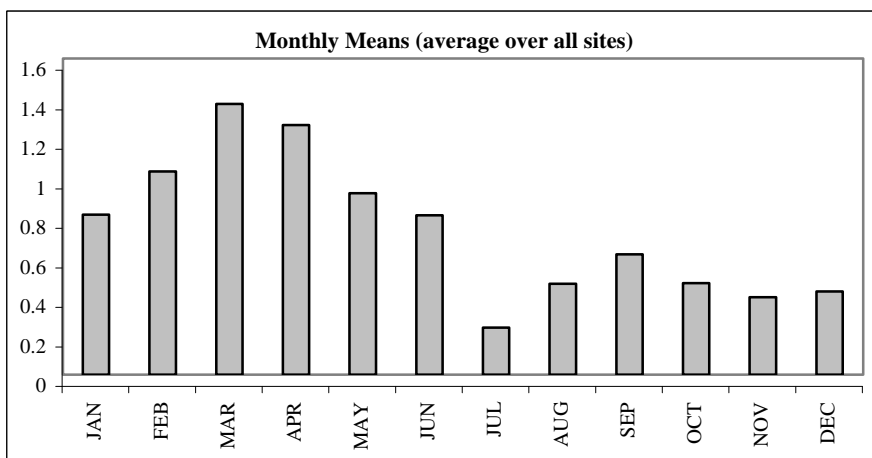
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	2.7	4.3	4.7	4.9	4.0	3.4						
CAI		0.4										
DRA												
GLE	0.4	0.5	0.8	0.8	0.5	0.4	0.3	0.7	0.5	0.5	0.4	0.3
HIL												
MOO	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2
NOR												
POR												
ROT	0.4	0.5	0.5	0.6	0.3	0.2					0.3	0.4
SNO	0.8	0.8	1.3	0.6	0.2	0.4	0.2	0.6	1.3	0.7	0.7	0.7
SOU	0.5	0.6	0.7	0.5	0.4	0.3	0.2	0.3	0.3	0.4	0.4	0.5
WYT												
Average	0.8	1.0	1.4	1.3	0.9	0.8	0.2	0.5	0.6	0.5	0.4	0.4
Std. dev.	0.8	1.3	1.5	1.6	1.4	1.2	0.1	0.2	0.4	0.2	0.2	0.2

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		1.5	1.4	1.6	3.3	3.7	1.4	1.2	1.1	1.3	1.6	1.3	4.0	1.9	1.0
CAI							0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.1
DRA		1.6			2.3	2.7	1.6	2.1	2.3	3.5	2.0	1.3		2.2	0.7
GLE	0.6	0.7	0.5	0.7	0.4	0.4	0.5	0.4	0.3	0.4	0.3	0.4	0.5	0.5	0.1
HIL		4.2	5.2	5.4	6.4	5.2	3.6	2.8						4.7	1.2
MOO	0.3	0.3	0.6	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.4	0.2	0.2	0.3	0.1
NOR	1.9	1.9	1.1	1.0	1.0	3.3	1.9	1.5	1.8	1.4	4.4	1.6		1.9	1.0
POR				1.7		1.6									
ROT		0.4	0.3	0.2	0.4	0.3	0.4	0.3	0.4	0.5	0.6	0.2	0.4	0.4	0.1
SNO					0.8	0.6	0.9	0.6	0.6	1.1	0.4	0.5	0.7	0.7	0.2
SOU	1.0	1.0	0.7	1.3	0.7	0.6	0.6	0.5	0.4	0.5	0.6	0.4	0.4	0.7	0.3
WYT	2.3	1.9	1.5			4.2	3.3	2.7	2.2	2.4	2.3	2.2		2.5	0.8
Average	1.2	1.5	1.4	1.5	1.7	2.1	1.3	1.1	1.0	1.2	1.3	0.8	0.9		
Std. dev.	0.9	1.2	1.6	1.7	2.0	1.8	1.2	1.0	0.8	1.1	1.3	0.7	1.4		

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Soil Solution shallow samplers - Iron (mg/l)

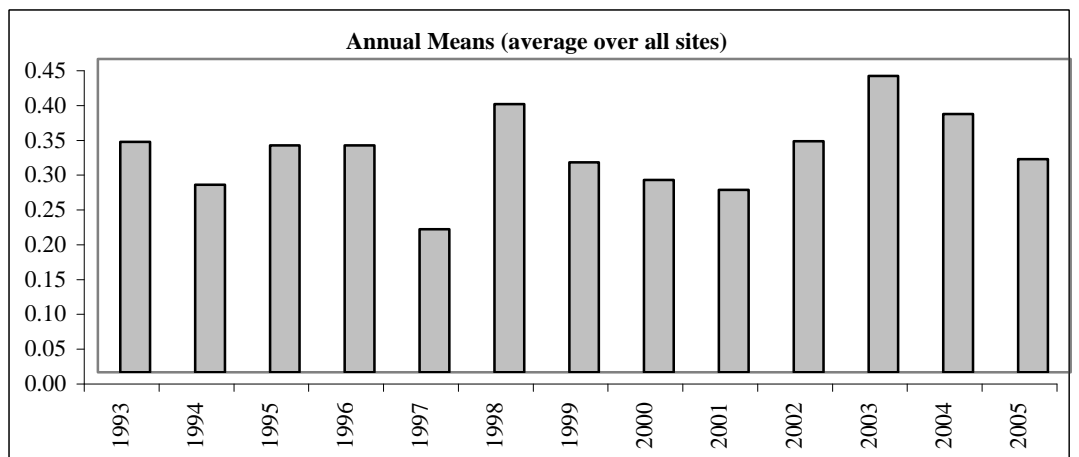
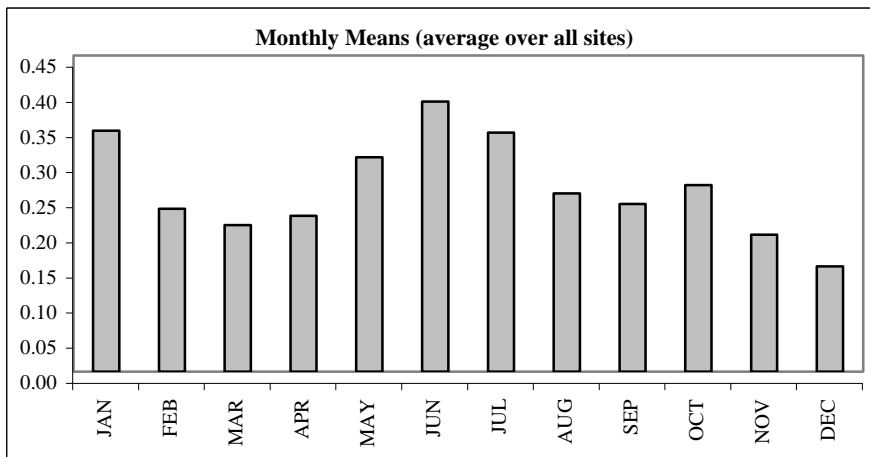
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	1.28	0.75	0.71	0.58	1.00	1.20						
CAI												
DRA												
GLE	0.34	0.27	0.22	0.24	0.35	0.50	0.70	0.28	0.34	0.56	0.42	0.35
HIL												
MOO	0.13	0.15	0.10	0.10	0.10	0.12	0.22	0.31	0.23	0.20	0.17	0.10
NOR												
POR												
ROT	0.04	0.04	0.04	0.18	0.04	0.07					0.05	0.04
SNO	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
SOU	0.26	0.18	0.18	0.23	0.34	0.42	0.44	0.42	0.38	0.30	0.33	0.26
WYT												
Average	0.34	0.23	0.21	0.22	0.30	0.38	0.34	0.25	0.24	0.27	0.19	0.15
Std. dev.	0.43	0.25	0.24	0.18	0.34	0.41	0.26	0.16	0.15	0.20	0.16	0.13

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.96	0.99	1.20	0.74	0.93	1.26	1.51	1.01	1.33	0.97	1.52	0.92	1.11	0.25
CAI							0.06	0.04	0.08	0.07				0.06	0.02
DRA		0.21			0.06	0.13	0.11	0.13	0.04	0.08	0.10	0.19		0.12	0.06
GLE	0.67	0.29	0.42	0.36	0.48	0.55	0.50	0.55	0.60	0.78	0.78	0.60	0.38	0.54	0.15
HIL		0.18	0.36	0.26	0.11	0.12	0.11	0.00						0.16	0.12
MOO	0.25	0.21	0.22	0.24	0.21	0.27	0.31	0.20	0.20	0.24	0.21	0.18	0.16	0.22	0.04
NOR					0.07	0.13	0.16	0.06						0.10	0.05
POR				0.06		0.00									
ROT		0.11	0.10	0.10	0.07	0.09	0.08	0.11	0.07	0.09	1.00	0.10	0.06	0.17	0.26
SNO					0.02	1.72	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.20	0.57
SOU	0.27	0.07	0.09	0.06	0.09	0.20	0.58	0.26	0.21	0.25	0.18	0.25	0.31	0.22	0.14
WYT	0.14	0.13	0.10			0.08	0.12	0.17	0.14	0.13	0.15	0.12		0.13	0.02
Average	0.33	0.27	0.33	0.33	0.21	0.39	0.30	0.28	0.26	0.33	0.43	0.37	0.31		
Std. dev.	0.23	0.29	0.32	0.40	0.24	0.52	0.37	0.44	0.33	0.44	0.42	0.50	0.33		

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Soil Solution shallow samplers - Aluminium (mg/l)

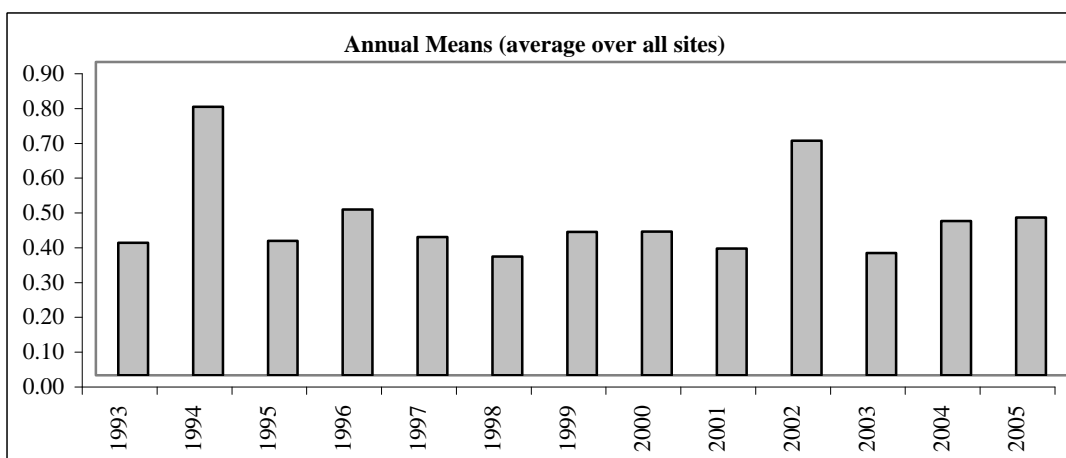
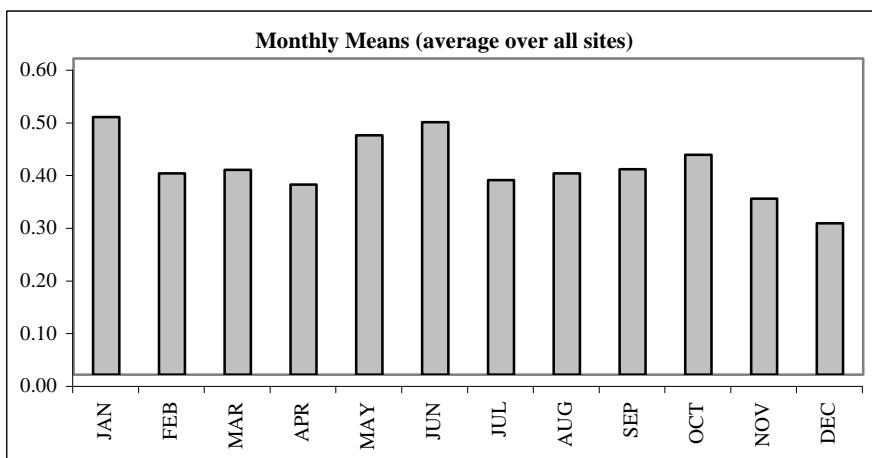
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	1.58	1.06	1.16	1.02	1.37	1.32						
CAI												
DRA												
GLE	0.53	0.43	0.43	0.48	0.54	0.67	0.59	0.57	0.64	0.77	0.64	0.59
HIL												
MOO	0.07	0.07	0.07	0.07	0.08	0.09	0.15	0.14	0.14	0.13	0.11	0.07
NOR												
POR												
ROT	0.11	0.12	0.08	0.03	0.12	0.12					0.18	0.16
SNO	0.04	0.06	0.06	0.06	0.07	0.07	0.09	0.07	0.05	0.05	0.04	0.03
SOU	0.61	0.56	0.54	0.51	0.55	0.60	0.65	0.75	0.72	0.72	0.70	0.59
WYT												
Average	0.49	0.38	0.39	0.36	0.45	0.48	0.37	0.38	0.39	0.42	0.33	0.29
Std. dev.	0.54	0.36	0.39	0.35	0.46	0.45	0.25	0.29	0.30	0.33	0.28	0.25

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.66	0.70	0.88	0.79	1.03	1.01	1.17	0.77	0.92	0.75	1.25	1.25	0.93	0.21
CAI							0.63	0.42	0.76	3.17	0.62	0.48		1.01	1.06
DRA		3.51			0.26	0.31	0.24	0.42	0.17	0.31	0.19	0.30		0.63	1.08
GLE	0.49	0.63	0.75	0.77	0.74	0.60	0.62	0.66	0.47	0.59	0.47	0.69	0.57	0.62	0.10
HIL		0.11	0.07	0.10	0.13	0.19	0.17	0.00						0.11	0.06
MOO	0.08	0.11	0.07	0.10	0.10	0.10	0.09	0.08	0.09	0.10	0.09	0.11	0.10	0.09	0.01
NOR															
POR				0.01		0.00									
ROT		0.11	0.19	0.20	0.19	0.22	0.19	0.26	0.19	0.13	0.16	0.21	0.12	0.18	0.04
SNO					0.05	0.08	0.04	0.05	0.05	0.08	0.07	0.05	0.06	0.06	0.01
SOU	0.91	0.96	0.87	1.29	0.92	0.78	0.98	0.83	0.60	0.61	0.63	0.74	0.62	0.83	0.20
WYT	0.05	0.09	0.06			0.10	0.16	0.22	0.18	0.17	0.19	0.16		0.14	0.06
Average	0.38	0.77	0.39	0.48	0.40	0.34	0.41	0.41	0.36	0.67	0.35	0.44	0.45		
Std. dev.	0.41	1.16	0.37	0.50	0.36	0.34	0.37	0.38	0.29	0.98	0.26	0.39	0.46		

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Soil Solution shallow samplers - PO4-P (mg/l)

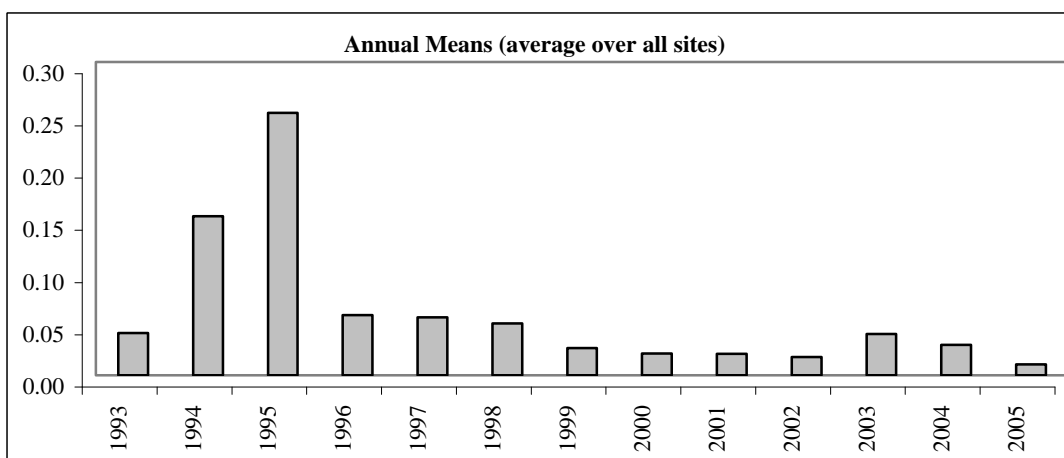
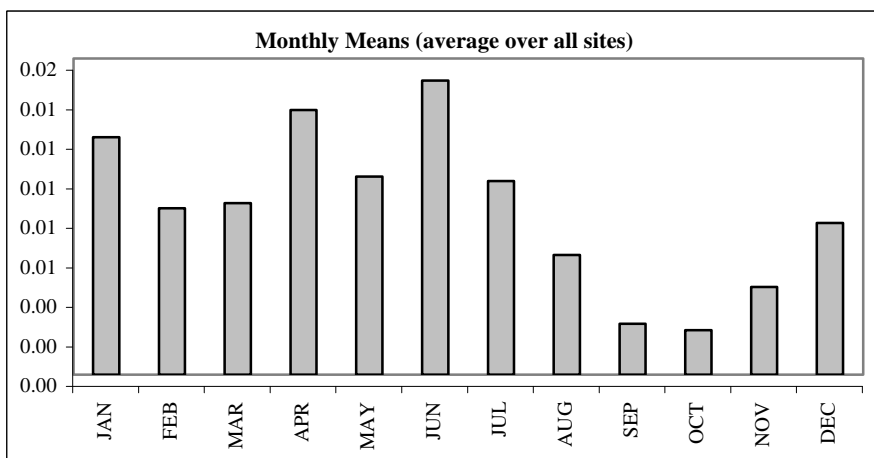
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.00	0.00	0.00	0.00	0.00	0.00						
CAI		0.00	0.00	0.03	0.01	0.02	0.03					
DRA												
GLE	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
HIL												
MOO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOR												
POR												
ROT	0.03	0.02	0.03	0.06	0.04	0.06					0.01	0.00
SNO	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.03
SOU	0.02	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01
WYT				0.00								
Average	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Std. dev.	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.01

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.00	0.00	0.00	0.09	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
CAI							0.00	0.01	0.00	0.00	0.01	0.00	0.02	0.01	0.01
DRA		0.38	0.21	0.39	0.38	0.15	0.18	0.16	0.09	0.11	0.26	0.13		0.22	0.11
GLE	0.18	0.01	0.01	0.14	0.01	0.20	0.01	0.02	0.07	0.01	0.00	0.00	0.01	0.05	0.07
HIL		0.05	0.00	0.00	0.00	0.01	0.00	0.00						0.01	0.02
MOO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOR	0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01		0.06		0.01	0.02
POR				0.00		0.07									
ROT		0.92	2.02	0.02	0.00	0.06	0.05	0.03	0.03	0.03	0.06	0.07	0.03	0.28	0.61
SNO					0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.01	0.00
SOU	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01
WYT	0.00	0.01	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.01		0.00	0.00
Average	0.04	0.15	0.25	0.06	0.06	0.05	0.03	0.02	0.02	0.02	0.04	0.03	0.01		
Std. dev.	0.08	0.31	0.67	0.12	0.12	0.07	0.05	0.05	0.03	0.03	0.09	0.04	0.01		

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Soil Solution shallow samplers - NO3-N (mg/l)

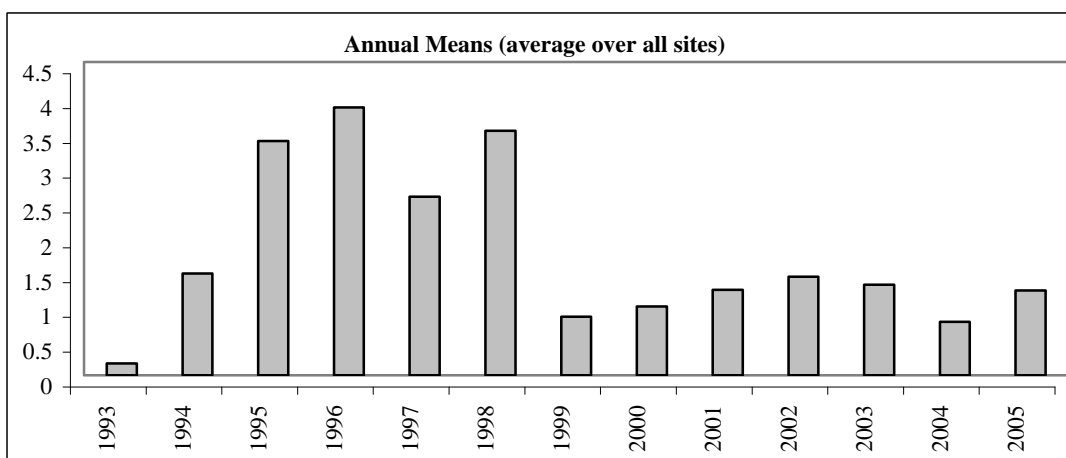
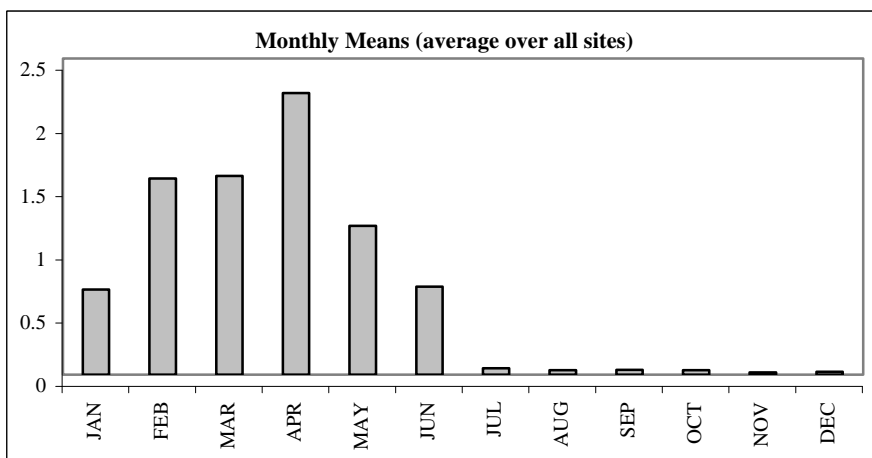
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	3.8	10.5	10.6	12.1	7.8	4.6						
CAI		0.0	0.0	0.1	0.1	0.0	0.0					
DRA												
GLE	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1
HIL												
MOO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR												
POR												
ROT	0.0	0.2	0.1	0.0	0.1	0.1					0.0	0.0
SNO	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
SOU	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
WYT				5.4								
Average	0.7	1.6	1.6	2.2	1.2	0.7	0.1	0.0	0.0	0.0	0.0	0.0
Std. dev.	1.4	3.6	3.7	4.1	2.7	1.6	0.0	0.0	0.0	0.0	0.0	0.0

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		1.4	0.6	0.0	1.6	8.9	0.1	0.4	1.8	0.4	2.7	0.8	8.2	2.2	3.1
CAI							0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.1
DRA		1.9	8.3		6.5	6.2	2.3	7.3	8.2	11.4	4.9	5.0		6.2	2.8
GLE	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
HIL		8.7	19.8	27.3	14.5	10.0	0.5	0.2						11.6	9.9
MOO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.4	0.1	0.1		0.1	0.1
POR				0.4		0.1									
ROT		0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
SNO					0.2	0.0	0.1	0.1	0.1	0.4	0.1	0.0	0.0	0.1	0.1
SOU	0.1	0.1	0.0	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
WYT	0.4	0.9	1.3	6.6		12.9	5.8	2.5	1.9	1.5	5.0	1.5		3.7	3.7
Average	0.2	1.5	3.4	3.8	2.6	3.5	0.8	1.0	1.2	1.4	1.3	0.8	1.2		
Std. dev.	0.2	2.8	6.7	9.0	5.0	5.0	1.8	2.2	2.5	3.5	2.1	1.6	3.1		

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Soil Solution shallow samplers - NH4-N (mg/l)

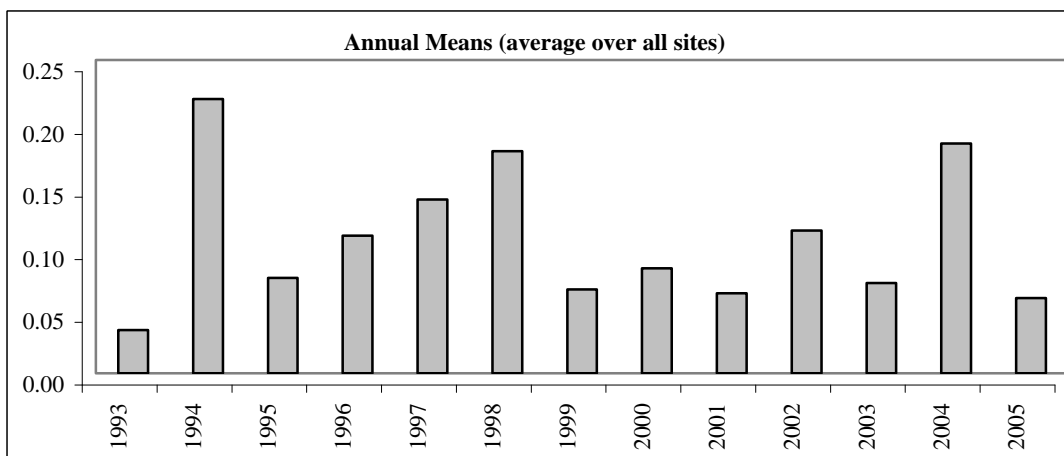
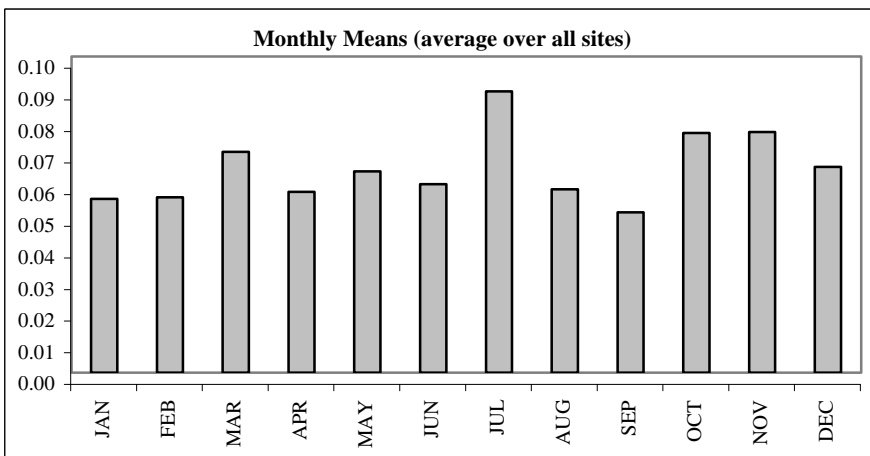
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.05	0.15	0.14	0.06	0.01	0.01						
CAI		0.00	0.01	0.00	0.00	0.01	0.02					
DRA												
GLE	0.03	0.03	0.06	0.04	0.05	0.06	0.03	0.02	0.01	0.03	0.03	0.06
HIL												
MOO	0.20	0.14	0.16	0.16	0.16	0.21	0.22	0.18	0.16	0.25	0.20	0.16
NOR												
POR												
ROT	0.02	0.02	0.05	0.04	0.18	0.02					0.13	0.04
SNO	0.01	0.02	0.02	0.03	0.01	0.07	0.15	0.00	0.01	0.00	0.00	0.01
SOU	0.03	0.04	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.03	0.02	0.05
WYT				0.08								
Average	0.05	0.06	0.07	0.06	0.06	0.06	0.09	0.06	0.05	0.08	0.08	0.07
Std. dev.	0.06	0.06	0.05	0.04	0.07	0.07	0.08	0.07	0.06	0.10	0.08	0.05

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.18	0.04	0.20	0.02	0.13	0.00	0.13	0.02	0.02	0.09	0.03	0.07	0.08	0.07
CAI							0.02	0.03	0.02	0.01	0.02	0.01	0.01	0.02	0.01
DRA		0.79	0.24	0.06	0.38	0.32	0.10	0.10	0.11	0.19	0.19	0.08		0.23	0.21
GLE	0.02	0.04	0.02	0.06	0.03	0.03	0.04	0.09	0.05	0.02	0.02	0.03	0.04	0.04	0.02
HIL		0.03	0.06	0.18	0.21	0.16	0.07	0.17						0.13	0.07
MOO	0.02	0.03	0.09	0.13	0.10	0.07	0.04	0.03	0.04	0.05	0.06	0.07	0.18	0.07	0.05
NOR	0.03	0.44	0.09	0.16	0.08	0.82		0.13	0.23	0.17		1.31		0.35	0.41
POR				0.07		0.00									
ROT		0.37	0.11	0.19	0.23	0.15	0.17	0.14	0.09	0.10	0.17	0.21	0.06	0.17	0.08
SNO					0.13	0.03	0.12	0.02	0.02	0.51	0.03	0.03	0.03	0.10	0.16
SOU	0.03	0.04	0.02	0.04	0.06	0.18	0.08	0.04	0.03	0.02	0.02	0.03	0.04	0.05	0.04
WYT	0.08	0.05	0.01	0.02		0.05	0.02	0.03	0.02	0.05	0.05	0.04		0.04	0.02
Average	0.03	0.22	0.08	0.11	0.14	0.18	0.07	0.08	0.06	0.11	0.07	0.18	0.06		
Std. dev.	0.03	0.27	0.07	0.07	0.12	0.23	0.05	0.06	0.06	0.15	0.07	0.40	0.06		

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Soil Solution shallow samplers - Chloride (mg/l)

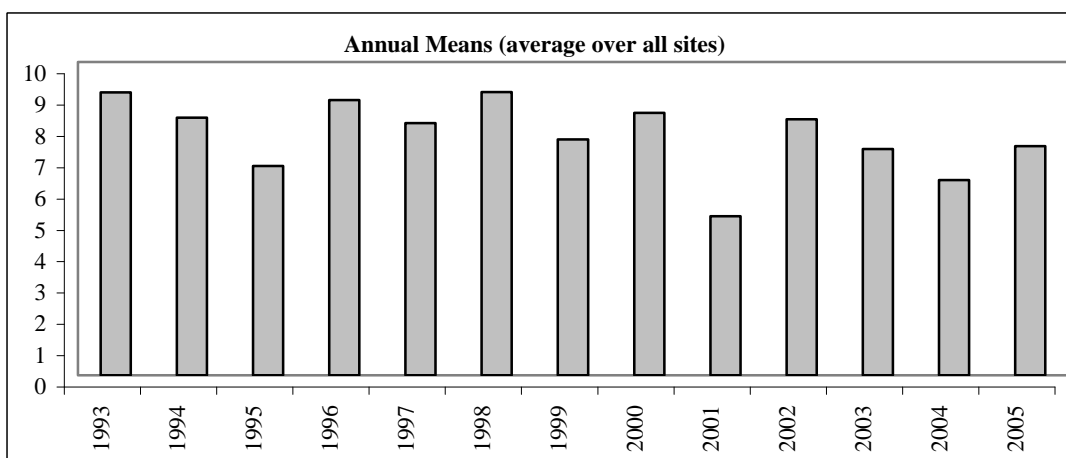
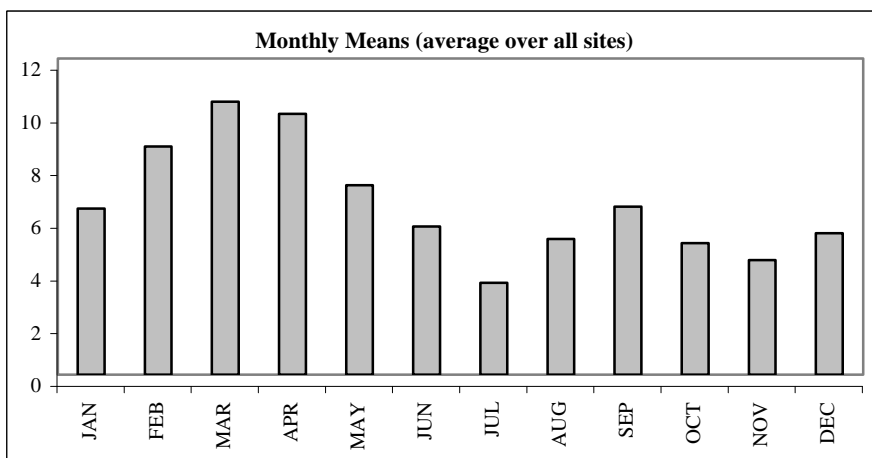
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	14.6	23.4	19.6	15.5	16.4	16.8						
CAI		9.1	8.7	8.5	14.4	3.8	4.7					
DRA												
GLE	5.1	6.9	12.2	11.5	7.9	5.6	5.8	10.6	8.8	6.7	5.5	6.4
HIL												
MOO	2.8	4.2	4.3	3.6	3.2	3.4	2.9	2.7	2.6	2.4	2.2	2.3
NOR												
POR												
ROT	2.9	5.9	5.8	1.5	3.1	3.7					1.7	2.4
SNO	7.9	5.2	13.2	4.7	1.1	2.6	2.4	5.3	11.9	7.8	6.8	9.7
SOU	4.5	5.8	8.7	6.8	4.4	3.5	1.7	2.0	2.2	3.1	5.5	6.0
WYT				27.0								
Average	6.3	8.7	10.4	9.9	7.2	5.6	3.5	5.2	6.4	5.0	4.4	5.4
Std. dev.	4.1	6.2	4.8	7.7	5.5	4.6	1.5	3.4	4.1	2.3	2.0	2.8

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		6.7	9.4	8.7	19.4	12.2	9.9	11.0	6.3	10.2	9.5	11.3	17.7	11.0	3.9
CAI							3.1	4.7	3.7	4.6	7.4	4.1	8.2	5.1	1.9
DRA		1.2	3.2		2.7	5.2	5.5	3.5	4.0	5.5	3.2	3.2		3.7	1.4
GLE	6.2	10.7	8.2	9.6	6.8	7.0	8.0	6.6	5.6	6.3	6.9	5.6	7.7	7.3	1.5
HIL		9.6	8.3	7.1	4.8	7.1	6.5	21.3						9.2	5.5
MOO	4.5	3.8	3.4	4.0	3.7	3.4	3.6	2.9	2.0	2.4	2.7	2.7	3.0	3.2	0.7
NOR	10.6	12.0	4.9	6.7	10.6	25.3	8.7	9.1	7.9	13.4	16.5	13.5		11.6	5.4
POR				5.6		2.1									
ROT		6.1	6.1	5.2	10.1	4.8	5.3	6.0	4.2	7.3	3.7	2.0	3.4	5.3	2.1
SNO					6.3	5.9	8.0	4.2	3.9	9.4	4.2	4.5	6.6	5.9	1.9
SOU	11.3	12.2	6.8	16.7	8.1	7.0	8.4	6.1	3.6	5.2	6.9	3.7	4.5	7.7	3.8
WYT	12.6	11.8	9.7	15.3		19.5	15.8	16.7	9.5	17.5	11.2	11.8		13.8	3.3
Average	9.0	8.2	6.7	8.8	8.1	9.0	7.5	8.4	5.1	8.2	7.2	6.2	7.3		
Std. dev.	3.5	4.0	2.5	4.5	5.0	7.2	3.5	5.9	2.2	4.6	4.3	4.3	5.0		

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Soil Solution shallow samplers - SO4-S (mg/l)

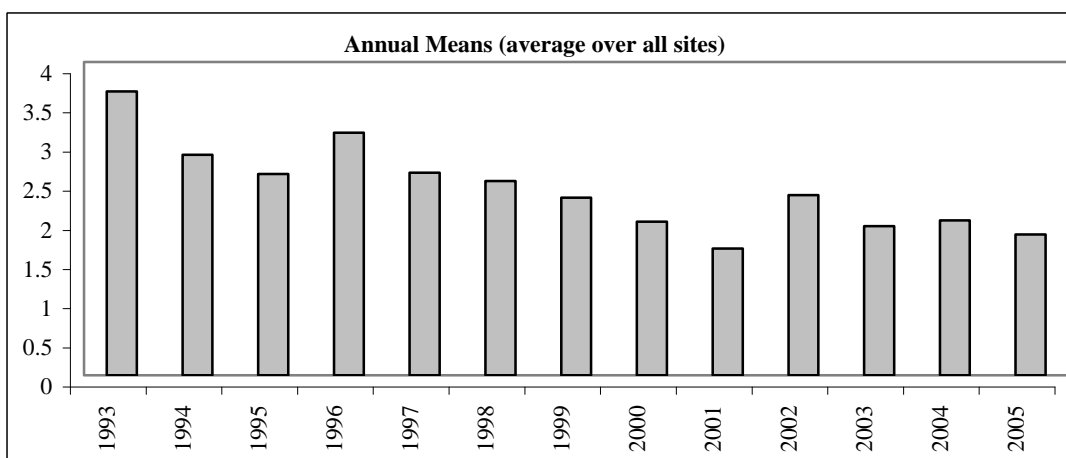
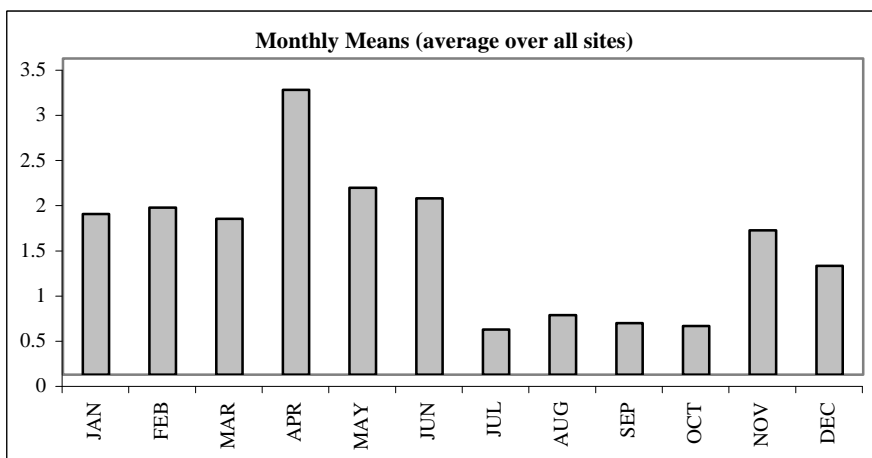
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.1	5.8	5.2	4.3	6.5	7.0						
CAI		0.5	0.5		0.4	0.6	0.9					
DRA												
GLE	1.7	1.4	1.3	1.3	0.7	0.4	0.8	1.7	1.6	1.4	1.1	1.0
HIL												
MOO	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0
NOR												
POR												
ROT	3.0	3.0	3.1	3.2	5.4	4.6					5.8	3.7
SNO	0.6	0.7	0.6	0.8	0.6	0.3	0.2	0.2	0.1	0.2	0.4	0.4
SOU	1.3	1.3	1.3	1.0	0.7	0.5	0.5	0.5	0.5	0.6	0.7	0.8
WYT				11.5								
Average	1.8	1.8	1.7	3.2	2.1	2.0	0.5	0.7	0.6	0.5	1.6	1.2
Std. dev.	1.4	1.9	1.7	3.7	2.5	2.5	0.3	0.6	0.6	0.5	2.1	1.3

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		3.7	3.1	5.5	7.2	4.2	3.4	2.9	2.2	2.6	2.9	3.8	5.5	3.9	1.5
CAI							0.6	0.4	0.5	0.5	0.9	0.5	0.6	0.6	0.2
DRA		1.9	1.9		2.9	2.1	2.1	2.0	2.5	6.2	2.2	2.3		2.6	1.3
GLE	1.9	2.4	1.8	2.2	1.5	1.1	1.2	0.7	0.9	0.9	0.7	1.0	1.2	1.3	0.6
HIL		1.4	1.3	2.3	2.0	2.5	3.5	1.6						2.1	0.8
MOO	0.1	0.5	2.4	0.4	0.1	0.1	0.3	0.1	0.1	0.1	1.3	0.1	0.1	0.4	0.7
NOR	1.6	1.1	0.8	1.3	2.0	1.4	1.0	1.2	1.6	1.8	1.5	1.6		1.4	0.4
POR				2.6		1.6									
ROT		3.9	3.5	2.8	4.5	3.1	3.1	2.7	2.5	2.2	2.1	3.3	4.0	3.1	0.7
SNO					0.9	0.6	0.8	0.6	0.5	0.7	0.4	0.4	0.4	0.6	0.2
SOU	3.2	2.9	2.2	2.5	2.2	1.2	1.4	0.9	0.9	0.9	1.4	0.9	0.8	1.6	0.8
WYT	11.3	7.6	6.1	8.3		9.3	7.4	8.4	4.6	7.2	5.7	6.0		7.4	1.9
Average	3.6	2.8	2.6	3.1	2.6	2.5	2.3	2.0	1.6	2.3	1.9	2.0	1.8		
Std. dev.	4.4	2.1	1.6	2.4	2.1	2.5	2.1	2.3	1.3	2.5	1.5	1.9	2.1		

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Soil Solution shallow samplers - Dissolved organic carbon (mg/l)

2005 monthly averages

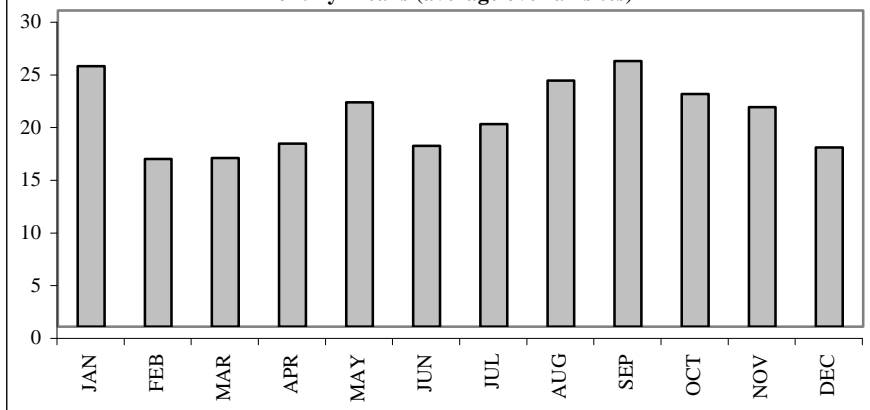
Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	60.0	37.7	37.8	30.4	47.7							
CAI		3.0				10.9	12.1					
DRA												
GLE	25.3	19.4	12.1	17.0	17.8	29.1	24.4	28.4	30.0	21.0	26.6	20.9
HIL												
MOO	18.6	17.3	15.5	16.9	18.9	23.2	29.2	33.9	39.5	35.9	31.4	26.8
NOR												
POR												
ROT												
SNO	2.2	2.5	2.0	3.5	5.6	4.9	4.9	3.1	3.5	4.2	2.8	2.8
SOU	17.5	15.7	12.6	14.1	16.3	17.8	25.6	28.1	27.7	27.2	22.6	17.5
WYT				22.3								
Average	24.7	15.9	16.0	17.4	21.3	17.2	19.2	23.4	25.2	22.1	20.8	17.0
Std. dev.	19.2	11.8	11.8	8.2	14.1	8.6	9.2	11.9	13.3	11.6	10.9	8.8

Annual Means

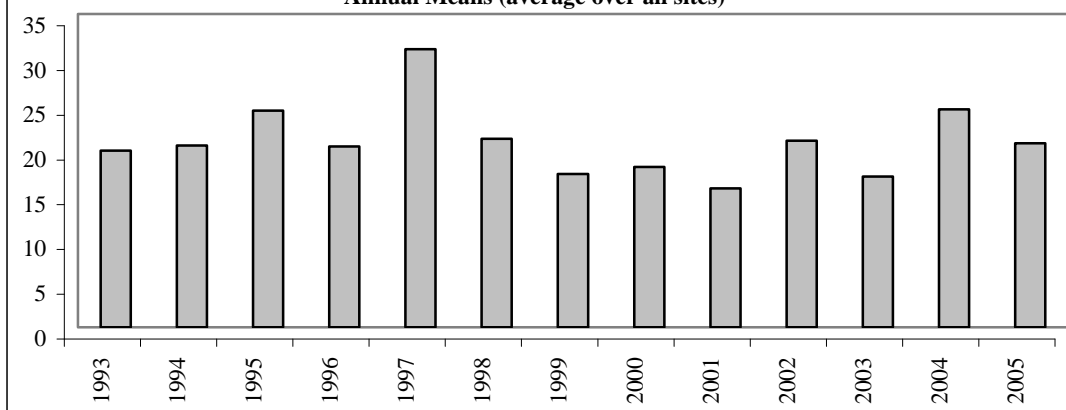
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI												50.2	42.7	46.4	5.3
CAI							8.7	6.5	8.6	8.6		6.1	8.7	7.9	1.2
DRA		37.1	47.5	45.0	85.5	66.2	34.3	50.6	23.8	66.6	35.8	36.6		48.1	18.1
GLE	16.2	13.4	18.0	16.6	19.1	18.9	23.2	22.2	17.4	21.2	15.9	28.7	22.7	19.5	4.0
HIL						11.1	14.5	7.4						11.0	3.5
MOO	23.4	20.5	18.2	23.0	26.6	26.0	24.4	23.4	24.2	23.3	22.5	23.5	25.6	23.4	2.2
NOR						18.0	7.8	5.5	8.3	2.8	3.9			7.7	5.5
POR				9.4		7.3									
ROT															
SNO					5.1	3.6	3.4	3.4	3.9	3.6	4.4	3.7	3.5	3.8	0.6
SOU	20.9	15.3	19.4	12.1	19.1	21.8	21.1	21.1	19.0	19.4	17.8	23.9	20.2	19.3	3.0
WYT	18.4	15.3	17.8	15.0		16.6	16.7	21.0	18.8	21.2	17.6	22.2		18.2	2.4
Average	19.7	20.3	24.2	20.2	31.1	21.1	17.1	17.9	15.5	20.8	16.8	24.3	20.6		
Std. dev.	3.1	9.7	13.0	13.0	31.4	18.3	9.7	14.8	7.6	20.3	10.9	15.1	13.8		

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Monthly Means (average over all sites)



Annual Means (average over all sites)



Soil Solution shallow samplers - Total N (mg/l)

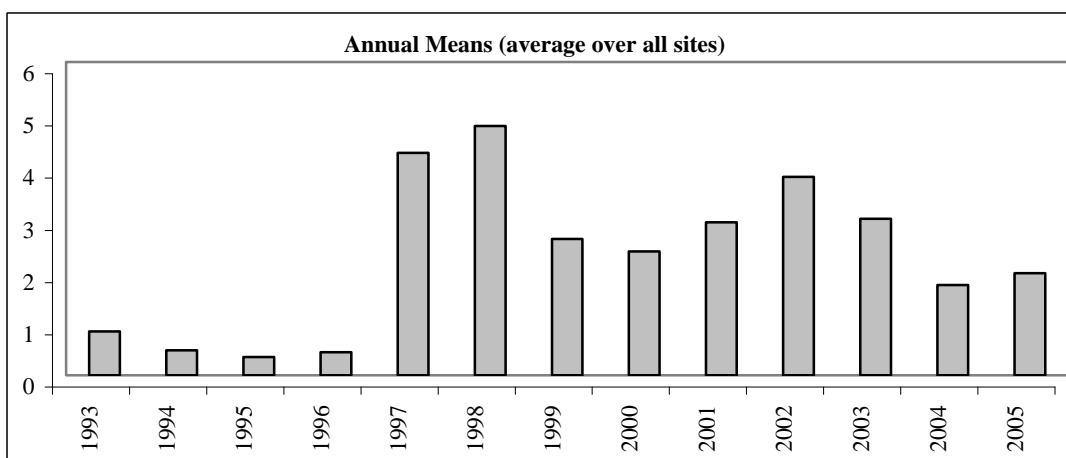
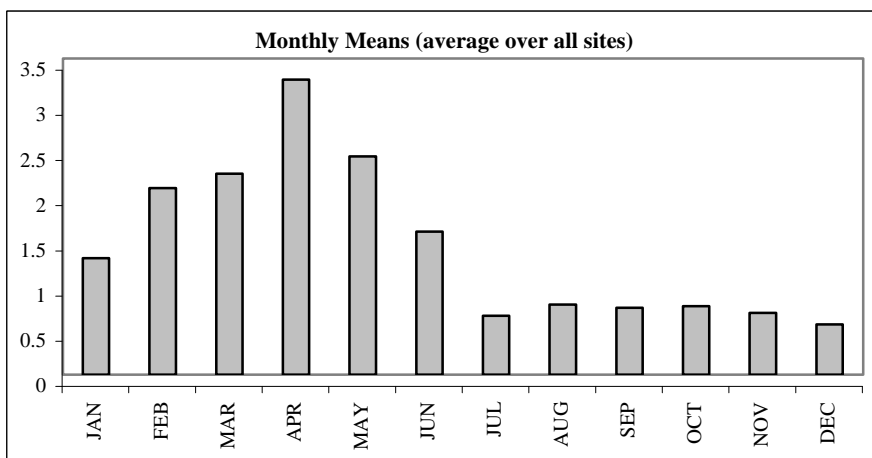
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	5.4	9.8	10.5	11.0	9.8	5.8						
CAI												
DRA												
GLE	0.6	0.4	0.6	0.4	0.5	0.6	0.6	0.6	0.7	0.6	0.6	0.4
HIL												
MOO	0.6	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.0	0.9	0.8	0.7
NOR												
POR												
ROT	0.1	0.6	0.6								0.9	0.7
SNO	0.4	0.3	0.4	0.4	0.5	0.0	0.0	0.4	0.2	0.5	0.2	0.3
SOU	0.8	0.8	0.6	0.7	0.7	0.7	1.1	1.1	1.1	1.1	0.9	0.6
WYT				6.6								
Average	1.3	2.1	2.2	3.3	2.4	1.6	0.7	0.8	0.7	0.8	0.7	0.6
Std. dev.	1.8	3.5	3.7	4.1	3.7	2.1	0.4	0.3	0.3	0.2	0.3	0.2

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI								2.2	2.3	1.4	3.6	2.4	8.7	3.4	2.7
CAI															
DRA						4.7	3.7	10.6	15.5	22.6	13.7	7.1		11.1	6.7
GLE						0.5		0.3	0.4	0.5	0.4	0.6	0.5	0.5	0.1
HIL															
MOO	0.5	0.5	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.8	0.5	0.1
NOR					11.8						0.4	0.1		4.1	6.6
POR															
ROT								0.8	0.6	0.7	0.8	1.0	0.6	0.7	0.2
SNO					0.4	0.4	0.4	0.3	0.3	1.3	0.6	0.4	0.3	0.5	0.3
SOU								1.1	0.9	0.8	0.8	1.0	0.8	0.9	0.1
WYT	1.2	0.5				17.7	5.8	3.3	2.8	2.6	6.1	2.4		4.7	5.2
Average	0.8	0.5	0.4	0.4	4.3	4.8	2.6	2.4	2.9	3.8	3.0	1.7	2.0		
Std. dev.	0.4	0.0			6.5	7.5	2.6	3.5	5.2	7.6	4.5	2.2	3.3		

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Soil Solution deep samplers - pH

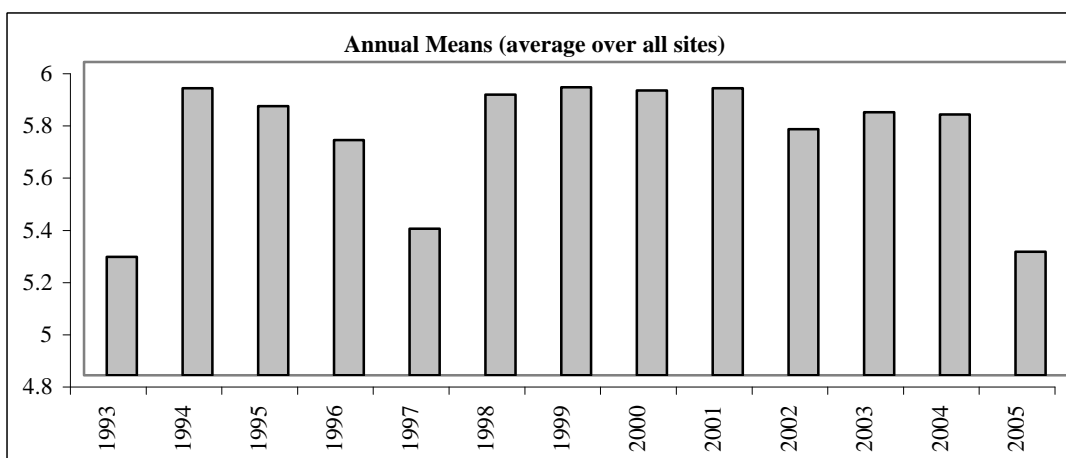
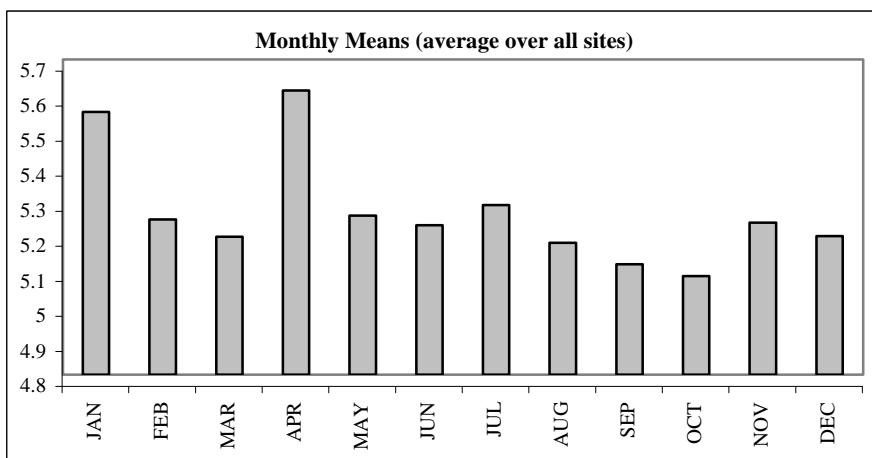
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.9	5.1	5.0	5.3	5.4	4.8					4.8	5.5
CAI		4.7	4.7	4.8	4.9	5.2	6.0	5.5	5.2	5.1	5.2	4.3
DRA												
GLE	5.2	5.1	4.9	4.8	4.8	4.8	4.8	4.7	4.7	4.8	4.9	4.9
HIL												
MOO	4.5	4.6	4.6	4.6	4.8	4.7	4.6	4.6	4.6	4.6	4.6	4.6
NOR												
POR												
ROT	6.6	6.4	6.6	6.8	6.3	6.3					6.4	6.4
SNO	5.8	5.8	5.8	5.8	5.9	5.9	6.0	6.0	5.9	5.9	5.8	5.8
SOU	5.1	5.0	4.8	4.8	4.8	4.8	5.0	5.0	5.2	5.1	5.0	4.9
WYT	6.8			8.0								
Average	5.6	5.2	5.2	5.6	5.3	5.2	5.3	5.2	5.1	5.1	5.2	5.2
Std. dev.	0.8	0.6	0.7	1.1	0.6	0.6	0.6	0.5	0.5	0.4	0.6	0.7

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		4.7	5.1	5.0	4.8	4.9	5.1	5.1	5.5	5.4	5.2	5.5	5.1	5.1	0.2
CAI							5.4	5.6	5.3	5.0	4.8	5.3	5.1	5.2	0.3
DRA		7.5	6.6	6.1	5.6	6.6	7.0	7.0	7.6	6.2	7.2	6.9		6.7	0.6
GLE	4.6	4.7	4.7	4.6	4.8	4.9	4.9	4.9	4.8	5.0	4.8	4.7	4.9	4.8	0.1
HIL		7.2	7.2	7.0	6.4	7.0	7.3	7.1						7.0	0.3
MOO	4.4	4.4	4.5	4.5	4.5	4.4	4.5	4.5	4.6	4.6	4.6	4.6	4.6	4.5	0.1
NOR	5.4	5.7	5.6	5.8	6.1	6.2	5.9	6.2	6.3	6.3	6.3	6.4		6.0	0.3
POR															
ROT		6.5	6.5	6.2	6.0	6.3	6.7	6.1	6.2	6.4	6.5	6.3	6.5	6.4	0.2
SNO							5.4	5.8	5.9	5.8	5.9	5.9	5.9	5.8	0.2
SOU	4.5	4.5	4.6	4.5	4.7	4.8	4.7	4.8	4.9	4.9	4.7	4.8	5.0	4.7	0.2
WYT	7.3	7.9	7.7	7.7		7.8	8.0	7.7	7.9	7.9	8.0	7.6		7.8	0.2
Average	5.3	5.9	5.8	5.7	5.4	5.9	5.9	5.9	5.9	5.7	5.8	5.8	5.3		
Std. dev.	1.2	1.4	1.2	1.1	0.8	1.2	1.2	1.0	1.1	1.0	1.2	1.0	0.7		

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Soil Solution deep samplers - Conductivity (microSiemens/l)

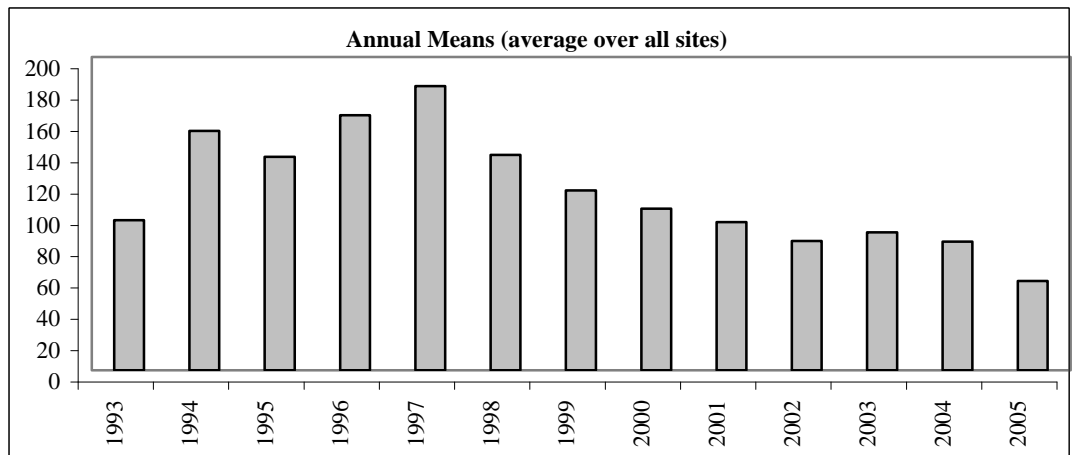
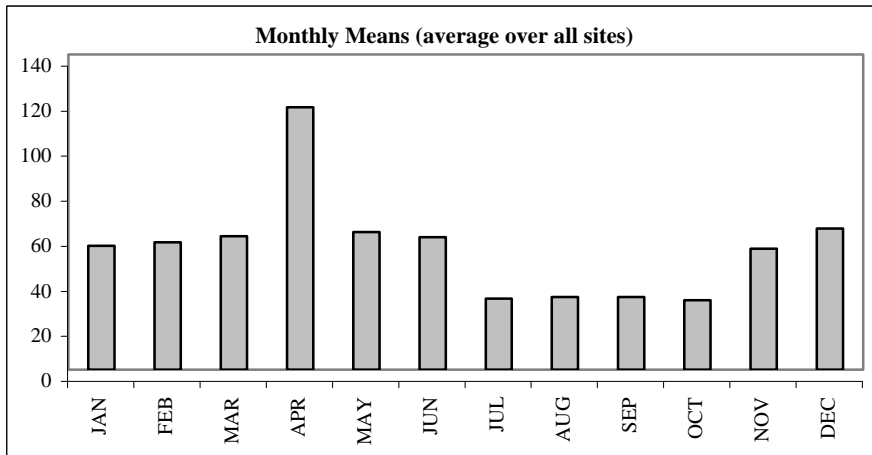
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	152	166	158	159	162	198					179	221
CAI		41	45	38	40	25	19	20	18	21	20	26
DRA												
GLE	30	31	45	51	49	44	44	44	46	41	38	41
HIL												
MOO	32	32	31	31	33	32	32	32	32	33	32	32
NOR												
POR												
ROT	51	55	56	59	73	47					44	47
SNO	33	37	35	35	31	30	29	35	37	31	30	35
SOU	31	35	45	45	41	36	33	30	28	28	33	37
WYT				517								
Average	55	57	59	117	61	59	32	32	32	31	54	63
Std. dev.	44	45	41	156	43	57	8	8	9	7	51	65

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		124	108	121	161	151	104	126	109	141	103	104	174	127	24
CAI							22	20	18	21	28	19	28	22	4
DRA		418	355	448	630	173	308	214	230	73	155	111		283	168
GLE	45	47	46	55	44	34	40	39	41	41	49	46	42	44	5
HIL		205	196	245	258	230	180	195						215	29
MOO	38	38	37	37	37	36	35	33	31	31	30	31	32	34	3
NOR						83	65	69	92	87	67	78		77	11
POR															
ROT		100	80	77	90	80	67	75	70	64	71	61	54	74	13
SNO							32	24	24	30	34	29	33	29	4
SOU	78	61	50	69	51	41	46	39	38	41	45	36	35	48	13
WYT	222	232	219	252		411	365	302	294	296	298	306		290	59
Average	96	153	136	163	182	138	115	103	95	82	88	82	57		
Std. dev.	86	128	112	142	213	123	119	94	94	83	84	85	52		

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Soil Solution deep samplers - Alkalinity (mg/l)

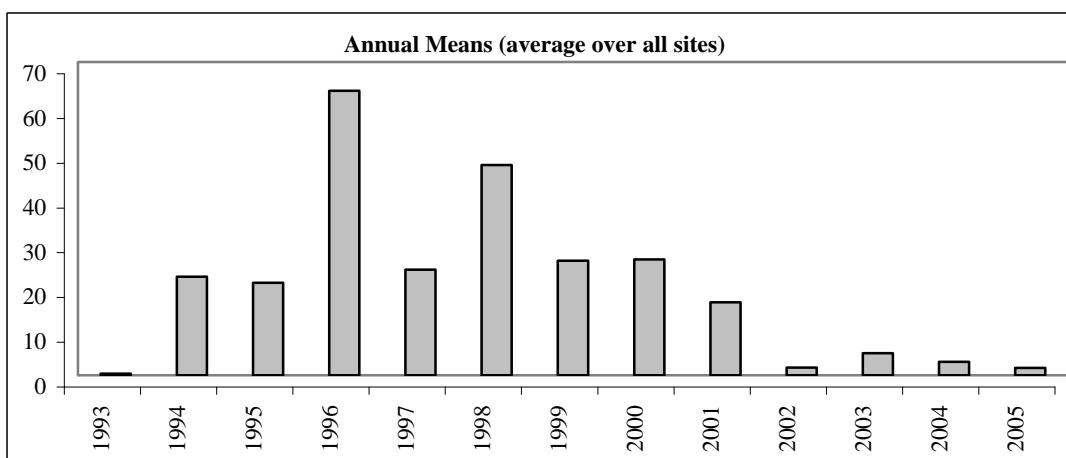
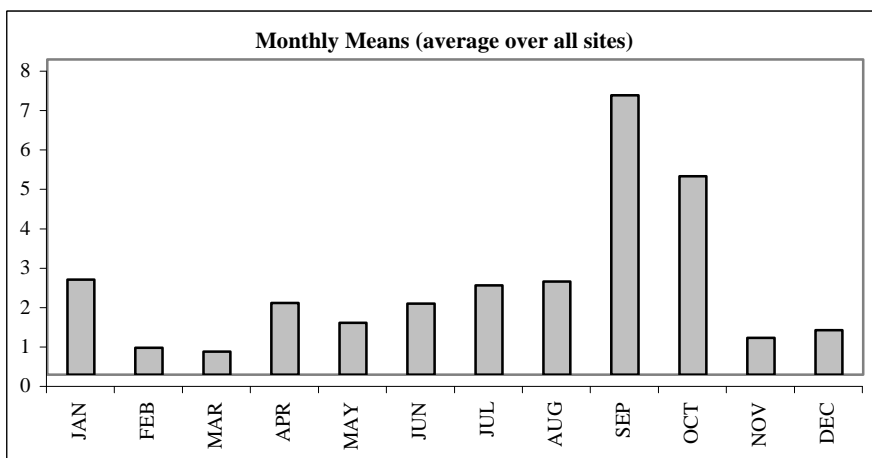
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	-0.7	0.2	-0.6		0.9						-0.2	
CAI		0.6	0.0	0.0	0.0	0.5					1.0	
DRA												
GLE	0.0	0.0	0.8	3.2	0.5	0.0	0.0	0.0	7.8	9.8	0.0	0.7
HIL												
MOO												
NOR												
POR												
ROT												
SNO	10.2	1.9	2.7	4.0	5.2	6.7	6.3	5.6	6.3	4.8	3.3	2.6
SOU	0.2	0.7	0.0	0.0	0.0	0.0	0.5	1.5	7.1	0.6	0.6	0.0
WYT												
Average	2.4	0.7	0.6	1.8	1.3	1.8	2.3	2.4	7.1	5.0	0.9	1.1
Std. dev.	4.5	0.6	1.2	1.8	1.9	2.9	2.9	2.3	0.6	3.8	1.3	1.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI					0.0	0.3	1.1	1.6	2.5	0.3	0.3	0.1	-0.1	0.7	0.9
CAI									0.5	0.7	0.8	1.3	0.3	0.7	0.4
DRA		12.6		212		100		12.0	101		25.3			77.1	77.9
GLE	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.9	3.1	2.1	0.3	1.0	1.9	1.0	1.2
HIL		77.4	70.1	96.1	118	152	146	132						113	32.7
MOO	0.0	0.1	0.2		0.0	3.9	2.0	0.0	0.0	0.0	2.6			0.9	1.4
NOR												8.6			
POR															
ROT		14.3	8.1	9.8											
SNO							1.7	3.6	4.8	5.4	5.0	4.9	5.0	4.3	1.3
SOU	1.6	0.0	0.0	0.0	0.0	0.0	1.1	3.1	2.4	1.8	0.2	2.0	0.9	1.0	1.1
WYT	0.0	50.0	45.4			72.8		51.4						43.9	26.7
Average	0.4	22.1	20.6	63.6	23.6	47.0	25.6	25.9	16.3	1.7	4.9	3.0	1.6		
Std. dev.	0.8	30.1	30.0	92.3	52.7	61.8	59.2	46.3	37.4	2.0	9.1	3.2	2.0		

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Soil Solution deep samplers - Sodium (mg/l)

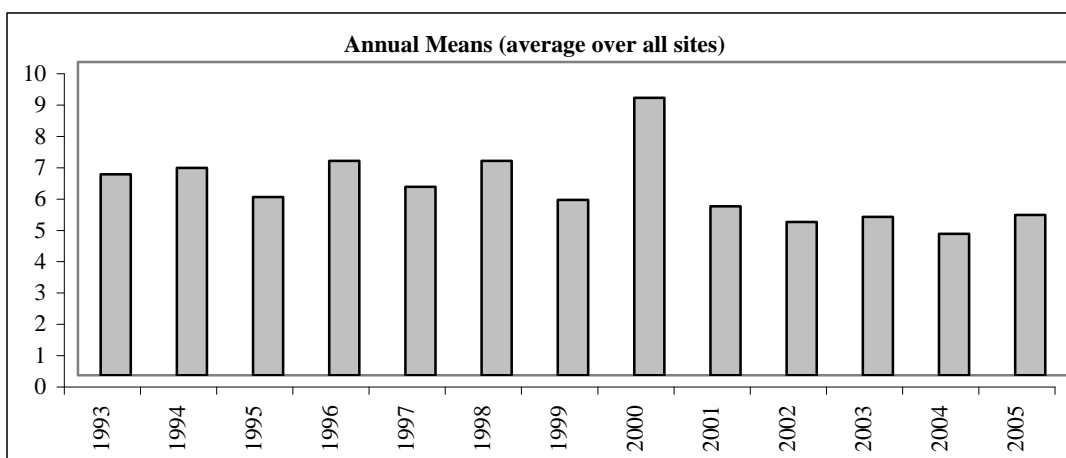
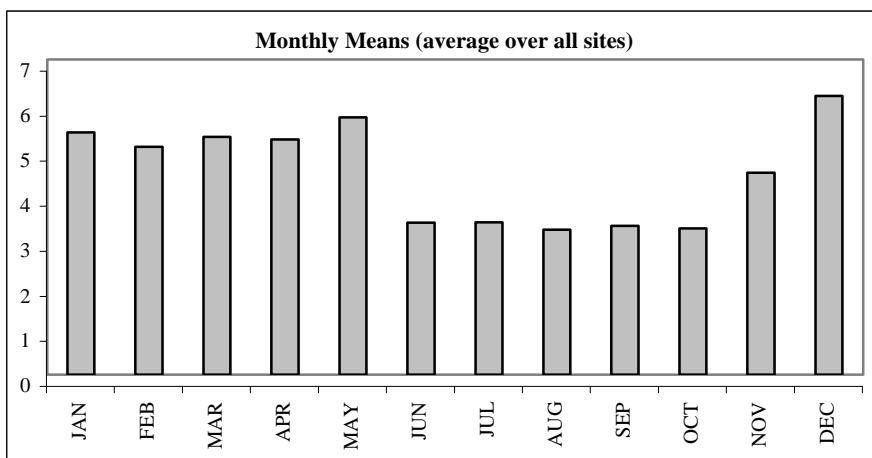
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	15.4	16.3	15.8	14.8	15.7						12.5	20.2
CAI		2.3	2.9	2.5		2.4					2.2	
DRA												
GLE	3.9	3.7	4.6	5.2	5.2	5.0	4.9	4.6	4.8	4.7	4.5	4.6
HIL												
MOO	2.1	2.2	2.2	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.3	2.2
NOR												
POR												
ROT	4.6	4.2	4.4	4.7	4.5	4.3					3.7	3.5
SNO	3.0	3.3	3.1	3.3	3.0	3.0	2.9	2.9	3.0	2.8	2.8	2.9
SOU	3.3	3.4	3.9	4.0	3.9	3.6	3.6	3.2	3.3	3.3	3.4	3.7
WYT												
Average	5.4	5.1	5.3	5.2	5.7	3.4	3.4	3.2	3.3	3.2	4.5	6.2
Std. dev.	4.5	4.6	4.4	4.1	4.6	1.0	1.0	0.9	0.9	0.9	3.4	6.3

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		14.2	11.5	12.2	14.0	13.5	10.2	10.7	9.6	11.7	10.5	10.5	15.8	12.0	1.9
CAI							1.0	40.3	2.3	2.1	3.7	2.1	2.5	7.7	14.4
DRA		4.3	1.7	10.9	5.8	3.8	3.2	2.8	3.3	1.3	2.7	2.3		3.8	2.6
GLE	4.2	4.9	5.5	7.3	5.9	4.9	5.6	4.7	4.3	4.4	5.0	4.9	4.6	5.1	0.8
HIL		4.6	3.5	2.9	3.1	2.4	2.2	3.0						3.1	0.8
MOO	2.1	2.1	2.3	2.2	2.1	2.1	2.1	2.2	2.4	2.2	2.4	2.4	2.1	2.2	0.1
NOR	8.1	7.3	7.8	7.4	6.2	8.3	8.1	7.7	7.7	9.9	8.3	7.4		7.9	0.9
POR															
ROT		4.9	3.6	4.6	4.9	5.0	5.5	5.7	5.4	5.2	5.2	4.3	4.2	4.9	0.6
SNO							3.3	2.9	2.8	3.3	3.2	2.7	3.0	3.0	0.2
SOU	5.8	6.2	5.3	7.2	6.1	5.5	5.5	4.6	3.8	3.8	4.5	3.9	3.5	5.1	1.1
WYT	11.9	10.9	10.0			16.1	14.8	12.9	12.4					12.7	2.1
Average	6.4	6.6	5.7	6.8	6.0	6.8	5.6	8.9	5.4	4.9	5.1	4.5	5.1		
Std. dev.	3.8	3.8	3.4	3.5	3.5	4.9	4.1	11.0	3.4	3.6	2.7	2.8	4.8		

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Soil Solution deep samplers - Potassium (mg/l)

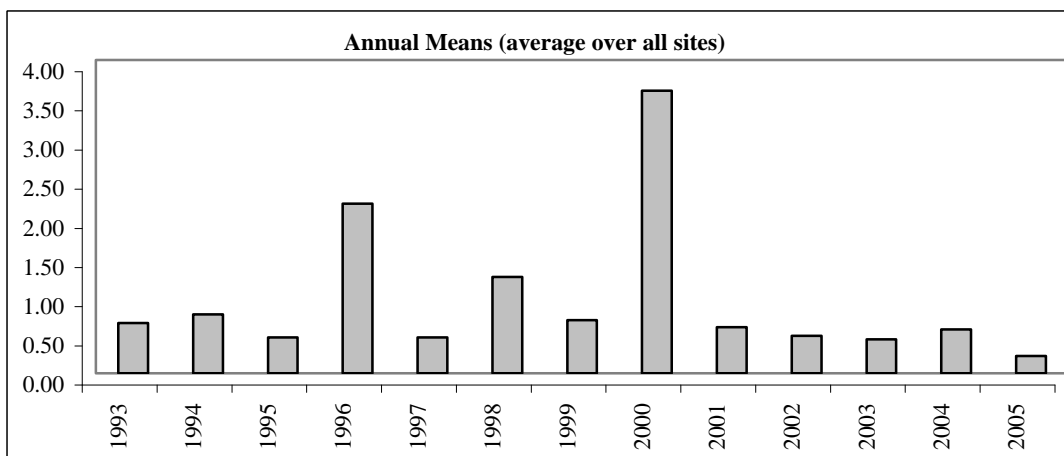
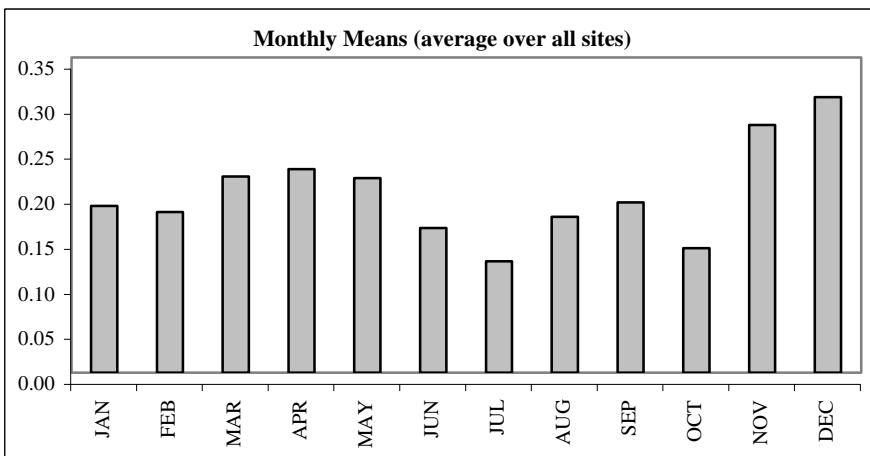
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.39	0.45	0.47	0.53	0.41						1.01	0.96
CAI		0.22	0.21	0.15		0.19					0.13	
DRA												
GLE	0.12	0.08	0.25	0.29	0.32	0.31	0.22	0.16	0.23	0.24	0.27	0.35
HIL												
MOO	0.24	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00
NOR												
POR												
ROT	0.02	0.16	0.04	0.23	0.10	0.14					0.14	0.07
SNO	0.19	0.20	0.19	0.20	0.21	0.17	0.17	0.45	0.48	0.25	0.25	0.23
SOU	0.16	0.13	0.36	0.15	0.24	0.14	0.09	0.06	0.03	0.06	0.13	0.22
WYT												
Average	0.19	0.18	0.22	0.23	0.22	0.16	0.12	0.17	0.19	0.14	0.27	0.31
Std. dev.	0.12	0.13	0.15	0.15	0.13	0.08	0.08	0.17	0.19	0.11	0.31	0.31

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.45	0.50	0.52	0.57	0.47	1.03	0.35	0.24	0.30	0.56	0.27	0.60	0.49	0.21
CAI							0.55	34.2	0.39	0.49	1.12	0.45	0.18	5.35	12.7
DRA		2.95	0.52	8.57	0.46	1.49	0.51	1.09	0.32	0.14	0.20	1.63		1.63	2.45
GLE	0.66	0.36	0.31	0.29	0.18	0.25	0.25	0.27	0.33	0.32	0.33	0.17	0.24	0.30	0.12
HIL		0.19	0.18	0.12	0.20	0.27	0.47	0.20						0.23	0.11
MOO	0.18	0.17	0.22	0.14	0.02	0.01	0.01	0.00	0.01	0.02	0.01	0.01	0.03	0.06	0.08
NOR	0.55	0.54	0.64	6.18	1.40	4.19	0.54	0.38	0.29	0.82	0.79	1.24		1.46	1.82
POR															
ROT		0.40	0.26	0.40	0.32	0.63	0.70	0.41	0.71	1.61	0.31	0.92	0.11	0.56	0.40
SNO							0.27	0.26	0.26	0.24	0.22	0.18	0.25	0.24	0.03
SOU	1.30	1.23	0.96	1.11	0.53	0.85	0.65	0.41	0.42	0.35	0.37	0.15	0.15	0.65	0.40
WYT	0.52	0.47	0.52			2.91	2.48	2.08	2.94					1.70	1.16
Average	0.64	0.75	0.46	2.17	0.46	1.23	0.68	3.61	0.59	0.48	0.43	0.56	0.22		
Std. dev.	0.41	0.88	0.25	3.29	0.42	1.42	0.65	10.2	0.85	0.48	0.34	0.57	0.18		

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Soil Solution deep samplers - Calcium (mg/l)

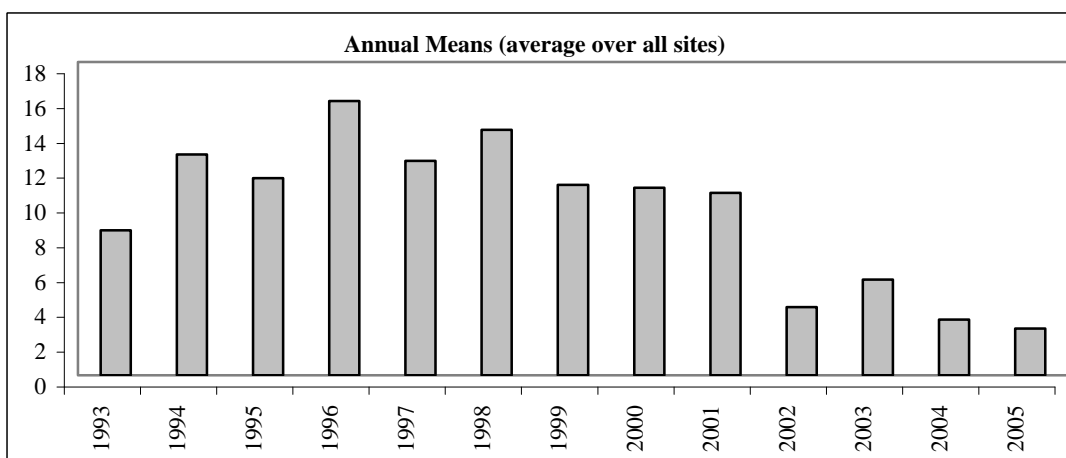
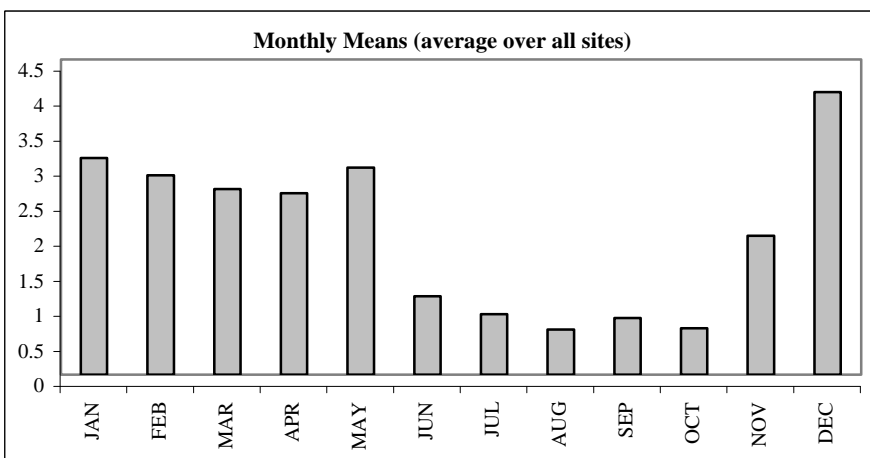
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	11.4	12.0	11.0	10.1	10.3						8.0	16.7
CAI		0.3	0.3	0.2		0.1					0.1	
DRA												
GLE	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
HIL												
MOO	0.4	0.5	0.6	0.5	0.5	0.6	0.5	0.6	0.6	0.5	0.5	0.5
NOR												
POR												
ROT	4.8	4.9	4.5	5.1	4.9	3.9					3.2	4.9
SNO	1.5	1.6	1.6	1.6	1.4	1.5	2.3	1.4	2.0	1.6	1.4	1.5
SOU	0.4	0.4	0.5	0.6	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.5
WYT												
Average	3.1	2.8	2.6	2.6	3.0	1.1	0.9	0.6	0.8	0.7	2.0	4.0
Std. dev.	4.0	4.1	3.7	3.5	3.7	1.3	0.9	0.5	0.7	0.6	2.7	5.9

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		8.9	7.3	8.4	10.6	10.5	6.8	7.1	5.3	7.1	6.3	6.0	11.4	8.0	2.0
CAI							0.4	7.9	0.7	0.5	0.7	0.4	0.2	1.6	2.8
DRA		26.0	35.9	78.1	42.4	18.9	28.8	26.1	40.7	13.9	28.5	9.6		31.7	18.5
GLE	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
HIL		31.2	22.1	26.9	32.5	30.2	24.5	29.9						28.2	3.8
MOO	1.0	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.6	0.8	1.1	0.5	0.7	0.2
NOR	4.3	3.5	2.7	2.2	1.8	4.1	3.5	5.3	12.4	5.0	4.4	5.1		4.5	2.7
POR															
ROT		10.7	7.5	8.6	9.7	8.9	7.7	6.7	6.1	5.4	6.2	4.6	4.5	7.2	2.0
SNO							1.8	1.4	1.7	2.0	1.8	1.5	1.6	1.7	0.2
SOU	1.3	1.1	0.8	1.1	0.7	0.7	0.8	0.6	0.5	0.6	0.6	0.5	0.5	0.8	0.3
WYT	34.9	31.8	24.8			52.9	45.0	32.6	36.6					36.9	9.3
Average	8.3	12.7	11.3	15.8	12.3	14.1	10.9	10.8	10.5	3.9	5.5	3.2	2.7		
Std. dev.	14.9	13.3	13.0	26.7	16.3	17.6	15.0	12.5	15.4	4.6	9.0	3.3	4.1		

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Soil Solution deep samplers - Magnesium (mg/l)

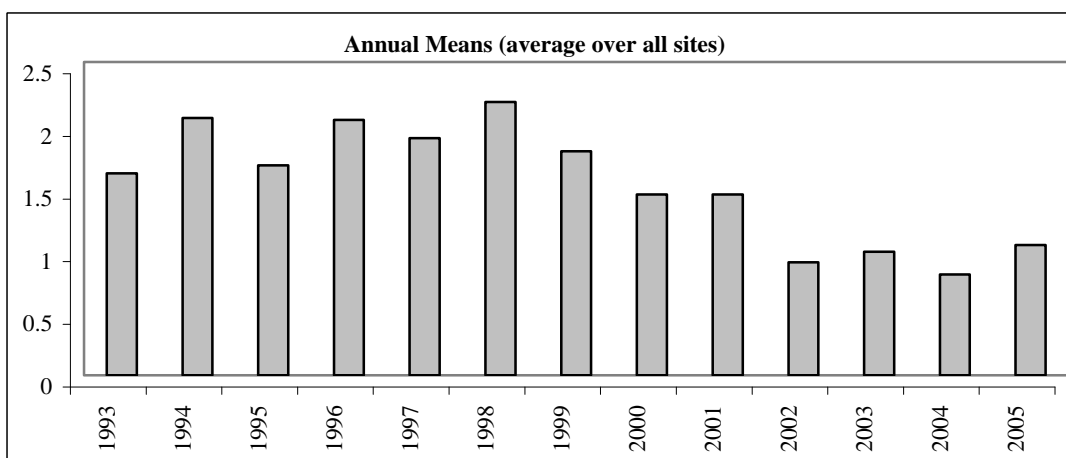
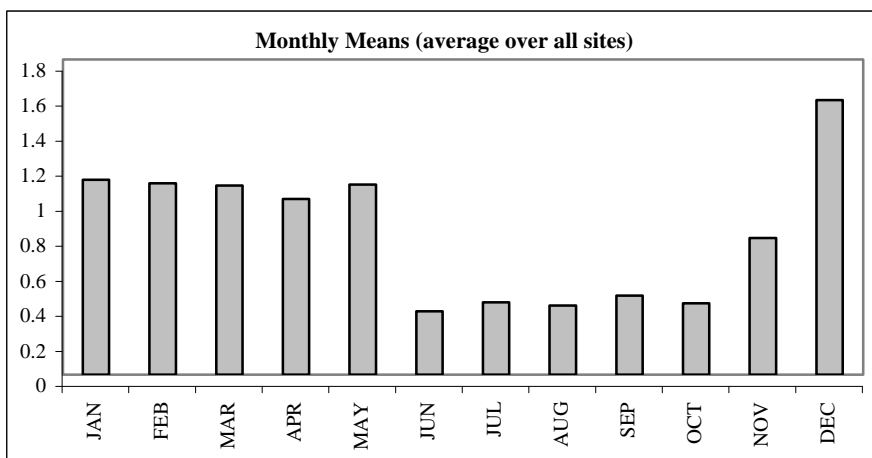
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.8	5.1	4.8	4.3	4.4						3.5	7.3
CAI		0.4	0.5	0.4		0.3					0.2	
DRA												
GLE	0.2	0.2	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
HIL												
MOO	0.3	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4
NOR												
POR												
ROT	0.4	0.4	0.3	0.3	0.3	0.2					0.2	0.4
SNO	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.5	0.7	0.6	0.5	0.6
SOU	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.4
WYT												
Average	1.1	1.1	1.1	1.0	1.1	0.4	0.4	0.4	0.5	0.4	0.8	1.6
Std. dev.	1.6	1.7	1.5	1.4	1.5	0.1	0.1	0.1	0.2	0.1	1.1	2.6

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		4.0	3.1	3.6	4.5	4.4	3.1	2.9	2.2	3.0	2.6	2.5	4.9	3.4	0.9
CAI							0.2	0.1	0.2	0.3	0.4	0.4	0.3	0.3	0.1
DRA		4.4	2.8	6.0	4.1	1.9	2.7	2.4	3.4	1.1	2.3	1.0		2.9	1.5
GLE	0.6	0.6	0.4	0.6	0.4	0.5	0.5	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.1
HIL		2.3	2.3	2.5	3.1	2.9	3.6	2.6						2.8	0.5
MOO	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.0
NOR	2.3	1.9	1.8	1.5	1.2	2.3	1.9	1.6	2.2	1.4	1.3	1.3		1.7	0.4
POR															
ROT		0.8	0.7	0.6	0.7	0.8	0.7	0.4	0.4	0.3	0.4	0.3	0.3	0.5	0.2
SNO							0.8	0.6	0.6	0.7	0.6	0.5	0.6	0.6	0.1
SOU	1.1	1.0	0.6	1.0	0.6	0.6	0.7	0.5	0.4	0.4	0.5	0.4	0.4	0.6	0.2
WYT	3.5	3.0	2.9			5.8	5.1	4.0	4.3					4.1	1.1
Average	1.6	2.1	1.7	2.0	1.9	2.2	1.8	1.4	1.4	0.9	1.0	0.8	1.0		
Std. dev.	1.3	1.5	1.1	1.9	1.7	1.9	1.6	1.3	1.5	0.9	0.9	0.7	1.7		

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Soil Solution deep samplers - Iron (mg/l)

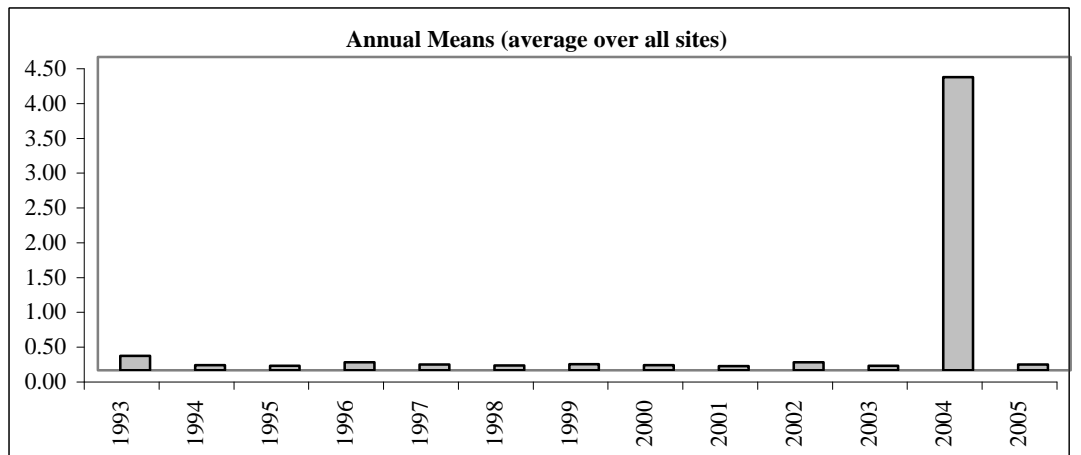
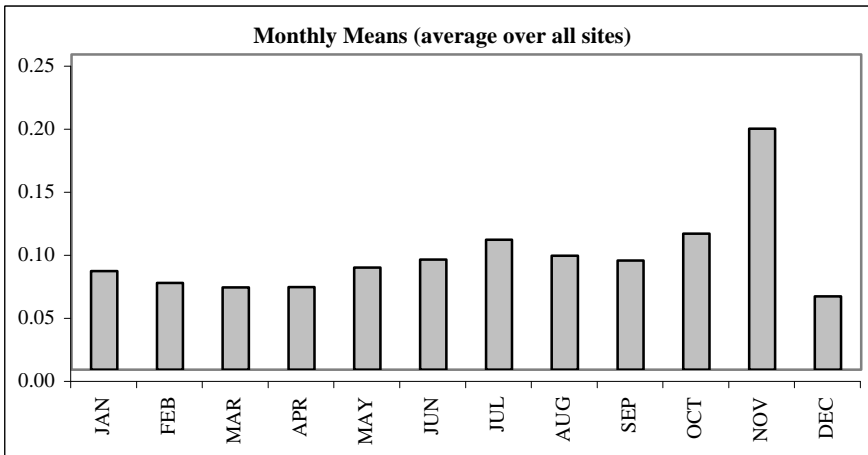
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.13	0.10	0.09	0.07	0.06						0.75	0.05
CAI		0.00	0.00	0.00								
DRA												
GLE	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
HIL												
MOO	0.14	0.21	0.21	0.20	0.20	0.20	0.21	0.21	0.20	0.20	0.20	0.19
NOR												
POR												
ROT	0.03	0.03	0.01	0.01	0.02	0.01					0.01	0.00
SNO	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
SOU	0.16	0.13	0.12	0.16	0.18	0.20	0.16	0.13	0.12	0.21	0.17	0.09
WYT												
Average	0.08	0.07	0.07	0.07	0.08	0.09	0.10	0.09	0.09	0.11	0.19	0.06
Std. dev.	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.08	0.10	0.26	0.07

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.09	0.09	0.13	0.06	0.08	0.26	0.16	0.14	0.47	0.13	33.0	0.18	2.90	9.49
CAI							0.04	0.01	0.01	0.04	0.00	0.01	0.00	0.02	0.02
DRA		0.05	0.06	0.08	0.11	0.05	0.04	0.04	0.02	0.11	0.05	0.23		0.07	0.06
GLE	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.00
HIL		0.02	0.02	0.19	0.09	0.08	0.19	0.00						0.09	0.08
MOO	0.26	0.22	0.25	0.28	0.28	0.25	0.25	0.22	0.24	0.22	0.21	0.23	0.20	0.24	0.02
NOR			0.01		0.02	0.03	0.06	0.18						0.06	0.07
POR															
ROT		0.04	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.01	0.03	0.01
SNO							0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.01
SOU	0.47	0.07	0.07	0.06	0.08	0.09	0.06	0.07	0.05	0.05	0.08	0.14	0.15	0.11	0.11
WYT	0.07	0.08	0.04			0.02	0.05	0.05	0.05					0.05	0.02
Average	0.21	0.07	0.07	0.11	0.08	0.07	0.09	0.07	0.06	0.12	0.06	4.21	0.08		
Std. dev.	0.21	0.07	0.07	0.09	0.09	0.07	0.10	0.08	0.08	0.16	0.07	11.6	0.09		

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Soil Solution deep samplers - Aluminium (mg/l)

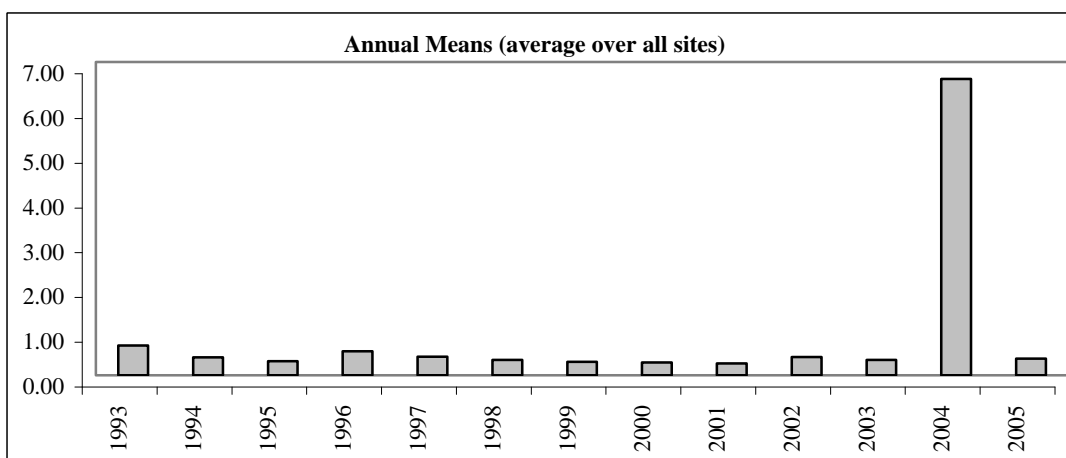
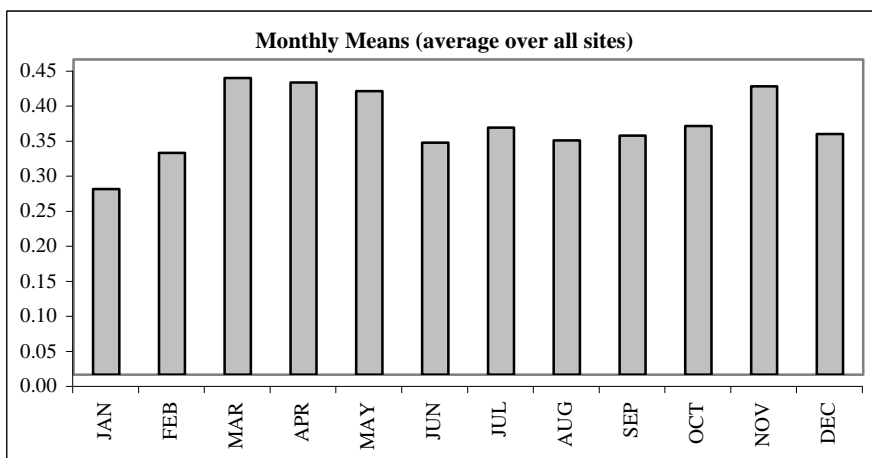
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.27	0.22	0.26	0.21	0.20						0.88	0.39
CAI		0.61	0.89	0.92	0.98	0.48					0.50	
DRA												
GLE	0.41	0.41	0.70	0.73	0.67	0.59	0.54	0.47	0.56	0.56	0.51	0.62
HIL												
MOO	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02
NOR												
POR												
ROT	0.01	0.00	0.00	0.00	0.00	0.00					0.00	0.00
SNO	0.04	0.05	0.04	0.04	0.04	0.05	0.05	0.04	0.05	0.02	0.02	0.03
SOU	0.84	0.90	1.03	1.00	0.92	0.85	0.80	0.80	0.73	0.81	0.95	1.00
WYT												
Average	0.26	0.32	0.42	0.42	0.40	0.33	0.35	0.33	0.34	0.36	0.41	0.34
Std. dev.	0.30	0.32	0.41	0.41	0.41	0.33	0.33	0.32	0.31	0.34	0.38	0.37

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.13	0.11	0.17	0.17	0.19	0.15	0.26	0.23	0.76	0.20	50.7	0.35	4.45	14.6
CAI							0.24	0.42	0.44	0.67	0.52	0.47	0.73	0.50	0.16
DRA		0.01	0.04	0.17	0.15	0.08	0.07	0.08	0.05	0.10	0.07	0.30		0.10	0.08
GLE	0.83	1.02	0.88	1.22	0.79	0.78	0.92	0.76	0.63	0.63	0.86	0.57	0.56	0.80	0.19
HIL		0.02	0.02	0.02	0.06	0.10	0.14	0.00						0.05	0.05
MOO	0.02	0.05	0.02	0.06	0.04	0.03	0.02	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.01
NOR			0.00												
POR															
ROT		0.03	0.02	0.02	0.03	0.05	0.02	0.02	0.01	0.01	0.02	0.02	0.00	0.02	0.01
SNO							0.01	0.03	0.03	0.05	0.04	0.03	0.04	0.03	0.01
SOU	1.80	1.91	1.71	2.07	1.67	1.49	1.37	1.23	0.92	1.04	1.02	0.85	0.89	1.38	0.42
WYT	0.01	0.04	0.03			0.02	0.06	0.06	0.04					0.04	0.02
Average	0.66	0.40	0.32	0.53	0.41	0.34	0.30	0.29	0.26	0.41	0.34	6.62	0.37		
Std. dev.	0.85	0.70	0.59	0.80	0.62	0.53	0.46	0.41	0.33	0.41	0.40	17.8	0.36		

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Soil Solution deep samplers - PO4-P (mg/l)

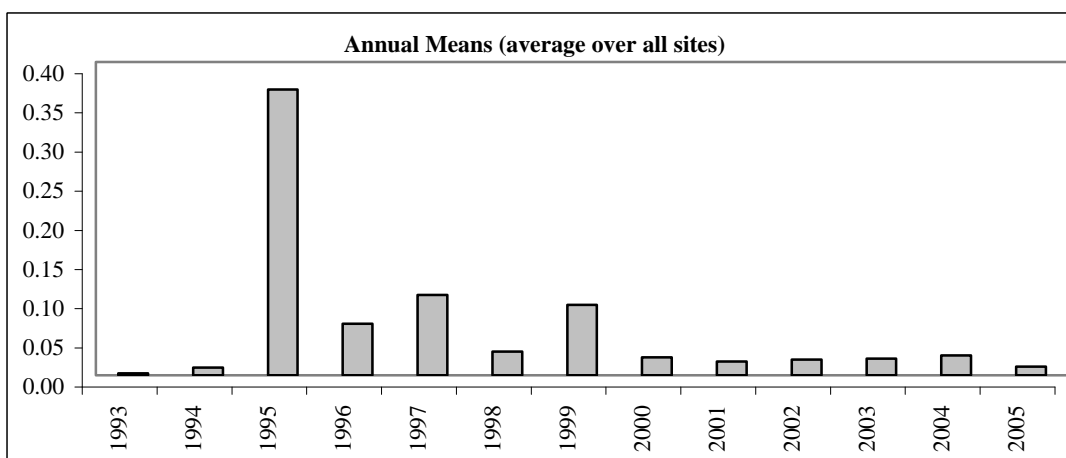
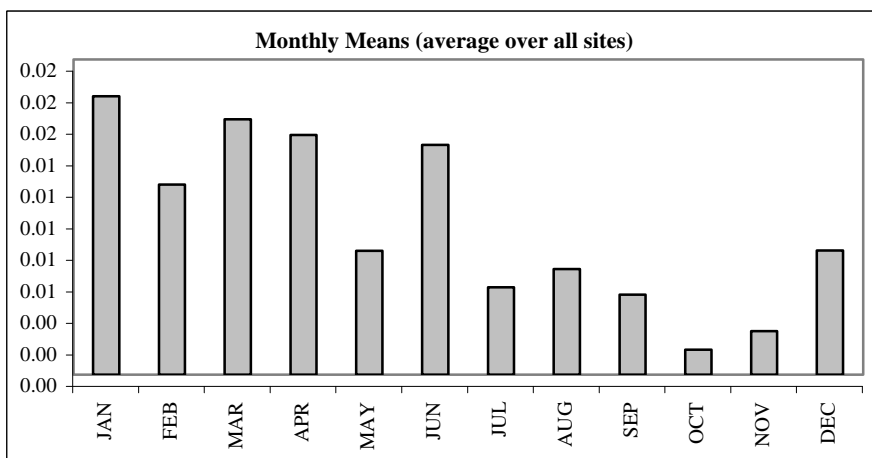
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.01	0.01	0.01	0.00	0.00						0.00	0.00
CAI		0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.00	0.01	
DRA												
GLE	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
HIL												
MOO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOR												
POR												
ROT	0.05	0.05	0.09	0.06	0.03	0.04					0.00	0.00
SNO	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.03
SOU	0.02	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
WYT												
Average	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01
Std. dev.	0.02	0.02	0.03	0.02	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.01

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.02	0.02	0.00	0.00	0.03	0.05	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01
CAI							0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.01
DRA		0.03	0.11	0.55	0.72	0.17	0.14	0.15	0.09	0.11	0.08	0.08		0.20	0.22
GLE	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00
HIL		0.00	0.00	0.00	0.00	0.00	0.02	0.00						0.00	0.01
MOO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOR	0.00	0.00	0.04	0.00	0.08	0.01	0.00	0.00	0.02	0.01		0.04		0.02	0.03
POR															
ROT		0.02	3.11	0.04	0.00	0.04	0.75	0.07	0.05	0.06	0.05	0.08	0.04	0.36	0.89
SNO							0.00	0.00	0.00	0.01	0.03	0.01	0.01	0.01	0.01
SOU	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00
WYT	0.00	0.01	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00
Average	0.00	0.01	0.37	0.07	0.10	0.03	0.09	0.02	0.02	0.02	0.02	0.03	0.01		
Std. dev.	0.00	0.01	1.03	0.18	0.25	0.05	0.22	0.05	0.03	0.04	0.03	0.03	0.01		

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Soil Solution deep samplers - NO3-N (mg/l)

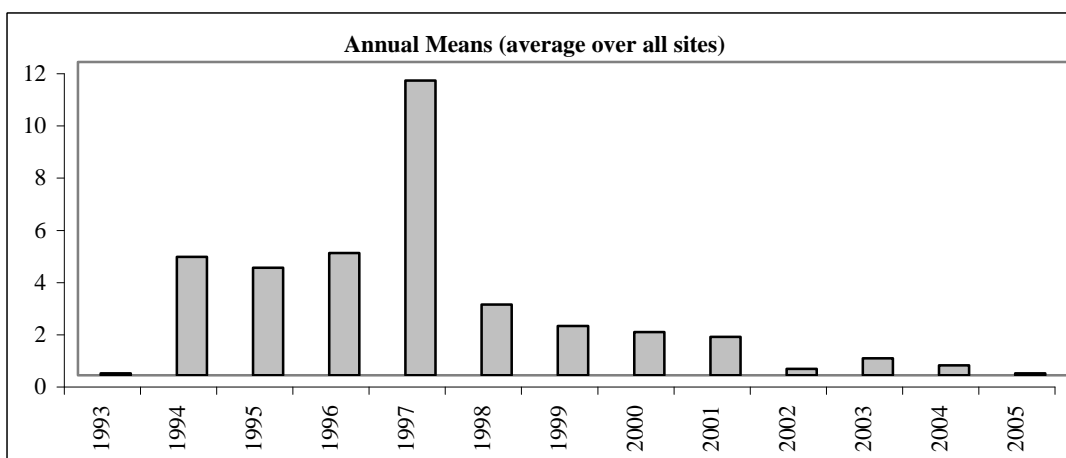
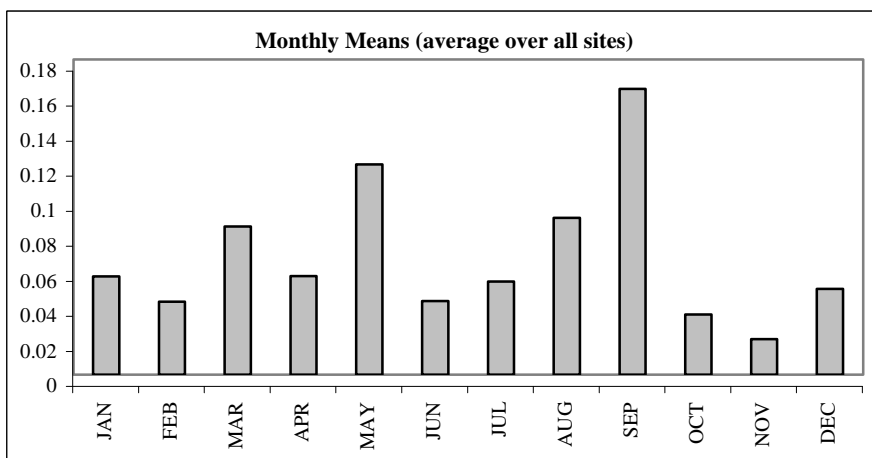
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.1	0.1	0.2	0.2	0.5						0.0	0.1
CAI		0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	
DRA												
GLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
HIL												
MOO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR												
POR												
ROT	0.0	0.0	0.1	0.0	0.0	0.0					0.0	0.0
SNO	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.6	0.0	0.0	0.2
SOU	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
WYT												
Average	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.0	0.0	0.0
Std. dev.	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.1

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.0	0.1	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.4	0.1	0.2	0.1	0.1
CAI							0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
DRA		34.0	26.5	18.1	70.4	7.7	15.5	15.7	12.3	1.6	3.8	1.8		18.9	19.9
GLE	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HIL		5.9	9.7	18.5	19.6	6.8	0.8	0.6						8.9	7.7
MOO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR	0.0	0.0	0.1	0.2	0.0	0.1	0.1	0.0	0.1	0.3	0.7	0.2		0.2	0.2
POR															
ROT		0.2	0.0	0.1	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
SNO							0.5	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.1
SOU	0.2	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
WYT	0.0	0.4	0.5	5.0		9.0	3.3	1.3	1.9	0.3	1.3	1.5		2.2	2.7
Average	0.1	4.5	4.1	4.7	11.3	2.7	1.9	1.7	1.5	0.2	0.6	0.4	0.1		
Std. dev.	0.1	11.2	9.0	7.9	24.9	3.9	4.6	4.7	3.9	0.5	1.2	0.7	0.1		

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Soil Solution deep samplers - NH4-N (mg/l)

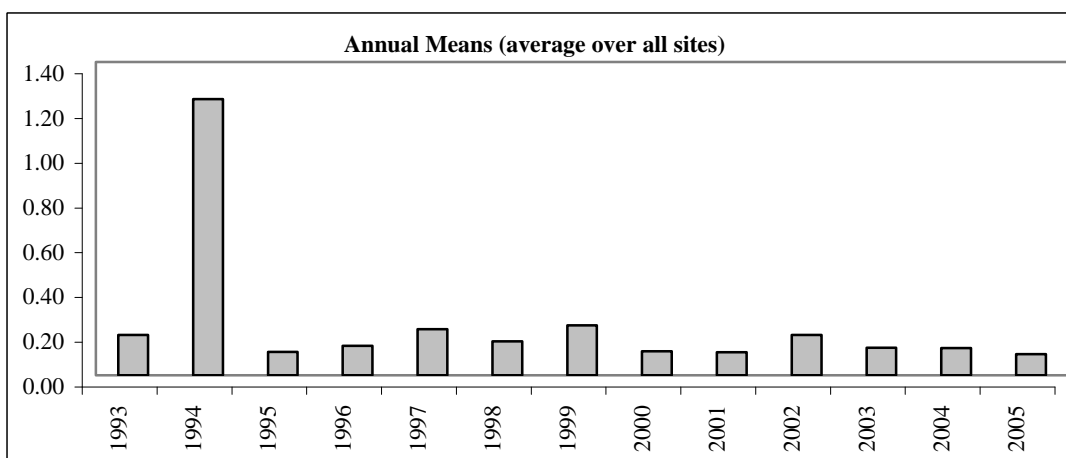
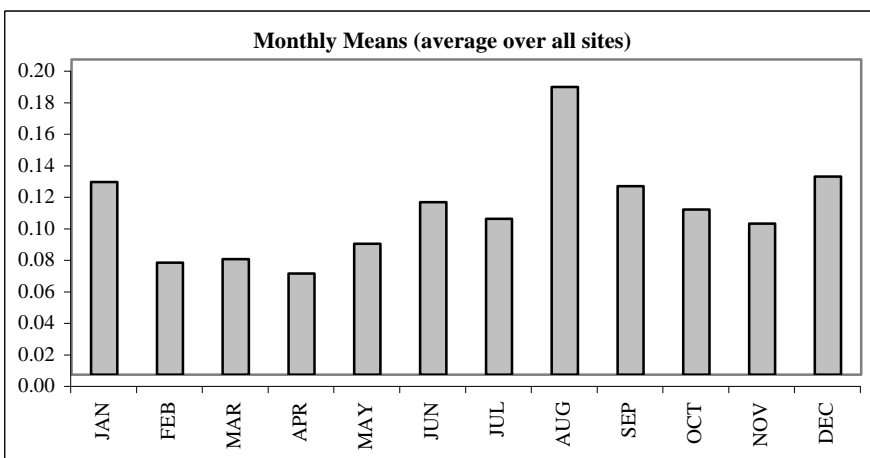
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.02	0.00	0.00	0.00	0.00						0.00	0.21
CAI		0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	
DRA												
GLE	0.03	0.02	0.03	0.01	0.04	0.05	0.01	0.06	0.02	0.01	0.01	0.01
HIL												
MOO	0.43	0.40	0.40	0.36	0.39	0.39	0.39	0.41	0.49	0.50	0.52	0.43
NOR												
POR												
ROT	0.24	0.05	0.02	0.03	0.13	0.13					0.13	0.06
SNO	0.00	0.00	0.01	0.02	0.00	0.04	0.08	0.42	0.07	0.00	0.00	0.00
SOU	0.02	0.03	0.04	0.03	0.03	0.04	0.01	0.02	0.01	0.02	0.01	0.06
WYT												
Average	0.12	0.07	0.07	0.06	0.08	0.11	0.10	0.18	0.12	0.10	0.10	0.13
Std. dev.	0.16	0.13	0.13	0.12	0.13	0.13	0.15	0.19	0.18	0.20	0.18	0.15

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.00	0.01	0.05	0.01	0.03	0.00	0.02	0.00	0.01	0.03	0.01	0.03	0.02	0.01
CAI							0.02	0.02	0.01	0.00	0.02	0.01	0.00	0.01	0.01
DRA		10.2	0.05	0.16	0.61	0.16	1.37	0.10	0.23	0.25	0.13	0.03		1.20	2.99
GLE	0.02	0.03	0.02	0.01	0.02	0.01	0.02	0.05	0.01	0.01	0.01	0.02	0.03	0.02	0.01
HIL		0.01	0.06	0.16	0.18	0.18	0.08	0.27						0.13	0.09
MOO	0.42	0.41	0.41	0.43	0.49	0.48	0.40	0.38	0.37	0.36	0.37	0.35	0.42	0.41	0.04
NOR	0.08	0.05	0.06	0.14	0.08	0.17		0.12	0.14	0.94	0.29	0.06		0.19	0.26
POR															
ROT		0.40	0.31	0.23	0.22	0.23	0.27	0.17	0.20	0.14	0.29	0.58	0.10	0.26	0.13
SNO							0.02	0.01	0.01	0.02	0.02	0.02	0.05	0.02	0.01
SOU	0.06	0.05	0.03	0.02	0.04	0.04	0.03	0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.02
WYT	0.32	0.00	0.01	0.00		0.06	0.03	0.02	0.04	0.05	0.06			0.06	0.09
Average	0.18	1.23	0.11	0.13	0.21	0.15	0.22	0.11	0.10	0.18	0.12	0.12	0.09		
Std. dev.	0.18	3.35	0.15	0.14	0.23	0.15	0.42	0.12	0.13	0.29	0.14	0.20	0.15		

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Soil Solution deep samplers - Chloride (mg/l)

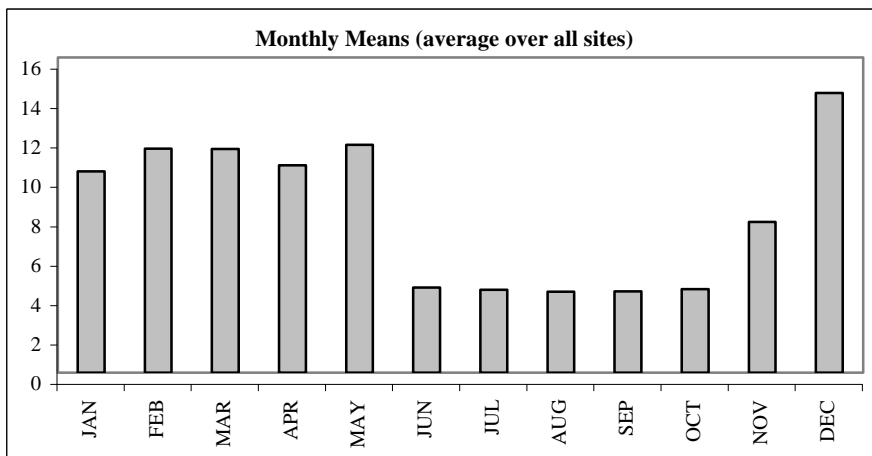
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	43.6	53.4	43.5	39.7	48.1						31.4	61.9
CAI		6.1	9.7	7.3	8.3	4.2	3.5	3.1	2.9	4.4	3.6	
DRA												
GLE	3.9	3.9	7.5	9.4	8.9	7.6	7.7	7.3	8.0	6.8	5.8	6.8
HIL												
MOO	3.5	3.5	3.6	3.4	3.4	3.5	3.4	3.6	3.6	3.6	3.7	3.6
NOR												
POR												
ROT	1.4	1.3	1.5	1.1	2.7	2.6					0.6	0.8
SNO	5.9	7.5	7.2	6.0	3.4	3.2	2.4	3.6	3.4	4.1	4.9	7.0
SOU	3.0	3.8	6.4	6.9	6.1	4.9	4.0	3.1	2.8	2.3	3.6	5.1
WYT												
Average	10.2	11.4	11.3	10.5	11.6	4.3	4.2	4.1	4.1	4.2	7.6	14.2
Std. dev.	15.0	17.3	13.3	12.2	15.1	1.6	1.8	1.6	2.0	1.5	9.8	21.4

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		22.7	18.5	30.0	35.2	35.0	24.0	24.3	19.8	29.0	23.4	23.9	45.9	27.6	7.9
CAI							3.0	3.3	3.0	3.7	6.1	3.6	5.3	4.0	1.2
DRA		18.1	5.4	64.8	25.0	5.0	4.1	4.8	8.9	1.5	3.0	2.0		13.0	18.7
GLE	6.7	9.6	8.1	13.1	7.4	7.7	9.2	7.0	6.1	6.6	9.4	7.0	7.0	8.1	1.9
HIL		4.3	5.0	7.1	4.3	4.0	10.5	18.7						7.7	5.4
MOO	4.9	4.5	4.2	4.1	4.2	4.4	4.2	3.7	3.5	3.4	3.3	3.5	3.5	4.0	0.5
NOR	18.0	12.5	14.6	12.0	8.6	18.8	13.8	10.5	9.2	13.2	10.9	11.8		12.8	3.2
POR															
ROT		6.0	5.9	7.3	16.0	8.8	4.8	3.6	6.2	4.6	5.5	8.7	1.5	6.6	3.6
SNO							8.2	4.0	4.0	5.7	5.0	4.2	4.9	5.1	1.5
SOU	11.6	13.1	7.3	13.0	8.4	7.5	9.9	6.6	4.3	5.6	7.2	4.2	4.3	7.9	3.1
WYT	17.0	14.6	12.6	16.0		33.4	22.6	22.6	11.9	29.4	15.7	19.9		19.6	6.9
Average	11.6	11.7	9.1	18.6	13.6	13.9	10.4	9.9	7.7	10.3	8.9	8.9	10.3		
Std. dev.	5.9	6.3	5.0	18.9	11.1	12.3	7.2	8.0	5.2	10.4	6.4	7.5	15.8		

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Soil Solution deep samplers - SO4-S (mg/l)

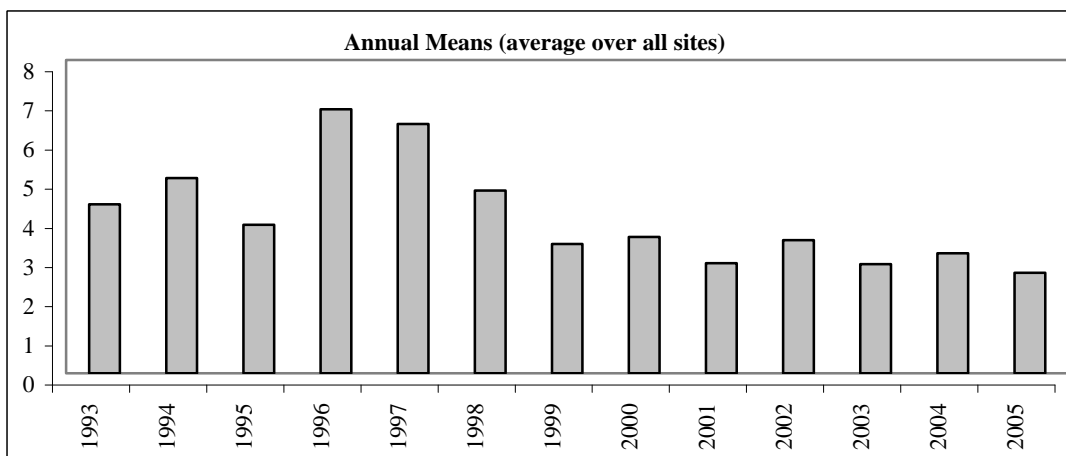
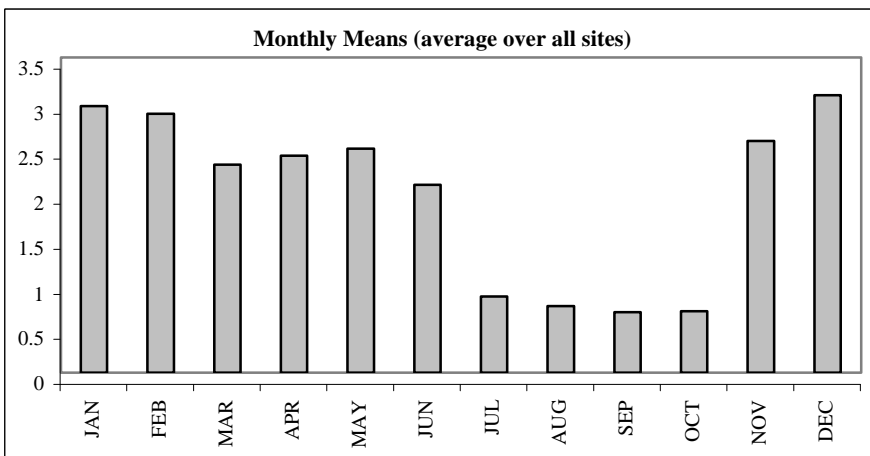
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	4.6	6.9	5.9	4.7	4.0						3.6	6.6
CAI		0.4	0.5	0.6	0.5	0.4	0.6	0.8	0.5	0.5	0.5	
DRA												
GLE	1.7	1.6	1.2	1.1	1.1	1.2	1.1	1.0	1.0	1.1	1.4	1.3
HIL												
MOO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR												
POR												
ROT	9.4	9.3	6.7	8.8	10.0	9.2					10.8	8.9
SNO	0.6	0.6	0.7	0.6	0.8	0.7	1.5	0.8	0.7	0.7	0.7	0.6
SOU	1.4	1.4	1.2	1.1	1.1	1.0	1.0	1.0	1.2	1.1	1.0	1.0
WYT												
Average	3.0	2.9	2.3	2.4	2.5	2.1	0.8	0.7	0.7	0.7	2.6	3.1
Std. dev.	3.2	3.4	2.6	3.0	3.3	3.2	0.5	0.4	0.4	0.4	3.5	3.4

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		5.8	4.9	7.5	8.0	7.5	6.7	5.5	3.5	4.2	4.1	4.2	5.2	5.6	1.5
CAI							0.6	0.4	0.4	0.4	0.6	0.5	0.5	0.5	0.1
DRA		7.6	4.9	19.1	17.5	2.3	2.3	2.7	3.1	2.9	2.9	2.6		6.2	6.2
GLE	2.2	1.9	1.9	1.8	2.3	2.0	1.8	1.9	1.7	1.6	1.3	1.4	1.2	1.8	0.3
HIL		2.1	1.0	1.6	1.2	1.6	1.2	1.3						1.4	0.4
MOO	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOR	3.2	3.1	2.9	2.8	3.7	2.6	2.6	2.1	2.3	2.4	2.1	1.9		2.6	0.5
POR															
ROT		11.9	7.1	16.9	15.8	9.2	7.5	10.0	8.6	9.4	7.2	9.9	9.1	10.2	3.2
SNO							0.4	0.8	0.7	0.6	0.7	0.7	0.7	0.7	0.1
SOU	3.1	2.6	2.4	2.9	2.4	2.3	1.6	1.4	1.3	1.2	1.2	1.4	1.1	1.9	0.7
WYT	13.1	9.8	8.8	8.1		14.7	11.4	12.3	6.4	11.2	7.8	8.2		10.2	2.6
Average	4.3	5.0	3.8	6.7	6.4	4.7	3.3	3.5	2.8	3.4	2.8	3.1	2.6		
Std. dev.	5.1	4.0	2.9	6.9	6.8	4.8	3.6	4.1	2.8	3.9	2.8	3.4	3.4		

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Soil Solution deep samplers - Dissolved organic carbon (mg/l)

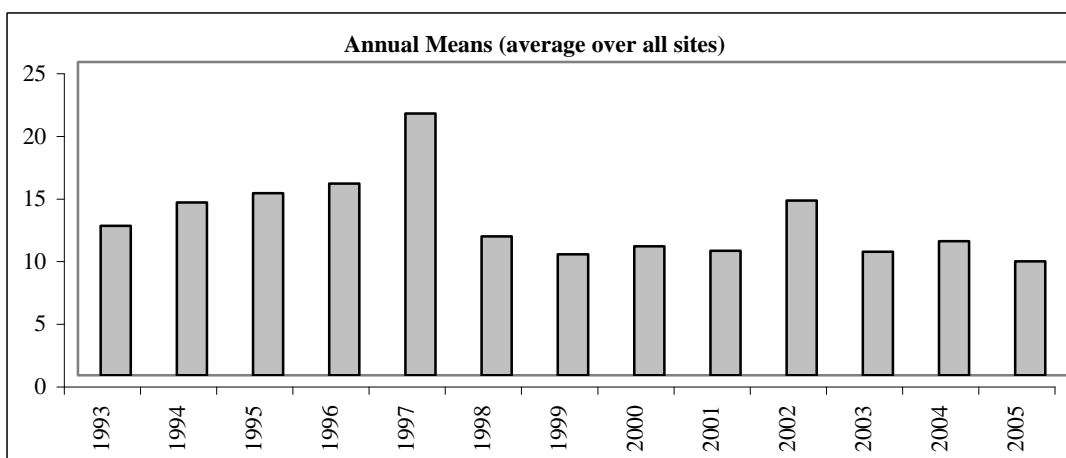
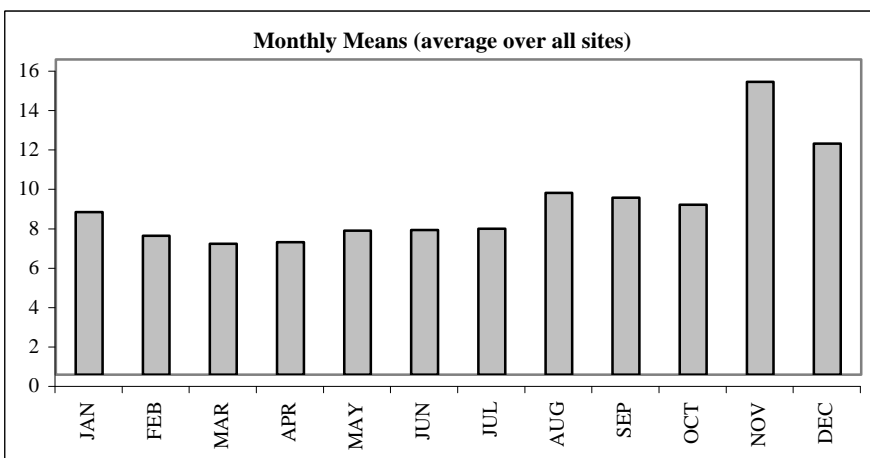
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	10.5	10.5	9.9	10.2	9.4						43.3	25.6
CAI		2.1	2.7	2.9	2.5	3.7	4.5	10.8		4.1	9.2	
DRA												
GLE	4.1	3.7	3.4	2.7	6.0	3.5	3.3	3.4	3.7	5.8	4.9	4.6
HIL												
MOO	15.4	16.4	14.9	15.6	15.5	16.7	17.1	18.3	19.7	19.1	18.9	17.6
NOR												
POR												
ROT												
SNO	1.3	0.9	0.7	0.7	1.2	2.0	1.6	1.5	1.4	1.4	1.3	1.1
SOU	9.9	8.7	8.4	8.2	9.1	10.9	10.5	12.1	11.0	12.7	11.5	9.7
WYT												
Average	8.3	7.0	6.7	6.7	7.3	7.3	7.4	9.2	9.0	8.6	14.9	11.7
Std. dev.	5.0	5.4	4.9	5.1	4.8	5.6	5.7	6.1	7.1	6.4	13.8	8.9

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI							6.7				12.2	10.5	17.1	11.6	4.3
CAI							4.9	4.4	5.3	4.5	4.9	4.1	4.7	4.7	0.4
DRA		27.7	25.8	31.9	50.3	19.7	28.0	29.0	16.8	53.5	25.0	28.0		30.5	11.4
GLE	2.7	2.6	3.2	5.7	2.4	2.7	2.7	2.7	2.5	2.6	2.1	3.5	4.1	3.0	0.9
HIL						7.2	8.2	8.1						7.9	0.6
MOO	17.5	17.2	16.1	17.1	18.2	18.9	17.4	16.6	17.6	16.6	16.7	16.8	17.1	17.2	0.7
NOR						4.5	3.0	3.7	7.0	4.3	3.9			4.4	1.4
POR															
ROT															
SNO							1.6	1.8	1.8	1.6	2.0	1.6	1.3	1.7	0.2
SOU	16.7	10.8	13.3	10.0	12.7	12.5	10.3	12.2	12.1	10.6	8.9	10.4	10.2	11.6	2.0
WYT	10.8	10.6	14.3	11.9		12.1	13.9	14.2	16.3	17.8	13.0			13.5	2.3
Average	11.9	13.8	14.5	15.3	20.9	11.1	9.7	10.3	9.9	13.9	9.9	10.7	9.1		
Std. dev.	6.8	9.3	8.1	10.2	20.7	6.7	8.2	8.8	6.6	17.2	7.7	9.3	6.8		

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Soil Solution deep samplers - Total N (mg/l)

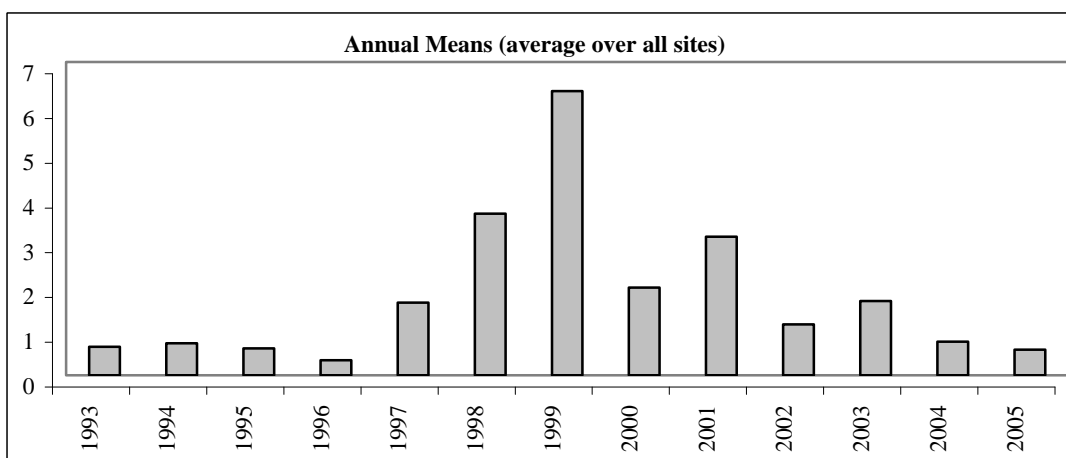
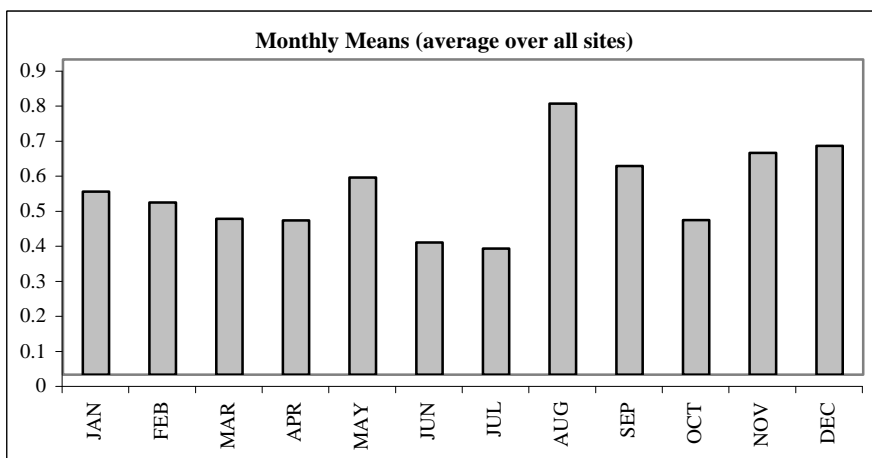
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI	0.6	0.5	0.5	0.6	0.9						1.3	1.8
CAI												
DRA												
GLE	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.2	0.3	0.2
HIL												
MOO	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.9	1.0	1.0	1.0	0.9
NOR												
POR												
ROT	0.9	0.9	0.4								0.8	0.6
SNO	0.3	0.2	0.4	0.2	0.4	0.1	0.0	1.4	0.7	0.0	0.0	0.1
SOU	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.4
WYT												
Average	0.5	0.5	0.4	0.4	0.6	0.4	0.4	0.8	0.6	0.4	0.6	0.7
Std. dev.	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.6

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI								0.6	0.3	0.3	0.8	0.5	0.9	0.6	0.2
CAI															
DRA				0.0		1.9	20.0	10.7	19.5	5.1	8.6			9.4	8.0
GLE						0.3		0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
HIL															
MOO	0.8	0.9	0.6	0.7	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.9	0.8	0.1
NOR					2.4						0.3	0.2		1.0	1.2
POR															
ROT								0.6	0.7	0.7	1.1	1.2	0.7	0.8	0.3
SNO							0.6	0.5	0.3	0.2	0.3	0.2	0.3	0.3	0.1
SOU								0.8	0.6	0.5	0.4	0.5	0.5	0.5	0.1
WYT	0.5	0.6				11.4	4.1	1.8	2.5	1.5	2.6	2.6		3.0	3.3
Average	0.6	0.7	0.6	0.3	1.6	3.6	6.3	2.0	3.1	1.1	1.7	0.8	0.6		
Std. dev.	0.2	0.2		0.5	1.0	5.2	9.3	3.6	6.7	1.7	2.7	0.8	0.3		

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4.3 Surface Water Chemistry

The possible causes and consequences of changes in climate, land use and industrial, urban and agricultural pollution can be expected to be reflected in the physical and chemical composition of water in rivers and streams. Monitoring of hydrological variables in ECN may therefore provide a sensitive indicator of environmental change.

For streams or rivers where the whole catchment area lies within an ECN terrestrial site weekly dip samples are taken and analysed for major ions and nutrients. Six ECN sites meet this criteria monitoring 16 streams in total. Separate results are presented for each stream. In some years, such as at Rothamsted in 1997, the smaller streams may dry up giving no surface water data for that year.

Surface Water Chemistry - pH

2005 monthly averages

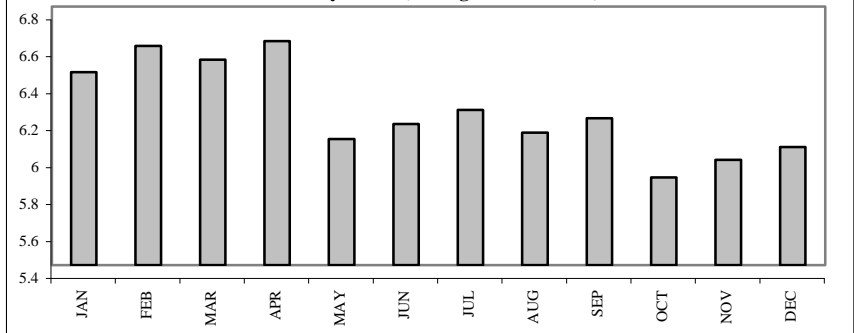
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	6.2	6.4	6.2	6.7	6.6	6.6	6.9	6.8	6.7	6.3	6.4	6.4
GLE	01	7.0	7.3	7.0	6.9	6.8	7.1	7.2	7.2	7.3	6.6	6.8	6.9
MOO	01	6.0	6.2	6.0	6.1	6.3	6.7	6.7	6.4	6.7	5.8	6.0	6.2
MOO	02	4.2	4.2	4.4	4.4	4.4	4.4	4.4	4.2	4.2	4.3	4.3	4.3
MOO	03	7.2	7.0	6.9	7.0	7.3	7.6	8.0	7.5	7.6	6.9	7.2	7.1
MOO	04												
MOO	05	4.1	4.1	4.3	4.4	4.2	4.1	4.0	4.0	4.0	4.2	4.2	5.0
MOO	06	4.1	4.1	4.2	4.3	4.3	4.3	4.3	4.1	4.1	4.1	4.2	4.2
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	5.0	5.3	5.3	5.4	5.6	5.4	5.6	5.5	5.5	5.4	5.4	5.2
SOU	01	7.7	7.7	7.5	7.5	7.6	7.6	7.5	7.6	7.8	7.5	7.5	7.4
SOU	02	6.9	7.9	7.6	7.7	7.8	7.8	7.8	7.9	7.9	7.7	7.7	7.7
WYT	01	8.1	8.1	8.1	8.1								
WYT	02	8.1	8.1	8.0	8.0								
WYT	03	7.9	7.9	7.8	7.9								
WYT	04	7.9	8.0	7.9	7.9								
Average		6.4	6.6	6.5	6.6	6.1	6.2	6.2	6.1	6.2	5.9	6.0	6.0
Std. dev.		1	1	1	1	1	1	1	1	2	1	1	1

Annual Means

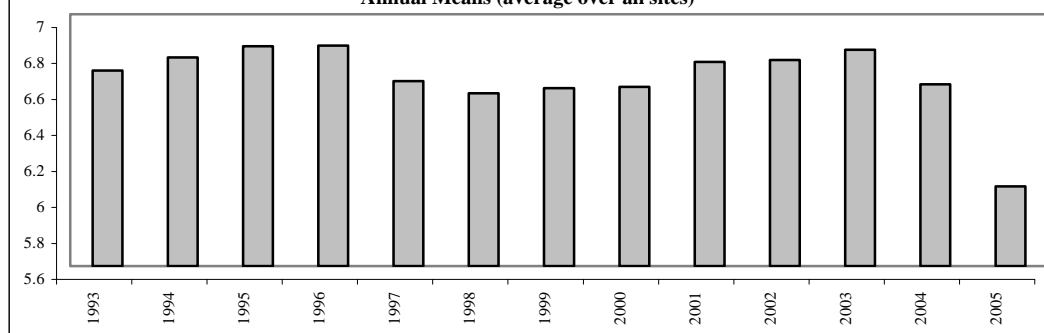
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							6.4	6.4	6.2	6.3	6.7	6.5	6.5		
GLE	01	6.7	6.7	6.8	6.8	6.9	7.0	7.1	6.7	6.8	6.7	6.9	6.7	7.0	6.8	0.1
MOO	01	6.0	5.5	5.5	5.4	5.7	5.3	5.9	5.8	6.1	5.9	6.1	5.8	6.3	5.8	0.3
MOO	02	4.2	4.3	4.3	4.4	4.3	4.2	4.3	4.4	4.5	4.4	4.4	4.4	4.3	4.3	0.1
MOO	03	6.9	6.1	6.1	6.0	6.1	6.1	7.0	6.8	7.2	6.9	6.9	6.8	7.3	6.6	0.5
MOO	04	6.3	5.9	6.0	5.9	6.1	5.8	6.3	6.1	6.3	6.3	6.4			6.1	0.2
MOO	05						4.2	4.2	4.3	4.2	4.2	4.1	4.2	4.2	4.2	0.1
MOO	06												4.2	4.2	4.2	0.0
NOR	01	6.9	6.6	6.5	6.7	6.4	6.7	6.0	6.5	6.8	6.9	7.0	7.1		6.7	0.3
NOR	02	6.8	6.5	6.7	6.5	6.4	6.8	6.1	6.6	7.0	7.2	7.2	7.3		6.8	0.4
NOR	03	6.1	6.3	6.4	6.4	6.5	6.7	6.2	6.6	7.1	6.9	6.9	7.0		6.6	0.3
ROT	01		8.1	8.0	8.0		7.6	7.3	7.3	7.6	7.7	7.6	7.6		7.7	0.3
SNO	01					5.1	4.9	5.0	5.3	5.4	5.4	5.6	5.5	5.4	5.3	0.2
SOU	01	7.0	7.1	7.2	7.3	7.2	7.3	7.5	7.3	7.3	7.3	7.4	7.3	7.6	7.3	0.2
SOU	02	7.2	7.4	7.4	7.5	7.4	7.4	7.7	7.5	7.4	7.5	7.7	7.4	7.7	7.5	0.1
WYT	01	7.7	7.8	7.9	7.9	7.8	7.9	8.0	7.9	8.0	8.1	8.0	7.8		7.9	0.1
WYT	02	7.7	7.8	7.9	8.0	8.0	8.0	8.0	7.9	7.9	7.9	7.9	8.0		7.9	0.1
WYT	03	7.4	7.7	7.8	7.9	7.7	7.7	7.8	7.7	7.7	7.9	7.8	7.7		7.7	0.1
WYT	04		7.6	7.8	7.8	7.8	7.9	7.8	7.7	7.7	7.8	7.7	7.7		7.7	0.1
Average		6.7	6.8	6.8	6.8	6.6	6.6	6.6	6.6	6.7	6.7	6.8	6.6	6.0		
Std. dev.		1	1	1	1	1	1	1	1	1	1	1	1	1		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - Conductivity (microSiemens/l)

2005 monthly averages

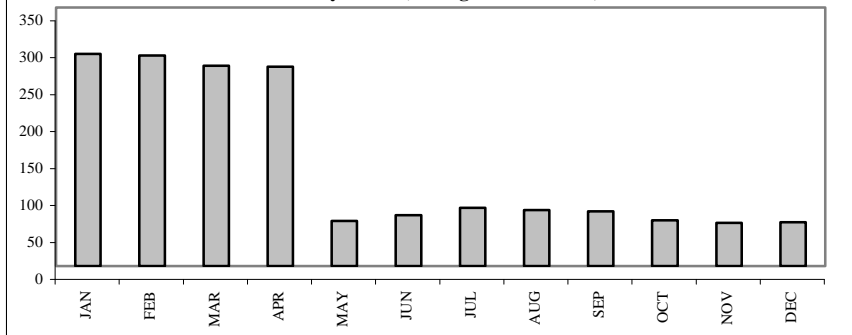
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	29	26	26	23	27	22	28	31	25	22	23	25
GLE	01	62	69	62	59	54	63	78	82	83	63	63	63
MOO	01	46	47	36	31	41	54	75	56	50	35	37	34
MOO	02	65	56	37	35	42	42	46	53	48	43	38	41
MOO	03	70	68	59	55	73	105	138	96	93	60	67	63
MOO	04												
MOO	05	73	68	43	37	51	60	70	59	61	47	45	53
MOO	06	68	59	44	38	45	46	50	61	58	49	44	45
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	34	31	31	27	25	23	23	22	22	21	24	28
SOU	01	126	129	110	113	121	133	136	144	148	137	117	117
SOU	02	110	140	111	121	131	139	146	153	155	140	125	124
WYT	01	744	709	703	754								
WYT	02	833	816	830	822								
WYT	03	868	880	830	825								
WYT	04	895	893	873	840								
Average		287	285	271	270	61	69	79	76	74	62	58	59
Std. dev.		349	345	343	343	35	40	44	42	44	41	34	33

Annual Means

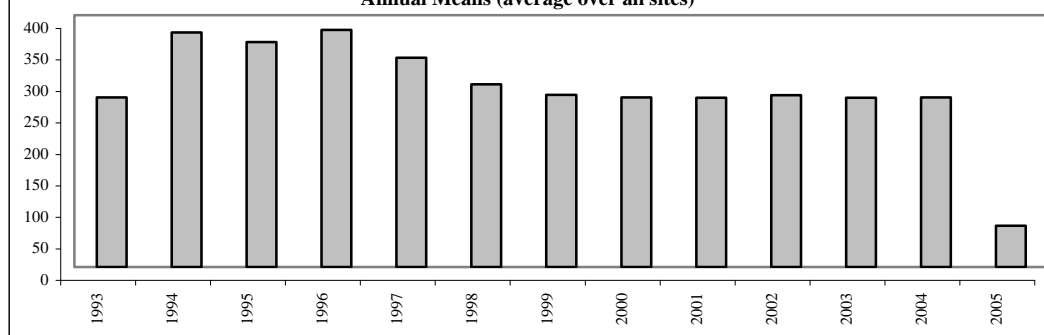
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							68	25	24	29	26	25	25		
GLE	01	65	63	61	58	61	46	52	53	70	59	77	63	67	61	8
MOO	01	31	44	51	57	48	37	43	39	42	41	59	37	45	44	8
MOO	02	45	48	55	60	49	44	44	37	38	39	45	40	45	45	6
MOO	03	44	75	85	90	84	61	76	67	77	71	90	64	79	74	13
MOO	04	32	49	58	62	54	38	47	41	46	48	75			50	12
MOO	05						53	50	40	44	44	56	46	56	49	6
MOO	06												46	51	48	4
NOR	01						98	104	103	99	104	104	115		104	6
NOR	02						114	109	139	181	154	141	168		144	27
NOR	03						109	117	116	113	214	118	189		139	43
ROT	01		717	730	724		656	678	684	733	703	709	658		699	29
SNO	01					24	23	21	20	19	24	27	24	26	23	3
SOU	01	123	96	109	105	110	82	88	100	117	124	138	122	127	111	16
SOU	02	121	108	120	115	124	91	99	107	123	133	143	128	133	119	15
WYT	01	691	738	743	840	912	912	819	839	740	706	782	750		789	75
WYT	02	740	784	818	795	782	822	844	880	884	870	807	817		820	43
WYT	03	802	723	703	744	813	881	893	816	802	800	750	765		791	58
WYT	04		###	759	869	931	865	768	743	691	745	691	795		807	104
Average		269	373	357	377	333	290	273	269	269	273	269	269	65		
Std. dev.		331	384	348	371	392	362	340	338	324	320	309	316	38		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - Alkalinity (mg/l)

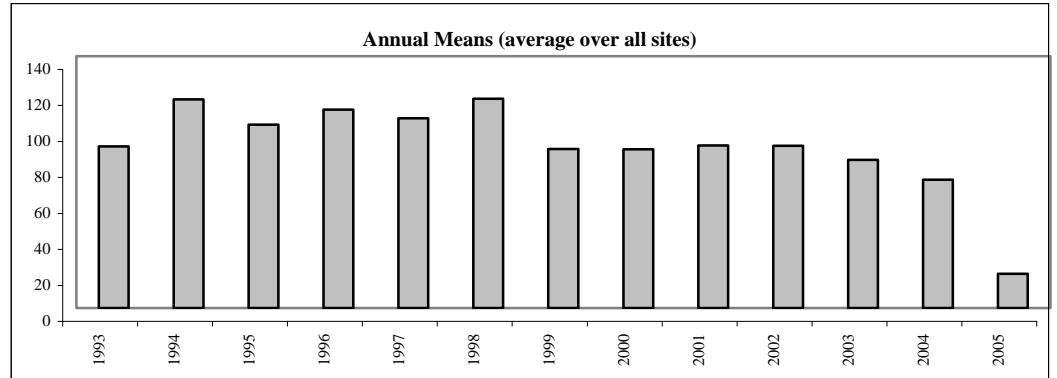
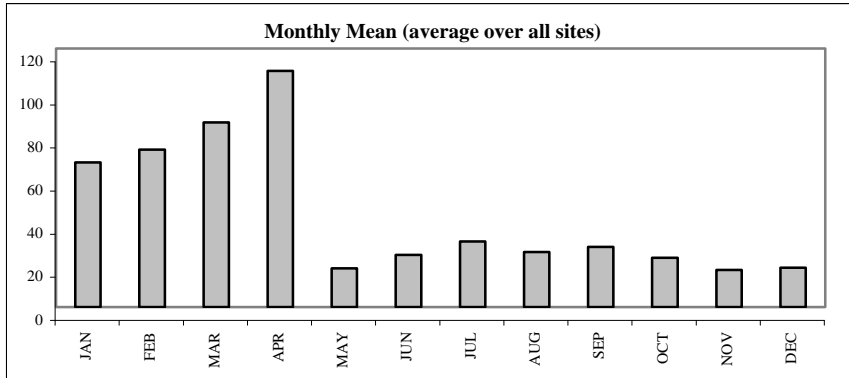
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	1	2	2	3	3	2	4	4	3	2	2	2
GLE	01	9	13	9	9	16	15	20	19	23	17	9	10
MOO	01	1	6	4	3	9	13	25	12	12	6	7	12
MOO	02	4	0			0							
MOO	03	13	20	15	15	27	39	64	32	33	19	21	21
MOO	04												
MOO	05	23											21
MOO	06												
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	30	0	0	0	0	0	0	1	0	-1	0	0
SOU	01	38	42	34	36	41	47	47	51	62	58	37	37
SOU	02	47	50	35	41	48	53	54	60	62	60	45	44
WYT	01	175	157	199	254								
WYT	02	194	166	209	279								
WYT	03	176	209	223	268								
WYT	04	161	213	213	298								
Average		67	73	86	110	18	24	30	26	28	23	17	18
Std. dev.		74	83	95	126	18	20	23	21	24	24	16	15

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							2	3	2	2	3	2	3		
GLE	01	7	11	8	6	6	4	8	9	10	7	17	12	14	9	3
MOO	01	6	6	12	10	9	6	9	6	9	6	9	7	9	8	2
MOO	02	0	0	0	6	11		0	0	0	0	3	4	1	2	4
MOO	03	22	25	30	25	28	19	25	20	26	23	30	23	27	25	3
MOO	04	8	8	13	10	12	7	10	7	11	9	14			10	2
MOO	05							0	0				10	22	8	10
MOO	06															
NOR	01												17			
NOR	02												48			
NOR	03												24			
ROT	01		223	203	207											
SNO	01						0	0	0	1	0	1	0	2	1	1
SOU	01	35	40	41	39	40	49	38	35	34	38	50	44	44	41	5
SOU	02	41	48	50	48	48	40	44	42	39	44	54	53	50	46	5
WYT	01	229	237	202	244	232	272	250	274	224	226	212	233		236	21
WYT	02	239	255	236	282	297	296	290	293	285	281	223	209		265	31
WYT	03	310	279	226	245	238	312	311	307	286	293	230	216		271	37
WYT	04		261	203	201	239	274	251	239	247	243	226	237		238	22
Average		90	116	102	110	105	116	88	88	90	90	82	71	19		
Std. dev.		120	121	100	113	118	138	124	126	120	120	99	93	18		

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Surface Water Chemistry - Sodium (mg/l)

2005 monthly averages

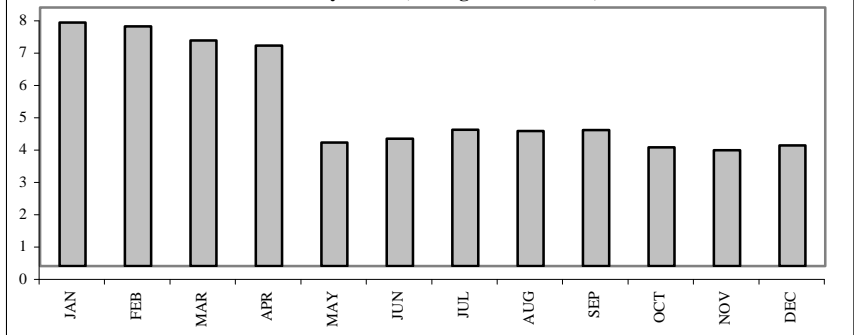
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	2.5	2.4	2.3	2.3	2.4	2.4	2.8	2.6	3.0	2.3	2.4	2.5
GLE	01	5.9	6.2	5.9	5.9	5.5	6.0	6.7	7.0	7.1	6.0	6.3	6.3
MOO	01	3.6	3.5	2.6	2.4	2.7	2.9	3.0	2.7	2.6	2.3	2.3	2.3
MOO	02	3.7	3.5	2.4	2.7	2.7	2.7	3.0	3.3	3.1	2.5	2.1	2.4
MOO	03	3.6	3.5	2.5	2.3	2.5	2.6	2.7	2.6	2.5	2.2	2.2	2.4
MOO	04												
MOO	05	3.7	3.8	2.5	2.2	2.7	3.0	3.6	3.2	3.2	2.4	2.3	2.2
MOO	06	3.6	3.4	2.6	2.3	2.7	2.8	2.9	3.2	2.9	2.3	2.2	2.3
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	3.7	3.4	3.5	3.1	2.8	2.6	2.5	2.4	2.3	2.3	2.5	2.9
SOU	01	7.3	7.4	6.9	6.7	7.5	7.6	7.9	7.8	8.0	7.6	7.2	7.3
SOU	02	6.9	6.8	6.1	6.2	6.8	6.9	7.1	7.1	7.3	6.8	6.5	6.6
WYT	01	14.5	14.5	13.8	14.2								
WYT	02	13.7	13.3	13.7	13.4								
WYT	03	16.0	15.2	16.1	15.7								
WYT	04	16.9	17.0	16.8	16.1								
Average		7.5	7.4	7.0	6.8	3.8	3.9	4.2	4.2	4.2	3.7	3.6	3.7
Std. dev.		5	5	5	5	2	2	2	2	2	2	2	2

Annual Means

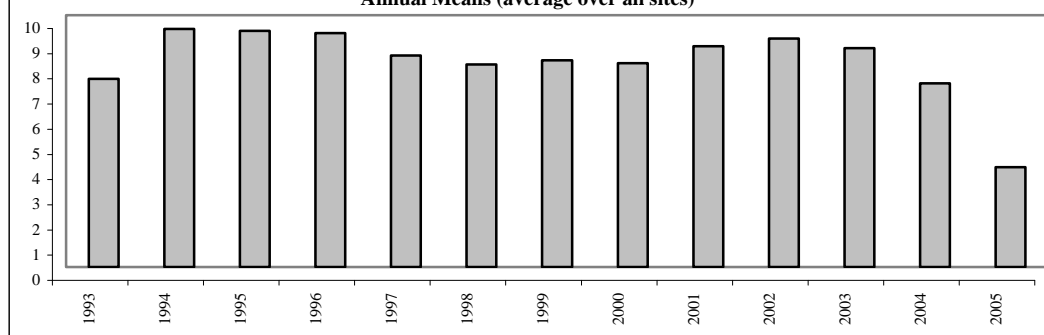
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							2.0	3.2	3.4	3.4	3.5	2.3	2.5		
GLE	01	6.1	6.9	6.7	6.8	6.8	6.3	6.6	5.9	6.1	5.7	6.7	6.1	6.2	6.4	0.4
MOO	01	2.8	2.5	2.9	3.2	3.1	2.6	2.9	2.9	2.8	2.9	3.1	2.4	2.7	2.8	0.2
MOO	02	2.7	2.5	3.1	3.1	2.8	2.6	2.9	2.8	2.9	2.7	2.9	2.4	2.8	2.8	0.2
MOO	03	2.8	2.5	2.9	3.1	2.9	2.6	2.9	2.7	2.8	3.0	3.0	2.4	2.6	2.8	0.2
MOO	04	2.9	2.5	2.9	3.2	2.9	2.6	2.9	2.7	2.9	2.8	3.3			2.9	0.2
MOO	05						2.7	2.9	2.7	2.8	2.7	3.0	2.4	2.9	2.8	0.2
MOO	06											2.5	2.8		2.6	0.2
NOR	01	8.4	8.2	8.2	9.4	9.2	8.7	9.9	9.2	9.9	11.0	10.1	7.8		9.2	0.9
NOR	02	7.4	7.9	7.5	7.3	8.2	9.8	10.6	10.1	9.2	13.8	9.8	7.9		9.1	1.9
NOR	03	8.9	8.5	7.4	7.5	9.1	10.5	10.6	10.6	8.6	11.8	10.9	7.0		9.3	1.6
ROT	01		28.3	29.2	21.4		7.8	14.3	14.9	32.1	27.3	23.1	12.6		21.1	8.3
SNO	01					2.8	3.2	2.9	2.5	2.6	3.5	2.9	2.6	2.8	2.9	0.3
SOU	01	7.2	7.6	7.7	7.9	8.0	7.4	7.4	7.3	6.9	7.0	7.7	7.5	7.4	7.5	0.3
SOU	02	6.8	7.1	7.2	7.3	7.6	6.9	6.9	6.6	6.3	6.5	7.0	6.8	6.8	6.9	0.3
WYT	01	13.2	13.6	13.1	14.8	16.9	16.5	15.2	15.3	14.4	14.0	15.2	14.0		14.7	1.2
WYT	02	12.3	12.7	13.2	13.5	13.2	14.0	14.2	14.9	14.6	14.2	14.0	13.7		13.7	0.7
WYT	03	15.5	14.4	13.0	15.2	16.5	16.2	16.8	15.7	15.1	15.4	14.3	14.9		15.3	1.0
WYT	04		16.4	15.5	15.6	16.0	16.4	15.8	15.7	14.4	15.5	16.0	15.8		15.7	0.5
Average		7.5	9.5	9.4	9.3	8.4	8.0	8.2	8.1	8.8	9.1	8.7	7.3	4.0		
Std. dev.		4	7	7	6	5	5	5	5	7	7	6	5	2		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - Potassium (mg/l)

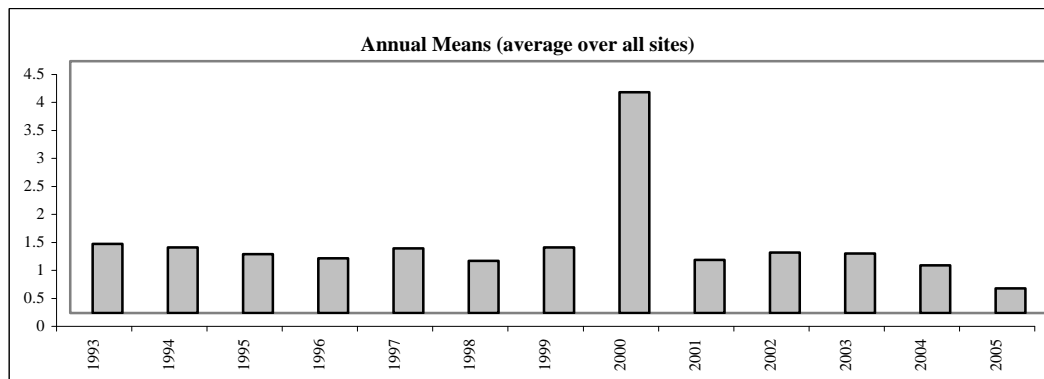
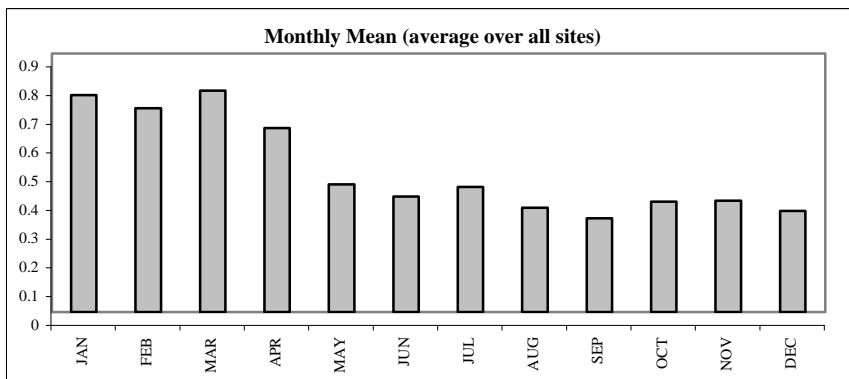
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
GLE	01	0.5	0.4	0.5	0.3	0.2	0.2	0.3	0.4	0.4	0.6	0.7	0.5
MOO	01	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.2
MOO	02	0.8	0.8	0.5	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3
MOO	03	0.5	0.5	0.4	0.4	0.3	0.4	0.5	0.4	0.3	0.2	0.2	0.2
MOO	04												
MOO	05	1.2	1.1	0.8	0.8	1.0	0.9	0.7	0.4	0.2	0.2	0.3	0.2
MOO	06	1.0	0.8	0.7	0.6	0.7	0.6	0.4	0.3	0.2	0.2	0.2	0.1
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2
SOU	01	0.7	0.7	0.7	0.5	0.6	0.5	0.7	0.6	0.7	0.9	0.8	0.8
SOU	02	0.7	0.6	0.8	0.5	0.5	0.4	0.7	0.6	0.7	0.8	0.8	0.8
WYT	01	1.2	1.1	2.1	1.5								
WYT	02	0.8	0.8	1.1	0.9								
WYT	03	0.9	0.9	1.1	1.1								
WYT	04	1.5	1.2	1.1	1.1								
Average		0.8	0.7	0.8	0.6	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.4	55.1	0.3	0.5	0.4	0.4	0.2		
GLE	01	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.5	0.1
MOO	01	0.9	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2
MOO	02	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.5	0.3	0.1
MOO	03	0.4	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.0
MOO	04	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.2	0.3	0.3	0.4			0.3	0.0
MOO	05						0.2	0.3	0.2	0.2	0.2	0.2	0.4	0.7	0.3	0.2
MOO	06												0.4	0.5	0.4	0.1
NOR	01	1.3	1.2	1.3	2.0	1.8	1.3	1.5	1.3	1.3	1.6	1.7	1.4		1.5	0.2
NOR	02	2.0	1.7	1.6	1.5	2.5	2.6	2.7	2.2	1.7	3.5	1.7	1.4		2.1	0.6
NOR	03	1.8	1.4	1.1	1.2	1.3	1.2	1.8	1.5	1.0	1.4	1.0	0.9		1.3	0.3
ROT	01		3.6	3.1	1.4		1.2	1.7	1.5	3.9	3.4	3.3	1.4		2.5	1.1
SNO	01					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0
SOU	01	1.1	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.6	0.7	0.7	0.7	0.8	0.1
SOU	02	1.0	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.7	0.6	0.7	0.6	0.7	0.8	0.1
WYT	01	3.5	2.0	1.3	1.3	2.6	2.1	5.9	2.5	2.0	2.4	3.1	2.4		2.6	1.2
WYT	02	1.3	1.0	1.1	1.0	1.2	1.1	0.9	1.0	0.9	1.1	1.0	1.1		1.1	0.1
WYT	03	1.6	1.1	1.0	1.0	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.1		1.2	0.2
WYT	04		2.1	2.1	1.9	3.4	1.8	1.3	1.3	1.0	1.2	2.1	1.8		1.8	0.7
Average		1.2	1.2	1.0	1.0	1.2	0.9	1.2	3.9	0.9	1.1	1.1	0.9	0.4		
Std. dev.		1	1	1	1	1	1	1	13	1	1	1	1	0		

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Surface Water Chemistry - Calcium (mg/l)

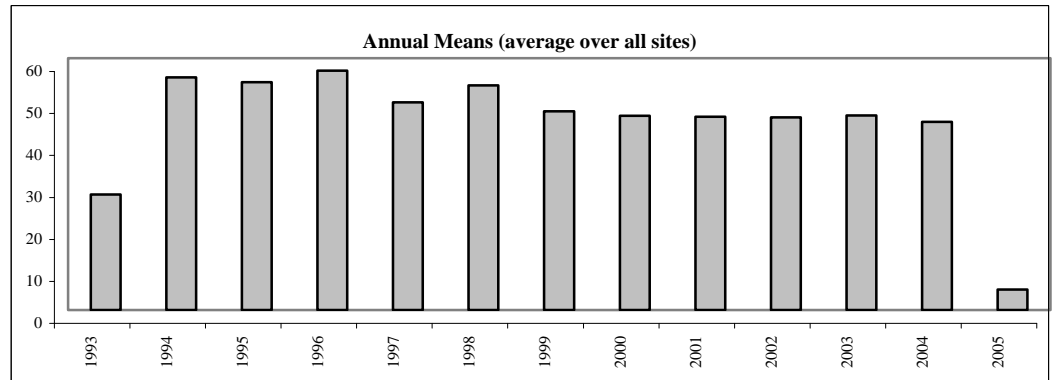
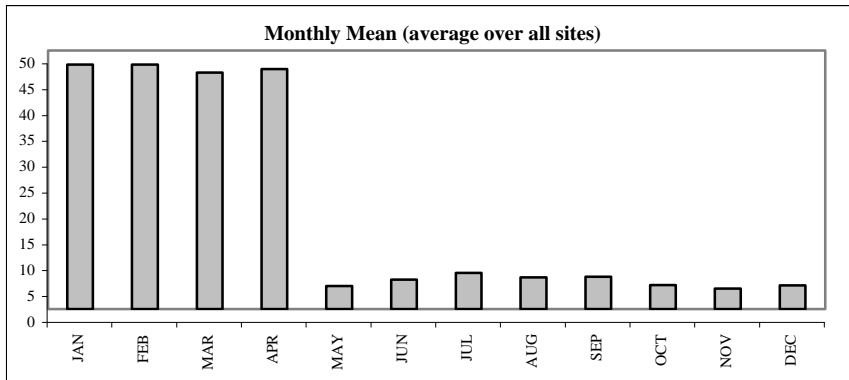
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	1	1	1	1	1	1	1	1	1	1	1	1
GLE	01	3	4	3	3	3	4	6	6	6	4	3	3
MOO	01	3	4	3	3	4	7	10	7	7	4	4	4
MOO	02	1	1	1	1	1	1	2	1	1	1	1	1
MOO	03	9	8	8	8	11	16	22	16	16	9	9	11
MOO	04												
MOO	05	1	0	0	0	0	1	1	1	1	1	1	4
MOO	06	0	1	0	0	1	1	1	1	1	1	1	1
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	1	1	1	1	1	1	1	1	1	0	0	1
SOU	01	10	11	9	10	10	12	12	13	14	13	10	10
SOU	02	12	13	9	11	12	13	14	15	15	14	11	11
WYT	01	135	130	129	143								
WYT	02	157	153	157	155								
WYT	03	163	167	156	156								
WYT	04	167	168	163	159								
Average		47	47	46	46	4	6	7	6	6	5	4	5
Std. dev.		69	68	67	68	5	6	7	6	6	5	4	4

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							1	1	1	1	1	1	1		
GLE	01	4	5	5	4	5	4	4	4	4	4	5	4	4	4	0
MOO	01	5	4	6	6	5	4	5	4	5	4	7	4	5	5	1
MOO	02	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
MOO	03	11	11	13	12	12	9	11	10	12	11	15	10	12	11	2
MOO	04	5	5	7	6	6	4	5	5	6	6	10			6	1
MOO	05						1	0	0	0	0	1	1	1	1	0
MOO	06												1	1	1	0
NOR	01	14	12	8	9	8	9	10	9	9	9	8	8		9	2
NOR	02	16	13	10	6	8	10	9	16	27	22	15	17		14	6
NOR	03	10	9	7	5	6	7	9	10	14	12	11	10		9	3
ROT	01		127	127	132		132	131	128	123	125	127	126		128	3
SNO	01					1	1	1	1	1	1	1	1	1	1	0
SOU	01	12	12	12	12	13	10	11	10	10	11	13	10	11	11	1
SOU	02	13	14	14	14	14	12	12	12	11	13	14	12	13	13	1
WYT	01	99	135	149	164	167	179	153	155	142	133	159	143		148	21
WYT	02	84	142	168	161	157	167	166	171	175	172	168	160		157	25
WYT	03	84	132	139	146	151	188	179	161	156	160	150	148		149	26
WYT	04		211	150	176	188	174	146	137	134	141	130	150		158	26
Average		27	55	54	57	49	53	47	46	46	46	46	45	5		
Std. dev.		35	71	68	73	73	77	69	67	65	65	65	65	5		

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Surface Water Chemistry - Magnesium (mg/l)

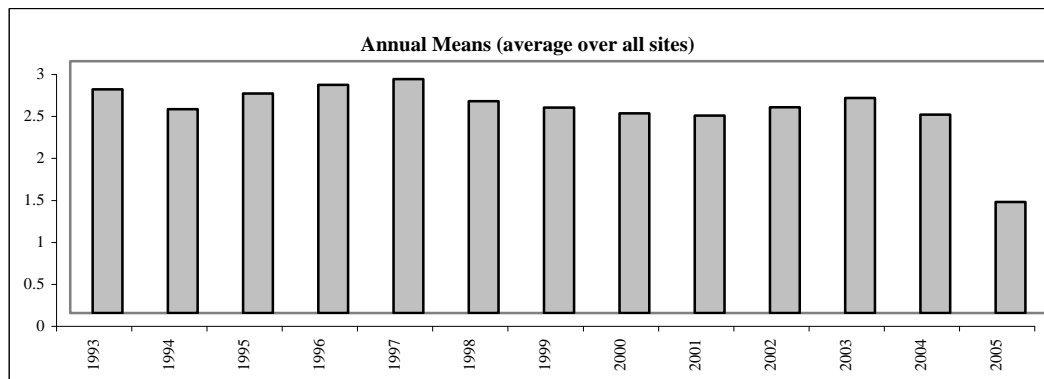
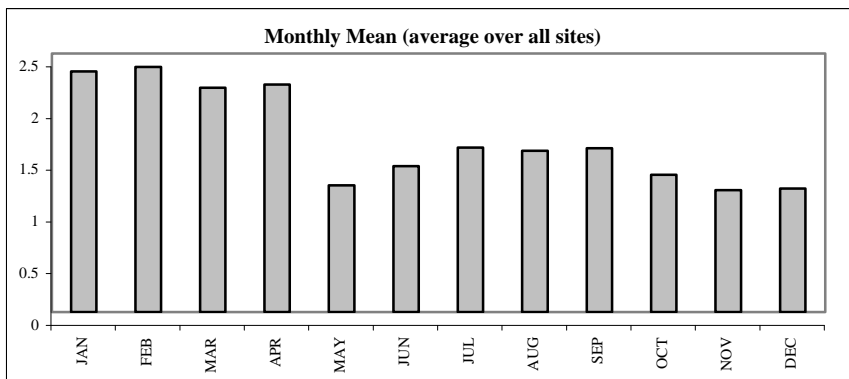
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.4
GLE	01	1.0	1.4	1.2	1.2	1.1	1.4	1.7	1.7	1.8	1.3	1.2	1.1
MOO	01	0.6	0.6	0.4	0.5	0.6	1.0	1.3	0.9	0.9	0.5	0.6	0.5
MOO	02	0.4	0.4	0.3	0.2	0.3	0.3	0.4	0.5	0.4	0.3	0.2	0.3
MOO	03	0.8	0.8	0.7	0.6	0.9	1.2	1.7	1.2	1.2	0.7	0.7	0.9
MOO	04												
MOO	05	0.5	0.4	0.2	0.2	0.3	0.4	0.5	0.4	0.4	0.3	0.3	0.3
MOO	06	0.4	0.3	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.3	0.3	0.3
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.5	0.4	0.5	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.4
SOU	01	3.7	4.0	3.3	3.5	3.7	4.1	4.3	4.5	4.7	4.4	3.6	3.6
SOU	02	4.5	4.7	3.6	4.0	4.5	4.8	5.0	5.2	5.3	4.8	4.4	4.2
WYT	01	5.9	5.7	5.9	6.1								
WYT	02	4.9	4.8	4.8	4.8								
WYT	03	4.6	4.7	4.6	4.5								
WYT	04	4.5	4.6	4.5	4.3								
Average		2.3	2.4	2.2	2.2	1.2	1.4	1.6	1.6	1.6	1.3	1.2	1.2
Std. dev.		2	2	2	2	1	2	2	2	2	2	1	1

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.3	0.3	0.4	0.4	0.4	0.5	0.3		
GLE	01	1.3	1.6	1.4	1.5	1.4	1.3	1.4	1.2	1.3	1.2	1.5	1.3	1.3	1.4	0.1
MOO	01	0.7	0.6	0.8	0.9	0.7	0.5	0.7	0.6	0.6	0.6	0.9	0.6	0.7	0.7	0.1
MOO	02	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.1
MOO	03	0.9	0.8	1.1	1.1	1.0	0.8	0.9	0.8	0.9	0.9	1.3	0.8	0.9	1.0	0.1
MOO	04	0.7	0.6	0.8	0.9	0.8	0.5	0.7	0.6	0.7	0.7	1.1			0.7	0.2
MOO	05						0.4	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.3	0.1
MOO	06											0.3	0.3		0.3	0.0
NOR	01	2.4	2.1	2.0	2.3	2.2	2.2	2.4	2.2	2.1	2.1	2.6	2.2		2.2	0.2
NOR	02	2.5	2.2	1.9	1.8	2.0	2.6	2.6	3.3	3.7	4.2	3.1	3.9		2.8	0.8
NOR	03	2.9	2.8	2.3	2.1	2.8	3.3	3.6	3.2	3.1	3.2	2.9	2.9		2.9	0.4
ROT	01		2.3	2.4	2.4		2.8	2.5	2.5	2.3	2.3	2.5	2.6		2.5	0.2
SNO	01					0.4	0.4	0.4	0.3	0.3	0.5	0.4	0.3	0.4	0.4	0.0
SOU	01	4.1	4.1	4.2	4.1	4.3	3.5	3.8	3.6	3.5	3.7	4.3	3.7	4.0	3.9	0.3
SOU	02	4.6	4.8	5.0	4.9	5.1	4.2	4.6	4.3	4.0	4.3	4.8	4.5	4.6	4.6	0.3
WYT	01	5.4	4.5	5.0	5.6	6.8	6.3	5.9	5.9	5.5	5.7	6.0	5.3		5.7	0.6
WYT	02	4.4	3.7	4.6	4.7	4.7	4.8	4.8	4.9	4.9	5.0	4.9	4.9		4.7	0.3
WYT	03	4.5	3.4	3.4	3.9	4.1	4.6	4.8	4.6	4.5	4.6	4.3	4.2		4.2	0.5
WYT	04		2.6	3.8	4.2	5.1	4.5	4.1	4.0	3.9	4.3	4.2	4.2		4.1	0.6
Average		2.7	2.4	2.6	2.7	2.8	2.5	2.4	2.4	2.4	2.5	2.6	2.4	1.3		
Std. dev.		2	1	2	2	2	2	2	2	2	2	2	2	2		

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Surface Water Chemistry - Iron (mg/l)

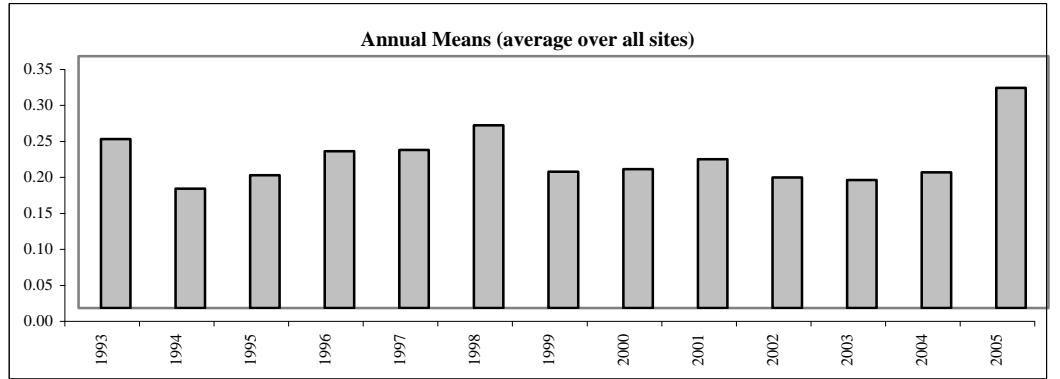
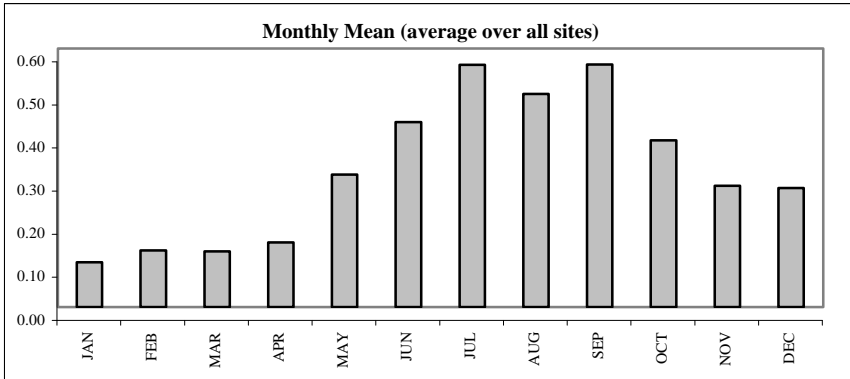
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01		0.00	0.01	0.00								
GLE	01	0.15	0.14	0.14	0.16	0.28	0.26	0.24	0.29	0.33	0.31	0.19	0.12
MOO	01	0.47	0.58	0.48	0.63	0.79	1.12	1.41	1.17	1.33	1.04	0.81	0.76
MOO	02	0.20	0.30	0.37	0.43	0.54	0.98	1.57	1.24	1.35	0.70	0.43	0.55
MOO	03	0.21	0.29	0.31	0.33	0.37	0.31	0.26	0.43	0.63	0.63	0.41	0.39
MOO	04												
MOO	05	0.09	0.15	0.18	0.19	0.27	0.39	0.61	0.38	0.54	0.30	0.21	0.23
MOO	06	0.19	0.34	0.25	0.33	0.51	0.77	0.85	0.88	0.85	0.47	0.44	0.42
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.01	0.01	0.01	0.01	0.01	0.02	0.11	0.05	0.04	0.03	0.02	0.02
SOU	01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
SOU	02	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00
WYT	01	0.01	0.00	0.01	0.01								
WYT	02	0.00	0.01	0.01	0.00								
WYT	03	0.00	0.00	0.01	0.01								
WYT	04	0.02	0.01	0.01	0.02								
Average		0.10	0.13	0.13	0.15	0.31	0.43	0.56	0.49	0.56	0.39	0.28	0.28
Std. dev.		0	0	0	0	0	0	1	0	1	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.03	0.03	0.02	0.06	0.10	0.01	0.00		
GLE	01	0.23	0.17	0.16	0.17	0.22	0.17	0.16	0.21	0.13	0.14	0.15	0.21	0.22	0.18	0.03
MOO	01	0.61	0.51	0.63	0.66	0.69	0.78	0.82	0.90	0.90	0.69	0.68	0.82	0.88	0.74	0.12
MOO	02	0.53	0.53	0.70	0.80	0.77	0.51	0.65	0.55	0.61	0.59	0.81	0.57	0.72	0.64	0.11
MOO	03	0.35	0.24	0.31	0.35	0.43	0.49	0.44	0.44	0.41	0.35	0.24	0.39	0.38	0.37	0.08
MOO	04	0.44	0.36	0.41	0.47	0.66	0.67	0.64	0.67	0.63	0.49	0.33			0.53	0.13
MOO	05						0.17	0.24	0.22	0.25	0.27	0.24	0.25	0.29	0.24	0.04
MOO	06											0.46	0.53		0.49	0.05
NOR	01			0.03		0.08	0.09	0.09	0.09						0.08	0.03
NOR	02					0.25	0.16	0.19	0.23						0.21	0.04
NOR	03					0.07	0.06	0.04	0.03						0.05	0.02
ROT	01		0.05	0.04	0.05		0.04	0.05	0.02	0.03	0.02	0.02	0.02		0.03	0.01
SNO	01					0.03	1.09	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.15	0.35
SOU	01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.00
SOU	02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
WYT	01	0.06	0.04	0.03	0.03	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.01		0.02	0.02
WYT	02	0.04	0.03	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01		0.01	0.01
WYT	03	0.05	0.05	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01		0.01	0.02
WYT	04		0.00	0.04	0.03	0.06	0.03	0.02	0.03	0.04	0.05	0.04	0.04		0.03	0.02
Average		0.23	0.17	0.18	0.22	0.22	0.25	0.19	0.19	0.21	0.18	0.18	0.19	0.31		
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0	0		

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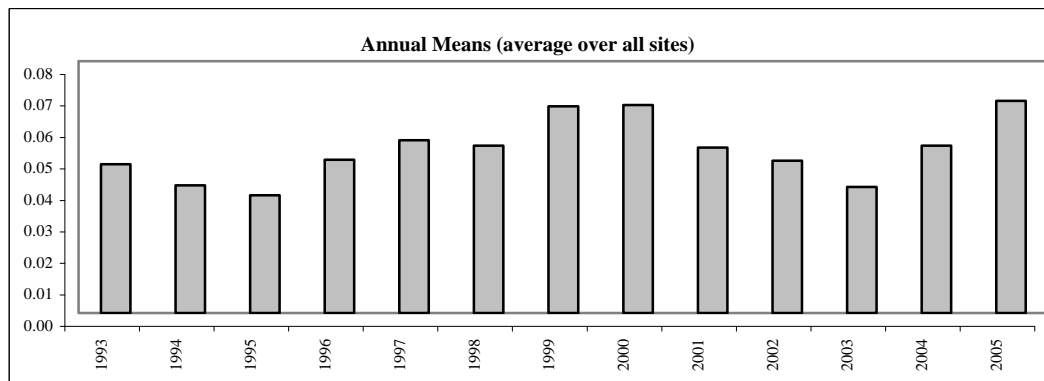
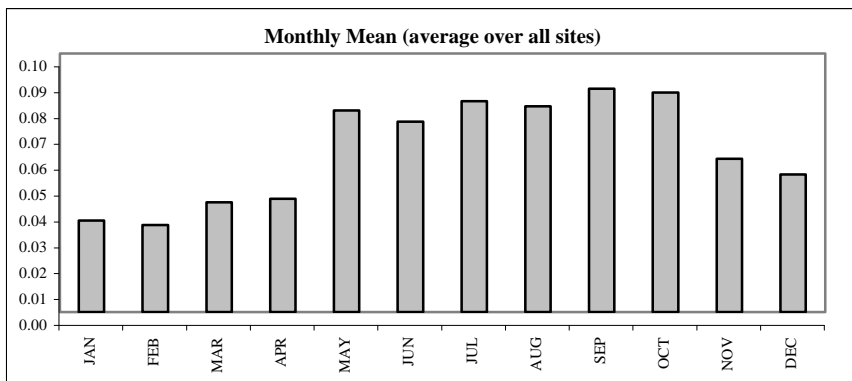
Surface Water Chemistry - Aluminium (mg/l)

2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.05	0.05	0.07	0.04	0.07	0.07	0.02	0.05	0.04	0.11	0.06	0.05
GLE	01	0.09	0.04	0.10	0.11	0.22	0.12	0.06	0.08	0.08	0.18	0.11	0.06
MOO	01	0.07	0.09	0.07	0.12	0.11	0.10	0.09	0.12	0.14	0.14	0.09	0.10
MOO	02	0.04	0.05	0.07	0.12	0.09	0.14	0.20	0.16	0.18	0.10	0.06	0.07
MOO	03	0.03	0.04	0.05	0.05	0.05	0.03	0.04	0.05	0.06	0.08	0.05	0.04
MOO	04												
MOO	05	0.02	0.04	0.04	0.05	0.06	0.09	0.14	0.10	0.14	0.07	0.05	0.05
MOO	06	0.04	0.06	0.04	0.05	0.07	0.11	0.11	0.15	0.16	0.09	0.07	0.07
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.06	0.06	0.06	0.06	0.05	0.05	0.10	0.04	0.04	0.05	0.04	0.05
SOU	01	0.02	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.03	0.02	0.02	0.02
SOU	02	0.03	0.02	0.06	0.01	0.03	0.02	0.02	0.02	0.01	0.02	0.03	0.03
WYT	01	0.01	0.00	0.00	0.00								
WYT	02	0.01	0.00	0.00	0.00								
WYT	03	0.01	0.00	0.00	0.00								
WYT	04	0.01	0.00	0.00	0.00								
Average		0.04	0.03	0.04	0.04	0.08	0.07	0.08	0.08	0.09	0.08	0.06	0.05
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.10	0.10	0.08	0.08	0.04	0.08	0.06		
GLE	01	0.11	0.06	0.08	0.09	0.13	0.13	0.10	0.17	0.09	0.12	0.06	0.13	0.11	0.11	0.03
MOO	01	0.09	0.10	0.10	0.12	0.12	0.13	0.11	0.10	0.10	0.12	0.10	0.14	0.10	0.11	0.01
MOO	02	0.07	0.11	0.08	0.12	0.10	0.07	0.08	0.07	0.08	0.09	0.12	0.09	0.11	0.09	0.02
MOO	03	0.03	0.04	0.04	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.04	0.06	0.05	0.05	0.01
MOO	04	0.09	0.12	0.09	0.11	0.11	0.12	0.10	0.09	0.09	0.10	0.08			0.10	0.01
MOO	05						0.02	0.04	0.05	0.04	0.05	0.06	0.07	0.07	0.05	0.01
MOO	06											0.08	0.09		0.08	0.00
NOR	01			0.00												
NOR	02															
NOR	03															
ROT	01		0.01	0.03	0.02		0.04	0.04	0.01	0.01	0.01	0.01	0.02		0.02	0.01
SNO	01					0.05	0.08	0.05	0.05	0.04	0.06	0.05	0.05	0.05	0.05	0.01
SOU	01	0.03	0.01	0.03	0.02	0.03	0.02	0.03	0.05	0.03	0.02	0.01	0.02	0.02	0.03	0.01
SOU	02	0.05	0.02	0.03	0.03	0.03	0.04	0.03	0.07	0.05	0.04	0.02	0.03	0.02	0.04	0.01
WYT	01	0.00	0.01	0.00	0.00	0.00	0.01	0.06	0.05	0.03	0.00	0.00	0.00		0.01	0.02
WYT	02	0.00	0.01	0.00	0.00	0.00	0.01	0.06	0.05	0.04	0.00	0.00	0.00		0.01	0.02
WYT	03	0.00	0.01	0.00	0.00	0.00	0.01	0.07	0.05	0.03	0.00	0.00	0.00		0.01	0.02
WYT	04		0.00	0.00	0.00	0.03	0.01	0.05	0.04	0.03	0.00	0.00	0.00		0.01	0.02
Average		0.05	0.04	0.04	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.04	0.05	0.07		
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0	0		



Surface Water Chemistry - PO4-P (mg/l)

2005 monthly averages

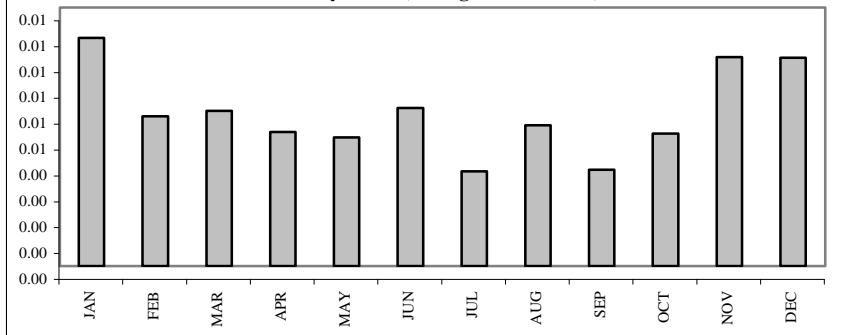
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.03	0.00
GLE	01	0.02	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00
MOO	01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	04												
MOO	05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
SOU	01	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.03
SOU	02	0.04	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.00	0.01	0.02	0.03
WYT	01	0.00	0.00	0.03	0.00								
WYT	02	0.00	0.00	0.01	0.00								
WYT	03	0.00	0.00	0.00	0.00								
WYT	04	0.00	0.00	0.00	0.00								
Average		0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0

Annual Means

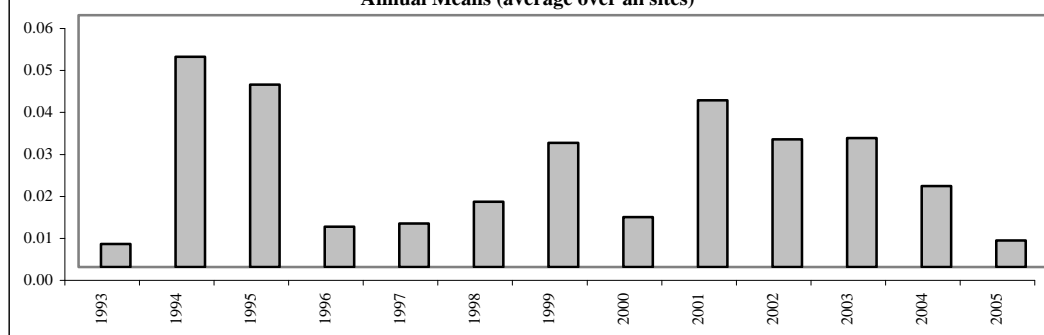
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.01	0.00	0.01	0.01	0.02	0.01	0.01		
GLE	01	0.01	0.01	0.01	0.00	0.01	0.03	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01
MOO	01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	05						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOO	06											0.00	0.00	0.00	0.00	0.00
NOR	01	0.00	0.00	0.03	0.02	0.04	0.03	0.04	0.04	0.05	0.03	0.05		0.03	0.02	
NOR	02	0.00	0.00	0.01	0.00	0.01	0.02	0.02	0.01	0.04	0.02	0.05		0.02	0.02	
NOR	03	0.00	0.00	0.00	0.00	0.01	0.03	0.01	0.01	0.00	0.01	0.04		0.01	0.01	
ROT	01		0.69	0.55	0.08		0.06	0.10	0.08	0.54	0.39	0.32	0.05	0.29	0.24	
SNO	01					0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.01	0.01
SOU	01	0.01	0.01	0.01	0.01	0.01	0.02	0.05	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.01
SOU	02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01
WYT	01	0.03	0.03	0.01	0.00	0.02	0.01	0.29	0.02	0.02	0.03	0.05	0.02	0.04	0.08	
WYT	02	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	
WYT	03	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	
WYT	04		0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.01	
Average		0.01	0.05	0.04	0.01	0.01	0.02	0.03	0.01	0.04	0.03	0.03	0.02	0.01		
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0	0		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - NO3-N (mg/l)

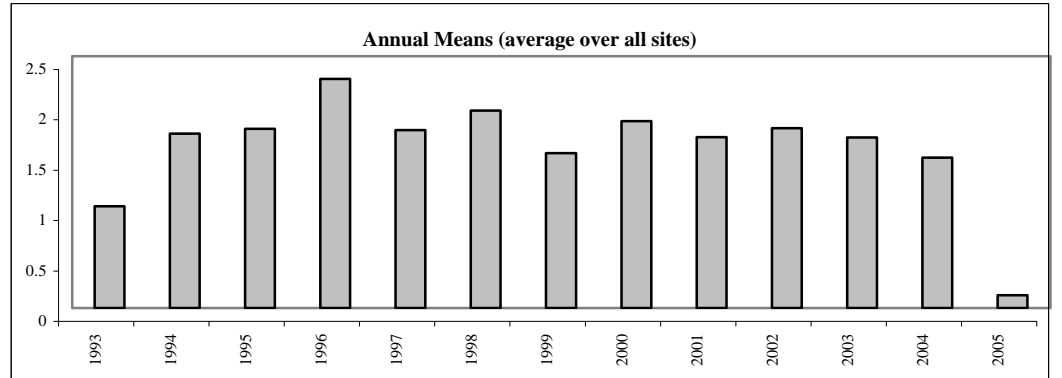
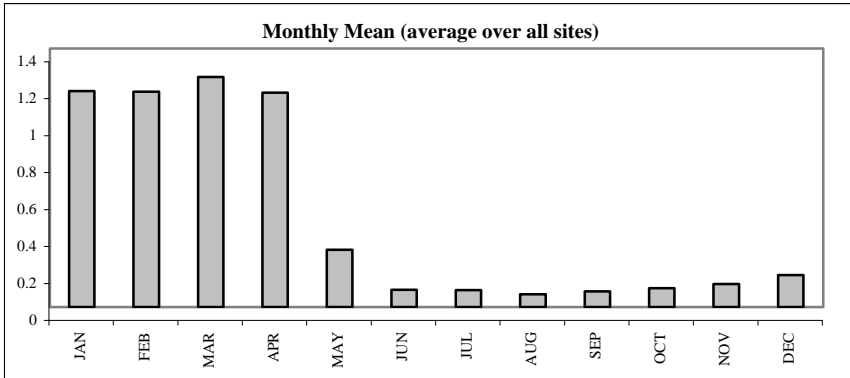
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.0	0.0	0.0	0.0	2.3	0.0	0.1	0.1	0.1	0.1	0.1	0.1
GLE	01	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
MOO	01	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
MOO	02	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1
MOO	03	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.0	0.0	0.1	0.1	0.1
MOO	04												
MOO	05	0.0	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.1	0.1	0.1	0.2
MOO	06	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.2
SOU	01	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4
SOU	02	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.3
WYT	01	4.4	4.5	4.1	3.6								
WYT	02	10.1	10.1	10.9	10.0								
WYT	03	0.6	0.4	1.0	1.1								
WYT	04	0.1	0.0	0.1	0.5								
Average		1.2	1.2	1.2	1.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Std. dev.		3	3	3	3	1	0	0	0	0	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.0	0.0	0.0	0.0	0.0	0.0	0.2		
GLE	01	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.0
MOO	01	0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
MOO	02	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
MOO	03	0.1	0.1	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MOO	04	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1			0.1	0.0
MOO	05						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
MOO	06												0.0	0.0	0.0	0.0
NOR	01	0.8	0.7	0.7	0.9	0.8	0.8	1.0	0.8	0.8	0.8	0.9	0.7		0.8	0.1
NOR	02	0.0	0.0	0.2	0.4	0.3	0.4	0.3	0.1	0.3	0.4	0.7	0.8		0.3	0.3
NOR	03	0.5	0.5	0.6	0.9	1.2	0.9	0.8	0.8	0.4	1.1	0.7	0.4		0.7	0.3
ROT	01		10.8	10.6	10.4		9.2	8.4	7.7	8.3	8.1	7.7	6.8		8.8	1.4
SNO	01					0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
SOU	01	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0
SOU	02	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0
WYT	01	6.5	9.2	8.2	11.9	17.8	13.8	9.9	14.0	9.7	8.8	6.9	6.3		10.2	3.5
WYT	02	3.0	2.9	4.0	7.3	3.4	5.7	5.5	8.2	9.4	11.4	11.6	10.3		6.9	3.3
WYT	03	1.6	1.0	1.0	0.7	1.7	1.1	0.7	0.7	0.5	0.5	0.7	0.7		0.9	0.4
WYT	04		0.2	0.6	0.5	0.3	0.4	0.2	0.3	0.2	0.2	0.2	0.1		0.3	0.2
Average		1.0	1.7	1.8	2.3	1.8	2.0	1.5	1.9	1.7	1.8	1.7	1.5	0.1		
Std. dev.		2	3	3	4	5	4	3	4	3	4	3	3	0		

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Surface Water Chemistry - NH4-N (mg/l)

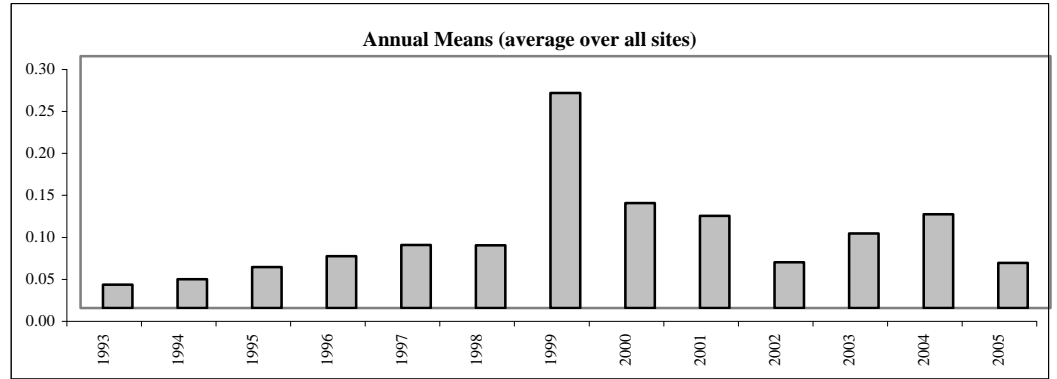
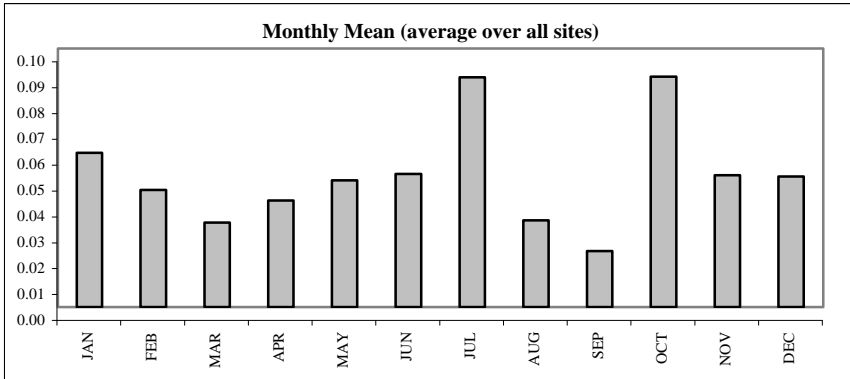
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00
GLE	01	0.01	0.01	0.03	0.01	0.03	0.02	0.01	0.02	0.02	0.00	0.00	0.01
MOO	01	0.18	0.00	0.00	0.01	0.00	0.01	0.04	0.02	0.02	0.16	0.07	0.01
MOO	02	0.19	0.18	0.09	0.12	0.08	0.07	0.07	0.07	0.07	0.22	0.16	0.17
MOO	03	0.04	0.05	0.00	0.00	0.01	0.02	0.00	0.01	0.03	0.13	0.03	0.01
MOO	04												
MOO	05	0.22	0.21	0.19	0.16	0.32	0.26	0.46	0.10	0.04	0.18	0.14	0.19
MOO	06	0.07	0.08	0.01	0.00	0.02	0.04	0.04	0.05	0.02	0.16	0.07	0.04
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.00	0.02	0.03	0.03	0.00	0.05	0.25	0.03	0.02	0.02	0.00	0.01
SOU	01	0.01	0.01	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.02	0.02	0.04
SOU	02	0.01	0.01	0.03	0.03	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.04
WYT	01	0.01	0.05	0.00	0.01								
WYT	02	0.02	0.00	0.00	0.02								
WYT	03	0.02	0.01	0.00	0.00								
WYT	04	0.07	0.01	0.04	0.16								
Average		0.06	0.05	0.03	0.04	0.05	0.05	0.09	0.03	0.02	0.09	0.05	0.05
Std. dev.		0	0	0	0	0	0	0	0	0	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.02	0.04	0.02	0.01	0.02	0.01	0.00		
GLE	01	0.02	0.02	0.02	0.01	0.03	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01
MOO	01	0.00	0.01	0.03	0.05	0.03	0.03	0.03	0.02	0.04	0.04	0.05	0.05	0.04	0.03	0.01
MOO	02	0.02	0.04	0.04	0.10	0.08	0.07	0.07	0.05	0.05	0.06	0.07	0.09	0.12	0.07	0.03
MOO	03	0.00	0.01	0.02	0.03	0.02	0.02	0.02	0.01	0.03	0.04	0.05	0.03	0.03	0.02	0.01
MOO	04	0.00	0.01	0.03	0.05	0.03	0.02	0.02	0.02	0.03	0.04	0.05			0.03	0.01
MOO	05						0.00	0.03	0.02	0.03	0.04	0.05	0.05	0.20	0.05	0.06
MOO	06												0.06	0.05	0.05	0.01
NOR	01	0.00	0.04	0.05	0.18	0.16	0.21		0.23	1.18	0.16	0.47	0.03		0.25	0.34
NOR	02	0.02	0.03	0.01	0.17	0.22	0.20		0.31				0.12		0.13	0.11
NOR	03	0.06	0.13	0.05	0.17	0.34	0.31	2.79	0.66			0.23	0.23		0.50	0.82
ROT	01		0.03	0.11	0.03		0.07	0.17	0.69	0.15	0.14	0.16	0.37		0.19	0.20
SNO	01					0.03	0.02	0.02	0.02	0.02	0.07	0.04	0.03	0.04	0.03	0.02
SOU	01	0.04	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.01	0.00	0.01	0.02	0.02	0.01
SOU	02	0.05	0.03	0.02	0.02	0.03	0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.01
WYT	01	0.06	0.03	0.03	0.03	0.03	0.10	0.80	0.05	0.05	0.07	0.08	0.05		0.12	0.22
WYT	02	0.01	0.01	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.04	0.04	0.04		0.03	0.01
WYT	03	0.09	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.03	0.03	0.04	0.03		0.03	0.02
WYT	04		0.08	0.27	0.03	0.05	0.07	0.02	0.04	0.06	0.11	0.14	0.78		0.15	0.22
Average		0.03	0.03	0.05	0.06	0.08	0.07	0.26	0.13	0.11	0.05	0.09	0.11	0.05		
Std. dev.		0	0	0	0	0	0	1	0	0	0	0	0	0		

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Surface Water Chemistry - Chloride (mg/l)

2005 monthly averages

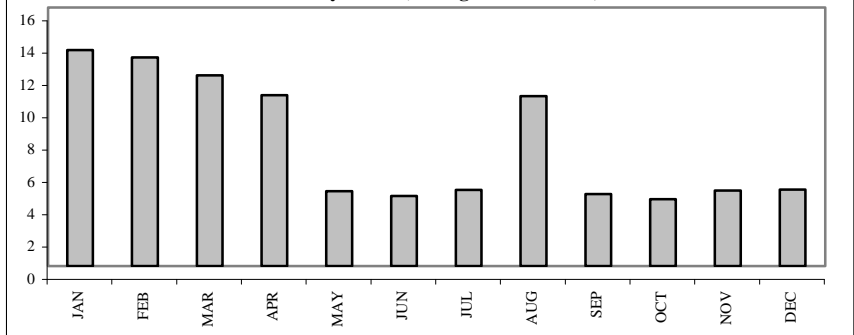
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	7.9	3.6	4.6	3.8	4.1	3.5	4.1	4.3	3.6	3.3	4.0	4.3
GLE	01	7.5	7.0	7.4	7.0	5.8	5.1	6.4	7.3	7.1	6.7	7.5	7.0
MOO	01	8.3	6.8	4.2	3.2	3.8	2.6	3.6	3.3	3.4	3.0	3.7	3.4
MOO	02	8.9	7.1	3.5	2.6	3.7	3.8	3.7	3.1	3.3	2.9	3.3	3.1
MOO	03	7.4	7.3	4.2	3.3	3.7	3.3	3.6	3.2	3.4	3.1	3.6	3.7
MOO	04												
MOO	05	9.4	7.8	3.7	3.0	3.6	3.5	2.9	2.3	2.5	2.4	2.8	2.8
MOO	06	8.4	6.8	4.2	3.2	3.9	4.0	4.1	3.4	3.4	2.5	3.2	3.1
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	7.4	6.7	6.9	5.6	4.7	4.3	4.7	4.0	3.8	3.8	4.8	5.8
SOU	01	7.0	7.1	7.2	6.5	6.5	6.6	6.9	35.3	6.9	7.0	7.0	6.9
SOU	02	7.1	7.1	7.7	6.5	6.7	6.6	7.1	39.0	7.2	6.7	6.8	7.0
WYT	01	18.3	18.4	17.4	17.5								
WYT	02	18.4	17.3	18.6	17.9								
WYT	03	28.5	33.7	32.2	29.8								
WYT	04	42.8	44.1	43.5	38.3								
Average		13.4	12.9	11.8	10.6	4.6	4.3	4.7	10.5	4.4	4.1	4.7	4.7
Std. dev.		10	11	12	11	1	1	1	13	2	2	2	2

Annual Means

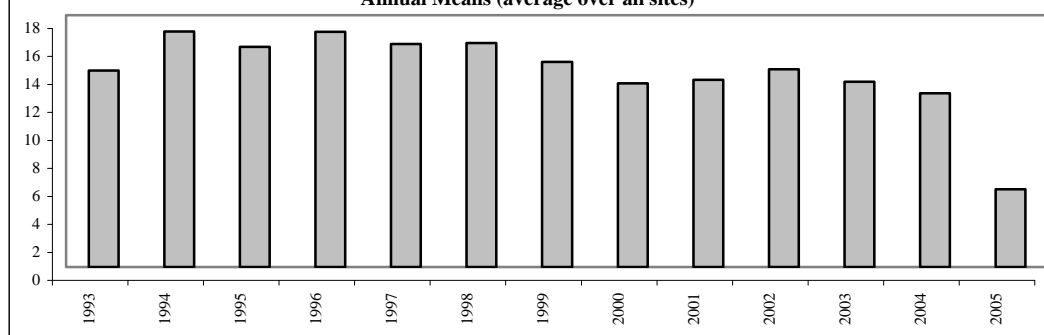
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							3.2	3.9	3.1	3.5	3.6	4.1	4.2		
GLE	01	7.4	8.0	7.7	8.4	8.6	8.4	8.1	7.3	7.3	6.8	7.6	7.1	6.8	7.7	0.6
MOO	01	5.6	4.3	4.1	4.7	4.5	4.2	4.3	3.4	3.1	3.6	4.2	3.4	4.1	4.1	0.7
MOO	02	4.7	4.4	4.1	4.7	4.2	4.1	4.3	3.3	3.0	3.6	3.8	3.4	4.1	4.0	0.5
MOO	03	4.9	4.3	4.2	4.6	4.2	4.2	4.5	3.5	3.3	3.5	4.1	3.4	4.2	4.1	0.5
MOO	04	5.2	4.3	4.1	5.1	4.1	4.1	4.3	3.4	3.2	3.6	4.4			4.2	0.6
MOO	05						6.0	3.9	2.8	2.7	3.4	3.7	3.3	3.9	3.7	1.0
MOO	06											3.5	4.2		3.8	0.5
NOR	01	16.1	14.1	13.4	14.1	15.3	14.6	17.4	14.9	15.4	14.1	15.1	13.7		14.9	1.1
NOR	02	14.2	14.5	12.2	12.5	14.9	20.3	23.2	17.8	20.6	23.8	13.3	15.3		16.9	4.1
NOR	03	19.8	14.6	11.3	11.0	13.4	20.1	22.2	19.3	15.3	18.9	16.6	13.6		16.3	3.7
ROT	01		41.3	44.7	45.4		20.8	28.1	26.9	45.4	39.0	34.6	23.1		34.9	9.6
SNO	01					4.4	5.4	5.2	4.3	4.2	6.2	5.1	4.7	5.2	4.9	0.6
SOU	01	8.8	8.3	8.1	8.2	9.3	9.2	8.1	8.3	7.5	7.3	7.9	7.1	9.2	8.3	0.7
SOU	02	8.2	8.0	7.6	7.7	8.7	8.6	7.8	7.9	7.4	7.3	7.8	7.0	9.6	8.0	0.7
WYT	01	31.0	27.3	23.9	37.2	46.3	44.8	30.9	25.2	21.3	21.9	23.7	22.1		29.6	8.8
WYT	02	25.3	24.8	24.8	21.7	19.4	24.3	23.3	23.9	22.9	24.1	19.4	19.4		22.8	2.2
WYT	03	31.4	27.5	26.7	30.9	42.1	34.5	29.1	26.4	24.5	28.2	26.9	30.3		29.9	4.7
WYT	04		46.6	39.3	36.0	39.8	38.7	35.9	33.8	30.7	35.5	36.3	38.9		37.4	4.1
Average		14.0	16.8	15.7	16.8	15.9	16.0	14.7	13.1	13.4	14.1	13.2	12.4	5.6		
Std. dev.		10	14	13	14	15	13	11	10	12	12	11	11	2		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - SO4-S (mg/l)

2005 monthly averages

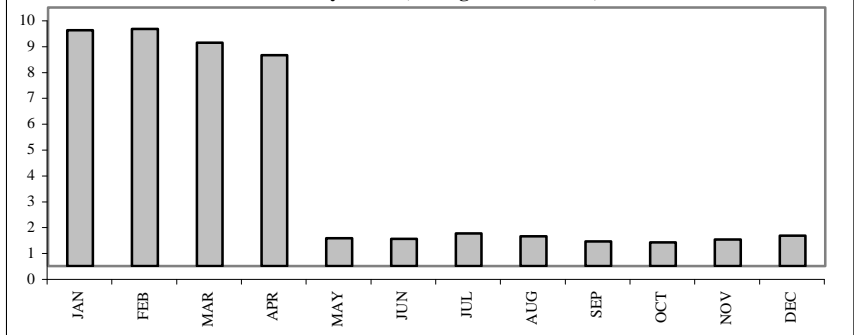
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	0.6	0.7	0.7	0.7	0.7	0.6	0.7	0.8	0.7	0.6	0.7	0.7
GLE	01	1.8	1.8	1.7	1.6	1.4	1.2	1.4	1.6	1.6	1.6	1.8	1.9
MOO	01	0.9	1.1	0.8	0.7	1.0	1.0	2.0	1.3	0.8	0.7	0.7	0.8
MOO	02	0.6	0.6	0.5	0.4	0.5	0.3	0.3	0.6	0.2	0.3	0.4	0.7
MOO	03	1.1	1.1	1.0	1.0	1.3	1.5	2.7	1.6	1.3	0.9	1.1	1.1
MOO	04												
MOO	05	0.7	0.9	0.6	0.6	0.7	1.0	0.8	0.4	0.3	0.5	0.5	1.0
MOO	06	0.5	0.5	0.4	0.4	0.3	0.2	0.3	0.6	0.1	0.3	0.3	0.5
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.7	0.6	0.9	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.6	0.7
SOU	01	2.4	2.4	2.3	2.3	2.3	2.1	2.0	2.1	2.1	2.0	2.3	2.4
SOU	02	1.9	1.9	1.7	1.9	1.9	1.8	1.7	1.8	1.9	1.7	1.9	2.0
WYT	01	23.0	23.5	20.8	22.9								
WYT	02	20.2	19.3	20.4	19.9								
WYT	03	29.3	30.9	28.0	24.3								
WYT	04	44.0	43.1	41.2	36.8								
Average		9.1	9.2	8.6	8.2	1.1	1.1	1.3	1.2	1.0	0.9	1.0	1.2
Std. dev.		14	14	13	12	1	1	1	1	1	1	1	1

Annual Means

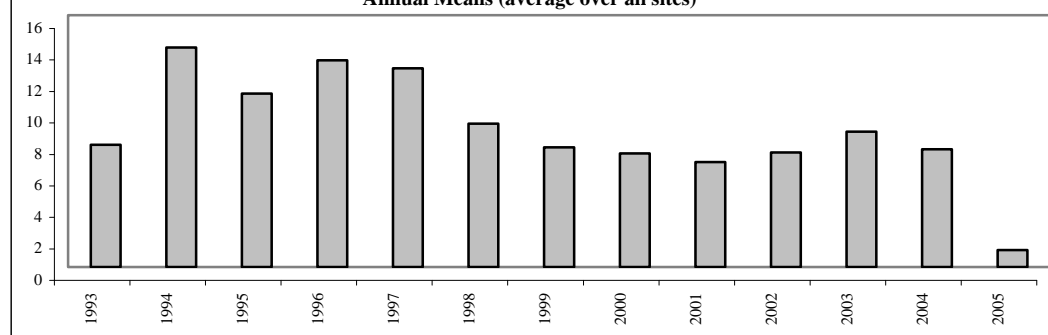
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							0.7	0.7	0.7	0.8	0.8	0.7	0.7		
GLE	01	1.8	2.1	2.1	2.0	1.8	1.8	1.8	1.6	1.8	1.7	2.0	1.7	1.6	1.8	0.2
MOO	01	1.6	1.5	1.8	1.8	1.2	0.9	1.0	0.8	1.0	1.2	2.4	0.9	1.0	1.3	0.5
MOO	02	0.9	0.8	1.3	1.1	0.5	0.6	0.5	0.4	0.4	0.4	0.8	0.4	0.4	0.7	0.3
MOO	03	1.6	1.5	1.9	1.8	1.4	1.1	1.2	1.1	1.2	1.3	2.2	1.1	1.3	1.5	0.3
MOO	04	1.8	1.6	2.0	1.9	1.4	1.0	1.1	0.9	1.1	1.4	3.0			1.6	0.6
MOO	05						1.3	0.6	0.4	0.5	0.5	1.0	0.4	0.7	0.7	0.3
MOO	06												0.3	0.4	0.4	0.0
NOR	01	4.8	4.3	4.4	4.5	4.6	3.7	4.3	3.9	4.1	3.8	4.1	3.9		4.2	0.3
NOR	02	1.3	2.9	3.1	2.6	2.2	1.5	1.8	0.9	1.6	1.4	1.8	2.3		1.9	0.7
NOR	03	2.3	2.8	2.7	2.5	2.1	1.8	2.2	1.7	1.7	1.7	1.6	2.4		2.1	0.4
ROT	01		12.8	13.1	11.0		8.7	9.6	9.7	12.3	11.3	10.7	9.4		10.9	1.5
SNO	01					0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0
SOU	01	2.2	2.4	2.5	2.4	2.4	2.5	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.3	0.1
SOU	02	1.9	2.0	2.1	2.0	2.0	2.0	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.9	0.1
WYT	01	27.2	30.5	33.3	33.6	38.2	29.1	26.1	24.7	22.5	22.9	48.9	22.8		30.0	7.7
WYT	02	25.4	27.3	28.1	26.6	23.5	24.6	23.9	24.4	22.1	23.2	21.1	20.6		24.2	2.4
WYT	03	28.1	26.6	25.5	33.0	40.5	32.7	28.8	25.8	22.3	24.8	24.2	28.8		28.4	5.0
WYT	04		89.9	41.6	70.1	66.9	40.7	28.6	28.5	21.9	29.8	25.5	34.3		43.4	22.2
Average		7.8	13.9	11.0	13.1	12.6	9.1	7.6	7.2	6.7	7.3	8.6	7.5	1.1		
Std. dev.		11	24	14	20	20	13	11	10	9	10	13	11	1		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - Dissolved organic carbon (mg/l)

2005 monthly averages

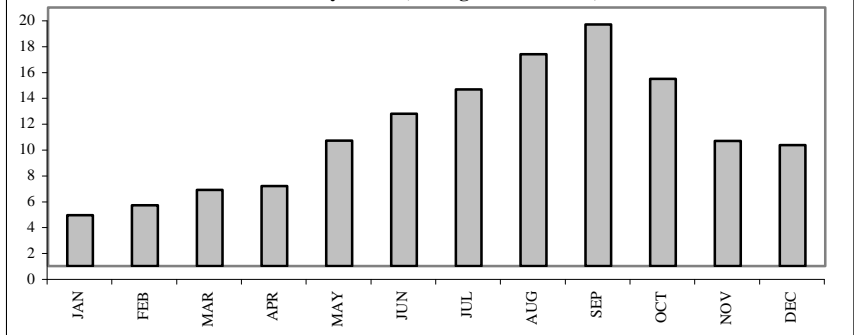
Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01	1.8	1.0	2.6	1.4	2.6	2.7	1.2	2.0	1.7	4.4	2.1	1.8
GLE	01	5.1	3.6	5.0	6.2	8.5	7.4	6.0	7.2	6.3	10.5	6.5	4.2
MOO	01	5.6	7.0	9.0	10.3	11.9	12.4	13.2	15.9	21.0	19.0	12.5	12.8
MOO	02	6.7	10.4	12.0	13.7	19.2	25.7	39.5	40.9	42.6	28.3	18.9	18.5
MOO	03	4.6	6.4	7.1	8.0	9.6	8.2	9.8	12.3	14.7	15.0	9.8	9.5
MOO	04												
MOO	05	6.6	11.0	13.9	14.3	20.7	29.2	34.6	44.2	50.1	28.6	18.4	18.9
MOO	06	8.8	13.5	13.6	15.6	19.8	25.3	25.7	36.2	43.4	31.6	21.7	21.4
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	1.1	1.2	1.1	1.4	2.4	2.9	2.4	2.2	2.6	2.5	1.9	1.9
SOU	01	1.2	0.9	1.9	1.4	1.2	2.2	2.1	1.5	2.2	2.4	2.2	2.1
SOU	02	1.2	1.0	2.8	1.4	1.2	1.7	2.3	1.4	2.2	2.6	2.6	2.4
WYT	01	2.8	2.2	3.8	3.4								
WYT	02	1.8	1.5	2.1	2.0								
WYT	03	2.8	2.2	3.6	2.8								
WYT	04	4.9	4.2	4.1	4.9								
Average		3.9	4.7	5.9	6.2	9.7	11.8	13.7	16.4	18.7	14.5	9.7	9.3
Std. dev.		2	4	4	5	8	10	14	16	19	11	7	8

Annual Means

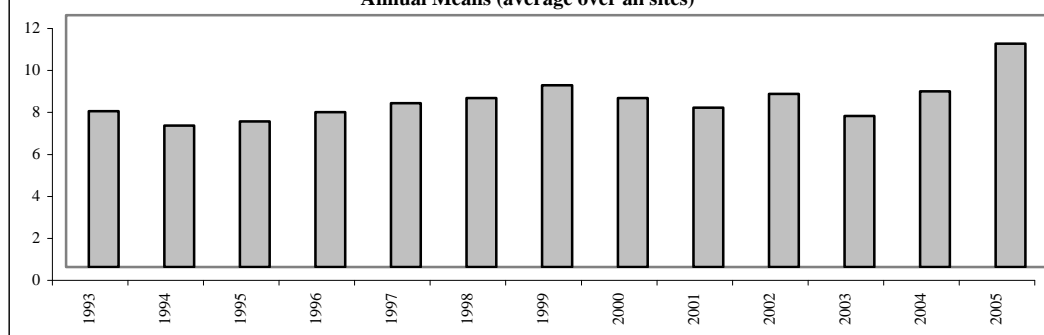
Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01							3.4	4.2	3.8	2.8	2.2	2.9	2.1		
GLE	01	7.5	5.0	5.7	5.2	6.4	6.7	5.8	7.4	5.9	8.3	4.8	7.5	6.4	6.4	1.1
MOO	01	11.8	10.7	10.3	10.7	11.6	14.6	12.4	13.0	12.3	11.6	11.0	13.3	12.6	12.0	1.2
MOO	02	16.8	15.3	16.3	18.5	21.8	17.8	18.6	17.3	18.4	16.9	19.5	18.8	23.0	18.4	2.1
MOO	03	9.3	8.4	7.8	8.1	10.2	11.4	9.6	9.9	9.4	9.1	8.2	10.3	9.6	9.3	1.0
MOO	04	11.8	11.0	10.3	10.7	13.8	14.6	12.4	12.9	11.7	11.6	10.4			11.9	1.4
MOO	05						12.0	18.2	17.4	18.6	16.6	18.2	19.2	24.2	18.0	3.4
MOO	06											20.2	23.0		21.6	2.0
NOR	01						5.2	3.4	2.8	2.2	3.5	3.8			3.5	1.0
NOR	02						12.8	11.3	12.1	5.4	12.4	10.2			10.7	2.8
NOR	03						5.2	27.0	4.7	3.6	6.4	7.1			9.0	8.9
ROT	01															
SNO	01					2.3	2.2	2.2	2.4	2.5	2.4	2.9	2.5	2.0	2.4	0.3
SOU	01	1.9	2.0	1.7	1.6	1.5	2.0	1.9	3.5	3.0	4.5	1.4	1.7	1.8	2.2	0.9
SOU	02	2.1	2.4	2.2	1.7	1.8	2.5	2.1	4.2	3.7	5.6	1.7	2.0	1.9	2.6	1.2
WYT	01	5.4	4.4	4.9	5.4	6.2	5.5	5.0	5.8	6.4	6.9	5.0	4.7		5.5	0.7
WYT	02	2.8	2.9	3.0	3.4	2.5	2.8	2.6	4.4	6.0	5.9	3.1	2.4		3.5	1.3
WYT	03	4.9	4.5	5.5	6.9	5.0	4.9	3.9	5.6	6.9	6.6	4.3	4.1		5.3	1.1
WYT	04		7.6	8.8	8.9	10.7	8.7	7.8	8.9	9.5	9.3	8.4	7.5		8.7	0.9
Average		7.4	6.7	6.9	7.4	7.8	8.1	8.7	8.1	7.6	8.2	7.2	8.4	10.6		
Std. dev.		5	4	4	5	6	5	7	5	5	4	5	7	10		

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Monthly Mean (average over all sites)



Annual Means (average over all sites)



Surface Water Chemistry - Total N (mg/l)

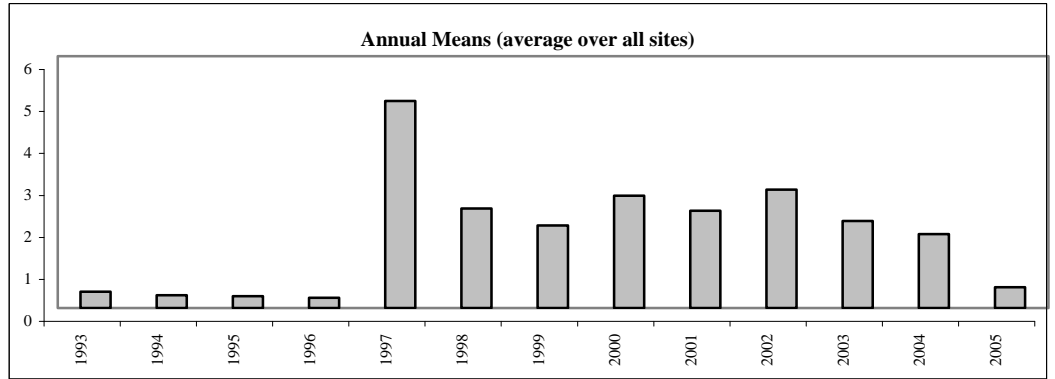
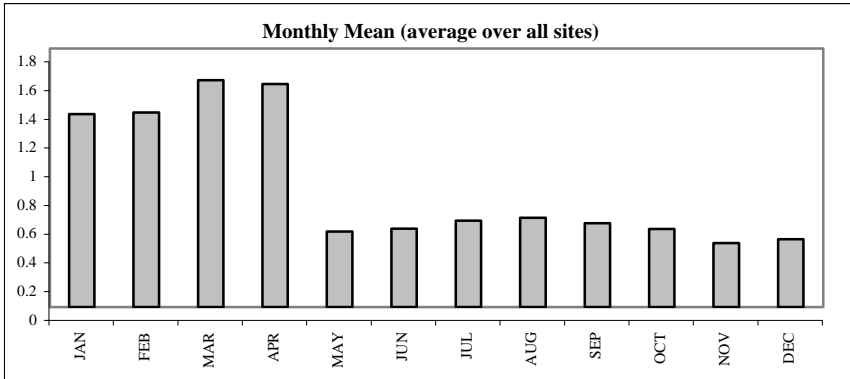
2005 monthly averages

Site	Stream	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CAI	01												
GLE	01	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.6	0.5	0.6
MOO	01	0.2	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.5	0.4	0.4
MOO	02	0.5	0.6	0.6	0.6	0.7	0.8	1.0	1.0	1.0	0.9	0.6	0.7
MOO	03	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4
MOO	04												
MOO	05	0.4	0.6	0.7	0.8	1.1	1.4	1.8	1.1	1.2	0.9	0.7	0.9
MOO	06	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	0.7	0.5	0.5
NOR	01												
NOR	02												
NOR	03												
ROT	01												
SNO	01	0.4	0.3	0.4	0.3	0.8	0.4	0.1	0.9	0.1	0.2	0.1	0.1
SOU	01	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.4	0.5	0.4
SOU	02	0.3	0.3	0.3	0.2	0.1	0.2	0.2	0.1	0.2	0.3	0.4	0.3
WYT	01	4.2	4.3	4.4	3.9								
WYT	02	8.9	8.8	10.5	10.1								
WYT	03	0.7	0.8	1.3	1.4								
WYT	04	0.5	0.3	0.5	0.9								
Average		1.3	1.4	1.6	1.6	0.5	0.5	0.6	0.6	0.6	0.5	0.4	0.5
Std. dev.		2	2	3	3	0	0	1	0	0	0	0	0

Annual Means

Site	Stream	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
CAI	01															
GLE	01			0.5			0.4		0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.1
MOO	01	0.3	0.2	0.2	0.2	0.4	0.4	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.1
MOO	02	0.4	0.2	0.4	0.4	0.6	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.8	0.5	0.1
MOO	03	0.3	0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.1
MOO	04	0.3	0.3	0.3	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4			0.4	0.1
MOO	05						0.3	0.4	0.4	0.4	0.4	0.4	0.5	1.0	0.5	0.2
MOO	06												0.5	0.6	0.5	0.1
NOR	01					5.3						1.1	0.7		2.4	2.6
NOR	02					16.6						1.0	0.6		6.1	9.1
NOR	03					11.0						1.1	0.4		4.2	6.0
ROT	01								8.6	6.5	8.3	8.2	7.5		7.8	0.9
SNO	01					0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0
SOU	01								0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.1
SOU	02								0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.1
WYT	01	0.6	0.7	0.2	0.3	17.8	14.8	10.1	15.2	10.6	12.2	7.3	5.6		7.9	6.4
WYT	02	0.3	0.2	0.2	0.1	3.6	6.1	5.5	8.7	10.4	13.5	11.3	9.4		5.8	4.9
WYT	03	0.5	0.3	0.2	0.2	1.8	1.4	0.8	1.0	0.8	1.2	1.0	1.0		0.9	0.5
WYT	04			0.4	0.3	0.8	1.0	0.6	0.6	0.8	1.1	0.9	1.4		0.8	0.3
Average		0.4	0.3	0.3	0.2	4.9	2.4	2.0	2.7	2.3	2.8	2.1	1.8	0.5		
Std. dev.		0	0	0	0	7	4	3	5	4	5	3	3	0		

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5. Surface Water Discharge

The impact of environmental change is likely to bring about a response in hydrological conditions at a site. The water balance at any location is controlled by climate, vegetation cover and soil properties. Any change in the external climate or in the internal structure of the soil/vegetation system will be reflected in changes in site hydrology. This may involve changes in evaporation, in soil moisture levels, and in the amount of runoff from the site. At sites where snow forms an important component of the precipitation, climate change may have particularly important effects. Monitoring of hydrological variables in ECN may therefore provide a sensitive indicator of environmental change.

Surface Water Discharge - Stage (Metres)

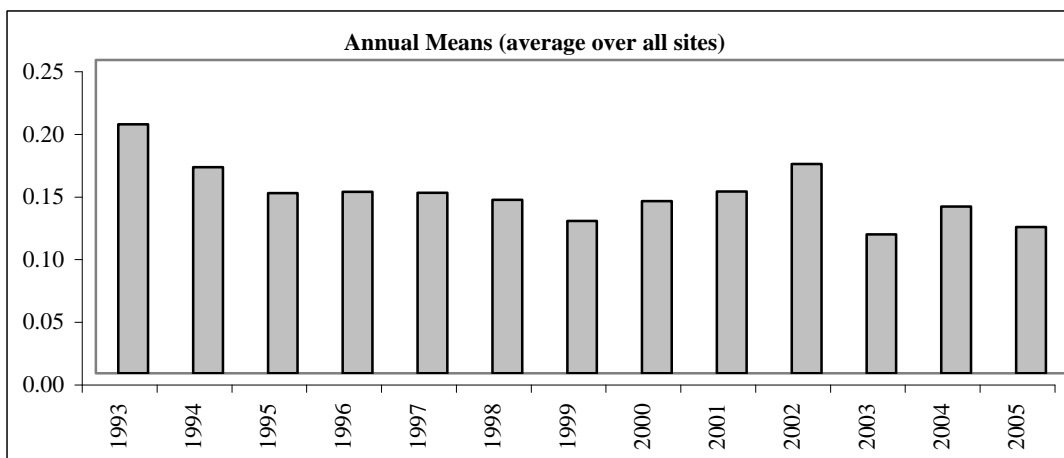
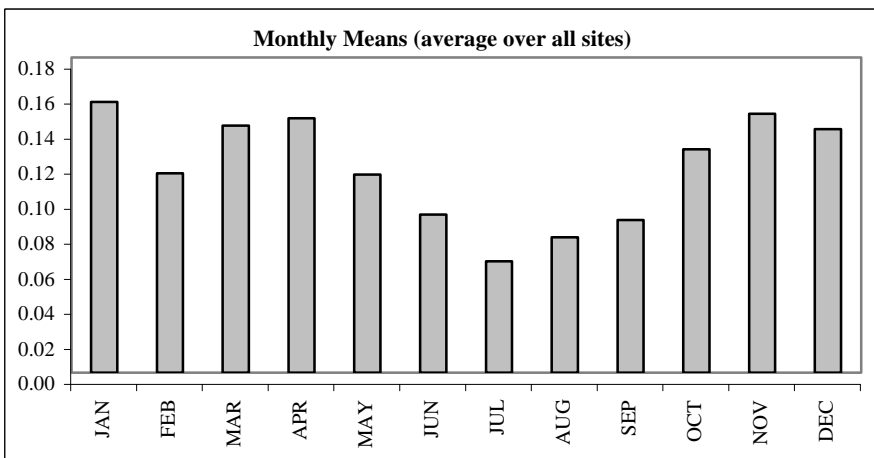
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI												
CAI												
DRA												
GLE	0.14	0.11	0.15	0.15	0.14	0.12	0.08	0.07	0.07	0.15	0.17	0.16
HIL												
MOO	0.29	0.19	0.23	0.21	0.17	0.15	0.09	0.14	0.16	0.23	0.24	0.23
NOR												
POR												
ROT												
SNO	0.21	0.16	0.15	0.18	0.15	0.13	0.10	0.12	0.15	0.19	0.21	0.16
SOU	0.10	0.08	0.14	0.15	0.09	0.06	0.05	0.05	0.04	0.07	0.12	0.12
WYT	0.04	0.02	0.03	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02
Average	0.15	0.11	0.14	0.15	0.11	0.09	0.06	0.08	0.09	0.13	0.15	0.14
Std. dev.	0.09	0.06	0.07	0.06	0.06	0.05	0.04	0.05	0.06	0.08	0.08	0.07

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI															
CAI															
DRA															
GLE		0.11	0.13	0.14	0.12	0.15	0.13	0.15	0.13	0.15	0.10	0.14	0.13	0.13	0.01
HIL															
MOO	0.20	0.22	0.18	0.17	0.19	0.23	0.20	0.23		0.21	0.19	0.22	0.20	0.20	0.02
NOR															
POR															
ROT															
SNO									0.16	0.16	0.15	0.16	0.16	0.16	0.01
SOU			0.12	0.12	0.13	0.16	0.13	0.15		0.14	0.09	0.11	0.09	0.12	0.02
WYT						0.03	0.03	0.03			0.03	0.03	0.01	0.03	0.01
Average	0.20	0.16	0.14	0.14	0.14	0.14	0.12	0.14	0.15	0.17	0.11	0.13	0.12		
Std. dev.		0.07	0.03	0.03	0.04	0.08	0.07	0.08	0.02	0.03	0.06	0.07	0.07		

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Surface Water Discharge - Mean Discharge (Cubic metres per second)

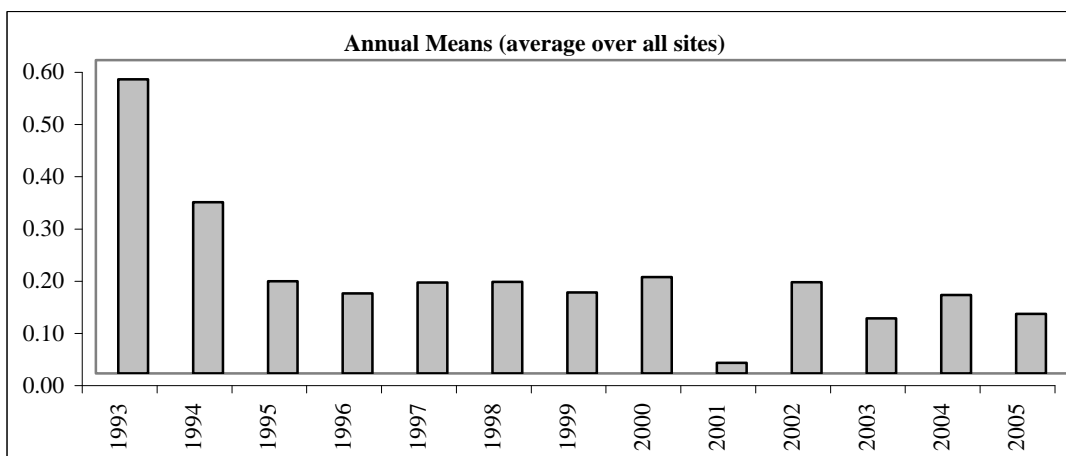
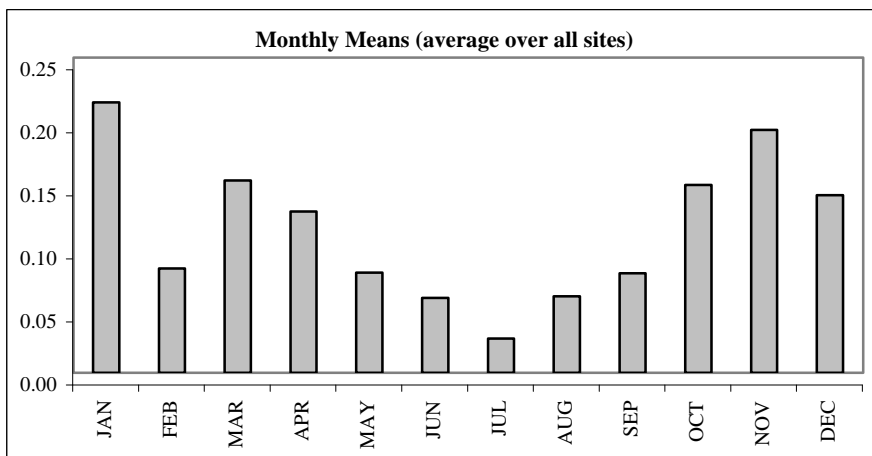
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI												
CAI												
DRA												
GLE	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.03	0.03	0.03
HIL												
MOO	1.00	0.37	0.70	0.57	0.36	0.27	0.12	0.29	0.37	0.68	0.87	0.64
NOR												
POR												
ROT												
SNO	0.04	0.02	0.02	0.03	0.02	0.01	0.01	0.01	0.02	0.03	0.05	0.02
SOU	0.01	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01
WYT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	0.21	0.08	0.15	0.13	0.08	0.06	0.03	0.06	0.08	0.15	0.19	0.14
Std. dev.	0.39	0.15	0.28	0.22	0.14	0.11	0.05	0.11	0.15	0.26	0.34	0.25

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI															
CAI															
DRA															
GLE		0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.01	0.02	0.02	0.02	0.00
HIL															
MOO	0.56	0.64	0.50	0.42	0.49	0.65	0.59	0.69		0.63	0.49	0.69	0.52	0.57	0.09
NOR															
POR															
ROT															
SNO									0.02	0.02	0.02	0.02	0.02	0.02	0.00
SOU			0.01	0.01	0.02	0.02	0.02	0.02		0.02	0.01	0.01	0.01	0.02	0.01
WYT						0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
Average	0.56	0.33	0.18	0.15	0.17	0.18	0.16	0.18	0.02	0.17	0.11	0.15	0.11		
Std. dev.		0.44	0.28	0.24	0.27	0.32	0.29	0.34	0.00	0.30	0.21	0.30	0.23		

£6



Surface Water Discharge - Maximum Discharge (Cubic metres per second)

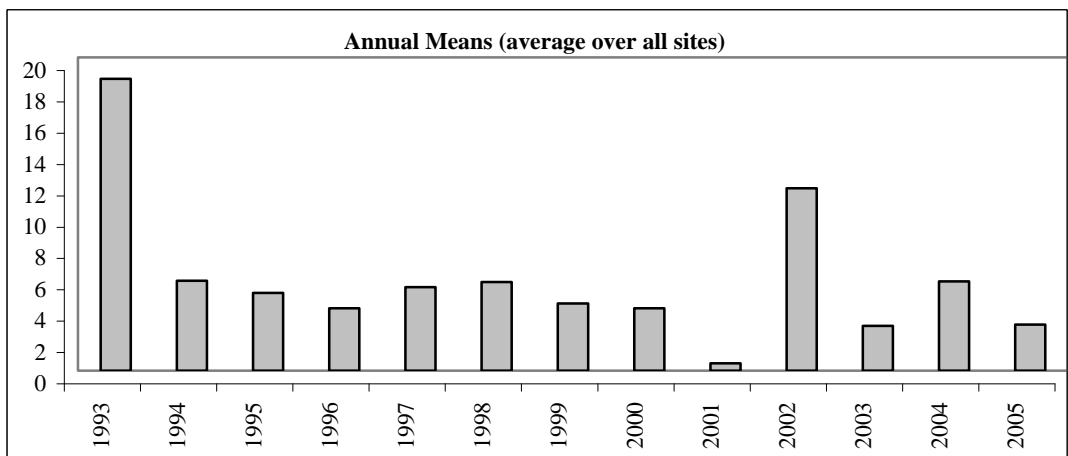
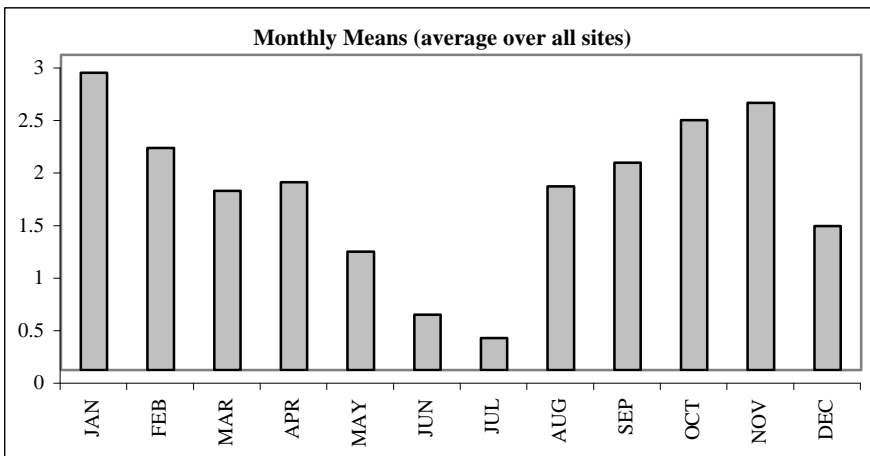
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI												
CAI												
DRA												
GLE	0.1	0.1	0.2	0.4	0.1	0.1	0.0	0.0	0.0	0.6	0.4	0.2
HIL												
MOO	13.3	10.0	8.0	8.0	5.4	2.5	1.4	8.5	9.7	10.7	11.9	6.4
NOR												
POR												
ROT												
SNO	0.7	0.5	0.2	0.3	0.1	0.1	0.0	0.2	0.2	0.5	0.4	0.1
SOU	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
WYT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	2.8	2.1	1.7	1.8	1.1	0.5	0.3	1.7	2.0	2.4	2.5	1.4
Std. dev.	5.2	3.9	3.1	3.1	2.1	1.0	0.6	3.4	3.9	4.2	4.7	2.5

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI															
CAI															
DRA															
GLE		0.6	0.3	0.4	0.5	0.9	0.8	0.5	0.5	1.0	0.7	0.5	0.6	0.6	0.2
HIL															
MOO	18.6	10.9	14.3	11.4	15.2	21.2	16.2	14.8		44.7	12.1	26.8	13.3	18.3	9.5
NOR															
POR															
ROT															
SNO									0.4	0.6	0.5	0.9	0.7	0.6	0.2
SOU			0.3	0.1	0.3	0.5	0.2	0.6		0.4	0.2	0.3	0.2	0.3	0.1
WYT						0.0	0.0	0.1			0.8	0.0	0.0	0.2	0.3
Average	18.6	5.7	5.0	4.0	5.3	5.7	4.3	4.0	0.5	11.6	2.9	5.7	2.9		
Std. dev.		7.3	8.0	6.4	8.5	10.4	7.9	7.2	0.1	22.0	5.2	11.8	5.8		

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Surface Water Discharge - Minimum Discharge (Cubic metres per second)

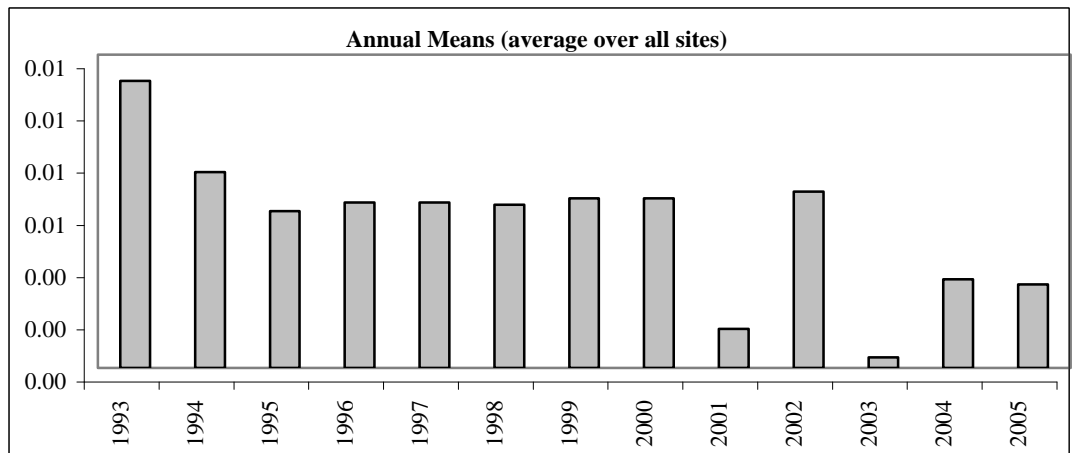
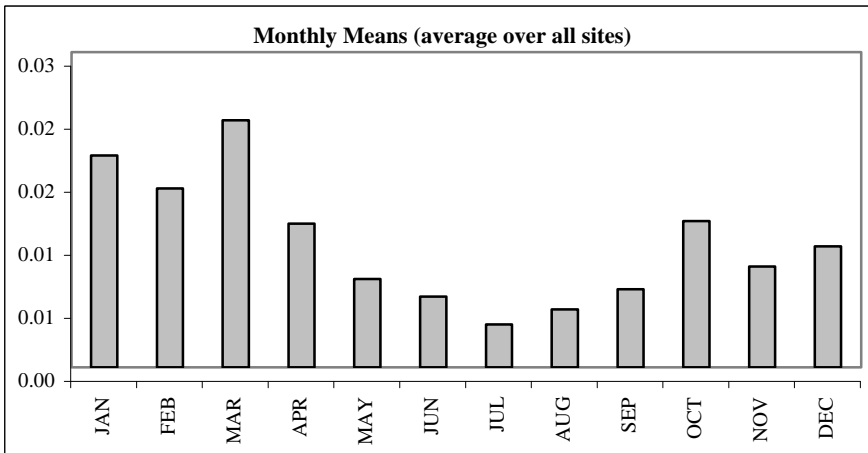
2005 monthly averages

Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ALI												
CAI												
DRA												
GLE	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01
HIL												
MOO	0.07	0.06	0.08	0.03	0.02	0.02	0.01	0.02	0.02	0.05	0.02	0.03
NOR												
POR												
ROT												
SNO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOU	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
WYT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	0.02	0.01	0.02	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01
Std. dev.	0.03	0.02	0.03	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.01

Annual Means

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI															
CAI															
DRA															
GLE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HIL															
MOO	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02		0.02	0.00	0.01	0.01	0.01	0.00
NOR															
POR															
ROT															
SNO									0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOU			0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.00	0.00	0.00	0.01	0.00
WYT						0.00	0.00	0.00			0.00	0.00	0.00	0.00	0.00
Average	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00		
Std. dev.		0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01		

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6. Invertebrates

The invertebrates are a large group in terms of species richness and pose some difficult problems in sampling for long-term monitoring; sampling is labour intensive and identification is difficult and therefore time-consuming for most groups. The general ECN policy has been to sample for indicator groups rather than for individual species and to concentrate on groups where monitoring schemes already exist or where there are already good ecological data which can provide a background to interpretation. Practical considerations concerning the availability of expertise and of other resources have also been taken into account so that as wide a range as possible of invertebrates are being sampled within the resources likely to be available within ECN.

6.1 Predatory Beetles (Carabidae)

In addition to monitoring phytophagous invertebrates such as moths, butterflies and spittle bugs, it was thought desirable for ECN to include a group of predatory species which might amplify changes in their prey or respond in some other, different way to environmental change. The ground beetles (Carabidae) are the obvious choice, being a group which is taxonomically tractable and for which an appreciable body of reliable biological information already exists. Analyses of existing data have shown that carabids can be sensitive indicators of changes in management and many species are known to be sensitive to temperature changes.

Carabid monitoring is undertaken at ECN sites using pitfall trapping, which has been used extensively and successfully for this group. Each site selects three transects, usually within different vegetation types. Ten pitfall traps are established in each transect with 10m spacing between traps. Traps are set out on the first Wednesday in May and emptied fortnightly for thirteen sampling periods. Traps are occasionally damaged resulting in less than ten samples per transect for some sampling occasions. In the following tabulations the number of samples obtained is referred to as trap occasions.

Carabidae counts by genus 2005

	ALI	CAI	DRA	GLE	HIL	MOO	NOR	POR	ROT	SNO	SOU	WYT	All Sites
Abax	661						1	1	116	1		320	1100
Acupalpus							1						1
Agonum							39		98			2	139
Amara	1						13	14	25	1		1	55
Asaphidion							9						9
Badister							12						12
Bembidion							240		39				279
Bradycellus													
Calathus		7					12	278	902	3		6	1208
Carabus	81	14				1	2	2	9	6		13	128
Chlaenius													
Cicindela													
Clivina						1							1
Cychrus	3	1					1		1	1			7
Cymindis													
Demetrias													
Dromius							1						1
Dyschirius													
Harpalus							7	6	26			23	62
Laemostenus								21				3	24
Leistus	1					2	10	10	81			6	110
Licinus								16					16
Loricera							8	3	5				16
Metabletus							83						83
Microlestes								3					3
Nebria	46						251	123	124			165	709
Notiophilus	2						44	93	14			4	157
Panagaeus								29					29
Patrobus		7				8							15
Pterostichus	5825	2				20	275	18	3039	1260		178	10617
Stomis							3					1	4
Synuchus										1			1
Trechus							54		33				87
Trichocellus													
All	6620	31				32	1066	617	4512	1273		722	14873

Carabidae counts by month 2005

Site	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	Total
ALI	6	56	436	1509	3060	1325	189	39	6620
CAI		1	8	14	6	2	1		32
DRA									
GLE									
HIL									
MOO		8	17	4	1	1	1		32
NOR		182	384	68	133	125	174		1066
POR	6	87	86	29	130	57	172	50	617
ROT		220	256	517	2946	249	324		4512
SNO	1	8	115	361	597	147	41	3	1273
SOU									
WYT	24	87	234	132	142	65	22	16	722
All site	37	649	1536	2634	7015	1971	924	108	14874

Number of trap occasions 2005

Site	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	Total
ALI	30	60	89	60	56	52	49	30	426
CAI		27	42	89	60	60	30		308
DRA									
GLE									
HIL									
MOO		80	120	80	40	40	40		400
NOR		30	90	60	60	60	60		360
POR	30	60	88	60	58	60	52	27	435
ROT		30	30	60	90	30	60		300
SNO	30	60	90	59	60	60	60	30	449
SOU									
WYT	30	60	90	60	60	60	30	30	420
All site	120	407	639	528	484	422	381	117	3098

Carabidae

Number of species observed

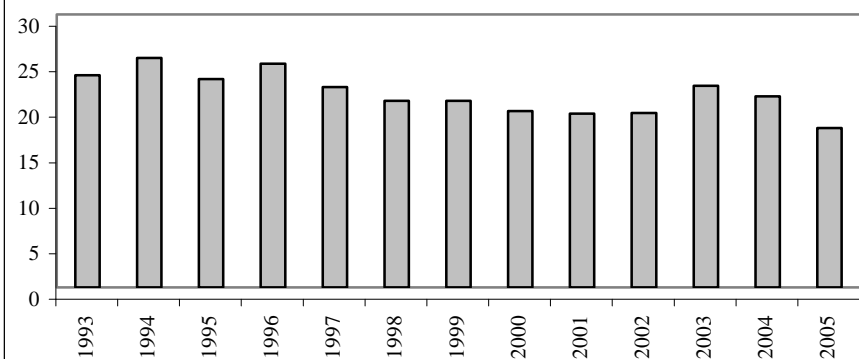
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		10	8	8	9	10	11	12	10	13	18	12	10	11	3
CAI							13	9	10	13	10	9	10	11	2
DRA	36	35	27	24	21	25	32	31	29	27	34	28		29	5
GLE		30	29	35	28	23	29	20	23	23	20	17		25	5
HIL	35	23	26	29	26	23	19	22	23	18	22	26		24	5
MOO	4	7	6	6	7	6	5	8	7	5	9	11	7	7	2
NOR	26	45	41	53	38	31	29	33	21	32	41	36	40	36	8
POR		16	13	14	13	19	18	21	22	18	23	21	22	18	4
ROT	29	35	35	27	33	29	27		22	27	21	25	22	28	5
SNO							17	17	11	13	14	12	9	13	3
SOU		26	27	29	28	20	26	21	29	27	27	29		26	3
WYT	10	25	17	21	17	19	20	19	22	14	27	26	20	20	5
Average	23	25	23	25	22	21	21	19	19	19	22	21	18	21	
Std. dev.	13	12	12	14	10	8	8	8	8	8	9	9	11		

Average number observed per trap

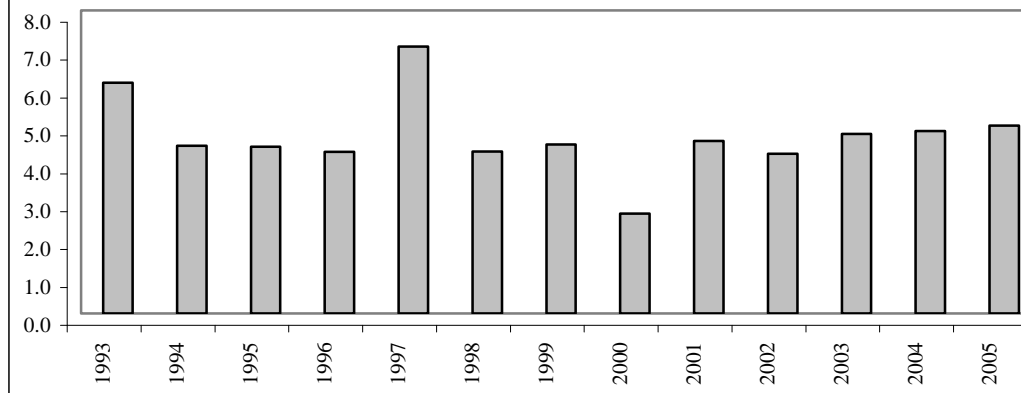
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		6.8	5.4	3.4	10.1	4.9	4.9	4.7	3.6	8.7	13.4	6.9	15.5	7.4	3.9
CAI							2.6	2.4	2.4	1.6	0.7	0.3	0.1	1.4	1.1
DRA	8.2	4.0	2.4	3.8	6.3	7.9	4.9	5.2	1.4	2.3	9.5	11.7		5.6	3.2
GLE		3.1	2.7	3.5	6.5	1.9	2.2	0.6	1.0	1.7	1.4	0.6		2.3	1.7
HIL	9.8	5.9	8.6	6.8	5.9	5.2	2.8	1.6	5.7	3.2	2.4	3.1		5.1	2.5
MOO	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.1
NOR	2.7	6.4	4.6	12.9	1.8	1.7	1.3	1.1	1.1	1.4	2.1	2.8	3.0	3.3	3.3
POR		0.6	0.8	1.1	0.3	1.0	1.9	0.9	3.8	3.3	3.0	1.5	1.4	1.6	1.1
ROT	13.5	10.3	12.8	7.4	32.4	15.4	21.3		21.7	19.6	15.4	24.5	15.0	17.4	6.8
SNO							6.7	9.3	7.0	4.7	3.8	3.2	2.8	5.4	2.4
SOU		5.5	4.2	2.1	4.7	1.6	1.1	0.8	1.4	1.1	1.0	1.2		2.2	1.7
WYT	2.4	1.6	2.5	1.6	2.4	3.1	4.0	2.3	5.5	2.8	4.0	2.0	1.7	2.8	1.1
Average	6.1	4.4	4.4	4.3	7.0	4.3	4.5	2.6	4.6	4.2	4.7	4.8	5.0	4.5	
Std. dev.	5.2	3.2	3.8	3.8	9.4	4.6	5.6	2.8	5.8	5.3	5.1	7.0	6.5		

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Average number of species per site



Annual average catch per trap



6.2 Spittle Bugs

Two species of spittle bug, *Philaenus spumarius* and *Neophilaenus lineatus* are both widespread and common throughout the United Kingdom, and because of the conspicuous feeding habits of the immature nymphs are relatively easy to sample. There is also a solid background of published ecological work on these species both at lowland and at upland sites. In addition to estimating an index of nymph density, the ECN protocol involves the sampling of colour morphs of *P. spumarius* adults because it is likely that the proportions of these may be environmentally determined and will therefore be good indicators of environmental change.

Spittle density is sampled using a 0.25m² quadrat. Since spittles for estimating the number of nymphs per spittle are collected in a separate sampling exercise it is possible, in years or for sites of low spittle density, for the estimated spittle density to be zero while still having a valid estimate of the number of nymphs per spittle.

Spittlebug Nymphs - *Neophilaenus lineatus*

Mean spittles per quadrat

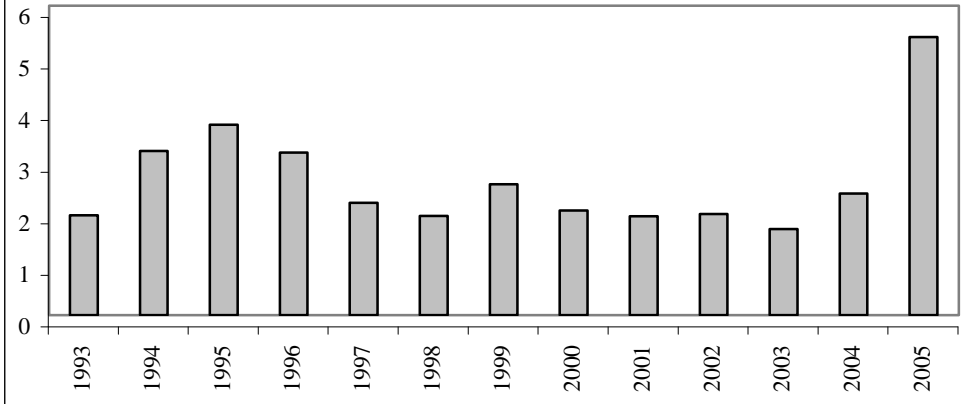
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		1.8	0.4			1.7	0.7	0.0	1.0	1.1	0.6	0.4	0.8	0.8	0.6
CAI															
DRA	0.7	2.9	3.4	14.2	3.3	3.4	3.8	0.2	1.0	1.5	0.0	0.0	0.0	2.6	3.8
GLE		0.4	0.8	0.2	0.9	0.2	0.0	0.6	0.3	0.4	0.7	0.4	0.6	0.4	0.3
HIL	3.4	8.7	6.8	5.6	5.4	2.5	1.7	7.4	7.4	2.6	2.2		1.9	4.6	2.5
MOO	0.3	0.3	0.4	0.8	0.8	0.6	0.1	0.0	0.0	0.6	1.2	3.0	4.3	0.9	1.3
NOR	7.1	2.5	0.5	0.3	0.4	0.6	0.5	0.1		0.7	0.8	0.0	0.1	1.1	2.0
POR		0.0	0.2	0.0	0.0	0.1		0.9	1.9	1.2	0.6	0.7	0.0	0.5	0.6
ROT	0.1	0.2	0.1	0.2	0.7	0.2	0.0	0.0	0.0	0.4	0.0	1.0	0.5	0.2	0.3
SNO						1.6	0.7	1.2	0.8		0.5	2.4		1.2	0.7
SOU		8.5	23.2	6.1	8.3	10.2	14.6	8.6	5.0	8.6	8.2	10.3	19.5	10.9	5.5
WYT	0.1	6.7	1.3	1.1	0.1	0.3	3.4	3.5		2.6	3.8	5.6	26.4	4.6	7.2
Average	1.9	3.2	3.7	3.2	2.2	1.9	2.5	2.0	1.9	2.0	1.7	2.4	5.4	2.5	
Std. dev.	2.8	3.5	7.2	4.8	2.9	2.9	4.4	3.1	2.6	2.5	2.4	3.3	9.5		

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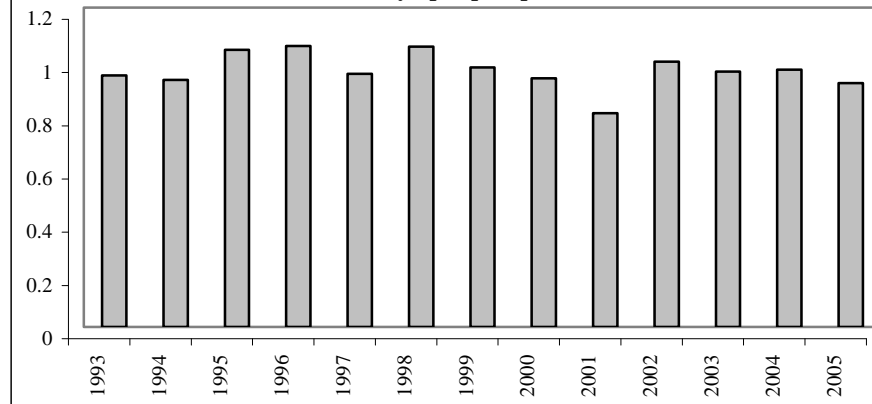
Mean nymphs per spittle

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.9	1.1			0.7	0.7		0.7	0.7	0.9			0.8	0.1
CAI															
DRA	1.1	0.9	0.9	1.1	1.0	1.0	1.0	1.1	1.0	1.0	0.0	1.0	0.9	0.9	0.3
GLE		1.1	1.0	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1			1.1	0.1
HIL	1.2	1.0	1.1	1.1	1.0	1.1	1.0	1.5	1.0	1.2	1.0		1.9	1.2	0.3
MOO	0.9	1.1	1.2	1.5	1.2	1.0	1.0	0.0	0.9	1.1	1.5	1.8	1.2	1.1	0.4
NOR	0.9	0.9	0.8	0.9	0.9	1.2	0.7	0.8		1.2	1.3	0.0	0.6	0.8	0.3
POR		0.4	0.5	0.9		1.0		0.9	1.0	0.9	1.0	1.0	0.0	0.8	0.3
ROT	1.0	0.7	1.0	0.5	0.5	1.0		0.7	0.0	0.8	0.9	0.8	0.8	0.7	0.3
SNO						1.3	1.2	0.9	0.5		0.8	1.1	0.8	0.9	0.3
SOU		1.5	1.4	1.5	1.1	1.2	1.1	1.3	1.1	1.1	1.1	1.1	1.2	1.2	0.2
WYT	0.6	0.8	1.6	0.9	0.7	1.0	1.0	1.0		1.0	1.0	1.0	0.9	1.0	0.2
Average	0.9	0.9	1.0	1.1	1.0	1.1	1.0	0.9	0.8	1.0	1.0	1.0	0.9	1.0	
Std. dev.	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.4	0.4	0.2	0.4	0.5	0.5		

Mean spittles per quadrat



Mean Nymphs per spittle



Spittlebug Nymphs - *Philaenus spumarius*

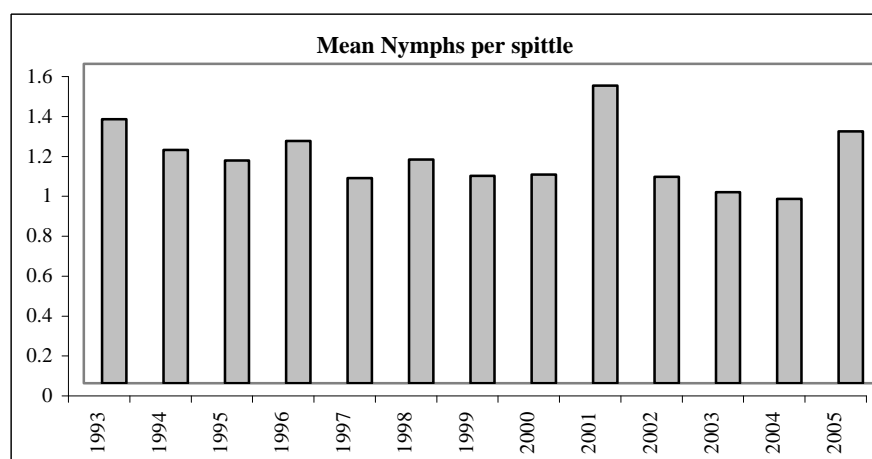
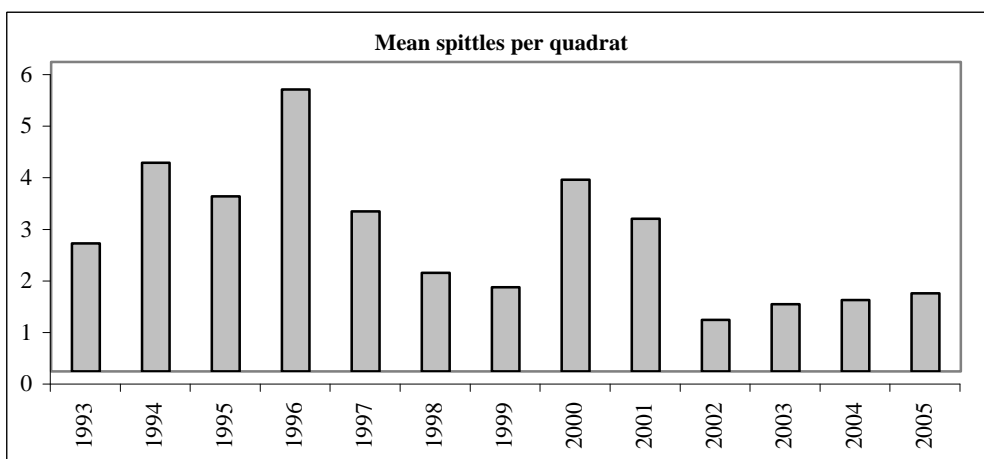
Mean spittles per quadrat

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.0	0.0			1.2	0.2	0.1	1.5	0.5	1.5	0.6	0.3	0.6	0.6
CAI							3.4	16.9	11.8		5.5	0.6	0.1	6.4	6.7
DRA	7.3	14.3	14.3	2.2	4.5	3.3	2.8	5.7	1.6	2.1	0.0	1.9	1.7	4.7	4.6
GLE		17.2	7.0	26.2	5.5	4.4	1.0	5.6	5.0	2.3	2.6	2.1	4.7	6.9	7.3
HIL	4.8	3.1	3.8	3.1	4.5	1.5	1.8	1.4	2.5	1.3	2.5		2.2	2.7	1.2
MOO	0.3	0.2	1.0	0.7	2.7	2.1	0.7	0.5	0.2	0.6	0.3	0.0	1.4	0.8	0.8
NOR	2.1	1.6	1.3	0.0	0.6	0.1	0.7	0.3		0.2	0.3	0.0	0.2	0.6	0.7
POR		0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.3	0.7	0.0	0.1	0.2
ROT	0.5	1.1	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.4	1.0	1.2	0.4	0.4
SNO						4.2	4.8	5.9	3.5		1.1	6.8	4.6	4.4	1.8
SOU		2.7	6.2	16.9	10.0	4.4	2.8	8.4	3.8	3.1	1.5	1.5	1.4	5.2	4.6
WYT	0.1	0.5	0.1	0.2	0.0	0.0	0.0	0.1		0.0	0.0	0.3	0.6	0.1	0.2
Average	2.5	4.0	3.4	5.5	3.1	1.9	1.6	3.7	3.0	1.0	1.3	1.4	1.5	2.7	
Std. dev.	2.9	6.3	4.6	9.5	3.4	1.8	1.6	5.1	3.5	1.1	1.6	1.9	1.6		

Mean nymphs per spittle

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI						1.2	0.9		1.1	0.8	0.8			1.0	0.2
CAI							0.9	1.1	6.0				1.3	2.3	2.4
DRA	1.9	1.5	1.2	0.9	1.0	1.0	1.0	1.0	1.1	1.0	0.5	1.0	1.1	1.1	0.3
GLE		1.2	1.5	1.6	1.2	1.1	1.1	1.3	1.3	1.1	1.2			1.3	0.2
HIL	1.3	1.8	1.6	1.1	1.3	1.4	1.1	1.1	1.1	1.2	1.1		2.2	1.4	0.3
MOO	1.1	1.0	1.0	1.1	1.0	1.1	0.8	1.0	1.0	1.0	1.1	0.0	1.2	1.0	0.3
NOR	0.9	1.0	0.8	1.1	1.0	1.1	0.9	0.8		1.6	1.1	0.0	0.8	0.9	0.4
POR		1.0	0.8	1.0				0.9	0.0	0.0	0.0	1.3	1.0	0.7	0.5
ROT	1.0	1.2	1.2	1.8	0.4	1.0		0.7	1.0	1.4	1.0	1.2	1.2	1.1	0.4
SNO								1.4	1.5	1.1		1.4	1.8	1.5	0.3
SOU		1.1	1.1	1.3	1.4	1.1	1.0	1.2	1.2	1.3	1.2	1.1	1.0	1.2	0.1
WYT	1.7	0.7	0.8	1.1	1.0		1.2	0.9		1.0	1.1	1.0	1.1	1.0	0.3
Average	1.3	1.2	1.1	1.2	1.0	1.1	1.0	1.0	1.5	1.0	1.0	0.9	1.3	1.2	
Std. dev.	0.4	0.3	0.3	0.3	0.3	0.1	0.2	0.2	1.6	0.4	0.4	0.6	0.4		

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Spittlebug adults - colour morphs of *Philaenus spumarius*

2005 catches

	Albomaculata	Flavicollis	Gibba	Lateralis	Leucocephala	Leucophthalma	Marginella	Populi	Praeusta	Quadrinaculata	Trilineata	Typica	Undeciphered	Total
ALI														
CAI		2						9		9	2	70		
DRA														
GLE		13		1			1			99	3	10	7	
HIL														
MOO		6		10			6			20	1	1		44
NOR				1	1	1		9		8	4	14		
POR		2				1		3						
ROT								4			5			
SNO		6		10	1	3		12		16	8	4		
SOU														0
WYT		2				1		10	1	9	7	5	1	36
Total	0	31	0	22	2	6	7	47	1	161	30	104	8	419

Percentage of morphs by site - combined catch from 1993 - 2005

	Albomaculata	Flavicollis	Gibba	Lateralis	Leucocephala	Leucophthalma	Marginella	Populi	Praeusta	Quadrinaculata	Trilineata	Typica	Undeciphered	Total
ALI	1.3	13.9		0.4	2.6	1.3	0.4	12.6		19.5	6.5	33.8	7.8	100
CAI	0.3	3.1		0.3	0.9		0.3	2.8		52.7	2.5	37.1		100
DRA	1.6	3.0		3.8	1.8	1.0	0.4	22.5	0.2	15.6	10.7	39.3	0.2	100
GLE	0.4	22.4		1.0	0.2		0.1	0.2	0.1	67.0	0.6	7.0	1.0	100
HIL	0.5	9.9		2.6	0.3	0.2	5.6	17.7	2.0	20.4	9.2	31.0	0.7	100
MOO	0.7	3.6		10.8		1.0	2.0	10.7		63.9	2.0	4.9	0.4	100
NOR	0.4	2.9	0.7	0.7	1.5	1.7	1.1	19.8		19.6	17.8	33.6	0.1	100
POR	1.3	6.3	0.4	11.0	0.4	2.1	37.6	6.8		6.8	8.0	11.4	8.0	100
ROT	1.6	16.1	1.0	1.0	1.9		3.5	26.8		6.6	19.2	20.8	1.6	100
SNO	1.1	4.6		7.1	0.9	2.7	0.5	25.8	0.2	31.7	12.3	9.8	3.2	100
SOU		4.0		1.7		0.1	0.1	0.8		87.5	1.8	3.4	0.6	100
WYT	1.2	4.9		2.2	0.5	1.2	1.0	46.4	0.5	10.3	11.3	18.7	1.7	100
All sites	0.9	7.9	0.7	3.5	1.1	1.3	4.4	16.1	0.6	33.5	8.5	20.9	2.3	100

Spittlebug adults - colour morphs of *Philaenus spumarius*

Percentage of morphs by year - combined catch from all sites

	Albomaculata	Flavicollis	Gibba	Lateralis	Leucocephala	Leucophthalma	Marginella	Populi	Praeusta	Quadrifasciata	Triineata	Typica	Undeciphered	Total
1993	1.2	13.7	0.2	2.9	1.7	0.7	1.4	19.0		25.5	9.9	22.1	1.7	100
1994	0.4	4.2	0.1	1.6	0.7	0.5	1.9	15.8	1.0	43.3	6.3	22.7	1.5	100
1995	1.5	10.8	0.3	1.6	0.3	1.2	5.1	15.8	0.3	33.1	11.0	14.8	4.2	100
1996	0.5	12.1	0.2	1.0	0.5	0.7	11.1	13.3	0.3	39.7	6.8	13.5	0.2	100
1997		15.2		0.8	0.4		0.4	6.5		61.6	6.5	8.4	0.4	100
1998	0.2	11.9	0.2	5.4	0.9	1.6	4.6	12.6		40.8	6.1	13.5	2.3	100
1999	1.0	8.2	0.2	2.9	0.4		0.2	24.2	0.2	34.0	9.4	19.3		100
2000	0.9	8.8	0.2	2.7	0.7	0.9	1.2	8.6	0.3	50.3	5.2	19.3	1.0	100
2001	0.4	7.4	0.2	1.1	0.5	0.2	0.2	11.7	0.2	55.9	4.5	17.5	0.4	100
2002	0.3	8.9		2.7	0.6	1.2	0.3	10.6	0.6	58.4	5.9	10.6		100
2003	1.0	10.8		2.3	1.1	0.4	0.6	10.1		39.2	8.2	24.5	1.9	100
2004	1.4	5.5		15.8	1.1	1.1	0.5	10.1		40.6	5.7	17.4	0.8	100
2005		7.4		5.3	0.5	1.4	1.7	11.2	0.2	38.4	7.2	24.8	1.9	100
All sites	0.8	10.2	0.2	2.2	0.7	0.8	2.9	14.2	0.4	42.7	7.3	16.8	1.4	100

6.3 Butterflies

The Lepidoptera (butterflies and moths) is a large Order of insects and is among the best known, both taxonomically and biologically. Butterflies are also one of the easier insect groups to monitor and are known to respond rapidly to changes in vegetation abundance and quality. The protocol adopted by ECN is that already in use for the national Butterfly Monitoring Scheme (Pollard, Hall & Bibby, 1986). This existing scheme provides a strong background of information for comparison with ECN data. Analysis of the existing data has already shown interesting changes in the distribution and phenology of individual species and significant relationships between butterfly population size and climate.

Under this scheme monitoring is undertaken along a designated transect and only takes place under restricted weather conditions. The number of observations made at each site therefore varies and summary data are presented in terms of the numbers observed per transect walk. All ECN terrestrial sites carry out butterfly monitoring and separate transects are monitored at Moor House and Upper Teesdale.

Butterfly counts 2005 by species

	ALI	CAI	DRA	GLE	HIL	MOO	NOR	POR	ROT	SNO	SOU	UPT	WYT	Total
Adonis blue														0
Brimstone	1		3				2	35	1				5	47
Brown argus								51					15	66
Brown hairstreak														0
Chalkhill blue								33						33
Clouded yellow														0
Comma	7		5				6		3				28	49
Common blue	1		4	15				295				17	50	382
Dark green fritillary				4				177				2		183
Dingy skipper								57						57
Duke of Burgundy														0
Essex skipper														0
Grayling														0
Green hairstreak								24						24
Green-veined white	48		47	190	52	5	60	4	3	36	28	49	80	602
Grizzled skipper								48						48
Hedge brown	82		22				135	9	76				169	493
Holly blue	1							4	5				4	14
Large skipper	17						9	2					8	36
Large white	23		15				13	28	33			6	30	148
Marbled white								44	2				33	79
Marsh fritillary														0
Meadow brown	329		505	38	6		593	1982	48	5	3	4	634	4147
Mixed whites														0
Orange tip	7		9		2		72		13				1	104
Painted lady			5				3					2	1	11
Peacock	4		5	46	2		43	4	17	8	5	60	64	258
Pearl-bordered fritillary														0
Purple emperor														0
Purple hairstreak														0
Red admiral	1	2	2	7	1		32	4	3	1	1	31	27	112
Ringlet	217		2	70	41		161	9	3		1	18	250	772
Silver-spotted skipper								211						211
Silver-washed fritillary	128						1							129
Small blue								17						17
Small copper				21			3	42				7	24	97
Small heath		1		25		39		255		89	8	75		492
Small pearl-bordered frit.				3										3
Small skipper	13		10					14				7		44
Small tortoiseshell		1	35	64	5	1	30	6	48		12	15	24	241
Small white	9		25	1	1		7	13	101			22	48	227
Speckled wood	57		15		9		84	14	21				41	241
Wall brown							7							7
White admiral	16													16
White-letter hairstreak														0
Total	961	5	709	484	119	45	1261	3382	382	139	58	315	1557	9390
Number of species	18	4	16	12	9	3	18	26	16	5	7	14	21	13

Butterflies

Number of species observed

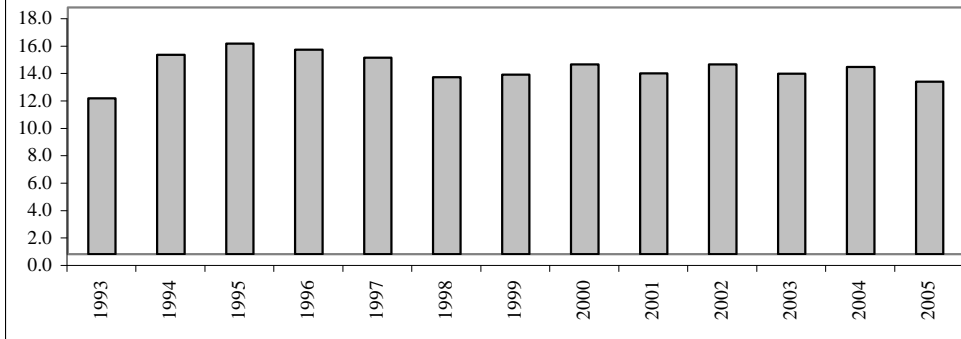
Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		21	24	25	22	17	22	19	17	17	19	22	18	20.3	2.8
CAI											4	4	4	4.0	0.0
DRA	15	15	14	17	16	14	15	16	17	16	14	15	16	15.4	1.0
GLE		7	11	9	11	8	10	12	11	13	13	13	12	10.8	2.0
HIL	6	5	10	11	9	7	8	9	8	9	9	12	9	8.6	1.9
MOO	3	4	5	5	6	3	0	5	5	5	7	4	3	4.2	1.7
NOR	19	22	23	24	22	22	17	20		19	21	22	18	20.8	2.1
POR		33	29	31	29	28	28	27	27	31	27	30	26	28.8	2.1
ROT	16	18	19	21	19	18	16	15	15	14	16	17	16	16.9	2.0
SNO				4	5	3	3	4	6	5	5	6	5	4.6	1.1
SOU	8	7	6	5	5	3	6	7	7	5	9	7	7	6.3	1.5
UPT	8	8	9	8	9				12		11	14	14	10.7	2.6
WYT	16	20	19	19	19	19	19	20	19	21	19	20	21	19.3	1.3
Average	11.4	14.5	15.4	14.9	14.3	12.9	13.1	13.8	13.2	13.8	13.2	13.7	12.6	13.1	
Std. dev.	5.8	9.2	7.9	9.1	7.9	8.6	8.5	7.0	7.0	7.7	6.9	7.9	7.2		

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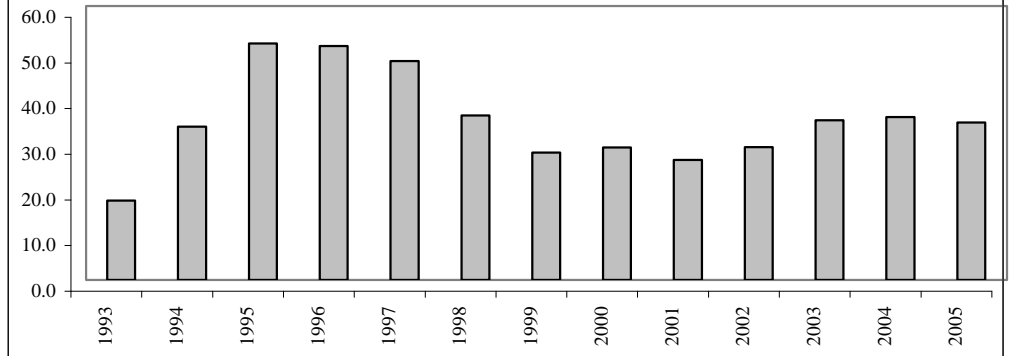
Number of butterflies observed per transect walk

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		66	77	60	50	27	25	43	34	37	46	73	51	49.1	17.2
CAI											17	1	1	6.3	9.2
DRA	14	19	25	32	35	17	16	25	26	16	24	36	34	24.5	7.8
GLE		14	25	44	38	20	19	26	18	16	22	19	21	23.5	8.9
HIL	3	4	8	9	18	8	6	12	7	7	8	13	7	8.5	4.0
MOO	2	1	3	8	5	1	0	3	4	5	11	15	15	5.6	5.1
NOR	52	91	162	120	90	40	40	52		53	58	72	63	74.4	36.3
POR		108	162	240	209	199	124	86	104	143	154	114	154	149.8	46.9
ROT	17	16	34	35	51	22	18	17	15	9	25	27	18	23.4	11.2
SNO				15	7	3	2	5	10	4	7	17	23	9.3	6.9
SOU	6	2	5	11	6	1	5	7	4	2	3	4	4	4.6	2.6
UPT	4	5	7	8	10			13		14	22	35	12	13.0	9.3
WYT	41	43	62	33	56	58	52	59	41	43	69	75	62	53.4	12.4
Average	17.4	33.5	51.8	51.3	47.9	36.0	27.9	29.0	26.3	29.1	35.0	35.7	34.5	34.3	
Std. dev.	19.0	38.3	59.4	67.4	56.9	56.8	35.7	25.8	30.1	39.6	42.5	34.2	42.8		

Average number of species per site



No of butterflies observed per transect walk



6.4 Moths

The ECN moth protocol involves sampling by light trap using the methodology of the Rothamsted Insect Survey (Taylor, 1986). This provides a strong background of expertise to ensure that the protocol requirements are met, as well as an existing extensive national database accumulated over the last three decades which will form the basis for analysing future trends in moth populations.

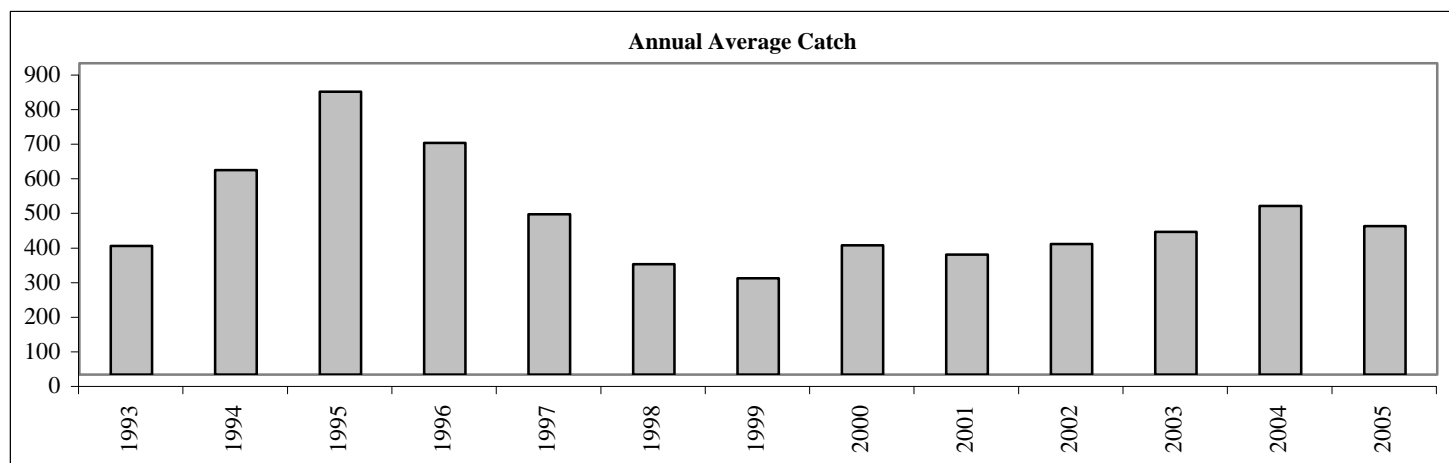
Results are presented for all species of moth as well as for the functional groups, geometridae, noctuidae and microlepidoptera. Only four microlepidoptera species of particular interest are identified and contribute to the counts.

Moths

Geometridae - annual catch

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	425	791	1016	900	764	563	637	651	586	562	833	1263	824	755.0	222.8
CAI									505	591	62	954	579	538.2	318.3
DRA	783	818	1034	1417	1137	732	601	590	541	705	980	1040	810	860.6	251.1
GLE		838	987	632	241	232	225	359	356	332	521	635	328	473.8	250.9
HIL	254	203	1079	489	354	66	127	389	320	336	229	306	199	334.7	250.2
MOO	131	235	471	593	234	100	139	268	214	217	288	141		252.6	145.2
NOR	124	261	340	158	271	71	153	51	14	58	62	69	78	131.5	100.8
POR		1192	1406		570	637	0	598	470	578	542	8	576	597.9	416.4
ROT	423	331	257	245	232	177	179	176	120	121	152	121	147	206.2	90.5
SNO															
SOU	594	988	1223	1177	466	369	440	348	405	384	622	539	439	614.9	308.8
WYT	242	257	368	414	363	244	282	305	282	267	248	287	310	297.6	53.7
Average	372.0	591.4	818.1	669.4	463.2	319.1	278.3	373.5	346.6	377.4	412.6	487.5	429.0	460.3	
Std. dev.	231.2	370.7	416.1	420.8	292.5	245.1	212.7	192.7	179.8	209.0	310.0	433.7	263.6		

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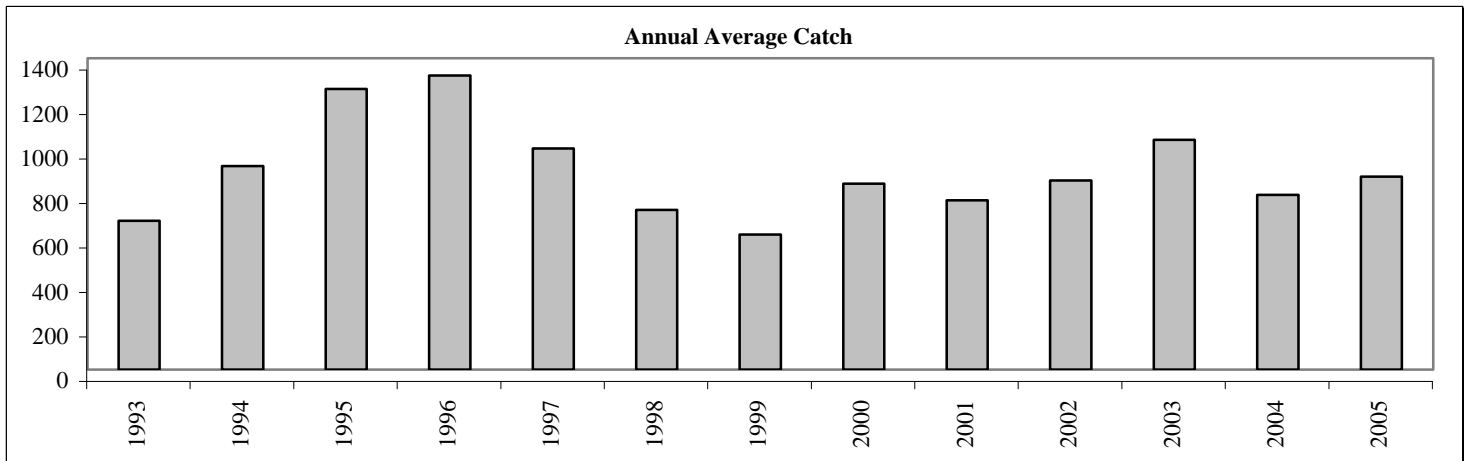


Moths

Noctuidae - annual catch

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	698	631	830	817	1045	633	659	880	732	761	1326	1474	1117	892.5	270.9
CAI									196	204	10	897	364	334.2	338.7
DRA	1008	1336	2503	3641	1170	1146	974	1700	1181	1606	2114	1422	1472	1636.4	745.3
GLE		543	696	1240	615	343	304	759	739	467	557	924	419	633.8	263.6
HIL	219	143	734	546	445	83	234	377	191	178	190	291	228	296.8	183.1
MOO	311	213	372	647	682	317	252	414	320	636	435	565		430.3	163.1
NOR	541	983	1883	1205	924	550	766	362	395	323	516	393	498	718.4	442.6
POR		2251	2094		2011	2305	526	1304	2157	2866	1996	5	1518	1730.3	837.2
ROT	923	1511	1514	1503	1353	507	1163	1139	1044	1121	2692	452	1332	1250.3	553.3
SNO															
SOU	1181	1048	1397	1598	1005	867	804	897	1011	786	889	1429	832	1057.2	265.4
WYT	466	495	599	705	687	430	383	524	408	404	635	784	890	570.0	161.3
Average	668.4	915.4	1262.2	1322.4	993.7	718.1	606.5	835.6	761.3	850.2	1032.7	785.1	867.0	868.2	
Std. dev.	344.5	651.8	724.0	948.7	452.0	631.7	320.5	444.7	580.2	791.2	878.7	499.2	479.4		

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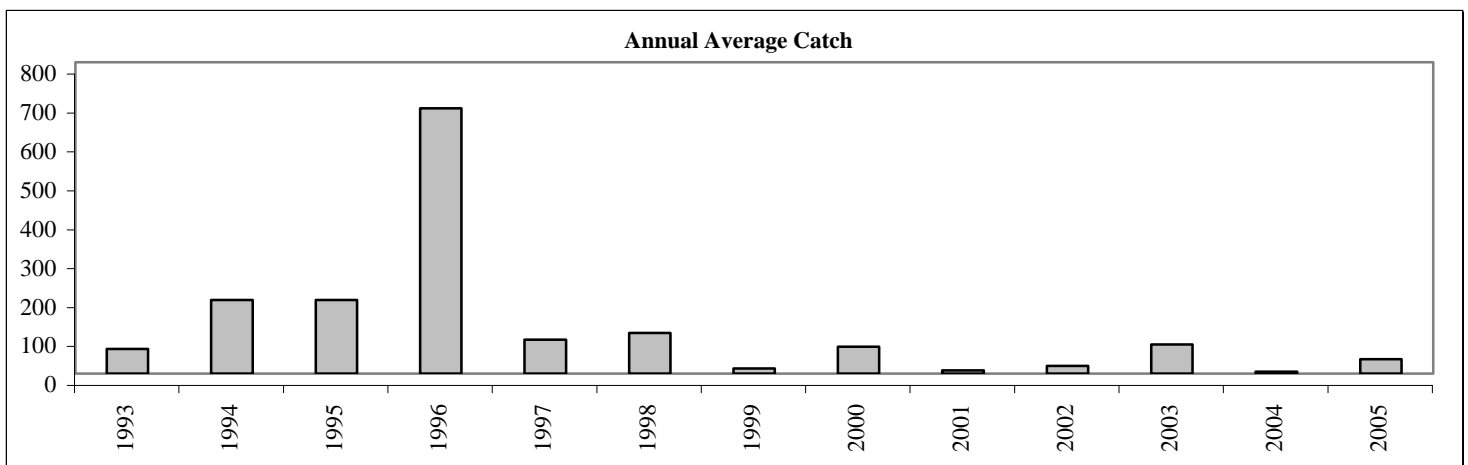


Moths

Microlepidoptera - annual catch

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	22	186	142	596	57	69	5	95	15	6	68	4	1	97.4	160.5
CAI									0	0	0	0	0		
DRA	7	55	73	326	24	30	0	31	3	34	19	0	4	46.6	86.8
GLE		23	92	60	16	8	1	23	7	6	21	1	0	21.5	27.7
HIL	4	4	33	32	15	23	0	16	0	20	59	0	0	15.8	17.7
MOO	0	0	0	0	0	0	0	0	0	0	0	0			
NOR	53	163	1048	766	117	268	28	31	0	30	82	1	5	199.4	328.2
POR		91	178		96	151	0	42	23	42	112	0	298	93.9	89.7
ROT	413	1325	0	4154	475	461	97	384	37	52	440	44	60	610.9	1122.8
SNO															
SOU	0	4	4	29	4	18	0	3	0	12	2	0	0	5.8	8.8
WYT	10	37	318	171	69	19	4	65	9	12	18	1	6	56.8	91.2
Average	63.6	188.8	188.8	681.6	87.3	104.7	13.5	69.0	8.5	19.5	74.6	4.6	37.4	127.6	
Std. dev.	142.2	404.6	317.9	1330.3	142.0	150.7	30.6	114.3	12.1	17.7	126.8	13.1	93.4		

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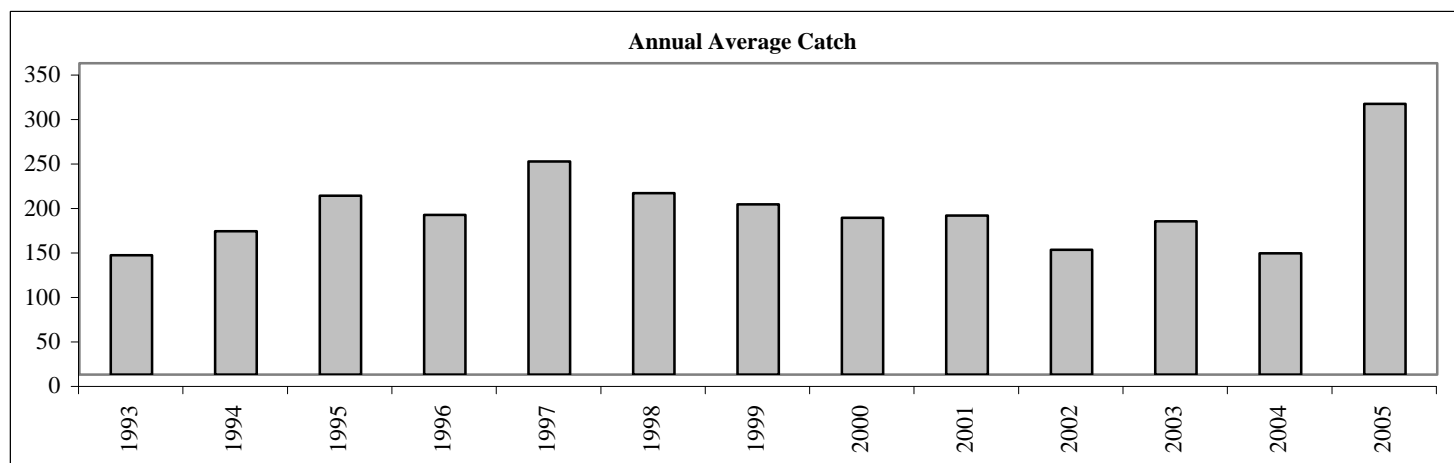


Moths

Other species - annual catch

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	150	172	243	188	228	200	260	224	201	162	222	283	305	218.3	46.3
CAI									0	8	0	12	13	6.6	6.3
DRA	159	260	365	474	508	193	208	184	176	292	381	368	280	296.0	115.3
GLE		53	48	65	49	36	27	48	48	23	20	54	55	43.8	14.1
HIL	74	11	125	119	107	48	51	77	96	53	63	58	48	71.5	32.7
MOO	10	48	26	34	37	8	16	15	30	7	22	13		22.2	13.0
NOR	121	179	260	287	358	132	156	140	37	66	66	249	204	173.5	95.2
POR		487	470		522	937	685	571	1034	458	570	13	1358	645.9	355.4
ROT	235	155	233	170	317	208	185	187	118	153	143	117	206	186.7	54.9
SNO															
SOU	220	129	120	147	91	168	102	84	95	146	268	152	320	157.1	71.8
WYT	104	117	122	132	180	110	224	234	130	175	141	182	255	162.0	50.5
Average	134.1	161.1	201.2	179.6	239.7	204.0	191.4	176.4	178.6	140.3	172.4	136.5	304.4	180.3	
Std. dev.	74.2	136.0	140.7	132.1	180.3	267.4	193.4	157.7	290.4	137.1	177.2	122.2	386.7		

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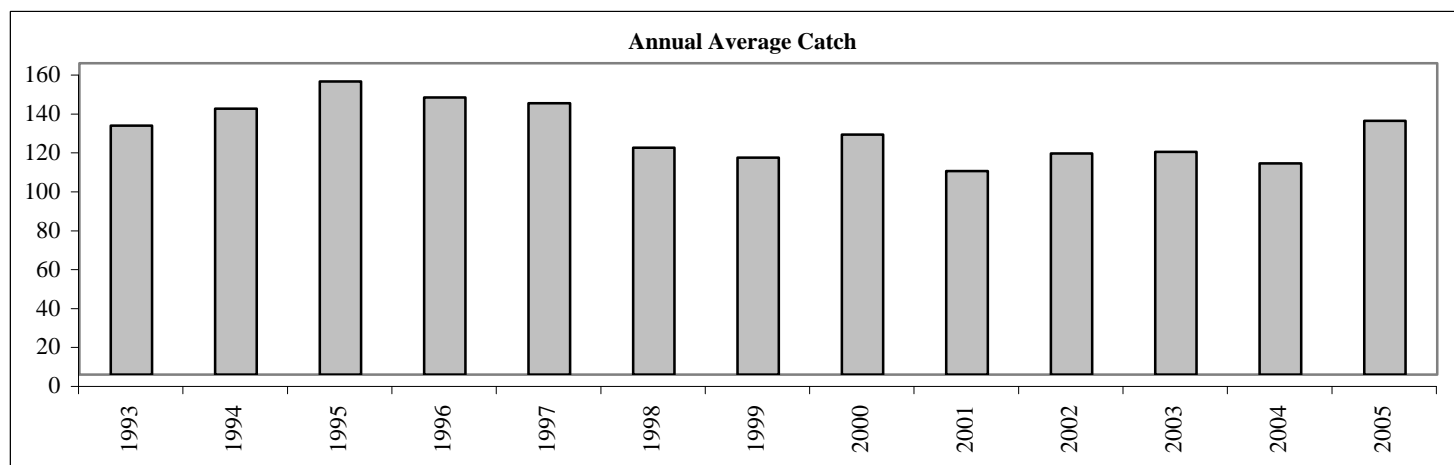


Moths

Total number of species observed

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	189	207	230	230	224	201	208	208	209	214	226	239	229	216.5	14.3
CAI									34	64	16	63	69	49.2	23.1
DRA	169	169	174	190	169	152	151	157	148	170	160	156	170	164.2	11.6
GLE		135	134	144	120	100	109	124	106	102	119	123	112	119.0	13.9
HIL	100	79	135	120	114	64	78	108	92	92	91	87	84	95.7	19.4
MOO	52	53	54	64	67	57	58	61	65	63	62	68		60.3	5.5
NOR	129	139	158	136	169	108	117	87	40	81	90	101	96	111.6	34.9
POR		193	200		143	140	41	130	128	144	137	7	156	129.0	57.5
ROT	134	136	147	126	131	114	120	104	90	103	104	79	122	116.2	19.5
SNO															
SOU	120	126	140	138	113	109	105	115	123	102	120	130	120	120.1	11.6
WYT	131	130	135	134	144	121	128	139	116	115	134	141	146	131.8	9.9
Average	128.0	136.7	150.7	142.4	139.4	116.6	111.5	123.3	104.6	113.6	114.5	108.5	130.4	119.4	
Std. dev.	41.5	46.7	46.6	46.1	42.1	41.7	47.4	40.1	49.9	46.0	54.0	60.3	46.9		

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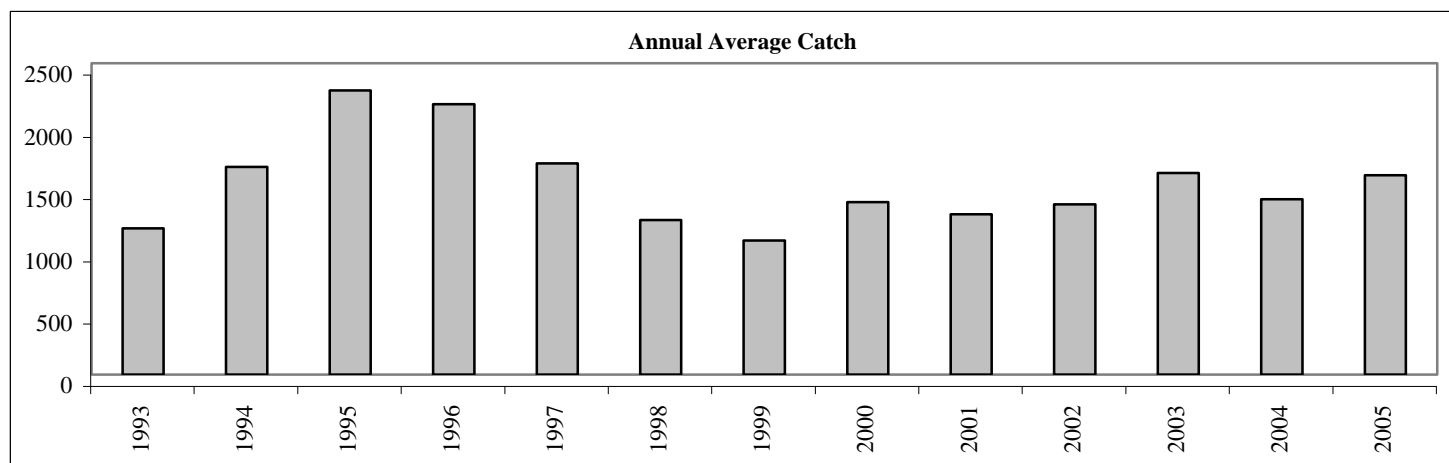


Moths

Total annual catch - all species

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI	1273	1594	2089	1905	2037	1396	1556	1755	1519	1485	2381	3020	2246	1865.8	486.7
CAI									701	803	72	1863	956	879.0	644.8
DRA	1950	2414	3902	5532	2815	2071	1783	2474	1898	2603	3475	2830	2562	2793.0	1024.2
GLE		1434	1731	1937	905	611	556	1166	1143	822	1098	1613	802	1151.5	445.9
HIL	547	357	1938	1154	906	197	412	843	607	567	482	655	475	703.1	447.7
MOO	452	496	869	1274	953	425	407	697	564	860	745	719		705.1	258.1
NOR	786	1423	2483	1650	1553	753	1075	553	446	447	644	711	780	1023.4	597.4
POR		3930	3970		3103	3879	1211	2473	3661	3902	3108	26	3452	2974.1	1279.5
ROT	1581	1997	2004	1918	1902	892	1527	1502	1282	1395	2987	690	1685	1643.2	570.6
SNO															
SOU	1995	2165	2740	2922	1562	1404	1346	1329	1511	1316	1779	2120	1591	1829.2	532.9
WYT	812	869	1089	1251	1230	784	889	1063	820	846	1024	1253	1455	1029.6	215.2
Average	1174.5	1667.9	2281.5	2171.4	1696.6	1241.2	1076.2	1385.5	1286.5	1367.8	1617.7	1409.1	1600.4	1508.8	
Std. dev.	615.0	1047.7	1037.1	1369.6	778.0	1076.0	496.5	677.8	915.9	1029.6	1190.2	967.1	930.4		

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7. Vertebrates

Recording of vertebrates in ECN is directed towards groups considered to be good indicators of environmental change. Animals with wide distributions can be used for inter-site comparisons of possible changes with time and those for which there are already national monitoring schemes provide background information with which results from ECN sites can be compared.

7.1 Breeding Birds Survey

The British Trust for Ornithology (BTO) is responsible for organising surveys and providing annual indices of population changes for British breeding bird species. Until recently there have been two major schemes, the Common Birds Census (CBC) and the Waterways Bird Survey (WBS), both of which use a territory mapping method and involve fieldworkers in making about ten visits to their usually subjectively chosen survey plot throughout the breeding season. The CBC has been used for farmland plots and semi-natural woodland since 1962 and is appropriate for many ECN sites, data from which can be placed in the wider regional and national context. Some ECN sites already had CBC surveys in operation when the ECN programme was initiated in 1993.

The CBC method is inappropriate for some bird species, particularly the waders, which breed on moorland. Some ECN sites have large areas of moorland and at these it has been necessary to adopt an alternative survey method devised for monitoring waders in the British uplands, supplemented by CBC methods for passerine species.

As a result of field trials, the BTO replaced the CBC with a new census method based on counting breeding birds observed in randomly selected 1 km squares of the National Grid (BTO 1995). This method, the Breeding Bird Survey (BBS), is therefore more representative of the countryside as a whole and is less labour-intensive than CBC, both in the field and at the analytical stage. The BTO intends to run the CBC and BBS in parallel for several years so as to maintain continuity and to provide a smooth transition from one system to the other.

ECN wishes to retain the advantages of linking to the national scheme for censusing breeding birds and therefore plans to convert to the BBS scheme, which will be appropriate for all ECN sites. There was a period of overlap, using both CBC and BBS methods at the ECN lowland sites, and both the ECN moorland breeding bird method and BBS at upland sites. The BBS method was adopted as the bird monitoring protocol at all ECN sites after 2001, though some lowland sites continue to do the CBC for continuity.

Breeding Birds Survey - Resident Insectivores

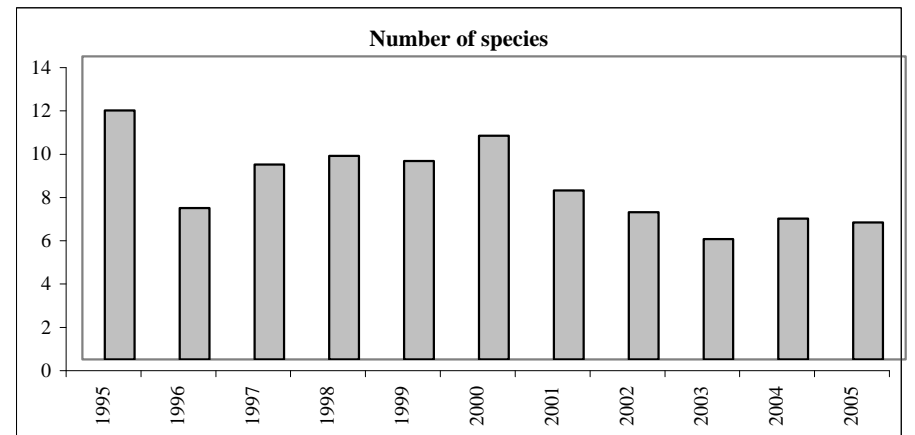
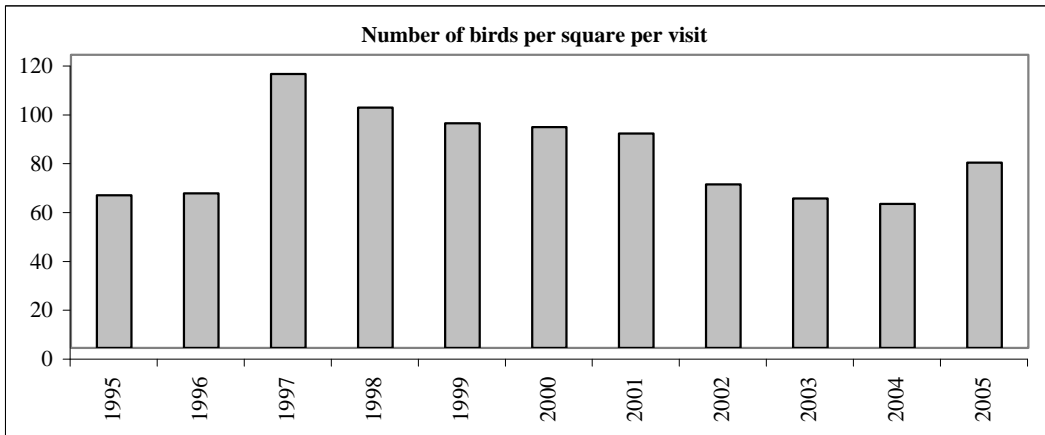
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				133	127	125	138	104	90	103	75	111.9	22.4
CAI								66	73	60	92	72.8	13.9
DRA	69	62	46	40	75	50		28	28	49		49.7	16.6
GLE								51	74	44	42	52.8	14.7
HIL													
MOO							15	52	38	22	41	33.6	14.9
NOR			178	192	111	109		77		79	118	123.4	45.1
POR	56	73	79	68	80	68	56	79	54	56	74	67.5	10.4
ROT			216		88	129	141	92	53	58	119	112.0	52.6
SNO		55	42	59	71	61	89	81	78	64	69	66.9	13.7
SOU								39	63	55	53	52.5	10.0
WYT													
Average	62.5	63.3	112.2	98.4	92.0	90.3	87.8	66.9	61.2	59.0	75.9	74.3	
Std. dev.	9.2	9.1	79.9	62.9	22.3	34.7	54.0	24.1	19.9	21.3	29.2		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				11	11	11	11	12	11	10	9	10.8	0.9
CAI								9	6	9	9	8.3	1.5
DRA	9	9	10	9	8	8		7	7	11		8.7	1.3
GLE								2	2	2	2	2.0	0.0
HIL													
MOO							2	2	2	2	2	2.0	0.0
NOR			13	13	10	14		12		11	14	12.4	1.5
POR	14	11	10	12	14	14	9	11	10	9	9	11.2	2.0
ROT			10		10	13	14	7	7	6	7	9.3	3.0
SNO		1	2	2	2	2	3	4	3	2	2	2.3	0.8
SOU								2	2	3	3	2.5	0.6
WYT													
Average	11.5	7.0	9.0	9.4	9.2	10.3	7.8	6.8	5.6	6.5	6.3	6.9	
Std. dev.	3.5	5.3	4.1	4.4	4.0	4.7	5.2	4.1	3.5	3.9	4.3		

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Breeding Birds Survey - Migrant Insectivores

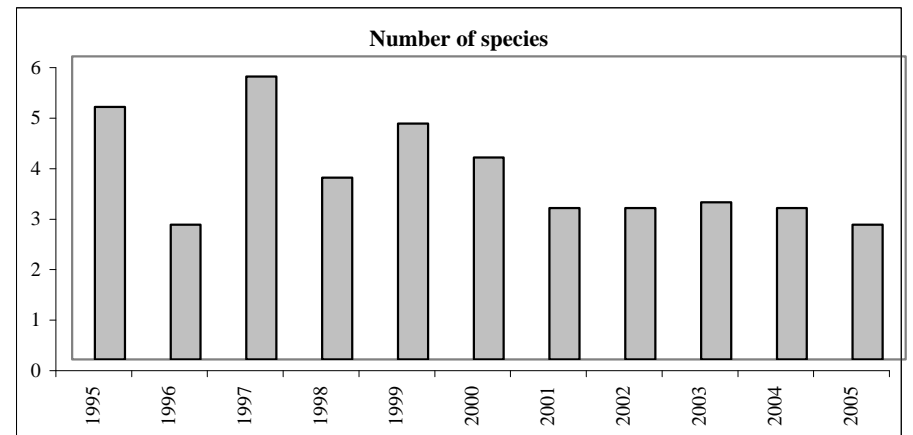
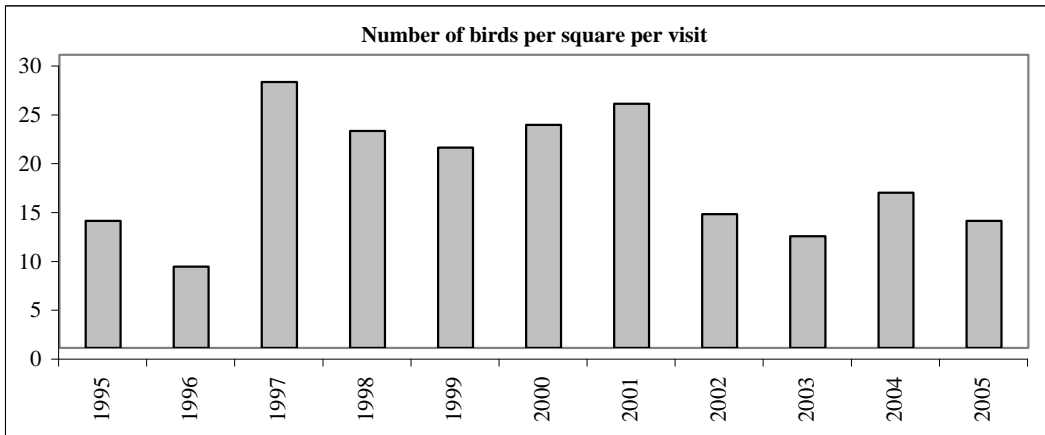
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				26	23	39	35	32	19	28	30	29.0	6.5
CAI								33	44	35	17	32.3	11.2
DRA	4	1	6	10	6	9		4	13	28		9.0	8.0
GLE								0	2	11	6	4.8	4.9
HIL													
MOO							0	0	1	1	0	0.4	0.5
NOR			64	54	56	21		28		23	32	39.7	17.7
POR	22	18	19	14	18	23	7	10	10	13	11	15.0	5.3
ROT			44		15	32	61	3	4	13	11	22.9	20.8
SNO		6	3	7	5	13	22	27	7	5	6	10.1	8.1
SOU								0	3	2	4	2.3	1.7
WYT													
Average	13.0	8.3	27.2	22.2	20.5	22.8	25.0	13.7	11.4	15.9	13.0	16.5	
Std. dev.	12.7	8.7	26.2	19.2	18.7	11.3	24.3	14.4	13.5	11.9	11.3		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				3	5	5	3	4	3	3	4	3.8	0.9
CAI								6	6	5	4	5.3	1.0
DRA	1	1	3	3	3	4		3	6	5		3.2	1.6
GLE								0	2	3	3	2.0	1.4
HIL													
MOO							0	0	1	1	0	0.4	0.5
NOR			7	7	8	5		8		5	6	6.6	1.3
POR	9	5	7	4	6	3	5	3	4	3	2	4.6	2.1
ROT			9		5	6	6	3	1	3	1	4.3	2.8
SNO		2	2	1	1	1	1	3	2	1	1	1.5	0.7
SOU								0	3	1	3	1.8	1.5
WYT													
Average	5.0	2.7	5.6	3.6	4.7	4.0	3.0	3.0	3.1	3.0	2.7	3.3	
Std. dev.	5.7	2.1	3.0	2.2	2.4	1.8	2.5	2.6	1.9	1.6	1.9		

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Breeding Birds Survey - Seed-eating Passerines

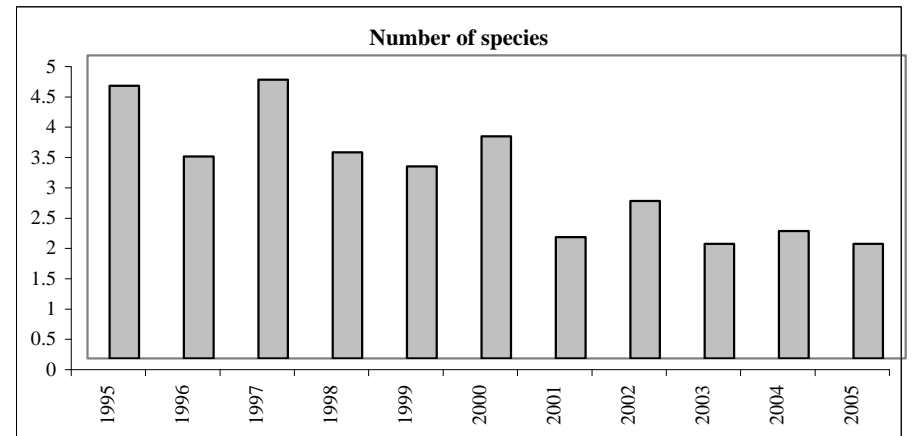
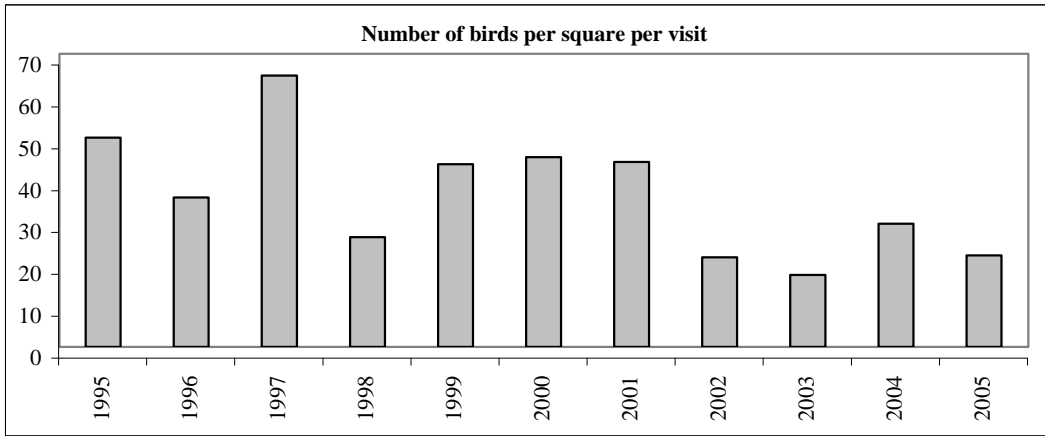
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				14	10	23	22	15	6	16	8	14.3	6.2
CAI								42	25	24	17	27.0	10.6
DRA	60	72	58	45	90	54		37	20	49		53.9	20.1
GLE								0	0	0	0		
HIL													
MOO							0	0	0	0	0		
NOR			42	44	33	22		26		11	26	29.1	11.6
POR	40	35	38	28	70	33	14	26	29	29	35	34.3	13.8
ROT			186		59	140	185	54	53	152	94	115.4	57.4
SNO		0	0	0	0	0	0	0	0	0	0		
SOU								14	22	13	17	16.5	4.0
WYT													
Average	50.0	35.7	64.8	26.2	43.7	45.3	44.2	21.4	17.2	29.4	21.9	41.5	
Std. dev.	14.1	36.0	71.0	19.4	35.3	49.6	79.3	19.0	17.8	45.7	29.7		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				2	1	3	1	2	1	1	1	1.5	0.8
CAI								4	3	4	2	3.3	1.0
DRA	5	6	7	6	4	5		5	6	4		5.3	1.0
GLE								0	0	0	0		
HIL													
MOO							0	0	0	0	0		
NOR			5	5	4	4		5		3	4	4.3	0.8
POR	4	4	5	4	5	3	1	4	3	4	5	3.8	1.2
ROT			6		5	7	8	5	3	4	4	5.3	1.7
SNO		0	0	0	0	0	0	0	0	0	0		
SOU								1	1	1	1	1.0	0.0
WYT													
Average	4.5	3.3	4.6	3.4	3.2	3.7	2.0	2.6	1.9	2.1	1.9	3.5	
Std. dev.	0.7	3.1	2.7	2.4	2.1	2.3	3.4	2.2	2.0	1.9	2.0		

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Breeding Birds Survey - Raptors and Owls

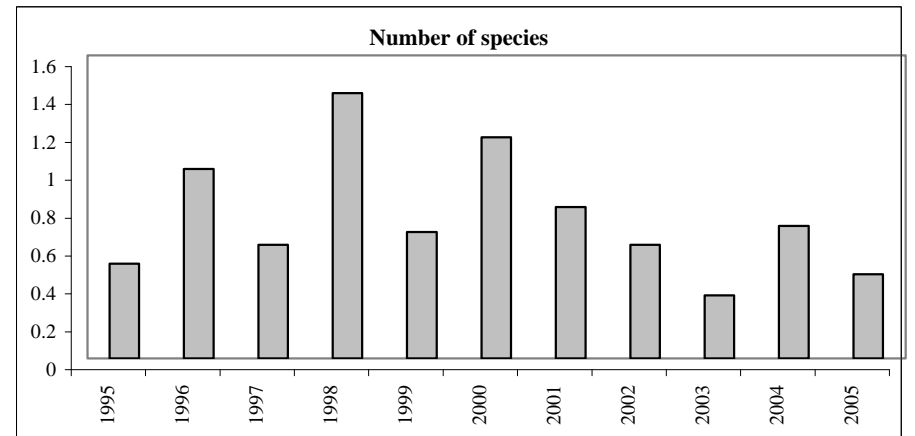
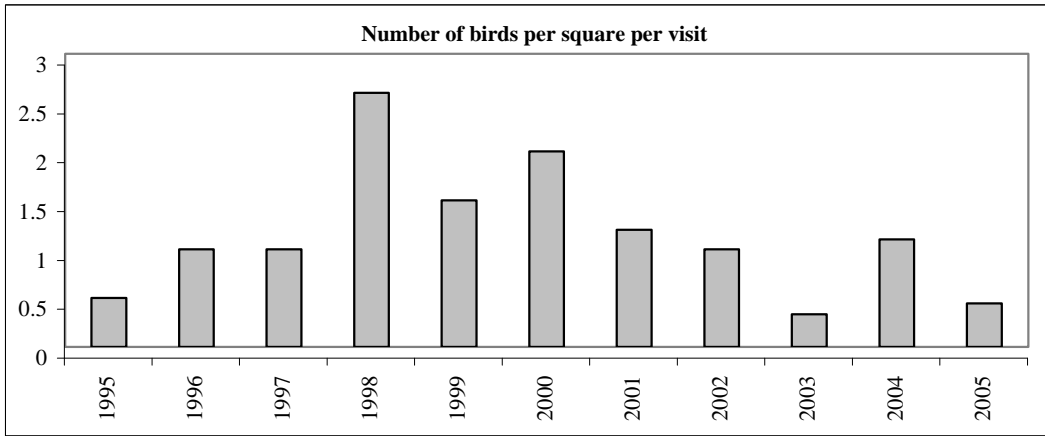
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				3	0	1	0	0	0	0	1	0.6	1.1
CAI								0	1	2	1	1.0	0.8
DRA	0	2	2	3	5	2		2	1	3		2.2	1.4
GLE								1	0	2	1	1.0	0.8
HIL													
MOO							0	5	1	0	0	1.2	2.2
NOR			2	6	0	3		1		0	1	1.9	2.1
POR	1	1	1	1	4	5	3	0	0	3	0	1.7	1.7
ROT			0		0	1	3	0	0	0	0	0.5	1.1
SNO		0	0	0	0	0	0	0	0	0	0		
SOU								1	0	1	0	0.5	0.6
WYT													
Average	0.5	1.0	1.0	2.6	1.5	2.0	1.2	1.0	0.3	1.1	0.4	1.2	
Std. dev.	0.7	1.0	1.0	2.3	2.3	1.8	1.6	1.6	0.5	1.3	0.5		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				2	0	1	0	0	0	0	1	0.5	0.8
CAI								0	1	1	1	0.8	0.5
DRA	0	2	1	2	2	2		1	1	3		1.6	0.9
GLE								1	0	1	1	0.8	0.5
HIL													
MOO							0	2	1	0	0	0.6	0.9
NOR			1	2	0	1		1		0	1	0.9	0.7
POR	1	1	1	1	2	2	2	0	0	1	0	1.0	0.8
ROT			0		0	1	2	0	0	0	0	0.4	0.7
SNO		0	0	0	0	0	0	0	0	0	0		
SOU								1	0	1	0	0.5	0.6
WYT													
Average	0.5	1.0	0.6	1.4	0.7	1.2	0.8	0.6	0.3	0.7	0.4	0.8	
Std. dev.	0.7	1.0	0.5	0.9	1.0	0.8	1.1	0.7	0.5	0.9	0.5		

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Breeding Birds Survey - Waterfowl

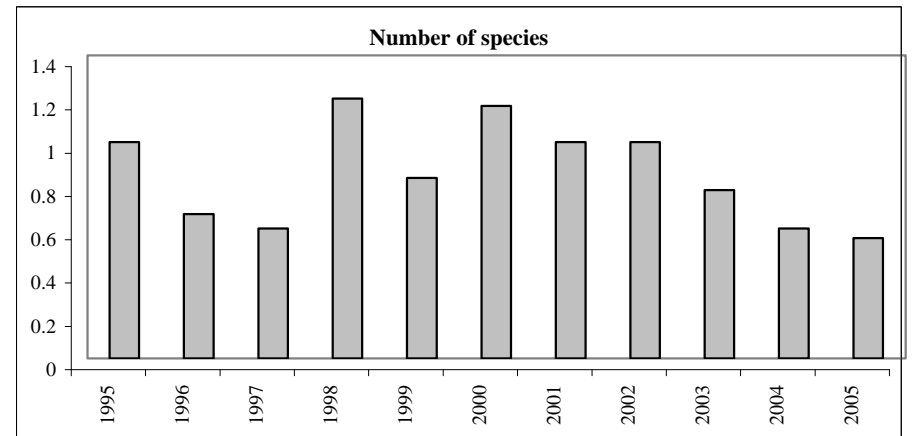
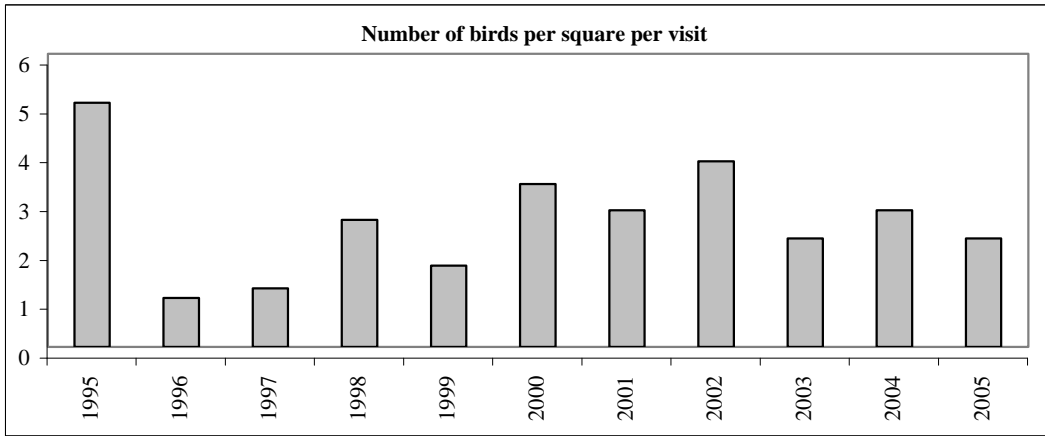
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				6	3	2	1	1	0	0	0	1.6	2.1
CAI								3	0	0	0	0.8	1.5
DRA	6	2	3	5	2	7		1	0	0		2.9	2.6
GLE								5	4	5	9	5.8	2.2
HIL													
MOO							9	15	6	11	4	9.0	4.3
NOR			0	0	0	2		0	0	0	2	0.6	1.0
POR	4	1	2	2	2	2	2	0	1	0	0	1.5	1.2
ROT			0		0	0	0	0	0	0	0		
SNO		0	1	0	3	7	2	0	0	0	0	1.3	2.3
SOU								13	9	12	5	9.8	3.6
WYT													
Average	5.0	1.0	1.2	2.6	1.7	3.3	2.8	3.8	2.2	2.8	2.2	3.7	
Std. dev.	1.4	1.0	1.3	2.8	1.4	2.9	3.6	5.6	3.3	4.8	3.2		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				3	2	1	1	1	0	0	0	1.0	1.1
CAI								2	0	0	0	0.5	1.0
DRA	1	1	1	2	1	2		1	0	0		1.0	0.7
GLE								1	1	2	1	1.3	0.5
HIL													
MOO							2	3	3	3	2	2.6	0.5
NOR			0	0	0	1		0		0	1	0.3	0.5
POR	1	1	1	1	1	2	1	0	1	0	0	0.8	0.6
ROT			0		0	0	0	0	0	0	0		
SNO		0	1	0	1	1	1	0	0	0	0	0.4	0.5
SOU								2	2	1	1	1.5	0.6
WYT													
Average	1.0	0.7	0.6	1.2	0.8	1.2	1.0	1.0	0.8	0.6	0.6	1.0	
Std. dev.	0.0	0.6	0.5	1.3	0.8	0.8	0.7	1.1	1.1	1.1	0.7		

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Breeding Birds Survey - Seabirds

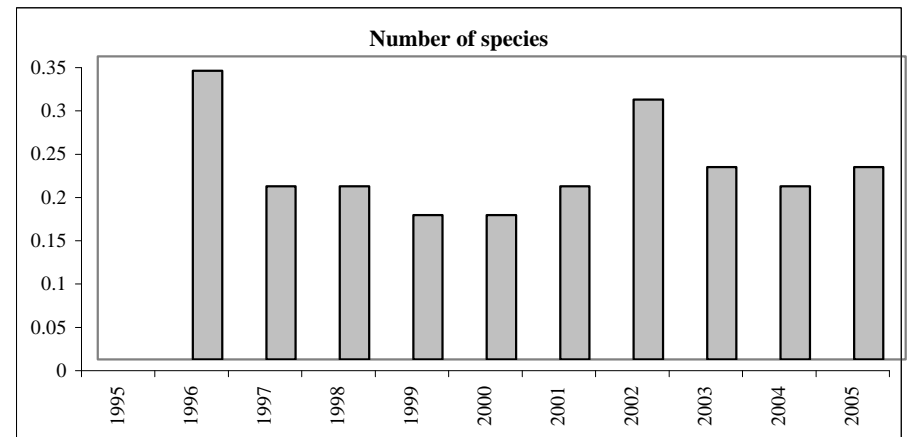
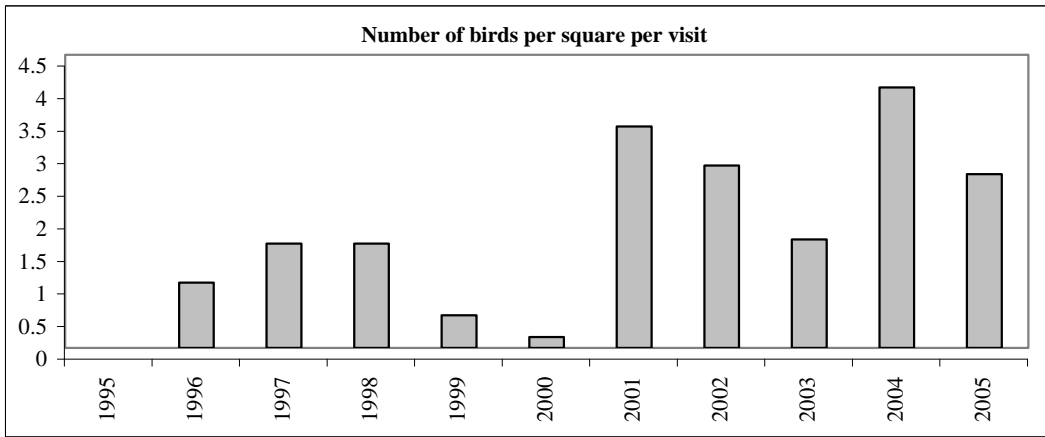
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				0	0	0	0	0	0	0	0		
CAI								0	0	0	0		
DRA	0	0	0	0	0	0		0	0	0			
GLE								3	1	35	14	13.3	15.6
HIL													
MOO							0	0	0	0	0		
NOR			0	0	0	0		3		0	0	0.4	1.1
POR	0	0	0	0	0	0	0	0	0	0	0		
ROT			0		0	0	0	0	0	0	0		
SNO		3	8	8	3	1	17	22	14	5	10	9.1	6.8
SOU								0	0	0	0		
WYT													
Average	0.0	1.0	1.6	1.6	0.5	0.2	3.4	2.8	1.7	4.0	2.7	7.6	
Std. dev.	0.0	1.7	3.6	3.6	1.2	0.4	7.6	6.9	4.6	11.0	5.4		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				0	0	0	0	0	0	0	0		
CAI								0	0	0	0		
DRA	0	0	0	0	0	0		0	0	0			
GLE								1	1	1	1	1.0	0.0
HIL													
MOO							0	0	0	0	0		
NOR			0	0	0	0		1		0	0	0.1	0.4
POR	0	0	0	0	0	0	0	0	0	0	0		
ROT			0		0	0	0	0	0	0	0		
SNO		1	1	1	1	1	1	1	1	1	1	1.0	0.0
SOU								0	0	0	0		
WYT													
Average	0.0	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.7	
Std. dev.	0.0	0.6	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4		

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Breeding Birds Survey - Other

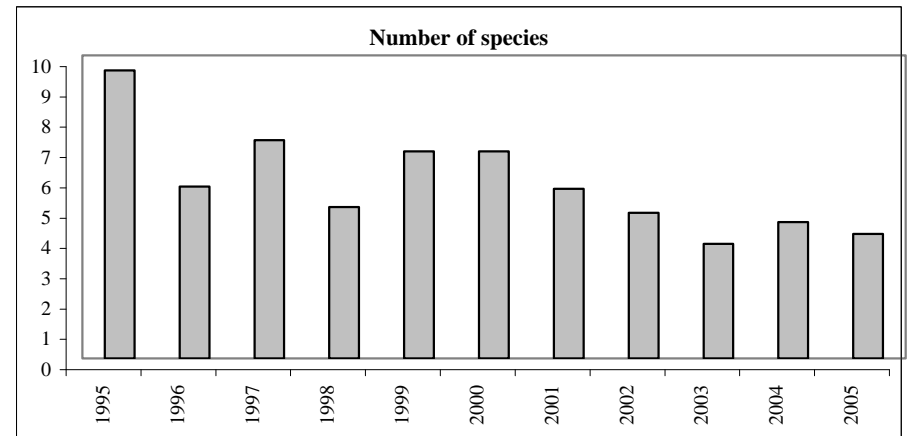
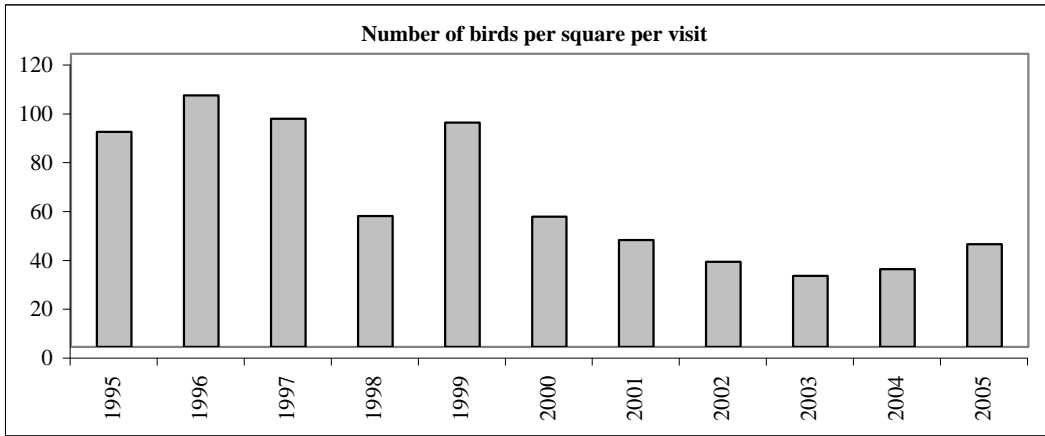
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				5	3	13	7	6	6	3	13	7.0	4.0
CAI								7	25	8	13	13.3	8.3
DRA	45	80	120	69	213	126		67	14	72		89.6	57.6
GLE								32	8	2	2	11.0	14.3
HIL													
MOO							0	23	3	12	9	9.4	9.0
NOR			90	62	43	36		39		22	100	56.0	29.3
POR	131	226	177	132	211	95	105	57	67	93	95	126.3	56.2
ROT			80		80	49	101	60	58	47	88	70.4	19.6
SNO		3	0	0	1	1	6	3	3	5	0	2.2	2.1
SOU								54	78	54	58	61.0	11.5
WYT													
Average	88.0	103.0	93.4	53.6	91.8	53.3	43.8	34.8	29.1	31.8	42.0	44.6	
Std. dev.	60.8	113.3	64.4	54.1	97.5	48.4	54.1	24.3	30.1	32.6	42.8		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				2	2	6	4	3	2	3	4	3.3	1.4
CAI								3	5	2	3	3.3	1.3
DRA	9	9	12	9	9	11		11	5	11		9.6	2.1
GLE								2	2	2	1	1.8	0.5
HIL													
MOO							0	1	2	2	1	1.2	0.8
NOR			8	7	9	6		9		5	12	8.0	2.3
POR	10	7	9	7	9	8	9	8	8	10	8	8.5	1.0
ROT			7		11	9	13	5	4	5	4	7.3	3.4
SNO		1	0	0	1	1	2	2	2	1	0	1.0	0.8
SOU								4	4	4	4	4.0	0.0
WYT													
Average	9.5	5.7	7.2	5.0	6.8	6.8	5.6	4.8	3.8	4.5	4.1	4.8	
Std. dev.	0.7	4.2	4.4	3.8	4.2	3.4	5.3	3.4	2.0	3.4	3.8		

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Breeding Birds Survey - All species

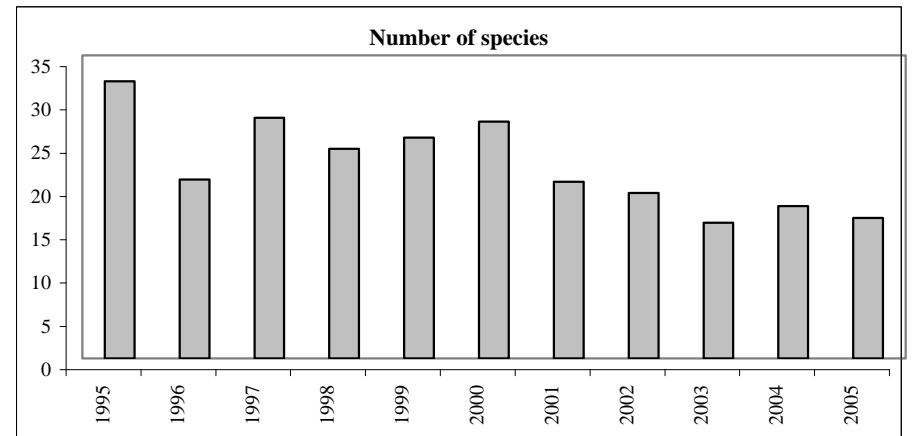
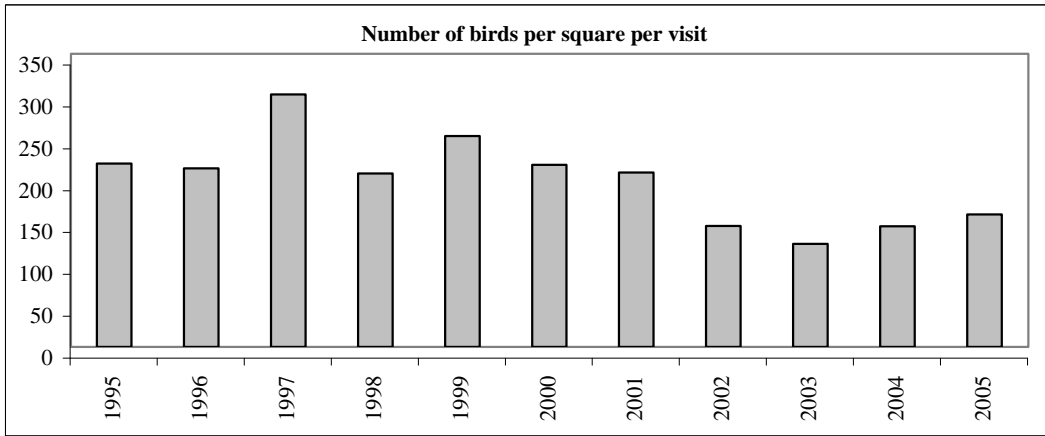
Number of birds

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				187	166	203	203	158	121	150	127	164.4	31.7
CAI								151	168	129	140	147.0	16.6
DRA	184	219	235	172	391	248		139	76	201		207.2	86.6
GLE								92	89	99	74	88.5	10.5
HIL													
MOO							24	95	49	46	54	53.6	25.8
NOR			376	358	243	193		174		135	279	251.1	91.9
POR	254	354	316	245	385	226	187	172	161	194	215	246.3	75.0
ROT			526		242	351	491	209	168	270	312	321.1	129.1
SNO		67	54	74	83	83	136	133	102	79	85	89.6	26.7
SOU								121	175	137	137	142.5	22.9
WYT													
Average	219.0	213.3	301.4	207.2	251.7	217.3	208.2	144.4	123.2	144.0	158.1	171.1	
Std. dev.	49.5	143.6	174.5	104.4	121.0	86.9	172.9	36.4	46.7	64.9	91.2		

Number of species

Site	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI				23	21	27	20	22	17	17	19	20.8	3.3
CAI								24	21	21	19	21.3	2.1
DRA	25	28	34	31	27	32		28	25	34		29.3	3.5
GLE								7	8	11	9	8.8	1.7
HIL													
MOO							4	8	9	8	5	6.8	2.2
NOR			34	34	31	31		36		24	38	32.6	4.5
POR	39	29	33	29	37	32	27	26	26	27	24	29.9	4.8
ROT			32		31	36	43	20	15	18	16	26.4	10.5
SNO		5	6	4	6	6	8	10	8	5	4	6.2	1.9
SOU								10	12	11	12	11.3	1.0
WYT													
Average	32.0	20.7	27.8	24.2	25.5	27.3	20.4	19.1	15.7	17.6	16.2	19.3	
Std. dev.	9.9	13.6	12.2	12.0	10.9	10.8	15.6	9.9	7.1	9.1	10.6		

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7.2 Bats

Bats are known to be sensitive to changes in the environment, their numbers having declined significantly during the present century through a combination of loss of habitats, roost sites and food supply, and by increased frequency of disturbance. Bats are therefore believed to be useful indicators of environmental change.

The method used by ECN is based on that used in the Bats and Habitats Survey organised by Professor S. Harris and colleagues at the University of Bristol for the Joint Nature Conservation Committee. It uses a tunable ultrasonic bat detector to record bats in 1 km squares, noting the positions along a pre-determined transect of all bats seen or heard. Habitat features along the transect, and changes in those features, are also recorded using a standard list.

Bats

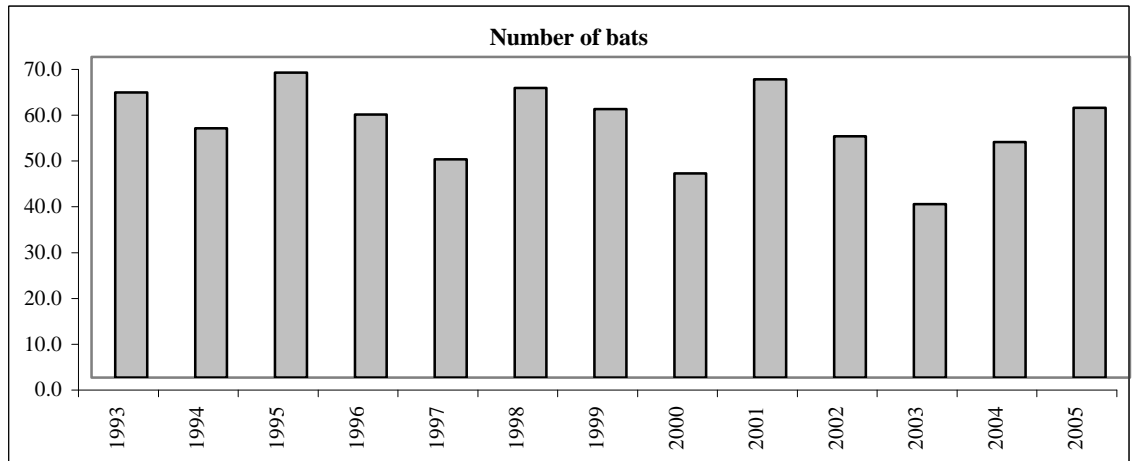
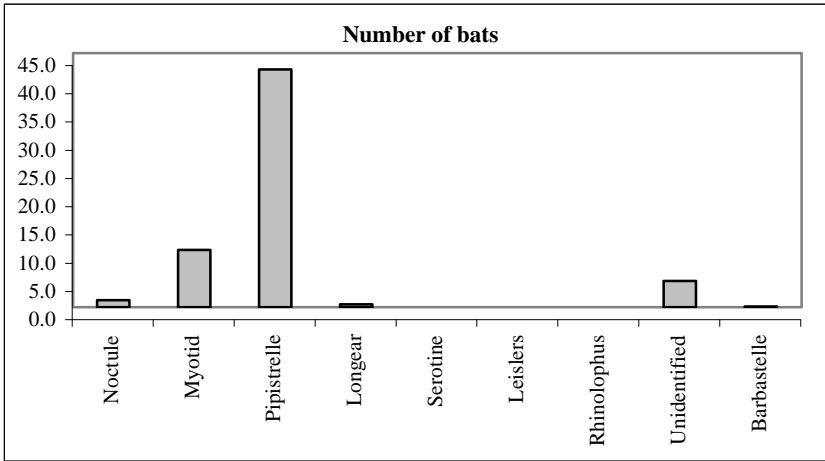
Number of bats in 2005

Site	Noctule	Myotis	Pipistrelle	Longear	Serotine	Leislars	Rhinolophus	Unidentified	Barbastelle	Average	Std. dev.
ALI	4	0	75	0	0	0	0	0	0	8.8	8.8
CAI											
DRA											
GLE	0	9	71	0	0	0	0	1	0	9.0	9.0
HIL											
MOO	0	0	0	0	0	0	0	1	0	0.1	0.1
NOR	4	24	114	2	0	0	0	16	1	17.9	17.9
POR	0	1	6	0	0	0	0	0	0	0.8	0.8
ROT											
SNO	0	2	3	0	0	0	0	0	0	0.6	0.6
SOU	0	0	24	0	0	0	0	0	0	2.7	2.7
WYT	2	45	44	2	0	0	0	19	0	12.4	12.4
Average	1.3	10.1	42.1	0.5	0.0	0.0	0.0	4.6	0.1	6.5	
Std. dev.	1.8	16.3	41.4	0.9	0.0	0.0	0.0	8.0	0.4		

Number of bats (all species)

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		39	30			10	33	49	64	51	45	79	79	47.9	21.8
CAI															
DRA	30	38	15	22	21	24	5	17	15		42	23		22.9	10.6
GLE		158	139	161	102		90	81	51	53	48	72	81	94.2	41.4
HIL		72	243	135	111	302	247	56	325	119				178.9	101.2
MOO	1	6	9	0	0	5	3	2	3	0	13	1	1	3.4	3.9
NOR	105	125	79	93	101	101	84	112		124	74	106	161	105.4	23.7
POR		3	1	0	0	0	12	8	11	0	0	5	7	3.9	4.6
ROT															
SNO				5	12	21	34	5	21	16	10	8	5	13.7	9.4
SOU		10	13	61	39	51	29	52	28	30	27	45	24	34.1	15.8
WYT	113	39	70	40	43	55	49	64	68	81	82	124	113	72.4	29.0
Average	62.3	54.4	66.6	57.4	47.7	63.2	58.6	44.6	65.1	52.7	37.9	51.4	58.9	57.7	
Std. dev.	55.4	54.5	79.9	60.1	45.3	95.0	72.6	36.4	100.2	47.0	28.2	45.9	59.1		

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7.3 Herbivores

Rabbits and deer (red and roe) are the most common wild herbivores in the United Kingdom where they have a considerable effect on vegetation structure and on plant diversity over very large areas of both grassland and woodland. There are several examples of ecosystems in which these animals are the principal determinants of plant composition and structure, and therefore of habitat for other organisms. Whilst it is important to know whether numbers of either or both of these herbivores have changed appreciably, there are no practicable methods of making direct measures of their population size, and an index method based on dropping counts is therefore used to estimate relative abundance. This recording method is expected to detect changes similar to those that have occurred in the past, such as the dramatic fall and slow recovery of rabbit numbers following the introduction of myxomatosis.

In late March, and again in late September, droppings are counted along pre-determined transects to record the relative abundance of rabbits (and deer if common). The transects are divided into sections based on discrete habitat types or on subdivisions of the same habitat which are being managed differently. All droppings within 1 m of the transects on both sides are cleared two weeks before recording is to take place. At the time of recording the transects are walked again and droppings within the cleared zone are counted and recorded. Separate records are kept for each section of each transect.

The original ECN protocol for monitoring rabbits specified twice yearly counts on 25 randomly selected plots but was found to be very labour intensive and producing little data. It was changed during 1993 to the protocol described above, based on counts along a specified transect, divided into sections and chosen to pass through a variety of habitats.

Dropping counts for deer were introduced in 1994 using the same transects as for rabbits.

Herbivores - Rabbits and Deer

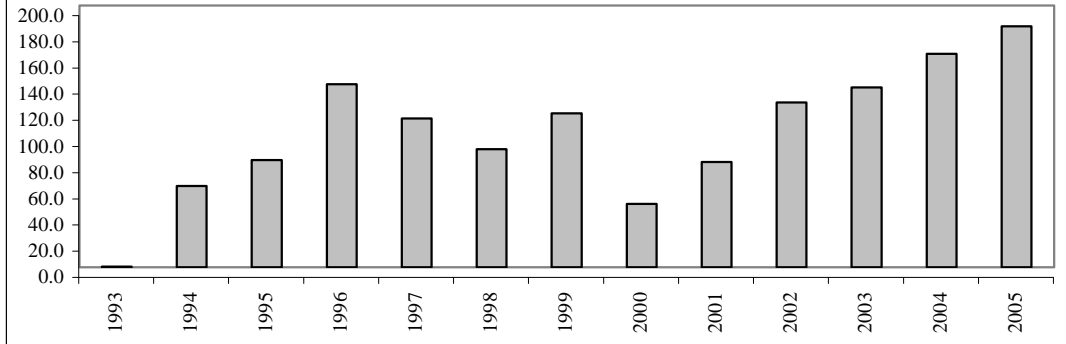
Rabbits - average droppings per transect section

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		0.0	32.0			0.0	0.2	2.5	0.0	0.0	0.0	0.0	0.0	3.5	10.1
CAI															
DRA		53.1	65.8	156.3	174.7	16.9	22.9	48.9	33.2	25.1	27.6	25.3	31.0	56.7	52.9
GLE															
HIL			104.9	46.8	19.7	31.0	87.4	41.2	14.8	17.8	22.7		7.3	39.4	32.5
MOO		6.2	0.0	2.7	0.2	4.1	36.1	73.0	48.2	162.5	427.5	364.5	942.3	172.3	283.3
NOR		0.6	0.7	0.3	0.3	0.0	0.0	0.0		0.0	0.0	0.0	1.6	0.3	0.5
POR		342.9	388.1	723.8	495.5	634.0	778.1	211.4	430.2	748.9	499.3	679.7	429.7	530.1	180.7
ROT		31.6	64.1	50.0	104.9	34.9	15.2	9.9	13.3	21.2	118.0	40.4	37.2	45.1	34.9
SNO															
SOU	0.5														
WYT		0.0	0.0	0.0	0.3	0.0	0.2	0.2	22.9	31.2	4.5	32.3	24.0	9.6	13.6
Average	0.5	62.0	82.0	140.0	113.7	90.1	117.5	48.4	80.4	125.8	137.4	163.2	184.1	107.1	
Std. dev.		125.5	129.5	263.3	181.2	220.2	268.5	71.2	155.0	257.2	205.7	262.0	339.0		

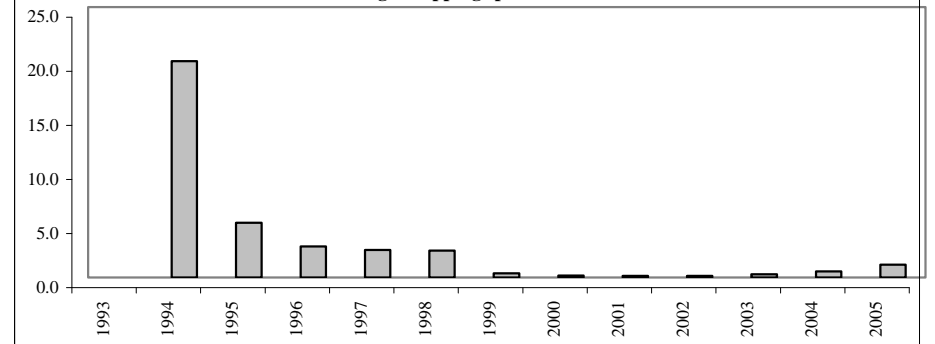
Deer - average droppings per transect section

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI		85.7	4.8			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
CAI															
DRA		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1	4.0	0.6	1.3
GLE															
HIL															
MOO															
NOR		14.2	17.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1.3	2.9	6.3	
POR		0.1	0.0	9.3	5.1	7.5	2.0	0.2	0.0	0.1	0.1	0.7	0.6	2.1	3.3
ROT															
SNO															
SOU															
WYT		0.0	3.5	2.2	5.1	5.0	0.0	0.7	0.6	0.7	0.0	0.0	0.0	1.5	2.0
Average		20.0	5.1	2.9	2.6	2.5	0.4	0.2	0.2	0.2	0.3	0.6	1.2	1.8	
Std. dev.		37.2	7.0	4.4	3.0	3.5	0.9	0.3	0.3	0.3	0.6	0.9	1.7		

Rabbits - average droppings per transect section



Deer - average droppings per transect section



7.4 Frogs

The common frog (*Rana temporaria*) has been selected for inclusion in the ECN programme as an example of a ubiquitous predatory amphibian. Adult frogs feed mainly on insects, slugs and snails but also eat woodlice and the larvae of moths and butterflies. During the breeding season, frogs live in shallow ponds and ditches, but spend much time on land during the rest of the year. The frog population is therefore affected by conditions on land as well as in the shallow water bodies in which they breed. The changing status of frogs and other amphibians in Britain has been studied and reported; populations have decreased, particularly during the 1960s, as a result of agricultural drainage, modification of breeding sites, and pollution by fertilizers and from other sources.

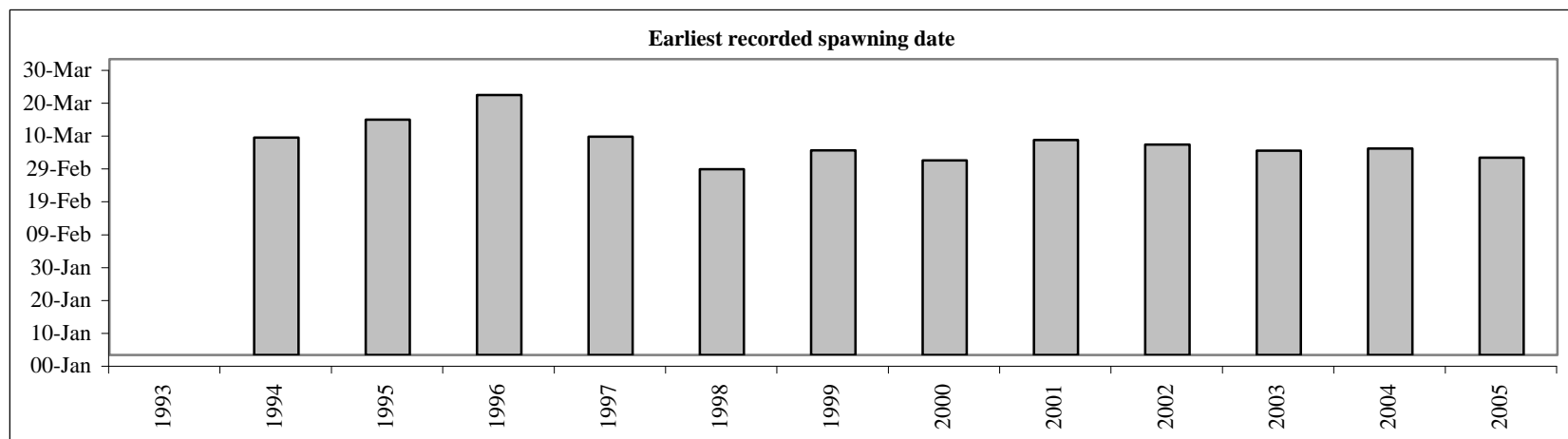
The time at which frog breeding starts in the UK varies greatly; in some years it may begin during December in Cornwall whilst not starting until April at high altitudes in the Pennines and in Scotland. In a particular pond, however, annual variation in the date of spawning tends to be rather small. Recorders check ponds weekly from about 1st January, or from an earlier or later date where local knowledge is available, to ascertain and record the date on which male frogs congregate in the spawning areas and begin calling. Thereafter the ponds are, if possible, visited daily until the first eggs have hatched. At sites where daily visits are impossible, because of time and distance constraints, visits are made as often as possible, with a minimum of weekly visits, until the first eggs have hatched. A record is made of the date on which spawn is first seen, and the date on which embryos are first seen to have hatched from the eggs is recorded. Once embryos have started to hatch, weekly visits and recording are sufficient and continue until newly metamorphosed frogs are seen leaving the pond, or for a period of 16 weeks from the time when spawn was first observed, whichever is the shorter. Monitoring of frogs was introduced at ECN sites in 1994.

Frogs

Earliest recorded spawning date

Site	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average	Std. dev.
ALI			15-Mar	01-Apr	09-Mar	06-Mar	18-Mar							16-Mar	10.1
CAI															
DRA		03-Mar	02-Mar	07-Mar	13-Mar	25-Feb	07-Mar	06-Mar	08-Mar		24-Feb	20-Feb	24-Feb	02-Mar	6.9
GLE		21-Mar	02-Apr	01-Apr	16-Mar	19-Mar	14-Mar	10-Mar	01-Apr	06-Mar	04-Mar	15-Mar	15-Mar	18-Mar	9.9
HIL		04-Mar	14-Mar	13-Mar	09-Mar	25-Feb	23-Feb	28-Feb	08-Mar	27-Feb	28-Feb			03-Mar	7.2
MOO		12-Apr	11-Apr	24-Apr	25-Mar	10-Mar	30-Mar			26-Mar	01-Apr	31-Mar	22-Mar	31-Mar	12.6
NOR		22-Jan	25-Jan	22-Jan	05-Feb	13-Jan	19-Jan	29-Jan	23-Jan	28-Jan	20-Jan	20-Jan	13-Jan	22-Jan	6.5
POR															
ROT		02-Mar	10-Mar	25-Mar	29-Feb	03-Mar	01-Mar	10-Mar	16-Mar	28-Mar	21-Mar			11-Mar	10.4
SNO				27-Mar	03-Mar	18-Feb	24-Feb	01-Mar		27-Feb	04-Mar	17-Mar	15-Mar	05-Mar	12.0
SOU															
WYT		08-Mar													
Average		06-Mar	11-Mar	19-Mar	06-Mar	25-Feb	02-Mar	28-Feb	05-Mar	04-Mar	02-Mar	02-Mar	29-Feb	06-Mar	
Std. dev.		24.4	24.7	27.2	14.5	19.9	21.3	15.5	25.6	22.1	22.7	27.9	28.1		

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8. References

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