

Annual Report
1993–1994



**Institute of
Terrestrial
Ecology**

Natural Environment Research Council

Foreword

The past year has been one of considerable change in the Natural Environment Research Council, both in the focus of its science and in its structures. The catalyst for these changes was the publication of the White Paper *Realising our potential: a strategy for science, engineering and technology* (Cm 2250). NERC was given a new mission for its science to embrace the concepts of meeting the needs of its user communities and contributing to wealth creation and the quality of life. We have, of course, always paid close attention to these objectives, but there is now a clear need for a sharper focus and better articulation of what we do in these areas. Basic science and long-term monitoring are also included in our mission, and due weight must be given to these when developing our science strategies.

The science directorates will cease to exist towards the end of 1994, and new structures will be put in place. TFSD Institutes are being regrouped as the Centre for Ecology and Hydrology, with a unified ITE under a single Director. However, the report of the Multi-Departmental Scrutiny of Public Sector Research Establishments is awaited, and decisions arising from this report may result in further organisational changes within NERC.

An important activity during the year has been the preparation of a new science and technology strategy for the terrestrial and freshwater sciences. Publication is expected in July, and a number of research areas will be identified for priority support over the next five years.

This is my second and final foreword. During my relatively short time with NERC, I have come to appreciate and value the breadth and strength of our work in the terrestrial, freshwater and hydrological sciences. Within ITE, for me, highlights of this year have been the report arising from Countryside Survey 1990 and the launch of the Land Cover Map. It is because of these, and very many other successes, that I am confident we can continue to produce high-quality and competitive science in the post-White Paper environment. Both ITE(North) and ITE(South) were visited by separate Science Management Audit Groups during the year. It is to the great credit of everyone involved in ITE that the reports of both groups recognised a continued advance in quality across the whole of the Institute over the five years since the previous visits.

Finally, I should like to state how much I have appreciated the friendships that I have established with so many members of our community. It is these that will be my most valued and lasting memories of NERC.

C Arme

*Director of Terrestrial and Freshwater Sciences
Natural Environment Research Council*

**Report of the
Institute of Terrestrial Ecology
1993–1994**

Natural Environment Research Council

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The ITE mission

The Institute of Terrestrial Ecology will develop long-term, multidisciplinary research and exploit new technology (molecular ecology, information technology, and modelling) to understand the science of the natural environment, with particular emphasis on terrestrial ecosystems

Priority is placed on developing and applying knowledge in the following areas

- the factors which determine the *composition, structure, and processes* of terrestrial ecosystems, and the *characteristics* of individual plant and animal species
- the dynamics of *interactions* between atmospheric processes, terrestrial ecosystems, soil properties and surface water quality
- the development of a sound scientific basis for *modelling and predicting* environmental trends arising from natural and man-made change
- the *dissemination* of this research to decision-makers, particularly those responsible for environmental protection, conservation, and the sustainable use of natural resources

The Institute will provide training of the highest quality, attract commissioned projects, and contribute to international programmes

By these means, ITE will seek to increase scientific knowledge and skills in terrestrial ecology, and contribute to national prosperity and quality of life

Introduction by Directors of ITE

In 1993–94, ITE has continued to pursue interdisciplinary 'directed-mode' research programmes supported by the Natural Environment Research Council in collaboration with other research institutes and the university sector. In addition, the portfolio of research contracted by ITE's broad user community is expanding (Figure 1). This period will be seen as one of change for the Institute, with a series of new initiatives, audits and reviews presenting a succession of challenges to both management and staff alike. The key events have been:

- the Government's White Paper *Realising our potential: a strategy for science, engineering and technology*, and the consequent restructuring of NERC;
- the NERC Science Management Audit (SMA) of ITE;
- the Office of Public Service and Sciences' Efficiency Scrutiny of Public Sector Research Establishments.

A great deal of effort has been devoted to coping with these activities whilst also

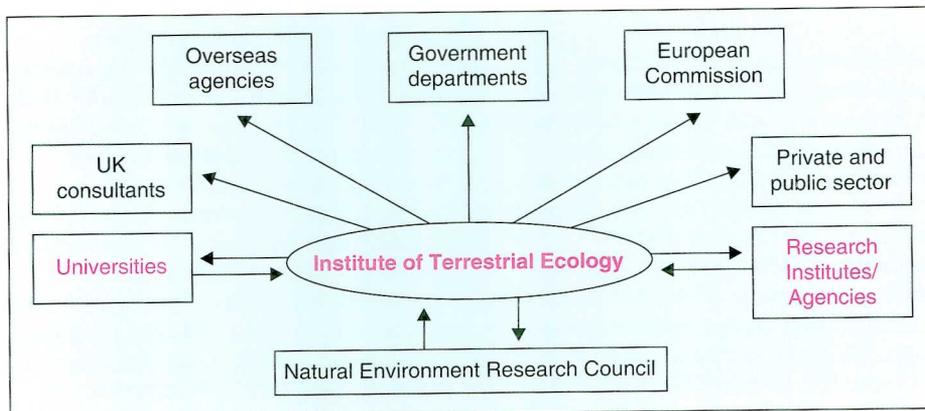


Figure 1. ITE research network



Plate 1. Prof Bill Heal, Director (North)

ensuring that the quality of scientific output has been sustained and the targets for commissioned research income achieved. That the performance indicators are improving is testament to the flexibility and resilience of all staff.

Opportunities for the environmental sciences are increasing as governments respond to the commitments made at the 1992 United Nations Conference on Environment and Development (the 'Earth Summit'). The European Community's Fifth Action Programme on the Environment and the British Government's Environment White Paper *This common inheritance* both give continued emphasis to the scientific basis for policy.

The global dimension

International environmental policies continue to be dominated by the UN

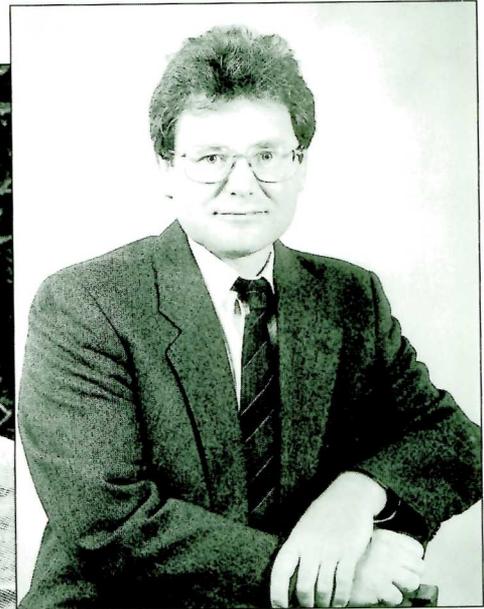


Plate 2. Prof Mike Roberts, Director (South)

Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, during 1992. The resulting Action Plan for 'Sustainable development into the 21st century (Agenda 21)' called for **'integration of environment and development which will lead to fulfilment of basic needs, improved living standards, better protection and management of ecosystems and a safer more prosperous future'**. The UK science base has an important role in the implementation of the UK Strategy for Sustainable Development (Plate 3). The Biodiversity Convention formulated at UNCED has resulted in the preparation of a UK Action Plan on Biodiversity. The UK Climate Change Programme also calls for the development of scientific understanding and consensus through the continuing deliberations of the Intergovernmental Panel on Climate Change (IPCC). The UK Programme on Sustainable Forestry (Plate 3) emphasises the significance of environmental objectives. UNCED also endorsed proposals to strengthen the World Health Organisation's International Programme on Chemical Safety (IPCS). Research on hazard assessment of chemicals will receive greater support at national level.

ITE research continues to support the development of global policies by providing data and information for major assessments of global environmental change. This support is facilitated through a variety of procedures:

- input to international scientific assessments, such as IPCC;

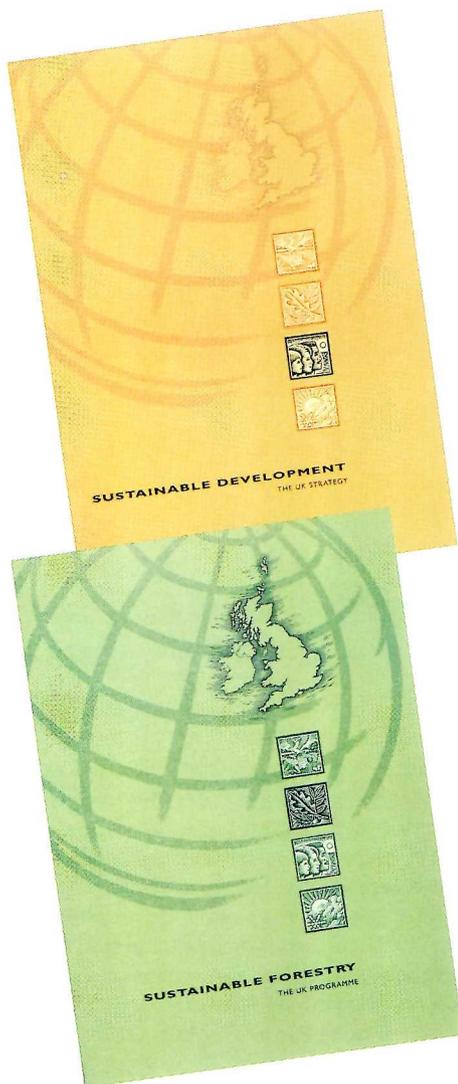


Plate 3. Two examples of UK research strategy documents

- incorporation of research into international programmes – for example, ITE research in the NERC Terrestrial Initiative on Global Environmental Research (TIGER) programme has been incorporated into the Global Change in Terrestrial Ecosystems (GCTE) project of the International Geosphere–Biosphere Programme (IGBP);
- research for implementing policies concerned with the protection and regeneration of tropical forests – in response to developments at UNCED, ITE has contributed to a NERC strategy for research on dryland degradation;
- technical contributions to co-ordination of international research – eg support for the UN Environment Programme (UNEP) Global Environment Monitoring System (GEMS).

- support technology transfer through national programmes – such as the Darwin Initiative.

The European dimension

The European Community programme 'Towards sustainability', accepted at the Edinburgh 'Summit' in late 1992, identified the main features of the Community's Fifth Action Programme on the Environment. The priority issues identified at the European scale were **climate change, air pollution and acidification, depletion of natural resources and biodiversity, pollution of water resources, deterioration of the urban environment and coastal zones, control of waste disposal**. ITE staff will continue to contribute to European research through the following mechanisms:

- participation in global change projects within the Environment Programme of the Fourth Research Framework (covering acid deposition, climate change impacts, land use change, biodiversity and coastal processes);
- collaborative research on climate change, biodiversity, land use change and ecotoxicology within CONNECT (European Conservation Institutes Research Network);
- technology transfer on regional development to eastern Europe through the PHARE (Assistance for Economic Restructuring in the Countries of Central and Eastern Europe) programme to promote environmental improvements;
- Europe-wide definition and mapping of 'critical loads' for acid pollutants under the auspices of the UN Economic Commission for Europe (UN-ECE);
- training of European scientists in terrestrial ecology through the 'Human capital and mobility' Programme.

In 1994, the European Union has established the European Environment Agency (EEA), with the aim of developing objective, reliable and comparable information to underpin environmental policies at the European level. Targets for the protection of nature and the maintenance of biodiversity, operating within a framework of broader countryside management policies, necessitate that, within the Agency's initial work programme, there will be research projects to address the complex issues of the countryside and nature conservation.

The primary goals for monitoring biodiversity at a European scale will include:

- developing databases on sites, habitats and species to support the successful implementation of the European Council's Habitats Directive and the development of the NATURA 2000 network of sites;
- developing a scientific methodology for monitoring the success of European legislation in meeting its targets for nature conservation and environmental deliverables from broader countryside management policies;
- facilitating research for predicting the consequences for biodiversity of policy measures and external environmental pressures, such as long-term climatic change;
- promoting the enhancement of nature conservation value in the wider countryside through programmes to monitor landscape change, and identify its causes, so as to inform policy-makers how they might effectively enhance features in the landscape of major importance for fauna and flora.

ITE has a long history of monitoring and research on the biodiversity of the United Kingdom, in collaboration with the Joint Nature Conservation Committee, the UK Government's scientific agency for the implementation of nature conservation policy. At the European level, ITE has played an important role in the CORINE (Co-ordinated Environmental Information in the European Community) programme for the establishment of a European environmental information system, and looks forward to contributing to UK participation in the EEA.

The UK dimension

The Third Year Report on *Britain's environmental strategy*, following progress since publication of the Environment White Paper in 1990, confirms the Government's commitment to maintaining a sound scientific basis for its policies. ITE's research input to Government departments and the CEC continues to be directed to the formulation and monitoring of environmental policies. Concern over the sources and levels of pollution, particularly atmospheric pollutants, has continued. The pollutants vary greatly from industrially derived trace gases, radionuclides, fertilizers, pesticides, and other organic

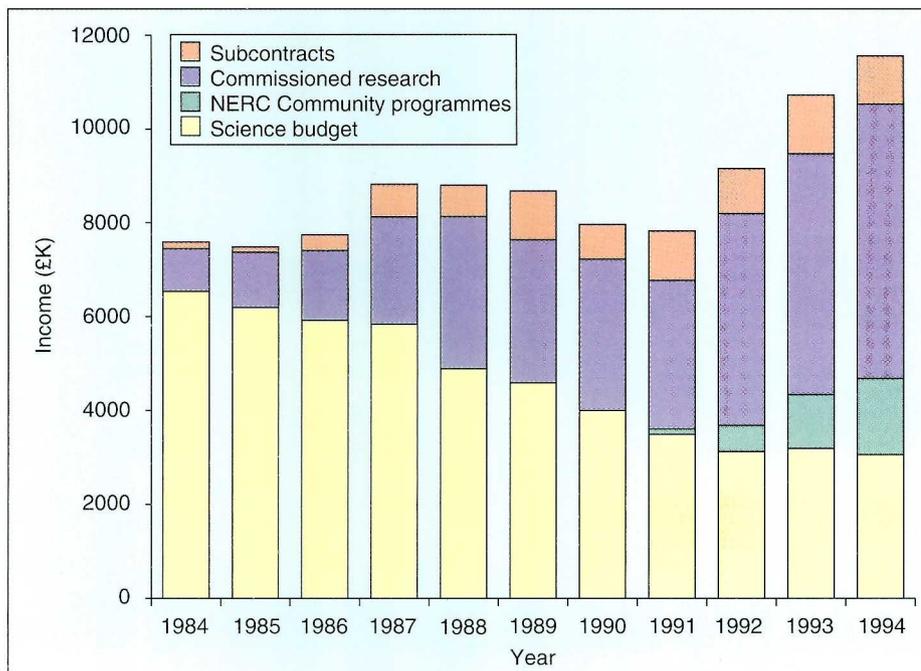


Figure 2. ITE trends in income (at constant prices – 1984–93 revalued to 1994 using Gross Domestic Product Indices)

compounds to derived products such as ozone and naturally produced gases such as methane and CO₂. Despite the variety, there are common features in the research required for policy-making. ITE contributes mainly to quantifying the natural source term and transport, deposition and toxicity of pollutants from various sources. This information helps to define acceptable levels in relation to sensitive conditions, areas or species. Policies such as Integrated Pollution Control require assessment of risk in relation to options and increasingly include locational information which benefits from the predictive capability of geographical information systems.

The industrial links complement ITE's traditional strengths in land use, forest science, environmental pollution and conservation (incorporating population and community ecology). Analysis of ITE expenditure over the last five years indicates the growth in global environmental change, land use research and environmental pollution at the expense of forest science and conservation ecology. The trends are largely driven by the changing priorities of the user communities and require close communication with the community leaders in order to identify research priorities and strategies.

In order to assist in the implementation of the UK Strategy for Sustainable Development, ITE scientists continue to

work alongside the business and regulatory sectors to:

- integrate national databases of environmental information and improve access to them;
- develop increasingly objective methods for defining the quality of the environment and for monitoring and detecting environmental change;
- enhance knowledge of the sensitivity of various organisms and habitats to

direct and indirect pressures that arise from natural causes or from human activity;

- increase our knowledge of the processes and mechanisms that lead to unexpected interactions between one pressure and another so as to improve prediction of future problems;
- attempt to reduce the adverse influence of scientific uncertainty on industrial and regulatory affairs by improving the ability to model complex environmental processes;
- provide the means by which environmental and ecological factors can be taken into account when assessing the options for economic development;
- identify management practices which ameliorate impacts or result in rehabilitation.

ITE performance in 1993–94

The financial position continues to improve due to stabilisation of the 'core' science budget at 30% of overall expenditure and an increase in support secured in open competition from NERC Community Programmes to 15% of the Institute's annual turnover (Figure 2). The remaining income is derived from an ever-increasing range of customers – ITE staff worked on over 150 contracts in the period of this Report (Figure 3). Over the

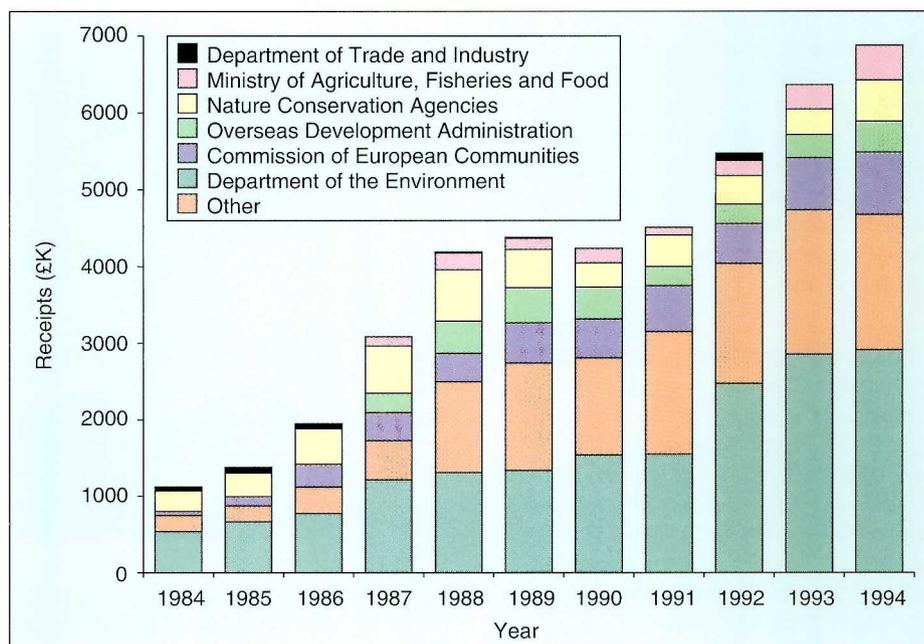


Figure 3. Long-term pattern of ITE receipts from major customers (at constant prices – 1984–93 revalued to 1994 using Gross Domestic Product Indices)

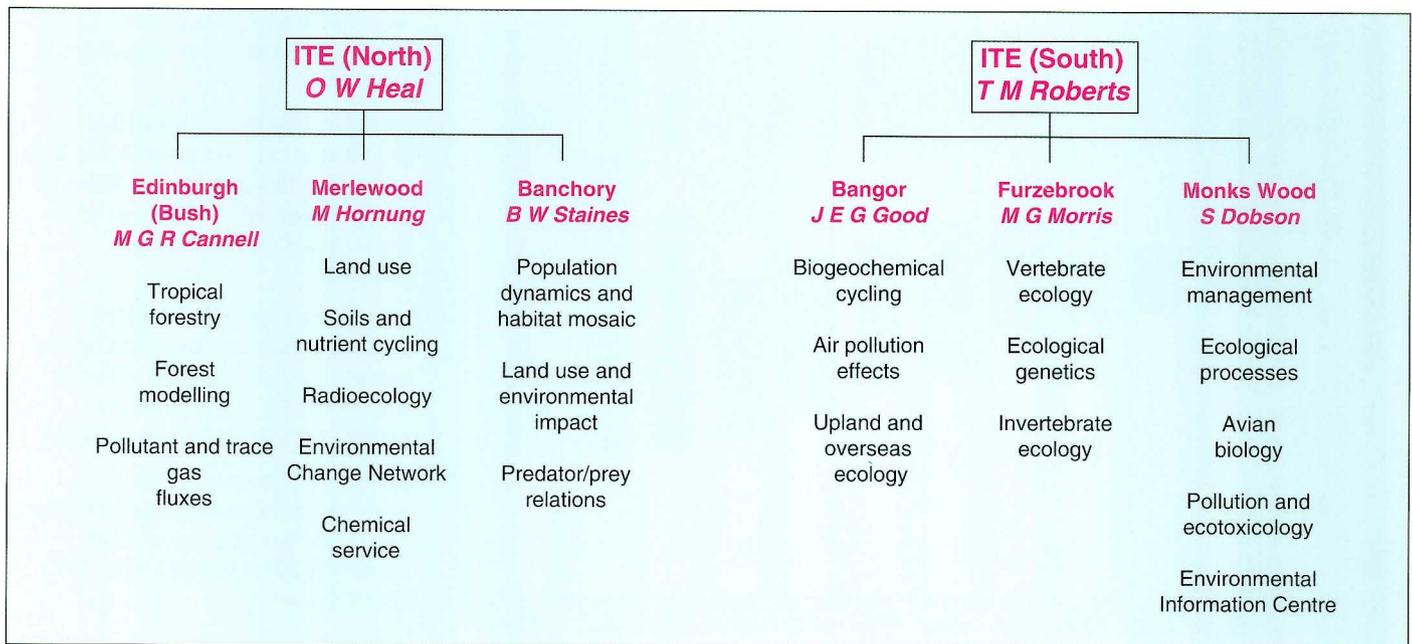


Figure 4. Current organisation within ITE

last five years, the major trend has been for increased contracts from the Department of Environment (DOE) as a wider range of environmental policies has required scientific underpinning (eg global environmental change; risk assessment for industrial chemicals and genetically modified organisms). More recently, there has been a growing demand from a number of departments and agencies for survey, monitoring and research on land use change.

A wide range of indicators is now used routinely to assess the performance of individual staff and the Institute as a whole. These include peer-review of new science projects, the ability to secure research support in open competition, 'value-for-money' in terms of publications, and quality assurance for commissioned research customers. These indicators are assessed regularly for each of the 20 scientific groups across the six ITE Stations (Figure 4).

The key output indicators – scientific publications and contract reports – continue to increase rapidly (Figure 5). Over 400 scientific papers were published in 1993–94 along with nearly 30 books. In addition, 200 contract reports were delivered to customers. The scientific output by ITE is making a substantial contribution to the overall output by NERC institutes.

The Science Management Audit of ITE, completed in early 1994, concluded that,

overall, staff had made considerable progress in meeting the strategic research objectives of the science programmes whilst delivering applied research to a broad user community. The SMA made a number of constructive recommendations to strengthen the management strategy:

- maintenance of a breadth of disciplines and flexibility to form interdisciplinary teams;
- retention of geographical distribution in order to provide a national capability, whilst exploiting regional

research and commission opportunities;

- accelerated utilisation of new technologies (particularly in information technology, molecular ecology and mathematical modelling);
- increased collaboration through larger UK contracts, CEC programmes and links to global environmental research;
- improved service to the science infrastructure by improved access to national databases and development of large-scale facilities;

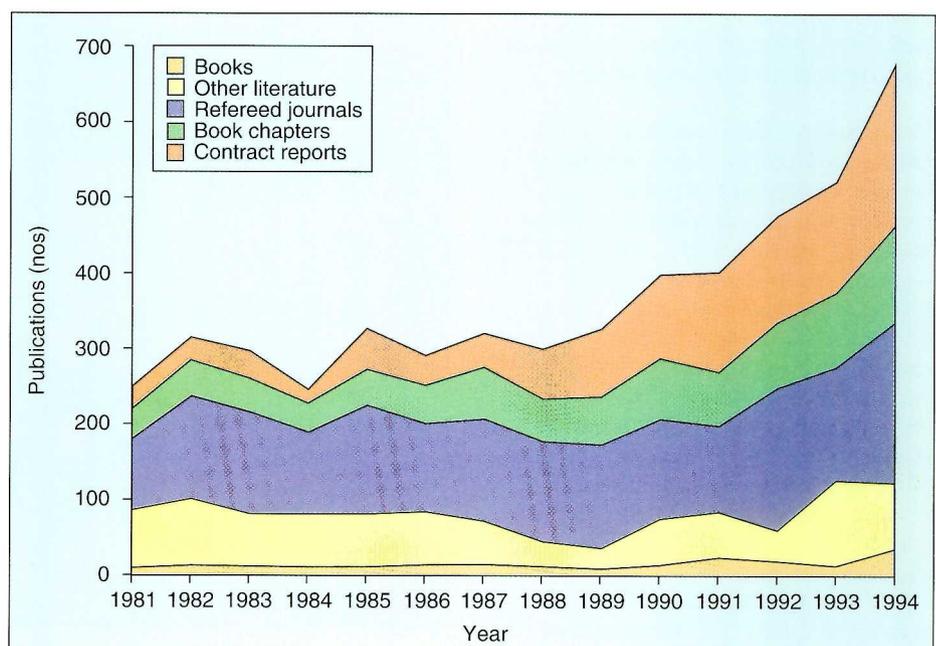


Figure 5. Trends in output of publications

- maintenance of strong links between strategic research projects and scientific requirements of Government policy,
- contribution to 'wealth creation' and 'quality of life' by collaborating with industry and commerce (including the rural as well as manufacturing industries)

The SMA also endorsed a series of underpinning research objectives within a hierarchy of scales from 'Genetic and molecular ecology' to 'Global environmental research'. The science budget 'core' funding is directed to programmes within this framework to provide underpinning research to meet the needs of the broad user community

Genetic and molecular ecology

- To quantify genetic variation in natural populations of selected plants and animals and its consequences
- To investigate mechanisms of population differentiation and speciation
- To develop and apply genetic markers to studies of breeding biology, dispersal, gene flow and population structure
- To apply the research to GMO risk assessment and conservation policy

Population ecology

- To elucidate the factors and processes (including the performance of the individual) that determine the distribution and abundance of organisms
- To develop methods to estimate relevant population parameters at different spatial and temporal scales
- To integrate data from intensive and extensive studies, where possible using existing ITE data sets, to seek relationships between functional types and population processes
- To test the predictions with field manipulations
- To use the knowledge gained to predict the impact on wildlife populations of environmental change (including climate change), and to underpin strategies for wildlife conservation and for the control of pest species

Community ecology

- To investigate mechanisms underlying pattern and process in biotic communities, including the development of models to describe species assembly, plant/animal interactions, co-evolutionary host/parasite systems, successional processes and determinants of biological diversity
- Based on this understanding, to develop and improve methods for community management, restoration and conservation for a broad user community in the conservation, consultancy and land use sector

Landscape ecology

- To integrate data, including land cover, climate and topographic features to predict species distribution, abundance and community structure
- To relate the dynamics of metapopulations and communities to landscape structure, including linear and fragmented features
- To identify mechanisms that enhance or limit spread of species (eg philopatry)
- To improve our ability to record (eg by remote sensing) and integrate (eg by GIS and data basing) environmental variables of relevance to landscape ecology
- To develop techniques for monitoring environmental effects of land use change
- To model the impacts of land use change on animal and plant populations and communities, and in particular towards the evolution of theory
- To develop techniques for environmental assessment of land use change for a broad user community

Critical loads/levels

- To monitor and determine the deposition, uptake and flux of gaseous pollutants and their impacts on key processes in terrestrial ecosystems
- To assess the sensitivity of ecosystem components to acidic pollutant impacts and exposure, and identify the consequences of any changes

- To determine the effects of interactions with other environmental factors
- To develop techniques for mapping the sensitivity of terrestrial ecosystems at the local, national and international scale
- Technology transfer to the industrial and regulatory sector using a variety of approaches including critical loads, monitoring, experimental manipulation, predictive modelling and the development of damage functions

Ecotoxicology

- To monitor the environmental trends in persistent pollutant residues and to quantify the transfer processes
- To study the bioavailability of organic and metal contaminants to a range of organisms
- To investigate biomarkers as a means of assessing exposure and predicting effects
- To integrate environmental toxicology with ecophysiology for studying a range of endpoints (mortality, sublethal effects on reproduction, growth, nutrition, etc)
- To relate the impacts of a pollutant on the individual to those at the population level
- To relate the results of field studies on population dynamics to laboratory and semi-field studies
- To evaluate the significance of interactive effects of pollutant mixtures
- To develop hazard and risk assessment methodologies that can be applied to sensitive species and habitats at the appropriate temporal and geographical scale for the regulatory and industrial sectors

Global environmental research

- To address issues concerning the impacts of change in climate, atmospheric composition and land use on biological diversity, and the vulnerability of fragile ecosystems
- Through the development of experimental facilities, specifically to study the effects of ozone depletion, loss of biodiversity through dryland degradation, and the effects of global environmental change on plant/soil interactions

- Through modelling, to integrate processes occurring at the individual, population, community and ecosystem (landscape) scale of organisation, and to integrate research effort in different disciplines (ecology, socioeconomics, hydrology and geology)
- To facilitate such integration through workshops, network participation, and dialogue between appropriate national Research Councils, overseas agencies and international organisations

Applications of ITE research in 1993–94

National Survey provides basis for Biodiversity Policy

With the support of DOE, ITE published the results of the 1990 Countryside Survey in 1993. This unique study combined the development of a national land cover map from remote sensing, with a stratified ecological survey of 500 × 1 km² squares across Britain. By reference to previous surveys in 1978 and 1984, the study showed a general reduction in botanical diversity across the countryside, particularly in hedgerows and lowland grassland species. The Secretary of State for the Environment has adopted this method as a national census of land use change (to be repeated in the year 2000). Although length and diversity in field boundaries have declined, they remain important reservoirs of semi-natural species. The results, widely available through a computerised information system, support DOE and other agencies targeting and monitoring policy incorporated in the UK Action Plan on Biodiversity.

The first digital Land Cover Map of Great Britain from remote sensing

In mid-1993, scientists in the Environmental Information Centre (EIC) at ITE Monks Wood published the first digital map of Great Britain's land cover. It was the first complete record of land cover since the 1960s. The Map was made by a semi-automated classification of 46 scenes of satellite data, collected by Landsat's Thematic Mapper sensor. By combining summer and winter data, seasonal characteristics of different types of vegetation were exploited to record the details of 25 cover types, on a 25 m grid, covering all of Great Britain.

The Land Cover Map of Great Britain has already found widespread use in areas of environmental monitoring, ecological research and development, pollution studies, environmental impact assessments, formulation of land use policy, and landscape planning and management. Users include Government departments, non-governmental research organisations, higher education establishments, the major utilities, industry and commerce.

Carbon map of Britain

The amount of carbon stored in vegetation and soils across Britain has been mapped for the first time. Collaborating with colleagues at the Soil Survey and Land Research Centre (SSLRC) and the Macaulay Land Use Research Institute (MLURI), ITE (with the support of DOE) has produced a unique national inventory of carbon storage across different land classes at a 10 km resolution.

Woodlands contain 80% of the total carbon in vegetation but occupy only 10% of the land area, and about half is stored by broadleaved tree species. Soils are by far the dominant carbon store in Britain, containing about 200 times more carbon than vegetation, 75% of which is in Scottish peats. The map will help to quantify the likely impact of land use management strategies to counteract the current increase in the atmospheric concentration of CO₂.

Genecological study prescribes policy on risk assessment of genetically modified organisms

Data on the distribution, breeding system and dispersal biology of the wild relatives of UK crop plants were integrated with recent developments in genetic transformation of crops to assess the likelihood of modified genes being transferred from genetically modified crops to wild species in the UK.

Categorisation of crops into three major groups differing in the probability of gene flow to wild relatives has underpinned the UK regulatory process. In its foreword to the report of the study, DOE states 'this report provided a significant proportion of the scientific rationale which allowed the Advisory Committee on Releases to the Environment to provide generic advice to the Secretary of State for the Environment for the new 'Fast-Track' Approval procedures (for certain GMO releases)'

Information technology underpins international agreement on acid pollution control

Following several years of work and discussions under the UN-ECE Convention on Long Range Trans-boundary Air Pollution, a new protocol has been signed by a number of countries, including the UK, which will reduce the emissions of sulphur across Europe. For the first time, an effects-based approach has been used to estimate reductions offering protection to sensitive parts of the environment (eg soils, freshwaters). Work in NERC institutes and universities has contributed significantly to the UK effort on this 'critical loads' approach.

UK maps of critical loads for acidity of soils have been collated by EIC from information supplied by SSLRC, MLURI, the University of Aberdeen and ITE. These data have been used in the European map of critical loads for acidity which has formed the basis for the new protocol. The UK has agreed to reduce its sulphur emissions by 70% in the year 2005 and by 80% in 2010.

The true absorption coefficient improves detection of radioactive contamination

In collaboration with MLURI, ITE has adapted a technique, previously used in agricultural research, to measure directly the absorption of radionuclides across the gut wall of ruminants. This technique has enabled us to show that the availability for adsorption of various forms of radiocaesium occurring in the environment differs substantially. For instance, radiocaesium adsorbed on to sediment particles in tide-washed pastures bordering the Irish Sea (derived from effluent from the Sellafield reprocessing plant) is less available for adsorption across the gut wall than radiocaesium from Chernobyl, which is incorporated into plant tissues. Estimating and quantifying bioavailability are major factors determining the degree of radioactive contamination of food products. The technique is now widely used in Europe to give a direct measure of adsorption of radionuclides.

Monoclonal antibodies enter the forest

As scavengers and releasers of soil nutrients, fungi are vital to the growth of plants. Below ground, many of the

The mission for the Natural Environment Research Council

To promote and support, by any means, high quality basic, strategic and applied research, survey, long-term environmental monitoring and related post-graduate training, in terrestrial, marine and freshwater biology and earth, atmospheric, hydrological, oceanographic and polar sciences and earth observation

To advance knowledge and technology, and to provide services and trained scientists and engineers which meet the need of users and beneficiaries, thereby contributing to the economic competitiveness of the UK, the effectiveness of public services and policy, and the quality of life

To provide advice, disseminate knowledge, and promote public understanding of the fields aforesaid

Figure 6 NERC mission statement

and policy NERC has since been restructured to deliver the new Mission, and ITE research has been reviewed with these objectives in mind As a result of the restructuring of NERC, ITE(North) and ITE(South) will be reunified as a single Institute The reunification coincides with the retirement of Prof Heal as Director (N), and Prof Roberts will take over responsibility for the whole Institute ITE now has an opportunity to redevelop the degree of integration of the science, facilities and organisation that are necessary to meet the long-term multidisciplinary needs of

decomposers grow as white, featureless mycelium so that individual species cannot be distinguished by their appearance A monoclonal antibody specific to the mycelium of such a decomposer, *Mycena galopus*, common in the temperate world, has been produced at the University of Essex and used successfully by ITE to identify and quantify the fungus in forest soil, revealing intriguing tree-related distribution patterns The technique, so far applied by pathologists rather than ecologists, has the advantage over DNA fingerprinting of speedier processing of large numbers of field samples

National response to environmental 'incidents'

In 1993-94, ITE was called upon to provide a response to a number of environmental 'disasters' These included the sea bird 'wreck' in the North Sea in early 1994, oil pollution from the *Braer* on Shetland, and investigations into toxic chemical pollution under the Control of Industrial Major Accident Hazards (CIMAH) regulations These incidents were unpredictable in both timing and location However, ITE's national coverage and breadth of environmental science provided the basis for a rapid and effective response

The changing priorities of NERC and ITE

The Government White Paper *Realising our potential a strategy for science, engineering and technology* confirmed that NERC is the lead organisation for research, survey and training related to the natural environment In addition, the new Mission Statement (Figure 6) strengthens NERC's commitment to promote research which contributes to the economic competitiveness of the UK and the effectiveness of public services

Collaborative research with universities through postdoctoral fellowships, CASE studentships or joint contracts	
UK universities	
Aberdeen	Liverpool John Moores University
Birmingham	London (Imperial College)
Bristol	London (Kings College)
Cambridge	London (Queen Mary/Westfield College)
Cranfield	London (University College)
Dundee	Manchester
Durham	Newcastle
East Anglia	Nottingham
Edinburgh	Open University
Essex	Oxford
Exeter	Reading
Hull	Sheffield
Kent	Southampton
Lancaster	Stirling
Leeds	Wales (Bangor)
Leicester	Wales (Cardiff)
Liverpool	York
Overseas universities	
Belgium	Italy
Katholieke Universiteit Leuven	Siena
Liege	Netherlands
China	Groningen
Shijiazhuang	Vrije Universiteit Amsterdam
Czech Republic	Norway
University of Agriculture, Brno	Agricultural University
Denmark	Poland
Copenhagen	Katowice
Eire	Russia
Dublin	Institute of Agricultural Radioecology
France	South Africa
Grenoble	Stellenbosch
Universite Louis Pasteur, Strasbourg	Spain
Universite Pierre et Marie Curie, Paris	Barcelona
Germany	Universitat Autonoma de Barcelona
Bayreuth	Sweden
Georg-August-Universitat Gottingen	University of Agricultural Sciences, Uppsala
Heidelberg	USA
Hohenheim	State University Colorado
Johann Wolfgang Goethe-Universitat	Zimbabwe
Justus-Liebig-Universitat, Giessen	University of Zimbabwe
Ulm	
Greece	
Aristotelian University of Thessaloniki	
Ioannina	

Figure 7 University collaboration

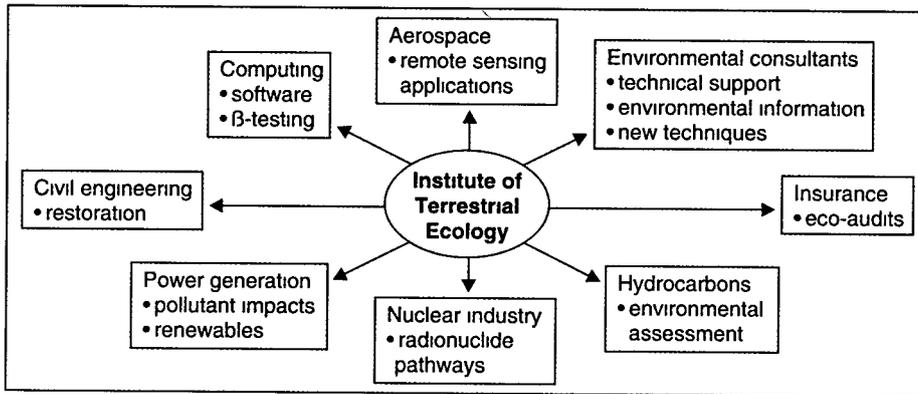


Figure 8 ITE partners with industry

modern ecology. The reunified Institute will be grouped within the Centre for Ecology and Hydrology (CEH) led by Prof Brian Wilkinson, which also incorporates the Institute of Freshwater Ecology, the Institute of Hydrology and the Institute of Virology and Environmental Microbiology. CEH will seek to promote interdisciplinary research, particularly at the interface between the constituent Institutes, and build on the extensive collaboration with the universities (Figure 7).

NERC has produced its *Strategy for terrestrial and freshwater science and technology 1994–2000*, which takes up the challenges of the Government's Environment White Paper to strengthen the relevance of research to the broad user community whilst continuing to support research of the highest quality. New initiatives are proposed in the areas of **sustainable land and water use, biological diversity, environmental quality and global environmental change**.

Central to this new Strategy are the NERC commitments to long-term monitoring and development of national databases. The new emphasis on 'long-term monitoring' recognises the importance of ITE activities in this area (eg Environmental Change Network, Land Cover Mapping, Countryside Surveys and Biological Records Centre). The transfer of responsibility for earth observation from the former Science and Engineering Research Council to NERC will create new opportunities for the application of remote sensing to ecological research. The 'critical mass' of remote sensing scientists in NERC's Remote Sensing Applications Development Unit and in ITE's Environmental Information Centre (EIC) – both based at Monks Wood – will be an important focus for new initiatives.

National databases, including those in EIC's Biological Records Centre, the GB Land Cover Map, the Countryside Information System, the national critical loads database and CORINE are essential, not only to define environmental characteristics and as resource

inventories, but also as a baseline against which to monitor the effectiveness of policies. These databases underpin ITE's capability to address land use issues nationally. Increasingly, the need is for integration across disciplines and across different spatial scales. An important feature of ITE policy in this area is to collaborate with other institutions, both within and outside NERC, in establishing information networks which will allow reciprocal access to environmental databases and provide a common vehicle for analysis.

Central to NERC's Mission is the imperative to harness the nation's strength in environmental science for the creation of wealth by bringing the science into closer and more systematic contact with those responsible for industrial and commercial decisions. ITE science makes a direct contribution to wealth creation through

- the development of commercial products and technologies, and
- the efficient exploitation and management of natural resources

This scientific expertise also contributes to wealth preservation by reducing the cost of commercial operations, through minimising the impact of natural hazards and developing good environmental policies and risk assessment procedures.

ITE has significant direct and indirect links with industry (Figures 8 & 9) which will be promoted in the following ways

Training

- Joint studentships with the academic, institute and industry sectors
- Staff mobility and interchange

Pre-competitive research

- Databases for exploitation
- Software for environmental applications
- Analytical techniques
- Molecular genetics

Technology transfer

- Information technology
- Analytical chemistry
- Environmental assessment procedures

User community in the industrial/consultancy sector	
Applied Environmental Research Consultants	Laing
ASH Consultancy	Mott Macdonald
Balmoral Estate	MRM Partnership
Binnie and Partners (Consulting Engineers)	National Power
Biotrack	National Power
Blond Trust	Nevis Range
British Coal	Nuclear Electric
British Gas	Peida
BP Exploration	PowerGen
Esso	Royal Society for the Protection of Birds
Forest Industry Committee of GB	Rutland Group
Forest Research Institute, Ghana	Scottish Forestry Trust
Game Conservancy	Shell
Gould Rural Environment	Travers Morgan
Greenpeace Environmental Trust	World Wide Fund for Nature
International Forestry Services	

Figure 9 ITE industrial customers in 1993–94



Plate 4. The Rt Hon John Major is welcomed to ITE Monks Wood by the Director (Prof Mike Roberts) and the Head of Station (Dr Stuart Dobson)

Development and application

- β -testing for new technology (eg geographical information systems)
- Enhancing market awareness (applications of remote sensing)
- Providing technical support for international marketing of UK companies
- Development of products to application stage (eg software products, Land Cover Map).

Personal achievements

Prof Mike Morris retired as Head of Furzebrook Research Station at the end of April 1994, after a long career in the Nature Conservancy and ITE. He will continue his responsibilities as secretary to the UK Man and the Biosphere (MAB) Committee. The Institute has also lost two of its senior researchers distinguished for their overseas research; both have moved to more senior positions in which there is potential for future interaction with ITE. Prof Terry Callaghan has transferred from Merlewood to become Director of the Centre for Arctic Biology at the University of Manchester, and Dr Roger Leakey has moved from Edinburgh to become Director of Research with the International Centre for Research in Agroforestry (ICRAF) in Nairobi.

A number of appointments reflect the involvement of senior staff in national and international research and advisory activities. For example, Prof Mike Roberts was appointed as Chairman of the UK MAB Committee, Dr Stuart Dobson to the Government's Advisory Committee on Toxic Substances, Prof Roberts to the Advisory Committee on Genetic Modification, Prof Heal to the UNEP Working Party on Global Monitoring, and Dr Melvin Cannell to the Board of Management of the European Forestry Institute. A particularly welcome award was to Nick Cox, a member of staff at Merlewood, who is the Base Commander of the NERC Arctic Research



Plate 5. John Major in discussion with senior staff prior to his presentation to all staff in which he emphasised the importance of environmental research in the formulation of Government policy

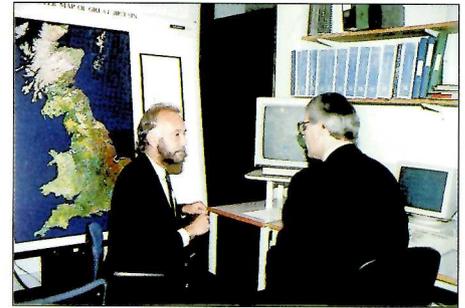


Plate 6. Mr Robin Fuller outlines the importance of remote sensing in monitoring land use change



Plate 7. Dr Mark Hill and Mr Simon Wright demonstrate the use of geographical information systems in studies of the effects of climate change



Plate 8. Dr Keith Bull describes the importance of the 'critical loads' approach to the development of UK policy on reduction of acid emissions

Laboratory at Svalbard, Norway. He was awarded the Polar Medal of the Scott Polar Research Institute, the first non-scientist to receive the award.

In July 1993 ITE was honoured with a constituency visit by the Prime Minister to Monks Wood (Plate 4). The Rt Hon John Major met with senior staff (Plate 5) and reviewed research on remote sensing, climate change and environmental pollution (Plates 6–8). He made a short presentation to all staff in which he stressed the importance of research in underpinning environmental policies.

O W Heal and T M Roberts
Directors, ITE

Appendix 1. Staff at 31 March 1994

DIRECTORATES

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(Grade 5)

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(SEO) (also TFS
Establishment Officer)

EO Mrs L M El-Ghorr

EO Mr T J Gray

AO Mr G Hartley

AO Mrs M W Kinnear

TYP Mrs D I Barrett

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EO Mrs S Stefaneli

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TYP Mrs J V Kimber

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AO Mrs D S Innes (PT)

TYP Mrs E C Lawrie

TYP Mrs M J Ferguson

SGB2 Mr J Wallace

IB8 Mr D A McEwan

Science

Grade6 Prof D Fowler

Grade7 Dr J N Cape

Grade7 Dr J H M Thornley (PT)

Grade7 Dr A D Watt

Grade7 Dr J Wilson

SSO Mr B G Bell

SSO Dr A Crossley

SSO Mr J D Deans

SSO Dr R C Dewar

SSO Dr A J Friend

SSO Mr G J Lawson

SSO Dr P A Mason

SSO Dr R Milne

SSO Mr A C Newton

SSO Dr L J Sheppard

SSO Mr R I Smith

HSO Dr J M Dick

HSO Dr K J Hargreaves

HSO Mr F J Harvey

HSO Mr K Ingleby

HSO Mr I D Leith

HSO Dr D C Mobbs

HSO Mr R C Munro

HSO Mr T D Murray

HSO Dr U Skiba

HSO Dr M Sutton

SO Mrs J Binnie
SO Mrs M B Murray
SO Mr R L Storeton-West

ASO Mr T A W Brown
ASO Mr C McBeath

PTO Mr G B Elphinstone

TECHI Mr J W McCormack

Library

ALIB Mrs S M Adair

AO Mrs L A Dickson (PT)

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TYP Mrs N Murphy

IB14 Mr R Lethbridge

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Grade7 Dr R G H Bunce

Grade7 Dr J Dighton

Grade7 Dr A F Harrison

Grade7 Dr A D Horrill

Grade7 Dr B J Howard

Grade7 Mr P J A Howard

Grade7 Dr P Ineson

Grade7 Mr D K Lindley

Grade7 Dr A Scott

Grade7 Mr J M Sykes

SSO Mr C J Barr

SSO Dr H E Jones (PT)

SSO Mr J A Parkinson

SSO Mr C Quarmby

SSO Mr J D Roberts

SSO Mr A P Rowland
SSO Dr A Sanchez

HEO(C) Ms A J M Lane

HSO Mr J K Adamson
HSO Mr C B Benefield
HSO Mr D G Benham
HSO Mr N A Beresford
HSO Mr P A Coward
HSO Mr N Cox
HSO Miss C J Hallam
HSO Dr D C Howard
HSO Mrs D M Howard
HSO Mrs G Howson
HSO Mrs V H Kennedy
HSO Mr R Scott
HSO Mr C Woods

SO Miss C L Barnett
SO Miss M K Gillespie
SO Miss A L Hodgson
SO Mrs J M Poskitt
SO Miss S M C Robertson
SO Miss D L Singleton

ASO Mrs J Parrington (PT)
ASO Mr M J Rossall
ASO Mr D Sleep
ASO Mr K Taylor
ASO Mr D Wilson

Dr J C Frankland (PT)

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LIB Mr J Beckett
AO Mrs J Dobson (PT)

TFSO
HEO Mrs P A Ward
PTO Mr C Hankinson
(Safety Technician)
AA(C) Miss K Threlfall

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IB10 Miss R A Roger

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Grade7 Dr P J Bacon
Grade7 Dr M P Harris
Grade7 Dr R Moss
Grade7 Mr D Welch

SSO Dr N G Bayfield
SSO Mr R P Cummins
SSO Mr D D French
SSO Dr M Marquiss
SSO Mr R A Parr
SSO Mr I S Paterson
SSO Mr N Picozzi

HSO Mr T R Barton
HSO Dr D N Carss
HSO Mr D C Catt
HSO Mr J W H Conroy
HSO Dr S E Hartley

SO Mrs G M McGowan
SO Mr D Scott

ASO Mr K Nelson

PTO Mr J A Morris

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AO Mrs R Ratchliffe

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TYP Mrs E M Guern
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IB10 Mr R H E Phillips
IB18 Mr A Turk
HKPR Mrs I S Wyllie

Science
Grade5 Dr I Newton

Grade6 Prof J Sheal

Grade7 Dr L A Boorman
Grade7 Dr K R Bull
Grade7 Dr A S Dawson
Grade7 Mr R M Fuller
Grade7 Mr P T Harding
Grade7 Dr M O Hill
Grade7 Mr K H Lakhani
Grade7 Dr D Osborn
Grade7 Dr R C Welch
Grade7 Mr T C E Wells
Grade7 Dr B K Wyatt

SSO Dr C P Cummins
SSO Mr B C Eversham
SSO Dr L G Firbank
SSO Dr M C French
SSO Mr A J Frost
SSO Dr A McLeod
SSO Dr D Moss
SSO Dr T W Parr
SSO Mr C D Preston
SSO Dr R F Shore
SSO Mr T H Sparks
SSO Mr A G Thomson

HSO Mr H R Arnold
HSO Mr N J Brown
HSO Dr P D Carey
HSO Miss R Cox
HSO Mr J C M Dring
HSO Dr J Eastwood
HSO Mr P Freestone
HSO Ms F Gerard
HSO Mr J N Greatorex-Davies
HSO Dr G B Groom
HSO Miss J R Hall
HSO Dr S A Hinsley
HSO Mr P D Howe
HSO Dr E A Leeson
HSO Dr A Meharg
HSO Mr T J Moffatt
HSO Mr J O Mountford
HSO Dr R J Pakeman
HSO Mr R F Pywell
HSO Dr S M Redpath
HSO Dr J R Treweek
HSO Dr J M Weeks
HSO Mr I Wyllie
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 SO Mr M Brown
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 SO Ms C Davies (PT)
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 SO Mr H M Malcolm
 SO Miss S Manchester
 SO Mr D G Myhill
 SO Mr J Wright
 SO Mr S Wright

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 Grade7 Dr G W Elmes
 Grade7 Dr A J Gray
 Grade7 Dr R E Kenward
 Grade7 Dr J A Thomas
 Grade7 Dr L K Ward
 Grade7 Dr N R C Webb

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 SSO Dr C J Reading
 SSO Mr R G Snazell

HSO Dr J M Bullock
 HSO Dr R W G Caldow
 HSO Ms S Le V dit Durell (PT)
 HSO Mr B Pearson
 HSO Dr A F Raybould
 HSO Mr W E Rispin
 HSO Mr R J Rose
 HSO Mrs J C Wardlaw (PT)

SO Miss K Hodder
 SO Miss R Mogg
 SO Miss I L Moy
 SO Miss E A Warman

ALIB Miss S Scobie

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 Grade7 Dr B Reynolds

SSO Dr L S Anderson
 SSO Dr A Buse
 SSO Mr C R Rafarel
 SSO Mr P A Stevens

HSO Dr B A Emmett
 HSO Mr S Hughes
 HSO Dr C Stirling

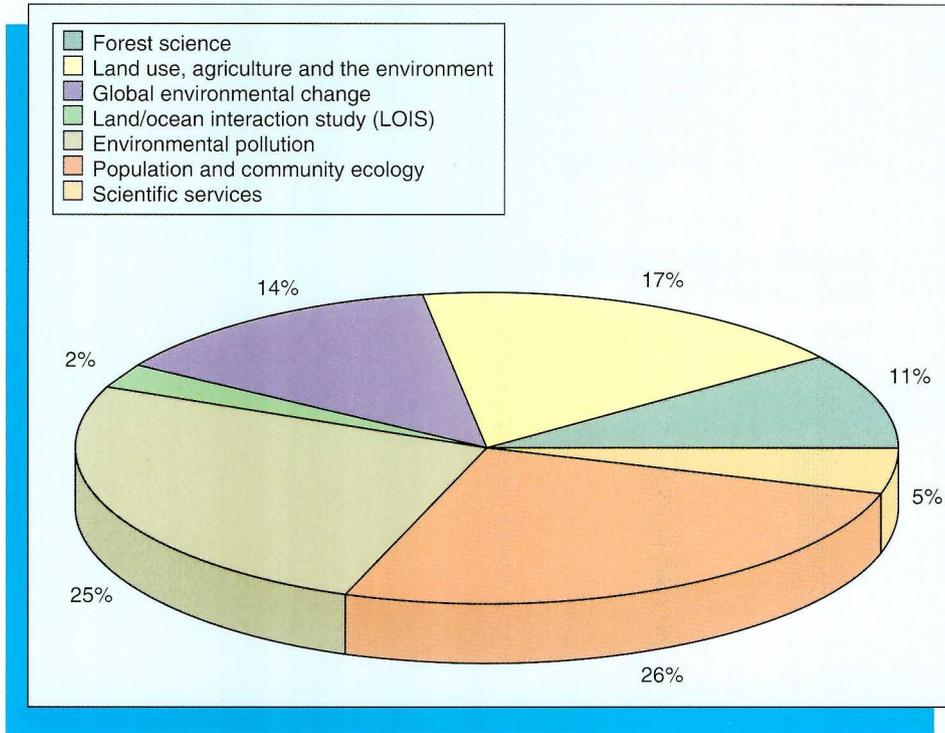
Postdoc Dr C Freeman

SO Mrs S A Bell
 SO Mr P Geissler
 SO Mr D A Norms
 SO Mr T G Williams

ASO Mrs A Brittain

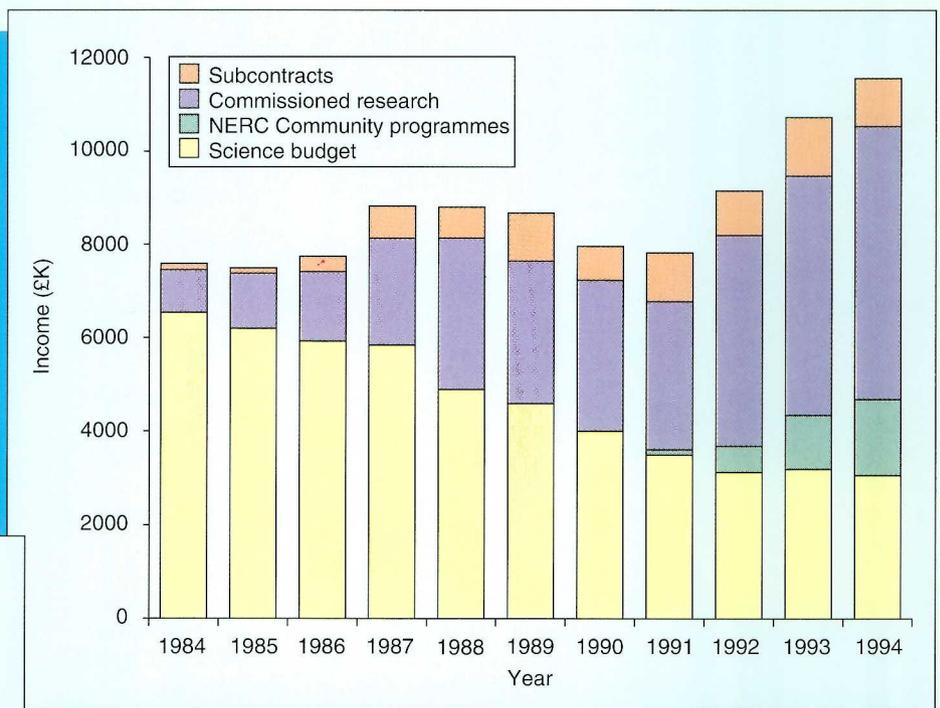
Appendix 2. Finance and administration

The following diagrams indicate levels of funding for the Institute, and provide details of expenditure

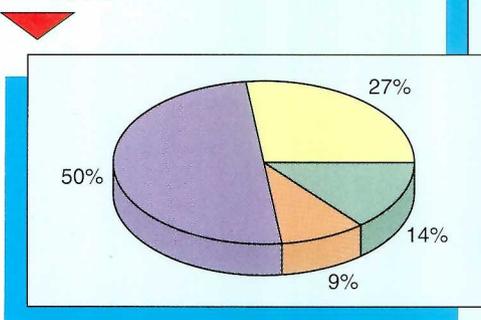


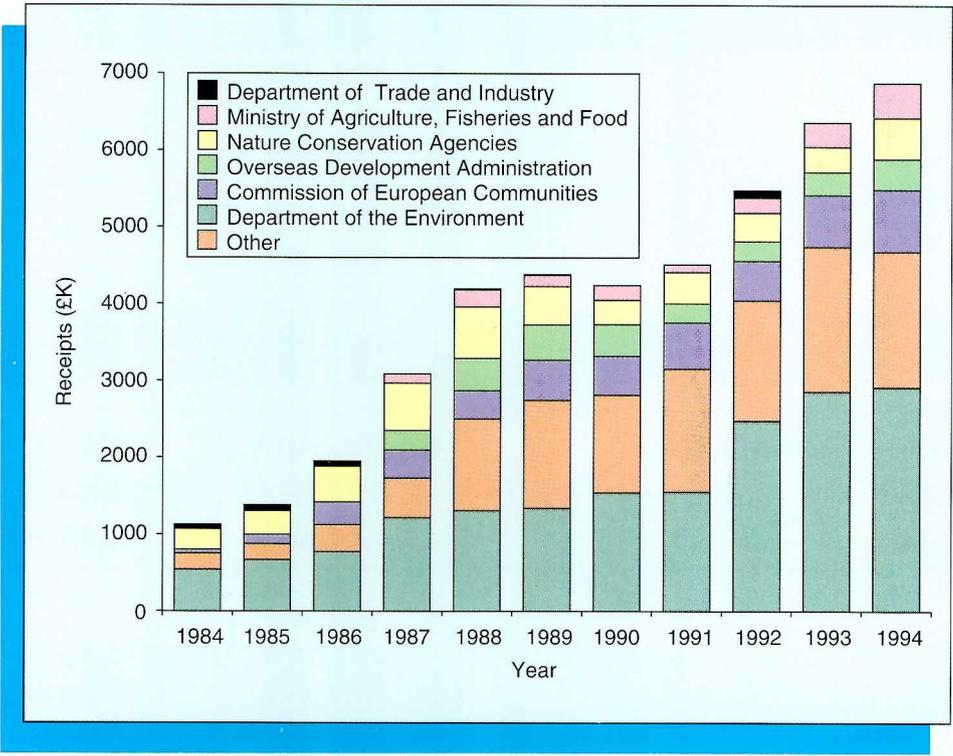
The pie chart shows Institute expenditure (as full economic cost) for the year 1993-94 by scientific programme of work

This graph illustrates trends in income (at constant prices – 1984-93 revalued to 1994 using Gross Domestic Product indices)



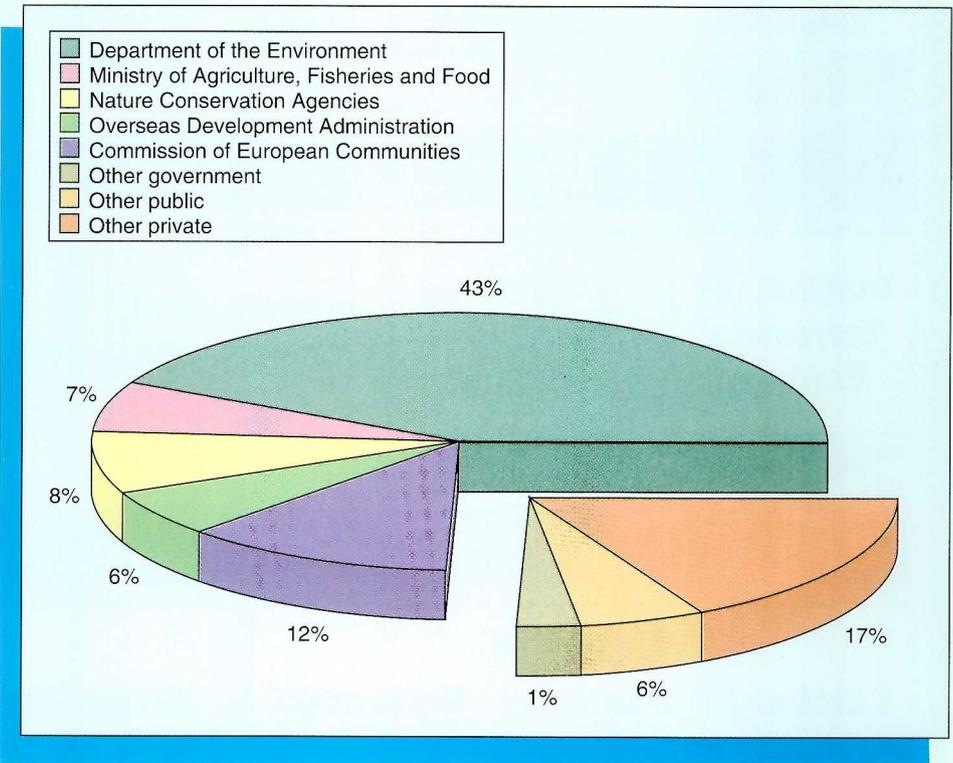
The pie chart shows the percentage breakdown for 1994





◀ This graph illustrates the long-term pattern of receipts from major customers (at constant prices – 1984–93 revalued to 1994 using Gross Domestic Product indices)

The pie chart shows the division of 1993–94 commissioned receipts by major customers



The Institute's position within the UK Research Council system is shown below. ITE is an integral part of the Natural Environment Research Council, which supports a wide range of basic and applied research in universities and institutes. It is able to draw on the expertise of about 400 colleagues in terrestrial and freshwater research, and on 1300 scientists within NERC.

UK GOVERNMENT

Office of
Science &
Technology



RESEARCH COUNCILS

Natural Environment	Biotechnology & Biological Sciences	Economic & Social	Medical	Engineering & Physical Sciences	Particle Physics & Astronomy
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DIRECTORATES

Terrestrial & Freshwater Sciences	Marine & Atmospheric Sciences	Earth Sciences	British Antarctic Survey	Scientific Services
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INSTITUTES, CENTRES AND UNITS

Institute of Terrestrial Ecology	Institute of Freshwater Ecology	Institute of Hydrology	Institute of Virology & Environmental Microbiology	Centres and Units
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RESEARCH STATIONS

NORTH
Edinburgh Banchory Merlewood

SOUTH
Monks Wood Bangor Furzebrook

Appendix 3. Research projects at 31 March 1994

ITE NORTH – EDINBURGH RESEARCH STATION

Programme 1 Forest science

T01057-5 Forest modelling	M G R Cannell/ A D Watt
T01057w2 Mechanistic models of tree and forest growth	R C Dewar/ J H M Thornley
T01057x2 Modelling the population dynamics of the pine moth	A D Watt
T01057y1 Carbon sequestration by vegetation	A D Watt/ M G R Cannell
T01057z1 Red alder demonstration plot at Glencorse	L J Sheppard

T01059-5 Mycorrhizas and tree production	J Wilson
T01059i1 Evaluating factors leading to optimum mycorrhizal development and growth of <i>Eucalyptus globulus</i>	P A Mason
T01059n1 <i>Eucalyptus</i> mycorrhizas in Chile	P A Mason

T01060-5 Tropical forestry and tree improvement	R R B Leakey
T01060a2 Domestication of tropical hardwoods	R R B Leakey
T01060i1 UNESCO MAB contracts	O W Heal
T01060k1 Cameroon forestry - Phase 2	R R B Leakey
T01060i2 Relationship between growth, shade tolerance and the physiology of rooting of tropical trees	A C Newton
T01060p5 Domestication of Cameroon fruit trees	R R B Leakey
T01060s1 Student training in tropical forestry	J M Dick
T01060z1 ECTF forest regeneration - Indonesia	R R B Leakey

T01065-5 Tropical forestry and tree improvement (cont'd)	R R B Leakey
T01065d1 Vegetative propagation of tropical trees - training video	R R B Leakey
T01065e1 Malaysian/vegetative propagation consultancy/training	J M Dick
T01065g1 Vegetation propagation of indigenous hardwoods - FORIG, Ghana	A C Newton
T01065h1 Agroforestry modelling and research co-ordination	M G R Cannell
T01065i1 Malaysia - training	M G R Cannell
T01065j1 CATIE/ITE link, Phase II Costa Rica	A C Newton
T01065k5 Sahelian trees growth, soil amelioration, water and nutrient use	J D Deans
T01065l2 Genetic variation in tropical trees application of molecular techniques	J Wilson
T01065m2 Application of process-based models to tropical forestry	J M Dick

T01066-5 Forest modelling (cont'd)	M G R Cannell/ A D Watt
T01066a1 Invertebrate fauna associated with birch in spruce forests	A D Watt
T01066b1 IPCC lead and contributing authors - consultancy contract	M G R Cannell

Programme 3 Global environmental change

T03054a6 Modelling carbon dioxide exchange at regional scales	R C Dewar
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T03055i6 Process-based modelling of grasslands and forests CO ₂ and climate effects	M G R Cannell/ J H M Thornley
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T03057c6 Carbon flux in tropical forests below-ground biomass	J D Deans
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T03064b6 Methane emissions from UK wetlands	D Fowler
T03064h6 N ₂ O flux measurement using chamber and micro-meteorological techniques	D Fowler

T03065a6 Measurement of methane emission fluxes at the field/landscape scale	D Fowler
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T03066d6 Tropospheric photochemistry in coastal and upland regions	J N Cape
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T03091d6 Flask sampling atmospheric trace gases	B G Bell
T03091e6 Cameroon co-ordination	B G Bell
T03091k6 Impact of CO ₂ on population dynamics of conifer-feeding insects	A D Watt

Programme 7 Environmental pollution

T07055-3 The effects of atmospheric pollutants on forests crops (special topic programme)	B G Bell
--	-----------------

T07056-5 Ecological effects of climatic change	M G R Cannell
T07056d5 Response of trees to elevated CO ₂	A D Friend

T07057-5 Atmospheric pollutants and trace gases	D Fowler
T07057d5 Land/atmosphere exchange of nitrous oxide	D Fowler
T07057m1 Ammonia deposition	D Fowler
T07057n1 SO ₂ dry deposition	D Fowler
T07057o1 Seeder/feeder deposition	D Fowler
T07057p1 Occult deposition	D Fowler
T07057q5 Methane oxidation	D Fowler
T07057r5 Exchange of atmospheric ammonia with European ecosystems	M A Sutton/ D Fowler
T07057s2 Fine resolution modelling of ammonia dry deposition in the UK	M A Sutton

T07058-5 Atmospheric pollution modelling and chemistry	J N Cape
T07058a2 The chemical composition of rainfall	J N Cape
T07058c1 Nitrogen chemistry at Great Dun Fell	J N Cape
T07058f1 DOE Programme Zero	D Fowler
T07058h1 Nitrogen oxide measurement	J N Cape
T07058i1 Anglo-Scandinavian acid deposition consultancy	D Fowler
T07058j2 Land/air exchange and atmospheric chemistry of carbon monoxide	J N Cape

T07059-5 Effects of atmospheric pollutants on trees	D Fowler/ J N Cape
T07059b5 Open-top chamber studies on spruce and beech	D Fowler
T07059e5 Effects of acid mist on mature trees	A Crossley
T07059h5 Ammonia fumigation of forests	J N Cape
T07059k5 Surface resistance emergency measurement programme (SREMP)	D Fowler

T07059l2 Chlorinated hydrocarbons in forests J N Cape
 T07059m5 Collaboration with Institute of Ecology, J N Cape
 Poland

Programme 13 Scientific services

T13054b2 Utilisation of LIBERTAS in ITE libraries L M Scoular
 - cataloguing
 T13054d2 Utilisation of LIBERTAS in ITE libraries S M Adair
 - serials management
 T13054f2 Use of email over JANET for L Dickson
 interlibrary loans
**T13059-5 Edinburgh scientific support M G R Cannell
 services**
 T13059a2 Glasshouse and nursery support F J Harvey
 and development
 T13059e2 Controlled environmental facilities at R Milne
 ITE Edinburgh
 T13059f2 Operation of the Rivox field site R Milne
 T13059g2 Biometrics research and consultancy R I Smith
 at ITE Edinburgh
 T13059m1 Local consultancies at ITE M G R Cannell
 Edinburgh

ITE NORTH - MERLEWOOD RESEARCH STATION

Programme 1 Forest science

**T01051-5 Mycological and faunal processes in J Dighton
 carbon and nutrient flux in soil and
 soil/root interactions**
 T01051a2 Role of fungi in nutrient cycling with J Dighton
 special reference to *Mycena galopus* in
 forest soil
 T01051g2 A mechanistic approach to the study of the J Dighton
 role of the extra-hyphae of mycorrhizal
 associations in nutrient uptake
**T01062-5 Organic matter and nutrient A F Harrison
 dynamics in forest and upland soils**
 T01062f1 Fast-growing tree project, Karnataka, A F Harrison
 India
 T01062g5 Rehabilitation of *Acacia* fallow system, D K Lindley
 Sudan/Senegal (MAB)
 T01062h5 The scientific management of renewable D K Lindley
 natural resources in China
 T01062i5 Nutrient cycling in European forests P Ineson
 T01062k1 *Acacia* tree fallows in Senegal D K Lindley
 T01062l2 Interactions between mineral nutrition A F Harrison
 of plants and air pollution, particularly CO₂
 T01062m5 Application of the nutrient deficiency A F Harrison
 root bioassays to forests
 T01062o1 Phosphorus dynamics in alley cropping A F Harrison
 systems in the humid tropics
 T01062p5 Organic matter management in *Eucalyptus* J Dighton
 forestry to enhance soil structure,
 stability and nutrition
 T01062r2 The fate and behaviour of cadmium in A F Harrison
 agricultural soil/plant systems
 T01062s1 *Eucalyptus* nutrition consultancy J Dighton
 T01062t5 Effects of nutrients on species diversity A F Harrison
 in grasslands
 T01062u2 The fate and behaviour of cadmium in A F Harrison/
 agricultural soil/plant systems F Nicholson
 T01062v2 Processes affecting carbon absorption A F Harrison/
 in upland soils J Kennedy
 T01062w1 Review of soil biodiversity UK and J Dighton
 European theatre

Programme 2 Land use, agriculture and the environment

**T02051-5 Land use change and ecological R G H Bunce
 impacts**
 T02051m5 Countryside survey 1990 C J Barr
 T02051n2 Extending the use of the Merlewood land C J Barr
 classification system liaison and collaboration
 T02051o2 Land use data management and D C Howard
 integration at ITE Merlewood
 T02051p2 The application of Geographical D C Howard
 Information Systems (GIS) to the
 Merlewood land use database
 T02051w1 Northern Ireland countryside survey R G H Bunce
 T02051y1 Countryside survey information system R G H Bunce
 T02051z1 Changes in key habitat C J Barr

**T02064-5 Environmental impact assessment - A F Harrison
 ITE Merlewood**

**T02071-5 Land use change and ecological R G H Bunce
 impacts (cont'd)**

T02071d1 Minor consultancy contracts R G H Bunce
 T02071e1 Processes of land use change C J Barr
 T02071f1 Countryside information system R G H Bunce
 (Northern Ireland)
 T02071g1 Ponds C J Barr
 T02071h1 Forest project R G H Bunce
 T02071j1 Centre for Agricultural Strategy R G H Bunce
 LUAM model
 T02071k1 Hedgerow survey, 1993 C J Barr
 T02071l1 Green audit of Cumbria D C Howard
 T02071m1 ITE land classes in Scotland C J Barr
 T02071n2 Ecological factors controlling botanical R G H Bunce
 diversity in the British countryside

**T02075-5 Disposal of oiled beach material A F Harrison
 (OBM) in sandy coastal environment, including
 low-grade dune and dune pastures**

T02075a1 Landfarming in dune pasture A F Harrison
 T02075b1 Bunal in dune pasture A F Harrison
 T02075c1 Lysimeters J A Parkinson
 T02075d1 Effect of different climate C J Barr
 T02075e1 Bunal in dunes A F Harrison
 T02075f1 Monitoring past dumps J A Parkinson
 T02075g1 Lysimeter - different soil types A F Harrison
 T02075h1 Soil fauna studies R E Daniels
 T02075i1 Plant toxicity tests N G Bayfield
 T02075j1 Illustrated guide D K Lindley
 T02075k1 Pendine Sands monitoring J A Parkinson

Programme 3 Global environmental change

T03055c6 O₂ fertilization effects on decomposition P Ineson
 processes
 T03055e6 Field experimental study of the effects of P Ineson
 global warming on carbon turnover in
 upland soils
 T03056d6 The use of DNA amplification to identify J Dighton
 patterns of fungal colonisation of litter
 affected by enhanced CO₂
 T03064g6 Measurement of trace gas fluxes in forest P Ineson
 and upland soils
 T03087m6 Interactions between organisms at T V Callaghan
 community boundaries in the uplands
 responses to simulated changes in climate
 and the environment

T03090c3	Arctic ecosystems and environmental change	T V Callaghan/ M C Press/J H Tallis	T07054-5 Critical loads of acidity, S and N for soils	M Hornung	
T03095-5 Detection of environmental change	J M Sykes		T07054a5	Determination of critical loads of acidity, N and S for soils	M Hornung
T03095a6	Environmental change network (ECN) co-ordination	J M Sykes	T07054c1	Subcontract to Aberdeen University	M Hornung/ M Cresser
T03095b6	ECN and TIGER co-ordination at Moor House and Upper Teesdale	J K Adamson	T07054d1	Subcontract to Lancaster University	M Hornung T A Mansfield
T03095c6	ECN and TIGER site management at Wytham	M D Morecroft	T07054e1	Subcontract to Nottingham University	M Hornung/ M H Unsworth
T03095d2	Effects of clearfelling on soil water chemistry	S M C Robertson	T07054g5	ENCORE	M Hornung
T03095e2	Long-term dynamics of forest ecosystems	J M Sykes	T07054j2	Modelling the effects on water quality of liming in upland catchments	M Hornung
T03095f2	Rehabilitation of riparian zones in coniferous forest	J K Adamson	T07054n1	Dose/response relationships for use in models to determine externalities of energy generation by the coal fuel cycle	M Hornung

Programme 7 Environmental pollution

T07050-5 Radionuclides in vegetation and soil	A D Horrill		T07054o5	Biological indicators for setting of critical loads for soils	J Dighton
T07050c5	Post-Chernobyl radiation levels in soils and vegetation	R Moss/ A D Horrill	T07054p5	Liming and faunal inoculation of forest soils	J K Adamson
T07050h2	The role of the litter layer in the recycling of caesium isotopes in upland Britain	A D Horrill	T07054q2	Effects of sulphur dioxide on fungal decomposition of tree leaf litter	P Ineson/ J C Frankland
T07050i2	The absorption and recycling of plutonium in plants	A D Horrill	T07054r5	Enhanced NH ₃ and SO ₂ deposition near point sources and their impacts	P Ineson
T07050j2	Advisory committees on radionuclide research	A D Horrill	T07054s5	Development of bioassay for N saturation	P Ineson
T07050k5	Radioactivity in natural ecosystems - EEC II	A D Horrill	T07054t5	Quantification of N losses by denitrification	P Ineson
T07050l2	Radioecology computer-based bibliography	V H Kennedy	T07054u1	Subcontract with MLURI	M Hornung
T07050m2	Development and calibration of mechanistic models for radionuclide uptake from soils	B J Howard	T07054v5	Isotopic characterisation of nitrogen pollutant inputs to forests (NIPHYS)	A F Harrison
T07050n2	Uptake of radionuclides by and distribution within basidiomycete fungi	J Dighton	T07054w5	Green accounting comparison of monetary valuation and the 'extasy' method	M Hornung
T07050o2	Monitoring of radionuclides in tidally inundated pastures	A D Horrill	T07056s1	Effect of management and climate on carbon sequestration by UK soils	P J A Howard
T07050p1	Radionuclides around nuclear sites	A D Horrill			
T07051-5 Radionuclide/animal transfers	B J Howard		Programme 8 Population and community ecology		
T07051d2	The dynamics of radionuclide uptake by sheep	B J Howard	T08052-5 Plant strategies response to environmental stress	T V Callaghan	
T07051g5	Transfer of radionuclides in animal production systems	B J Howard	T08052f2	Winter ecology in the high arctic of Svalbard plant/animal interactions in snow-free and snow-lying areas	J M Welker
T07051i2	Transfer of ³⁵ S to goat milk	B J Howard			
T07051j1	Identification of hot spots in restricted areas	N A Beresford	Programme 13 Scientific services		
T07051l1	Rapid prediction of radionuclide availability	N A Beresford	T13054-2 ITE library services	J Beckett	
T07051m1	Review of the influence of stable iodine on radioiodine transfer to milk	B J Howard	T13054e2	Database of ITE staff publications	J Beckett
T07051n5	Radioecological studies in the CIS	B J Howard	T13055a2	Chemical support studies	J A Parkinson
T07051o1	Identification of grazing habits/areas which may influence radiocaesium levels in west Cumbrian sheep using global satellite techniques	N A Beresford	T13055i2	Merlewood Analytical Section accreditation scheme	A P Rowland
T07051p5	Research and technology development in the field of nuclear security with USSR	B J Howard	T13055j2	Database for Merlewood Analytical Section records	A P Rowland
T07051q1	Desk review of the transfer of radiostrontium to milk and possible counter-measures	B J Howard	T13055l2	Analytical group methods book update and revision	J D Roberts
			T13055n1	Direct contract analysis for non-TFS customers	J A Parkinson
T07052-5 Chemistry of radionuclides	A Sanchez		T13056-4 NERC mass spectrometer service	C Quarmby	
T07052d2	Radiochemical development	A Sanchez	T13056a2	NERC mass spectrometer service	C Quarmby
T07052h2	Radioanalytical services	A Sanchez	T13057-5 Merlewood scientific support services	D K Lindley	
T07052i2	Construction and commissioning of ¹⁴ C analysis rig	A D Horrill/ A Sanchez	T13057a2	Graphics and publications	C B Benefield
T07052j2	ITE Merlewood radiochemistry laboratory accreditation scheme	V H Kennedy	T13057b2	Biometrics and modelling support services at Merlewood	D K Lindley
			T13057f1	Lecturing and liaison with Charlotte Mason College, University of Lancaster	R G H Bunce

ITE NORTH - BANCHORY RESEARCH STATION

Programme 1 Forest science

T01061j3 Interactions between farm forestry and the population biology and dispersion of roe deer B W Staines

Programme 2 Land use, agriculture and the environment

T02050-5 Human impact, erosion rehabilitation N G Bayfield

T02050d1 Monitoring at Aonach Mor N G Bayfield

T02050h1 Upland revegetation studies N G Bayfield

T02050ql NIREX deep repository study N G Bayfield

T02050r1 Impact of snow-fencing on vegetation and soils at Glas Maol D Welch

T02050t2 North-western ethylene pipeline survey N G Bayfield

T02050v1 Erosion control study N G Bayfield

T02050w1 Monitoring Spey wellfield N G Bayfield

T02051x1 Land cover database for Scotland R P Cummins

T02070e2 Vegetation change in Scottish moorland and set-aside fields D Welch

T02071a2 Hedgerow diversity R P Cummins

T02073-5 Human impact, erosion rehabilitation (cont'd) N G Bayfield

T02073a1 Glen Coe bridge study N G Bayfield

T02073b5 Status of mountain ringlet N G Bayfield

T02073c1 Brathens consultancies B W Staines

T02073d2 Scottish centre for land use databases R P Cummins

T02073e1 Cairngorm summit management strategy N G Bayfield

Programme 7 Environmental pollution

T07050c5 Post-Chernobyl radiation levels in soils and vegetation R Moss/A D Hornill

Programme 8 Population and community ecology

T08050-5 Vertebrate population dynamics and upland habitat geometry R Moss

T08050a2 Population regulation of cycling and non-cycling tetraonids R Moss

T08050c5 Population ecology of capercaillie R Moss

T08050g2 Population genetics of mute swans P J Bacon

T08050i2 Epidemiology of *Trichostrongylus tenuis* R Moss

T08050j2 Structure of moorland vegetation for red grouse P J Bacon

T08050k1 Scottish adder survey C J Reading/B W Staines

T08050m1 Impact of afforestation on moorland birds R A Parr

T08050n1 Defining sustainability in upland Scotland R Moss

T08051-5 Population ecology of predators H Kruuk

T08051c5 Interactions between populations of fish predators, and fish and their food species H Kruuk

T08051d5 Piscivorous birds in Scottish salmon rivers M Marquiss

T08051h5 Seabird studies M P Harris

T08051i5 Comparison of high- and low-latitude shags M P Harris

T08051n1 Avian piscivores basis for NRA policy M Marquiss

T08051o1 Monitoring pollutants and hydrocarbons in fish and otter populations in the Shetlands J H W Conroy

T08051p2 Population biology of montane tipulids (mainly *T. montana*) in relation to their availability as food for birds M Marquiss

T08051q2 The relationship between pine marten and red squirrel H Kruuk

T08051s2 Predator/prey interactions between otters and amphibians D N Carss

T08073-5 Dynamics of upland and montane plant communities B W Staines

T08073c2 Vegetation dynamics and soils R P Cummins

T08073f2 Deer in production forests B W Staines/D Welch

T08073g2 Response of Sitka spruce to browsing and bark-stripping damage D Welch/B W Staines

T08073h2 Competition and niche segregation in red and roe deer B W Staines

T08073i5 Selection of individual plants within species by herbivores (JAEP) S Hartley

T08073j5 The influence of vegetation pattern on the distribution and foraging strategies of hill sheep and red deer (JAEP) J Clarke

T08073k1 Blaeberry ecology D Welch

T08073l2 Habitat use by wild boar in Tuscany B W Staines

T08073m2 Habitat use by red and roe deer in Abruzzo B W Staines

T08073n2 The effects of culling in roe deer populations B W Staines

T08073p1 Red deer at Mar Lodge D Welch/B W Staines

T08073r1 Vegetation dynamics in Scottish uplands S Hartley

T08073s2 Loss of heather moorland in Scotland under current and future environmental conditions the role of insect outbreaks S Hartley

T08073t2 Genetics of host-shifts in insect herbivores winter moth outbreaks on upland plants S Hartley

T08073u1 Pine regeneration at Ballochbuie D Welch

T08073v1 Red deer modelling B W Staines

Programme 13 Scientific services

T13053-5 Services at ITE Banchory B W Staines

T13053d2 Biometrics P J Bacon

ITE SOUTH - MONKS WOOD

Programme 1 Forest science

T01061-3 Farm forestry (special topic programme) T W Parr

T01064h5 Seasonal light and water use of banana-based interculture systems C M Stirling

Programme 2 Land use, agriculture and the environment

T02053-5 Ecological data management and GIS T W Parr

T02053a2 GIS research and applications development N J Brown

T02053e2 Data cataloguing and management B K Wyatt

T02053o1 Development and support of GIS software and data packages T W Parr

T02053p1 Tablefit sales M O Hill

T02053q1 Targetting of lowland heathland recreation in Dorset T W Parr

T02053r2 Development of a national map database T W Parr

T02053s2 A framework for the development of conservation strategies in the wider countryside T W Parr

T02053t1 Global land use and cover classifications study B K Wyatt

T02054-5 EIC Biological Records Centre - biodiversity data centre P T Harding

T02054a5 EIC-BRC botanical recording C D Preston

T02054h5	EIC-BRC Butterfly Monitoring Scheme	T J Yates	T02070k1	Bracken control and vegetation restoration - literature review	R J Pakeman
T02054i5	EIC-BRC database and atlas of aquatic plants	C D Preston	T02070l5	Landscape ecology in changing agricultural landscapes	L G Firbank
T02054n5	BRC - Co-ordinating Commission for Biological Recording (CCBR) Programme	P T Harding	T02070m4	The effects of organic farming on wildlife populations	L G Firbank
T02054p1	EEC Programme Corine Project biotopes	D Moss	T02071b1	Comparison of land cover definitions	B K Wyatt
T02054q5	BRC - liaison on biological recording	P T Harding	T02072-5 Remote sensing for ecological research	R M Fuller	
T02054r5	BRC - zoological recording	B C Eversham	T02072a5	Land cover mapping (BNSC)	R M Fuller
T02054s5	BRC - database management	J C M Dring	T02072b1	Supply of land cover data	R M Fuller
T02054t5	BRC - database development	J C M Dring	T02072c2	Testing and development of analytical methods for remote sensing interpretation	R M Fuller
T02054u1	BRC - output and advice to Nature Conservation Agencies	P T Harding	T02072d2	Experimental studies of ecological variables	J Eastwood
T02054v2	BRC - taxonomy and identification	C D Preston	T02072e2	Evaluation of new types of imagery	R M Fuller
T02054w1	Extension of CORINE biotopes recording to central Europe	D Moss	T02072f2	Spectral responses of vegetation	R M Fuller
T02054x5	EEC CORINE project biotopes	D Moss	T02072g2	Recording test sites	R M Fuller
T02055-5 Environmental impact assessment	J R Treweek		T02072h3	Identification and mapping of humid tropical forest types from ATSR-2	F Gerard
T02055i2	The interpretation of ecological information in environmental impact assessment	J R Treweek	T02072i5	Darwin initiative remote sensing, GIS, Sango Bay, Uganda	R M Fuller
T02055n2	English Nature review package for environmental assessment handbook	J R Treweek	T02072j1	CORINE land cover map of Great Britain trial (feasibility study)	R M Fuller
T02057-5 Historical aspects of environmental management	J Sheal		T02072k1	A spatial resolution study for a high-resolution land surface processes mission	R M Fuller
T02057a5	Historical aspects of environmental perception	J Sheal	T02074-5 Biogeographical studies of GB	B C Eversham	
T02057c1	Provision of assistance to the Queen's Award Office	J Sheal	T02074a2	Biodiversity and landscape patterns	B C Eversham
T02059-5 Grassland dynamics and management	T C E Wells		T02074b2	Biogeography of species dynamics	P T Harding
T02059c5	Environmental impact of flood protection measures on the water regimes of wildlife habitats	J Sheal	T02074c5	Classification of species distributions	C D Preston
T02059d1	The effects of nitrogen on species diversity and agricultural production on the Somerset Moors	T C E Wells	T02074d2	Ecological studies	B C Eversham
T02059f1	Wetland restoration - phase 2	J Sheal	T02074e2	Methods for biogeographic analysis	B C Eversham
T02059g2	Population studies on terrestrial orchids	T C E Wells	Programme 3 Global environmental change		
T02059h1	Autecology of rare species	T C E Wells	T03057e6	Radar remote sensing for tropical forestry inventory and carbon balance	G B Groom
T02059i1	Review of air pollution effects on vegetation (Liphook)	A R Mcleod	T03087b6	Ecological factors controlling species distribution and abundance	L G Firbank
T02059k1	Species recovery - fen violet (<i>Viola persicifolia</i>)	T C E Wells	T03088b6	Landscape dynamics and climate change dispersal models and GIS	B K Wyatt
T02059l2	Effects of increased UV-B radiation on woodland and grassland species	A R Mcleod	T03088j6	Effects of climate change at regional and global scales remote sensing of disturbance in biomes as a measure of their sensitivity to change	B K Wyatt
T02059m5	Field experiments to investigate ecological aspects of wetland restoration	J R Treweek	T03091n6	Small-scale mobile open-air CO ₂ fumigation system	A R McLeod
T02059n5	ESA catchment models	J R Treweek	T03091p6	Review of FACE systems	A R McLeod
T02059o1	Review of heathland and limestone/chalk grassland management	T C E Wells	T03091r6	Effects of increased UV-B on the vegetation of natural ecosystems	A R McLeod
T02059p1	Management and restoration of species-rich grassland	T C E Wells	T03091s6	Swiss FACE experiment	C P Cummins
T02059q1	Multi-site experiments on the restoration of herb-rich grassland	T C E Wells	Programme 5 Land/ocean interaction study (LOIS)		
T02059r1	Reversion of intensive arable land to grass heath and <i>Calluna</i> heath (HLO1)	T C E Wells	T05060-6 Land/ocean interaction study (LOIS)	A J Gray	
T02059s1	Assessment of the effects of managing water levels to enhance ecological diversity		T05060a6	A coastal zone terrestrial GIS for the LOIS community	K R Bull
T02070-2 Successional models for predicting ecological effects of changing agricultural practices	M O Hill		T05060d6	Flux studies at coastal sites	L A Boorman
T02070a2	Development of successional models	M O Hill	T05060e6	Remote sensing of intertidal biotopes	A G Thomson
T02070b2	Plant dispersal within and between habitats	M O Hill	T05060f6	LOIS analytical chemistry	A A Meharg
T02070c2	Neighbourhood relationships in establishment of herb-rich grassland	P D Carey	T05060g1	Further development of airborne remote sensing techniques	A Thomson
T02070d2	Population and community dynamics of arable weeds	L G Firbank	Programme 7 Environmental pollution		
T02070j1	Integrated bracken control and vegetation restoration	R J Pakeman	T07061-5 Hazard and risk assessment	D Osborn/S Dobson	
			T07061a1	Hazard assessment of chemicals	S Dobson

T07061gl	Analysis of biological and other environmental samples	M C French	Programme 8 Population and community ecology
T07061l1	Database for HMIP	S Dobson	T08054-2 Population dynamics of raptors I Newton
T07061j1	Media biomonitoring methodology	D Osborn	T08054a2 Population ecology of sparrowhawks (Accipiter nisus) I Newton
T07061k1	Task group for World Health Organisation	S Dobson	T08054b2 Tawny owls in fragmented habitats S M Redpath
T07061ml	Landfill operations and the contamination of wildlife	D Osborn	T08054c5 Wildlife and pollution I Newton
T07061ol	Environmental follow-up to major industrial accidents	D Osborn	T08054d5 Raptor predation on red grouse populations S M Redpath
T07061ql	Arsenic in gold mines	J H Weeks	T08054f1 Population trends in red kites I Newton
T07061r1	Blueprint to protect habitats (ERLs)	S Dobson	T08056-2 Environmental control of avian breeding cycles A S Dawson
T07061t1	Ecotoxicological testing on bats	R F Shore	T08056d2 Avian photoperiodism A S Dawson
T07061ul	Conservation and pollutants	J H Weeks	T08056e2 Deferred breeding A S Dawson
T07061vl	Media biomonitoring methodology - phase 2 development of expert system	D Osborn	T08056f2 Puberty in starlings A S Dawson
T07062-5 The critical loads approach		K R Bull	T08068-5 Molecular ecology A J Gray/I Newton
T07062a1	National critical loads mapping programme	K R Bull	T08068c2 Relatedness in sparrowhawks I Newton
T07062i1	Critical loads maps for China	K R Bull	T08068d2 Relatedness in other birds of prey I Newton
T07062k5	Pan European social and environmental impact of air quality (PEAQ)	K R Bull	T08074-5 Ecology and management of coastal systems L A Boorman
T07062l1	Assessment of environmental effects of power stations	K R Bull	T08074a5 Effects of environmental change on British salt marshes L A Boorman
T07062m1	Supply of critical loads data	J R Hall	T08074b2 Climate change, sea level rise and the English coast L A Boorman
T07062n1	Contribution to sulphur deposition from ships in the English Channel	J R Hall	T08074c5 Large-scale experimental set-back L A Boorman
T07069-5 The impacts of climate change		K R Bull	T08077k1 Assessment of critical loads exceedance in Wales G L Radford
T07069a1	Application of GIS to climate change studies	K R Bull/ G L Radford	T08080-3 Wildlife diseases (special topic programme) D Osborn
T07069b1	DOE climate change modelling programme	M O Hill/ J P Grime	T08082-5 Metapopulation dynamics I Newton
T07069h5	Modelling effects of climate change on species distribution	M O Hill	T08082a5 Metapopulations and habitat fragmentation I Newton
T07069k2	Influence of climatic factors on amphibian breeding success	C P Cummins	T08082b2 Metapopulation dynamics of breeding woodland birds S Hinsley
T07069u5	Effects of rapid climatic change on plant biodiversity	M O Hill	T08082c2 Habitat fragmentation and breeding woodland birds S Hinsley
T07069v1	The potential for spread of alien species in England following climate change	M O Hill	T08082d5 Landscape ecology of birds I Newton
T07070-5 Ecotoxicology		D Osborn/S Dobson	Programme 13 Scientific services
T07070a2	Avian ecotoxicology	S Dobson	T13054c2 Development of current awareness services in ITE libraries M Palmer
T07070d2	Detecting subtle impacts of pollutants on individuals	D Osborn	T13055-5 Chemistry research, development and maintenance M C French
T07070h2	Ecotoxicology chemical analysis	M C French	T13055o2 Analytical support studies M C French
T07070k2	Ecotoxicology of terrestrial invertebrates	J H Weeks	T13055p2 Computerisation of Analytical Chemistry J Wright
T07070l2	The ecology of vertebrates of conservation importance in eastern England	A S Cooke	T13055q2 Equipment maintenance in Analytical Chemistry M C French
T07070m2	The impact of pesticide drift	A S Cooke	T13055r2 NAMAS and Quality Assurance M C French
T07070n2	Serving on the Advisory Committee on Pesticides, the Environmental Panel and the Veterinary Products Committee	A S Cooke	T13060-2 Statistical research and development in ITE South K H Lakhan
T07070o1	Spray drift	B N K Davis	T13060a2 Estimation of population parameters K H Lakhan
T07070p2	Insecticide spray drift and bioassay	B N K Davis	T13060b2 Statistical consultancy for Monks Wood/ITE/NERC K H Lakhan
T07070q5	Recognition of biochemical perturbations by proton nuclear magnetic resonance spectroscopy	J H Treweek	T13060c2 Biometrical research T H Sparks
T07070r2	Bioavailability and environmental fate of organic chemicals	A Meharg	T13060d2 Statistical consultancy for Monks Wood and Bangor T H Sparks
T07070s2	Urban ecology and pollution	D Osborn	T13061-1 ITE South consultancies T M Roberts
T07070t2	Effects of liming on moorland ecology	R F Shore	T13061a1 Small consultancies at ITE Monks Wood S Dobson
T07073-5 Interactive effects of pesticides		A S Dawson	
T07073a5	Pesticide interactions reproductive and field effects	A S Dawson	
T07073b4	Pesticide interactions biochemical effects	A S Dawson	

ITE SOUTH - FURZEBROOK RESEARCH STATION

Programme 3 Global environmental change

- T03086f6 Effects of elevated CO₂ and temperature on the growth rates and life cycle characteristics of herbivorous terrestrial invertebrates N R C Webb
- T03087d6 Ecological factors controlling species distribution and abundance J A Thomas
- T03087f6 Climate-related plant migrations and invasions ecological genetics and reproductive biology as determinants of plant response to climatic change A J Gray/
R E Daniels

Programme 5 Land/ocean interaction study (LOIS)

- T05060-6 Land/ocean interaction study (LOIS) - ITE A J Gray
- T05060b6 Biogenic factors in sediment transport S M McGroarty
- T05060c6 Coastal vegetation and sediment dynamics A J Gray

Programme 8 Population and community ecology

- T08050k1 Scottish adder survey C J Reading/B W Staines
- T08057-5 Migratory wader ecology J D Goss-Custard**
- T08057a2 Predator/prey interactions between the oystercatcher and mussel J D Goss-Custard
- T08057b2 Winter feeding ecology of juvenile oystercatchers S E A Durell
- T08057h5 Birds in estuaries J D Goss-Custard
- T08057i1 Training in wetland bird research J D Goss-Custard
- T08057m1 Determinants of the intertidal and sediments of estuaries J D Goss-Custard
- T08057n1 Compensatory feeding in shorebirds J D Goss-Custard
- T08057o5 Shellfish and shorebirds J D Goss-Custard
- T08057p1 Shorebird densities J D Goss-Custard

T08059-5 Applied plant ecology and genetics

- A J Gray/
R E Daniels
- T08059c2 Genetic variation in wetland species R E Daniels
- T08059r2 Genetic structure of plant populations R E Daniels
- T08059s1 Wytch Farm development R E Daniels

T08060-5 The evolutionary ecology of interacting populations ant/plant/butterfly/parasitoid systems under different climates

- J A Thomas/
G W Elmes
- T08060h2 Brunei rainforest biodiversity G W Elmes
- T08060i2 Social structure and ecological adaptations of *Myrmica* ants G W Elmes
- T08060j2 Comparative evolutionary ecology of *Maculinea* species J A Thomas
- T08060k5 Field tests of butterfly/ant population models J A Thomas
- T08060l1 Black hairstreak beside the M1 J A Thomas

T08068-5 Molecular ecology

- A J Gray/I Newton
- T08068a2 Gene flow in brassicas A J Gray
- T08068b2 Ant socio-biology G W Elmes
- T08068g1 Gene flow in natural populations of *Brassica* and *Beta* A J Gray
- T08068h1 Gene flow between forage crops and wild relatives A J Gray

T08071-4 Biodiversity of ants in Brunei rainforest

G W Elmes/
R May

- T08078-5 Assessment, management and reconstruction of lowland communities M G Morns/
NR Webb**
- T08078c1 West Wellow bypass ecological appraisal L K Ward
- T08078e1 M3 Bar End to Compton ecological studies M G Morns/
N R C Webbs
- T08078f2 Diversity of grassland types invertebrates M G Morns
- T08078g2 Demography and conservation of scrub L K Ward

T08079-5 Metapopulation dynamics, habitat templets and successional processes

- N R C Webb
- T08079d5 New Forest cicada L K Ward
- T08079e2 Heathland habitat templets N R C Webb
- T08079f2 Habitat occupancy and dispersal by heathland species N R C Webb
- T08079g2 Invertebrate successions on heathland N R C Webb
- T08079h2 Dorset heaths GIS N R C Webb
- T08079j2 Biodiversity of hyperdiverse taxa M G Morns
- T08079k5 Survey of heaths in west Gwynedd N R C Webb
- T08079l1 Heath fragmentation and heathland species N R C Webb
- T08079m1 Juniper habitat and species directive L K Ward

T08083-5 Vertebrate geodemography

- R E Kenward
- T08083a1 Demography of saker falcons in central Asia R E Kenward
- T08083b5 Red squirrel conservation and ecology R E Kenward
- T08083d5 Developing software for radiotag studies R E Kenward
- T08083e2 Geodemography of large raptors R E Kenward
- T08083f2 Ecology and metapopulation dynamics of herpetofauna C J Reading
- T08083g1 Evaluation of reptile survey methodologies C J Reading

Programme 13 Scientific services

- T13060e2 Statistical research and development at ITE Furzebrook R T Clarke
- T13060f2 Statistical consultancy for the IFE River Laboratory R T Clarke

T13061-1 ITE South consultancies

- T M Roberts
- T13061b1 Small consultancies at ITE Furzebrook M G Morns

ITE SOUTH - BANGOR RESEARCH UNIT

Programme 1 Forest science

- T01064-5 The water, carbon and energy relations of plants in fragile habitats L S Anderson**
- T01064a2 Dryland ecophysiology L S Anderson
- T01064c2 Clonal selection for tolerance of drought and salinity in semi-arid zone trees and shrubs J E G Good
- T01064e5 Productivity of intercropped sorghum in relation to water and nutrient stresses L S Anderson
- T01064f5 Nutrient cycle of semi-arid agroforestry in Nigeria P A Stevens
- T01064g5 Soil fertility and agroforestry in NE Nigeria B A Emmett
- T01064j1 Pilot study to assess the value of implementing logical frameworks L S Anderson

Programme 3 Global environmental change

- T03086d6 Ecophysiological responses to CO₂ enrichment and other climatic factors in a wide sample of functional types of British plants T W Ashenden

- T03087e6 Growth and developmental responses to CO₂ enrichment under different temperature and nutrient regimes in a wide sample of functional types of British plants T W Ashenden
- T03087u6 The effect of climate change on woodland ecosystems - experimental studies on CO₂ and temperature effects on oak/sycamore - herbivorous insect interaction J E G Good
- T03091c6 Methane and nitrous oxide fluxes from mire soils and plants responses to nitrogen supply and carbon dioxide enrichment M C Press/
J A Lee/
T W Ashenden

Programme 7 Environmental pollution

- T07064-5 Air pollution/climate change research** T W Ashenden
- T07064i5 Critical loads of N and S deposition to semi-natural vegetation T W Ashenden
- T07064m5 Effects of increasing concentrations of carbon dioxide on grassland communities T W Ashenden
- T07064o5 Critical loads of pollutants for semi-natural ecosystems in Wales T W Ashenden
- T07064p2 Effects of acid fog on upland vegetation T W Ashenden
- T07064q2 Environmental facility development C R Rafarel
- T07064r2 Effects of climate change on upland ecosystems T W Ashenden
- T07064s5 Effects of elevated CO₂ and temperature on ryegrass T W Ashenden
- T07064t2 Ecophysiology of the effects of elevated atmospheric carbon dioxide on growth of montane plant species R Baxter
- T07072-5 Upland nitrogen dynamics** B Reynolds
- T07072a5 Nitrogen critical load experiment B A Emmett
- T07072d5 Estimation of atmospheric inputs to catchments B Reynolds
- T07072h5 Biochemical consequences of climate change upon riparian wetlands C Freeman
- T07072i5 Modelling upland nitrogen dynamics B Reynolds
- T07072j5 Solute pathways in upland catchments B Reynolds
- T07072m2 Climate change and microbial ecology a university support project C Freeman
- T07072n5 Nitrogen processes in upland forest soils B A Emmett
- T07072o1 Soil/plant interactions in lowland grassland P A Stevens
- T07072p5 Project definition study, Welsh acid waters resurvey P A Stevens

Programme 8 Population and community ecology

- T08077-5 Upland ecology** G L Radford
- T08077c1 Upland grass re-establishment J E G Good
- T08077e1 Effects of grazing on upland invertebrates in Snowdonia A Buse
- T08077g2 Climate and high-altitude invertebrates A Buse
- T08077h5 A GIS for conservation in Wales G L Radford
- T08077i1 Environmental assessment of four British Gas sites G L Radford
- T08077j5 Tir Cymen - evaluation and monitoring G L Radford
- T08077l5 Population biology of *Lloydia serotina* J E G Good

Programme 13 Scientific services

- T13055s2 Laboratory equipment maintenance and quality assurance in analytical chemistry at Bangor S Hughes
- T13061-1 ITE South consultancies** T M Roberts
- T13061c1 Small consultancies at ITE Bangor J E G Good

Appendix 4. Publications by ITE staff, 1993–94

1. Refereed papers in journals

- (Aebischer, N J, Robertson, P.A.) & Kenward, R E 1993 Compositional analysis of habitat use from animal radio-tracking data *Ecology*, **74**, 1313–1325
- (Anderson, A R), Adamson, J.K., (Pyatt, D G) & Hornung, M. 1993 pH, aluminium and calcium concentrations of streams draining acidic soils on calcareous till at Kershope, Cumbria *Journal of Hydrology*, **149**, 27–37
- Anderson, L S & (Sinclair, F L) 1993 Ecological interactions in agroforestry systems *Agroforestry Abstracts*, **6**, 57–91, *Forestry Abstracts*, **54**, 489–523
- Anderson, L S., (Muetzelfeldt, R I. & Sinclair, F L) 1993 An integrated research strategy for modelling and experimentation in agroforestry *Commonwealth Forestry Review*, **72**, 166–174
- (Aspinall, R.) & Veitch, N. 1993 Habitat mapping from satellite imagery and wildlife survey data using a Bayesian modeling procedure in a GIS *Photogrammetric Engineering & Remote Sensing*, **59**, 537–543
- Bardgett, R D , Frankland, J C & (Whittaker, J B) 1993 The effects of agricultural management on the soil biota of some upland grasslands *Agriculture, Ecosystems and Environment*, **45**, 25–45
- Bardgett, R D., (Whittaker, J B) & Frankland, J C 1993 The diet and food preferences of *Onychiurus procampatus* (Collembola) from upland grassland soils *Biology and Fertility of Soils*, **16**, 296–298
- Bardgett, R D , (Whittaker, J.B.) & Frankland, J C 1993 The effect of collembolan grazing on fungal activity in differently managed upland pastures a microcosm study *Biology and Fertility of Soils*, **16**, 255–262
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- Cannell, M.G R. & Dewar, R C 1994 Carbon allocation in trees a review of concepts for modelling *Advances in Ecological Research*, **29**, 59–104
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- Cape, J N 1993 Direct damage to vegetation caused by acid rain and polluted cloud definition of critical levels for forest trees *Environmental Pollution*, **62**, 167–180
- Cape, J N. 1993 The use of ³⁵S to study sulphur cycling in forests *Environmental Geochemistry and Health*, **15**, 113–118
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- (Casey, H), Clarke, R T & (Smuth, S M.) 1993 Increases in nitrate concentrations in the River Frome (Dorset) catchment related to change in land use, fertilizer applications and sewage input *Chemistry and Ecology*, **8**, 105–117
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- Snazell, R. G.** 1993 *M3 Bar End to
Compton summary of ecological works
and advice* October 1993 8pp Mott
MacDonald Civil Ltd
- Snazell, R. G. & Ward, L. K.** 1993 *M3 Bar
End to Compton proposals for ecological
monitoring Summer 1994* December
1993 16pp Mott MacDonald Civil Ltd
- Snazell, R. G., Rispin, W. E., Thomas, J. A.,
Webb, N. R., Ward, L. K. & Daniels, R. E.**
1993 *M3 Bar End to Compton ecological*

survey 1992 October 1993 42pp Mott MacDonald Civil Ltd

(Spoor,G , Morris,J , Gowing,D J G , Hill,D), Mountford,J O & Eversham,B C 1993 *Northmoor Core Wetland implementation options* 80pp National Rivers Authority (Wessex Region)

(Spoor,G , Morris,J , Gowing,D J , Hill,D), Mountford,J O & Eversham,B C 1993 *Northmoor Pumping Station pump replacement scheme phase 1 impact assessment* 65pp National Rivers Authority (Wessex Region)

(Spoor,G , Morris,J , Gowing,D J , Hill,D), Mountford,J O & Eversham,B C 1993 *Northmoor Pumping Station pump replacement scheme phase 2 impact assessment* 100pp National Rivers Authority (Wessex Region)

Stevens,P A & Reynolds,B 1993 *A review of the water quality implications of conifer harvesting in the UK 2 Unpublished results from ITE clearfelling studies and management options* National Rivers Authority

Stevens,P A , Emmett,B A & Reynolds,B 1993 *Forest Nitrogen Survey nitrogen critical loads & processes controlling nitrate leaching Report for 1993* October 1993 63pp Department of the Environment

Stevens,P A , Brittain,S A , Hughes,S , Sparks,T H & Worth,J 1994 *Soil/plant interactions in lowland grassland soil analyses and interpretation* February 1994 100pp Countryside Council for Wales

Stevenson,M J & Ward,L K 1993 *M3 Bar End to Compton Chalk grassland restoration seed collection and pot plant production 1993* December 1993 51pp Mott MacDonald Civil Ltd

Sykes,J M 1993 *The United Kingdom Environmental Change Network Progress report for 1992-93* April 1993 11pp Department of the Environment

(Tallowin,J R B , Kirkham,F W , Wilkins,R J , Thomas,G H , Smith,R E N), Mountford,J O . & Lakhani,K H 1994 *The effects of inorganic fertilisers in flower-rich hay meadows on the Somerset Levels Executive summary of the Tadhams project,*

1986-1993 29pp Ministry of Agriculture, Fisheries and Food, English Nature, Department of the Environment

Taylor,P J & Riddell,D J 1993 *Allt Rugh bridge pre-demolition stream survey* November 1993 15pp Lang Scotland

Thomas,J A & Greated-Davies,N 1993 *M1 widening junctions 10-15 black hairstreak survey* July 1993 10pp Kelsey Associates

Thomas,J A & Simcox,D J 1993 *The large blue butterfly in 1993* December 1993 20pp English Nature, Butterfly Conservation

Treweek,J R , Manchester,S J , Hankard,P , Osborn,D , Mountford,J O , Eversham,B C , Arnold,H R , Veitch,N & Fuller,R M 1993 *The development of a comparative environment index* April 1993 Department of the Environment

Treweek,J R , Manchester,S J , Hankard,P , Osborn,D , Mountford,J O , Eversham,B C , Arnold,H R , Veitch,N & Fuller,R M 1993 *The development of a comparative environment index* September 1993 128pp Department of the Environment

Veitch,N , Parr,T W & Webb,N R 1994 *Heathland re-creation in Dorset a pilot project for the rest of England* 18pp English Nature

Ward,L K 1993 *New Forest cicada (Cicadetta montana Scopoli) (Hemiptera Cicadidae) survey and management 1993* (English Nature Species Recovery Programme) October 1993 67pp English Nature

Ward,L K & Snazell,R G 1993 *M3 Bar End to Compton proposals for ecological monitoring Summer 1993* June 1993 14pp Mott MacDonald Civil Ltd

Watt,A D & (Stork,N E) 1993 *Ecology of insects in Cameroon plantation forests Forest Management and Regeneration Project ONADEFI/ODA Mbalmayo, Cameroon Second consultancy report* Overseas Development Administration

Watt,A D & (Stork,N E) 1993 *Ecology of insects in Cameroon plantation forests Forest Management and Regeneration Project ONADEFI/ODA Mbalmayo, Cameroon Third consultancy report* Overseas Development Administration

Webb,N R & Rose,R J 1994 *Habitat fragmentation and heathland species* 23pp English Nature

Weeks,J M 1994 *A critique of proposed IPC environmental assessment methodology* January 1994 61pp WWF-UK

Welch,D , Scott,D , Staines,B W & Stolte,A 1993 *Study on effects of wintering red deer on heather moorland* December 1993 39pp Scottish Natural Heritage

Welch,D , Scott,D & Watson,A 1994 *Monitoring the effects of snow fencing on vegetation, herbivores and soils at Glas Maol in 1993* January 1994 13pp Scottish Natural Heritage

Welch,R C 1993 *A34 Newbury Bypass ecological implications of proposed modifications to culvert under A343 interchange* 9 June 1993 2pp Mott MacDonald

Welch,R C 1993 *A34 Newbury bypass recommendations for wildlife* 3pp Mott MacDonald

Welch,R C 1993 *A34 Newbury bypass A343 junction Management of National Trust land* 3pp Mott MacDonald

Welch,R C 1993 *An assessment of the invertebrates associated with the Institute of Terrestrial Ecology's land cover classes* September 1993 94pp Her Majesty's Inspectorate of Pollution

Welch,R C 1993 *The ecology of the River Kennett valley in the vicinity of the proposed A34 Newbury bypass* September 1993 61pp George Black Associates

Wells,T C E , Preston,C D , Croft,J , Mountford,J O & Cox,R 1993 *Species Recovery Programme fen violet (Viola persicifolia) First progress report* December 1993 4pp English Nature

Wells,T C E , Sparks,T H , Cox,R & Frost,A 1993 *Critical loads for nitrogen - assessment and effects on southern heathlands and grasslands Final report* November 1993 2 vols National Power

Wells,T C E , Preston,C D , Cox,R , Croft,J M & Frost,A 1994 *Species Recovery Programme fen ragwort (Senecio paludosus) and ribbon-leaved waterplantain (Alisma gramineum) Final report* March 1994 23pp English Nature

(Winder, J. M. & Symes, K. L.) 1993 *An investigation between aquatic plant and animal communities of rivers Report for the period April 1992 to March 1993* 130pp Scottish Natural Heritage

(Wright, J. F.), Clarke, R. T. & (Blackburn, J. H.) 1993 *Macronvertebrates in lowland rivers in summer a guide to macroinvertebrate – habitat associations* 107pp Scottish Natural Heritage

(Wright, J. F., Furse, M. T.), Clarke, R. T., Moss, D., (Gunn, R., Blackburn, J. H., Winder, J., Symes, K. & Grieve, N.) 1993 *Testing and further development of RIVPACS phase II October–December 1992* 10pp National Rivers Authority

(Wright, J. F., Gunn, R. J. M., Blackburn, J. H., Winder, J. M., Symes, K. L., Grieve, N. J., Furse, M. T.), Clarke, R. T. & Moss, D. 1993 *Testing and further development of RIVPACS (phase 2) Progress report for the period April 1993–June 1993* July 1993 17pp National Rivers Authority

(Wright, J. F.), Moss, D., (Gunn, R. J. M., Blackburn, J. H., Winder, J. M., Symes, K. L., Grieve, N. J., Furse, M. T.) & Clarke, R. T. 1993 *Testing and further development of RIVPACS (phase 2) January – March 1993* 15pp National Rivers Authority

(Wright, J. F., Gunn, R. J. M., Blackburn, J. H., Winder, J. M., Symes, K. L., Grieve, N. J., Furse, M. T.), Clarke, R. T. & Moss, D. 1994 *Testing and further development of RIVPACS (phase 2) Progress report for the period July 1993 – December 1993* January 1994 21pp National Rivers Authority

Wyatt, B. K., Greated-Davies, N., Hill, M. O., Bunce, R. G. H. & Fuller, R. M. 1994 *Comparison of land cover definitions Final report* March 1994 3 vols Department of the Environment

Yates, T. J. 1994 *Butterfly Monitoring Scheme Annual progress report* Joint Nature Conservation Committee

Appendix 5. ITE publications

HMSO publishes for the Institute, and acts as an agent for a substantial backlist of ITE titles. Unless specified otherwise, all books are paperback with prices shown net (as per the Net Book Agreement), and are available from HMSO bookshops

Forest science

- | | |
|---|---|
| Cumbrian woodlands (ITE symposium no 25)
J K Adamson (ed)
94pp 0 11 701421 4 £7 10 1989 | A field key for classifying British woodland vegetation: Part II
R G H Bunce
95pp 0 11 701417 6 £7 95 1989 |
| The ecology of even-aged forest plantations
E D Ford, D C Malcolm & J Atterson (eds)
582pp 0 904282 33 3 £9 00 (Hardback) 1979 | Identification of ectomycorrhizas (ITE research publication no 5)
K Ingleby, P A Mason, F T Last & L V Fleming
112pp 0 11 701461 3 £30 00 1990 |
| Effect of birch on moorlands
J Miles
18pp 0 904282 47 3 £1 50 1981 | Pasture woodlands in lowland Britain
P T Harding & F Rose
94pp 0 904282 91 0 £5 00 1986 |
| Environmental aspects of plantation forestry in Wales
(ITE symposium no 22)
J E G Good (ed)
77pp 1 870393 02 3 £3 25 1987 | The temperate forest ecosystem (ITE symposium no 20)
Yang Hanxi, Wang Zhan, J N R Jeffers & P A Ward (eds)
189pp 1 870393 01 5 £7 50 1987 |
| A field key for classifying British woodland vegetation: Part I
R G H Bunce
103pp 0 904282 68 6 £3 00 1982 | Trees and wildlife in the Scottish uplands (ITE symposium no 17)
D Jenkins (ed)
196pp 0 904282 97 X £3 50 1986 |

Land use, agriculture and the environment

- | | |
|---|---|
| Agriculture and conservation in the hills and uplands
(ITE symposium no 23)
M Bell & R G H Bunce (eds)
164pp 1 870393 03 1 £5 00 1987 | Historical ecology: the documentary evidence
J Sheal
22pp 0 904282 34 1 £2 00 1980 |
| Agriculture and the environment
(ITE symposium no 13)
D Jenkins (ed)
195pp 0 904282 73 3 £3 50 1984 | Land use change: the causes and consequences
(ITE symposium no 27)
M C Whitby (ed)
201pp 0 11 701553 9 £35 00 1992 |
| Angling and wildlife in fresh waters
(ITE symposium no 19)
P S Matland & A K Turner (eds)
84pp 0 904282 99 6 £4 00 1987 | Moorland management: a study of Exmoor
G R Miller, J Miles & O W Heal
130pp 0 904282 79 1 £4 50 1984 |
| The biology and management of the River Dee
(ITE symposium no 14)
D Jenkins (ed)
160pp 0 904282 88 0 £6 00 1985 | Rural information for forward planning
(ITE symposium no 21)
R G H Bunce & C J Barr (eds)
115 pp 1 870393 05 8 £5 50 1988 |
| Britain's railway vegetation
C Sargent
34pp 0 904282 76 7 £3 50 1984 | The use of land classification in resource assessment and rural planning
R S Smuth
43pp 0 904282 62 7 £3 00 1982 |
| Distribution of freshwaters in Great Britain
I R Smuth & A A Lyle
44pp 0 904282 25 2 £2 00 1979 | Vegetation change in upland landscapes
D F Ball, J Dale, J Sheal & O W Heal
45pp 0 904282 64 3 £2 00 1982 |

Global environmental change

Climatic change, rising sea level and the British coast

(ITE research publication no 1)
L A Boorman, J D Goss-Custard & S McGrorty
24pp 0 11 701429 X £2 75 1989

Climatological maps of Great Britain

E J White & R I Smuth
37pp 0 904282 69 4 £2 00 1982

The greenhouse effect and terrestrial ecosystems of the UK

(ITE research publication no 4)
M G R Cannell & M D Hooper (eds)
56pp 0 11 701488 5 £2 45 1990

Environmental pollution

Acidification and fish in Scottish lochs

P S Matland, A A Lyle & R N B Campbell
71pp 1 870393 04 X £3 50 1987

Pollution in Cumbria

(ITE symposium no 16)
P Ineson (ed)
92pp 0 904282 96 1 £52 50 1986

Early diagnosis of forest decline

J N Cape, I S Paterson, A R Wellburn, J Wolfenden, M Mehlhorn,
P Freer-Smith & S Fink
68pp 1 870393 07 4 £5 00 1988

Predatory birds, pesticides and pollution

A S Cooke, A A Bell & M B Haas
74pp 0 904282 55 4 £4 00 1982

Effects of air pollutants on agricultural crops

F T Last, D Fowler & P H Freer-Smith
27pp 0 904282 90 2 £2 00 1985

Radionuclides in terrestrial ecosystems

K L Bocock
27pp 0 904282 42 2 £2 00 1981

Methods for studying acid precipitation in forest ecosystems

I A Nicholson, I S Paterson & F T Last (eds)
36pp 0 904282 36 8 £3 00 1980

Population and community ecology

Atlas of mammals in Britain

(ITE research publication no 6)
H R Arnold
145pp 0 11 701667 5 £12 50 1993

Distribution and status of bats in Europe

R E Stebbings & F Grnffith
142pp 0 904282 94 5 £2 50 1986

Bedford Purlieus (ITE symposium no 7)

G F Peterken & R C Welch (eds)
209pp 0 904282 05 8 £1 00 1975

Ecology of quarries

(ITE symposium no 11)
B N K Davis (ed)
77pp 0 904282 59 7 £2 00 1982

Biological recording of changes in British wildlife

(ITE symposium no 26)
P T Harding (ed)
78pp 0 11 701560 1 £19 50 1992

Handbook of European sphagna

R E Damels & A Eddy
262pp 0 11 701431 1 £10 50 1990

Birds of St Kilda

M P Harns & S Murray
42pp 0 904282 27 9 £6 50 1989

Heather in England and Wales (ITE research publication no 3)

R G H Bunce (ed)
40pp 0 11 701422 2 £2 95 1989

Butterfly research in ITE

M L Hall
28pp 0 904282 46 5 £1 50 1981

Spartina anglica - a research review

(ITE research publication no 2)
A J Gray & P E M Benham (eds)
80pp 0 11 701477 X £8 75 1990

Coast dune management guide

D S Ranwell & R Boar
105pp 0 904282 93 7 £3 00 1986

The status of the Atlantic salmon in Scotland

(ITE symposium no 15)
D Jenkins & W M Shearer (eds)
127pp 0 904282 92 9 £3 00 1986

Conserving otters

D Jenkins
14pp 0 904282 44 9 £1 00 1980

Woodlice in Britain and Ireland: distribution and habitat

P T Harding & S L Sutton
152pp 0 904282 85 6 £5 00 1985

Scientific services

Chemical analysis in environmental research

(ITE symposium no 18)

A P Rowland (ed)

104pp 0 904282 98 8 £7 00 1987

Cotton strip assay: an index of decomposition in soils

(ITE symposium no 24)

A F Harrison, P M Latter & D W H Walton (eds)

176pp 1 870393 06 6 £12 50 1988

Ecological mapping from ground, air and space

(ITE symposium no 10)

R M Fuller (ed)

142pp 0 904282 71 6 £6 00 1983

Register of permanent vegetation plots

M O Hill & G L Radford

32pp 0 904282 86 4 £2 00 1986

The following titles have been published by the Biological Records Centre at ITE Monks Wood, and are available from Publication Sales, ITE Merlewood

Provisional atlases

Provisional atlas of the insects of the British Isles: Part 4, Siphonaptera, fleas

RS George

72pp 0 900848 70 7 £1 00 1974

Atlas of the non-marine Mollusca of the British Isles

M P Kerney

105pp 0 904282 02 3 £3 00 1976

Provisional atlas of the nematodes of the British Isles: Parts 1-3. Longidoridae, Trichodoridae and Criconematidae

D J F Brown, C E Taylor, B Boag, T J W Alphey & K J Orton-Williams

74pp 0 904282 04 X £2 00 1977

Provisional atlas of the insects of the British Isles: Part 8, Trichoptera Hydroptilidae, caddisflies (Part 1)

J E Marshall

35pp 0 904282 18 X £2 00 1978

Provisional atlas of the insects of the British Isles: Part 5, Hymenoptera: Formicidae, ants

K E J Barrett

51pp 0 904282 39 2 £3 00 1979

Provisional atlas of the marine dinoflagellates of the British Isles

J D Dodge

142pp 0 904282 53 8 £4 00 1981

Provisional atlas of the mycomycetes of the British Isles

B Ing

104pp 0 904282 67 8 £1 00 1982

Provisional atlas of the marine algae of the British Isles

T A Norton

67pp 0 904282 89 9 £3 50 1985

Provisional atlas of the Sepsidae (Diptera) of the British Isles

A Pont

33pp 1 870393 00 7 £3 00 1986

Provisional atlas of the insects of the British Isles: Part 9, Hymenoptera: Vespidae, social wasps

M E Archer

18pp 0 904282 38 4 £2 50 1987

Provisional atlas of the centipedes of the British Isles

A D Barber & A N Keay

127pp 1 870393 08 2 £7 00 1988

Provisional atlas of the ticks (Ixodoidea) of the British Isles

K P Martyn

62pp 1 870393 09 9 £4 00 1988

Provisional atlas of the click beetles (Coleoptera: Elateroidea) of the British Isles

H Mendel

89pp 1 870393 11 2 £5 50 1990

Provisional atlas of the Larger Brachycera (Diptera) of the British Isles

C M Drake

131pp 1 870393 14 7 £5 00 1991

Provisional atlas of the long-palped craneflies (Diptera: Tipulinae) of Britain and Ireland

A E Stubbs

134pp 1 870393 16 3 £5 00 1992

Provisional atlas of the Cryptophagidae-Atomariinae (Coleoptera) of Britain and Ireland

C Johnson

91pp 1 870393 17 1 £5 50 1993

Final atlas

Atlas of the non-marine Mollusca of the British Isles

M P Kerney

105pp 0 904282 02 3 £3 00 1976

Other title

Recent surveys and research on butterflies in Britain and Ireland: a species index and bibliography

P T Harding & S V Green

42pp 1 870393 15 5 £2 50 1991

New titles published by HMSO in 1993–94

Critical loads: concepts and applications

(ITE symposium no. 28)

M Hornung and R A Skeffington (editors)

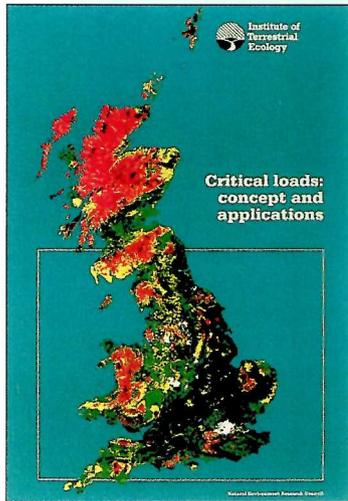
The concept of 'critical loads' is of great ecological, economic and political importance. Although a simple concept – the threshold at which a pollutant load causes harm to the environment – turning this basic idea into scientifically acceptable criteria is an ambitious undertaking. Nevertheless, governments are pressing ahead with European legislation on air pollution based on acceptable critical loads. However, there has been little opportunity for the ecological community as a whole to participate in these vital discussions on European policy, or for those who have been involved to present the results of their deliberations to their scientific peers. To help remedy this situation, ITE organised a conference in 1992 for all interested parties. It generated new ideas, re-assessed existing views, and sparked some controversies. This book documents the proceedings of the conference and will be invaluable in the further development of the critical loads concept.

134pp

0 11 701666 7

1993

£30.00



Tropical trees: the potential for domestication and the rebuilding of forest resources

(ITE symposium no. 29)

R R B Leakey and A C Newton (editors)

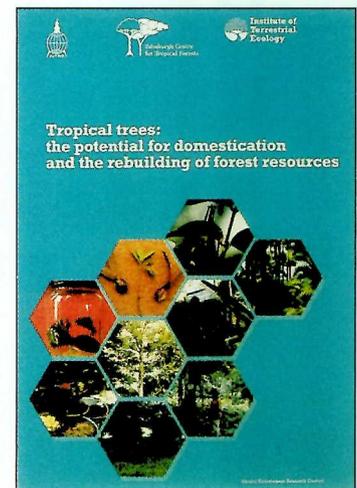
A 'woody plant revolution' needs to take over where the 'green revolution' left off. Throughout the tropics there are numerous perennial woody species that have provided indigenous peoples with many of their needs for millennia: fuelwood, poles, timber, fruits, gums, nuts, resins, fibre, pharmaceutical products, etc. These trees are cut down indiscriminately and are often commercially ignored in favour of a handful of exotic species. The aim of an international conference organised by ITE in 1993 was to draw attention to a growing effort to domesticate a much wider array of genetically rich tree species and introduce them into agricultural and forestry systems. The techniques described in these conference proceedings aim to solve the biological issues which until now have stood in the way of the rapid domestication of tropical trees.

284pp

0 11 701562 8

1994

£40.00



Managing set-aside land for wildlife

(ITE research publication no. 7)

L G Firbank

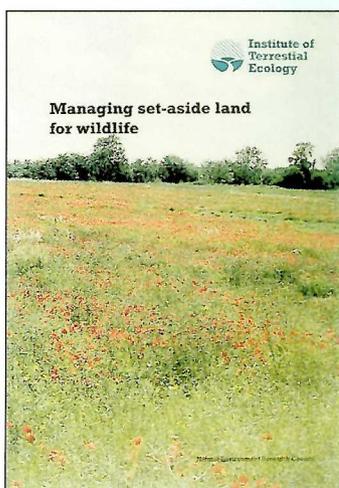
Whether you are raising sheep or stone curlews, growing continuous cereals or growing lowland heath, managing farmland for wildlife involves the same process of farm management as agricultural production. Following on from the Countryside Premium Scheme and other countryside schemes, the Ministry of Agriculture, Fisheries and Food wishes to encourage farmers to manage set-aside land to improve the quality of our rural environment. The scale of set-aside offers great opportunities for wildlife, but only if it is managed appropriately. This reference guide has been written specifically to help farmers and their advisors to manage set-aside land for wildlife. It will also be of interest to all those concerned with wildlife management and habitat restoration in general.

146pp

0 11 701568 7

1993

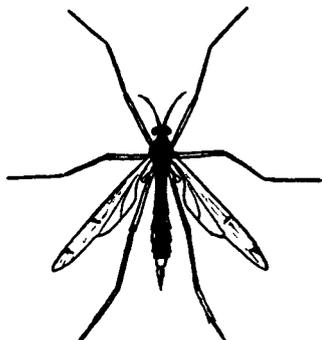
£9.95



New titles published by ITE in 1993-94

Provisional atlas of the ptychopterid craneflies (Diptera: Ptychopteridae) of Britain and Ireland

A E Stubbs



The *Atlas* summarises information on the occurrence of the seven species of ptychopterid craneflies known from Britain and Ireland. It includes distribution maps and brief species accounts based on records compiled to the end of 1992. Also included are illustrated keys to males and females known from elsewhere in Europe and North Africa.

34pp

1 870393 19 8

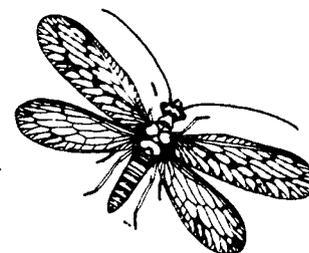
1993

£2 50

Provisional atlas of the lacewings and allied insects (Neuroptera, Megaloptera, Raphidioptera and Mecoptera) of Britain and Ireland

C W Plant

The *Atlas* summarises information on the occurrence in Britain and Ireland of lacewings, snakeflies, alderflies, scorpionflies and the snow flea. It includes an up-to-date synonymised checklist, distribution maps and accounts of 74 species, an assessment of the status of each species and Red Data list, and a bibliography of more than 70 publications mainly concerned with identification.



203pp

1 870393 18 X

1994

£6 50

Appendix 6. Environmental data network

Through its many scientific programmes and commissioned research activities, the Institute is accumulating environmental data at an ever-increasing rate. Such a phenomenon is not unique to ITE but is common to all NERC Institutes. In total, the NERC data sets comprise a valuable environmental science resource for the UK, and a Data Policy has been established by the Council which describes the framework for the management of this resource in terms of the stewardship of the data sets, and 'their exploitation in pursuit of scientific understanding and the creation of wealth' [NERC Data Policy Draft of Public Statement, 1994]

NERC recognises that data sets are tradeable assets. Their value is determined by their end use, and can be realised by

- giving, exchanging or licensing/selling data to scientific researchers,
- using the data internally to create wealth within NERC Institutes,
- licensing/selling data to the commercial and industrial sectors who will themselves create wealth

It is NERC's policy to charge for the provision of data at a rate that is dependent on the use to which the data will be put (eg *bona fide* research, non-profit-making or commercial applications) and to specify any restrictions on the use of the data in formal licensing agreements

The policy is implemented by a network of six designated data centres, each serving broadly different scientific disciplines. The **Environmental Information Centre** (EIC), set up in 1989 and based at Monks Wood, is the nominated data centre for terrestrial ecology and the rural environment. EIC is responsible for maintaining standards of data stewardship within the Institute and acts as a focus for a network of regional centres, and data managers at each ITE Station. The Centre is also custodian of a number of key national and European data sets, which have been developed to underpin research on species and ecosystems' responses to changes in environmental conditions

EIC comprises three component units

- The **Biological Databases Unit** compiles and manages spatially and temporally referenced databases on the biodiversity of the British Isles and databases on sites of importance for wildlife conservation in Europe

- The **Remote Sensing Unit** uses remote sensing for applications in ecology and land use, in particular natural resource management and land use planning
- The **Geographical Information Systems Unit** is developing and applying methods of spatial data analysis and modelling to appropriate areas of the Institute's strategic science and commissioned research programmes. The Unit also undertakes technical developments in respect of the use of GIS in ecological research and the provision of technical support for the GIS centres at other ITE Stations

Outside EIC there are other research programmes developing large spatial and/or temporal databases which are linked into the data network. The largest of these programmes is conducted by the **Land Use Section** (LUS) at Merlewood. The Section undertakes research which explains the relationships between the distribution of plants and animals and human activities in Great Britain. In addition to research on the ecology of land use, the **UK Environmental Change Network** (ECN) long-term monitoring programme is managed at Merlewood by a Central Co-ordination Unit. The Unit also runs one of the founding monitoring sites at Moor House/Upper Teesdale in the northern Pennines. ECN's role is to collect, analyse and interpret data from a network of representative sites on a selected set of integrated environmental variables likely to be driving and responding to environmental change. Because the scope of both these research programmes is geographically extensive and multidisciplinary, large data sets have been generated. For practical reasons, the databases are managed and maintained at Merlewood by dedicated data managers, who serve also the programme collaborators and other external customers

In addition to the major database centres at Monks Wood and Merlewood, there are two national centres for Scotland and Wales, serving major customers such as the Conservation Agencies (Scottish Natural Heritage and the Countryside Council for Wales) and the Scottish and Welsh Offices. The **Scottish Centre for Ecological Data** (SCED), based at Banchory, has access to all the major databases in the Institute. SCED was established in 1993 not only to serve requests for information that were specific to Scotland and its regions, but also to provide expertise on national flora and fauna to help with the interpretation of the data. In the same way that SCED serves Scottish sectoral interests, so **Bangor** serves requests for information in Wales and has direct access to the UK databases held by EIC and LUS

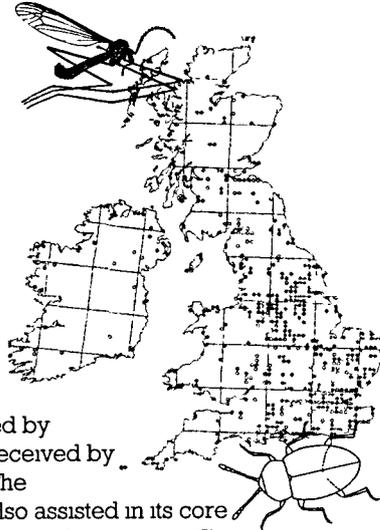
List of databases

The Institute holds many digital (and paper-based) databases, some of which are held by individual scientists and some by EIC and other centres, some are *live* databases which are continually managed and extended by the addition of more data, and some form archives which are created after research projects have been completed

The following list of databases and related information systems is not intended to be a comprehensive list but it provides information on the major corporate databases of the Institute

Database of the Biological Records Centre

The database comprises distributions of biological species in the British Isles. The data incorporate the taxonomic code of the organism, together with geographical co-ordinates of its location, date of observation, information on habitat and conservation status. Over 6 million records covering 15 000 species are held in digital form as Oracle tables. The majority of the data are donated by volunteer recorders and are received by national recording schemes. The Biological Records Centre is also assisted in its core activities and database functions by the statutory Conservation Agencies through a support contract administered by the Joint Nature Conservation Committee. The database is used to publish distribution atlases and to provide computerised retrieval and mapping services to a wide user community. *Further information can be obtained from EIC, Monks Wood*



CORINE Biotopes Inventory

The database is a computerised inventory of sites of international importance for nature conservation in the European Union (EU) and Finland (data for other countries are in preparation). Records identify the location and extent of over 7000 sites, with descriptions of important habitats and biological species, rationale for notification and protection status. The inventory forms a layer of the European Union CORINE (Co-ordinated Environmental Information in the European Community) geographical information system (GIS) on the state of the environment of the EU, co-ordinated by the European Environment Agency. *Further information can be obtained from EIC, Monks Wood*



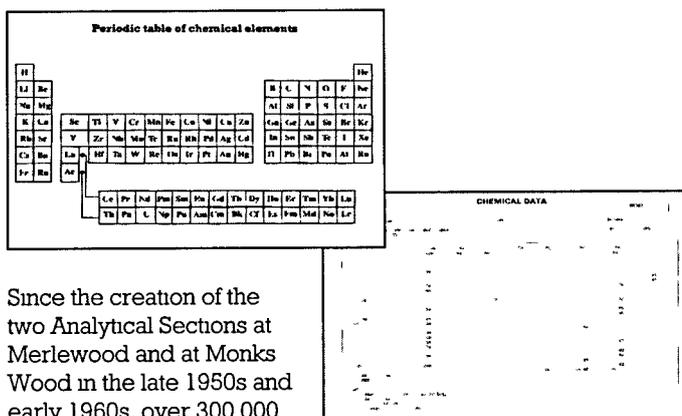
Database of Critical Loads of Atmospheric Pollutants

The database comprises estimates of the vulnerability of the land surface of Great Britain to the effects of atmospheric pollution (particularly acid deposition), on the basis of air quality and the sensitivity of receptor soils, geology, freshwaters and vegetation (trees, semi-natural vegetation and crops). The Critical Loads Database was developed by the amalgamation of data sets from the Institute of Terrestrial Ecology, the Soil Survey and Land Research Centre (SSLRC), Macaulay Land Use Research Institute (MLURI) and the University of Aberdeen. The database is managed by the Critical Loads Mapping and Data Centre (MADC) at Monks Wood and acts as the UK National Focal Centre for the Critical Loads Advisory Group (CLAG), which was set up in 1991 by the Department of the Environment to develop a national critical loads and levels programme.

Data within the basic database correspond to each of the c 250 000 1 km squares of the British National Grid. The data are held in digital forms within Laserscan Horizon and Arc/Info GIS and within an Oracle database. The MADDC uses the database to map particular receptor pollutant combinations which are then combined with current deposition loads or exposure levels for that pollutant to produce critical load or level exceedance maps. Areas of potential damage can be quantified from these maps and these form a basis for relating policy on pollutant emission abatements to environmental benefits.

Further information can be obtained from EIC, Monks Wood

Analytical Chemistry Databases



Since the creation of the two Analytical Sections at Merlewood and at Monks Wood in the late 1950s and early 1960s, over 300 000 biological samples have been analysed for over 2 million individual determinations. Most of the data at Merlewood relate to water, soil and vegetation analyses for major and minor nutrient and trace elements and the major ions. The data stored at Monks Wood relate to both vertebrate and invertebrate tissue, soils, water and vegetation for pesticide and toxic chemical residues. The data at these Stations are not stored in a structured computerised database, but information can be obtained from the leader of the Analytical Section at the respective Stations.

Ecological Surveys of Great Britain



The database includes information collected in field surveys of selected 1 km squares of the British National Grid, representative of 32 distinct land classes (classified according to environmental characteristics such as geology, altitude and climate derived from maps) Information includes botanical data (occurrence and cover within quadrats), soil type and strata, and land cover, and the data have

been collected from up to 508 sample squares, surveyed in 1978, 1984 and 1990 (eg the Countryside Survey 1990, sponsored by the Department of the Environment, the British National Space Centre, and the Natural Environment Research Council) The data are regarded as being representative of the land classes and, by classifying every 1 km square of the National Grid, it is possible to make statistical predictions of the ecological characteristics of each square [see Countryside Information System] The national database comprises the land class assignment for each of c 250 000 1 km squares of the British National Grid together with the characteristics of each land class The map data are held digitally within Arc/Info GIS and the attribute information and summary data on the and classification are recorded in an Oracle database

Further information can be obtained from LUS, Merlewood

Countryside Information System

The Countryside Information System (CIS) is a PC-based information system running under the Microsoft Windows operating environment, developed under contract to the Department of the Environment It provides easy and flexible access to information on land cover, landscape features, vegetation, soils and freshwater animals from the Countryside Survey 1990 The CIS stores, analyses and displays data by the 1 km squares of the British National Grid Two types of data are held census data which are available for each 1 km square in the country (eg designated and administrative areas and boundaries, Land Cover Map) and sample data which are referenced to the ITE land classification (eg land cover stock and change 1978, 1984 and 1990, and linear features stock and change 1984 and 1990) Any other types of census or sample data which can be related to the 1 km square framework can be used in the CIS Data can be output as hard copy maps, tables and simple charts, or copied within Windows to other spreadsheets, graphics or desktop publishing software

Further information can be obtained from LUS, Merlewood

Land Cover Map of Great Britain

The Land Cover Map of Great Britain is a digital map derived from the classification of cloud-free satellite images from the American Landsat Thematic Mapper (TM) Seventeen key land cover classes were identified throughout Britain and, of these, eight classes were subdivided into, for example, upland and lowland variants, giving a total of 25 cover types The 25 land cover types include built-up areas, arable farmland, pastures and forestry, together with a variety of semi-natural vegetation types The classes are mapped on a 25 m raster overlay of the complete land surface of Great Britain The data are held in digital form as a 25 m raster overlay on the British National Grid and can be presented in a variety of digital exchange formats They can be summarised by 1 km squares (or other resolutions) of the National Grid and summary data are also held as Oracle tables

There are a wide range of users of the Land Cover Map in organisations concerned specifically with environmental impact assessments, pollution control, water resources management, policy and planning, and environmental management Its greatest potential can be realised through integration with other data, such as geology, soils, climate, biological records, agricultural statistics, and population census for use in decision support systems and geographical information systems

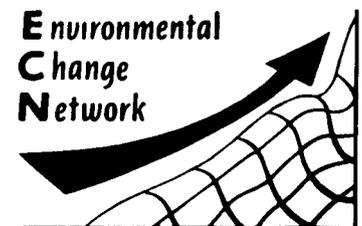
Further information can be obtained from EIC, Monks Wood

Database of the UK Environmental Change Network

The Environmental Change Network (ECN) is a multi-agency, long-term monitoring programme for identifying and quantifying environmental changes associated with man's

activities It aims to distinguish man-made changes from natural variations and trends, and to give early warning of undesirable effects ECN measurements are collected regularly at a growing number of network sites (currently 10 terrestrial and 37 freshwater) throughout the UK, using standardised protocols The data cover a wide range of physical, chemical and biological parameters, including climate, air quality, water quality and flow, soil development and chemistry, invertebrates, vertebrates, vegetation, land use and site management practice Oracle and Arc/Info are used to handle the resulting temporal and spatial database, incorporating meta-information on data specifications, origins and quality

Further information can be obtained from ECN, Merlewood



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