North Wyke Farm Platform

Case study no. 24

Visualization of the spatial distribution of pasture species

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Knowledge of the botanical composition and how it changes over time is fundamental for understanding the contribution of the different species to NWFP system productivity. This case study presents visualization results for plant species data collected in the baseline period (October 2013). Post-baseline data have also been collected in July 2016, with the eventual aim of relating the two surveys together, along with any subsequent post-baseline collections.

For the 2013 survey, botanical assessments were made using a mixture of 25m and 50m sampling grids, with GPS to locate the sampling points. The botanical composition was assessed in 0.25m^2 quadrats at each of the sampling locations and species scored according to the Domin Scale.

The National Vegetation Classification: Users' Handbook (Rodwell, 2006) describes the Domin Scale in the following manner: "For every species recorded in the sample, an estimate should be made of its quantitative contribution to the vegetation. Cover is a measure of the vertical projection on to the ground of the extent of the living parts of a species." Cover is defined as follows:

Cover (%)	Domin score
91-100	10
76-90	9
51-75	8
34-50	7
26-33	6
11-25	5
4-10	4
<4 (many individuals)	3
<4 (several individuals)	2
<4 (few individuals)	1

The Handbook explains that "Even when vegetation does not appear to be considerably layered, the sum of all the Domin values for a species can be greater than 100% cover because of structural overlap of the plants."

For the baseline survey, the dominant species across all NWFP pastures were *Lolium perenne* (perennial ryegrass) and *Agrostis stolonifera* (creeping bent grass). Other species that were present in at least 50% of the quadrats included: *Holcus lanatus* (Yorkshire fog grass), *Alopecurus geniculatus* (meadow foxtail), *Ranunculus repens* (creeping buttercup), *Rumex obtusifolius* (broadleaved dock) and *Taraxacum officinale* (dandelion).

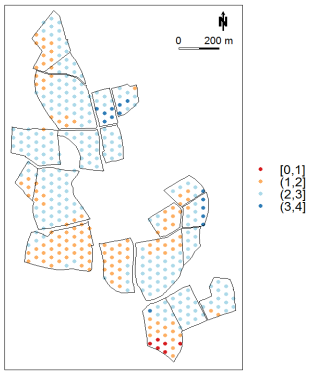
As part of this project's objectives, ways in which the species data could be spatially-visualized were also investigated. Here, we suggest how to visualize species richness together with species diversity. Species diversity is a function of the number of species present (i.e. species richness) and the evenness of how the individuals are spread (Hurlbert 1971). In Figs. (a-b), we view species richness as our main (or 'average') output and species diversity (via Shannon's index) as its 'variance'. To aid these visualizations we have smoothed (kriged) both indices to a 15m sampling grid.

These visualizations can be brought together via a single 'sketchy' map - combining both species metrics. Species richness levels remain the same for maps in Figs. (a) and (c) whereas high levels of species diversity coloured dark green in Fig. (b) correspond to areas of high 'sketchiness' in Fig. (c). Thus plant species are both rich and diverse, in for example, the Longlands catchments (14 and 15).

To achieve these visualizations, the R caricRture package was used (https://github.com/chrisbrunsdon/caricRture). For further information, see Brunsdon (2016); Harris et al. (2016).

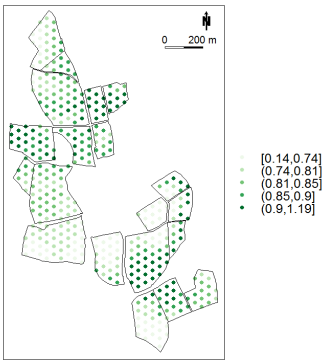
(a)

Predicted species richness



(b)

Predicted species diversity



(c)

References

Brunsdon (2016). Representing Uncertain Geographical Information with Algorithmic Map Caricatures. *Geophysical Research Abstracts Vol 18 EGU2016-2609*, EGU General Assembly 2016.

Harris P, Brunsdon C, Comber A, Sint H, Orr R, Lee M, Murray P (2016) Modelling, interpreting and visualizing uncertainties for the North Wyke Farm Platform baseline field surveys. Spatial Accuracy 2016, Montpellier, France; ISBN: 978-2-9105-4510-5

Hurlbert SH (1971). The Nonconcept of Species Diversity. *Ecology* 52(4), 577-586.