



Looking to the future of conservation

As NERC looks forward to its next 50 years, we can't know for sure what issues will arise. But some scientists have had their eye on the future for some time. Tom Marshall talks to Bill Sutherland about his work bringing environmental research into the 21st century.

Back in 2007, when Professor Bill Sutherland of the University of Cambridge first invited scientists, journalists, regulators and conservationists to identify important but unrecognised future threats and opportunities for biodiversity, the idea seemed optimistic to say the least. Dealing with known threats is one thing, but how can we prepare for issues before they've arisen?

But in the years since, the now-annual exercise has become an important part of the conservation science landscape. Not all the issues it's turned up over the years have so far hit the headlines, but in many cases the predictions have proved uncannily prescient.

One is synthetic biology – the science of creating new microscopic life forms in the lab. It's a young and hugely exciting field that could let us tackle previously insoluble problems – but it's also potentially risky. What could happen if these new life forms get into the wild? Invasive species from elsewhere in the world cause enough problems; could wholly new microbes be even worse? Sutherland and his colleagues were among the first to highlight these risks, which have since been widely discussed.

'This was something I heard of for the first time at our initial meeting,' says Sutherland. 'Synthetic biology has gone from being obscure to being part of the mainstream scientific debate, and we know we initiated research on the topic. This is what we aim to do – give researchers and policymakers earlier notice of the possibilities so we're better prepared if an issue does become important.'

Bill Sutherland is Miriam Rothschild Professor of Conservation Biology at the University of Cambridge.

Other examples include the 3D printing revolution, microplastic pollution in the oceans, the ecosystem impact of nanoparticles of silver and countries buying up farmland abroad to secure their future food supply – all barely known when first proposed, but all now critically important and widely-discussed issues. One of the preconditions of an idea making it into the final list of emerging issues is that most of the group must not have heard of it before, to avoid the temptation of including well-known topics.

Others look good contenders to rise to prominence but haven't yet – for instance, widespread adoption of thorium reactors as an energy source. Still others remain conjectural for the time being – despite a lot of hype, meat isn't yet being grown in vats, and extinct species aren't yet being brought back to life through Jurassic Park-style genetic wizardry. Although in each case they are creeping higher up the agenda. The point isn't to predict exactly when threats and opportunities will turn out to be serious; it's to raise awareness so we're not blindsided when they do.

The whole exercise has slowly gained wider acceptance; organisations in other fields have imitated it – Sutherland helped the Australian government identify the forthcoming issues for managing its national parks, for example, and various UK scientific and public-sector organisations have shown an interest. Earlier this year researchers published a horizon scan of potential invasive species threats to UK biodiversity; in the top spot was the quagga mussel, which shortly afterwards turned up here for the first time and has since been found across the south-east. 'That was an impressive prediction, and it shows the power of this technique,' Sutherland says.

The latest meeting's issues for 2015 are as varied as ever, ranging from underground coal gasification to legalisation of recreational drugs and fund managers investing in conservation projects in search of a profit – see the sidebar for a full list. Judging by previous years, some of them will rocket to prominence.

Sutherland's efforts at making conservation more effective don't end with horizon-scanning. He also promotes evidence-based conservation – moving efforts to preserve biodiversity away from relying on received wisdom to focus on things that are shown by research to work.

He leads an international group synthesising research information into summaries that are easily digestible for conservation practitioners who need a fast answer and can't spend weeks surveying the literature before deciding what to do.

'You can present scientific information on several levels,' Sutherland explains. At the bottom you have the results of individual research papers; above them are systematic reviews and above them, summaries of the evidence on whole subject areas, such as amphibians or farmland. 'As scientists, we often produce material at the bottom two levels, which are essential, but policymakers and practitioners don't often have time to read these – they need something much simpler. Our aim is to cut review time from months or years to minutes, and to cut its cost from tens of thousands of pounds to free.'

Sutherland and his worldwide network of collaborators read over 170 journals and pull out all the papers testing particular conservation measures; they also use systematic literature searches. The papers are categorised and classified, and their key conclusions summarised in a short paragraph.

Within five years, Sutherland wants to have completed or be

THE LATEST HORIZON SCAN – issues to watch in 2015

- Chemicals that disrupt insects' sense of smell
- Making bioplastics from waste
- Replacing palm oil with algae
- Electric vehicle adoption
- Legalisation of recreational drugs
- Underground gasification of coal
- Loss of aquatic biofilms due to drug pollution
- Sustainable intensification of agriculture
- Increasing coral disease in the Indo-Pacific
- Effects on krill of declining Antarctic sea ice
- New ecosystems opened up by retreating ice
- Improving legal and ethical status of animals
- Impact investment in conservation projects
- Concerns over reproducibility in conservation science
- Growing ability of investors to sue states.

under way with the summaries of evidence on conservation in all habitats and for all major groups of organisms.

It's an ambitious goal but he estimates a third of the work is already done or being done, with a global team of nineteen working on it last year. The ultimate aim is to package all this material into a decision-support system like the one GPs use to check the best treatment for a patient's symptoms; the team have talked to commercial providers and are now seeking funding and thinking about how to proceed with a pilot version related to farmland management methods and their effects on biodiversity.

'Discussions over science and policy tend to focus on a few contentious issues, such as badgers and TB, where there are endless reviews and discussions', he comments. 'But each week thousands of decisions need to be made by those who cannot spend months or even days reviewing the evidence – and often wouldn't have access to it anyway. We intend to enable such people to still make decisions based on the best possible evidence.' The results should give people from supermarket executives and politicians to farmers and staff in national parks access to high-quality research on how their decisions are affecting wildlife and ecosystem services, and how they can improve the situation. In doing so they could radically transform the way environmental science is used.