

Science & Evidence in Natural England

An update from the Chief Scientist Directorate (CSD) - May 2019



Hen harrier disappearances provide compelling evidence of widespread killing on grouse moors

Natural England's Hen Harrier Recovery Project commenced in 2002. [A Future for the Hen Harrier in England?](#) documented the project's first seven years, providing evidence illegal persecution continued to thwart the efforts of the conservation community. Poor over-winter survival was assumed to be preventing recovery, but confirming the fates of radio-tracked birds proved problematic. Short battery life and harrier dispersal distances exceeding the range of the radio-tags' limited signal, prevented the cause of multiple disappearances being confirmed.

The advent of solar-powered satellite tags in 2007 removed these constraints. If birds were being killed, even if carcasses were disposed of, patterns of mortality could not be hidden. Such analyses, however, would require a much greater sample size, dictating an extended period of study. The long-anticipated analyses of Natural England's hen harrier satellite tracking data have now been published in [Nature](#). Stephen Murphy, who led the data collection, and Richard Saunders, Senior Ornithologist, are co-authors of the paper which confirms that 72% of harriers were either confirmed or considered to have been illegally killed. Hen harriers were ten times more likely to die, or disappear, in areas dominated by grouse moors. The highest proportion of terminal fixes came from the North York Moors and the Peak District, suggesting that the place harriers are most likely to be illegally killed or suspected of being illegally killed are National Parks with high proportions of grouse moors.

Restoring heathland paths and tracks with its wildlife in mind

Isabel Alonso (Senior Heathland specialist in CSD) has just published an article in the latest issue of Conservation Land Management (CLM) on heathland paths and tracks. The idea was developed as a result of many requests for advice over the years on the type of materials that could (or could not) be used when restoring them. Paths and tracks on lowland heathlands are very important for germinating plants, basking and nesting reptiles and invertebrates, such as the rare sand lizard or mason wasps. Site managers could inadvertently replace sandy loose substrates, which are rare but important in many heaths, with hardened surfaces, which may facilitate public access but would destroy nesting sites, sometimes entombing developing larvae or eggs. The article highlights the importance of the various types of paths and tracks and the most suitable materials to restore them when necessary.



Natural England's Marine Conference

For the 4th year running marine staff gathered in Nottingham to share marine work with colleagues. Various projects were presented and workshops arranged to discuss future marine monitoring scenarios, improving marine communication and marine protected area management. Marion Spain and her Senior Leadership Team joined for the keynote presentation 'Our marine journey – new directions for marine'. The Area Team presentations clearly demonstrated the huge amount of work being undertaken on a wide range of partnership projects. Presentations on SPA Network and bird monitoring, marine Conservation Advice and a review of the highly successful EA/Natural England joint marine monitoring programme closed the 1st day. The 2nd day began with an update on the MCZ project with a final round of designations expected this summer. Dr Ashleigh Tinlin from Newcastle University spoke about a Marine Strategy Framework Directive partnership project off the Northumberland Coast trialling a variety of innovative monitoring methods. A marine reporting update reviewed the first round of 16 SAC condition assessments, Article 17 reporting and the Designated Site System. NE's marine staff continue to lead on a wide range of projects and the marine conference is a great way to showcase this.



Getting to grips with priority freshwater habitats

For some years now Natural England freshwater habitat specialists have been working with partners and stakeholders to modernise the approach to priority freshwater habitats in England. The rationale is to emphasise the importance of natural habitat function in providing the conditions that characteristic assemblages need. This allows action to protect and restore priority habitats to work in synergy with our work on freshwater SSSIs and wider efforts under the Water Framework Directive, as explained in the [freshwater and wetland habitat narrative](#). We have remapped priority [river](#) and [lake](#) habitat to identify the most naturally functioning remaining examples of our rivers and lakes, based on available national datasets. We have also generated [proposals](#) for coherent assessment of the river and lake habitat resource based on priority habitat objectives for improved natural habitat function. The maps are being built into planning and permitting processes but require considerable refinement to plug knowledge gaps, particularly in the huge resource of small streams and lakes which have been neglected by monitoring to date. To address this, and help embed the revised approach to priority river and lake habitats in local partnerships, we have been working with the Freshwater Biological Association on a web-page that allows stakeholders to contribute data on habitat naturalness that can be used in future refinements of the maps. At the same time, the page also provides explanatory material, a repository of useful documents and links to a wide range of partner web-sites and initiatives to help join up different citizen science and habitat management projects. [The page](#) is now live for testing, and we are currently collating feedback from a wide range of organisations and individuals prior to a formal launch later in the spring. Click on the link and have a look for yourself – [all feedback welcome](#).

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How well is the Legume and Herb-rich Ley option implemented under Environmental Stewardship? DEFRA M&E Report - LM0468

The recent 25 year Environmental Plan, Our Green Future, identifies the reintroduction of grass leys into arable rotations as a key tool in achieving good soil management. Natural England has been promoting the idea of biodiverse, multipurpose leys since the introduction of several Legume and Herb-rich Ley options in 2013. These aim to address factors in soil degradation such as erosion, compaction and the decline in soil organic matter while providing food resources for invertebrates and birds as well as quality forage for livestock.

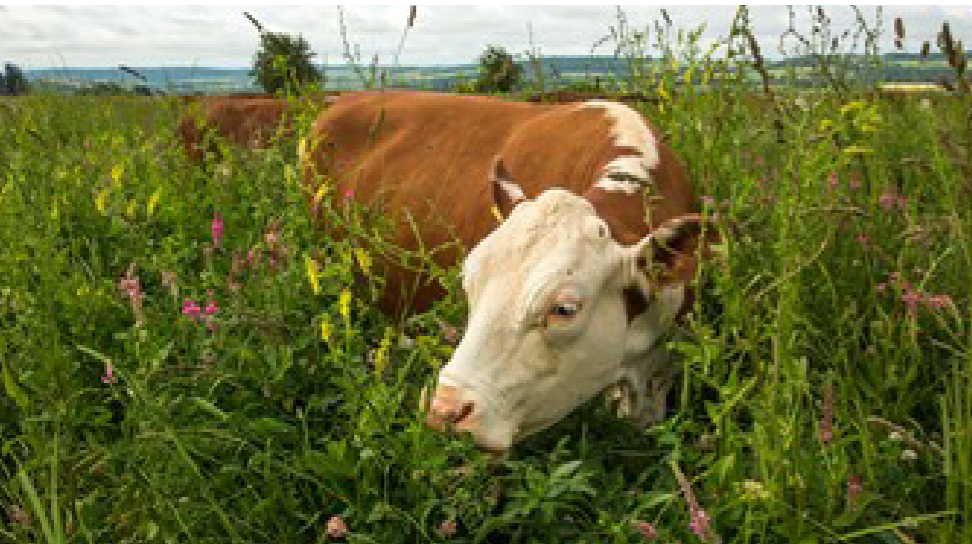
The key objectives of this study were to: understand how agreement holders have implemented the options; assess the quality of establishment against option objectives; establish which factors contribute to sward quality; and, assess the contribution of the option to soil quality.

Results showed that overall, agreement holders were positive about the option and nearly all would include it in a future agreement. However, most of the farmers in the survey chose the option because it fit their current practice, in other words, they already used leys in rotation. This demonstrates that there may need for additional incentives to encourage uptake by arable farmers who may not have the equipment, experience and end-use for the forage produced.

Another key finding of the study is that only 10% of the parcels surveyed were meeting all of the requirements of the option. Species composition is significantly influenced by soil fertility, grazing or cutting management, seed mix composition, establishment method and time. The persistence of sown species was a strongly linked to the proportion at which species were sown, however, minimum specifications for seed mix composition is currently not required under the option. Farmers also expressed an interest in better establishment and management guidance.

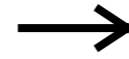
This study indicated that farmers are willing to implement measures to enhance soil quality in addition to providing benefits to wider biodiversity. Additional efforts are required to encourage change in cropping practices among farmers not currently utilising leys in their arable rotation, particularly those without livestock. Further agronomic research is required to improve outcomes when sowing and managing multi-species mixtures.

The DEFRA M&E Report - LM0468 can be accessed [here](#).



From Space 2 Eye Lens

The poster to the right shows a State of the Bog and Wetness spatial tool which is being developed by our Evidence Earth Observation Service (EEOS) to help inform the Uplands Programme as part of the Protected Site Reforms Monitoring Project working in partnership with the Cheshire to Lancashire Area team. This tool could be used alongside other spatial tools like the Moorland Change Map. For more information contact Rob Keane at [Evidence Earth Observation Service](#).



Winston Churchill Memorial Trust Fellowships

Last year, Senior Marine Mammal Specialist Rebecca Walker received a [Winston Churchill Memorial Trust Fellowship](#) to travel to South Africa, Canada and the USA to research commercial and recreational wildlife watching regulations, codes of conduct and education, aimed at protecting marine mammals. Her report on [Evaluating marine mammal watching legislation, regulations and codes of conduct](#) has now been published. For more information on Rebecca's travel and findings, check out her [blog](#).



Humpback Whale © Rebecca Walker

While Rebecca is now busy taking her recommendations to Government and into ongoing cetacean Conservation Strategies aiming to improve protection of marine mammals from disturbance in UK waters, our Senior Mammal Specialist Kat Walsh has just received a [2019 Winston Churchill Fellowship](#). Kat will be working on land mammals, namely lynx and wildcats and will travel to Germany and Switzerland to assess approaches to reintroduction for these two species. Her findings will inform the production of practical reintroduction guidelines for the species tailored to the UK.



Wildcat © Peter Cairns



Earth Observation of the Uplands

Rob Keane (rob.keane@naturalengland.org.uk)



From Space to Eye Lens is a partnership between Natural England, Manchester Metropolitan University (MMU) and United Utilities set up to develop Earth Observation spatial tools for mapping habitat condition and monitoring change over time at the landscape scale using **Sentinel II Satellites** (Right), across Protected Sites.

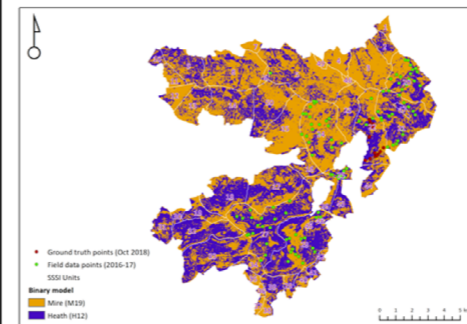


On the **Bowland Fells** we have used a Sentinel II derived vegetation index (NDVI), trained using plant community data to classify and map blanket bog habitats, **mire and heath**. The binary habitat model **cross validated at 74%** and when **ground truthed** across one unit gave **76%** accuracy, showing encouraging signs for operational use (left).

The **Training Data** was collected using an adapted Common Standards Monitoring (CSM) survey method using 2x2m & 10x10m plots (below).

Innovative approaches to collecting training data have been applied across Bowland for testing:

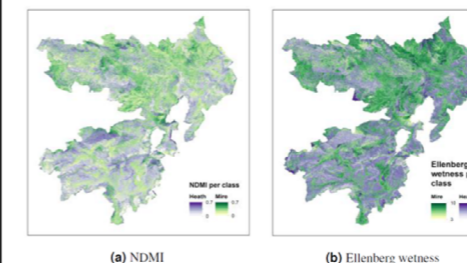
- Habitat and condition and
- Natural Capital Asset mapping



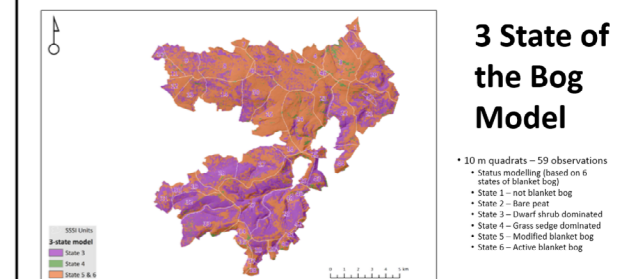
Bowland Habitat Mapping

Ground Truthing Results & Re-modelling

In developing a **Bog Wetness Index**, two different approaches were used a) Sentinel Satellite derived Moisture Index (NDMI) and b) Ellenberg Wetness; one measuring direct wetness, one a predictor of wetness, for mapping Blanket Bog Condition (below).



Bowland Wetness Index Mapping



3 State of the Bog Model

- 10 m quadrats – 59 observations
- Status modelling based on 6 states of blanket bog
- State 1 – not blanket bog
- State 2 – Rare peat
- State 3 – Dwarf shrub dominated
- State 4 – Grass sedge dominated
- State 5 – Modified blanket bog
- State 6 – Active blanket bog

We have mapped at the next level down to the **State of the Bog** using the six states of the Moorland Toolkit to further understanding of condition and map with Wetness for informing the **Upland Long-term Management Plans**. A 3 state model **cross validated at 69%** accuracy again showing encouraging results (above right).

Summary: These habitat condition models combined could be used for monitoring **Upland Blanket Bog restoration** & mapping **Natural Capital Assets** for targeting re-wetting to improve both condition and the ability to hold more water in the uplands, acting as an Ecosystem Service slowing the flow in big storm events.

Tim Hill, Chief Scientist, 8 May 2019



The Chief Scientist Directorate in Natural England consists of our national specialists and evidence staff. For comments or queries, please contact us at CSD.Communications@naturalengland.org.uk.



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