

Sharing our Science and Evidence

Introduction

In this section we describe how Natural England shares its work with others and how we are committed to making our science and evidence as widely accessible as possible. In 2015 we were challenged by former Defra Secretary of State for Environment, Food and Rural Affairs Liz Truss to make more of our data (8,000 datasets to be precise) available and we describe what we have done to meet this challenge within this section.



MAGIC home page

Natural England and its colleagues within the Defra group have a wealth of environmental data and this is all made accessible to the public through the MAGIC website. Our article 'Map MAGIC' shows just how popular this website is!

Everyone loves a good map, but they are more than just visual tools and Natural England maps are designed with specific purposes in mind. In this section we describe how we have created SSSI Impact Risk Zones that will help local planning authorities understand the potential environmental impacts of planning proposals at a very early stage in the process and prevent delays. Also from a mapping angle we describe publication of the first England level ecosystem service maps and our updated priority habitats inventory.

Using data and mapping to create practical tools is a strong point within Natural England and we showcase two such tools within this section. The National Biodiversity Climate Change Vulnerability Assessment tool will provide practitioners to understand the relative vulnerability of different areas to assist them with their planning. Our SeaMaST tool assesses the density of seabird populations to provide evidence to support (among other things) marine spatial planning and environmental impact assessments. A purely data driven tool, the Pantheon Invertebrate database is 'the invertebrate equivalent of the national vegetation classification' and includes information of over 12,000 species.

Sharing our evidence is not just about data, maps and tools. In our article on helping conservation practitioners respond to climate change, we describe the creation of a Climate Change adaptation manual alongside the RSPB. Also from a climate change angle, we describe the Natural England led update to the biodiversity report card documenting the ecological impacts of climate change.



Open data: putting data and transparency at the heart of government

by Hannah Ross

In June 2015 Liz Truss, former Secretary of State for Environment, Food and Rural Affairs announced that Defra would make 8,000 datasets freely available under an Open Government Licence (OGL) by the end of June 2016 for commercial or non-commercial use. This would give businesses, organisations, companies and the public access to be innovative with and generate revenue from Defra's data. Natural England pledged to make 1,000 datasets open by this date.

This target was achieved early in March 2016; so Natural England pledged a further 1,000 datasets, the total number published being 2,844. The final number, for the whole Defra group, was an impressive 11,007 datasets.

When the Ordnance Survey started their exemption process in 2012 it gave organisations the ability to publish data derived from OS data under the OGL, allowing them to reuse data and generate revenue from it. Natural England embraced this service and between 2012 and June 2015 we published 85 datasets under the OGL.

What are we publishing?

Datasets we've published include marine datasets, available from the [EMODnet Seabed Habitats](#) website. We commissioned these datasets for the identification or monitoring of marine protected areas and to inform decision making on activities that can affect marine biodiversity.

Included in our total is Long Term Monitoring data showing changes in vegetation over a period of time, reflecting issues such as climate change, air pollution and land management on soils, their biodiversity and function.

Also published were 2,716 agricultural land classification (ALC) survey records in our [Access to Evidence Catalogue](#); a significant proportion of the total number of ALC records. Customers previously had to request these records from Natural England and receive them via a manual search of data. The open data project is enabling a long standing desire to automate this process so customers will be able to access the data directly, as geographic data linked to published survey report information, freeing up both time and resources. The ALC data is used extensively by developers who are tasked to use poorer quality agricultural land for development where possible.

This open data project has not just been about publishing data; it has also been about working collaboratively across the Defra group to achieve the 8,000 goal (see introduction) and share solutions for doing this, e.g. Natural England are now using the metadata tool originally created for the Environment Agency and sharing data using single data sharing platforms.



Map MAGIC

by Andrea Ryder

The **MAGIC website** provides authoritative geographic information about the natural environment from across government in an interactive map. The information covers rural, urban, coastal and marine environments across Great Britain. Natural England manages the service under the direction of a Steering Group who represent the six MAGIC partnership organisations. The interactive map includes various mapping tools that help users explore the data within the interactive map using standard web browsers so they don't need specialist geographic information software.

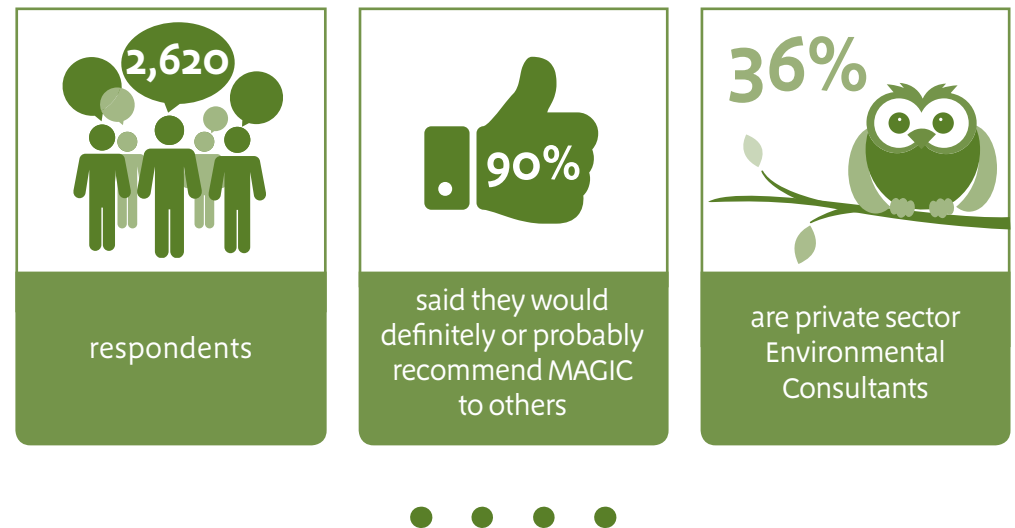
As Figure 1 shows by far the biggest user group are environmental consultants, who make up more than 36% of recorded use. The uses include searching for statutory and local designations which may affect a proposed development; assessing and planning conservation efforts at different spatial scales and geographical information on sites in a local area.

The success of MAGIC

The MAGIC website was first launched in 2002. In 2013 it had a significant makeover and it now sits in "The Cloud" along with other websites, including **Gov.UK** and our **Access to Evidence Catalogue**.

MAGIC continues to be popular and in 2015 there were 2,400 average user sessions per day. May 18th 2015 saw the largest number of users in a single day since the re-launch, with 3,876 user sessions. However, there is always room for improvement and the MAGIC team has been asking customers what they think about MAGIC and listening to what they say. It's win-win because improving the service for customers will ultimately benefit the natural environment.

Figure 1 below shows some of the key results of the survey which closed in January 2015.



Sites of Special Scientific Interest Impact Risk Zones

by Michael Knight

The Impact Risk Zones (IRZs) are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks posed by development proposals to: Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas and RAMSAR sites. They define zones around each site which reflect the particular sensitivities of the features for which it was notified and indicate the types of development proposal which could potentially have adverse impacts.

The tool helps local planning authorities and developers understand the potential impacts of planning proposals and decide whether they need to consult Natural England, or whether a pre-application discussion with us for a proposed development would be helpful.

The tool will reduce the number of unnecessary consultations with Natural England, allowing all involved to concentrate resources on higher risk developments and avoid delays in the planning process.

The Impact Risk Zones for each SSSI are shaped by the particular sensitivities of the site and evidence relating to the potential impacts from different types of development. The IRZs are updated every 2 months and Natural England specialists continue to review the evidence and advise on improvements. Recent examples of how new evidence has been gathered and used to refine the IRZs includes the national mapping of SSSI surface water catchments and local mapping of functional habitat used by SPA birds (Figures 2 and 3).

Figure 2 shows how SSSI IRZs for discharges to surface water have been shaped by the mapping of surface water catchments for water quality sensitive SSSIs.

 [CLICK MAP TO ENLARGE](#)



A total of 159 local planning authorities have downloaded the impact risk zones dataset ([download it here](#)) and early feedback has been very positive:

"This tool is going to be incredibly useful to us, I am encouraging our planning team to adopt it in our pre-validation checklist"

Yorkshire Dales National Park Authority

"...we are currently exploring how we could use [impact risk zones] to help assess and score potential development sites as part of a Sustainability Appraisal"

New Forest District Council

Figure 3: This map illustrates our understanding of the local requirements of SSSI bird populations and the sensitivity of SSSI habitats and their catchments to impacts on water quality have helped to shape the IRZs for rural residential development in this area.

Benefits to customers and to the natural environment

An analysis of consultations on proposed residential developments received by Natural England in 2014/15 showed that just over 60% (nearly 6,000) could be screened out and avoided using the impact risk zones. Most of these (75%) came from 25% of local planning authorities. We are now working to promote and improve the Impact Risk Zones in areas where we believe that this would result in the greatest reduction in unnecessary consultations.

We also believe that the Impact Risk Zones will prove useful in earlier stages of the planning process. Developers and ecologists can use the tool to identify projects that would benefit from pre-application advice via Natural England's Discretionary Advice Service. The service aims to help developers and consultants take appropriate account of environmental considerations at an early stage of proposal development, particularly relating to issues where Natural England is a statutory consultee. This will potentially save the customer time and money in the planning process, whilst also securing good outcomes for the natural environment.



What matters where: putting ecosystem services on the map

by Nick Dales

The Natural Capital Committee produced its [second report](#)¹ to the Economic Affairs Committee in March 2014. Within Section 5: A Framework for a 25 Year Plan to Maintain and Improve Natural Capital there is the following statement:

“Targeting effort in the right places requires a good understanding of where natural capital and those who benefit from it are located and needs some form of spatial framework. Such a framework would help ensure maximum benefit from investments such as agri-environment schemes, water company catchment restoration projects and proposed biodiversity offsetting”.

Natural England’s continuing development of ecosystem service/ natural capital maps demonstrates how we strive to present complex data in ways that customers can understand and apply easily.

Partly in response to this challenge and partly to meet the needs of landscape-scale partnerships, such as Nature Improvement Areas, Natural England undertook a [research project](#)² which described a new approach to mapping ecosystem services at the England scale. This approach produced maps of ecosystem services based on their underlying habitats, following an interpretation of information contained in the UK National Ecosystem Assessment (2011).

There are many tools available which can map ecosystem services or natural capital, but they all require time, sometimes money, data availability and significant expertise in Geographical Information Systems (GIS). Many of our customers do not have these resources

and so our primary goal was to produce maps at the England level, accessible to all, useful as communication tools and which would assist local practitioners in making decisions relating to services on the ground. See example map in Figure 4.

Figure 4: Mapping Ecosystem Services – Climate Regulation potential

The maps were largely successful in meeting our objectives, but proved to be of limited use for the key purpose of supporting *local* decision making. Feedback from the South Downs Nature Improvement Area helped us confirm this limitation.

To address these limitations we worked with the Centre for Ecology and Hydrology (CEH) to develop new maps of Natural Capital. The suite of 10 maps, covering different aspects of natural capital, is accessible through [Natural Capital Maps](#), where it is possible to view and download the maps as images and GIS compatible layers, as well as brief accompanying reports.



Natural England's continuing development of ecosystem service / natural capital maps demonstrates how we strive to present complex data in ways that customers can easily follow. This more simplistic and pragmatic approach, in what is an incredibly complex area, also fills a gap in the market of tools available to those interested in valuing the natural environment.



Documenting the impacts of climate change on biodiversity

by Mike Morecroft and Lydia Speakman

What impact is climate change having on the ecosystems and biodiversity of the UK? What changes will it bring in the future? The UK Climate Change Impacts Report Card for Biodiversity summarises the evidence on these topics in a way that is both authoritative and accessible

Led by Natural England, the second edition of the UK Biodiversity Climate Change Impacts **Report Card** was published by the Living With Environmental Change (LWEC) partnership in October 2015 ³. The report card is based on a series of statements that have been agreed by over 40 of the UK's leading experts on the ecological impacts of climate change and independently peer reviewed. Underpinning the report card are 18 review papers, covering a range of specific topics, which bring together the published scientific literature. The concise evidence statements in the report card are clearly linked to evidence through these review papers.

The 2015 report card includes the results of newly-published research, for example on genetic changes and how conservation sites can help species to survive when the climate starts to become less suitable for them. It also includes information from new reviews of the effects of climate change on freshwater and soil ecology.

The basic message of the report card has remained consistent: there is strong evidence that climate change is affecting UK biodiversity and impacts are expected to increase as the magnitude of climate change increases (Figure 5).

Figure 5: Some of the changes in the natural world observed recently as a result of climate change.

 [CLICK CHART TO ENLARGE](#)

One of the clearest observed changes is that many animal species are occurring further north than they have done in the past (Figure 6). This is seen across a wide range of different animal groups over decades. The only consistent explanation for this phenomenon is a rise in temperatures, allowing species to survive in these new locations. This can be good news for some species such as the Dartford warbler, which has been able to expand to the midlands from a previously very limited distribution in the south. However there is an increasing risk to northern and high altitude species, which are adapted to cold conditions. So far, there is less evidence of these species being lost due to climate change, but there are indications it is starting to happen. For example, a number of upland butterfly species, such as



the mountain ringlet, have disappeared from previously occupied locations. Where species are moving, the rate of change differs according to their mobility and other non-climatic habitat factors such as soils and management history. The fragmented nature of many natural areas in the UK makes it hard for the less mobile species to move across the landscape. For species which can move freely, warmer temperatures are facilitating their long distance spread in the UK. This includes species such as the southern emerald damselfly which add to our natural history interest, but could also include pests and pathogens, such as the oak processionary moth.

Another clear trend in biological systems is towards life cycle events, such as budburst and egg laying, happening earlier in the spring, consistent with the effects of warmer spring temperatures. This has been known for some time, but the impacts of this on the relationships between species through, for example, pollination, feeding patterns and competition, remain an issue about which much remains to be learnt.

The trends towards more extreme weather can have a big impact on biological systems. Studies have shown that when extreme events occur their effects can be profound. In particular an extreme drought can alter the nature of a biological community for decades. A classic study is the long-term monitoring of Lady Park Wood on the border between England and Wales, where drought in 1976 led to the death of many beech trees: this is still reflected in the species composition of the wood today.

The report card is focused on the UK, but it includes information about migrant species. Migration may follow the pattern of other seasonal events and take place earlier in the spring, but it also introduces a range of unique factors which climate change can influence. One of the most significant is the shorter distances some bird species now travel to over-wintering locations as sufficient food is available closer to where they breed in summer.

A long-standing dilemma in making science useful for decision makers is the level of detail required. Most 'real world' decision making requires a wide range of factors to be taken into account, including both scientific and practical considerations. There is a critically important task in synthesising a wide range of different pieces of evidence to produce an integrated assessment of a topic area. The report card format, originally pioneered by the Marine Climate Change Impacts Partnership (MCCIP)⁴, is an effective way of doing this, and it allows decision makers to choose the level of detail they require. The positive feedback we have received indicates the success of this type of approach.

Figure 6: Observed and expected range shifts of different groups of species.



Assessing and mapping vulnerability of the natural environment to climate change

by Sarah Taylor

Natural England has developed a tool to help conservation practitioners assess relative vulnerability of different areas and consider this information in their planning.

The vulnerability of the natural environment to climate change is not geographically uniform. Different species vary in their sensitivity to factors such as temperature and moisture availability, and local features such as topographic variation can also have a strong influence on how vulnerable a species or ecosystem is. Our National Biodiversity Climate Change Vulnerability Assessment (NBCCVA) tool ⁵ allows us to assess the vulnerability of areas of semi-natural land cover to climate change using a range of metrics, including sensitivity to direct climate change impacts (such as changes in temperature and precipitation), habitat fragmentation, topographic variety and habitat management and condition. This GIS-based tool carries out an assessment at a national scale using 200m grid squares. This assessment produces spatial data on climate change vulnerability and a number of its components. In addition, it can show where and how vulnerable areas of habitat can be made more resilient through habitat creation, restoration and management.



Holehaven Creek SSSI, Essex



Using the NBCCVA in Morecambe Bay

These maps show the results (at 200m grid resolution) produced by the assessment for the area around Morecambe Bay in northwest England. The first four maps show spatial variation in the four variables that contribute to the assessment of vulnerability:

- a)** intrinsic sensitivity of vegetation (Biodiversity Action Plan 'priority habitats') to projected climate change;
- b)** fragmentation of those areas of semi-natural land cover (calculated using a model that looks at the spatial pattern and proximity of priority habitats and other semi-natural land cover across each 1km square, 200m squares with higher fragmentation scores have less habitat cover surrounding them);
- c)** topographic variation (an important factor in creating stable or locally unusual microclimates that can provide refugia; and
- d)** the level of conservation management in place (for example the presence or absence of agri-environment scheme agreements), as appropriate management is likely to increase adaptive capacity.



(a)

(b)

(c)

(d)

(e)

The final map **(e)** shows the overall vulnerability score, made up of the scores in a-d combined (in this case with equal weighting). It indicates that the coastal grazing marsh and saltmarsh in the River Gilpin and River Lune Estuaries are likely to be highly vulnerable to climate change – although there are fairly contiguous stretches of vegetation and other semi-natural land cover in these areas their intrinsic sensitivity and absence of conservation management make them vulnerable. The assessment also indicates that some isolated patches of upland wetland, heathland and woodland and river habitats in the fells north of Windermere and Kendal might also have high vulnerability – here the vulnerability score is primarily the result of fragmentation combined with absence of conservation management.



How are the data being used?

Spatial data produced by the NBCCVA contributed to a range of projects and initiatives in 2015.

Data from the assessment on habitat sensitivity to climate change and habitat fragmentation contributed to development of the new Countryside Stewardship agri-environment scheme. This will help target actions that build resilience for sensitive natural systems and enhance habitat networks in line with Biodiversity 2020 targets. The data also form an important component of a joint Natural England-Defra project assessing whether current agri-environment agreements are delivering the right things in the right places to deliver climate change adaptation. This will inform spatial targeting of future agreements and monitoring of delivery.

A number of external partners have used the assessment tool. For example, the South Downs National Park has used the data and the assessment tool to contribute to the evidence base for a report they will provide to Defra, under the Climate Change Act, on the adaptation action they will take.

We believe the assessment tool, maps and data have great potential to continue to inform projects, adaptation action and partnership working in our work towards understanding how our natural environment will change and adapt in the future.



Helping conservation practitioners respond to climate change

by Andy Neale and Simon Duffield

Natural England and RSPB's guide to climate change adaptation for conservation managers had an important influence on conservation in 2015.

As the article on the biodiversity report card earlier in this section highlighted, different natural systems face a range of potential pressures and changes as a result of climate change.



Figure 7: Some of the ways that climate change can affect the natural environment.



To help ensure that conservation managers are better equipped to meet this challenge, in June 2014 Natural England published the [Climate change adaptation manual: evidence to support nature conservation in a changing climate](#)⁶.

This was developed jointly by Natural England and the RSPB, with input from the Environment Agency and the Forestry Commission.

The manual provides up-to-date, detailed and practical information to help conservation managers and others prepare for and respond to the impacts of climate change on the natural environment (Figure 7). Because impacts and approaches to adaptation will vary from place to place, information is tailored to different circumstances.

The manual draws on a range of sources of information, including published studies and experience gained from climate change impact assessments. It has also benefited from experience gained at National Nature Reserves (and similar work on RSPB reserves)^{7,8} and expert advice from staff of Natural England and partner organisations.

The manual currently includes:

- Background information, including a summary of the main impacts of climate change on the natural environment and the key concepts and principles that underpin approaches to adaptation;
- Detailed assessments of climate change impacts and potential adaptation responses for a range of habitats;
- A section on the relationship between climate change and ecosystem services.

In 2015, we held a series of workshops and other events to promote and explain the manual. It has been received enthusiastically by conservation practitioners; there have been 3,600 downloads of the full document and 25,000 downloads of individual habitat sheets. Feedback has been overwhelmingly positive. The manual is already informing the management of nature reserves, and we hope it will be used by many others managing sites, running conservation projects, and delivering Countryside Stewardship.

Climate change adaptation is a fast moving field and we intend to produce regular updates of the manual. A revised and expanded edition is currently being developed; this will include a significant new section on species. We also plan to expand the scope of the manual to include various 'non-biodiversity' issues of interest to Natural England, such as green infrastructure planning, recreation and access, the historic environment and geodiversity.



Mapping seabird sensitivity to offshore wind farms

by Alex Banks

The UK has led in offshore renewables, with 20 offshore wind farms (OWFs) now operating in English waters and more planned. Many seabirds are sensitive to marine developments, and OWFs present potential hazards. Some birds, particularly divers and seaducks, can be displaced from their habitat because they avoid OWFs, whilst aerial foraging seabirds such as gannets, gulls and terns risk death from collisions with turbine blades.

Sensitivity maps

Density surface model predictions were made for each species across English waters using relationships between seabird observations and predictor variables. These were combined with sensitivity scores for either collision or displacement effects to produce sensitivity maps.

Figures 8 and 9 show predicted density and the confidence in model predictions for breeding guillemots. Areas of highest marine density correspond well to locations of breeding colonies, with notable densities also predicted in the North Sea at Dogger Bank. We have good confidence in the model's predictions in most areas, except the far south west where survey effort was lowest. Such maps can be produced within SeaMaST for all seabird species, for breeding and non-breeding seasons and for flying and sitting behaviours. Sensitivity maps suggest that nearshore areas may be more sensitive to OWF effects than those further offshore, though confidence in model predictions is generally greater closer to shore owing to increased survey effort.

However, there are some large sea areas that appear comparatively less sensitive to such effects and where developments may have lesser impacts on seabirds.

SeaMaST ⁹ is freely available as a Geographic Information (GI) package and has already been downloaded more than 70 times in the past year.



SeaMaST can be used for marine spatial planning, Environmental Impact Assessments and identification of evidence gaps for seabirds. We can now describe key areas of seabird distribution and our confidence in this knowledge. SeaMaST thus represents a significant new tool for all marine stakeholders interested in seabirds.

These pioneering techniques are developing and form the basis of sensitivity maps being developed by partners for other sectors, such as fishing. We aim to keep the tool updated with new distribution data, to investigate spatial sensitivity to emerging marine development areas like wave and tidal technology, and to integrate with other mapping projects, so that SeaMaST helps stakeholders and staff make decisions that are based on robust evidence.



Natural England's Priority Habitats Inventory

by Andy Cooke

Natural England's Priority Habitats Inventory provides reliable and accessible data on the location and extent of the habitats identified as priorities in the Biodiversity 2020 Strategy, such as lowland meadows, upland heathland and coastal saltmarsh.

Habitat data supports different areas of our work, for example reporting on progress against biodiversity targets, developing spatial targeting for Countryside Stewardship and advising on sustainable development. By sharing our habitat data through **MAGIC** and as a data download, it is also available to the external partners who help us deliver our environmental objectives.



Mapping of Priority Habitats on the North Cornwall Coast showing lowland heath (light purple), maritime cliff and slope (dark blue) and broadleaved woodland (green).

Over the last four years, the Evidence Team has led a project to develop our habitat data from a series of more than 20 BAP habitat inventories into a single spatial layer, the Priority Habitat Inventory. This has been vital to some of Natural England's other work such as our **National Biodiversity Climate Change Vulnerability Assessment**.

Based on user feedback the Inventory is being widely used by consultants, planners and members of the public looking to understand the nature of environmental features in specific places.



The view looking north-east from Porthtowan

We would like to develop the Inventory further, both in terms of coverage and accuracy.

Natural England has other habitat data which needs to be put into a format to be evaluated and processed. As well as Natural England data, there are also opportunities to work with partners to source data held elsewhere.

We are keen to reassess whether habitats not yet included in the Inventory could be integrated, notably freshwater habitats and to explore opportunities to improve how woodlands are presented.



There are also great opportunities to exploit data from earth observation. Development work has demonstrated that satellite data provides effective mapping at a variety of scales. The challenge is prioritising where these new techniques can be applied to add the greatest value to our existing habitat data. Over the last four years, the Evidence Team has led a project to develop our habitat data from a series of more than 20 BAP habitat inventories into a single spatial layer, the Priority Habitat Inventory. This has been vital to some of Natural England's other work such as our [National Biodiversity Climate Change Vulnerability Assessment](#).

Based on user feedback the Inventory is being widely used by consultants, planners and members of the public looking to understand the nature of environmental features in specific places. We would like to develop the Inventory further, both in terms of coverage and accuracy. Natural England has other habitat data which needs to be put into a format to be evaluated and processed. As well as Natural England data, there are also opportunities to work with partners to source data held elsewhere. We are keen to reassess whether habitats not yet included in the Inventory could be integrated, notably freshwater habitats and to explore opportunities to improve how woodlands are presented.



The Pantheon invertebrate database

by Jon Webb

Pantheon is a database tool developed by Natural England in partnership with the Centre for Ecology and Hydrology to analyse samples of invertebrate species, focusing on species primarily found in England.

To date over 12,000 species have been typed, this being about a quarter of the total macro-invertebrate fauna (estimated at 40,000). The database remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, true bugs, moths, bees and many more.

Users import their sample species lists of invertebrates from sites into Pantheon, which then analyses those species, attaching trait values, scores and assemblage codings against them. The Pantheon analysis then displays the ecological requirements of species from the samples as well as providing numerical scores which can be used to determine sample quality.

This information can be used to determine the quality of a site and the ecological characteristics of the species found there, and assist in management decisions by revealing the key ecological resources. Pantheon will also establish a shared terminology for describing invertebrate interest which will greatly augment invertebrate conservation.

Pantheon could be seen as the invertebrate equivalent of the NVC (National Vegetation Classification) where a shared language has helped to describe, analyse and conserve vegetation communities.





Green hairstreak butterfly

© Natural England/Allan Drewitt

Pantheon consists of a number of analytical modules:

- A one-to-many relationship to assign invertebrates to resources (e.g. dung) and habitats (e.g. saltmarsh)
- A compilation of a number of already published indicator species and indices
- Ecological guilds, describing both the larval and adult feeding type
- An Index of over 11,000 described species
- Up-to-date conservation status for each species
- Analysis of associated species (e.g. food plants and prey items).

Benefits

The production of Pantheon will have immense benefits for invertebrate nature conservation in the UK. Users from all communities can test samples to get an indication of site quality and on-site management issues. Users will include those involved in citizen science projects, people interested in knowing what invertebrates are present on their local patch, and Natural England advisers and other Government and national NGO bodies dealing with nationally important sites. Simply put, Pantheon will revolutionise invertebrate conservation by allowing analyses of species lists to be done in seconds rather than days of searching through dispersed sources of information.

Examples of how Pantheon can be used are shown in Table 1.



Table 1: Examples of how Pantheon could be used.

1

A student is undertaking a study on the best way to manage a woodland site. He is given a list of species from a series of pitfall traps but he knows nothing about invertebrates. He cuts and pastes the list into Pantheon and this produces a taxonomic listing of all the species and the link between each species and types of microhabitat within the woodland. This helps him to identify key features of the site that need to be retained or enhanced. The student then decides to focus on the ground beetles. He wants to study know how many of these are predatory; Pantheon can list these.

2

Natural England staff are undertaking work to further the Detailed Notification Review on rivers in the Northeast. A current SSSI has been notified for its river shingle assemblages. Further survey work in the area has been undertaken to see whether the boundary merits an enlargement. Pantheon analyses these results identifying species associated with Expose Riverine Sediments and its two sub-categories (Riparian Shingle and Riparian Sand) and uses a numerical scoring system to determine if the site boundary should be increased based on the invertebrate samples.

3

Under the auspices of the Water Framework Directive, a series of rivers are being ecologically restored. Although the water chemistry is measured in a number of different ways, biological scoring is not. Pantheon is used to assign scores to riparian species so these can be sampled and 'ecological restoration' can be considered based on the sample scores.

4

Natural England and research partners are working on a project to determine whether the presence and abundance of different species groups in woodlands is affected by the size, age and other characteristics of the woodland patch, how far it is from other woodland areas, and the surrounding landscape. Pantheon can tell them which species are typical of woodland canopies, dead wood and shaded woodland ground layers and thus help them with the analysis.

5

Defra wants to know whether there are any links between declining species and habitat quality and type. A list of the declining invertebrates is analysed using Pantheon, determining that a large proportion of the declining species are associated with either flower-rich habitats or permanent wet mires.



Managing for people, places and wildlife: Ecosystem Transfer Toolkit

by Ruth Waters and Jane Lusardi

The **Ecosystem Services Transfer Toolkit** has been developed to provide peer-reviewed information on land management interventions, their impacts on ecosystem services, and their applicability to other places.

Natural England, the University of York and the Directorate of the Natural Environment Research Council BESS Programme (Biodiversity and Ecosystem Service Sustainability) worked together on a literature review of the effect of land management actions on the provision of ecosystem services. The researchers worked closely with staff within Natural England to ensure that the management interventions meant something to staff and could be widely used.

The Ecosystem Services Transfer Toolkit ¹⁰, in the form of an Excel spreadsheet, can be searched and queried to find evidence of the effects of specific land management actions on ecosystem services provided by upland, freshwater, urban, lowland agriculture, coastal and marine habitats. It also assesses how transferable the effect of a land management action on ecosystem services may be, if done in a different place. The toolkit indicates the magnitude of the effect on an ecosystem service and the strength of the supporting evidence. Where available, abstracts from peer-reviewed papers are included in the toolkit.



© Natural England/Tricia Rice

Early stages of gully blocking and cotton grass planting management intervention on the National Trust's Kinder Scout as part of an extensive National Trust, United Utilities and Natural England bare peat restoration project to deliver biodiversity and water quality improvements and enhance ecosystem service delivery (2012)



A total of 1,203 separate papers or other documents were entered into the database, to create statements of the effects of management interventions on ecosystem services. The database allows the display of even small amounts of evidence for relatively small management interventions, such as ditch cutting or turf removal. This enables the wider implications of these management interventions, outside the immediate biodiversity issues, to be assessed. It presents the best available information for decision making but also highlights significant gaps in the literature.

To make the information more easily accessible, we developed evidence summary sheets. Twenty three summary sheets were produced for management interventions in marine, coastal and terrestrial habitats. The summary booklets provide a more readily accessible visual representation of the data covering the main evidence base. This inevitably meant that only the larger management interventions were addressed as these were the ones that had the greatest number of evidence sources. They provide an overview of the **quantity** of evidence, the **quality** of evidence and the **direction** of the effect. A graphic is provided on the front page of each datasheet which demonstrates this. Text boxes on each provisioning, cultural and regulating service then supply further detail on the evidence available. Finally, a full reference list for the evidence cited is provided.

The Toolkit and summary sheets have been shared widely across the Defra network; promoted through the Ecosystems Knowledge Network, (a practitioners' network across the UK with over 1,725 members from academics through to nature reserve managers) and the BESS network, with over 150 academic and practitioner members across the UK.

