

DF

The

# Centre for Ecology & Hydrology

Annual Report  
1998 - 1999



**Centre for  
Ecology &  
Hydrology**

Natural Environment Research Council

# FOREWORD

One of the features of the past year has been the scale of natural disasters. On a global scale, the news during the summer was dominated by immense earthquakes in Turkey, Greece and, more latterly, Taiwan, with their resulting destruction and loss of life. The hurricane season has begun with destructive hurricanes hitting the coasts of the Caribbean and SE USA. Massive flooding has occurred in China, Mexico and Bangladesh, and at a more local scale in the UK we saw the sudden spring floods causing disruption and significant damage to property in various parts of the country.

NERC, with its impressive knowledge in the natural environmental sciences, is contributing to the study of such disasters and how we respond to them. This is exemplified in NERC's 1999 Strategic Plan, published during the summer, which sets out the Research Council's three strategic objectives for the next five years, namely:

- ◆ to enhance the excellence of the science base for the environment
- ◆ to focus NERC science on priority issues
- ◆ to put NERC science to work

Sir John Krebs, who retired in September 1999, has led NERC for the last five years. I am delighted to take over as Chief Executive and look forward to working with the NERC Centres and Surveys and also the UK academic community in developing and strengthening the UK capability in these exciting areas of science.

As Chairman of the Terrestrial and Freshwater Science and Technology Board for the past few years, I am familiar with the work of the Centre for Ecology and Hydrology. This has been a noteworthy year for CEH, with the Science and Management Audit in the spring of 1999, the retirement of the first Director, Professor Brian Wilkinson, and the appointment of the new Director, Professor Mike Roberts. I think that Brian Wilkinson did an excellent job in establishing CEH as a coherent and nationally-recognised organisation and in developing an integrated science programme that delivers high quality science in a very cost-effective way. I am confident that Mike Roberts will build on this foundation and that CEH will grow in strength and reputation over the coming years.

Such changes can be disruptive, so I am delighted to see that CEH scientists are contributing fully to the major environmental science challenges of the day. Output from CEH remains high, both in terms of peer-reviewed publications and of commissioned research. I am also pleased to see the level of collaboration between CEH scientists and universities, nationally and internationally.

This, the 1998/9 Annual Report of CEH, outlines some of the major changes that have taken place during the year and presents some of the scientific achievements for the year, together with information on administration and funding. I commend this report to you.

JOHN LAWTON



*Professor John Lawton  
Chief Executive,  
Natural Environment  
Research Council*



The

---

**Centre for  
Ecology &  
Hydrology**

---

Annual Report  
1998 - 1999

NATURAL ENVIRONMENT RESEARCH COUNCIL

©NERC COPYRIGHT 1999

THIS REPORT HAS BEEN PRINTED ON 50% TOTALLY CHLORINE FREE / 50% RECYCLED PAPER

GROWN FROM A SUSTAINABLE SOURCE.









# CONTENTS

CEH MISSION	4
FIRST YEAR REPORT OF THE CEH ADVISORY COMMITTEE	6
DIRECTOR'S INTRODUCTION	9
CEH SCIENCE PROGRAMME	15
INTEGRATING ACTIVITIES	37
MEASURING OUR PERFORMANCE	47
HIGHLIGHTS FROM THE INSTITUTES	54
FINANCE	76
STAFFING	81
APPENDICES	84

COMPONENT INSTITUTES OF CEH ARE:

- INSTITUTE OF FRESHWATER ECOLOGY (IFE)
- INSTITUTE OF HYDROLOGY (IH)
- INSTITUTE OF TERRESTRIAL ECOLOGY (ITE)
- INSTITUTE OF VIROLOGY & ENVIRONMENTAL MICROBIOLOGY (IVEM)

# THE CEH MISSION.....

TO ADVANCE THE SCIENCES OF ECOLOGY, ENVIRONMENTAL MICROBIOLOGY (INCLUDING VIROLOGY) AND HYDROLOGY THROUGH HIGH-QUALITY AND INTERNATIONALLY RECOGNISED RESEARCH LEADING TO A BETTER UNDERSTANDING AND QUANTIFICATION OF THE PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES RELATING TO LAND AND FRESHWATER AND LIVING ORGANISMS WITHIN THESE ENVIRONMENTS.

TO INVESTIGATE, THROUGH MONITORING AND MODELLING, NATURAL CHANGES IN THE ECOLOGICAL, MICROBIOLOGICAL AND HYDROLOGICAL ENVIRONMENTS, TO ASSESS BOTH PAST AND FUTURE CHANGES, AND TO PREDICT MAN'S IMPACT ON THESE ENVIRONMENTS.

TO SECURE, EXPAND AND PROVIDE ECOLOGICALLY AND HYDROLOGICALLY RELEVANT DATA TO FURTHER SCIENTIFIC RESEARCH AND PROVIDE THE BASIS FOR ADVICE ON ENVIRONMENTAL CONSERVATION AND SUSTAINABLE DEVELOPMENT TO GOVERNMENTS AND INDUSTRY.

TO PROMOTE THE USE OF THE CENTRE'S RESEARCH FACILITIES AND DATA, TO PROVIDE RESEARCH TRAINING OF THE HIGHEST QUALITY AND TO ENHANCE THE UNITED KINGDOM'S RESEARCH BASE, INDUSTRIAL COMPETITIVENESS AND QUALITY OF LIFE





## .....IS DELIVERED THROUGH:

- ◆ an international reputation for science of the highest quality
  - ◆ an holistic approach to the terrestrial and freshwater sciences
  - ◆ a regional network of UK laboratories
  - ◆ extensive publications in national and international journals
  - ◆ the maintenance of a high quality skills base
  - ◆ contributions to Foresight and NERC science strategies
  - ◆ the development and involvement in NERC Thematic Programmes
  - ◆ ten issue-based integrated Science Programmes
  - ◆ internal and external quality assurance procedures
  - ◆ joint research initiatives with HEIs
  - ◆ an extensive involvement in European science networks
  - ◆ participation in international science programmes
- ◆ an extensive range of laboratory and field facilities
  - ◆ long term monitoring of key ecological and hydrological sites
  - ◆ development of new instrumentation, methodologies and techniques
  - ◆ the management and analysis of long-term datasets
  - ◆ development of predictive models
  - ◆ ongoing integrated collaborative research projects
  - ◆ the development of internal scientific networks to address specific environmental issues
- ◆ management of two NERC Designated Data Centres
  - ◆ the management of national and international environmental monitoring programmes
  - ◆ wide dissemination of data in a user-friendly format
  - ◆ scientific research for government departments (both national and overseas)
  - ◆ contributions to government consultations on environmental policy
  - ◆ advice to statutory bodies
  - ◆ extensive involvement, with and contribution to, governmental and scientific committees (nationally and internationally)
  - ◆ undertaking collaborative projects with industry
- ◆ provision of a safe and healthy working environment for staff
  - ◆ hosting visiting workers from international research organisations
  - ◆ the supervision of joint studentships with UK universities
  - ◆ teaching in UK universities
  - ◆ holding scientific seminars and conferences
  - ◆ addressing environmental topics of national importance
  - ◆ establishing dialogue with industry and user groups
  - ◆ products being made commercially available
  - ◆ establishing joint venture and spin-off companies
  - ◆ producing a variety of publicity material
  - ◆ contributions to press, radio and television coverage of science
  - ◆ designated schools liaison officers

# ANNUAL REPORT OF THE CEH ADVISORY COMMITTEE

The CEH Advisory Committee was formed in the autumn of 1998 and I am pleased to present this first Annual Report. I would like to thank all Advisory Committee members for their attendance and input to the meetings, to the Directors of CEH and its Institutes for hosting our meetings, to the staff of CEH who have presented their science to us and, especially, Jane Metcalfe for arranging the meetings and providing secretarial support to the Committee.

The Advisory Committee comprises the Chairman and 13 members, who bring a wide range of skills and experience from their personal and professional backgrounds. Our remit is to advise the CEH Director on developing the vision and strategic priorities for CEH, on enhancing the profile of the Centre and on management policy.

The inaugural meeting was held on 15 December 1998 at the Institute of Hydrology, Wallingford. At this meeting, which was essentially an occasion for familiarisation, Committee members met the CEH Director, Professor Brian Wilkinson, and the CEH Institute Directors. The Terms of Reference were discussed and agreed and the Committee began to hear about some of the science conducted in the Institutes. At that time the Institute of Hydrology was in the middle of a substantial building programme. We look forward to another visit when there will be more opportunity to view the new and existing facilities and meet staff.

The Committee aims to visit the CEH sites on a rolling programme. Of three meetings planned in 1999, the first two were in March at the Institute of Terrestrial Ecology, Monks Wood and in July at the Institute of Freshwater Ecology, Windermere. The meetings now follow a regular pattern starting with an evening gathering at which there are scientific presentations from senior scientists in CEH. The formal meeting is held the following day, concluding with a tour of the site. Committee members have also started to present agenda items during the meetings, as well as CEH members. This model seems to be working well, producing active and informative discussions on how CEH can further develop its potential.

This has been a particularly significant year in the development of CEH, marked by several notable events. At the beginning of 1999 CEH underwent its first Science and Management Audit. With Dr Eileen Buttle, I met the SMA group on behalf of the Advisory Committee and discussed the role of this new Committee. It is to the credit of all CEH staff that the final SMA report was so positive, particularly on the quality of the science undertaken by the Centre. In March 1999 the first Director of CEH, Professor Brian Wilkinson, who established the Advisory Committee, retired and was succeeded by Professor Mike Roberts, Director of CEH's Institute of Terrestrial Ecology. Professor Roberts brings fresh ideas to the organisation, and has already presented some of his initial plans to the Committee.





In the light of the first three meetings, the Advisory Committee considers that its main role will be to develop the forward looking strategic vision for CEH and to provide an interface with the user community, academia and national and devolved administration. The breadth of work and the knowledge and enthusiasm of the scientists we have met so far have impressed us all. It is also stimulating to visit the sites of CEH and talk to individual scientists about their work and personal specialisations.

I feel that the changes and developments over the past year, and those that will continue into the next, will provide new opportunities for CEH and that the staff have the strength and calibre to rise to the challenges. We look forward to providing guidance over the coming year.

Earl of Cranbrook  
Chairman



*Earl of Cranbrook*

## CEH ADVISORY COMMITTEE MEMBERS

Dr Alan Apling	Head of Division, Science & Technical Policy Division, DETR
Professor Chris Arme	Department of Biological Sciences, Keele University
Mr Andrew Bennett	Chief Natural Resources Advisor, DfID
Dr Eileen Buttle	European Environment Agency
Dr Alan Cooper	School of Environmental Studies, University of Ulster
Professor David Cope	Director, Parliamentary Office of Science & Technology
Ms Julie Hill	Programme Advisor, The Green Alliance
Dr Paul Leinster	Director of Environmental Protection, Environment Agency
Dr Norman Lowe	Chief Scientist Environment, Hyder Utilities
Professor Chris Payne	Department of Horticulture & Landscape, University of Reading (formerly Chief Executive Horticulture Research International)
Dr Andrew Rushworth	Head of Agricultural & Biological Research Group, SERAD
Dr Mike Tricker	Director, Partnership & Innovation Directorate, NERC
Professor Roger Williams	Vice Chancellor, University of Reading
Professor Mike Roberts	Director, CEH
Dr Jane Metcalfe	Science Policy, CEH (Secretary to the Committee)







# CEH DIRECTOR'S INTRODUCTION



The staff of the Centre for Ecology and Hydrology continue to play a key role in support of NERC's position as the UK's leading body for research, survey, monitoring and training in the environmental sciences. This has been a very challenging year for CEH with many notable successes both at the scientific and personal level. The key events in the management calendar have been:

- ◆ Completion of the quinquennial NERC Science and Management Audit (SMA) chaired by Professor Paul Harvey (Oxford University).
- ◆ Development of the site rationalisation and staff restructuring (R&R) programme toward enhancing the well-found laboratories in CEH and creating opportunities for young scientists.
- ◆ Establishment of the CEH Advisory Committee with representatives from the user community, academia and research management sector. Three meetings have been held to date with Lord Cranbrook in the Chair.

Our vision is to maintain an international reputation for high-quality interdisciplinary research in the terrestrial and freshwater sciences and provide a valued service to a broad user community. Delivering the CEH Vision requires:

- ◆ A forward-looking science strategy
- ◆ Modern well-found laboratories
- ◆ Commitment to innovation and collaboration
- ◆ Effective technology transfer
- ◆ Efficient management and networking

## SCIENCE STRATEGY

Our Science Strategy has been designed to support the five key NERC environmental and natural resource issues (biodiversity, environmental risks and hazards, pollution and waste, global change, natural resource management). We have developed ten Science Programmes which define the framework for strategic research carried out by CEH for NERC and the user community. In 1998/99, the total published output from these Programmes increased by over 10%, to nearly 1500 items (including over 500 journal papers, 29 books and 461 contract reports). The Programmes are reviewed each year by independent Programme Review Groups (PRG's). Last year the PRG's considered that the Programmes were of "national or international standard and the commissioned research was meeting the requirements of the broad-based user community". The NERC Science and Management Audit Team was also "impressed by the quality of the research and the good academic and customer links forged by CEH". We recognise that the Science Programmes must continue to evolve. To this end we will incorporate the constructive comments from these independent assessors in a forthcoming review of our science strategy.

The CEH research portfolio also continues to respond to the changing requirements of the user community. In particular, this has involved a general increase in support for molecular ecology and large-scale processes in relation to climate change and land use change. There has been a decline in commissioned research support for biodiversity and freshwater resources. We foresee an expansion of research on biotechnology (particularly for scientific risk assessments), information technology (for predictive modelling and access to environmental data) and environmental engineering (particularly ecosystem management and restoration).



*Professor Mike Roberts,  
Director, CEH.*

## WELL-FOUND LABORATORIES

The NERC "Rationalisation and Restructuring Review" highlighted the need to enhance investment in the CEH sites in order to maintain the "well-found" laboratory status. Considerable progress has been made over the past year towards the modernisation of the research infrastructure in CEH:

- ◆ The extension at Wallingford which replaces temporary accommodation has been completed and was officially opened by Lord Sainsbury in September 1999.
- ◆ Plans to relocate the two CEH Dorset sites, Furzebrook and East Stoke, at the Winfrith Technology Centre have been approved. Refurbishment of an existing building to provide a modern laboratory will be completed in April 2000. An agreement has been reached with the Freshwater Biological Association (FBA) to retain access to research facilities on the River Frome.
- ◆ Discussions are underway with Lancaster University to move CEH's Merlewood Research Station to the campus. Integration with the highly graded Environmental Sciences capability at Lancaster would produce a major interdisciplinary research centre.
- ◆ The hydrological field stations at Plynlimon, Stirling and York have been closed. Day-to-day management of the long-term catchment monitoring at Plynlimon has been transferred to the Bangor Research Unit.
- ◆ Replacement of the original British Antarctic Survey Biological Sciences building at Monks Wood has been approved. Construction of an office block to house 25 staff is underway.
- ◆ CEH and FBA are considering options for refurbishing and extending the research laboratories at the Windermere site.
- ◆ Outline planning permission is being sought for extensions at the CEH sites at Institute of Virology and Environmental Microbiology (Oxford) and at Bush Estate (Edinburgh).

CEH has commissioned an independent review of the analytical chemistry facilities across the CEH sites. A strategy has been implemented to upgrade the facilities, to increase operational efficiency and provide greater access for research scientists. This strategy has been supported by an infrastructure grant from NERC to increase investment in modern analytical equipment. NERC and CEH have also funded a major upgrade of the Stable Isotope Facility at Merlewood. There is still much to do in modernising the laboratory infrastructure but progress has been excellent over the last year.



*Lord Sainsbury opening  
the new Wallingford  
extension.*





Construction  
at the  
Winfrith Site  
in Dorset.

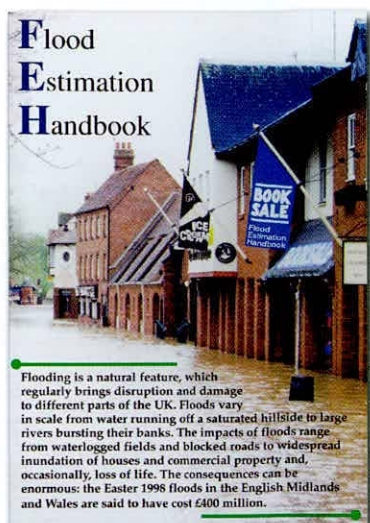
## INNOVATION & COLLABORATION

A major objective for CEH management has been to promote interdisciplinary research by forging new partnerships. Fifteen per cent of the Science Budget allocation has been ring-fenced in an Integrating Fund to support innovative projects across the component Institutes. The SMA Team commented on the success of this scheme and recommended continuation at the present level. Many of the projects have opened up new areas of research and created opportunities for interdisciplinary research supported by other funding sources.

CEH will continue to ring-fence resources to promote research with other Centre/Surveys, Institutes and universities. For example, CEH and the British Geological Survey support a joint project on surface hydrology and groundwater interactions. CEH and the Meteorological Office have just established a joint research centre for hydrology and meteorology. Bilateral projects with individual universities (such as the Oxford Centre for Environmental Biotechnology and the Aberdeen Molecular Ecology Initiative) have been very productive and will be extended. Links with European research organisations have expanded rapidly through strategic networks and success in the EU Framework programmes.

CEH has a well-established policy to promote interdisciplinary research through collaboration with the university sector. The success of this policy is reflected in the high co-authorship of journal publications with scientists outside CEH (over 30% of all papers). CEH staff currently supervise 20 sandwich students, 20 MSc students and over 100 postgraduate CASE students. Research collaboration has been enhanced by joint bids to the NERC Non-Thematic (Responsive Mode) Programme with university colleagues. Since CEH was granted access to Non-Thematic mode in 1996, staff have been involved in 15 successful proposals.

CEH management have used the NERC staff restructuring programme to rejuvenate the research capability in several areas. Resources released by the staff restructuring programme have been ring-fenced for a "new-blood" recruitment scheme. The objective is to create opportunities for young scientists to gain experience from working on projects which are of key importance to the CEH Science Programmes. We will continue to introduce new technology and expertise and provide incentives for retention of key staff.



*The Flood Estimation Handbook has been developed at IH and will be published in late 1999.*

## EFFECTIVE KNOWLEDGE TRANSFER

The main mechanisms of technology transfer are through the extensive portfolio of commissioned research projects, participation in NERC Industry-Link schemes and exploitation of intellectual property. The importance of CEH's capability to deliver independent and predictive science to government departments and the public has never been greater. Major developments in commissioned research have taken place in several areas of public concern:

- ◆ Flood risk estimation and flood forecasting (arising from concerns raised by severe floods over the past few years in the UK)
- ◆ Countryside surveys of land use change (arising from effects of agricultural intensification on landscapes and biodiversity)
- ◆ Risk assessment of genetically-modified crops (arising from the concerns about the effects of GM crops on biodiversity)
- ◆ Ecological effects of endocrine disruptors (arising from potential hormonal effects on fish populations).

CEH will continue independent research to inform government policy on natural resource management and environmental protection, and to increase public awareness of environmental issues.

Commercial activities are an important mechanism for realising the benefits of new intellectual property. CEH currently generates nearly 2% of the annual turnover from the sale/licensing of intellectual property and environmental information. CEH has formed the first spin-out company in NERC (Evolutec Ltd) to exploit the pharmaceutical properties of tick-saliva proteins. Other commercial activities with private sector partners/contractors include:

- ◆ Developing intellectual property through new research in environmental genomics, bioremediation and earth observation.
- ◆ Development of environmental monitoring instruments (such as weather stations, water quality monitors and biosensors).
- ◆ Development of software for commercial applications (such as flood forecasting, radiotracking software and environmental Decision-Support systems).

CEH will support NERC initiatives to increase exploitation through incentive schemes, seedcorn funding and professional advice on commercialisation and outsourcing.



## EFFICIENT MANAGEMENT & NETWORKING

CEH was established by NERC in 1994 to provide an interdisciplinary research centre for ecology, hydrology, virology and environmental microbiology. The four component Institutes had 630 staff at 12 sites and an annual turnover of £28M. By 1999, CEH had established a corporate identity, ten interdisciplinary science programmes and an Integrating Fund to promote collaborative research. In April 1999, the SMA team concluded further scientific integration should take place and a change to the management structure would enable this to occur. In June 1999, NERC Council supported a recommendation that CEH should move from the existing structure of four Institutes to a Centre of 9 Sites, each with its own Director.

As a result, the CEH and ITE Directorates will be merged to form a single Administration based at Monks Wood. Each site will be organised into discipline-based Divisions/Sections which will deliver research to the CEH strategic framework (see Appendices 8 & 9). Management of the Science Programmes will be strengthened. Networks will be established to improve communication between scientists and video-conferencing facilities will be introduced. A new Environmental Science and Policy Group will be established in the CEH Directorate to promote socio-economic and policy-driven research. CEH will strengthen its role in the co-ordination of research at the international level. CEH already plays a major role in the International Geosphere-Biosphere Programme and several other prestigious international programmes. The return of the UK to UNESCO will raise the profile of CEH research in support of sustainable development overseas.



*Members of the new  
CEH Management  
Committee.*

## STAFF DEVELOPMENTS & AWARDS

Professor Brian Wilkinson retired in 1999 after a distinguished career in hydrology and research management. As the first Director of CEH, he was largely responsible for creating the corporate identity and promoting interdisciplinary research. He led CEH through the Prior Options Review and secured resources for the subsequent rationalisation and restructuring programme.



*Sir James Smith, Chairman of  
NERC, presenting Brian Wilkinson  
(left) with a violin bow on his  
retirement.*

Professor Mike Harris (Banchory) also retired after a distinguished career in seabird ecology culminating in the award of the Tucker Medal in ornithology. Professor Ian Newton FRS received an OBE for services to avian science and was awarded an Emeritus Leverhulme Fellowship. These notable events, coupled with the numerous awards, prizes, professional fellowships and honorary university professorships reflect the high status of CEH scientists in the research community.



