



Scottish Natural Heritage

Science Newsletter

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Welcome from the Scientific Advisory Committee Chair

Bob Furness

I'm looking forward to the Scientific Advisory Committee (SAC) meeting on 28th September, when we shall be joined by three new members, Dan Haydon, Neil Metcalfe and Martin Price. This will be Ruth Mitchell's first official meeting as an SAC member and also Sally Thomas's first meeting as SNH Director of Policy and Advice. We have a full agenda covering a range of issues, including decision tools for setting priorities, progress in meeting the 2020 CBD biodiversity targets for Scotland (and thinking beyond then), the role of NNRs in science, and monitoring protected areas.

In the last newsletter I thanked our four departing SAC members, whom I am sure will continue to work with us in various ways. One of our SAC Expert Panel members, Dr Dick Birnie, is also stepping down. Dick played a formative role in helping SNH develop the National Countryside Monitoring Scheme, its trends and indicators work, and surveillance programme. With the James Hutton Institute's predecessor body, The Macaulay Land Use Research Institute, Dick helped staff greatly in advising on communications work related to science. Several staff have remarked that Dick was, and remains, a great 'mentor'. In science, we often lose sight of the importance of mentors (a wonderful word, derived from Greek mythology, and named after Mentōr, a wise and trusted adviser and guide). Mentors are incredibly important in science – essentially, critical and experienced advisers, who often become friends. Masters and PhD students often point to the importance of a particular mentor (not necessarily a supervisor!), and describe how his or her influence has become so defining in life's passage. We should all take a moment to thank our mentors and to reflect on what makes them so special. In SNH we have embarked on a programme of mentoring staff in scientific writing and other work, to help people give their best. Such enterprises can be equally rewarding and refreshing for the mentee and mentor.

Evidence complacency hampers conservation

David O'Brien, Ed Mackey and Des Thompson

A recent [paper](#) by Bill Sutherland and Claire Wordley in the journal *Nature Ecology & Evolution* (NEE) identified barriers to evidence-use in conservation and how that hampers effective action. It concludes, somewhat starkly, that '*if we do not make concerted efforts to hold ourselves and each other to account when we fail to use evidence, we are complicit in the perpetuation of a post-truth world*'.

We recognise the underlying problem and, among impediments cited in the paper, are targeting what we see as an overarching issue faced by decision makers: '*too much effort to check the evidence*'. For example:

- Our quality-assured research and our data holdings are now published for use by all and are easily available on our [website](#);
- We are assembling disparate and complex data from multiple sources into a single, standardised habitat map;
- We see transformational opportunities in the application of new technologies to provide factual evidence, where and when it's needed, for timely action; and
- We've supported the [Conservation Evidence](#) project by linking in our research, making it available to a wider audience, as well as publishing in the journal.

All of this is aimed at improving, simplifying access to, and raising awareness of, evidence. Our ambition for a *Natural Heritage Report Card*, recently discussed by our Management Team sets out how we aim to construct a publicly accessible overview of natural heritage status and trends that is easy to assimilate, with supporting detail to hand. This ties in with a two-stage solution advanced in the NEE paper:

- *'Improving access to evidence through evidence repositories and communication about those repositories'*. We implement and advocate this through open data publication for use in inter-linked public portals, such as Scotland's Environment Web ([SEWeb](#)), [NBN Atlas](#) and [Marine Scotland Information](#).
- *'This seems to work when there are simultaneous attempts to enhance the opportunity and motivation for decision makers to use evidence'*. The three public portals continue to be developed with Scottish Government and other user-needs in mind. As *'the gateway to all you need to know about Scotland's environment'*, SEWeb is overseen by the Scottish Government Rural Affairs, Food and Environment RAFE Partnership.

We see evidence-based conservation as the only way to protect our environment and help to realise the benefits for people that flow from nature. We can't do this on our own, and we will continue to work with academics and citizen scientists, along with other partners in government and society to make sure that we meet our aspirations.

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Launch of Dynamic Coast – Scotland's National Coast Assessment

Alistair Rennie



Roseanna Cunningham MSP (Cabinet Secretary for Environment, Climate Change and Land Reform) at the launch of DynamicCoast, in St Andrews 4th August.

Scotland's long and rugged shoreline makes up 11% of Europe's coastline. Whilst 80% is rocky and physically resilient, the remainder is soft and potentially erodible. New research has shown that the soft sections of coast have already started to respond to climate change. The research has also identified the assets at risk and the important role nature has played, and can play, against the backdrop of climate change.

DynamicCoast.com provides the evidence base on how Scotland's soft (potentially erodible) shorelines have changed since the 1890s, then 1970s, through to the modern day. Whilst the online [webmaps](#) show the changing position of the shore, [reports](#) and [videos](#) summarise the results. In the last month the website has received 3,000 hits as people see the reports and maps.

Since the 1970s, the proportion of soft coast experiencing erosion has increased by 39%, the proportion experiencing accretion (i.e. building seawards) has fallen by 22%, and the average erosion rates have doubled to 1m/yr. The distribution of coastal assets (including buildings, infrastructure and designated sites) has been compared against coastal type. This shows that £13bn of coastal assets lie behind sand dunes and salt marshes – our natural coastal defences; whilst £5bn of assets lie behind human-made defences. If areas of erosion are projected landward at the recent rate, then 50 buildings, 5km of road and 2km of railway are expected to be affected by 2050. The value of the assets at risk is around £400m.

The potential implications for our natural heritage can also start to be considered. Whilst some may perceive the future projections as a concern, they mirror past changes and thus inform us of the considerable dynamism that has occurred and will continue to affect parts of our coastline. This dynamism drives much of the diverse landform and habitat assemblages and environmental niches.

The extensive evidence base has been developed to support the Scottish Government's, SNH's, SEPA's, HES's and Local Authorities' statutory duties. This includes a better appreciation of climate change risk (duties under the Climate Change Act and Scottish Climate Change Adaptation Programme) and improved understanding of coastal erosion exacerbated flooding (Flood Risk management Act). It also enables SNH to take forward its duties in developing mitigation and adaptation planning for our designated sites, but also fully supports the inclusion of the evidence base within terrestrial and marine planning advice.

Further work is planned within SNH to integrate the result in our advice. More research is planned to improve our understanding of climate change implications, links with flooding, and demonstration sites for Mitigation and Adaptation Plans. For more information please visit www.DynamicCoast.com.

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Successful PhD

Bob Furness

Many congratulations to Alex Robbins (Policy & Advice Officer, Marine Ornithology) in SNH's Marine Energy Team, who has been awarded the degree of Doctor of Philosophy by the University of Glasgow for her thesis 'Seabird ecology in high-energy environments: approaches to assessing impacts of marine renewables'. The thesis was examined by Professor Ben Wilson (SAMS, UHI) and Professor Jason Matthiopoulos (University of Glasgow). Tidal-stream turbines are predicted to have potential to impact diving seabird populations through collision, disturbance, habitat loss and changes to food availability. However, we know little of the detail about how seabirds use high energy marine habitats where tidal flows make deployment of turbines economically attractive. Alex's thesis addressed key knowledge gaps relating to our understanding of seabird ecology in high-energy marine environments. This involved fieldwork in Shetland and Orkney in relation to both tidal-stream and wave energy converter sites, and development of data collection and analytical approaches that improve the accuracy of impact assessments and monitoring of any potential impacts. Two papers arising from the research have already been published, in *ICES Journal of Marine Science* and in *Marine Policy*. The complete thesis is available from the University of Glasgow at <http://theses.gla.ac.uk/8300/>.

Clear it – but will they come? Native plants need re-seeding after rhododendron removal, study finds

Jeanette Hall



A recent paper by Janet Maclean, based on the results of her SNH-funded PhD, shows that rhododendron eradication may need to be supplemented by re-seeding for the original plant community to re-establish. Following a press release by the British Ecological Society, this attracted positive attention in a range of publications, including the [Scotsman](#), [Daily Mail](#) and [Horticulture Week](#).

Working in the Atlantic oak woodlands of Argyll, Kintyre and Lochaber on Scotland's west coast, Janet studied plots that had never been invaded, others covered in dense rhododendron thickets, plus a time-series of sites cleared of rhododendron at different periods between 1984 and 2014.

She found that – even 30 years after rhododendron removal – instead of the native ferns, grasses and other vascular plants characteristic of these woodlands, only dense mats of common mosses and liverworts had returned.

As well as analysing plant communities, Janet also tested the soil at different sites but found that rhododendron had not affected its acidity, nutrient levels or carbon:nitrogen ratio. Instead, it appears that the deep shade which the invasive species casts is responsible for its impact on native plants – even decades after rhododendron eradication.

Janet said: “During the invasion, rhododendron dramatically reduces the amount of light reaching the woodland floor throughout the year, causing local extinction of native grasses and other herbaceous plants. Many of the common bryophytes cling on because they can tolerate the darkness.

“When rhododendron is removed, common mosses and liverworts quickly re-colonise. But by the time grass and other plant seeds arrive, the thick mossy mat prevents them from germinating, so the site never recovers its previous rich flora.”

The research has important implications for rhododendron eradication efforts. Rhododendron has spread throughout the UK, affecting around 827,000 hectares, and is particularly widespread across western Scotland and Snowdonia. Eradication programmes cost around £8.6 million a year and the results of this study show that – as well as removing rhododendron – land managers should also consider clearing mats of common mosses from the ground and reseeded with typical woodland grasses and flowering plants.”

“Our results strongly support continued clearance of rhododendron, because cleared sites are far richer than invaded sites. But for them to resemble uninvaded sites, removing rhododendron is not enough. This is an important discovery, because it means that many sites may need further intervention to meet their conservation goals”.

Since it was first imported in 1763 to brighten up our gardens, rhododendron has become one of Britain's most damaging invasive species. As well as its dramatic impact on native species, rhododendron interferes with forestry and prevents access to public land.

Janet Maclean, Ruth Mitchell, David Burslem, David Genney, Jeanette Hall and Robin Pakeman (2017). 'Understorey plant community composition reflects its invasion history decades after invasive *Rhododendron ponticum* has been removed', was published in *Journal of Applied Ecology* on 23 August 2017 and is available [here](#).

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Pearls in Peril – improving the conservation of the freshwater pearl mussel

Iain Sime



Freshwater Pearl Mussel glochidia on fish gills. As part of Pearls in Peril, River Trusts worked to artificially enhance this essential phase of the freshwater pearl mussel's life cycle in several rivers.

March 2017 marked the end of a 4.5 year project, 'Pearls in Peril', that has been working to improve the conservation of freshwater pearl mussels across Great Britain. This project,

involving 22 partners and funded by the EC LIFE+ Nature fund, has implemented a wide range of actions across a total of 21 Special Areas of Conservation. Feedback from the EC on the final report stated that the project was 'well managed throughout and the technical and financial reports were very well presented'.

The project was led by SNH, and our work has restored many areas of key catchments, including the establishment of riparian woodlands, the restoration of instream habitats, the targeting of wildlife crime, and the development of a schools programme that has been experienced by more than 4,000 school children.

More information about the work of the project can be found in the recently published [summary report](#). The work of the project is also being maintained and extended through a range of different initiatives, much of which is described in the (not-ironically named) [AfterLIFE report](#).

Within the project, important natural processes have been restored in key catchments. A number of those landscape-scale restoration sites are now also serving as long term research and monitoring sites. The Baddoch Burn in the upper River Dee catchment is where extensive riparian woodlands have been established to guard against increased water temperatures. It is now a long term monitoring site for Marine Scotland Science and part of the Upland Waters Monitoring Network. Another site where a flood embankment has been removed and the river Dee better reconnected with the flood plain on Mar Lodge Estate is also now a long term research site for the Scottish Government's Rural Affairs, Food and Environment Research Strategy. These and other research initiatives mean our work to restore freshwater pearl mussel populations will help inform and refine our understanding of how large-scale conservation actions affect and benefit wider ecosystems.

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Commissioned Research Reports

Kamila Fraser

Reports published recently

The following SNH Commissioned Research Reports have been published in the last few months. All are on the SNH website and searchable at:

<http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/>

- CR919 A review of the social, economic and environmental benefits of wild land
- CR927 Morrich More coastal change analysis 1987 to 2015
- CR939 Marine Biodiversity and Climate Change (MarClim): Scotland 2014/15
- CR947 Analysis of the possible displacement of bird and marine mammal species related to the installation and operation of marine energy conversion systems
- CR949 Aith Meadows and Burn of Aith Site of Special Scientific Interest: NVC/EUNIS survey and management advice
- CR962 Loch Leven nutrient load and source apportionment study
- CR968 Herbivore Impact Assessment of Ardvair Woodlands SSSI woodland features

Reports reviewed recently

CR958 Validating the JNCC Nitrogen Deposition Decision Framework - Phase 1

CR983 Habitat Map of Scotland upland mapping pilot: developing a method to map upland habitats using stereo colour near-infrared aerial imagery

Information: research@snh.gov.uk

Conferences and meetings

Raptor Science Supports Conservation: 22-23 September 2017

An international line-up of speakers are presenting talks in Edinburgh and SW Scotland on cutting edge raptor work, at a conference organised by Watson Birds, SNH, RSPB Scotland and the SOC:

<http://www.the-soc.org.uk/watson-birds-events-raptor-science-supports-conservation/>

Spotlight on Scotland's Biodiversity: 10-11 October 2017

A two day conference will be held at the Royal Society of Edinburgh:

<https://www.rse.org.uk/event/spotlight-scotlands-biodiversity/>

Student presentations and contributions from Young Scot contribute to a strong line-up of talks. A special issue of *Science Scotland* <http://www.sciencescotland.org/> will highlight advances in research and applications.

World Forum on Natural Capital: 27-28 Nov Edinburgh

The three questions to kick-start the conversation will be:

- How do we support better decision-making?
- How do we put natural capital at the heart of the green economy?
- How can we create pathways to the Global Goals for 2030?

Further information: <https://naturalcapitalforum.com/>

Changing Landscapes – Protecting the environment in a new Europe: 6 Nov 2017, Dynamic Earth, Edinburgh

The European Environmental Bureau Annual Conference will be organised together with EEB member Scottish Environment Link, and will debate how to put people and planet central in these uncertain times for the EU, the UK and Scotland.

Further information: <http://tinyurl.com/yaadgszg>

Appointments

Many congratulations to SAC Expert Panel member **Dr Nicholas Aebischer** on being awarded the degree of Doctor of Science at Durham University.

Further information: <http://tinyurl.com/yaxdhdec>

SAC Expert panel member **Professor Stuart Gibb** has been appointed as Vice-principal (International and external engagement) at UHI.

Further information: <https://www.uhi.ac.uk/en/media/news/vice-principals-take-up-roles-at-university-of-the-highlands-and-islands.html>

Dr Richard Birnie is stepping down from the SAC Expert Panel and we would like to note our thanks to him for his contributions to various aspects of SNH's work including the National Countryside Monitoring Scheme, developing our trends and indicators, and providing advice on peatland restoration which is now used in our Peatland Action restoration programme.

SNH Staff Profile

Dr Alistair Rennie



Alistair is the project manager for Dynamic Coast.

Alistair joined SNH's Earth Science Group in 2005 as their Coastal Geomorphologist. He joined the group during the final stages of his PhD. His research was part-funded by SNH, and it investigated the changing shape of islands during periods of sea level rise. The coral beaches and dunes of Sanday (Orkney) were used to see how the shape of the island had changed over millennia, and how they may change into the future. This brought together geomorphology, topographic surveying, geophysics, archaeology and near-shore surveying.

During his PhD he was a contractor on a SNH commissioned research project to develop methods to assess the changes to beaches and dunes. This work used 'then-novel' techniques of three dimensional [fly-throughs](#) of how beaches have changed over the last few decades. On joining SNH, the then group manager, Professor John Gordon, suggested Alistair should develop a good understanding of Scotland's shoreline: "I don't expect to see you much next week!" Over the years Alistair has advised on casework across much of Scotland and supported the Public Local Inquiries on Trump International Golf Links and more recently the Rosyth International Container Terminal. In both cases SNH's advice was accepted by the Reporters as robust.

It was through one of SNH's PhDs that a new venture opened up. James Fitton attempted to develop '[A national coastal erosion risk assessment for Scotland](#)', which mapped and then placed a value on the protective function provided by Scotland's beaches and dunes. The work developed a coastal erosion susceptibility map (seen on SEPA's [flood maps](#)), and identified billions of pounds worth of assets protected by 'natural coastal defences'. This demonstrated the potential risks of erosion to the Scottish Government, and the lack of evidence on recent

changes. At the same time assessments of coastal change were being called for by UK Climate Change Risk Assessment, and [DynamicCoast](#) was commissioned.

Alistair is the Project Manager for [DynamicCoast](#), which has leveraged over £250k in research funds. The research project has shown that £13bn of assets are protected by 'natural coastal defences' (beaches and dunes), and of these £400m are at risk from erosion between now and 2050. It also shows that erosion is affecting more of our coast, and at twice the rate, since the 1970s. Dynamic Coast's second phase is about to be commissioned by CREW <http://www.crew.ac.uk/>, which will help us better appreciate climate change in future vulnerability assessments, develop smarter assessments of coastal change (using satellite, aerial imagery and hand-held devices), develop adaptation planning case studies, and consider social disadvantages of coastal erosion.

SAC Expert Panel member Profile

Dr. Sarah Woodin



Sarah Woodin is a Reader in Plant Ecology in the School of Biological Sciences, University of Aberdeen. Sarah's research interests are in the effects of drivers of change on native plant species, vegetation communities and ecosystem process in the British uplands and the Arctic.

Sarah is involved in projects investigating ecological impacts of climate change, herbivory, land management practices and atmospheric nitrogen deposition, often in interaction with each other. Much of Sarah's research in Scotland is conservation based, and undertaken in collaboration with SNH. Sarah is also very involved in teaching and does her best to get undergraduate and Masters students interested in plants! Sarah currently oversees the University of Aberdeen's suite of Masters programmes which covers ecology, conservation, environmental science and marine science.