

# in-land

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## Landscape Change

Scottish river water  
quality atlas

Reducing carbon emissions  
from deforestation



# MLURI website makeover

The Institute website underwent a makeover in July. The website as a whole has been refreshed with a new colour scheme but the most dramatic change is to the homepage, which has been redesigned to give a fresher look and to comply with best practices relating to design and usability.



1 Introductory paragraph

2 Slide show of Featured Projects - RELU: Integrated Deer Management, Mountain Hare Research, Soil Forensic Research, Lyme Disease.

3 Links to each of the six main Research Themes

4 Featured Research Partner. This alternates between Global Land Project, Aberdeen Centre for Environmental Sustainability, East Grampian Coastal

Partnership, North East Scotland Local Biodiversity Action Plan, Dee Catchment Partnership and Grampian Squirrel Group.

5 Links to the Environment - Land Use and Rural Stewardship website www.programme3.net

6 Link to the Linking Hydromorphology to Ecology research network.

7 Links to Consultancy Services

8 An alternating link between

Macaulay Films and New Publications

9 What's New

10 Featured events

11 Latest job vacancies

12 Link to Environmental Monitoring Data pages with meteorological data from our sites at Glensauigh (Aberdeenshire), Sourhope (Scottish Borders) and Invercauld (Aberdeenshire) and river data from Tarland (Deeside), Birnie Burn (Aberdeenshire) and the Lunan (Angus).

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“ Talking about the amount of carbon stored in tropical forests is probably not the best way to convince local people against deforestation. Talking about the benefits that the community might gain from improved water quality, flood control, and forest products may carry more weight. ”

**Robin Matthews**

# Welcome



This past year has highlighted a series of important new policies for Scotland and the UK that recognise major issues such as the security and availability of food, water, and energy, and the protection and use of natural resources. These issues are central to the scientific work carried out at the Macaulay Land Use Research Institute and it is clear that our work has never

been more relevant or important than it is today. These issues all concern the nature and rate of change in the economy, society, and environment, and change is the major theme of this edition of in-land.

*Changes in our landscapes are nothing new.* On page six we outline how landscape changes through time can be revealed through a comparison of historical and contemporary photographs. Examples of dramatic changes can be found, as well as examples of landscapes where surprisingly little appears to have changed over the last century. Our science helps us to understand why these changes occur, the consequences of changes, and helps us to inform choices and decisions that will influence changes in the future.

The theme of landscape change continues with the results of our Moments in Time photography competition (page 20). This challenged schoolchildren to capture what their local area looked like in 2009 and the competition was run in conjunction with three events held at the Institute during the first week of June: the 33rd T. B. Macaulay Lecture, delivered by Professor Jon Foley, Director of the Institute on the Environment at the University of Minnesota, an evening of Murder, Mystery & Microscopes, and our Open Doors event where we opened the Institute to the public and highlighted the quality and range of activities we undertake.

Another major part of the Institute's work this year has been in the re-sampling of the National Soil Inventory of Scotland (NSIS). This re-sampling of Scotland's soil is important scientifically for revealing how our soils have changed over the last 30 years. As soils will form an extremely important part of our ability to respond to climate change, we are particularly interested in how the amounts of carbon in the soils have changed. Willie Towers is one of several colleagues involved in the original sampling during 1978-87 as well as the more recent work and on page 14 he offers his own personal perceptions and reflections of how the Scottish landscape has changed.

The links between soils, land use and climate change are also evident in REDD-ALERT, a project we are leading aimed at, as the title suggests, Reducing Emissions from Deforestation and Degradation through Alternative Land Uses in Rainforests of the Tropics. This project will also contribute to the successor to the Kyoto Protocol which expires in 2012. Read more on this project on page 22.

It is not only visual and environmental landscapes that change. We are also all aware of changes in financial and political landscapes. The political landscape of Scotland changed recently with the passing of the Climate Change Bill which includes an amendment that requires the Government to draft a Land Use Strategy. Issues relevant to both climate change and land use are threaded through all our science, and the Climate Change Bill and Land Use Strategy represent major opportunities for us to utilise our science to directly inform policy.

The recent announcement that the Macaulay Land Use Research Institute and the Scottish Crop Research Institute (SCRI) have agreed in principle to unite, represents a very fundamental change in the scientific landscape of Scotland, and indeed Europe, positioning Scotland as the world leader in integrated research for sustainable economies, societies and environments.

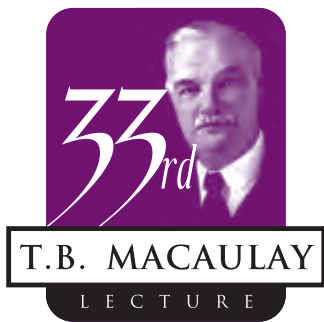
*The need to support rural communities and industries as well as meet future demands for food, energy and water may well result in future environmental and landscape change on both a local and global scale. The expertise, knowledge and advice we bring to the new institute is fundamental in the challenge to bring about desirable changes and mitigate and avoid the effects of unwelcome changes.*

We are, as ever, committed to sharing our knowledge and scientific output and I hope this edition of in-land gives you a taste of the depth and breadth of work we undertake.

Until we meet,

  
Richard Aspinall  
Chief Executive





# The 33rd T. B. Macaulay Lecture

Professor Foley, Director of the Institute on the Environment at the University of the Minnesota, was warmly welcomed to the Macaulay Land Use Research Institute to give the 33rd T. B. Macaulay Lecture.

His work focuses on complex global environmental systems and their interactions with human societies. He and his students have contributed to our understanding of large-scale ecosystem processes, global patterns of land use, the behaviour of the planet's climate and water cycle, and the sustainability of our biosphere.

The presentation, *'Living on a Shrinking Planet: Challenges and Opportunities for Sustaining Global Land Use'*, addressed the challenges of managing trade-offs between immediate human needs and the long-term capacity of the Earth to provide food, clean water, and to regulate the climate.

Land use has generally been considered a local issue but is becoming a force of global importance. Worldwide changes to land resources are driven by needs for food, fibre, water and shelter for six billion people. Global croplands, pastures, plantations and urban areas have expanded in recent decades, accompanied by increased energy, water and fertiliser consumption, and by biodiversity loss.

These changes have increased human consumption of the planet's resources, but undermine the capacity of ecosystems to sustain food production, maintain freshwater, regulate climate, and restrict infectious diseases.

*"We are pushing the Planet to its limits"* he said as he explained that between 1980 and 2000.

- The population of the Earth almost doubled
- The world economy grew seven-fold
- Use of fossil fuels rose by 400%
- Food consumption and water use tripled

The presentation also outlined the role that land use and agriculture plays in climate change. Agricultural emissions account for one-third of global greenhouse gas emissions, and almost 85% of total global water consumption.

## In the last 40 years:

- The amount of land allocated to agriculture has grown by almost 12%
- 10% more agricultural land is intensively irrigated
- Fertiliser use has grown 700%
- There has been a marked decrease in the number of types of crops grown throughout the world.

Outlining the future of land use, Prof Foley highlighted that the amount of crops being grown specifically for animal feed is rising and that in the

last 6 years, we've consumed more food than we've grown resulting in shrinking global stockpiles of grains. Increasing populations, a preference for meat over a more vegetarian diet and increased use of petroleum have led to an increased vulnerability for global food supplies.

Ending on a positive note, the need to link food, water and energy use was highlighted, plus the need to value assets that have previously been ignored such as the value of land for flood prevention, mitigating against natural disasters, and storing carbon plus the role of pollinating species.

*"Choices and decisions we make now will affect future generations and beyond."* ■



David Riley

Professor Foley planting a Rowan tree, *Sorbus aucuparia* to commemorate his visit to the Institute.

# Photographs and a changing Scottish Landscape

The debate on landscape change often centres on major proposals for future land uses. However, over time, more gradual or incremental changes in landscapes can lead to significant changes in their character. Historical photographs provide us with an opportunity to illustrate and examine such changes.

A current research project aims to reveal the types and extent of changes in the Scottish landscape over the past century through a systematic comparison of historical and contemporary photographs. A secondary aim is to discover how different people perceive these changes. For example, do people focus on changes in cultural features such as buildings, or semi-natural features, such as woodlands?

Landscapes are a popular and inspiring subject for both amateur and professional photographers.

The impression they can make on others is largely determined by the photographer's skill in capturing the essence of the landscape in a single image. This is often as much about what is omitted from an image as what is included. Therefore, how representative can an image be of a particular landscape, and can it be used to examine change?

Landscape change is commonly monitored using remotely-sensed data, both airborne and satellite, which is generated from above ground level. Whilst good for measuring

change with regards to individual land-cover types, such data are not effective for communicating and monitoring changing perceptions of the landscape.

Photographic collections across Scotland, including those of Robert Adam, Valentines Dundee, George Washington Wilson and Erskine Beveridge, provide an extensive ground-level resource of the Scottish landscape, albeit from the photographer's own perspective, from the late 1800s onwards. Carefully re-photographing the scenes from old



© RCAHMS



© Rick Rohde



© Aberdeen University



© Jim Livingston

Arnisdale 1896 and 2006 & the Muir of Dinnet 1890 and 2009





Clare Neely

The Landscape Change exhibit at the Royal Highland Show being explained to Roseanna Cunningham MSP by Richard Aspinall, Chief Executive and Michael Gibson, Chairman of the Board of Governors.

photographs from the same viewpoint allow us to compare the historical photographs and contemporary images and to analyse change.

By showing these historical and contemporary images to a wide range of people and asking them to 'spot the differences', the team will be able to better understand what people perceive as significant differences and test various ideas about what makes some changes more or less acceptable.

This research formed the basis of the Macaulay Land Use Research Institute's

exhibit at the Royal Highland Show, held at Ingleston in Edinburgh in June. Members of the public visiting the stand were given the opportunity to play an active part in the research project by doing a 'comparison' exercise on two views of the small west coast township of Arnisdale taken in 1896 and 2006 (see images on page 6.)

The results will be used in conjunction with other landscape data to better understand the potential implications of landscape change for landscape planning. ■

## For more information contact:

**Inge Aalders**

[i.aalders@macaulay.ac.uk](mailto:i.aalders@macaulay.ac.uk)

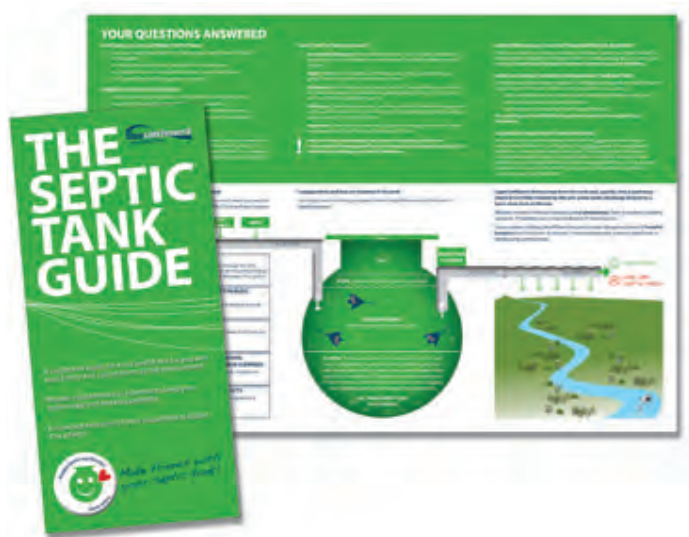
*Historic photographs are available from the collections at:*

**Royal Commission on the Ancient and Historical Monuments of Scotland**  
(RCAHMS): [www.rcahms.gov.uk](http://www.rcahms.gov.uk)

**St Andrews University**  
[special.st-andrews.ac.uk/saspecial/](http://special.st-andrews.ac.uk/saspecial/)

**University of Aberdeen**  
[www.abdn.ac.uk/historic/Online\\_collect.shtml](http://www.abdn.ac.uk/historic/Online_collect.shtml)

## Guide to Septic Tanks



A guide to septic tanks, created by the Dee Catchment Partnership, has been so popular that the Scottish Environment Protection Agency (SEPA) has funded the national distribution of the resource.

The Big Green Septic Tank Guide explains why regular maintenance is essential to keep septic tanks system safe and working properly. It also offers tips to keep septic tanks in working order, reducing the number of times they have to be emptied, protecting the environment and saving householders money!

The Dee Catchment Partnership aims to ensure that activities in the River Dee Catchment area do not have a negative impact on the quality of the water in the river. The high quality of the water ensures the river's value as a habitat for wildlife, for drinking water, as a recreational environment, as a basis for tourism and salmon fishing, and as a central asset underpinning much of the rural economy.

Susan Cooksley, Project Officer with the Dee Catchment Partnership, explains, "Although the River Dee is regarded as one of the least contaminated of the larger Scottish rivers, contaminants entering the catchment's water courses from small, separate sources have a major collective impact. In particular sewage effluent is a major pollutant."

A copy of the Septic Tank Guide can be downloaded from: [www.theriverdee.org/userfiles/file/SepticsSepticTanksFINAL.pdf](http://www.theriverdee.org/userfiles/file/SepticsSepticTanksFINAL.pdf)

**For more information contact:** Susan Cooksley  
s.cooksley@macaulay.ac.uk

## Water Scotland

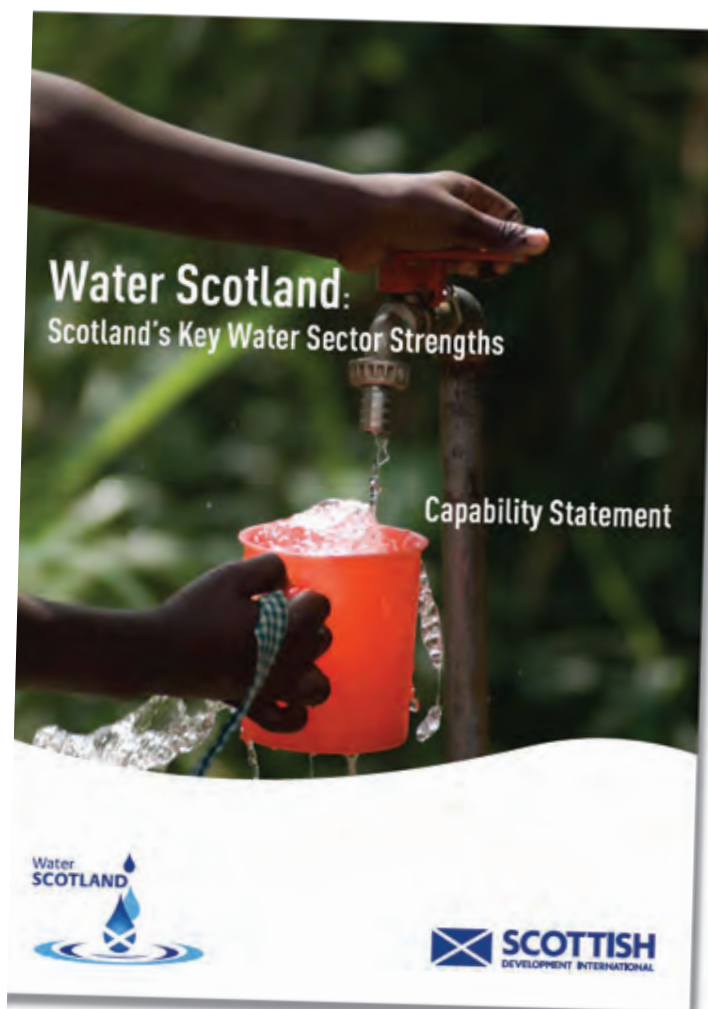
The Macaulay Land Use Research Institute is currently helping to shape a new government initiative called **Water Scotland** that is currently being coordinated by Scottish Development International.

**Water Scotland** will offer a gateway and one-stop shop to the wealth of experience and capability which Scotland has to offer in water for the international development banks and donor agencies.

A capability statement which describes Scotland's key water sector strengths and outlines how knowledge transfer can assist developing countries in areas including climate change, security, sanitation, pollution, human health and research and innovation is available from:

[www.macaulay.ac.uk/aboutus/water\\_scotland.pdf](http://www.macaulay.ac.uk/aboutus/water_scotland.pdf)

**For more information contact:** Bob Ferrier  
r.ferrier@macaulay.ac.uk





# Fungal Ecologist Scoops Young Scientist Award

Ian Anderson, a fungal ecologist, has been announced as the winner of the Asia Pacific Young Scientist Award in the area of Agriculture and Natural Resources.

The awards recognise and honour outstanding young scientists and researchers in the Asia-Pacific region who have made significant contributions to scholarship and research.

One hundred and four scientists and researchers under the age of 40 submitted their work for consideration in one of three categories: Business, Engineering and Technology and Agriculture and Natural Resources. Ian collected his award based on the work he carried out at the Macaulay Land Use Research Institute on the ecology of fungi in native Scottish ecosystems at an event held at the Asian Institute of Technology in Bangkok, Thailand in June.

“I am absolutely thrilled” said Ian. “Studying soil microbes, particularly fungi, is tremendously difficult because they are small, live below-ground and we know very little about their diversity. The only way of being able to truly assess their diversity is through the use of state-of-the-art DNA fingerprinting and other molecular biology techniques.”

“Soil is one of the most diverse ecosystems that exists. Unravelling this diversity, along with understanding the function of soil microbes in key ecosystem processes, will allow us to understand the role of soil and soil microbes in increasing forest soil carbon storage. Soils, and the microbes contained within them, have the ability to store large amounts of carbon and are therefore key components of how forest ecosystems will respond to future climate change.”

Now an Associate Professor at the School of Natural Sciences University of Western Sydney, Ian completed his PhD with the Macaulay Land Use Research Institute in 2001, and was promoted through the ranks to the position of Senior Research Scientist before returning to Australia in November 2007 to take up his current position.

In this capacity, Ian conducts a significant amount of research in the areas of plant-soil-microbe interactions, molecular ecology, and climate change. Ian has maintained his links with Scotland via honorary appointments with both the Macaulay Land Use Research Institute and the University of Aberdeen. ■



AIT's Vice President for Academic Affairs, and Chairman of the Board of ProSPER.Net, Peter Haddawy presents Ian Anderson with his award.

## Environmental Change Awareness Day

The Aberdeen Research Consortium (ARC) Environmental Change Awareness Day was held at the Macaulay Land Use Research Institute in May 2009. The aim of the meeting was to raise awareness of the environmental change research going on in the Aberdeen research institutions (Macaulay Land Use Research Institute, Marine Scotland Marine Laboratory, The Robert Gordon University, SAC and the University of Aberdeen) to encourage and facilitate collaboration and development of new research areas, and to identify future funding opportunities.





On Saturday 6th June, the Macaulay Land Use Research Institute held an open day which provided friends and relatives of staff and students, representatives from partner organisations and members of the public with an opportunity to visit the Institute to find out about our research programmes, the work we undertake in our research laboratories and facilities, and explore our grounds.



Images David Riley

The internal exhibition was arranged into six Hubs, each of which covered a different area of our work.

If you missed the event, more photographs taken at Open Doors along with several exhibition posters are available at:

[www.macaulay.ac.uk/OpenDoors2009/](http://www.macaulay.ac.uk/OpenDoors2009/)



## Health and Environment



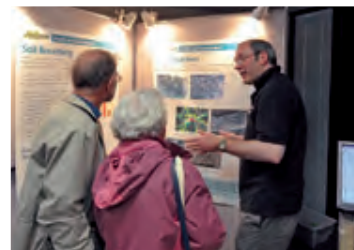
Visitors to this Hub were able to discover how the environment, and our general surroundings, affects us.

For example:

- Healthy food comes from healthy and unpolluted soils
- We all depend on clean water
- The environment is where we take exercise
- The environment can contribute to a 'feel good' factor in a psychological sense
- There are also aspects of our environment that can have negative impacts such as pollution in rivers and seas, or litter in our towns and cities. There are also lots of less obvious but everyday compounds that cause serious health impacts

Current research focuses on understanding the environment and measuring and monitoring the health of our soils and water.

We also conduct research on what nature means to people. We believe that better environmental policies require a better understanding of public views on the natural environment.



## Analysing our Environment



Visitors to our state-of-the art laboratory facilities were able to discover what analysis can reveal about the environment; from understanding how Scotland's soils may respond to climate change to fighting crime and searching for oil under the North Sea and see the facilities available to undertake environmental analyses related to plants, soils, water, gas and sediments. More than 50,000 samples are tested each year supporting the Institute's research programmes as well as providing specialist commercial analytical services for industrial sectors as diverse as oil and gas, and food.





## Future Climate: Future Environment



The study of the impacts of climate change and how we can best adapt to it requires an integrated approach by many scientific disciplines. A shared understanding of the specific climate change challenges relative to a particular sector is a vital foundation to achieve support for changes to current policies and practices.

Current work at the Macaulay Land Use Research Institute looks at the relationships between climate change, people and the environment.

Visitors to this Hub were able to enter our Climate Controlled Growth Rooms which allow us to alter the heat, light and atmosphere to study how plants grow in different climates. This is important as the trees, crops and plants we grow in Scotland might change in the future due to climate change.



## National Soils Archive



The National Soils Archive is a long term store of representative soil samples from all over Scotland. The soil samples are a reference to the state of the soils in the past and are used to test new analyses and to check if soils are changing over time.

Many visitors to this Hub were surprised to learn that soil is alive – in fact there are more living things in just one teaspoon of soil than there are people on the planet.

Like all living things, soil can become unwell and even die if it is not looked after properly. This would be bad news for us because soils play a crucial role in almost every aspect of our lives. If we didn't have healthy living soil we wouldn't have food to eat, or freshwater to drink.



Images David Riley



## Biodiversity: Nature's Network



Scotland's natural heritage can be best protected and enhanced through the evidence provided by research.

We need to understand what biodiversity is present, and what regulates interactions within and between species, as well as between species and their environment. We also need to determine how biodiversity might be impacted by climate change and how it can best be conserved and managed.

Visitors to this Hub were able to discover some of our research work using Global Positioning System (GPS) collars to monitor foraging and ranging behaviour in livestock and social behaviour in reindeer and some of our work relating to insect conservation.



## Future Landscapes



Transport, housing, energy and flood prevention are issues that affect us all, and imaginative solutions to these will need to come from a wide range of ideas. If we are to succeed, new planning and sustainable development policies require the full understanding and involvement of local people.

Visitors to this Hub were able to participate in a simulated planning decision process using our Virtual Landscape Theatre.

Younger visitors were also able to participate in planning policies by playing Pipe Dreams to decide if land should be used for crops, forestry, natural vegetation or livestock. ■



# Muiemore Stables 33 years on

A personal account by Willie Towers



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In April 2009, I had the privilege of revisiting an area of Northern Scotland that I first visited in April 1976 as a newly qualified soil scientist. This experience has given me the opportunity to reflect on changes in the work place, in soils research and whether my perception of the landscape has changed. Allow me to share some of these thoughts with you.

For those of you who consider that Aberdeen is remote in a Scottish context, think again. If you take the A9 north of

Inverness, turn inland at Brora for nine miles and then take a 6.5 mile drive up an estate track you'll arrive at Muiemore Stables. It is an unimpressive building, essentially a hut used by stalkers which still contains the equipment used for the transport of culled deer now lying redundant through the advent of cross country vehicles.

In 1976 my job, along with many others, was to survey the soils of Scotland and to collect soil samples that were representative of the area surveyed, hence my visit to Muiemore Stables. I had no refereed paper submission targets, no external funding targets, no e-mail, no mobile phones, no lap-top computers....Perhaps our single-minded focus helped us achieve what we did and which we as an Institute continue to benefit from and promote as one of our key assets.

In the mid 1970, the Institute and the forerunner to BBSRC, the Agriculture and Food Research Council (AFRC), were still driven by expansionist agricultural and forestry objectives. The potential for increasing agricultural production

through grassland improvement and the ploughing and draining of peat bogs for tree establishment was still very much in vogue.

Environmental issues we take for granted today such as acid rain, climate change, wind farms, as well as carbon stocks within, and greenhouse gas emissions from, soils were not on the agenda. Similarly policies on biodiversity were in their infancy and ecosystem services would have been an alien concept. Our soils data have been used to advance both our theoretical understanding in these areas and in the development of practical solutions. I, for one, am proud of this.

But now in 2009, what are my personal perspectives on my revisit to Muiemore Stables? The land appeared more austere and emptier than I remembered and somehow sadder. However, in the hour or so of sunshine that I experienced during my visit in April, it was as stunning as it was back in 1976.

It is difficult to describe east and central Sutherland as an iconic or beautiful landscape but it does have a distinct presence which I suspect I would not have appreciated if I had not actually lived there. It takes a long time to get into the psyche of small communities, to understand what makes them tick, and to get underneath the bitter history that many of them have endured. Two centuries previously Strath Skinsdale, where Muiemore Stables are located, was the home to several families and probably hosted a small school. Kinbrace about ten miles north as the crow flies, still has a primary school. This had 18 pupils in 1978 and two teachers; it now has three pupils.

What does 21st century Scotland do with remote areas such as central Sutherland with impoverished, from a traditional perspective, natural resources? I hope and believe that the Institute can help provide some answers. ■



Willie Towers



# New Species Award

Andy Taylor, a leading fungi expert at the Macaulay Land Use Research Institute, has been recognised for his role in the recent discovery and description of a new species, *Xerocomus silwoodensis* by the International Institute for Species Exploration.

This new mushroom species was discovered on Silwood Campus, a campus of Imperial College, London, and was named accordingly. The new species is a non-edible relative of the famous Penny Bun (or *Cep. Boletus edulis*) commonly used in French cuisine.

The mission of the International Institute for Species Exploration (IISE) is to inspire, encourage and enable the advancement of taxonomy and exploration of earth's species and each year the IISE announces a list of the Top 10 New Species for the preceding calendar year.

The new finding was described in the journal Mycological Research by Andy Taylor and his colleagues, Alan Hills, Giampaolo Simonini, José Muñoz and Ursula Eberhardt who share the award. Other notable top ten winners are a 75-million year old giant duck-billed dinosaur, a shocking pink millipede and a venomous snake. The full list for 2008 can be found at [http://species.asu.edu/Top10\\_2008](http://species.asu.edu/Top10_2008) ■

For more information contact: Andy Taylor  
[a.taylor@macaulay.ac.uk](mailto:a.taylor@macaulay.ac.uk)

# Fungal Foray

There are dozens of species of edible wild mushrooms in our British woodlands. Autumn is the most productive time for edible mushrooms and a good way to learn more about fungi is by attending a 'fungal foray'. These trips, led by local experts or fungus groups, are ideal for gaining confidence in mushroom identification.

Organisations such as Scottish Natural Heritage and the Forestry Commission offer guided 'fungal forays' during September and October. On these popular guided walks you can discover which mushrooms make a tasty treat and those that can kill...! ■

## Gathering wild mushrooms

The Scottish Wild Mushroom Forum has developed a Mushroom Code to advise gatherers and landowners how to pick fungi responsibly and protect future harvests. A copy can be downloaded from:

[www.forestharvest.org.uk/Images/ScottishWildMushroomCodeLeaflet.jpg](http://www.forestharvest.org.uk/Images/ScottishWildMushroomCodeLeaflet.jpg)

### When picking mushrooms for any purpose, PLEASE CONSIDER THE FOLLOWING POINTS.

- 1 Wildlife, especially insects, need mushrooms too, so only pick what you will use.
- 2 Do not pick mushrooms until the cap has opened out and leave those that are past their best.
- 3 The main part of the mushroom is below the surface; take care not to damage or trample it and not to disturb its surroundings.
- 4 Scatter trimmings discreetly in the same area as the mushroom came from.
- 5 Some mushrooms are poisonous and others rare and should not be picked – only pick what you know and take a field guide with you to identify mushrooms where you find them.
- 6 Before you collect mushrooms at a nature reserve please always seek advice from the manager, as special conditions may apply.

#### If you own or manage land:

- 7 Be aware that your management activities may affect mushrooms.

#### If you run a foray or collect for scientific purposes remember to:

- 8 Ensure the safety of your party, obtain permission in writing.
- 9 Give a record of what you have found to the landowner or manager and explain the significance of your findings.



The countryside is a working landscape. Please be aware of safety and follow the countryside and access codes. In accordance with these codes, and as a matter of courtesy, you are advised to ask for permission before you pick mushrooms.

By respecting the natural environment you can help to manage and conserve the countryside

### The Scottish Wild Mushroom Code

This code was created by: the Scottish Wild Mushroom Forum, a group consisting of representatives of conservation organisations, landowners, public land owning bodies, mushroom buyers and mushroom packers.

The creation of the Forum and the Code was funded by Scottish Natural Heritage, the Millennium Forest for Scotland Trust and Moray, Badenoch and Strathspey Enterprise.



SCOTTISH EXECUTIVE



Scottish Natural Heritage  
Add to the natural beauty of Scotland





## Macaulay Institute Arboretum Guide

*The beautiful grounds of the Macaulay Land Use Research Institute at Craigiebuckler date back to the 1800s.*

*Formerly the gardens of the Manor House (the remains of which form part of the Institute's administration offices and we now call Craigiebuckler House) the grounds include one of the tallest Red Alders (*Alnus rubra*) in the country.*

A guide to the Estate and Grounds, a self-guided walk which highlights points of interest, is available from:

[www.macaulay.ac.uk/OpenDoors2009/  
macaulay-arboretum\\_guide.pdf](http://www.macaulay.ac.uk/OpenDoors2009/macaulay-arboretum_guide.pdf)

For a hardcopy, please contact:  
[enquiries@macaulay.ac.uk](mailto:enquiries@macaulay.ac.uk)





# The Benefits of Getting Together

A report on the 2009 BES Symposium 'Facilitation in Plant Communities'

For decades, the way in which ecologists have thought about the natural world has been dominated by the detrimental effects that organisms can have on each other. This is the classic image of nature, operating through competition for space, light or nutrients, or the impacts of predation or disease. However, there has also always been a recognition that in some cases organisms can have beneficial effects on one another. One classic example is the obvious mutualism between flowering plants and pollinating insects: insects obtain food and the plants are pollinated.

The last few decades have seen an increasing acknowledgement of the important role played in some plant communities by these beneficial interactions. A plant can benefit its neighbours by providing shade and nutrients, protection from extremes of temperatures or the impacts of browsing animals. The increasing recognition of these interactions – particularly in extreme environments such as deserts, mountain tops or polar regions, which make up a very large part of the Earth's land surface – is challenging some of our fundamental ecological understanding, and forcing us to revisit our basic theories of how plant communities are structured and function.

There is a growing, global network of researchers currently exploring this topic, and the opportunity to get together in an open meeting to discuss progress and possible future directions was given to us by the British Ecological Society (BES) through their Symposium series. Jointly organised by the Society and the Macaulay Land Use Research Institute,

the 2009 BES Symposium 'Facilitation in Plant Communities' was held at the University of Aberdeen over two days in April. Over 50 posters were displayed at the meeting with the event attracting more than 100 delegates from universities and ecological institutions from across the world, including the USA, South America, and Europe.

The aims of the meeting were to give researchers working on this topic the chance to meet and discuss current developments and to challenge them to look outside their own field to seek opportunities for new research and further understanding that might come from making links to other relevant research.

Speakers were invited with this in mind, and resulted in an interesting mix of talks from researchers working in a wide range of fields, as well as from younger less-well-known researchers pursuing interesting and novel ideas.

As the event was the first ever international conference on positive plant interactions, the success of the meeting is more difficult to assess. However the wide geographic spread of the meeting's participants, the range of interesting presentations and posters, the general atmosphere of the meeting, and some very pleasant springtime sunshine seem to have created a lasting and positive impression on many of the delegates.

A report on the meeting will be appearing in *Biology Letters*, and papers from the Symposium will be published as part of a Special Feature in the *Journal of Ecology*. I will be following with interest the fate of these papers over the next few years as I hope they become the springboard for exciting new developments in plant ecology. ■

**For more information contact:**

**Rob Brooker** [r.brooker@macaulay.ac.uk](mailto:r.brooker@macaulay.ac.uk)

*Grateful thanks are given to everyone from the Macaulay Land Use Research Institute and University of Aberdeen who helped in the organisation and preparation of the event.*



Rob Brooker

Scientific discussion in full flow in Elphinstone Hall, University of Aberdeen

## A new power source for the Institute



Dauid Riley

The Institute has been carrying out a review of the energy it uses at its main building at Craigiebuckler.

As some of our experimental facilities, such as our plant growth rooms and the glasshouses, require a lot of power, sadly the building is not energy efficient to run. A recent engineer's report suggested that it consumes approximately twice as much energy as would be expected for a building of its size.

At present, the Institute's main building is heated by two 775kW gas boilers and all electricity is imported from the national grid. Commissioned reports from both local and national carbon consultants suggested that the installation of a Combined Heat and Power (CHP) unit in the boiler room would be an appropriate way of realising carbon emission reductions and improving efficiency.

A CHP unit has now been purchased and with its installation well underway, it should become operational in October.

The CHP unit that has been chosen (pictured being craned into position) uses a gas-powered reciprocating engine to drive a 110kW electricity generator. This will reduce the amount of electricity that has to be imported and heat recovered will be used to pre-heat the water going into our heating boilers.

The project engineers have estimated that this dual output will cut the Institute's carbon dioxide emissions by 200 tonnes per annum as well as save around £20,000 in fuel bills.

## Biomass Boiler Sparks Learning Opportunity

Pupils at an Aberdeenshire Secondary School have been given a unique insight into a world without oil or gas by learning more about the new biomass boiler on their doorstep.

Aboyne Academy's boiler depends upon a renewable energy source, woodchips, produced as a by-product from local sawmills and through collaboration between teachers at the school, staff from the Macaulay Land Use Research Institute and Irvine Ross, a local forester, around 40 second year pupils were involved in a project which aimed to find out just how big an area of woodland is needed to keep the school's biomass boiler burning for a year.

In the 'Forest to Fire' project, pupils had to learn how to measure the height and diameter of growing trees, calculate the volume of wood in a tree, and then estimate the weight of wood in a hectare of woodland. With this information, pupils had to work out how many lorry loads, and the weight of woodchips, that need to be delivered to the school to keep the boiler burning for a year. With all these measurements and calculations in place, the pupils worked out that it takes about 10 hectares of woodland, equivalent to about 20 football pitches, to fuel the boiler for a year.

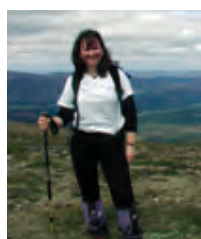
Richard Birnie, Head of Communications at the Macaulay Land Use Research Institute explained,

*"The project raised the pupil's general level of awareness about how we depend on the environment for a whole range of things other than food and water. The biomass boiler is a perfect illustration of this as it fundamentally connects the school heating to the local woodland. Put another way: no trees, no heat!"*





# Experiences of a British Science Association Media Fellowship with BBC COUNTRYFILE



Last year, Lorna Dawson, a Senior Soil Scientist at the Macaulay Land Use Research Institute, was awarded a British Science

Association media fellowship which offered the opportunity to work with BBC Birmingham on Countryfile, a magazine programme highlighting 'the people, places and stories making news in the British countryside'.

"Each week the programme contains location stories, lead stories, topical stories, video diaries, as well as the feature story," Lorna explained.

"Features are items of general interest, such as a river swimming contest, or a steam fair. Lead stories are the hard news items such as bluetongue or food security. Topical stories are a current issue that reflects the time of filming and is 'picture rich', for example a harvest or blooming flowers, and the video diary is an interesting character filmed by the researcher talking about his or her countryside passion."

As an information hungry programme, one of Lorna's main

roles was to contribute new ideas by acting as a Programme Researcher.

"Researchers write scripts with the Directors and then plan the logistics of these shoots with back up from an administration team. The Researchers are a bit like media detectives, exploring first the investigation angles, then evidence gathering for building up an interesting piece.

I was also able to work on location shoots, including the Dorset Steam Fair, saw how the different clips are compiled into an entertaining but factual story with the addition of suitable music and the mixing of the final track, ready to be stored for broadcast."

*"The experience has taught me a lot about broadcast communications," continued Lorna, "And in particular how to compose a story to make it 'come alive'. I have found that the information and knowledge gained throughout this fellowship has been of great benefit to myself, my workplace colleagues, and my students and will continue to do so."*

"Broadcast communication is very similar to science communication, with the joint aims to inform and educate. The one main difference is that broadcast communication also sets out to entertain, which is one thing that we may also benefit from as a science community." ■

#### For more information

read Lorna's blogs of her experience:

[www.macaulay.ac.uk/blogs/](http://www.macaulay.ac.uk/blogs/)

The British Science Association Media Fellowships are intended to create a greater awareness and understanding of the workings of the media among practising scientists, social scientists, clinicians and engineers. The Fellowships provide placements working with a national press, broadcast or internet journalist. During placements of between 3 and 8 weeks, Fellows learn to work within the conditions and constraints of the media to produce accurate and well informed pieces about developments in science.

[www.britishtscienceassociation.org/web/scienceinsociety/MediaFellowships/index.htm](http://www.britishtscienceassociation.org/web/scienceinsociety/MediaFellowships/index.htm)



## "Moments in Time" Landscapes/Cityscapes

"Each period of time sets its mark on the landscape. Landscape reflects our priorities and values."

"A photograph's unique feature is that it freezes and reflects both moment and place."

Tilbakeblikk - Norwegian Landscapes in Retrospect. Tun Forlag

Over time, views and landscapes within the city and countryside change. What our grandparents and their grandparents saw from their town house or country farm is most likely to be very different from what we see from our windows in 2009.

As new housing estates, industrial parks and road systems appear around our city and countryside, what our grandchildren and their grandchildren will see may be unrecognisable to us.

The *Moments in Time* photography competition challenged schoolchildren in Aberdeen and Aberdeenshire to photograph a view of their town, city or the countryside to record what our area looked like in 2009. This will allow future generations to see how we lived and worked today.

*Entries were judged in three categories:*

- Primary School class entry
- Individual attending Secondary School aged 13 years and under
- Individual attending Secondary School aged 14 - 18 years

*A 2010 calendar featuring the six winning photographs, plus six others rated as 'highly commended' is available. For a free copy, please e-mail: [enquiries@macaulay.ac.uk](mailto:enquiries@macaulay.ac.uk)*



Beth Cooper of Easterfield Primary School near Turriff holding her winning photograph in the Macaulay Land Use Research Institute's 2010 calendar, looked on by the school. Richard Aspinall is pictured in the back row, 2nd from right.

## Congratulations to the winners:

- 1 **PRIMARY SCHOOL** 'A pillar box serving the community, but for how much longer?' Primary 1, Easterfield School
- 2 **SECONDARY SCHOOL - aged under 13** 'Coming Home', Rosalind Watt, Inverurie Academy
- 3 **SECONDARY SCHOOL - aged 14+** 'View from St Nicholas House, Aberdeen', Lisa Gerrard, Bankhead Academy

and to the runners up:

- 4 **PRIMARY SCHOOL** 'Snow fall in February', Ordiqhill Primary
- 5 **SECONDARY SCHOOL - aged under 13** 'Fence', Andrew Mason, Robert Gordon's College Junior School
- 6 **SECONDARY SCHOOL - aged 14+** 'Dusk at Aberdeen Harbour', Jonathan Dawson, Robert Gordon's College





1



2



3



4



5



6

The winners of the competition were decided by a panel of judges made up of Adam Henson from BBC's Countryfile, experienced landscape photographer Oskar Puschmann from the Norwegian Forest and Landscape Institute, Richard Aspinall from the Macaulay Land Use Research Institute and Rick Rhode from the University of Edinburgh. ■

# Reduced Emissions from Deforestation and Forest Degradation



Images by Robin Matthews

The majority of greenhouse gas (GHG) emissions come from the burning of fossil fuel; however 20% of global GHG emissions are released by the destruction of the world's forests. The current international treaty on climate change, The Kyoto Protocol, does not have a mechanism to reward countries for protecting their existing forests, thereby reducing greenhouse gas emissions. After the Kyoto Protocol expires in 2012 there are plans to include such a mechanism in the next treaty. In order to do this, the international community needs a better understanding of the current rates of deforestation, and how these rates can be reduced without adversely affecting the livelihoods of people living in and around tropical forests.

The REDD-ALERT (Reducing Emissions from Deforestation and Degradation through Alternative Land uses in Rainforests of the Tropics) officially launched on 1st May, aims to address this.

The project, totalling €4.5million, focuses on ways in which reductions in the rate of tropical deforestation can help to reduce global greenhouse gas emissions. These will

make major contribution to the United Nations Framework Convention on Climate Change (UNFCCC) process leading up to successor to the Kyoto Protocol after 2012, and contributing to the Fifth Assessment Report of the IPCC.

In addition to the Macaulay Land Use Research Institute, which is leading the project, the consortium involves three European partners from Germany, Belgium, and Holland, four international CGIAR research institutes in Indonesia, Kenya, Nigeria and Columbia, and four national research institutes in Indonesia, Vietnam, Cameroon, and Peru. Headed by Robin Matthews, the Institute's team includes Klaus Glenk, Innocent Bakam, Shibu Muhammed, Laura Poggio, and Maria Nijnik.

The first meeting, organised by the World Agroforestry Centre, took place in Sumatra, Indonesia from May 25-29. Robin and Klaus attended the workshop along with twenty participants representing the 12 partner countries.

Following the project launch at the headquarters of CIFOR (Centre for International Forestry Research) and ICRAF (World Agroforestry Centre) in Bogor, near Jakarta, the



participants travelled to the island of Sumatra for a mix of project planning meetings, field visits, and further interactions with stakeholders at the provincial and local levels.

Field visits included peatland forests converted to oil palm plantations, jungle rubber agroforestry systems, community-based sustainable forest management initiatives, and tree planting schemes for the voluntary carbon market.

Discussions were also held on the best way to represent REDD-ALERT issues to local people, as Robin explained.

*“Talking about the amount of carbon stored in tropical forests is probably not the best way to convince them against deforestation, whereas talking about sustainable forest management and the benefits that the community might gain from improved water quality, flood control, and forest products may carry more weight.”*

“We also learnt that the debate on clearing tropical forest for biofuels is not as simple as it first appears. In many cases the land was cleared years previously for paper pulp production, and has only recently been converted to oil palm for biofuel production. To whom then should the deforestation be attributed – the paper pulp company, or the biofuel company? Often the latter argue that they are, in fact, restoring carbon stocks by planting oil palm, and are, therefore, the ‘good guys’ and should be rewarded for it!”

A significant contribution that the Macaulay Land Use Research Institute will make to the project is exploring some of these issues using modelling approaches developed in a Scottish context.

Robin added, “To our knowledge, there are no simulation models of the carbon and nitrogen dynamics in tropical peatlands, so by building on the ongoing

work of modelling such processes in Scottish peatlands by Shibu Muhammed, Rebekka Artz and others, and together with the expertise of colleagues from the University of Aberdeen, we plan to use detailed data collected on the project to develop such a model.

This will provide a tool to evaluate the impact on greenhouse gas emissions of different land-use changes on such soils, and help fill a gap in our understanding of the role of such emissions to overall global emissions.” ■

**For more information contact:**

**Robin Matthews** [r.matthews@macaulay.ac.uk](mailto:r.matthews@macaulay.ac.uk)  
or visit: [www.redd-alert.eu/](http://www.redd-alert.eu/)



# Hunting for Sustainability

New international research initiatives on sustainable hunting and hunting tourism

Biodiversity conservation increasingly takes place outside designated national parks. In Scotland, formally protected areas make up only a small fraction of our country and much of our biodiversity is found on privately-owned land. Success in achieving biodiversity objectives in such multiple-use landscapes is closely linked to the extent to which conservation can be integrated with the cultural, social and economic objectives and aspirations of local people. Perceptions, attitudes and preferences about biodiversity are central to the decisions made by individuals and groups about the management of wildlife and other natural resources.

In a major new international research project, Hunting for Sustainability, hunting will be used as a 'lens' through which the wider issues of how people interact with biodiversity will be examined. Hunting, used here in the broader sense as the killing of game animals for meat and/or recreation, provides a valuable study in the use of biodiversity because it involves

tens of millions of people globally, is conducted across a wide range of land tenure and land use systems, and is an important source of revenue and protein, particularly in developing countries. Hunting is also deeply embedded in social structures and cultural patterns and has a key role in conflicts over natural resource management around the world.

## Project aims

A multidisciplinary team of scientists will assess the social, cultural, economic and ecological functions and impacts of hunting across a range of contexts in Europe and Africa. The aim is to understand what influences attitudes to hunting, how these attitudes influence and determine individual and societal behaviour in relation to hunting, and finally, how hunting behaviour influences biodiversity.

Social, economic and ecological scientific disciplines will be integrated with a diverse selection of stakeholders recruited to develop novel

approaches to the mitigation of natural resource conflicts involving hunting.

Finally, the results will be interpreted in respect to current and future EU policy on hunting and biodiversity conservation and contribute to the global debate about the sustainable use of biodiversity.

## Partners

HUNTING for Sustainability is financed by the European Commission 7th Framework Programme and will run from January 2009 to June 2012. The project is being co-ordinated from the Macaulay Land Use Research Institute with partners from Frankfurt Zoological Society, Imperial College, London, Instituto de Investigación en Recursos Cinegéticos, Spain, the Norwegian Institute for Nature Research, Tanzania Wildlife Research Institute, Umeå University, Sweden, the University of Aberdeen, the University of Barcelona, the University of Ljubljana, Slovenia, the University of Stirling and the University of Zagreb.

## Scottish National Consultative Group

As part of the process of engaging with hunters and other stakeholders in Scotland with views and opinions on hunting, a 'National Consultative Group' has been developed. This group includes representatives from the main organisations representing hunters and professional wildlife managers, as well as conservation organisations and animal welfare groups, plus government agencies and departments. The purpose of the National Consultative Group is to facilitate two-way exchange of information.

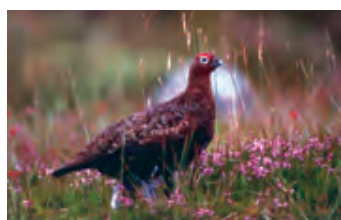
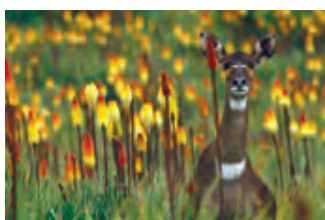




Stakeholders will be engaged at all steps of the process and passed on the results of the work as it develops. Stakeholders are also encouraged to pass on some of their knowledge about hunting in Scotland and offer the programme suggestions for future work.

The first meeting of the National Consultative Group was held at the Scottish Game Fair at Scone Palace in July. ■

For more information visit: <http://fp7hunt.net/>



## It is with the deepest regret that we report the tragic death of Professor Simon Thirgood.



Simon died late on Sunday 30th August when the building he was in collapsed during a sudden storm. He was in Ethiopia setting up a project to build community capacity conserving and monitoring biodiversity, funded by the UK Darwin Initiative (see in-land spring/summer 2009 page 15 for further details on the project).

He was also the Project Co-ordinator of HUNTING for Sustainability and was instrumental in instigating the first meeting of the National Consultative Group to engage with stakeholders on the issues relating to hunting.

Simon was very highly respected ecologist, passionate about conservation issues at home and abroad, and will be sadly missed by all those who worked with him.

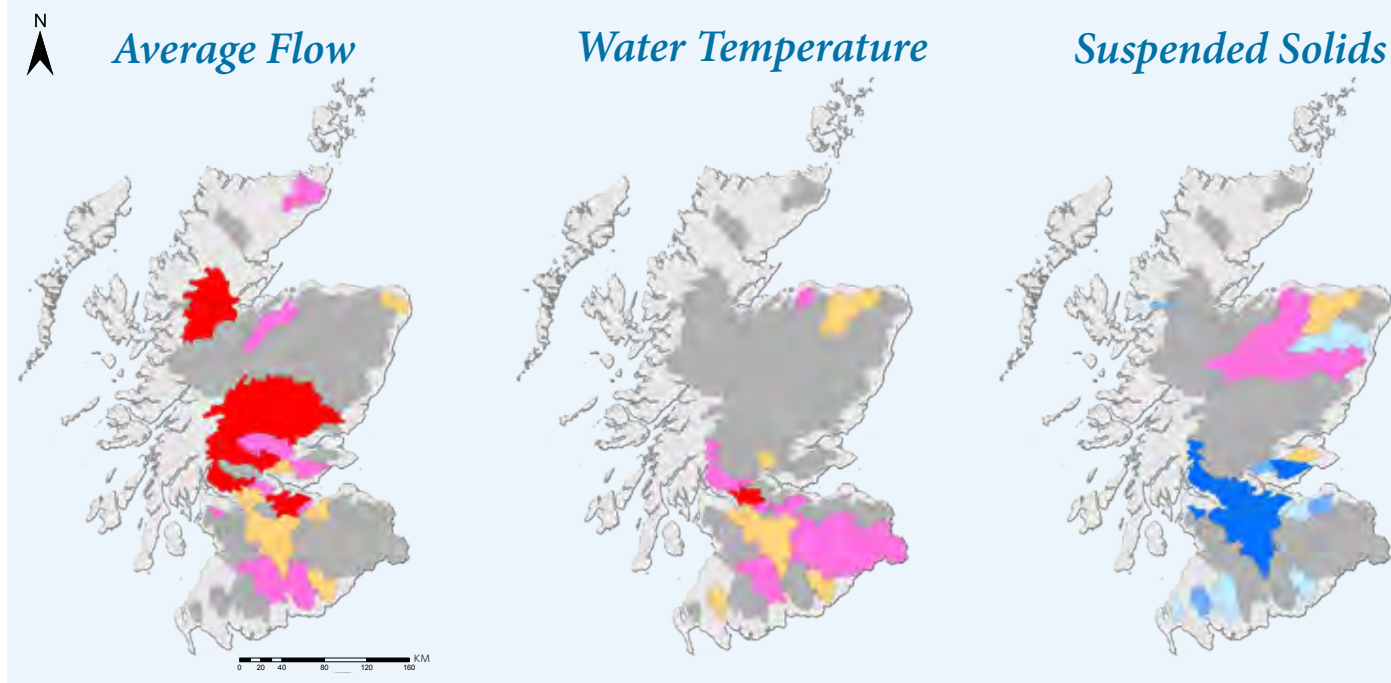
## Scottish River Water Quality Atlas

A joint initiative between SEPA and the Macaulay Land Use Research Institute has resulted in the publication of a Water Quality Atlas for Scottish rivers.

Under the Harmonised Monitoring Scheme, SEPA monitors and reports on the quality of the water in 56 Scottish rivers. SEPA and its predecessor organisations have monitored these rivers since the mid 1970s, producing data that provides an invaluable record of environmental status and change in Scotland.

Staff from the Macaulay Land Use Research Institute undertook some analysis on the Scottish Harmonised Monitoring Data in conjunction with SEPA and this analysis of the records supports two main conclusions:

- **Climate change is already having an effect on Scottish rivers, with water temperatures increasing in rivers across Scotland and river flow increasing in some places.**
- **Stewardship of Scotland's water environment is working and improvements in water quality have been delivered**



River flows are changing across Scotland. Annual mean river flows are increasing in many rivers and there are no rivers showing statistically significant declining trends in annual average flow. This suggests that climate change is making Scotland a wetter place. The trends towards increasing spring flows are mostly the result of changing temperatures; warmer springs result in earlier, more rapid snowmelt. In some rivers, the effect is amplified by higher rainfall.

Annual average temperatures are increasing in many Scottish rivers. This may have important implications for river ecology and salmon behaviour. While some of the trends towards warmer water might be the result of increased urbanisation, most is thought to be due to warmer air temperatures. This effect is most pronounced in the winter, when widespread warming has been observed.

The amount of suspended solids in water is an important measure of water quality. High levels of suspended solids are associated with soil erosion and sewage effluent. Changes in soil erosion can be caused by changing rainfall, agricultural practice or increased construction activity. Improvements in sewage treatment often lead to reductions in suspended solids concentrations in rivers which run through cities.

Two trends can be seen in the annual concentration of suspended solids in Scotland: concentrations are declining in the centre and south of the country, probably resulting from improvements in sewage treatment and industrial processes, but are typically increasing in the north east, possibly related to increased erosion.



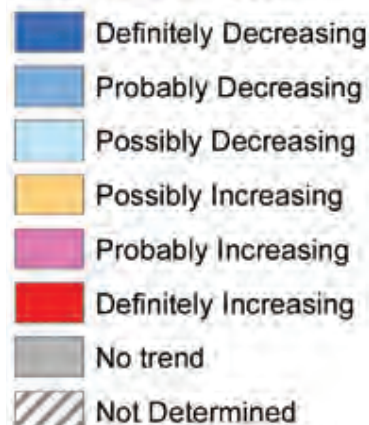
through environmental regulation, cleaner technologies, improved sewage treatment and changes in agricultural practice

## Next steps

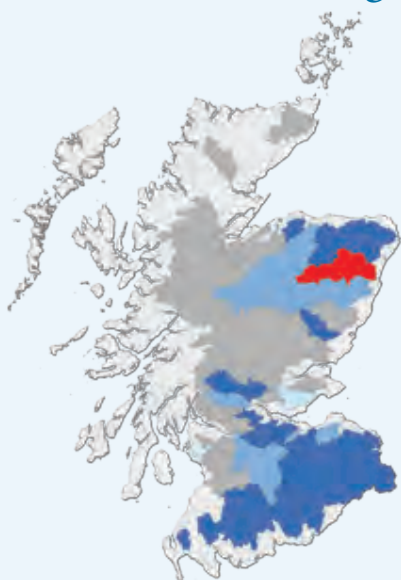
This assessment demonstrates the great value of long-term environmental monitoring in identifying and characterising the state and changing state of the environment. It is crucial that we maintain and develop such monitoring and that we do so in conjunction with other science and research providers and other stakeholders as part of a shared approach to environmental stewardship.

The full atlas will be available electronically in the autumn of 2009.

### Trend strength

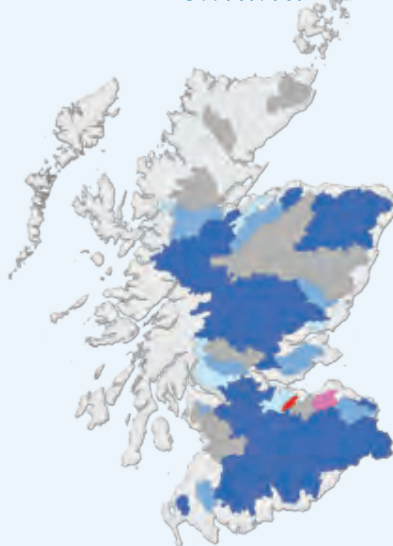


### Ammoniacal Nitrogen



Ammoniacal nitrogen is associated with sewage and agricultural fertiliser. Concentrations of ammoniacal nitrogen are declining in rivers across Scotland. The Don was the only river identified as having an increasing trend and is the subject of ongoing investigations.

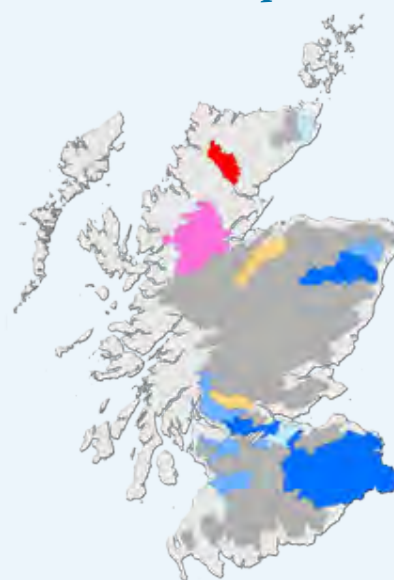
### Biochemical Oxygen Demand



Biochemical oxygen demand (BOD) is a measure of the oxygen consumption of a water sample. Typically, the test is run over five days and results are reported as milligrams of oxygen consumed per litre of water. High levels of BOD are an indication of poor water quality and are often associated with urban or industrial pollution.

In Scotland, BOD has declined in almost all rivers but there are some exceptions, most likely due to changes both in flow and in BOD concentration.

### Total Phosphate



Total phosphorus measures the combined concentration of dissolved and particulate-bound phosphorus (e.g. phosphorus bound to suspended sediments).

Concentrations of total phosphorus are declining in many urbanised rivers. This appears to have been achieved by improved sewage treatment and reduced use of phosphate-containing detergents; however the total phosphorus concentration in some northern rivers appears to have increased.

*Changing river flows can make trends in concentration more difficult to interpret. However, by assessing data on concentrations and fluxes (loads) together, a better understanding of environmental change can be obtained. For example, if river flows increase and the mass of a pollutant entering a river remains the same then the concentration of that pollutant in the river will inevitably decline.*

# STUART MACBRIDE

*'Wonderfully gripping and grim'* Mark Billingham

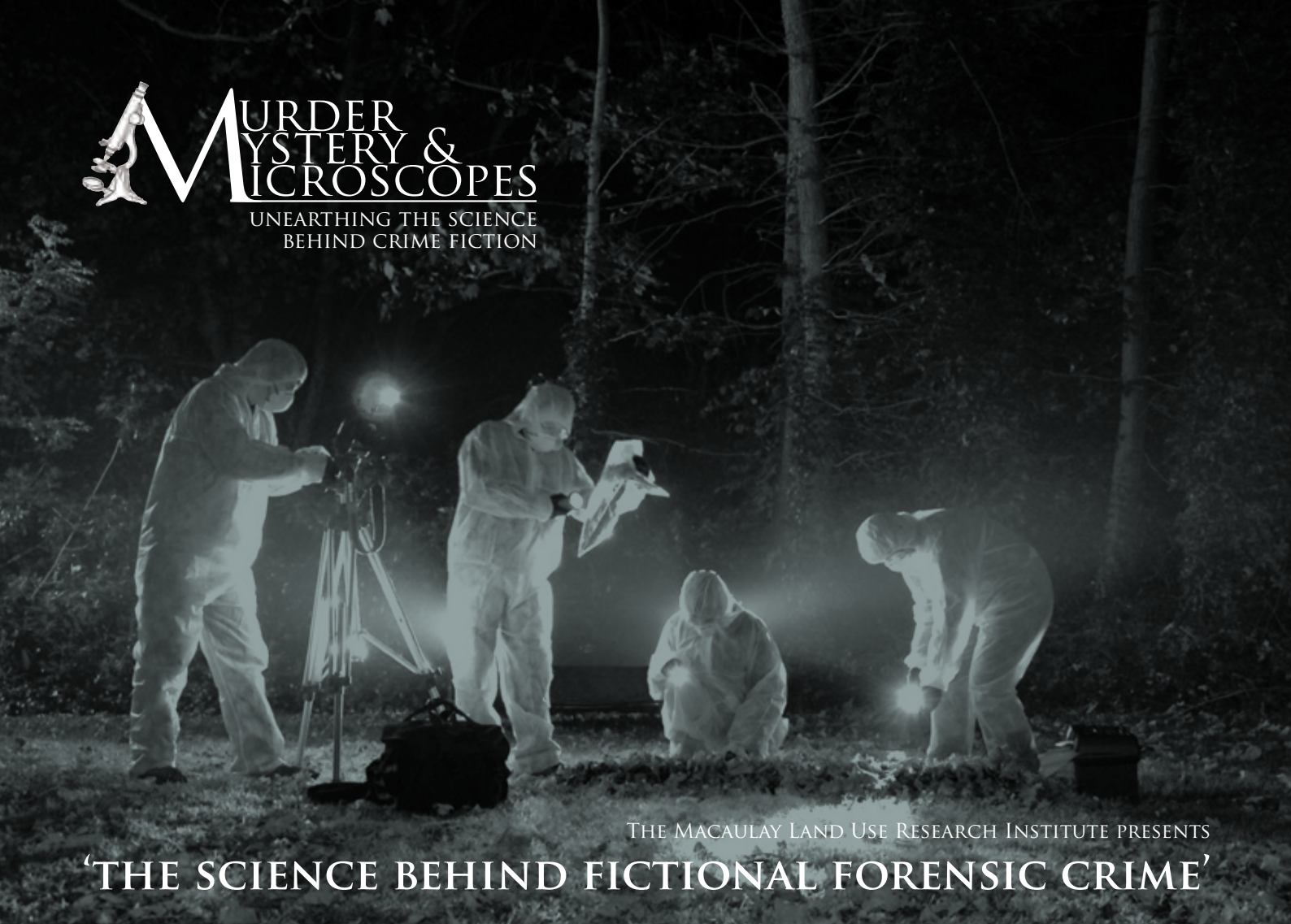
## DYING LIGHT





# MURDER MYSTERY & MICROSCOPES

UNEARTHING THE SCIENCE  
BEHIND CRIME FICTION



THE MACAULAY LAND USE RESEARCH INSTITUTE PRESENTS

## ‘THE SCIENCE BEHIND FICTIONAL FORENSIC CRIME’

The Macaulay Land Use Research Institute delved into the science behind fictional crime when it presented ‘Murder, Mystery & Microscopes’ as part of Open Doors 2009.

Crime fiction came face to face with science fact on the evening of 5th June as the fictional forensics of crime writer Stuart MacBride were put under the microscope by a group of real-life CSIs.

Stuart MacBride read out excerpts from his own Logan McRae crime novels, whilst forensics experts Dave Barclay from The Robert Gordon University, Lorna Dawson, Head of Soil Forensic Science at the Macaulay Land Use Research Institute, and James Grieve, Senior Lecturer at the Department of Pathology at the University of Aberdeen and a Police Forensic Pathologist were on hand to reveal all about the science behind these stories.

Hosted by Northsound 2 presenter, Damien McLeod, the event closed with a book signing and an opportunity for the audience to question both the author and the scientists.

Macaulay Land Use Research Institute has received a share of £650,000 from the Scottish Government’s Science Engagement Scheme, for the Murder, Mystery & Microscopes project.

Designed to make science more accessible to the public, the funding was announced in August by the Cabinet Secretary for Education and Lifelong Learning, Fiona Hyslop who said, “The science engagement scheme is designed to complement more formal learning for science and inspire more Scots, particularly our young people, to take an active scientific interest in the world in which they live.”

“It gives members of the public - from pre-school children to adults - the chance to meet scientists involved in a range of pioneering work, learn about how science impacts on their every day lives and get involved in a range of fun but educational activities and workshops.”

For more information on future events, visit: [macaulay.ac.uk/MMM](http://macaulay.ac.uk/MMM)





# State of the Coast



Emily Hastings

A new report looking at the state and condition of the East Grampian coast aims to gather, for the first time, information on social, economic and environmental issues along the East Grampian coast from Fraserburgh to St Cyrus.

A healthy marine and coastal environment is not only important for maintaining ecosystems but it is also essential for employment opportunities, carbon storage, research and education, a natural sea defence, leisure, recreation and tourism, transportation of goods and people, sustaining biodiversity, preserving examples of our history and heritage and acting as a method of waste disposal. However with a changing climate and an increasing population in the coastal zone many of these services are now at risk.

The report by East Grampian Coastal Partnership gives a snapshot of the coast in 2009 and will be used as a template to identify opportunities for future work and to monitor the changes that take place on the coast in the coming years.

Emily Hastings, author of the report said, "The East Grampian Coastal Partnership decided to write the report as the marine and coastal environment plays a fundamental role in all of our lives and as such, its health is important to everyone who lives in, works in or visits the north east.

It is hoped the findings of this report will be of interest to local stakeholders and decision makers as well as people that live or have an interest in the area."

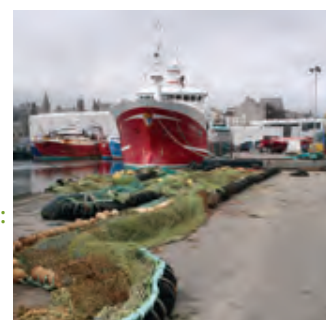
The report will be available in hard copy and online on the East Grampian Coastal Partnership website. ■

**For more information contact:**

**Emily Hastings**

[e.hastings@macaulay.ac.uk](mailto:e.hastings@macaulay.ac.uk)

or visit [www.egcp.org.uk/](http://www.egcp.org.uk/)





# Rain storm puts equipment to the test

A series of short, sharp rainfall events were dramatically recorded by the Institute's environmental monitoring site at Sourhope in the Scottish Borders. Rainfall during early July culminated in a particularly heavy and prolonged downpour during Friday 17th and the early hours of Saturday 18th July. The weather station record, illustrated below, shows that 126mm (nearly five inches) of rain fell in around 28 hours.

The result was a deluge of water down the usually benign burn and a substantial amount of material washed into the gauging station. Down the valley the approach road to Sourhope has been washed out and the repair work, only just completed after last year's flood, has unfortunately suffered significant damage.

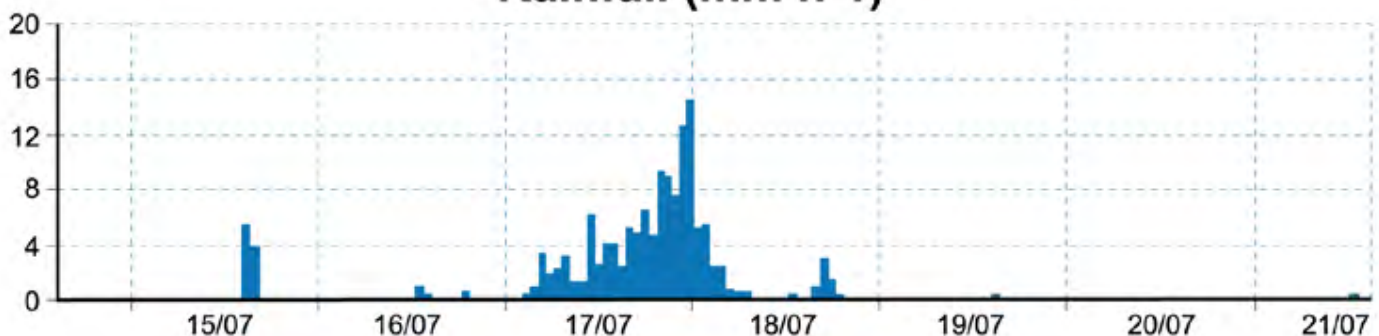
The Environmental Change Network site at Sourhope is managed by the Macaulay Land Use Research Institute with consent and support from Roxburghe Estate. The research station lies 15 miles south-east of Kelso near the head of the Bowmont valley on the western slopes of the Cheviot. The mean annual rainfall is 1100mm (43 inches) on the hilltops.

Real-time data from the meteorological monitoring sites at Sourhope, plus Glensaugh and Invercauld in Aberdeenshire, along with river data from the river monitoring sites on the Tarland burn, Deeside, Birnie Burn, Aberdeenshire and Lunan in Angus are available at: [www.macaulay.ac.uk/ECN/](http://www.macaulay.ac.uk/ECN/) ■



Gordon Commons

## Rainfall (mm h<sup>-1</sup>)



# Featured Project



GILDED is funded by the European Commission under the 7th Framework Programme and runs from December 2008 to November 2011.



The European Union aims to lead the rest of the world in developing a sustainable, competitive and secure supply of renewable energy for its citizens. However, in laying the foundations for a 'post-carbon' society, where greenhouse gas emissions are dramatically reduced, technology has, so far, received more attention than social, economic, cultural and political

factors, and energy supply far more than energy demand.

Launched in May, GILDED (Governance, Infrastructure, Lifestyle Dynamics and Energy Demand), an interdisciplinary social science project funded by the European Commission, aims to change this and identify the social, economic, cultural and political changes which could help households in Europe consume less carbon-intensive energy.

Led by the Macaulay Land Use Research Institute in partnership with the Potsdam Institute for Climate Impact Research in Germany, the Institute for Political Science of the Hungarian Academy of Sciences, the University of Groningen in the Netherlands and The Institute of Systems Biology and Ecology, Academy of Sciences of the Czech Republic, the project focuses on household energy consumption, as in Europe about 35% of all primary energy use and 40% of all greenhouse gas emissions come from private households.

Each GILDED partner has a case study area consisting of a medium-sized city and its associated rural areas. Within each

area, a stakeholder advisory group has been recruited and desk research and interviews are underway to assess current infrastructural and governance constraints on reducing household energy demand.

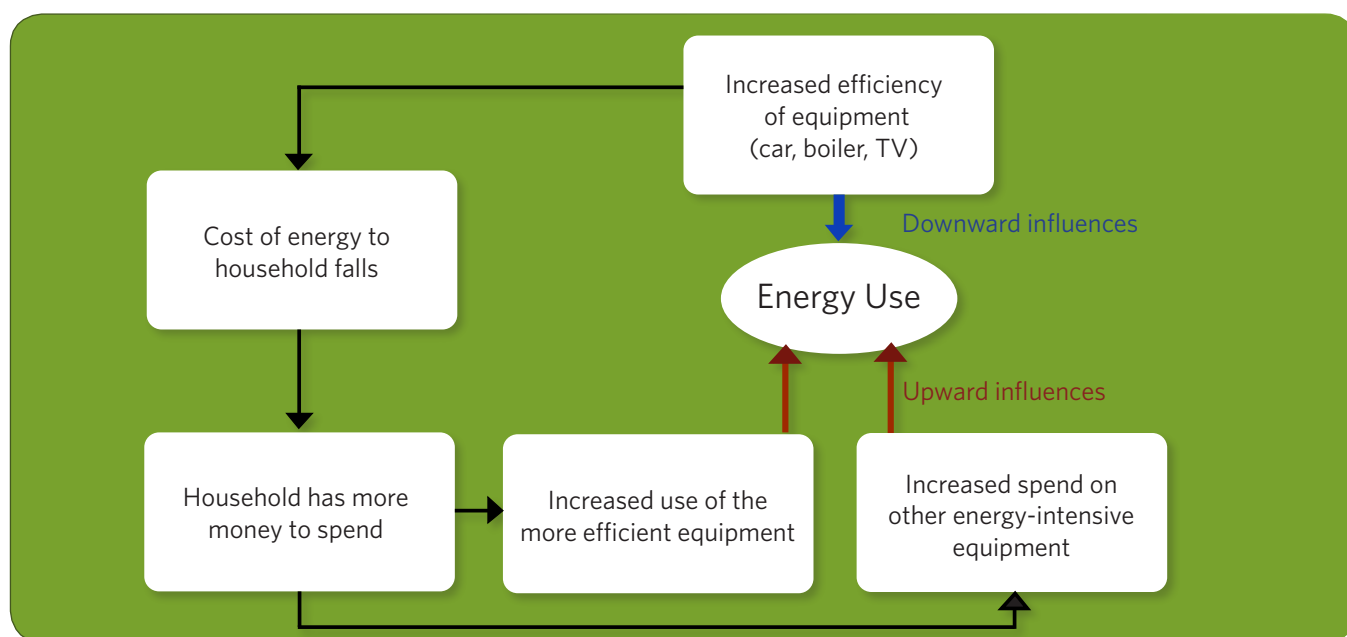
While technological innovations can reduce the energy requirement for specific activities, people still have to choose to consume less. If this is not achieved, increases in energy efficiency may simply raise demand for energy-intensive products and services, for example, cheaper home heating may lead to a rise in home temperatures, or money saved by improved home insulation may be spent on air travel. This is known as the 'rebound effect'.

Within Aberdeen and Aberdeenshire, interviews on energy and climate have been carried out with a random sample of householders, and a broader survey using a written questionnaire, including a 'carbon calculator', is planned. Some of the householders completing the questionnaire will be invited to commit to reducing their energy use by a specific amount over a year; and the effects of this, and of giving these subjects additional information, will be tested by comparing any changes they make with those made by the rest of the group.

Agent-based modelling will be used to explore scenarios of energy demand under a range of policy environments up to 2050, initially focusing on the Scottish case study. ■

## For more information contact:

**Nick Gotts** GILDED Co-ordinator [n.gotts@macaulay.ac.uk](mailto:n.gotts@macaulay.ac.uk) or **Lee-Ann Sutherland** GILDED Project Manager [l.sutherland@macaulay.ac.uk](mailto:l.sutherland@macaulay.ac.uk)





# Promoting grassland insect conservation and diversity



John Dover

Grasslands comprise some of the most biodiverse semi-natural habitats known and represent landscapes typical of rural areas such as mountain pastures or dry meadows.

Through their role in agriculture, grasslands can be key to maintaining rural livelihoods. However, agricultural practices are under multiple pressures to change and these pressures are changing the biodiversity of grasslands and the appearance of rural landscapes.

Within grasslands, insects play a crucial role in maintaining overall biodiversity. Aside from their intrinsic value, insects provide unique services in the form of nutrient cycling and pollination. They are also highly effective environmental indicators, due to their rapid response to climatic and management changes, and provide food for birds and other predators. However, insect biodiversity may be declining even more rapidly than that of vertebrates and plants and this may have particularly serious consequences for overall grassland biodiversity and for sustainable agricultural production.

To promote insect conservation and research as an integral part and product of sustainable grassland management, Nick Littlewood, an Invertebrate Ecologist from the Macaulay Land Use Research Institute, and Alan Stewart, a Senior Lecturer in Ecology at the University of Sussex jointly organised a symposium, 'Promoting grassland insect conservation and diversity' as part of the 2nd European Congress of Conservation Biology which took place at the Czech University of Life Sciences, Prague in September. Research ranging from specific management case studies to mechanisms with wide-ranging applications were presented to reflect the overall Congress theme: 'conservation biology and beyond: from science to practice'. ■

**For more information contact:**

**Nick Littlewood**

[n.littlewood@macaulay.ac.uk](mailto:n.littlewood@macaulay.ac.uk)



## River South Esk Catchment Management Plan

The River South Esk Catchment Management Plan is due to be launched in its final form in December 2009. It will set out a strategic framework to guide sustainable use of this water resource, ensuring the protection and enhancement of water quality and biodiversity enhancement whilst recognising opportunities to utilise the river and its catchment to enhance social and economic wellbeing on a sustainable basis.



© Scottish Natural Heritage

The River South Esk catchment covers an extensive area of Angus supporting a wide range of economic activity such as farming, forestry, fishing, tourism and recreation and as a private drinking water source. The river has been designated a Special Area of Conservation (SAC) under the European Habitat's Directive as it is home to internationally important populations of Atlantic salmon and freshwater pearl mussels. However, the ecological status of some tributaries is poor, fish stocks and freshwater pearl mussels at certain life stages are in decline, non-native invasive weeds are spreading in the middle to lower areas of the catchment, flooding is a serious concern in some areas and the sustainable economic development of the catchment is in its infancy.

The River South Esk catchment planning process included extensive public consultation to capture views on key environmental, social and economic issues within the catchment. From initial consultation an issues document was drawn up and made available for further public consultation. Responses and direction from within the steering group were then used to formulate strategic aims, catchment objectives and actions. Throughout the development phase, a strong commitment has been shown by organisations, agencies and individuals towards working together. The success of implementation of this Plan will depend on continuing levels of co-operation and commitment to work towards achieving the management objectives and actions outlined in the plan.

Members of the South Esk Catchment Management Plan steering group include Angus Council, Atlantic Salmon Trust, Cairngorms National Park Authority, Esk District Salmon Fishery Board, Esk Rivers and Fisheries Trust, Farming and Wildlife Advisory Group, Forestry Commission Scotland, National Farmers Union Scotland, SAC, Scottish Government Rural Payments and Inspections Directorate, Scottish Natural Heritage, Scottish Rural Property and Business Association, Scottish Water and SEPA. The Macaulay Land Use Research Institute was represented by Andrew Vinten with Kirsty Blackstock and Sue Cooksley providing support and advice to the project officer, particularly during the consultation meetings. ■

For more information visit:

[www.angusahead.com/LiveAngus/  
RiverSouthEskCatchmentPartnership/Introduction.asp](http://www.angusahead.com/LiveAngus/RiverSouthEskCatchmentPartnership/Introduction.asp)





# Investigating populations of worms



Research scientists from the Macaulay Land Use Research Institute are involved in a project to count Scotland's worms. The unique study may also help our understanding of how climate change is affecting our earthworm population.

Earthworms influence soil structure through their burrowing whilst at the same time aerating and providing drainage channels for water. Such is the importance of earthworms to Scotland's soil, scientists from SCRI and the Macaulay Land Research Institute are joining forces to conduct a nationwide survey.

During the early 1990s, scientists at SCRI carried out the first ever national earthworm survey of Scotland. The new project will revisit exactly the same sites at 100 farms across the country. Comparing new data with the baseline study will be used to determine if, for example, climate change is impacting upon these crucially important species and whether any other factors may be affecting their numbers.

The survey will be conducted by Helaina Black from the Macaulay Land Research Institute and Roy Neilson of SCRI, who explained why earthworms are crucial.

"There are three different groups of earthworms; those that stay near the top of the soil, those that burrow horizontally and those that burrow vertically. The paths of the horizontal and vertical earthworms cross, creating important natural drainage channels in the soil. If there is a reduction in the earthworm population there would be less natural drainage and that, combined with increased rainfall caused by climate change, could result in more flooding." ■

**For more information contact:**

**Helaina Black**

[h.black@macaulay.ac.uk](mailto:h.black@macaulay.ac.uk)



# Investigating climate impacts on soil carbon emissions

A collaborative research project between the University of Aberdeen and the Macaulay Land Use Research Institute has been awarded a substantial grant to investigate how climate influences carbon dioxide (CO<sub>2</sub>) emissions from Europe's soils.

The Natural Environment Research Council grant worth nearly £500,000 will allow Pete Millard and Andy Midwood, along with colleagues from the Institute of Biological and Environmental Sciences at the University of Aberdeen, to investigate if soils across Europe are likely to release more carbon dioxide if the climate becomes warmer or wetter. This will be achieved using a novel technique to detect minute changes in the composition of soil carbon dioxide developed by the Macaulay Land Use Research Institute.

The technique can indicate if the CO<sub>2</sub> is being released from young organic matter made up mainly of dead plant remains or from much older material or 'historical' soil organic matter.

If CO<sub>2</sub> produced from the old organic matter outstrips that taken up by vegetation, it will contribute to the continuing CO<sub>2</sub>

increases in the atmosphere.

Pete Millard explains, "Many people know that carbon dioxide is released from cars and factories, but emissions from soil are also an important factor in measuring climate change. Soil provides a vast reservoir into which carbon dioxide taken up from the atmosphere by living plants is transferred when they die, and where it can be stored as organic matter for thousands of years. When soil is disturbed during vegetation burning or clearing, or if soil microbes respond to warmer climates, the release of carbon dioxide from the large underground carbon stores can increase."

As well as finding out more about how Europe's soils interact with climate, the project will provide information to guide Scottish and UK governments' and EU efforts to reduce carbon emissions. ■

**For more information contact:**

**Pete Millard**

[p.millard@macaulay.ac.uk](mailto:p.millard@macaulay.ac.uk)





## British Science Festival

The Macaulay Land Use Research Institute ran a competition offering two Aberdeen based students the opportunity to attend the British Science Festival, held in Guildford in September. The winners were Emma Woodham, a 2nd year Biochemistry student at the University of Aberdeen and Diana Feliciano, a PhD student studying Greenhouse Gas Budgeting and Management with the Macaulay Land Use Research Institute.

Here they recount their experiences.



Guildford at night

Images by Diana Feliciano



Guildford Castle



Emma at RHS Wisley



The Science Festival

Emma Woodham



"For me there are so many reasons why science is fascinating. Its sheer diversity is truly remarkable and the opportunities it provides for us in our world today could never have been imagined a hundred years ago.

Our scientific knowledge is advancing more rapidly than ever before and the way which science progresses from here is in the hands of my generation, and I want to play a part. This is why I have chosen to study Biochemistry at the University of Aberdeen so I can have a career learning about the molecular side of science. Being able to take part in the British Science Festival was an excellent opportunity to further my knowledge, meet new people and witness cutting edge science delivered by today's experts. Here are the highlights from my British Science Festival experience."



The first event I attended was an informative lecture on '*Transition Towns*'. I have to admit I had never heard of the project before, but I soon learned that this was a community based initiative which aims to begin to make the necessary changes in our lifestyles to prepare for

limited oil supplies and the effects of climate change. This made me realise more than ever that we need to act now to prevent irreversible damage to our planet, or suffer the consequences of our actions.

'*What's so funny about science?*' encouraged the audience to tell jokes. The best contribution: two atoms were walking down the road and one said to the other "I think I've lost an electron". "Are you sure?" the other asked. "Yes, I'm positive!!"

I went along to see '*The new IQ: Working memory*' lecture delivered by Tracy Alloway from the University of Stirling. She presented us with her research into working memory, comparing our working memory to a post-it note -some people just have bigger post-it notes than others.

I attended the talk of the *Kavali prize winner Sumio Iijima*, for his work on nanotubes. These are tubes of single walled sheets of carbon. The prize is given to leading research in the fields of astrophysics, nanotechnology and neuroscience. He outlined the possible implications of his discovery on industry - among them that this material was an excellent conductor and a perfect building material as it is so light and strong. Nanotubs may even hold the cure to cancer so watch this space...!

One talk I had been looking forward to was '*Vitamin D: The sunshine superstar*'. All I knew on the subject was that sunlight was needed for vitamin D synthesis, and I wondered, being from Scotland, if I might be deficient! Four speakers talked covering different areas of the subject, including a general introduction to vitamin D, its effect on the immune system and on osteoporosis. I learned that almost everyone in Britain spends most of their lifetime deficient in the vitamin, apart from the summer months where some of us manage to obtain sufficient levels!

The '*physics for life*' talk took my interest as it promised to discuss the overlap between physics and the life sciences. Being a biochemistry student, physics has always been a bit confusing to me, so I went along and was not disappointed! The first speaker covered the biomechanics of blood capillaries and bones, which I knew very little about, however it was the second speaker who stole the show, talking about how nature achieves iridescent colours in animals such as butterflies. He had beautiful pictures, some magnified x 1 million times to show the intricate microscopic make up of the butterfly's pattern.

My final talk was given by *Dr Andy Stanford Clark, IBM's master inventor* who has taught his house how to twitter! His house tells him how much water it is using, and how much he is spending on electricity, amongst many other things. It even texts him when there is a mouse in the mouse trap!

To finish I would like to say I have thoroughly enjoyed my time here in Surrey, I have seen and learned so much and the experience has been a great part of my summer! I would like to thank the Macaulay Land Use Research Institute for this opportunity, and Diana for being great company.

The full version of Emma's blog can be read at [macaulay.ac.uk/blogs/emma.php](http://macaulay.ac.uk/blogs/emma.php)

Emma

"I was so pleased to be one of the winners of the bursary. As I have recently started my PhD I am now reading as much as I can to try and be informed about the novelties and developments in relation to climate change, my area of study. It is currently a hot topic, high on the agenda of this festival and the opportunity to listen to important researchers was certainly helpful for my own research and project development. Here are the highlights from my British Science Festival experience."



he is currently experiencing a two week increase in the growing season.

'Entering the ecological age: the engineer's role' with Peter Head, a leading expert in urban development made using electric cars and scooters in the city, putting solar panels on buildings, having solar energy trains, planting vegetables on the roofs of houses, improving public transport and putting the main services around the public transport spots all so easy...According to him, the technology for all these examples is already developed. Some cities are already moving forward - in Seoul, South Korea a motorway in the middle of the city was replaced by streams and trees!

In the morning I went on the 'Tour of renewable energy systems local to Guildford' and the first stop was the primary school where 39 photovoltaic solar panels are installed in the roof. A digital board showed us how much power was being generated at the time we were there. As the day was a bit grey, 2.49 Kw of power was being generated by the panels with 5 Kw the maximum possible. We then left the primary school to visit a small scale hydroelectricity turbine on the river Wey. According to the engineer in charge of the project, the water mill has the capacity to power 50 average electricity consumption houses per year, saving about 120 tonnes of carbon per year.

The morning was filled with 'New ways to produce and store energy: chemistry to the rescue' which explained how chemical sciences have a key role to play in the development of new technologies for producing and storing renewable

energy. In London some experimental buses running on clean hydrogen with fuel cell engines have proven the reliability of such a system.

During 'The North Sea: a store for Europe's future CO<sub>2</sub> emissions' I heard that carbon capture and storage (CCS) could be part of the solution to tackle climate change. This technique consists of storing the CO<sub>2</sub> produced by coal or gas fired power stations in the depleted gas and oil reservoirs of the North Sea. Some questions remain unanswered though: Is there enough storage space? Is the storage safe?

Perhaps because I come from Portugal, when I was at school we were told about water shortage problems and were taught the daily actions we should take to save water. Living in the UK I almost forget that the problem of water scarcity still exists but this was highlighted in 'Stand pipes and hose pipe bans: Water scarcity in South East England - myth or science?' The South East England, with a very high population density, may have to deal with severe droughts in the next years due to global warming, as well as severe flooding.

I participated in the debate 'Living with environmental change'. Here several subjects related to climate change were raised: from flying to food miles, from population reduction to carbon rationing, from individual trading schemes to eco-houses. The debate ended with a statement from someone in the panel: "Although the UK is currently only responsible for 2% of world's emissions, it was in the past responsible for large emissions while leading the industrial revolution. Hopefully the UK will lead the green revolution too".

I hope these blogs have given readers an insight into my time at the British Science Festival and perhaps small amount of the knowledge I have absorbed has been passed on.

Diana

The full version of Diana's blog can be read at [macaulay.ac.uk/blogs/diana.php](http://macaulay.ac.uk/blogs/diana.php)



“ Although the UK is currently only responsible for 2% of world's emissions, it was in the past responsible for large emissions while leading the industrial revolution. Hopefully the UK will lead the green revolution too. ”



Photovoltaic tiles on a Primary School



Watermill on Rivey Way



# SOIL Profiles

*Three new Soil Health Profiles have been added to the Dirt Doctor database, joining Heather, Claude, Sandy, Pete and Rusty.*



Heather



Claude



Sandy



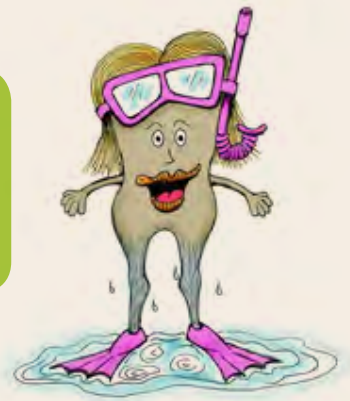
Pete



## Rusty

# Allý

Ally is a young, attractive soil with a flexible character who likes nothing better than splashing about beside rivers. Prone to flooding, she can sometime become almost totally submerged. Living in some of the most sheltered and warmest parts of Scotland and being very easy to plough she is popular with both farmers and plants.



# Monty

Monty displays a strong resistance to extreme cold and windy weather and enjoys nothing more than outdoor activities on mountain tops. Providing a home to many important small plants, he hates being disturbed. As he is very intolerant of heat, he is very vulnerable to global warming.



Rocky can usually be found in the West Highlands. A bit of a hard man, he is almost unemployable as an agricultural base and is particularly useless as pasture land.

