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scrr

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for Rural Research

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PHOTOGRAPH: ISTOCKPHOTO



This issue in numbers

5% maximum of the food we eat, by calories, should come from animal sources if we are to avoid severe water shortages – **page 2**

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21 people have been head of the Royal (Dick) School of Veterinary Studies before Prof David Argyle, its new boss – **page 8**

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1 surviving plant of the St Helena gum tree *Commidendrum rotundifolium* was found in 1982 and destroyed in a gale in 1986, but seedlings were taken and the species lives on – **page 10**

Living with the weather

Prof Stuart Monro, scientific director of SCRR, on the role of the jet stream

WE HEAR MUCH about climate change and the likely long-term effects for agriculture in Scotland, but while this is undoubtedly an important issue, our recent 'summer' has highlighted the effects of weather. The differences between the west of Scotland – usually known for rain – and the east have been remarkable. The north-west Highlands basked in sunshine, with very little rain; the east was grey and wet.

The culprit seems to be that strange phenomenon, the jet stream. This is a 10km-high wind blowing around the planet which controls the position of the surface pressure systems. This summer's record-breaking grim weather has been due to the jet stream lying unusually far south.

But what causes the jet stream to move? It seems the answer lies in the energy transport from the tropics to the polar region. When heat energy moves north, cooler air from the north will be

displaced southward with the jet stream located between these air masses. It will be strongest where the thermal gradient is the strongest, between the coldest and warmest air masses. As these air masses move, so will the jet stream and this will have a strong influence on local weather systems.

For those working in rural Scotland, unexpectedly bad weather can have a dramatic effect on food production. For potato growers, the weather has had a significant effect on yield and on the prevalence of plant pathogens. The gloomy start to summer also had an impact on soft-fruit growers and may have cost them as much as £10m in poor sales and unharvestable crops.

Perhaps it is time to develop long-range weather forecasts that track and predict movement of the jet stream so that we shift the odds in favour of the scientific approach to rural land use that we all advocate.

About SCRR

THE SCOTTISH CONSORTIUM FOR RURAL RESEARCH –

known until May 2012 as the Edinburgh Consortium – exists to promote sharing of ideas and techniques among a group of organisations active in research into land, freshwater, coastal and marine resources, and their uses.

Our member organisations have bases throughout Scotland and are at work all over the world.

Further details of our membership can be found on the back page.

Climate change adaptation indicators: how they could take shape in the future

Anne Marte of SNIFFER on the first steps in establishing standards for how 'preparedness' is assessed

A NEW REPORT from Sniffer looks at the gaps in our climate change indicators and data sets, and assesses the form and function of adaptation indicators for future policy development.

The report, *Climate Change Adaptation-Related Indicators*, sets out five parameters to help inform the future development and use of adaptation indicators:

- Agree focus and vision
- Secure and legitimise implementation
- Ensure seamless integration
- Design to provide the information that users need
- Guarantee credibility

This is the conclusion of Phase 1 of the project, which was undertaken by the contractors AEA and Heriot Watt University. The Phase 1 Report captures the essential elements to develop adaptation indicators: relevant research and thinking; the current state of play in the UK and worldwide; underlying assumptions and issues;



PHOTOGRAPH: ISTOCKPHOTO

Climate change: how to measure levels of adaptation?

the needs of stakeholders and the implications of these needs for indicator development. The recommendations are based on

the findings of a scoping studies, and from discussions held at a stakeholder workshop.

The overall aim of this project, with Phase 2 now being scoped, is to help inform the future development and use of adaptation-related indicators. It builds on previous indicator work, including the report of June 2011 commissioned from AEA by the Adaptation Sub-Committee (ASC) of the Committee on Climate Change, and related recent reports on climate change 'preparedness'.

The project is aimed primarily at policy-makers and aims to help inform the future development and use of adaptation-related indicators in line with future requirements as identified in the UK government's Climate Change Risk Assessments, adaptation programmes, UKCP09 models and assessed by the ASC.

<http://www.sniffer.org.uk/knowledge-hubs/environmental-regulation/better-regulation/climate-change-adaptation-related-indicators/>

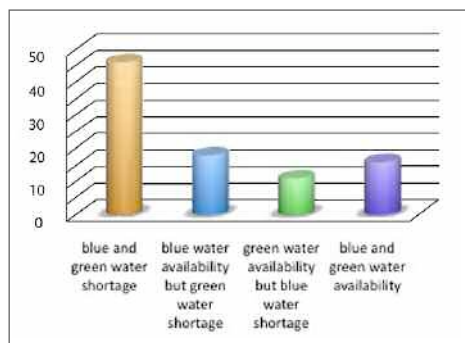
What will the world's water availability look like in 2050?

Prof Malin Falkenmark of the Stockholm International Water Institute (SIWI) describes the challenges ahead in this extract from a report published by SIWI for World Water Week in August 2012

RECENT ANALYSES have shown that there will not be enough water available on current croplands to produce food for the expected population in 2050 if we follow current trends and changes towards diets common in Western nations (3,000 kcal produced per capita, including 20 per cent of calories produced coming from animal proteins).

There will, however, be just enough water, if the proportion of animal based foods is limited to 5 per cent of total calories and considerable regional water deficits can be met by a well organised and reliable system of food trade.

The numbers suggest that water shortage will develop into a very real challenge for the next generation, with



almost half the world population living in chronic water shortage.

In the future, an integrated approach to land and water will be needed to navigate our competing demands for, and shared dependence

'Blue water' is surface water; 'green water' is trapped in soil as soil moisture

upon, available green water (infiltrated cropland rainfall) and blue water (current irrigation) provided in the basin. Finding the best path for sustainable food production requires an understanding of the resource requirements from cities, industrial use, energy production and for sufficient environmental flow in the river to maintain healthy habitats for freshwater and coastal aquatic ecosystems. This calls for a shift in thinking that is based upon sequential reuse along a river system.

Feeding a Thirsty World: Challenges and Opportunities for a Water and Food Secure world. Jägerskog, A, Jönch Clausen, T (eds) 2012: <http://www.siwi.org/sa/node.asp?node=1562>

CHEMICAL POLLUTION from past industrial development poses current and future environmental threats, as many substances are toxic in high concentrations, and could have long-term implications for ecosystems and human health.

The Glasgow area has been significantly affected by its industrial past. Subsurface coal mining, shipbuilding, chemical and engineering industries have all left their mark in the catchment of the River Clyde.

In order to assess sediment and water quality in the post-industrial River Clyde catchment, the British Geological Survey collected rural stream sediments across the entire Clyde basin¹, stream sediment and water samples from selected urban tributaries draining into the Clyde², and sediment and water samples in the Clyde estuary³. All three surveys form part of BGS's multi-disciplinary Clyde-Urban Super-Project (CUSP). Sediment and water samples underwent analysis for 29 chemical elements.

The current project integrates and interprets these datasets to assess human impacts on environmental quality in the Clyde catchment. To distinguish natural variations in sediment element concentrations and calculate the impact of human sources and past industrialisation on overall pollutant levels, it was necessary to model the natural geochemical background. With the exception of mining areas, such as the Leadhills, in rural parts of the Clyde catchment, the sediment composition is largely determined by the underlying geology and rock type. Crucially, it is possible to use these rural results to model the



Sediment quality in the River Clyde catchment

Solveigh Lass-Evans of BGS explains a project trying to assess human impact, including the effects of past industrial activity, on the natural environment

natural background composition in urban areas with similar geology. This has revealed that stream sediments in central Glasgow have been enriched in metals (antimony, arsenic, copper, lead, and tin) more than ten times the natural concentration as a consequence of human activities, reflecting Glasgow's mining and

Pictured above: taking samples of sediment from the bed of the Clyde

industrial history, and a legacy of possibly long-term environmental problems.

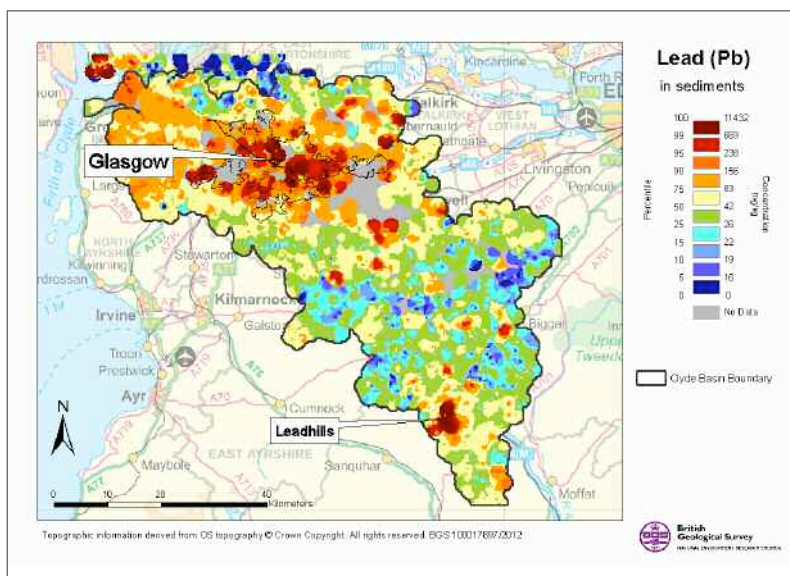
The rural stream sediment and water data have a variety of other uses: those interested in using the data are encouraged to contact the authors.

Footnotes

1. Geochemical Baseline Survey of the Environment (G-BASE)
2. Clyde Tributary Geochemical Project co-sponsored by Glasgow City Council
3. Clyde Estuarine Contamination Project co-sponsored by Glasgow City Council and the Scottish Environment Protection Agency (SEPA)

For further information, contact Dr Solveigh Lass-Evans, sollsan@bgs.ac.uk or Fiona Fordyce, fmf@bgs.ac.uk

Dr Lass-Evans is a Daphne Jackson Research Fellow, funded by the National Environment Research Council and based at the British Geological Survey in Edinburgh. The Daphne Jackson Trust is an independent charity assisting scientists to return to their profession following a career break.



Left: prevalence of lead in sediments

Members' reports

Agronomy Institute, UHI



Developing an 'all-Orkney' single malt whisky

Peter Martin of the Agronomy Institute, Orkney College, describes growing Britain's most northerly malting barley



Left: a field of Tartan barley growing in Burray, Orkney

Right: Tartan new-make spirit coming off the still at Highland Park, 2011



AS A RESULT of Orkney's northern location and high soil nitrogen levels, it has generally been assumed that the islands could not produce good quality malting barley. Recent collaboration between Highland Park Distillery and UHI's Agronomy Institute (AI) has challenged this assumption and the distillery is now using locally grown malting barley, which is malted on site, to produce spirit for a niche-market, 'all-Orkney' whisky.

The collaboration between the two organisations started in 2009 with a variety trial in which five malting barley

varieties were grown at Orkney College. To cope with Orkney's climate, the partners were looking for an early maturing variety, and the trial showed that Tartan provided the best combination of earliness, yield and malting quality.

The distillery then asked the AI to develop and manage a local supply chain producing about 50t of grain per year. The supply chain, which includes five growers, is now in its third year of operation and in both 2010 and 2011 achieved its production goal. Quality has also improved and, by 2011, all

growers achieved grain nitrogen levels below the target of 1.65% which is necessary to maximise alcohol yield.

Apart from the Orkney links in the supply chain, it also receives technical support from the Edrington Group and the seed supplier McCreath, Simpson & Prentice Ltd. The breadth of the supply chain, together with a free exchange of information across it, has brought benefits to all stakeholders and has resulted in a new market for malting barley in Orkney and a high-value product maturing in Highland Park's warehouses. The distillation of the first crop of Tartan in 2011 is thought to be the first Orkney-grown barley distilled at Highland Park since 1942.

This article is a summary of one which appeared in Brewer & Distiller International, July 2012 (pp 45-47). Further information on this project can be obtained from peter.martin@orkney.uhi.ac.uk

Prof Martin Price receives King Albert medal

Director of Centre for Mountain Studies is honoured by top Belgian award for his 'global contributions'

ON SEPTEMBER 1, Prof Martin Price, Director of the Centre for Mountain Studies at Perth College, University of Highlands and Islands, was awarded a gold medal by the King Albert I Memorial Foundation.

The Foundation was established in 1993 in memory of King Albert I of Belgium, a keen mountaineer. Its aim is to honour persons and institutions that have made exceptional contributions to the mountain world.

The citation for the award commends Martin's work with



international organisations, and his role as the organiser of international mountain conferences over the last two decades. It also praises his wide knowledge and editorial competence, describing this as a vital role for the

mountains of the world: 'His global interactions and contributions have

been a major force in mountain research and development.'

Martin holds the UNESCO Chair in Sustainable Mountain Development, and has written and edited many books contributing to the knowledge and sustainable development of mountain areas, on topics including forests, tourism, global change and interdisciplinary research.

Centre for Mountain Studies:
www.perth.uhi.ac.uk/SPECIALISTCENTRES/CMS/



Scottish Natural Heritage
Dualchas Nàdair na h-Alba

Members' reports
Scottish Natural Heritage

Pictured right: research with JHI and independent consultants has enabled SNH to develop policy to protect internationally important moss and liverwort populations in oceanic ravines

AS THE STATUTORY BODY for nature conservation across all species and habitats in Scotland, SNH has a huge range of work to do. Our staff deal with a wide range of topics from development management and agri-environment scheme policy to climate change, and the surveillance and monitoring of protected species and places. We base our policy and advice on the best available scientific evidence.

Bryophytes, fungi and lichens are species-rich groups, with many Scottish populations of international importance, but which have relatively few experts and often require novel techniques to study effectively. SNH has one dedicated policy and advice officer with responsibility for all three groups, and we rely heavily on research from the wider academic community.

Partnership working is one of the most effective and rewarding ways of achieving targeted and relevant research. Research organisations gain a better understanding of current conservation priorities; SNH gains access to the wealth of knowledge and technical resources within research centres. We also work closely with independent specialist consultants who add unique taxonomic skills and a wealth of field experience.

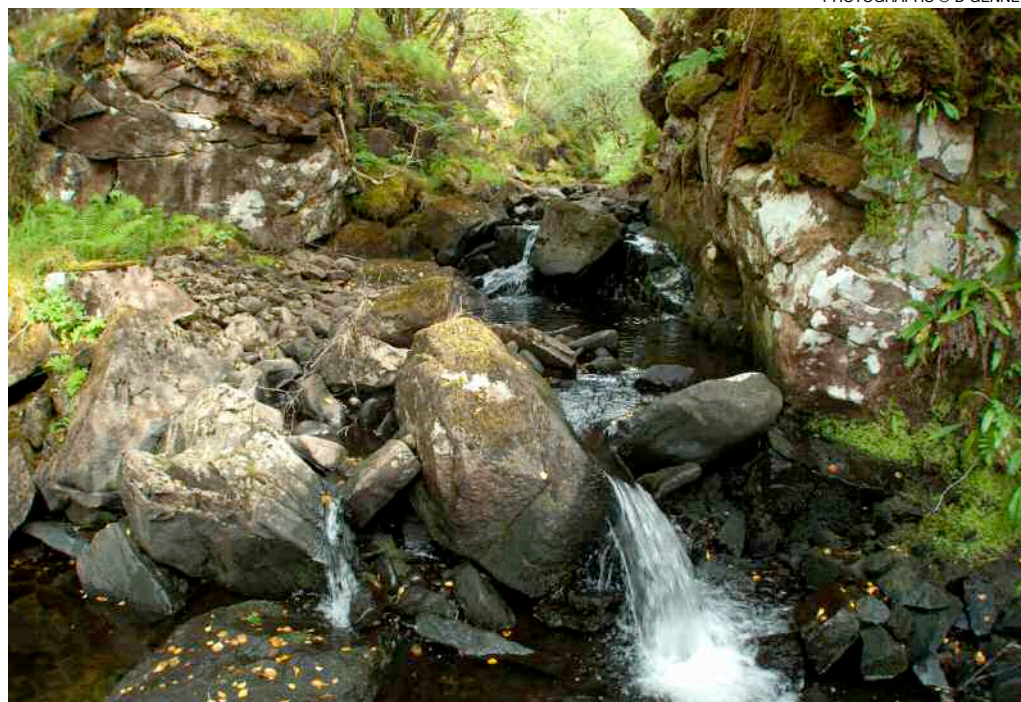
The following projects are examples of recent and ongoing



A PhD studentship with the University of Aberdeen, JHI and RBGE is contributing to our knowledge of the ecology the rare hazel glove fungus in Atlantic hazel woods



The mountain lichen *Flavocetraria nivalis* is being used in by SNH and JHI to see if translocation could be a viable conservation tool



PHOTOGRAPHS © D GENNEY

SNH partnerships in research into bryophytes, lichens and fungi

These fascinating groups can be difficult to study, but contribute enormously to Scotland's rich ecology. David Genney of SNH explains how his organisation relies heavily on the efforts of the wider academic community

collaborative research that supports SNH's bryophyte, fungus and lichen conservation work.

- Surveillance of priority fungi and lichens (with the James Hutton Institute) – developing statistically robust techniques to monitor trends in species' populations across Scotland.
- Translocation as a tool to help species adapt to climate change (JHI) – feasibility study based on the restricted montane lichen *Flavocetraria nivalis*.
- Assessing the impact of small scale hydroelectric schemes on rare bryophytes and lichens (JHI).
- Bryological assessment for hydroelectric schemes in the west Highlands (independent consultants).
- Confirming the taxonomic status of the protected lichen *Calicium corynellum* (RBGE).
- Lichen epiphyte dynamics in Scottish Atlantic oakwoods – the effect of tree age and historical continuity (RBGE).
- Bryophyte-dominated snowbed re-survey and establishment of a

Scotland-wide monitoring network (RBGE/University of Bergen).

PhD partnerships include...

- Ecology and restoration of Scottish hepatic heath (University of Aberdeen/RBGE)
- Ecology of the hazel glove fungus, a Species Action Framework species (University of Aberdeen/JHI/RBGE).
- Alpine ectomycorrhizas in Scotland: exploring the biogeography of undiscovered fungal communities (RBGE).

The key to successful SNH research partnerships is to identify projects that produce novel, high impact scientific publications on topics that directly support SNH's species policy and management advice.

And the key to this, of course, is good communication.

Dr David Genney, SNH policy and advice officer, bryophytes, fungi and lichens - 01463 725253, david.genney@snh.gov.uk



Advances in digital image analysis

Is it possible for software to automatically monitor the growth of plants by interpreting digital images? Chris Glasbey of BioSS is finding out...

AUTOMATIC INTERPRETATION of images of plants and animals remains challenging despite decades of advances in computing hardware and software. BioSS has a long history of contributing to methodological developments in image analysis, motivated by our collaborations with SCRR partners. We have worked with SAC on segmentation and analysis of X-ray CT imaging of live sheep, using a suite of analysis tools in our STAR programme; and with SASA to estimate quantitative features of individual plants and assess differences between varieties, using our IMAGIN software.

A common feature of these collaborations is that the individuals to be measured have been laid out separately. But when sequences of images of growing plants are collected, this may not be possible and hence images may represent parts of multiple individuals, posing fresh analytical challenges.

In an EU-FP7 project with several partners including the University of Wageningen in Holland, we are developing methods for automatically measuring growing plants in greenhouse conditions. The project, called SPICY (Smart tools for Prediction and Improvement of Crop Yield), aims to develop an advanced suite of tools for breeding of crop plants, using pepper as the exemplar crop. Sets of colour and range images record the plants as they grow, from which we wish to estimate phenotypic characteristics such as leaf area or fruit size.

We have developed methods based on a graph-cut optimisation algorithm to combine colour and coarse resolution range images to estimate depths at finer resolution, which is the first step in locating features of interest and extracting quantitative information about important phenotypic features.

For many reasons, an image analysis approach, which seeks to assess the plant characteristics by looking for identifiable features such as fruits, flowers and leaves, will encounter difficulties, and the other approach we are therefore pursuing is to use statistical characteristics of the images. Each image consists of many pixels with three intensity measurements (red,



Images of pepper plants from the SPICY project: colour image (left) and coarse resolution range image (right) with red areas being closest to the camera and blue furthest away



A 3D leaf reconstruction made by combining range images and stereo pairs of colour images, which can be used for accurate measurements of phenotypic features such as leaf area

green and blue). Summaries of these can be related to manually measured plant characteristics, or can be assessed for differences between genotypes. We have used the intensity histograms of the red, green and blue components, calculated principal components and followed this by a linear discriminant analysis.

Counting fruit, the most important characteristic of the plants, has been particularly challenging due to their mainly green colour and being adjacent to the more numerous leaves. However, a combination of spectral and spatial processing produced results which achieved a correlation of 0.64 with manually counted fruit.

For more details on research at BioSS, please see www.bioss.ac.uk

FOREST RESEARCH SCIENTISTS

have recently produced two topical reports (free on-line) on the role of forests in climate change mitigation.

Forests and woodlands represent a substantial stock of carbon that is contained in soil, trees and other vegetation. They are a key component of the global carbon cycle and their effective management, at both global and regional scales, is an important mechanism for reducing greenhouse gases in the atmosphere.

Understanding what determines the size of carbon stocks, and the processes and controls on the exchanges of carbon dioxide and other greenhouse gases, is critical in helping the forestry sector to contribute to reducing anthropogenic climate change. James Morison and Robert Matthews have therefore prepared a review, *Understanding the Carbon and Greenhouse Gas Balance of Forests in Britain*, which summarises key information on carbon stocks in British forests, the fluxes of carbon dioxide and other greenhouse gases, how these are affected by changes as trees grow, and how they are affected by forest operations and other forest management decisions.

Comparing the cost-effectiveness of different climate change mitigation measures is also essential in minimising the cost of meeting national greenhouse gas reduction targets. The costs of different measures and their potential to reduce emissions or sequester greenhouse gases can be depicted using a Marginal Abatement Cost Curve. Previous studies have

EUPHRESCO aims

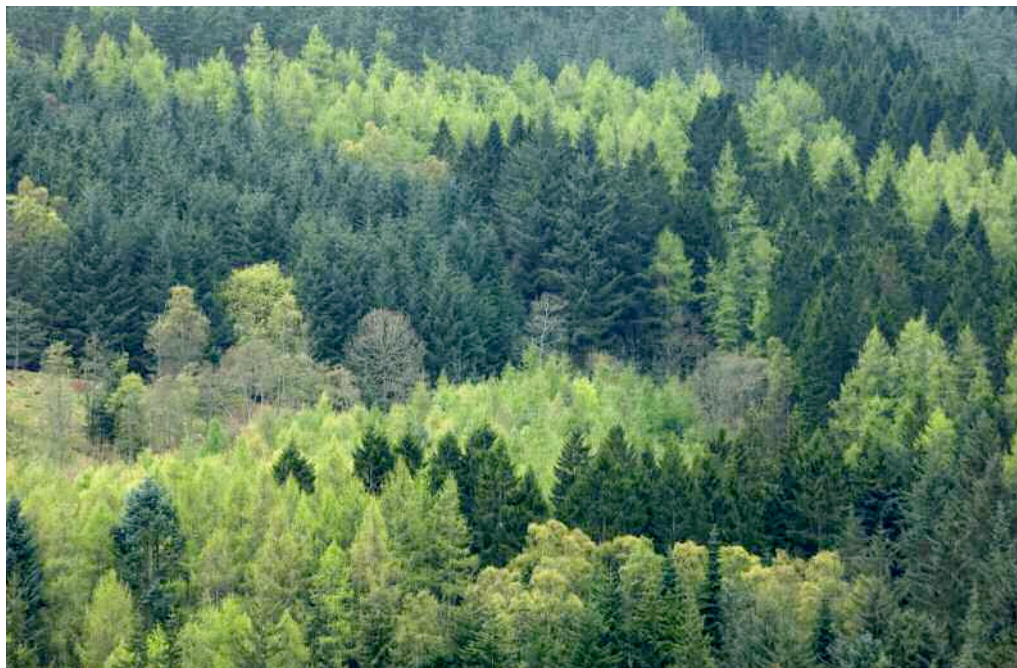
SASA's role in the European network on plant pests, diseases and invasive species

AS GLOBAL TRADE has increased, so too has the rate of introduction and establishment of new, economically or environmentally damaging plant pests and diseases. Policy designed to protect European agriculture and the environment from these exotic pest threats is determined at the EU level. However, the research that underpins this policy is undertaken primarily at the national level and has benefited from little in the way of coordination.

Improved collaboration between national research programmes is



PHOTOGRAPH: FORESTRY COMMISSION PICTURE LIBRARY



Forest Research events programme

Forest Research organises events throughout the year. The full current list is at www.forestry.gov.uk/fr/INFD-5ZM9UN

Forest Health (awareness of current pests and disease) events on September 20 and 27: www.forestry.gov.uk/fr/INFD-8X5BU9

Managing forests for ecosystem services: can spruce forests show the way? An international conference in Edinburgh October 8-11: www.forestry.gov.uk/fr/INFD-8K6C49

Research Update Seminar in Birnam on November 8: www.forestry.gov.uk/fr/INFD-8UKK8D

Forests and carbon

Two new reports from Forest Research emphasise the role of forests in mitigating climate change

shown that UK forestry measures are generally highly cost-effective by comparison with government estimates of the social value of carbon used in policy appraisal.

However, estimates are sensitive to a range of factors including the species planted, forest management regime, environmental conditions, co-benefits and methodology adopted.

Gregory Valatin reviews past approaches and summarises the current approach in his report *Marginal Abatement Cost Curves for UK Forestry*.

For any further information contact Steve Penny, Research Liaison Officer, steve.penny@forestry.gsi.gov.uk or www.forestry.gov.uk/forestresearch



Both reports can be downloaded from the 'New publications' page of Forest Research's website at www.forestry.gov.uk/forestry/HCOU-4VXJ5B

to coordinate plant health science at a European scale

essential to ensure effective support of EU policy and its implementation. EUPHRESKO aims to achieve this through networking of research funding activities. Currently the network includes 31 partners in 22 countries, with 12 European observer countries.

Each year a number of research priorities are agreed, with member countries signing up to projects that are important to their own plant health strategies. Funding from national programmes then pays for scientists in that country to implement research.

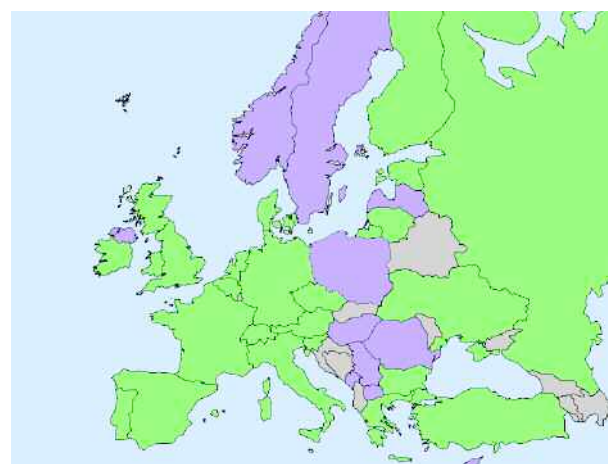
SASA represents the Scottish government in EUPHRESKO, acting as a liaison point with colleagues in policy and funding areas. It is in this role that SASA is now leading two projects of

specific importance to Scotland.

The first of these is focusing on the detection and epidemiology of phytoplasma and liberibacter in potato, which has taken on a heightened importance following the discovery of liberibacter in Scandinavia. The second is examining the population structure of potato cyst nematode at a pan-European scale and its implications for the utilisation of host resistance.

Being involved in such a network is hugely rewarding, not just in terms of accessing a network of specialist plant health researchers, but also in gaining on average a tenfold return for every £1 of funding committed.

For more, see www.euphresco.org



EUPHRESKO includes 31 nations (green), with 12 observing (purple)



Roslin receives £23 million boost for animal health and livestock production research

Award includes funding for a new national avian institute to help improve poultry farming

THE ROSLIN INSTITUTE'S goal of improving animal health and welfare and improving productivity in the livestock sector has been boosted with a multi-million-pound funding award.

Roslin has received a £23 million grant from the Biotechnology and Biological Sciences Research Council (BBSRC) as the first part of a larger five-year funding stream.

The award from the UK's leading bioscience agency will facilitate Roslin's animal sciences research over the next five years.

It will fund new and existing facilities at The Roslin Institute, such as those looking at how genomics and genetics can help better understand diseases in livestock, which will form part of a number of UK National Resource Centres.

Professor David Hume, director at Roslin, said: 'I am delighted to receive this support from the BBSRC. The Roslin Institute is one of the leading animal sciences institutes in the world and this award highlights the importance of our research to the productivity of the UK livestock sector.'



Government support for research institutes is critical and vital for economic success. It is estimated that since the mid-1960s, The Roslin Institute has alone generated approximately £101.8 million in terms



of value for productivity gains in the agricultural and food production sectors across the UK.'

A report by BIGGAR Economics found that Roslin's contribution to the Scottish economy was worth more than £40 million in 2009/10, with the institute supporting 1,179 jobs.

The institute also generates an additional £25 million for research, following on from BBSRC strategic funding. Professor Hume said: 'This new funding will enable us to undertake research that will lead to gains in the sector at a time when food production practices must be

David Willetts, minister for universities and science, visits Roslin (above). Left: a silkie chicken. Below: salmonella (left) and campylobacter.

refined to accommodate the expanding world population.'

BBSRC funding to support National Resource Centres will enhance the work of ARK Genomics at Roslin – the UK's major centre for livestock genetics and genomics.

It will also support a multi-million-pound National Avian Research Facility, a collaboration between The Roslin Institute and the Institute for Animal Health.

The centre, planned for construction on the University of Edinburgh's Easter Bush campus, will look at the biology of diseases such as salmonella and campylobacter. Research will include looking at developing vaccines and treatments to improve the health and welfare of around one billion chickens raised in the UK every year, as well as ways to address the impact of poultry infections on human health.

www.roslin.ed.ac.uk/news/2012/05/24/roslin-receives-£23m-funding-boost/



Professor David Argyle takes the reins at Veterinary School

ONCOLOGY SPECIALIST Professor David Argyle has been appointed as the 22nd head of The Royal (Dick) School of Veterinary Studies. He takes up the role at a significant moment in the history of the School, following the relocation to the £42 million teaching building at the Easter Bush campus.

Previously Head of Clinical Oncology at the University of Wisconsin-Madison, Professor Argyle first came to the University of Edinburgh in 2005, to the William Dick Chair of Clinical Studies. He is a



Prof David Argyle

member of the Royal College of Veterinary Surgeons, a European Specialist in Veterinary Oncology, a diplomat of the European College of Internal Medicine in Oncology and is co-scientific editor of the Journal of Veterinary and Comparative Oncology. He has been Director of the Veterinary Oncology and Imaging Centre at the Dick Vet since it opened in 2009.

His major research interests are cancer biology and gene therapy,

telomeres and telomerase, cancer stem cells and stem cells in regenerative medicine. His most high profile work has drawn parallels between dog cancers and bone cancer in children.

The outgoing Head of School, Professor Elaine Watson, has been appointed Vice President of Ross University and Dean of Ross University School of Veterinary Medicine.

www.ed.ac.uk/schools-departments/vet/news-events/news/new-head

SCIENCE EDUCATION is a key part of MoreDun's public engagement agenda. Staff are involved in a number of initiatives that help support and encourage school children to take an active interest in science.

One such initiative is Science Sparks, a new range of free, curriculum-linked resources to support cross curriculum learning.

With the help of funding from the Scottish Government, MoreDun has teamed up with the Bright Business Partnership in the past year to work with teachers in rural areas of Scotland to develop and deliver this new collaborative educational resource for the primary classroom.

Science Sparks not only provides teachers with resources (teacher notes, worksheets, and project and activity suggestions) but also helps generate ideas, confidence and enthusiasm to enable the exploration of current scientific issues and allow pupils to have fun discovering the relevance of science to the world around them.

Currently, in collaboration with our partners, these resources cover a range of curriculum-linked topics

Education initiative aims to spark an early interest in science

MoreDun's latest scheme offers free resources for use in primary schools



Left: teachers at a workshop to develop the new curriculum-linked resources.



including health and wellbeing; conserving biodiversity; climate change and disease impact; and renewable and alternative energy.

The resources were introduced and developed through a number of successful interactive teacher workshops and are now available online for anyone to use. Since the launch of the Science Sparks website, 230 users across 20 different regions of Scotland have signed up to download these free resources.

We are looking at opportunities to further enhance and develop this successful scheme going forward.

For more information please visit the Science Sparks website at www.sciencesparks.org.uk or email education@moredun.org.uk

Carbon Busters – helping schools to improve their carbon footprint

This project from the Crichton Carbon Centre, Dumfries is showing good results

CARBON BUSTERS is a whole-school project in its fourth year. The project has run in 22 schools in Dumfries and Galloway, working with pupils from P5 to P7 and S1 to S2. In the 22 schools a sustainable reduction of over 100t CO₂e has been achieved through the project.

The aim of the project is to help schools to reduce their carbon footprint. The project runs as a combination of lessons and activities, followed by practical experience of collecting data to calculate their school's footprint using the Schools Global Footprint Calculator at www.educationscotland.gov.uk/schoolsglobalfootprint.

To reduce their school's carbon emissions, pupils suggest ideas for a Carbon Management Action Plan, to be implemented by pupils, teachers and other relevant staff.

The project is a partnership between Crichton Carbon Centre and participating schools. It is funded by



the Climate Challenge Fund – a Scottish Government scheme that assists communities to tackle climate change and reduce their carbon emissions – and The Robertson Trust.

Carbon Busters complements the Eco Schools programme and assists schools in achieving a Green Flag

About the Crichton Carbon Centre

The Crichton Carbon Centre is a not-for-profit postgraduate teaching and applied research organisation based at the Crichton University Campus in Dumfries.

It undertakes grant funded programmes and commercial commissions, working with individuals, communities and a wide range of organisations, including businesses, social enterprises, schools, colleges, universities and public institutions.

award. Through the project, pupils gain a better understanding of climate change and learn how their everyday lives impact on the environment.

Teachers are provided with training and supported throughout the project by Crichton Carbon Centre staff, and a teacher's guide and resource materials have been developed to encourage teachers to continue the project and sustain a low-carbon ethos at school.

For more, see <http://carboncentre.org/>

Tropical forest research at CEH Edinburgh

Plant ecologist Jill Thompson's work in Puerto Rico is just one of CEH's many projects around the world



All four corners of the globe ...

Other tropical research at CEH Edinburgh includes:

Senegal

Increasing the quality and yield of the gum tree *Acacia senegal*

Uganda

Genetics of shea nut *Vitellaria paradoxa*, formerly known as *Butyrospermum parkii*

India

The ecology of blue tongue, a viral disease of ruminants

Malawi

Ecosystem services in the tropics

St Helena

Developing an invertebrate conservation plan and studies to prevent the extinction of *Commidendrum rotundifolium*

Ascension Island

Establishing a biodiversity action plan and an ecosystem approach to plant conservation

ROBIN

ROBIN is a new European Union project that involves many collaborators and is investigating biodiversity and mitigation of climate change across Meso- and Latin America

INTEREST IN TROPICAL FOREST

has increased in recognition of the threat to their survival from climate change and human destruction. Tropical forests hold much biodiversity, store and sequester carbon, have a significant effect on global hydrological cycles, and are important for combating climate change. CEH supports tropical research through collaborations in many countries.

We collaborate with the Institute for Tropical Ecosystem Studies at the

Tropical forests hold much biodiversity, store and sequester carbon, have a significant effect on global hydrological cycles and help to combat climate change

University of Puerto Rico, and the Luquillo Long Term Ecological Research programme (Luq-LTER) in the forests of the Luquillo mountains. Luq-LTER studies plant and animal populations, primary and secondary production, biogeochemical cycles and the impact of natural and human disturbance on forest terrestrial and aquatic ecosystems. The main natural disturbances are hurricanes, flash

floods and landslides. Puerto Rico experiences major hurricanes (class 4–5) every 50–60 years, but three or four times each hurricane season (June to October), panic-buying of food, an alcohol ban and a cacophony of saws and hammers as hurricane shutters are put in place speeds up the Caribbean lifestyle.

Collaboration with Luq-LTER focuses on the Luquillo Forest Dynamics Plot (LFDP) of 16 hectares. Established to assess forest damage and recovery after Hurricane Hugo in 1989, it was then struck by Hurricane Georges in 1998. Subsequently we showed that the LFDP tree species distribution resulted from the mixture of undisturbed forest areas and natural regeneration after subsistence farming (pre-1934).

We investigate interactions among human disturbances, and the predicted climate change impact of changes in intensity and frequency of hurricanes. The time of hurricane impacts, tree condition, species distribution and species specific characteristics all influence the trajectory of forest recovery.

Dr. Jill Thompson, plant ecologist, CEH, jjom@ceh.ac.uk

Left: Peak Dale, the largest remnant of the once widespread *Commidendrum robustum* forest on St Helena (*C. robustum* is at centre of picture)

Below: teamwork is needed to measure the diameter of trees in the Luquillo Forest Dynamics Plot, Puerto Rico





ON MAY 29TH, SAC's Rural Policy Centre published the second in its series of two-yearly Rural Scotland in Focus reports.

In these reports, we aim to show why and in what ways rural Scotland is changing, and why these changes matter. We provide evidence in a readable format, and give a 'fast track' to key information, research and policy reports and data that are sometimes hard to track down otherwise.

We also, and critically, provide impartial commentary on the trends that we are seeing.

Rural Scotland is clearly a broad area, so in each report we focus on what we see as 'persistent' topics –

In each report we focus on what we see as 'persistent' topics – things that have been a concern or issue for many years – to see if we can bring a new perspective

things that have been a concern or issue for many years – to see if we can bring a new and helpful perspective to these. In the 2012 edition, we looked at what has changed since in our 2010 report in terms of: population, housing needs, economic resilience, and environmental change.

We then looked at three 'drivers' of change: rural towns, the private sector



PHOTOGRAPH: SCOTLAND ON CANVAS, BY PERMISSION OF SAC

Rural Scotland in Focus 2012 report proposes a 'tailored' approach

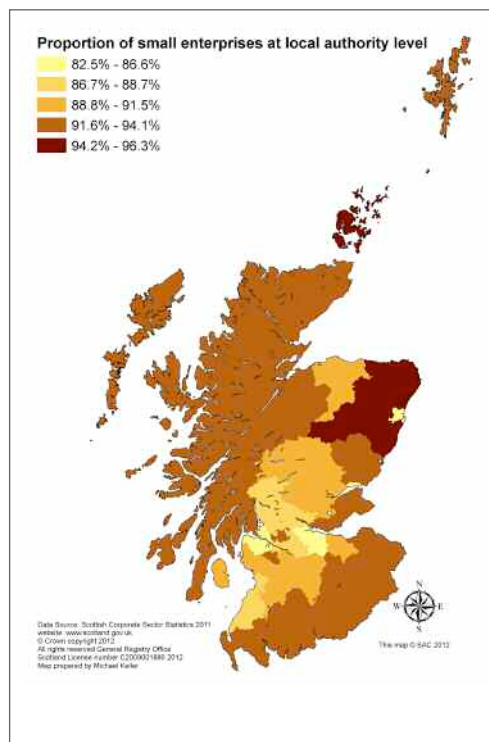
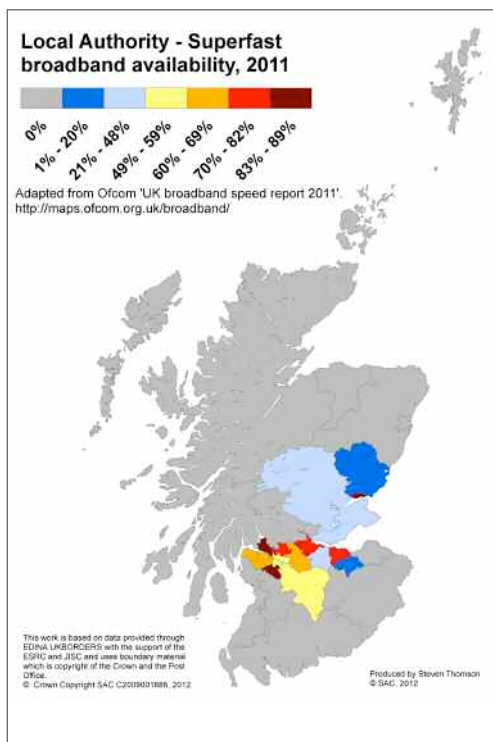
Dr Sarah Skerratt of SAC, editor of the report, explains its scope and its key findings

(including social enterprise), and the third sector. After that, we explored the implications of having/not having next-generation broadband across rural Scotland, and the potential to shift to a low carbon rural Scotland.

Our key overall finding is that, based on the evidence we've presented, national policies must be tailored not only to rural Scotland, but to the diversity of rural Scotland. When you say 'tailored', people think of 'bespoke', of expensive luxury in straitened times. However, we argue that not to tailor is more expensive, because resources are then mis-spent and wasted.

We're not saying that rural should be privileged over urban. We're saying the characteristics of rural Scotland must be recognised in national policy architecture. 'Fit for purpose' policies will then increase the scope for everyone, irrespective of where they live and work in rural Scotland, to contribute and thrive.

Dr Sarah Skerratt is editor of the Rural Scotland in Focus Reports 2010 and 2012, and is Senior Researcher and Team Leader, Rural Society Research at SAC. View the report at www.sac.ac.uk/info/120336/thriving_communities/466/2012_rural_scotland_in_focus_report



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Members' meetings

Monday October 8, 2012

Perth College,
University of the Highlands and Islands
Executive Committee meeting
Directors' lunch, 12:30
Host, Prof Martin Price

Monday December 3, 2012

Old Moray House,
The University of Edinburgh
Board meeting, 11:00
Directors lunch, 13:00
Host, Prof Steve Yearley

Monday January 21, 2013

Royal Zoological Society of Scotland,
Edinburgh
Executive Committee meeting
Directors' lunch, 12:30
Host, Prof Chris West, chief executive

Wednesday March 20, 2013

SCRR Rural Sociology Workshop
Perth Concert Hall
'Researching Scotland's ruralities:
social science perspectives on current
issues in rural Scotland'

Thursday May 9, 2013

SCRR Metagenomics meeting
SNH Battleby Conference Centre, nr Perth

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FUTURE ISSUES

Contributions to the SCRR newsletter
(formerly the ECRR newsletter, and before
that The Bush Telegraph) are welcomed.
All contributions, comments and
suggestions should be emailed to the
Secretary/Treasurer as above

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The deadline for copy in the next issue is
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