Environment and Rural Affairs Monitoring & Modelling Programme

ERAMMP Year 1 Report 14: Responsive Monitoring Part 2 - Development of Reduced Habitat Mapping Methods

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Version History

Version	Updated By	Date	Changes
0.1	PMO	30/4/19	Initial draft.
0.11	PMO	8/5/19	Mainly formatting edits – draft for SG
0.12-0.13	PMO	19/9/19	Formatting edits
0.14	PMO	27/9/19	Approved for publication
1.0	PMO	30/9/2019	As published

Contents

Abbreviations and some of the technical terms used in this report are expanded in the project glossary: https://erammp.wales/en/glossary (English) and https://erammp.cymru/geirfa (Welsh)

1 Background

A repeat of the field-survey of GMEP baseline 1km squares is scheduled to start in 2020.

In order to meet the requirements of a reduced budget an 80% reduction in survey effort is required. Field mapping of habitat areas, linear and point features will be cut or drastically curtailed in order to meet this requirement. This will effectively sever the time-series of measurements available from the Countryside Surveys (CS) and through to the end of the GMEP baseline. If reporting is required in the future that maintains a connection with the past time-series then new methods have to be developed that ensure that the major reduction in field survey effort and methodology either does not impact reported quantities or that the unique effect of an abrupt change in methods can be estimated and isolated from real change. Thus, innovative new approaches are required focussing on a synthesis of limited ground-truthing with Earth Observation (EO) products.

Note that this development work is entirely supported by aligned funding from the NERC UKSCAPE National Capability programme because the exploration of new methods for synthesis of EO plus field survey is also needed to compensate for the reduction of mapping activity in the planned 5-year rolling repeat of Countryside Survey squares across Great Britain.

2 Approach

CEH statistician Dr Steve Freeman has created multinomial models of the matrices that represent the overlap between Land Cover Map (LCM) derived from EO data (2000, 2007 and 2015) and corresponding field surveys (GMEP and CS). These models provide an estimate of the probability of a LCM polygon containing a field surveyed sample plot belonging to any one broad habitat which is needed to accurately ground-truth EO data.

The initial models are complete but the level of disagreement between EO and field survey is sometimes substantial, which reflects the classification error in each mapping method. The next stage is to introduce additional information into each model that explains the variation in both the EO classification accuracy (spectral ambiguity and its systematic variation in terms of polygon size and geographic location) and field survey accuracy (% concordance between CS surveyor and QA surveyor by broad habitat). Once these predictor variables are introduced into the models we will be able to determine how new joint estimates of habitat extent compare with full mapping approaches as part of the traditional mapping approach within the field survey and the Land Cover map alone.

The logic behind this approach is that each independent mapping method validates the other. If LCM and CS generally agree then we can be more certain of the true habitat type whereas if they tend to disagree there is more uncertainty. By bringing in explanatory variables that help understand how these levels of agreement, or disagreement, vary in space we can also make the joint habitat assignment more geographically sensitive. The method will guard against declaring change over time when none has occurred. Because the approach is based on much more limited mapping effort within each GMEP square much less detail will be recorded within each square going forward although this will significantly reduce the cost of the field survey.

3 Benefits and Limitations of new approach

3.1 Benefits

One positive benefit of the new approach is that the results for habitat extent and change will be more repeatable due to reduction in unquantified surveyor impact but because fewer points are surveyed in each square uncertainty will inevitably increase.

Moving to a model-based approach, as already implemented in the ECOMAPS platform, would also enable flexible interpolation of the modelled relationships between attributes and habitat outside of the 1km square sample and across regions of varying size. The caveat, as ever, is that even if such models can be produced they may have high uncertainty. The likely outcome is that models will work well for some variables and not so well for others.

3.2 Limitations

Because of the need to connect future survey data with the past, the synthesis of EO and field survey is initially required for past surveys. For habitat extent we are focussing on the census satellite Land Cover Maps from 1990, 2000, 2007 and 2016. Exploring the need to connect future change in linear features with the past has required scoping the availability of LiDAR datasets. Because we know that EO and LiDAR do not record many structural attributes nor many priority habitats we can say with certainty that the time-series that can be reconstructed based on the best modelled synthesis of EO and point-based survey will not be able to report at the level of detail available up until GMEP 2016.

Early conclusions from a review of past LiDAR coverage has also indicated that coverage in Wales is very patchy and does not reproduce the coverage or detail available from field survey. Going forward, a new LiDAR campaign is planned for Wales. Once details are known then it will be possible to estimate the extent to which the new LiDAR data can reproduce the detail recorded in the field from the initial start-up year. However, it is extremely unlikely that any new product will be able to discriminate useful attributes such as plant species composition, presence of fences, streams and ditches beneath hedges.

With respect to other woody features, it may be difficult to estimate extent for small woodlands in the new approach but ongoing work will substantiate this. There will also be a loss of tree distribution estimations which has previously been used for tree disease work and there will be a loss of species compositional changes which particularly relate to priority habitat classification (e.g. wet woodland, upland oak, upland ash, Lowland mixed deciduous, Lowland beech, wood pasture). Finally, there will be a loss of management information.

3.3 Response to manage/reduce limitations

The limitations with respect to a reduced capacity to report on the change in extent, connectivity and condition of woodlands and linear features have resulted in the re-instatement of mapping and extent of small woodlands and linear features within the ERAMMP field survey (see Woodland Monitoring Review) due to their importance in the Wales landscape. Mapping of other habitats will move across to the new EO approach ground-truthed with field data.

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