

Building long-term monitoring capacity

Observe TO Conserve

FOR MANY OF US, periodic health checks are the norm, but when we are unwell, perhaps in hospital, our vital signs are monitored much more closely. This is essentially the approach taken in the UK to monitoring the environment, though because detailed assessment of the state of the environment is expensive, it is restricted to relatively few locations, such as ECN sites. To address this, a much more extensive network of ECN-style long-term monitoring sites is being planned, in a project funded by the Department for Environment, Food and Rural Affairs, English Nature and the Countryside Council for Wales.

Statutory conservation of biodiversity in the UK is largely concentrated on a network of designated sites, such as Sites of Special Scientific Interest and National Nature Reserves (NNRs). The valued habitats and species at these sites are subject to pressures which can have an adverse impact. Some pressures, like land management regimes are easier to manage for than others. The effects of climate change and air pollution, for example, are less easy to detect or control. Periodic 'condition assessment' helps us determine the 'health' of these sites, but it is often difficult to identify the cause of a problem. More detailed monitoring is needed, so that policy and management techniques for conserving biodiversity can be developed on the basis of reliable scientific evidence.

The proposed network will be linked to the existing Environmental Change Network of sites, substantially increasing its spatial coverage across the UK. If agreement for funding can be achieved, it is hoped that implementation will start during 2006.

Testing whether climate change, air pollution or another factor, such as changing management patterns, is the cause of an ecological change is a key requirement, and the network will be designed accordingly. For instance, at each site, climate and some air pollutants will be monitored together with aspects of biodiversity, such as vegetation composition and populations of selected animal groups.

The network aims to cover the whole of the UK with sufficient sites to ensure that results are representative, and that similar habitats can be compared in areas with contrasting climate and pollution conditions. Sites will



Photos: Andrew Sier © CEH

Creag Meagaidh NNR in the Scottish Highlands. Inset: A new Automatic Weather Station at Ingleborough NNR, Northern England. Both these sites are being considered for inclusion in the new network.

have stable management and high conservation value: it is anticipated that NNRs will form the core of the network.

The monitoring programme will be associated with a programme of data analysis and interpretation, to both identify changes and test what is causing them. Data will be managed by the ECN Data Centre.

This proposed network will inform the UK's implementation of European legislation such as the Habitats and Birds Directives, by providing information on the causes of change in protected areas. It will help inform the development of new policy instruments aimed at enabling biodiversity conservation to adapt to climate change and minimising the impacts of air pollution.

The Centre for Ecology and Hydrology is leading the planning phase, due for completion in March 2006. Biomathematics and Statistics Scotland is responsible for the statistical analyses, and staff from UK conservation agencies, universities and research organisations are also contributing to the project.

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Contents

Network news	Meet Rover!	Going global
2	3	4

A full issue of *ECN News* will be produced later in the year

News

New survey boat for Windermere

WINDERMERE, an ECN freshwater lake site, now has a new CEH Survey vessel, 'The John Lund'. The boat is named after Dr J.W.G. Lund FRS, an eminent and long-serving member of the freshwater science community. Now in his nineties, John still contributes to work at Windermere in his role as an FBA Honorary Research Fellow. Back in 1945, John started the long-term monitoring work on Windermere that CEH now undertakes. Although this was originally a specific piece of work to understand phytoplankton dynamics, it included measurements of temperature and oxygen profiles, nutrient chemistry, phytoplankton and zooplankton and complemented other work on fish populations that had already started and became, by default, a long-term monitoring programme. Today the weekly or fortnightly measurements made on the two basins of Windermere, two other nearby lakes, Esthwaite Water and Blelham Tarn that also began in 1945, and three other Cumbrian lakes started more recently, are the most complete long-term data on lakes anywhere in the world. This invaluable information documents how lakes have responded to a range of environmental perturbations such as nutrient enrichment and climate change and provides important insights into how lakes function. Much of the data collected are, of course, also provided to ECN, which has 16 lake sites across the UK.

The new boat, officially launched by Pat Nuttall, Director CEH, will allow CEH to continue this monitoring and other work on Windermere for many years to come.



Pat Nuttall (CEH Director), Dr John Lund FRS and Stephen Maberly (Head of Lake Ecosystem Group at CEH Lancaster) beside the new survey vessel.

ECN's new freshwater sites

ECN MONITORING has recently begun on the Birnie Burn, a stream on the existing Glensaugh ECN terrestrial site in Scotland. The work is being undertaken by staff from the Macaulay Institute. The addition of Birnie Burn means that ECN now has three co-located terrestrial and freshwater sites, the other two being the Trout Beck, a tributary of the Tees traversing Moor House-Upper Teesdale NNR, and the Allt a'Mharcaidh, a stream flowing over the Cairngorms ECN site.

There are many advantages to co-locating terrestrial and freshwater sites. Existing site staff can often undertake

the new measurements relatively easily, and, of course, the range of information collected at such sites is substantially increased. For example, at Moor House, long-term monitoring of carbon in both the blanket peat and the emerging Trout Beck provides essential information for calculating a carbon account for the site.

Meanwhile, in Northern Ireland, The Environment and Heritage Service has shifted ECN monitoring from the River Faughan to the Owenkillew River. Regrettably, monitoring on the Faughan had to cease because of health and safety issues.

In brief

There's a hole in my pollen bucket
2005 was the first of three years of pollen monitoring at ECN terrestrial sites. Pollen, along with rain, is collected in a bucket with a 5 cm diameter hole in the lid and set into the ground. The trapping year runs from October and at the end the sample is sent to the University of Hull for pollen identification. The pollen data together with ECN vegetation data will be used by the international Pollen Monitoring Network as a basis for interpreting fossil pollen spectra.

ECN set to count spiders
SPIDER MONITORING is to become a core ECN measurement. The existing Ground Predators Protocol used at terrestrial sites involves fortnightly pitfall trapping for carabid beetles for six months of the year. This has also proved to be a very effective way of trapping spiders so to make good use of this "collateral damage" and because spiders represent an important component of

ecosystems some sites have been sorting spiders from the catch for identification. From spring 2006 all sites will be undertaking this and, although it does not involve additional fieldwork, it can at some sites represent a significant commitment of time simply sorting the spiders from the other material in the traps. Some sites propose in-house species identification while others intend to contract out the identification.

Biodiversity research press service launched
A NEW ONLINE SERVICE promoting biodiversity news and press releases to journalists was launched in Brussels in December 2005. The International Press Centre, Biodiversity Research - an initiative of ALTER-Net (see page 4) - provides a portal for news on biodiversity research to the international press community. Registered users may submit news items, or receive them by e-mail. The service is free of charge, and is already being well used.

www.biodiversityresearch.net



A-roving we shall go

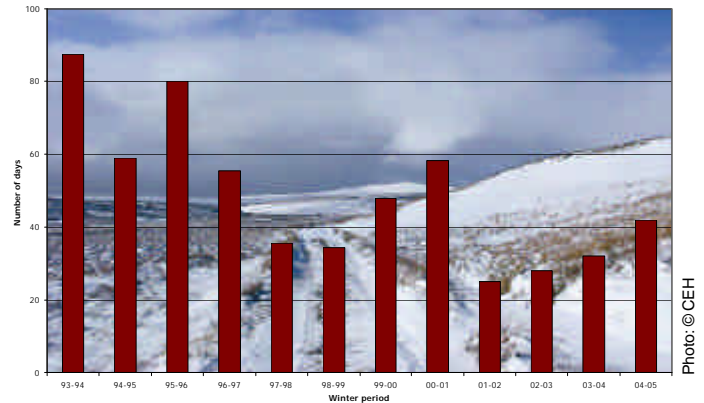
Climate observations at ECN sites are revealing some possible effects of climate change, such as the increasing rarity of lying snow at Moor House in the North Pennines. To be certain that the trends in the data we collect are real and not an artefact of poor data requires rigorous quality control procedures. As JOHN ADAMSON, ECN's Operations Manager, reports, ECN's latest faithful friend is helping to 'sniff' out the problems.

CLIMATE RECORDING is a key ECN protocol with all terrestrial sites operating an automatic weather station (AWS) that records hourly values for 12 meteorological variables. AWS data are used to identify if climate is correlated with changes in biodiversity at the sites and so the data must accurately reflect the climate of the locality where the biological monitoring takes place.

ECN Site Managers undertake routine quality control checks on their AWS data by downloading at fortnightly intervals and making comparisons against other sources of meteorological data such as local manual instruments. AWSs are also serviced every year which includes field recalibration of those sensors for which this is possible. However with most of the ECN AWSs now more than ten years old it is important that we have some between-site comparison of data quality. A full ECN specification AWS has been purchased that is being deployed at all sites in rotation for a period of at least three weeks so that the performance of the aging sensors can be compared with new factory calibrated sensors. This new machine, which is known affectionately as "Rover", has already been deployed at Moor House – Upper Teesdale, Wytham and Porton. It is hoped that it will visit the remaining ECN sites in 2006 and also spend some time at CEH Wallingford where various types of meteorological equipment are constantly under test.

Comparisons between Rover and the three site AWSs have been very encouraging with no great discrepancies. Wind speed, wind direction, air temperature and rainfall have shown good agreement at all sites and the main light sensor, a Kipp pyranometer, has shown good agreement except at one site where the older AWS was recording lower values. Soil temperature has shown poor agreement, reflecting the importance of locating sensors precisely at the specified depth and ensuring the soil above is always compact and free of vegetation. Changes in sensor design have made comparisons difficult with the relative humidity sensor changing from a wet bulb temperature sensor to a digital sensor and the modern surface wetness sensors being inherently more sensitive and thus recording longer periods of wetness. The comparisons demonstrate the importance of regular servicing, regular data inspection and the need for detailed recording of meta-data, all of which are required by ECN.

Sourhope, Glensough and Wytham have already purchased replacements for their first ECN AWSs and other sites are looking into complete replacement of stations or phased replacement of sensors. When Rover has visited all the ECN terrestrial sites at least once it will take up permanent



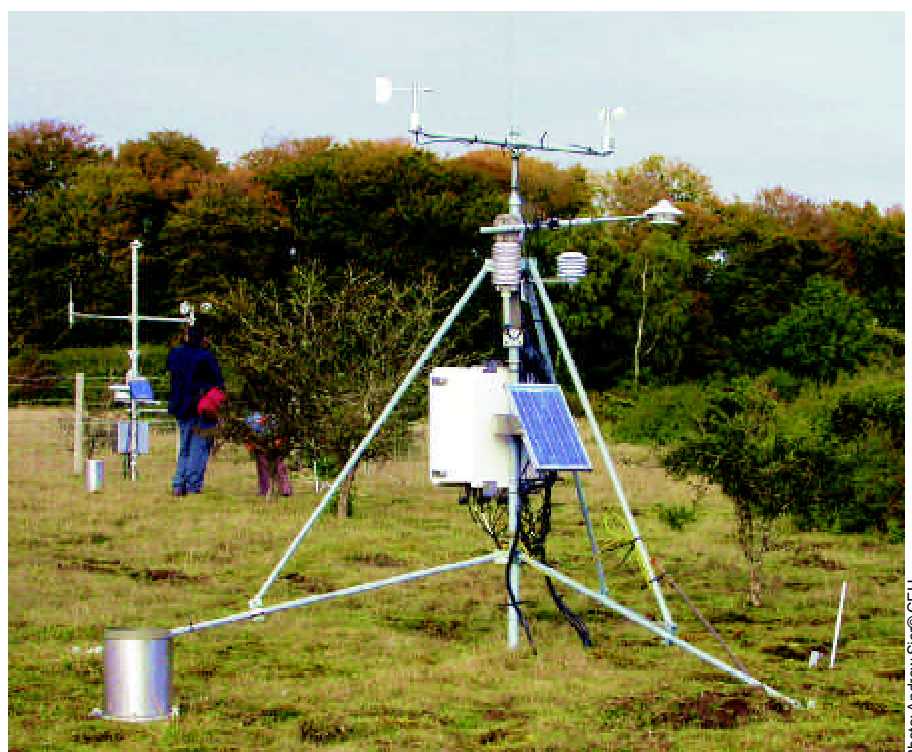
Number of days each winter with snow cover at noon at the Moor House – Upper Teesdale ECN site. This is recorded by the AWS using upward and downward pointing light sensors and a high reflectance from the ground indicates snow.

residence at Moor House, replacing the AWS that has operated there since 1991.

Quality assessment of AWS data is just one component of a rigorous quality assurance programme, which includes lab chemistry, vegetation recording and tipulid identification.

John Adamson
Centre for Ecology and Hydrology

Rover deployed at Porton with, in the background, the permanent AWS at the site.



Going global

IN ORDER TO UNDERSTAND the impacts of drivers of environmental change, such as climate change, air pollution and land use change, we need long-term environmental monitoring and research programmes which operate in an integrated fashion at national, regional and global scales. ECN's Central Coordinating Unit staff are at the centre of UK, European and Global programmes aimed at establishing large-scale long-term ecosystem research (LTER) networks.

On the European front, ECN Co-ordinator, Terry Parr, also coordinates the European Union Framework VI project, ALTER-Net (A Long-Term Biodiversity, Ecosystem and Awareness Research Network). A central component of this 'Network of Excellence' is the development of a European LTER network. ALTER-Net aims to develop the cultural and technical integration of national LTER networks that is needed to create a pan-European network. This includes agreeing common methodologies, developing shared research and monitoring agendas, agreeing procedures for sharing facilities, joint training programmes and new approaches to data sharing and access.

ALTER-Net is also developing the concept of Long-Term Socio-Ecological Research sites (LTSER). These are usually large 'sites' (often extensive regions) within which a variety of traditional ecosystem research and monitoring is undertaken, but integrated with socio-economic surveys and research. The aim is to bring together natural and social scientists to collaborate on common research issues. Methodologies are being developed that can be applied at the European scale. In the UK, one case study site is Aberdeenshire, which includes several ECN sites, including the Cairngorms terrestrial ECN site, and the Allt a'Mharcaidh catchment.

Globally, ECN is an active player in the International Long Term Ecological Research Network (ILTER). A number of European national LTER networks are members of

ILTER, and are represented as two groups, a well-developed Central and Eastern European LTER network, and a less-well established Western European network. Through ALTER-Net and related initiatives, it is hoped that a single European LTER network can be developed.

European LTER capacity continues to develop: this year, the newly formed German and Lithuanian LTER networks became formal members of ILTER.

There is still much to do in order to integrate LTER activities at these large scales, and to develop the LTSER concept. ECN will continue to play a leading role in these initiatives.

Andrew Sier
Centre for Ecology
and Hydrology

Web links:

www.alter-net.info
www.ilternet.edu
www.lter-europe.ceh.ac.uk

Image: © NASA's Earth Observatory

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