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The potential uses of data from the National Plant Monitoring Scheme: A scoping report

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Developing a framework for the long term

It is currently envisaged that the key indicators arising from NPMS data will be species and habitat trends; see *Scoping analyses for the National Plant Monitoring Scheme* (Pescott 2015) for a short overview of the analytical challenges involved in the production of these trends. See also Pescott *et al.* (2015) for historical, methodological and philosophical discussion of the background to the scheme. The current document gives an overview of a range of other summary metrics that could ultimately be produced from NPMS data, reviews the applications to which these metrics could be put, and, finally, summarises the spatial coverage of the current (November 2015) NPMS dataset (allocated monads and those surveyed to-date) with respect to a range of environmental variables. This final step is intended to highlight gaps in the current coverage of spatial gradients, but also to demonstrate that, in its first year (2015), the NPMS is already sampling these gradients extensively. The current country-level habitat coverage of NPMS plots is also presented in an appendix.

Plot-based metrics

In addition to temporal abundance (i.e. cover) and/or plot or monad frequency trends in positive and negative indicator species, and similar trends aggregated across such species, the NPMS data should allow a variety of plot-based metrics to be derived. For example, metrics that are often used to provide insight into ecological change at the plant community level include:

- Best match of the vegetation to the types of the National Vegetation Classification (NVC).
- Grass:forb ratio, vegetation height, ericoid shrub cover, woody plant cover, species richness and evenness (i.e. diversity metrics)[1].
- Mean Grime Competitor, Stress-tolerator and Ruderal ('CSR') scores, together with cover-weighted versions of these scores.
- Mean Ellenberg fertility, substrate pH, light and wetness scores, together with cover-weighted adaptations of these scores. These could also be derived for 'idealised' NVC communities if comparisons with such 'targets' were deemed appropriate. (Although note that the use of the NVC in this way implies the acceptance of a normative set of communities towards which conservation should aim, a view which is by no means universally accepted amongst ecologists; Rackham 2006.)

Other, more habitat- or function-specific summaries can also be envisaged, for example:

- Cover and diversity of preferred pollinator food plants (classifying species using the CEH Database of Plant-Pollinator interactions).
- Cover and diversity of non-native species, or of invasive non-natives.
- Cover and diversity of important farmland bird seed species.

[1] Note that so-called 'diversity' metrics also provide information about the relative dominance of species if they include information on evenness.

- Other subsets of species with known or assumed value for ecosystem service provision or 'natural capital' (e.g. see Oliver *et al.* 2015).

Note that any of the above scores that are normally applied to complete community data would need to be evaluated for explanatory power when applied to partial community data as collected by the NPMS Indicator and Wildflower levels. One way to investigate the potential loss of power from such data reductions would be to analyse existing datasets, such as the NPMS Inventory level, Countryside Survey (CS) or other quadrat datasets focusing on particular habitats (e.g. the 'Bunce' woodland plots), where the analysis of community data, reduced according to NPMS species lists, can be compared to full data. This would require an assessment of the equivalence of habitat definitions between schemes; for example, the equivalence of CS broad habitats with NPMS broad habitats, to ensure that the NPMS Indicator and Wildflower lists could be usefully applied to the comparative dataset, otherwise, random subsets of species (or subsets weighted to have a similar family composition) could be used. This habitat equivalence assessment is currently being undertaken for the CS by CEH in the context of using NPMS data as a 'counter-factual' dataset for the analysis of survey data collected on Higher Level Stewardship (HLS) farmland. The idea here being that by establishing equivalence between CS and NPMS data, temporal trends (in species richness and other metrics such as Ellenberg scores) can be created between 2007 (CS) and 2015/16 (NPMS) plots, which can then be compared to those trends exhibited on HLS land, demonstrating the impact of HLS management (also see the next section 'Comparisons between NPMS and other surveys').

It should be noted that plot-based metrics, such as species evenness and cover-weighted Ellenberg and Grime CSR scores, are only one way of inspecting plot data for changes in the relative dominance of species or functional/indicator groups; unweighted versions of these metrics (i.e. simple means of the scores of the species present) can also be used. The use of unweighted versions allows for the verification of trends resulting from cover-weighted methods, whilst removing noise and short-term variation that may be of less interest (e.g. inter- or intra-annual trends in cover associated with the weather but without longer-term directionality). Unweighted Ellenberg and Grime score metrics may also be of use due to the fact that controls on some species may be more related to presence/absence rather than high cover values (Wilson 2012), e.g. small-scale disturbance could be important for the persistence of some species (and so for the richness of a habitat), even though these species may never attain high cover at the 5 x 5 m scale.

Comparisons between the NPMS and other surveys

As noted above, one central use of NPMS data is as a comparator for other datasets (again, either for species richness or, potentially, for any of the other plot-based metrics discussed above). Temporal comparisons (e.g. looking at change in the countryside since the last CS campaign) can be facilitated by sampling the full set of CS 1 x 1 km squares using the NPMS monad weightings, in order to ensure that the CS data represent a set of squares with similar habitat composition. The fact that CS utilises a nested plot structure means that 5 x 5 m and 10 x 10 m plot data can be directly compared with the NPMS. Linear plots are not directly comparable, but it is possible that rarefaction techniques able to adjust for species-area relationships, or simply using plot area as a covariate in analyses, could be used to overcome plot size differences.

Spatial comparisons, e.g. is the set of NPMS plots in arable land of different composition to those in agricultural stewardship schemes, are also possible, assuming that enough of the NPMS plots are outside of the area of interest (e.g. plots inside and outside of land under HLS) to enable a comparison to made (the caveats regarding differences in plot size also apply here). Note, however, that the initial weighting schema applied to the selection of NPMS monads gave zero weight to arable land, this means that arable land in NPMS squares is likely to associated with rare habitats on average, which may be important; these types of bias, built in to the design of the NPMS to increase its focus on rarer semi-natural habitats and to increase volunteer satisfaction and retention, will be important to consider in any such comparative project.

Comparisons with data collected at different scales, or with those using different assessment methodologies, are also possible. For example, trends in frequency at larger scales (e.g. 10 x 10 km or 2 x 2 km) derived from opportunistic or 'Atlas' data could be profitably compared to NPMS trends. Either for the obvious purpose of providing early warnings of declines (or increases), or for investigating the scale-dependence of ecological patterns and processes (e.g. invasions are often associated with high species richness at larger scales, but not at smaller scales; Fridley *et al.* 2007).

Habitat-condition monitoring, e.g. the 'Common Standards Monitoring' system for monitoring SSSIs currently in use in Great Britain, also provides an opportunity for investigating whether time trends in CSM assessments can be clearly mapped on to any of the plot-scale metrics discussed above. However, given the fact that NPMS was not designed to intensively sample small areas (i.e. the sampling of multiple plots in a habitat parcel was not the primary intention of the NPMS), such comparisons are likely to be best done at the country, regional, or land-cover class (e.g. the ITE Land classification; Bunce *et al.* 1996) scale. Note that the NPMS collects a number of habitat variables (e.g. bare ground, observed management, grazing, moss and lichen cover, vegetation height and wooded structure) and photographic evidence (although photographs are not a required part of the basic NPMS methodology requested of volunteers), that may also be important for CSM-type comparisons.

Spatial gradients and the potential drivers of environmental change

Samples of any type must cover a gradient of any particular feature of the environment if they are to be able to detect relationships associated with that gradient (Smart *et al.* 2012). Here we inspect the current distribution of both allocated and surveyed NPMS monads in the context of the full distribution of a range of environmental variables for the UK (average January temperature; average July temperature; number of wet days per year; peaty soils; calcareous bedrock; population density), or, where Northern Irish data are not readily available, for Great Britain (GB; NOx; NHx; altitude). For the purposes of this review NPMS monads were degraded to the 10 x 10 km (hectad) level; this was done to provide a common scale for analysis given that many of the following environmental variables are only available at coarser resolutions than 1 x 1 km. Further information about derivation of the environmental data used in this analysis is given in Appendix 1; also see Blockeel *et al.* (2014) for maps of the majority of these variables. Note that number of wet days per year is investigated rather than rainfall, because this is generally thought to have more explanatory power in the context of plant biogeography (Ratcliffe 1968).

Distributions are compared visually in the form of smoothed empirical probability densities using the 'geom_density' function in the ggplot2 library in the statistical software R (R Core Team 2014). A Principal Components Analysis (PCA) is also presented, also performed in R (using the R base package function 'prcomp'); variables were subject to transformations specified in the figure legends to improve normality (this being more successful in some cases than others) for the purposes of PCA (Figs 11, 12).

Altitude

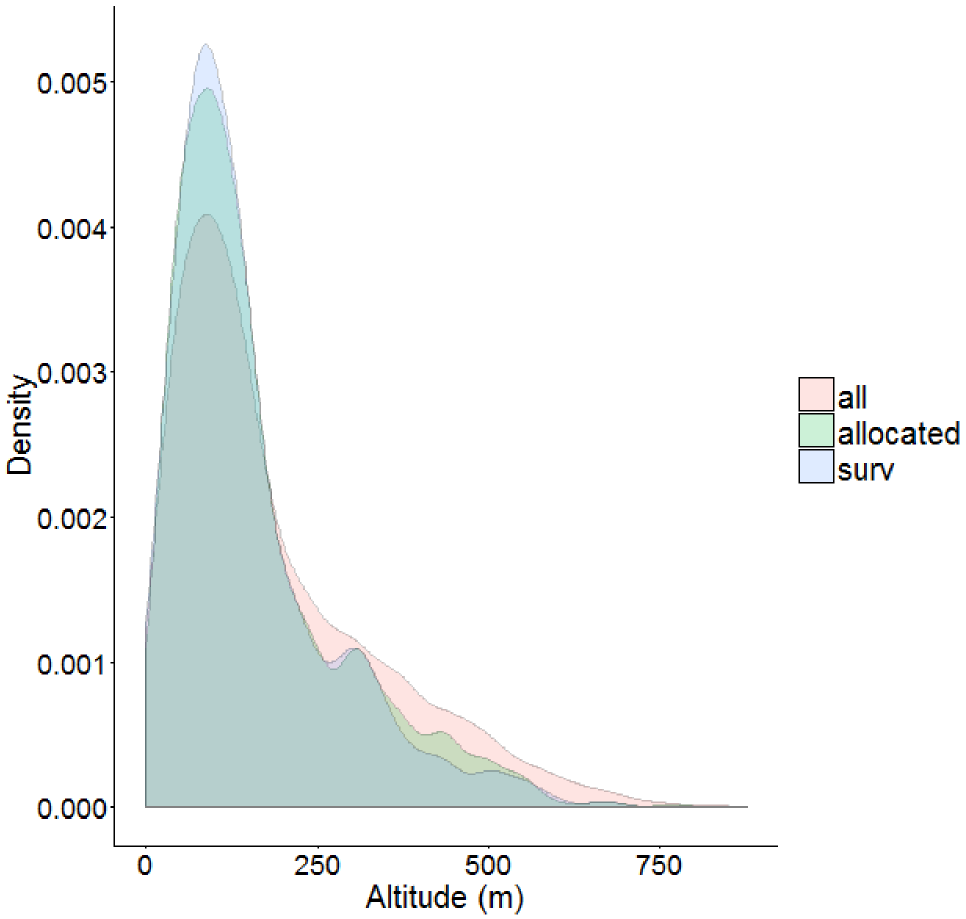

Figure 1. Probability distributions for mean hectad altitudes. For all GB hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

January average temperature

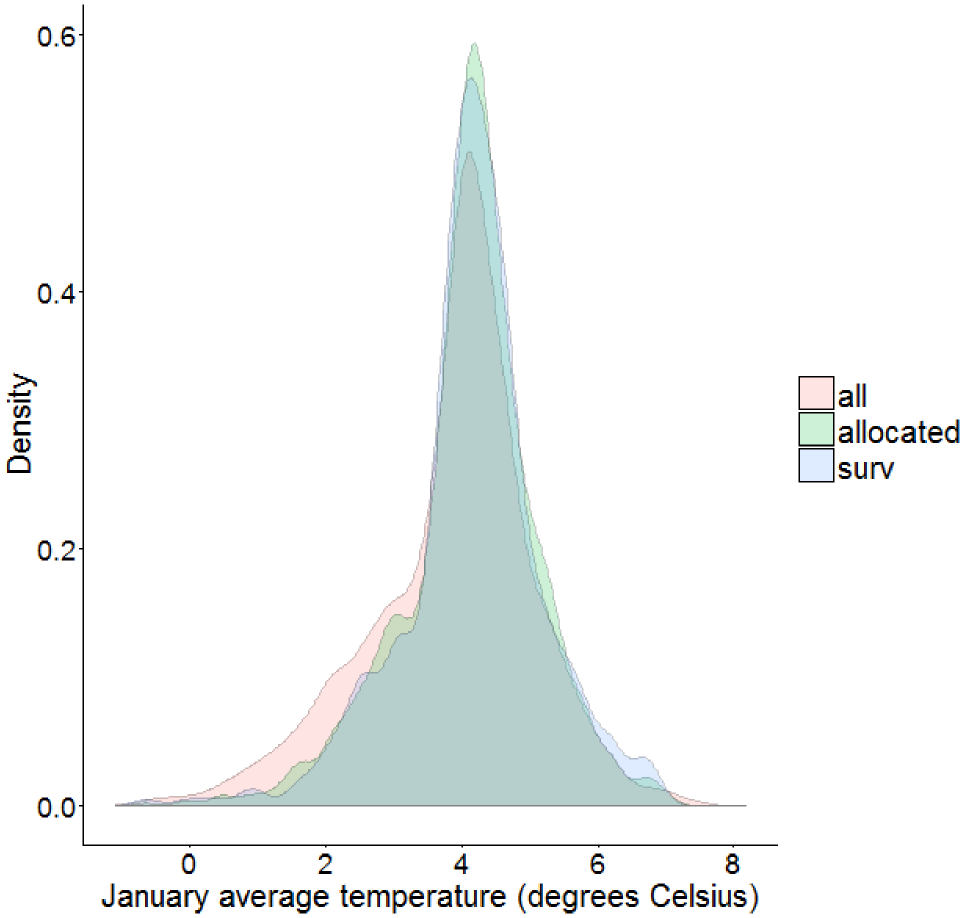

Figure 2. Probability distributions for January average temperature (degrees Celsius). For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

July average temperature

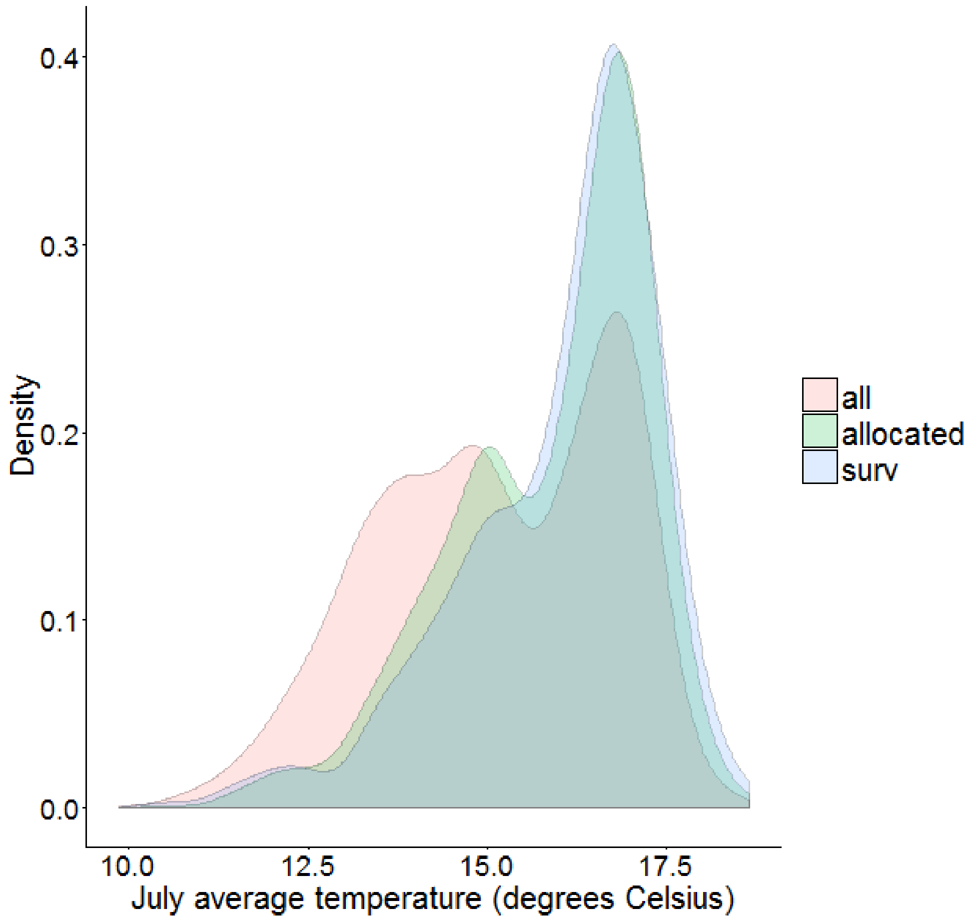

Figure 3. Probability distributions for July average temperature (degrees Celsius). For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Wet days per year

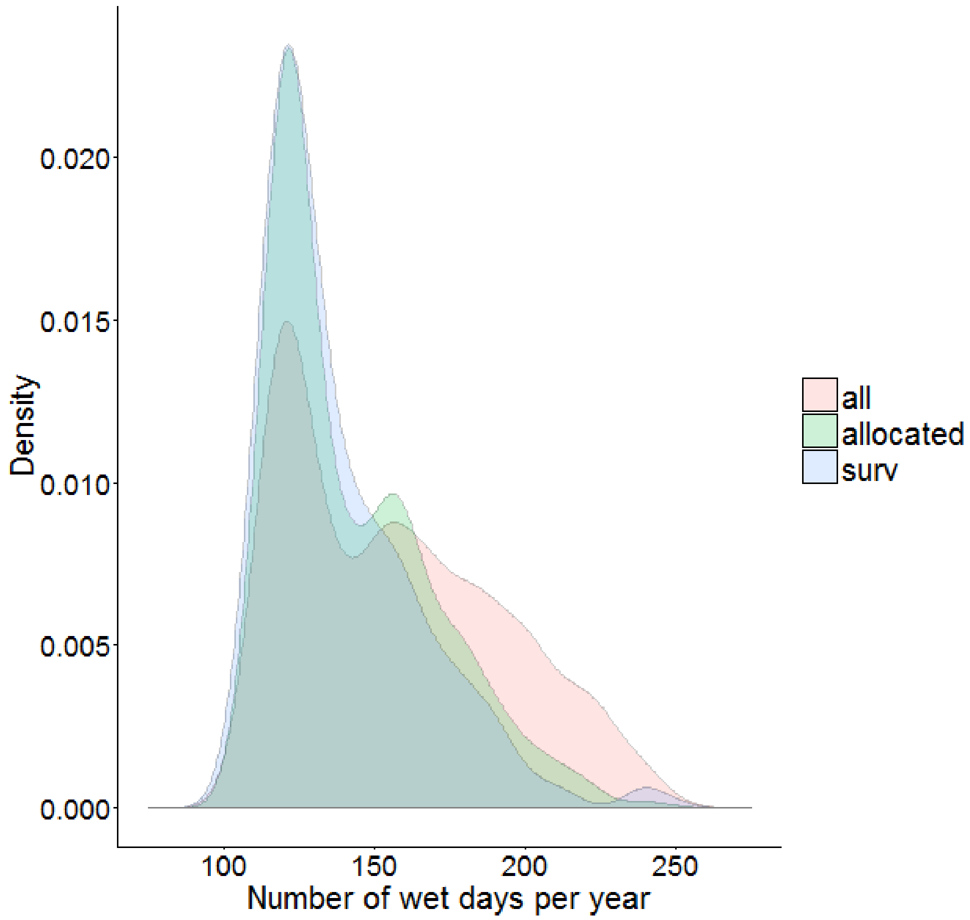

Figure 4. Probability distributions for the number of wet days per year. A wet day is defined as a day receiving more than 1 mm of rain. For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

NHx

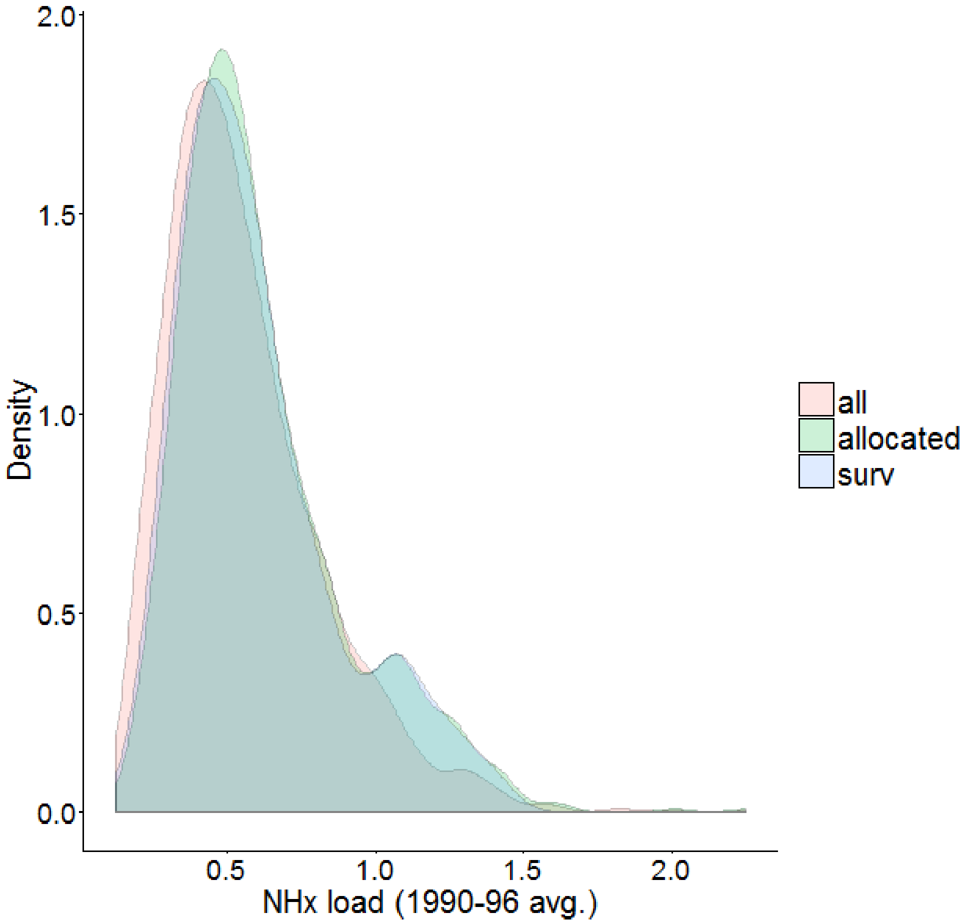

Figure 5. Probability distributions for the average hectad NHx load (kg ha^{-1} yr^{-1}; 1990-1996). For all GB hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

NOx

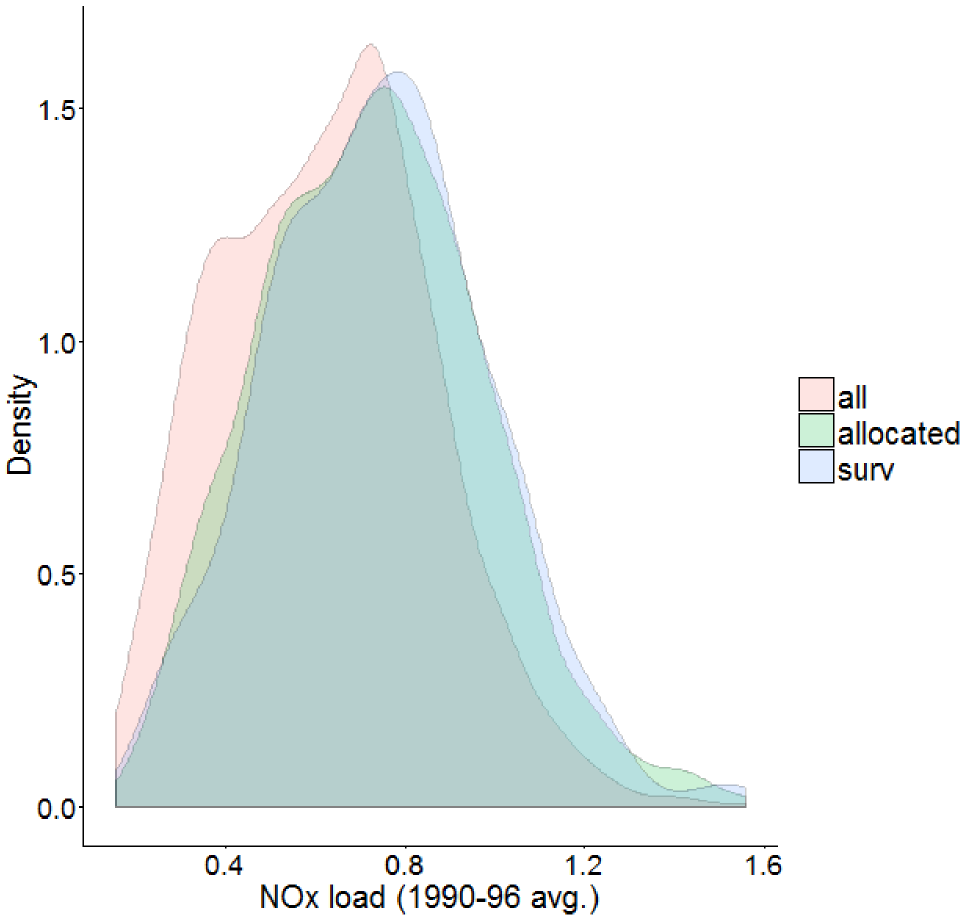

Figure 6. Probability distributions for the average hectad NOx load (kg ha^{-1} yr^{-1}; 1990-1996). For all GB hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Calcareous bedrock

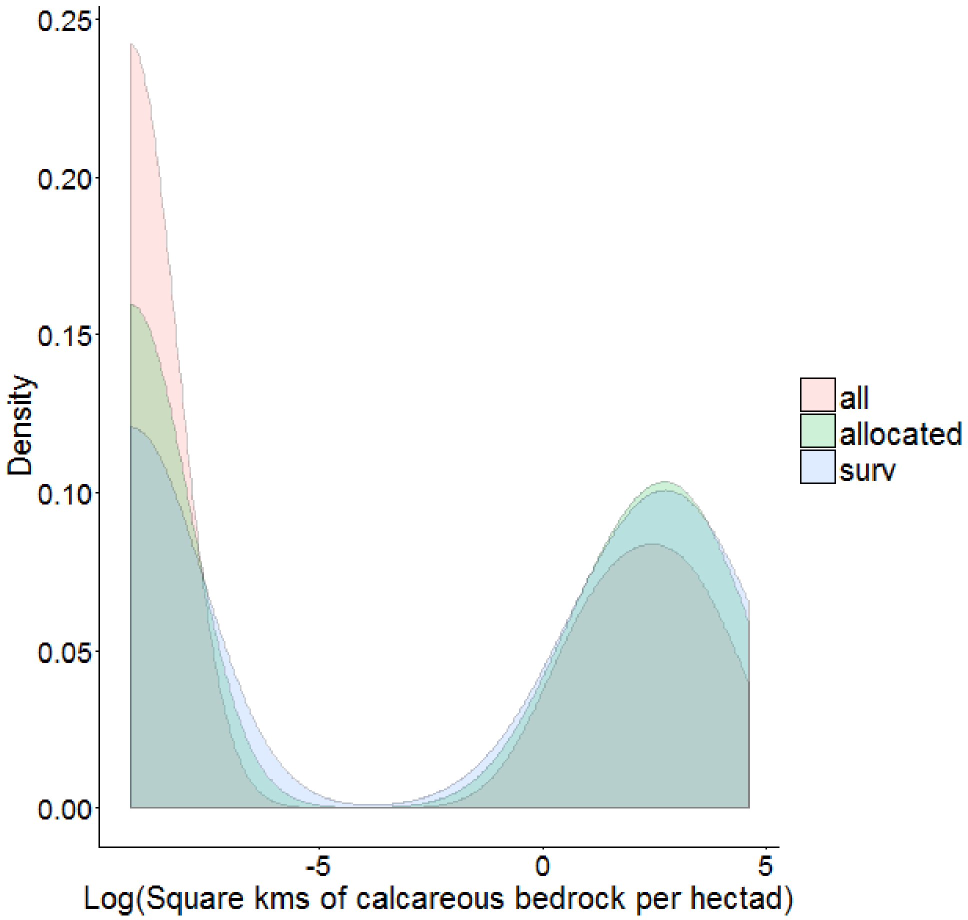

Figure 7. Probability distributions for the logarithm of the number of square kilometres of calcareous bedrock per hectad; 0.0001 was added to all values before the logarithm was taken. For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Peaty soils

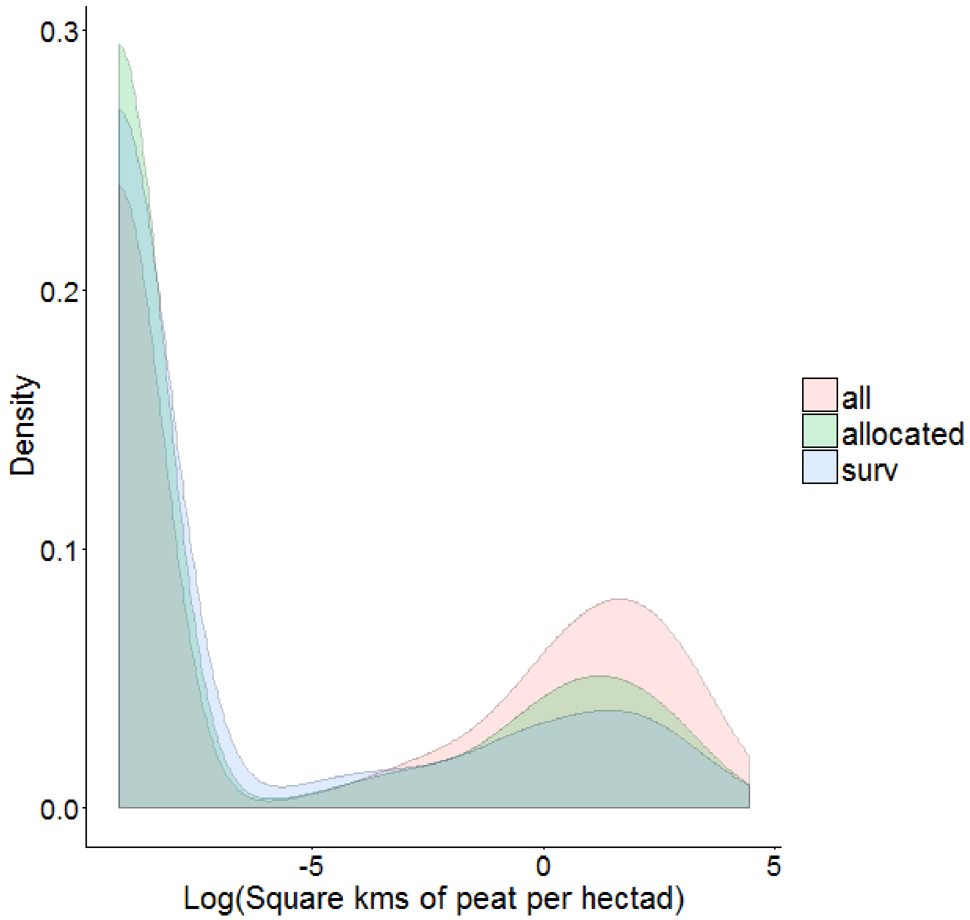

Figure 8. Probability distributions for the logarithm of the number of square kilometres of peaty soils per hectad; 0.0001 was added to all values before the logarithm was taken. For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Population density

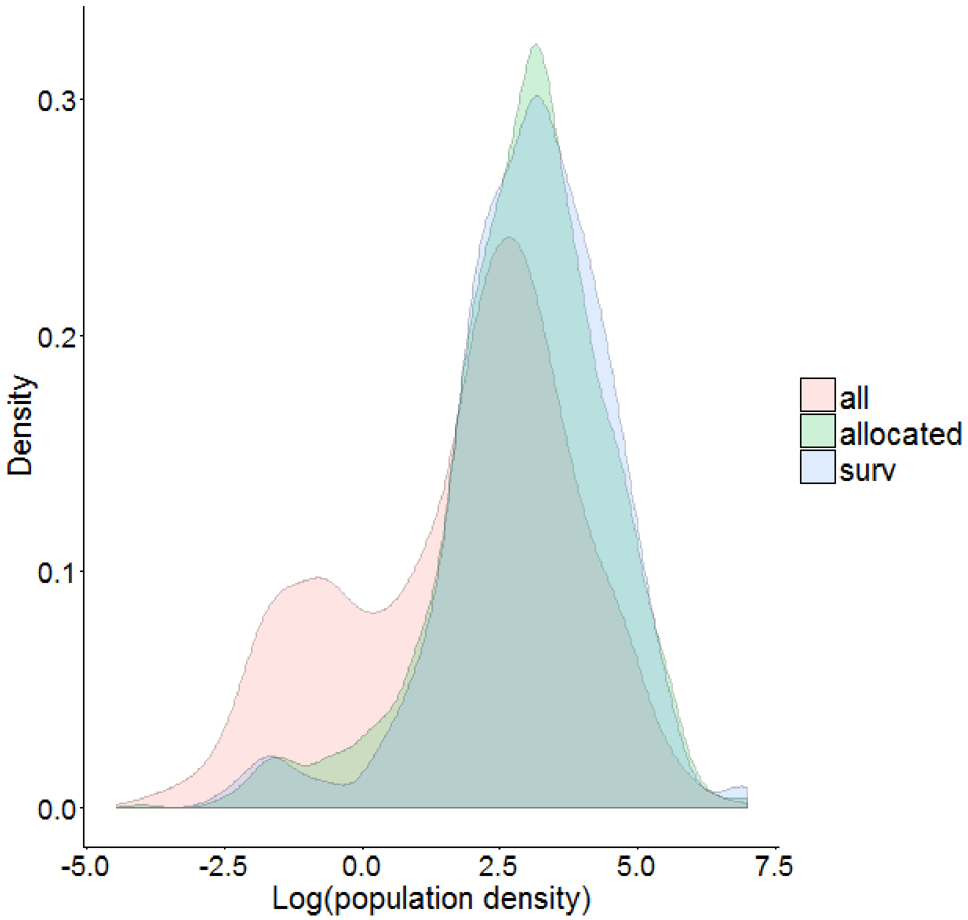

Figure 9. Probability distributions for the logarithm of hectad population density; population density was originally summarised as the average number of people per square kilometre within a hectad. For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Arable and horticultural land

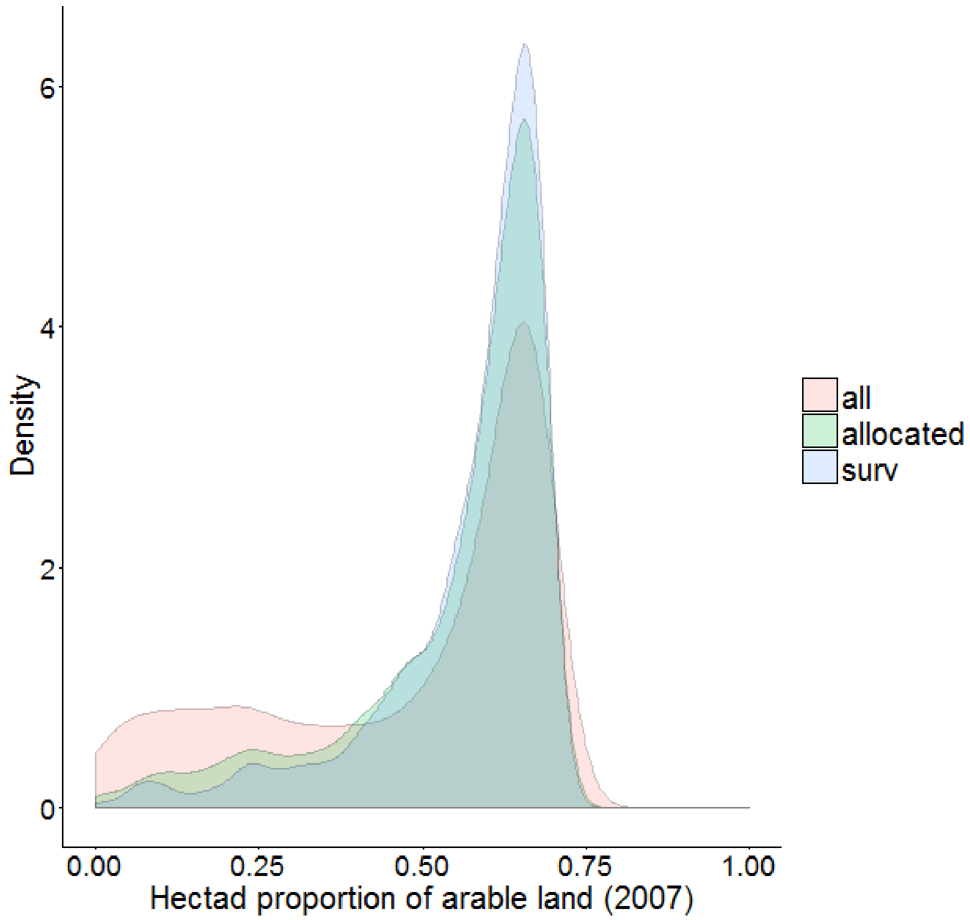

Figure 10. Probability distributions for the hectad proportion of arable and horticultural land (2007). For all UK hectads ('all'), hectads containing an allocated NPMS square ('allocated'), and for those hectads containing an allocated square that has been surveyed ('surv').

Principal Components Analysis of hectad environmental space

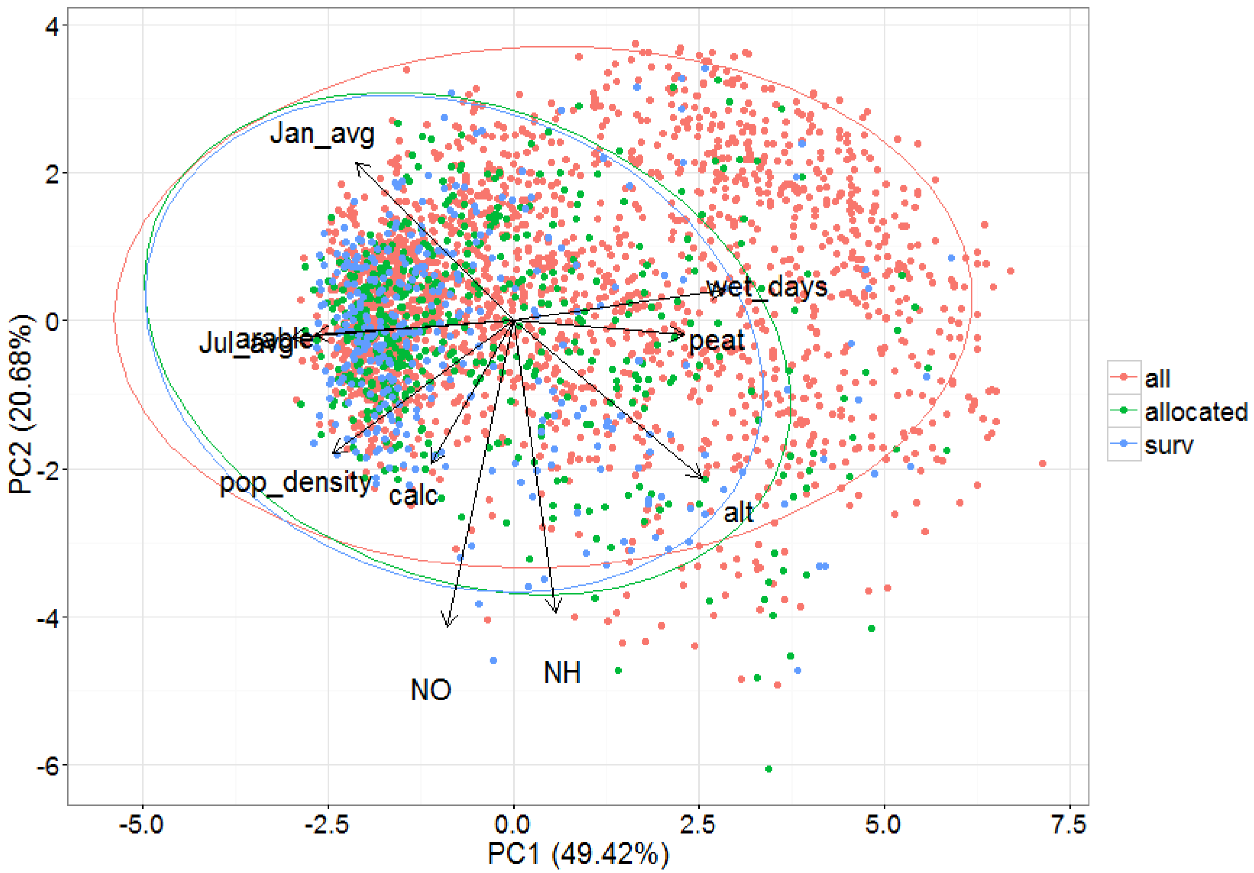

Figure 11. PCA of all preceding GB hectad environmental variables available, grouped by NPMS survey status. Note that hectads with missing values for any of the environmental values are excluded. Arable, calcareous bedrock and peaty soils (as proportions) were all arcsine transformed prior to entering into the PCA. Population density was log transformed. Ellipses represent 95% confidence intervals. The axis label percentages indicate the percentages of variance explained by a principal component.

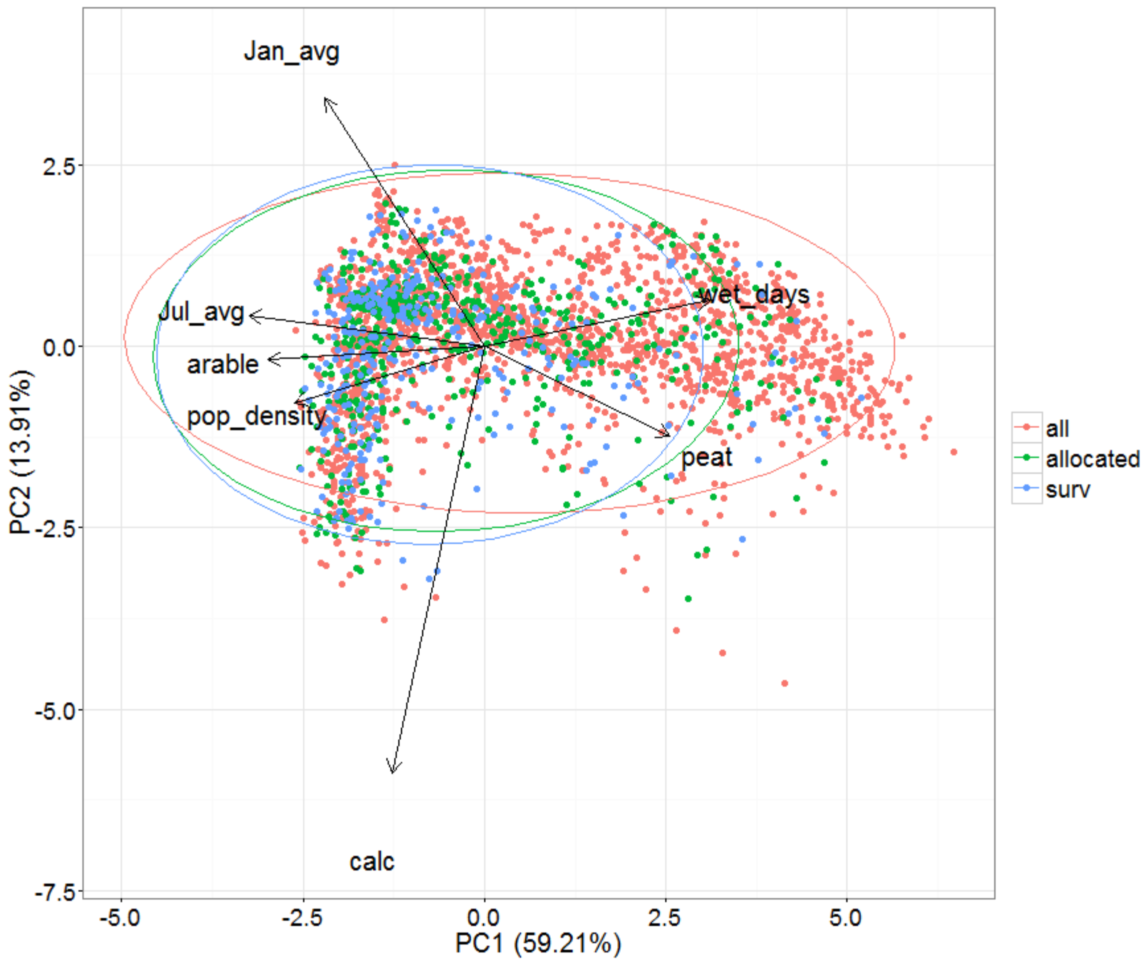

Figure 12. PCA of all preceding hectad environmental variables available for the whole of the UK, grouped by NPMS survey status. Note that hectads with missing values for any of the environmental values are excluded. Arable, calcareous bedrock and peaty soils (as proportions) were all arcsine transformed prior to entering into the PCA. Population density (+ 0.0001) was log transformed. Ellipses represent 95% confidence intervals. The axis label percentages indicate the percentages of variance explained by a principal component.

Habitat inventories and remote sensing

NPMS data could also supplement other quadrat datasets in validating remotely-sensed habitat inventories; in a similar vein, the dataset could also be used as a training dataset for other earth observation (EO) products, whereby NPMS habitat classifications (whether those selected by volunteers, or those inferred from NVC fits or indicator species approaches) are used to help classify spectral signatures into habitat types via statistical procedures.

General comparisons against other EO products, such as the Land Cover Map 2007 (Morton *et al.* 2011), could also be of mutual benefit to both datasets, both helping to validate future Land Cover Maps, and supporting or querying NPMS surveyor habitat choices. Appendix 2 summarises the number of NPMS plots by habitat (as of 3rd November 2015) to provide an overview of the likely resource of NPMS fine habitat information for the different countries for these purposes.

Investigating drivers of change using NPMS data

This section overviews important drivers of change in the plant communities and habitats of the UK, and reviews the NPMS analytical options and (current) dataset features outlined above that may support or restrict further scientific understanding of these drivers. Clearly these options represent a subset of all possibilities, and should not be taken as an exhaustive list of potential research uses of the NPMS dataset, even for those topics included. Moreover, the options and restrictions outlined here are based on the returns from the first year of surveying, and we fully expect that, with appropriate support and resourcing, the scheme will continue to attract new surveyors and support existing ones, ultimately broadening the analytical options available to scientists working with these data.

Of course, all of the drivers listed below can, and have, been investigated by researchers working with biological records collected or summarised at larger spatial grain sizes (10 x 10 km and 2 x 2 km being particularly common; Pocock *et al.* 2015); and, the fact that NPMS records can be summarised at larger spatial scales than at which they were collected, and thus be used in such broad scale analyses of environmental change, is not repeated for every topic that follows, although the reader should remember that this is possible. Likewise, plot-metrics such as weighted Ellenberg values, will often provide information on functional trait changes within a community that can be linked to environmental drivers. Every possible relationship between environmental drivers and plant trait composition is not reviewed here, due to the size of this task, and the availability of numerous book length treatments on plant trait-environment relationships (e.g. Bazzaz 1996; Grime *et al.* 2007; Shipley 2010; van der Maarel & Franklin 2012). It is perhaps sufficient to note that numerous plant trait databases now exist to enable such work to take place (e.g. Hill *et al.* 2004; Kleyer *et al.* 2008).

Climate change

- Currently allocated NPMS monads under-sample parts of the climatic gradients of the UK, although this bias appears to be more associated with the under-sampling of oceanic ecosystems (number of wet days per year) and peaty soils (themselves associated with oceanic climates), rather than altitude and January average temperature.
- The fine scale (i.e. small spatial grain size) at which species data are collected within the NPMS may allow for detailed micro-climatic niche modelling (Bennie *et al.* 2008).
- As for any structured recording scheme, species or habitat trends could be compared for different climatic zones, assuming that the division into such zones retains enough data for analysis. Such comparisons can also control for species trait differences using species ‘buddy’ contrasts (Hill & Preston 2015).

- In the future, it may be worth asking volunteers whether any individual species that they record is in flower. Not only will this provide extra information on volunteer identification expertise, but it may also open the door to future phenological analyses.

Habitat management

- The collection of a certain amount of habitat structural and compositional information can be potentially be linked to species' trends, and of course compared to independent assessments, such as CSM, as outlined above.
- Encouraging volunteers to take plot photos in each NPMS survey year will also supplement interpretation of such trends, although it should be stated that these are not formal fixed point photographs. However, broad trends in habitat change may be interpretable from such images, and the link (enforced by the NPMS database structure) between species and habitat information and the photos should allow for increased confidence in interpretations of change.

Invasive species

- Whilst only a limited number of invasive negative indicators are included in the Indicator and Wildflower species lists, the collection of cover data within the NPMS should provide interesting comparisons to similar analyses that have been performed using CS data (Maskell *et al.* 2006).
- Again, plot photos may also provide extra evidence for the increasing (or diminishing) dominance of invasive species.

Air pollution and eutrophication

- Although the currently allocated and surveyed monads are slightly biased towards more polluted monads, the coverage of these gradients appears good.
- Eutrophication signals in the NPMS data could be compared with those from the CS (Smart *et al.* 2003) or other quadrat datasets (e.g. Stevens *et al.* 2004).
- It is also possible that, in the future when the scheme methodology is well established amongst volunteers, that small extra tasks could also be requested of volunteers, e.g. watching out for ozone damage to plants, which can be photographed or recorded via existing phone apps (see http://icpvegetation.ceh.ac.uk/record/mobile-app-ozone-injury).

Coastal management

- Coastal trends can potentially be produced using the appropriate NPMS habitats (coastal habitats appear to be reasonably well-represented at the Inventory and Indicator levels in 2015; Appendix 2).
- Plot photographs may also help to provide information on erosion or shingle movement in the appropriate geographic areas.

Agri-environment stewardship

- Contrasts could be made between arable margin or grassland plots in and outside of AES (see the section 'Comparisons between the NPMS and other surveys' above for further discussion of this).
- Many other potentially relevant plot-based metrics (e.g. cover of important bird seed species) are also discussed above.

Pest and pathogens

- As for air pollution, volunteers could occasionally be asked to look out for signs of tree disease, for example; although again, the impacts of extra tasks on volunteer motivation and retention would have to be carefully considered.
- For tree disease, plot vegetation structural characteristics and photos may also be useful.
- The standard plot data may also allow for the impacts of tree disease on associated field layer species to be determined, and possibly to supplement other projects collecting similar data in this area (e.g. http://www.brc.ac.uk/splash).

Protected areas

- Similar ideas to those discussed under the agri-environmental stewardship section may also be relevant here.

Animal-plant interactions

- Resources such as the CEH 'Database of Insects and their Foodplants' may be of use here; either for designing additional projects, or for highlighting particular insect species that may be associated with NPMS Wildflower or Indicator species (in the NPMS annual or habitat newsletters, for example).

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Appendix 1. Sources of environmental information

See Blockeel *et al.* (2014) for source references not in the above reference list.

Environmental factor(s)	Source
Mean altitude	Integrated Hydrological Digital Terrain Model (Great Britain) (Morris & Flavin 1990, 1994)
January mean temperature and July mean temperature (both 1981-2010)	Met Éireann (Ireland); Met Office (GB)
Mean number of wet days per year (1981-2010)	Met Office (UK)
NOx and NHx (kg ha^{-1} yr^{-1}; 1990-1996 mean)	Dore *et al.* (2007)
Arable land	'Arable and horticulture' cover class, Land Cover Map 2007 (UK) (Morton *et al.* 2011)
Peaty soils	'Bog' cover class, Land Cover Map 2007 (UK) (Morton *et al.* 2011); Derived Irish Peat Map Version 2 (Republic of Ireland) (Connolly & Holden 2009)
Calcareous rocks	BGS Parent Material Model Version 6 (Great Britain); BGS 1:625,000 Bedrock Geology (Northern Ireland). The original map (Blockeel *et al.* 2014) is based on bedrocks with CaCO3 contents classified as High (e.g. chalk), Variable (high) (e.g. interbedded limestone and mudstone beds) and Moderate (e.g. dolomitic limestone, calcareous mudstone)
Population density	Gridded Population of the World, Version 3 (CIESIN 2005)

Appendix 2.

SURVEY TYPE	FINE HABITAT	COUNTRY	NO.
2015 INVENTORY	Arable field margins	CHANNEL ISLES	2
2015 INVENTORY	Dry acid grassland	CHANNEL ISLES	4
2015 INVENTORY	Dry deciduous woodland	CHANNEL ISLES	2
2015 INDICATOR	Acid fens, mires and springs	ENGLAND	6
2015 INVENTORY	Acid fens, mires and springs	ENGLAND	3
2015 WILDFLOWER	Acid fens, mires and springs	ENGLAND	5
2015 INDICATOR	Arable field margins	ENGLAND	100
2015 INVENTORY	Arable field margins	ENGLAND	74
2015 WILDFLOWER	Arable field margins	ENGLAND	56
2015 INDICATOR	Base-rich fens, mires and springs	ENGLAND	3
2015 INVENTORY	Base-rich fens, mires and springs	ENGLAND	7
2015 WILDFLOWER	Base-rich fens, mires and springs	ENGLAND	3
2015 INDICATOR	Blanket bog	ENGLAND	6
2015 INVENTORY	Blanket bog	ENGLAND	3
2015 WILDFLOWER	Blanket bog	ENGLAND	5
2015 INDICATOR	Coastal saltmarsh	ENGLAND	13
2015 INVENTORY	Coastal saltmarsh	ENGLAND	6
2015 WILDFLOWER	Coastal saltmarsh	ENGLAND	1
2015 INDICATOR	Coastal sand dunes	ENGLAND	1
2015 INVENTORY	Coastal sand dunes	ENGLAND	2
2015 INDICATOR	Coastal vegetated shingle	ENGLAND	17
2015 INVENTORY	Coastal vegetated shingle	ENGLAND	8
2015 INDICATOR	Dry acid grassland	ENGLAND	5
2015 INVENTORY	Dry acid grassland	ENGLAND	7
2015 WILDFLOWER	Dry acid grassland	ENGLAND	1
2015 INDICATOR	Dry calcareous grassland	ENGLAND	27
2015 INVENTORY	Dry calcareous grassland	ENGLAND	22
2015 WILDFLOWER	Dry calcareous grassland	ENGLAND	23
2015 INDICATOR	Dry deciduous woodland	ENGLAND	68
2015 INVENTORY	Dry deciduous woodland	ENGLAND	64
2015 WILDFLOWER	Dry deciduous woodland	ENGLAND	55
2015 INDICATOR	Dry heathland	ENGLAND	24
2015 INVENTORY	Dry heathland	ENGLAND	12
2015 WILDFLOWER	Dry heathland	ENGLAND	28
2015 INDICATOR	Hedgerows of native species	ENGLAND	78
2015 INVENTORY	Hedgerows of native species	ENGLAND	71
2015 WILDFLOWER	Hedgerows of native species	ENGLAND	70
2015 INDICATOR	Inland rocks and scree	ENGLAND	6
2015 INVENTORY	Inland rocks and scree	ENGLAND	5
2015 INDICATOR	Maritime cliffs and slopes	ENGLAND	12
2015 INVENTORY	Maritime cliffs and slopes	ENGLAND	2
2015 WILDFLOWER	Maritime cliffs and slopes	ENGLAND	1
2015 INDICATOR	Montane acid grassland	ENGLAND	1

2015 INVENTORY	Montane acid grassland	ENGLAND	3
2015 WILDFLOWER	Montane acid grassland	ENGLAND	3
2015 INVENTORY	Montane calcareous grassland	ENGLAND	2
2015 WILDFLOWER	Montane calcareous grassland	ENGLAND	1
2015 INDICATOR	Montane dry heathland	ENGLAND	1
2015 INVENTORY	Montane dry heathland	ENGLAND	3
2015 INVENTORY	Montane rocks and scree	ENGLAND	2
2015 WILDFLOWER	Montane rocks and scree	ENGLAND	2
2015 INDICATOR	Neutral damp grassland	ENGLAND	16
2015 INVENTORY	Neutral damp grassland	ENGLAND	19
2015 WILDFLOWER	Neutral damp grassland	ENGLAND	11
2015 INDICATOR	Neutral pastures and meadows	ENGLAND	42
2015 INVENTORY	Neutral pastures and meadows	ENGLAND	68
2015 WILDFLOWER	Neutral pastures and meadows	ENGLAND	48
2015 INDICATOR	Nutrient-poor lakes and ponds	ENGLAND	6
2015 WILDFLOWER	Nutrient-poor lakes and ponds	ENGLAND	5
2015 INDICATOR	Nutrient-rich lakes and ponds	ENGLAND	6
2015 INVENTORY	Nutrient-rich lakes and ponds	ENGLAND	14
2015 WILDFLOWER	Nutrient-rich lakes and ponds	ENGLAND	5
2015 INVENTORY	Raised bog	ENGLAND	1
2015 INDICATOR	Rivers and streams	ENGLAND	11
2015 INVENTORY	Rivers and streams	ENGLAND	13
2015 WILDFLOWER	Rivers and streams	ENGLAND	9
2015 INDICATOR	Wet heath	ENGLAND	9
2015 INVENTORY	Wet heath	ENGLAND	3
2015 WILDFLOWER	Wet heath	ENGLAND	10
2015 INDICATOR	Wet woodland	ENGLAND	14
2015 INVENTORY	Wet woodland	ENGLAND	13
2015 WILDFLOWER	Wet woodland	ENGLAND	11
2015 INDICATOR	Acid fens, mires and springs	N.I.	4
2015 INDICATOR	Blanket bog	N.I.	3
2015 INDICATOR	Dry heathland	N.I.	2
2015 INDICATOR	Hedgerows of native species	N.I.	1
2015 INDICATOR	Montane rocks and scree	N.I.	1
2015 INDICATOR	Wet heath	N.I.	2
2015 INDICATOR	Acid fens, mires and springs	SCOTLAND	3
2015 INVENTORY	Acid fens, mires and springs	SCOTLAND	2
2015 WILDFLOWER	Acid fens, mires and springs	SCOTLAND	1
2015 INDICATOR	Arable field margins	SCOTLAND	6
2015 WILDFLOWER	Arable field margins	SCOTLAND	6
2015 INVENTORY	Base-rich fens, mires and springs	SCOTLAND	6
2015 INVENTORY	Blanket bog	SCOTLAND	1
2015 WILDFLOWER	Blanket bog	SCOTLAND	1
2015 WILDFLOWER	Coastal saltmarsh	SCOTLAND	1
2015 INVENTORY	Coastal sand dunes	SCOTLAND	2
2015 WILDFLOWER	Coastal sand dunes	SCOTLAND	1

2015 INDICATOR	Coastal vegetated shingle	SCOTLAND	1
2015 INVENTORY	Coastal vegetated shingle	SCOTLAND	3
2015 INDICATOR	Dry acid grassland	SCOTLAND	5
2015 INVENTORY	Dry acid grassland	SCOTLAND	3
2015 INDICATOR	Dry deciduous woodland	SCOTLAND	8
2015 INVENTORY	Dry deciduous woodland	SCOTLAND	5
2015 WILDFLOWER	Dry deciduous woodland	SCOTLAND	5
2015 INDICATOR	Dry heathland	SCOTLAND	11
2015 INVENTORY	Dry heathland	SCOTLAND	3
2015 WILDFLOWER	Dry heathland	SCOTLAND	3
2015 INDICATOR	Hedgerows of native species	SCOTLAND	3
2015 WILDFLOWER	Hedgerows of native species	SCOTLAND	2
2015 INDICATOR	Inland rocks and scree	SCOTLAND	1
2015 WILDFLOWER	Inland rocks and scree	SCOTLAND	1
2015 INDICATOR	Maritime cliffs and slopes	SCOTLAND	1
2015 INDICATOR	Montane acid grassland	SCOTLAND	2
2015 INVENTORY	Montane acid grassland	SCOTLAND	3
2015 INDICATOR	Montane dry heathland	SCOTLAND	4
2015 INVENTORY	Montane dry heathland	SCOTLAND	1
2015 INDICATOR	Montane rocks and scree	SCOTLAND	1
2015 INVENTORY	Montane rocks and scree	SCOTLAND	1
2015 INDICATOR	Native conifer woods and juniper scrub	SCOTLAND	3
2015 INVENTORY	Native conifer woods and juniper scrub	SCOTLAND	3
2015 WILDFLOWER	Native conifer woods and juniper scrub	SCOTLAND	2
2015 INDICATOR	Neutral damp grassland	SCOTLAND	5
2015 INVENTORY	Neutral damp grassland	SCOTLAND	5
2015 WILDFLOWER	Neutral damp grassland	SCOTLAND	1
2015 INDICATOR	Neutral pastures and meadows	SCOTLAND	5
2015 INVENTORY	Neutral pastures and meadows	SCOTLAND	4
2015 WILDFLOWER	Neutral pastures and meadows	SCOTLAND	1
2015 INDICATOR	Nutrient-poor lakes and ponds	SCOTLAND	1
2015 INVENTORY	Nutrient-poor lakes and ponds	SCOTLAND	2
2015 WILDFLOWER	Nutrient-poor lakes and ponds	SCOTLAND	1
2015 INDICATOR	Nutrient-rich lakes and ponds	SCOTLAND	1
2015 INVENTORY	Nutrient-rich lakes and ponds	SCOTLAND	2
2015 INDICATOR	Rivers and streams	SCOTLAND	1
2015 INDICATOR	Wet heath	SCOTLAND	6
2015 INVENTORY	Wet heath	SCOTLAND	9
2015 WILDFLOWER	Wet heath	SCOTLAND	4
2015 INDICATOR	Wet woodland	SCOTLAND	2
2015 INVENTORY	Wet woodland	SCOTLAND	1
2015 WILDFLOWER	Wet woodland	SCOTLAND	3
2015 INDICATOR	Acid fens, mires and springs	WALES	3
2015 INVENTORY	Acid fens, mires and springs	WALES	3
2015 WILDFLOWER	Acid fens, mires and springs	WALES	3
2015 WILDFLOWER	Arable field margins	WALES	2

2015 INDICATOR	Base-rich fens, mires and springs	WALES	3
2015 INVENTORY	Blanket bog	WALES	1
2015 INVENTORY	Coastal saltmarsh	WALES	3
2015 INVENTORY	Coastal sand dunes	WALES	6
2015 INVENTORY	Coastal vegetated shingle	WALES	1
2015 INDICATOR	Dry acid grassland	WALES	3
2015 INVENTORY	Dry acid grassland	WALES	10
2015 WILDFLOWER	Dry acid grassland	WALES	3
2015 INDICATOR	Dry calcareous grassland	WALES	3
2015 INVENTORY	Dry calcareous grassland	WALES	1
2015 WILDFLOWER	Dry calcareous grassland	WALES	2
2015 INDICATOR	Dry deciduous woodland	WALES	5
2015 INVENTORY	Dry deciduous woodland	WALES	4
2015 WILDFLOWER	Dry deciduous woodland	WALES	4
2015 INDICATOR	Dry heathland	WALES	1
2015 WILDFLOWER	Dry heathland	WALES	4
2015 INDICATOR	Hedgerows of native species	WALES	11
2015 INVENTORY	Hedgerows of native species	WALES	5
2015 WILDFLOWER	Hedgerows of native species	WALES	8
2015 INDICATOR	Inland rocks and scree	WALES	2
2015 INVENTORY	Inland rocks and scree	WALES	1
2015 WILDFLOWER	Inland rocks and scree	WALES	3
2015 INDICATOR	Maritime cliffs and slopes	WALES	4
2015 WILDFLOWER	Maritime cliffs and slopes	WALES	1
2015 INDICATOR	Montane acid grassland	WALES	2
2015 INVENTORY	Montane acid grassland	WALES	11
2015 WILDFLOWER	Montane acid grassland	WALES	5
2015 INVENTORY	Montane calcareous grassland	WALES	2
2015 INDICATOR	Montane dry heathland	WALES	1
2015 INVENTORY	Montane dry heathland	WALES	1
2015 WILDFLOWER	Montane dry heathland	WALES	1
2015 INDICATOR	Montane rocks and scree	WALES	1
2015 INVENTORY	Montane rocks and scree	WALES	1
2015 WILDFLOWER	Montane rocks and scree	WALES	1
2015 INDICATOR	Neutral damp grassland	WALES	2
2015 INVENTORY	Neutral damp grassland	WALES	1
2015 WILDFLOWER	Neutral damp grassland	WALES	2
2015 INDICATOR	Neutral pastures and meadows	WALES	7
2015 INVENTORY	Neutral pastures and meadows	WALES	12
2015 WILDFLOWER	Neutral pastures and meadows	WALES	2
2015 INDICATOR	Nutrient-poor lakes and ponds	WALES	2
2015 INDICATOR	Nutrient-rich lakes and ponds	WALES	2
2015 INVENTORY	Nutrient-rich lakes and ponds	WALES	1
2015 INDICATOR	Rivers and streams	WALES	3
2015 INVENTORY	Rivers and streams	WALES	3
2015 WILDFLOWER	Rivers and streams	WALES	2

2015 INDICATOR	Wet heath	WALES	4
2015 INVENTORY	Wet heath	WALES	1
2015 WILDFLOWER	Wet heath	WALES	4
2015 INDICATOR	Wet woodland	WALES	1
2015 INVENTORY	Wet woodland	WALES	2
2015 WILDFLOWER	Wet woodland	WALES	3