Response to Reviews

Response: Many thanks for the thorough and constructive comments regarding our manuscript which we have endeavoured to address as follows:

1) comments from Referees, (2) author's response, (3) author's changes in manuscript.

Response to Referee #1

(1) The authors have reported on components of land cover data for a sequence of landscape types. This types of reports have a generic interest in a monitoring context, in this case in the context of Countryside Survey and contribute to the build-up of monitoring experiences and capacity. To be useful in a scientific context, however, I miss the purpose, objective and direction of the manuscript

(1) - Which research questions are addressed and what results were extracted?

(2) A key part of the data set is its contribution to monitoring, particularly as an element of Countryside Survey. However, the data also provide information to allow a more detailed assessment of the rarer habitats and land cover types of Britain not surveyed in the wider monitoring scheme of the Countryside Survey field survey.

Questions addressed:
- *To quantify and evaluate the quality of rarer and localised English habitats at a national level*
- *To establish a baseline for long term monitoring of ecological change*

Results extracted:

- *National estimates of Broad (and Priority) Habitats and boundaries*
- *Assessment of vegetation types in terms of quality and abundance*
- *Description of repeatable methods*

(3) Clarification inserted in the introduction, lines 45+

(1) I also miss the context in which this study is placed
- How does this contribute to monitoring and using outputs from monitoring in the U.K. and internationally in comparison with the existing know-how?

(2) We have substantially rewritten sections in order to emphasise the role of the Key Habitat Survey within the internationally unique Countryside Survey monitoring framework

(3) Updated Section 2, lines 95+

(1) Finally, despite a rich reference list - these references are not reflected well enough in the text. I also find that the review of the international literature is not adequate, e.g. the statements on lines 80-81 on not known monitoring of rarer habitats. There are examples available.

(2) Yes, there are many examples of the monitoring of rare habitats, sometimes at a national level. However, the point we were trying to get across was that monitoring programmes at a national scale, including a full range of different habitats, are not common.

(3) We have rewritten lines 105-112 to clarify the point above.

Response to Referee #2

(1) This manuscript and data set represents the most recent in a sequence of Wood et al. CEH data releases. Each data set describes landscape or land cover features of the UK terrain. In some cases the data sets focus on specific vegetation features, e.g. woodlands, and in other cases on very specific regions, e.g the Shetland Islands. In this particular case the data relate to rare and specialised biogeographic features surveyed once nearly 25 years ago. Collectively this series of data sets provide a remarkable and very likely "unique contribution" to terrestrial ecology. With other data sets at similar spatial resolution (e.g. UK rainfall or streamflow, both also published in ESSD) one gets a sense of, and must admire, one of the most detailed attempts anywhere on this planet to understand the composition and function of our complex biophysical environment. Whether by intent or happenstance, UK science seems to have led the way. I applaud the authors' intentions to make these data openly available. I understand completely the challenges of preparing and presenting any such data, especially 25-year-old data, for public viewing and use. I believe ESSD represents absolutely the appropriate journal and mechanism for sharing these data. This report on the 'Stewardship' activity could represent a bright jewel among the series of Wood et al. CEH products. It could serve to attract researchers and land managers to the larger holdings and products of CEH. It could excite people about continuing or future survey activities?

(2) We have substantially revised the text, as described below, which we hope addresses the issues above.

(1) Unfortunately, this particular package has proven very difficult to understand and review. Having also reviewed the Wood/CEH submission immediately prior to this one (ESSD-2017-121 Countryside Surveys 1978 -2007, ESSD owes me some reward for effort above and beyond?), I should have started with sufficient background and basic knowledge to understand how this piece both stands on its own and fits within a larger picture. I feel, however, that in this case the authors have packaged, released and described the data entirely and exclusively on their terms, e.g. the terms of the original Countryside Stewardship Scheme research proposal nested deeply within UK science infrastructure of that time. The fact that an outside researcher or ecosystem manager, one not familiar with UK jargon but interested either in the ecology aspects or in lessons offered about how one might (or might not!) go about replicating such surveys, might want to actually understand and use these data seems never to have occurred to these authors. They have attempted to transmit these data without, apparently, understanding or even acknowledging the needs and interests of the receivers.

(1) This reviewer felt that only after a day or two sitting down with these authors could one really understand this particular data and its potential impact. Absent that opportunity, the research community needs a much clearer, much more accessible, and much more useful presentation of and guide to these data. CEH employs science communication experts? Ask one of them to help you revise and rewrite this product with a friendlier face for a broader audience.

(2) Again, we have substantially revised the text, as described below, which we hope addresses the issues above.

(1) I start with my usual complaint about the CEH data access processes. As before, I compliment CEH as an effective and well-organised data archive! But, based on registration barriers imposed, CEH now knows my identity and which data sets I have requested and downloaded. How does that qualify as free and open access? How does the ESSD review process offer true anonymity to its reviewers in the face of such barriers?

(2) The NERC Environmental Information Data Centre (EIDC) is an acceptable repository to ESSD, currently fulfilling the repository criteria as stipulated by the journal (https://www.earth-system-science-data.net/for_authors/repository_criteria.html):

• *Persistent identifier: The data sets have to have a digital object identifier (DOI).*

• *Open access: The data sets have to be available free of charge and without any barriers except <u>a usual registration to get a login free-of-charge</u>.*

• *Liberal copyright: Anyone must be free to copy, distribute, transmit, and adapt the data sets as long as he/she gives credit to the original authors (equivalent to the Creative Commons Attribution License).*

• *Long-term availability: The repository has to meet the highest standards to guarantee long-term availability of the data sets and permanent access.*

Also, as a point of information, CEH and EIDC are not the same thing, hence data regarding users who have downloaded data from EIDC will not be passed to CEH staff without good reason.

(1) My second observation echoes comments by several reviewers throughout this sequence: the reliance of each of these data descriptions on a large volume of Wood and Barr literature, both published and unpublished reports. Good on these authors for constructing that body of work but for those of us who will not or - again due to access barriers - can not find nor read all of that background information, each data presentation needs to explicitly provide an appropriate subset or summary of that information. In this particular case the authors clearly know much more about political and ecological landscapes of 1992 but fail to effectively transmit necessary bits of that knowledge to users. Too often we encounter a phrase that invites us to find additional information or necessary details in, e.g. Barr et al. original project report. Most of us will not find that information or detail elsewhere; we need it here.

(2) As a large national survey, it is not possible to include every detail in the text without substantially increasing the manuscript to an unacceptable length. All relevant documents are provided as supplementary documents with the datasets so there should not be a problem in finding the salient information, as addressed lower down. However, we have endeavoured to clarify issues by inserting a series of new tables.

(3) Tables 1-4 have been newly inserted or substantially updated in order to clarify points raised above.

(1) In this particular data description the reader/user confronts the prominent and persistent issue of 'designated' versus 'non-designated', casually at first but substantially and seriously by the time we reach results and conclusion. As used here, but as not defined until line 222, these terms represent a peculiar UK framework for identification and protection of specific landscape features and regions. Researchers from other countries will not understand these terms as the authors do, but the authors have made only minimal efforts to translate for outside users. We need to see these terms clearly defined,

including analogy to like terms in use across Europe or in North America, almost as a first step of the entire narrative.

(2/3) Clarified, additional description of designation inserted in abstract and lines 254+.

(1) Likewise the morass of UK land survey, monitoring and assessment organisations and products. Perhaps only the authors can or should understand this full array but they need to help users at least know what they have done. I tried to construct a table as follows to help me understand the various sources these authors used to define and validate their land masks. Unfortunately, we never get a definition of the ITE acronym (I know it as Institute of Terrestrial Ecology, the previous appellation for CEH, but most users will not pick out that connection). I suspect, but have no way to confirm, that ITE Land Classification 1990 and Land Cover Map 1990 represent similar products? Or perhaps not, with one a geological map and the other compiled from satellite data? We need better information about these source data, as well as information about base spatial resolution of these products. All at 1km or have the authors performed interpolations? The information in the table above, extracted by me directly from text, does not match what the authors present in their Table 1? Or I have missed something?

(2) *The Land Cover Map is described in section 3.3. The information in Table 1 is correct and matches the presented text. However, we have clarified the terms a little more. Additional detail regarding the landscape masks is given in the supplementary information available with the data sets.*

(3) ITE acronym inserted in line 55. We have revised Section 3 to describe the ITE Land Classification more fully and updated Table 2 to clarify issues above.

(1) The manuscript offers to readers a completely confusing array of terms and terminology. We read about habitats, sites and squares. We find X plots, X-plots (evidently distinct from the former but not used consistently), Y plots, S/W linear features, 25 element squares, 16-element squares, land use and land cover codes, boundary codes, key habitat types from other surveys, priority habitat types from this survey, lists of pre-defined boundary features e.g. in Table 5 (which do not match those from the Countryside Survey), habitat indicator species e.g. in Table 6 apparently unique to this survey, and more. I hope the authors forgive this reviewer for wondering whether they have deliberately attempted to hide useful or pertinent features of their data under a cloud of codes and keywords?

(2) We have substantially edited the text which we hope addresses these issues, also hopefully the new figure 2 will hopefully assist with understanding.

(3) New figure 2 and substantial edits in Section 4.

(1) I understand that the authors must balance between terms used in their contracts and notebooks of 25 years ago and modern precise ecological meanings of, for prime example, habitats. (I note that a reviewer of one of the earlier data sets raised the same issue.) Strictly, a habitat attaches to a plant or animal, not to a geographic feature.

(2/3) We have revised the text and hope the edits clarify these issues.

(1) A reader encounters the term 'site' or 'sites' very frequently, but not always with a certain or clear meaning. A site equals the geographic location of a square or squares? Yes. A site represents a sub-sample protocol within a square? Yes, occasionally.

(2) We have substantially edited the text which we hope addresses these issues, also hopefully the new figure 2 will hopefully assist with understanding.

(3) New Figure 2 and edits in Section 4 and Figure 1.

(1) In some cases a site includes or coincides with a priority habitat. How does the reader keep up with these various interpretations? The authors should help all of us by declaring their terms up front.

(2/3) We have revised the text throughout and hope the edits clarify these issues.

(1) Lowland heath and calcareous grassland regions had 4 m2 X-plots at every point of the 25- element squares in the lowland heath but at only 5 pre-selected spots of the 16-element squares in calcareous grasslands (lines 333 to 335)? Larger 200 m2 X plots (unfortunately, as in line 347, also called X-plots), occurred in upland and coastal environments (line 340) or in upland and calcareous grassland sites (line 343) but not in lowland heath? In upland environments, these 200 m2 X plots occurred at 5 pre-determined points of the 25-element squares, while in coastal and calcareous grassland environments the X plots occurred at 5 pre-determined points of the 16- element squares. Five small Y plots occurred anywhere within upland, coastal and calcareous grassland squares, at the discretion of surveyors for random deployment?

From this text we understand that calcareous grasslands had X plots, X-plots and Y plots, but these verbatim text extracts contradict what we read in Table 3. Trying to specify these sampling strategies in narrative text allows this confusion to arise. Replacement of, or perhaps supplements to, Figures 2 and 3, could go a long way to clarifying these various options. One could even show hypothetical boundary and streamside features? Rather than reproducing dull graphics from old reports, a small effort to produce fresh inclusive graphics could have a large positive impact?

(2/3) 'and calcareous' removed, line ? New figure 2 inserted to clarify.

(1) On lines 356 to 358 the authors defend the CSS sampling approach. In truth, 25 years out, what could they change? Today, faced with complex 2-D biophysical patterns of plant abundance, one would develop a hypothetical species distribution (including pseudo-absences) based on slope, exposure, elevation, etc., compare or perhaps validate such distributions with remotely sensed colour or radiance data, then apply various tools (principle component analysis, cluster analysis, etc.) to develop a (one hopes) statistically valid sampling strategy. A question here, which perhaps the authors can't answer but should at least address, has to do with how different a strategy one could or should apply if one repeated this work now or in the immediate future.

(2) Yes, one might go about things differently if one were to start the survey from scratch. However, the key aim of the sampling framework, heavily based on the ITE Land Classification, is that it provides an objective and static sampling framework, independent of specific environmental indicators being measured. The stratification of the ITE land classification partitions the region on question (GB) into distinct classes representing the key environmental and topographical spatial variation. As the under pinning data used in the classification is static over time, the classes themselves will not change and repeat surveys and repeat analyses are possible and easily comparable. The consistency in sampling protocols is crucial for robust, repeat analyses.

Thank you for the suggestion above. However, as the suggestion requires information regarding vegetation (the key variable being sampled by the survey), it would not create a stable sampling framework for long term monitoring – i.e. the stratification might change over time. It would not be statistically valid to stratify the sample based on the variable being sampled. This would prove ineffective in detecting serendipitous events or significant change points as the sampling protocol would effectively be confirming the original species distribution model. In addition to this, when up to 2000 species are recorded over the survey alongside many more environmental indicators, it would be unclear how a single "species distribution" would help our sampling protocol – where one may sample for one species/indicator one may not wish to for another. We suspect this approach would require a vast increase in sample sizes.

With long term monitoring, the repeated use of consistent, established methods are essential in extending the time series of data despite more modern designs perhaps being preferable if we were to start again.

In terms of analysing the data, yes, there are many new techniques which could be utilised. However, the aim of the paper is to highlight the existence of the data, not accomplish an exhaustive analysis of every possible scenario. Data users are welcome to attempt novel analyses as they wish. In the event of a repeat survey, it is likely slightly different questions would be addressed to those addressed in the 1990s.

(3) Amended lines 479-484 to 'Whilst it is acknowledged that with the increased quality and availability of digital data, the masks could be improved, a key aim of the sampling framework (heavily based on the ITE Land Classification) is that it provides an objective and static sampling framework, independent of specific environmental indicators being measured. As the underpinning data used in the classification is static over time, the classes themselves will not change and repeat surveys and repeat analyses are possible and easily comparable. The consistency in sampling protocols is crucial for robust, repeat analyses'.

(1) An essential question, hinted at (lines 410 and 411, lines 560 to 563) but not discussed in detail, arises: to detect and quantify change over 25 years, and admitting that one could today produce better masks for most of these vulnerable land cover types, would one necessarily repeat the exact analysis based on updated masks, go back to the same sites (at several points the authors mention 'permanent' markers evidently in anticipation that they or colleagues would return) or build a statistical model that would allow direct connection of today's or tomorrow's survey outcomes to these "baseline" data from 1992 and 1993? Scientific urgency accepted, logistically could we accomplish a repeat survey today? Sad to think not, but certainly presentation of this data carries with it the responsibility by these authors - beyond defending their own approaches and outcomes - to offer readers such an assessment?

(2) As above. Logistically a repeat survey would cause few problems. In order to extend the time series consistently, the same sites could be revisited and changes could be analysed in a range of different ways. The methods utilised in the survey are well established, published and described in such a way as to be highly repeatable.

Whilst the site locations are confidential, there are few (arguably no) other organisations in Britain placed to undertake such a large, national ecological survey as the Centre for Ecology & Hydrology. Any follow up survey would necessarily be large and logistically complex. In the event CEH was not able to undertake another survey, appropriate arrangements would have to be made to transfer the substantial resources relating to the survey, including the site locations, to a suitable third party.

(3) We have rewritten Section 4 to insert the following 'With maximum resource, the ideal survey methodology would follow exactly the methods of the Countryside Survey as described in Wood et al. (2017) and Wood et al. (2018) in order to obtain the most comprehensive dataset for a full understanding of the landscapes in question. In terms of the land cover and boundary data, this would mean that the whole of each 1km survey square site would be fully mapped with landscape point, line and area features. Whilst the grid based approach has the potential to save time in the field, much information regarding structure and pattern is lost. A further assessment of alternative methods is described in Wood et al. (2018). In terms of the vegetation data, the approach taken has been proven as being highly effective for assessing the quality of vegetation at a national scale, as described in Wood et al. (2017)'.

(1) Although the authors at several points in the abstract, introduction and conclusion mention the importance of the rare and perhaps disappearing plant communities and micro-environments as anchors of floral and faunal biodiversity, data presented here address only flora, not fauna. After repeatedly mentioning the relevance to birds, insects, amphibians, etc., the authors should admit and caution that this data includes only macro-vegetation? Although this reviewer found only plant species lists in all data files, I couldn't help feeling somewhat disappointed after the text had led me to understand their impact more broadly beyond only the vegetation.

(2) Clearly stated in the abstract: 'with information being collected regarding vegetation species, land cover, landscape features and land use'.

(3) Have clarified in the Introduction, line 61, 'information being collected regarding vegetation species, land cover, landscape features and land use'.

(1) This reviewer happens to know a few details of the Countrywide Survey. Most readers and data users will not. This data, addressing a provocative topic, could serve as enticement for researchers to turn to the larger longer records of the Countrywide Survey? Although this manuscript mentions intersection between the Countrywide Stewardship Scheme (designated CSS but the authors only use the acronym twice after the initial definition) and the Countrywide Survey (designated CS) multiple times in nearly all sections, we never gain clear understanding of a) how the two activities fit and b) of how the two survey activities differ.

We know that Countrywide Survey conducted 5 mappings from 1978 to 2007. We know that those surveys missed - knowingly - the rare, unusual and/or threatened landscape features addressed by this CSS survey. We know that the same team of researchers conducted both surveys!

We know that the Countrywide Survey recognised and corrected some methodological and terminology discontinuities in the interval between their 1990 and 1998 surveys. We know that both surveys relied on similar base data, sampling strategies, quality control procedures, data entry processes, etc. I itemise uncertain or confusing CS to CSS intersections in my detailed comments below but a basic observation applies: these authors never help us as readers understand clearly how the two mapping activities fit together. They could consider a table itemising similarities and differences?

(2) We have clarified these issues in a new table, Table 1.

(3) Inserted new Table 1.

(1) The shapefiles of the land use masks, referenced under this doi: https://doi.org/10.5285/dc583be3-3649-4df6-b67e-b0f40b4ec895, work well. I can open them with QGIS, view the database, understand

presence / absence (1 / 0) structure, all good. I could, with time, reproduce landscape mask backgrounds as in Figure 1.

(1) Survey sites remain hidden, not an acceptable trade-off in the opinion of this reviewer but too late to argue that point. The data files, under this doi: https://doi.org/10.5285/7aefe6aa-0760-4b6d-9473-fad8b960abd4, prove worse than useless. Their dismal quality and information should immediately earn a rejection from ESSD. If I didn't know other work by and good intentions of this group, I would recommend outright rejection. In not one of the seven .csv files do we find any metadata, units, explanations of headers, etc. One might expect, based on the sample design described extensively in the manuscript, to find some mention of squares. Never, not once, not even in the file with the word SQUARES in its filename. SERIES_NUM represents the sole common variable (column header) among all the files. Nowhere, not once, do we get an explanation or definition. How does SERIES_NUM relate to squares? No hint, no idea. We get - scattered across various files - GRIDCODE, HAB_TYPE, SP_LINK, HABT, HABT_DESC, LUSE, REP_ID, QUAD_TYPE, REP_CODE, PLOT_SIZE, SPECIES, COVER, SPNO, BRC_NUMBER, BRC_NAMES with nary a definition, unit, explanation, external link, etc. Under PLOT_SIZE we find countless 2x2 (metres, presumably, but zero explanation of any codes or units) and many 1x10 (presumably streamside or roadside but not one hint) but only (in my spreadsheet count) 238 14 x 14 (200 m2) large plots. But according to Table 3 we should find 241?

Under PLOT_SIZE we find 351 1x10, while in Table 3 we should find 361? For 2x2, PLOT_SIZE gives 1297 values while Table 3 gives 1282. Nothing matches, no units, no explanations, even the file names leave us guessing. BD means boundary? LC means land cover? PLOT means? No readme files, no metadata lines at the top of the files, no explanations in the text. Useless.

(2) A range of supporting information is supplied with each dataset, accessible from the DOI landing page. Data files and metadata files deposited with EIDC are stored and provided separately. The DOI for each dataset links to a landing page, from which the links to both the data download and document download are displayed clearly in the 'Get the data' panel on the right-hand side.

EIDC will not accept or publish any dataset without adequate supporting information as described: http://eidc.ceh.ac.uk/deposit/supportingDocumentation

(1) A competent reviewer would expect to find an easy path to reproducing and checking the shaded bolded values in Table 4. This reviewer finds absolutely no chance to accomplish that check. Data **not** ready for public display or use, the authors should withdraw them in embarrassment. Start from a well-described well-documented easy-to-use spreadsheet that you would find personally useful and feel proud to share - if you need a nice example look at what your neighbours over at UEA do with their very complicated but very accessible annual global carbon budget spreadsheet - then break that down into clear easy-to-reassemble .csv files with abundant metadata headers in each. You might need one composite product for features and a second for species but ideally readers and users would find easy close links to allow us to match species to features as you do. Give us detailed readme files and a detailed description with instructions in the text. Use an example Excel file if needed, to show how the .csv files work together. Extremely disappointing as presented, not up to standards of this group or of the journal.

(2) See comment above. We have also provided a Supplementary Table S1 to demonstrate the translation of field codes to the land cover codes of the original project and the new standardised UK Broad and Priority Habitats.

(3) New supplementary table S1. Edited Section 6.1 for clarification.

(1) Specific concerns (almost too many to itemise)

(1) Line 30, climate change included as a possible forcing factor, but lines 45, 46 climate not included.

(2/3) Added to lines 45

(1) Line 50, introduction to landscape types addressed by the CSS: Countrywide Stewardship Scheme. The authors introduce the term 'key habitats' in quotes but the reader does not know whether that phrase came from the original contract language or represents a deliberate usage by these authors. Some definition of terms here would help!

(2/3) Clarification inserted lines 73+

(1) Line 52 reference to Countryside Survey of 1990 but, due to time needed to compile and assess 1990 data from the Countrywide Surveys, features or outcomes from that 1990 CS mapping that might have proved relevant to these CSS surveys probably did not emerge in time to inform 1992 and 1993 surveys? Also strange to read about river valley and waterside landscapes as apparently covered in the CS (not in my memory but I focused on linear features of CS) but not in this survey when in fact later (lines 375 to 380) these authors discuss and define their S/W (streamside / waterside) survey efforts. Here we first encounter pervasive confusion about how CS and CSS fit together.

(2) Data from Countryside Survey 1990 was used in order to inform the original reports for this Key Habitat survey, in particular a separate report covering the river and waterside landscape, using CS data from a river and waterside mask. This was possible because these data were collected using the same methodologies. However, as these data from CS 1990 have already been published and described separately, it is not relevant to repeat the information in this paper, other than to point out that it is available.

The recording of waterside plots (S/W plots) from within the other landscape types (lowland heath landscapes, chalk and limestone grassland landscapes, coastal landscapes and upland landscapes) is a separate issue, hence the description in the paper.

(3) We have removed references to streamside landscapes for clarification.

(1) Lines 57 to 60, here we gain a relatively clear statement of the different mandates for CS and this CSS but then we encounter the unhelpful phrase "utilising comparable methods". Good! Which? How?

(2/3) Line 60 added 'as described below'. New table 1 inserted to clarify CS and KHS methods.

(1) Lines 77 to 79: refers to "studies carried out in the last Century" but includes a reference (Steven 2007) from the present century?

(2) Thank you for pointing this out,

(3) Changed to 'last 50 years'.

(1) Here also we find the familiar pattern of a sequence of references correctly punctuated within but missing punctuation (spaces) between. Reviewers see this often - a consequence of the imperfect merger of automated reference software with document software. Better that the authors correct the problem throughout the manuscript now rather than assume they or the typesetters will catch everything later at

proof stage? As a reviewer who sees these small typos often, they suggest to me rather casual attention given to the quality of the product as submitted.

(3) Corrected.

(1) Lines 82, 83: designed to "integrate" with the Countryside Survey. Good again, but how?

(2/3) We have made frequent corrections throughout to emphasise the relationship between Key Habitat Survey and CS.

(1) Line 93: Here the authors provide a careful and accurate list of "landscapes", avoiding the term 'habitat' entirely. Here again they could define for the reader the terms they will use, including 'site' and 'habitat', throughout the remainder of the manuscript. And, one hopes, follow that precise terminology themselves?

(2/3) We have edited the introduction and have also made frequent corrections throughout to clarify these issues.

(1) Lines 98, By capitalisation here we understand these terms to derive from some other official or semi-official source. The Countryside Survey? Other structure or activity?

(2) Yes, these are JNCC Broad Habitats (Jackson, 2000)

(3) Reference inserted.

(1) Line 108, Again capitalisation indicates some formal UK-based designation, but the authors provide no attribution.

(2) As above.

(1) Line 115, The four-digit numeric codes introduced here refer to the EU Habitats Directive or to an internal UK or CEH code?

(2) Yes, EU Habitats.

(3) Inserted 'Annex 1 Habitats', line 115.

(1) Lines 115 to 117, Appreciate the precision of the species names here but also give us the common names of these heather plants? An example of understanding the interests and needs of a wider range range of potential users?

(2) These are the official terms for the EU Annex 1 Habitat classes, as quoted in Romão (2013) therefore we do not think it appropriate to add in the common names.

(1) Line 150, Four-digit codes again, they must derive from the EU Habitats list but the reader should not need to guess?

(2) The sentence clearly says 'In Annex I of the EU Habitats Directive, the following are included: 6210/6211..'

(3) This seems clear - we are not sure how to clarify this any further.

(1) Line 179, UK Biodiversity Action Plan, another source of terms and definitions?

(2/3) This relates to the UK Broad and Priority Habitats which have been clarified throughout.

(1) Line 181, "special responsibility"? What does this mean in a UK or EU context? Will the UK now abandon these 'responsibilities'?

(2) Special responsibility means that the UK holds a large proportion of the specified resource in Europe.

(3) Clarification inserted, lines 203

(1) Lines 194 to 197, In these few sentences certain plant communities have "restricted distribution", but then "diverse geographic distribution", which somehow renders them "distinctive"? Assuming the authors have some valid points to make here, they have failed.

(2/3) Sentence deleted

(1) Lines 212 to 214, Here we read about consistency among sample designs but we get no details and no explicit mention of CS?

(2/3) Lines 214 amended 'The methods are utilised in the national Countryside Surveys 1978-2007 (Carey et al., 2008) and also the recent Welsh Glastir Monitoring and Evaluation Programme 2013-16 (Emmett and GMEP team, 2017). The methods have also been successfully deployed in a range of British regional surveys (Wood and Bunce, 2016;Bunce and Smith, 1978;Wood et al., 2015). A comparison of the sampling approaches used in both the Countryside Survey and the Key Habitat Survey is given in Table 1.'

(1) Lines 215, 216, An almost identical sentence appears in ESSD-2017-121 to describe the CS sampling design?

(2) Yes, because as described, the methods are the same.

(1) Line 221, Use of the terms designation and non-designation before the reader understands the meaning or distinctions!   Line 222, Finally, a useful definition of the term 'designated'! We should have had this definition up front, at the top of the narrative.

(2/3) Addressed in comment further up.

(1) Table 1, line 279 - here we have ITE Land Classes with two-digit codes? If the authors need us as readers to understand these codes, give us an appendix table that lists them and their criteria?

(2) It is not necessary not understand the codes, other than to understand, as described, which classes are Lowland and which are Upland.

(1) Line 243, as in Table 1, ITE not defined? Most readers will wonder who produced what, a UK soils / landscape product?

(2/3) ITE now defined earlier in text as addressed in comment further up. Additional detail regarding ITE Land Classification provided in Section 3.

 (1) Line 255, confused by the use of the term 'solid' in this context? Standard term from BGS categories? But reference to "drift deposits" (line 256) suggests unconsolidated soil features, different to 'solid' sedimentary limestones? Perhaps slight confusion here?

(2) 'Solid' refers to bedrock, overlain by superficial deposits (formerly known as 'drift' by BGS), the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 2.6 million years from the present.

(3) 'Bedrock' inserted, line 299.

(1) Line 285, What constitutes the variation to the Survey methods? Not the 1 km squares used by both CS and CSS. The within-square grid points and their application to lowland vs upland landscapes? The authors may understand these 'variations' but the reader does not.

(2/3) We have inserted a new comparison table, Table 1 to clarify.

(1) Line 297, This sentence implies that CSS used the land use and land cover codes from CS 1990. But we know that CS revised its codes and terminology after 1990? Which specific codes? All? The features codes? The linear feature attributes? Again the authors presumably know these various codes and their use in both CS and CSS but readers do not! Line 301, "supplied as supporting information with the data sets"? Where? Needed but missing!

(2) CS did not revise its codes after 1990 – the recorded codes have largely remained the same, with additions and improvements. Issue of supporting information addressed in previous comment.

(1) Line 307, As written, the sentence refers to nearest vertical boundary taller than 20 m. Even in old England most hedges do not rise above 20 metres. The authors mean vertical features including fences with horizontal extents greater than 20 metres.

(3) Inserted 'in length'

(1) Line 316, We go from section 4.1.2 to 4.3. What happened to 4.2?

(3) Corrected

(1) Line 341, Random not in the sense of at the discretion of the mapping team but random in the sense of five pre-selected randomised points of each grid?

(2) Yes, correct.

(3) Amended line 342 to 'Five plots were placed at pre-selected randomised points on a grid within the squares'

(1) Line 397, Should we understand 1km as lower resolution than other surveys or higher?

(2) Lower resolution

(3) Added '(higher resolution geological data were in existence)' to line 467.

(1) Lines 422, CS made extensive and quantitative use of these repeat visits. Here the repeat visits deserve mention but seem rather casual. No assessment of quantitative difference between initial visit and subsequent visit? Does this represent a difference between CSS and CS?

(2) The results from the QA exercise were unpublished but suggest a 72-76% accuracy in the recording of vegetation plots.

(3) Information inserted into section 5.2.

(1) Line 429 and elsewhere: "permanent"? For what purpose? Anticipating a potential future resurvey?

(2) Yes, correct.

(3) Inserted into line 432, 'These steps were taken in order to facilitate any potential future visits to the plots'.

(1) Lines 451, 452: "previous intensification of agriculture"! Do the authors draw this conclusion from the outcomes of this CSS? I don't doubt their attribution of agriculture as a cause but do they have other evidence to point to?

(2/3) Reference inserted, Chamberlain et al. 2000

Chamberlain, D. E., Fuller, R. J., Bunce, R. G. H., Duckworth, J. C., and Shrubb, M.: Changes in the abundance of farmland birds in relation to the timing of agricultural intensification in England and Wales, Journal of Applied Ecology, 37, 771-788, doi:10.1046/j.1365-2664.2000.00548.x, 2000.

(1) Table 6: Where did these 'habitat indicator groups' come from?

(2/3) Additional text to explain. Lines 595- 600 rewritten to clarify Habitat Indicator Groups.

(1) Why do we now discover, for apparently the first time, the terms 'main' vs 'habitat' applied to calcareous grasslands?

(2) These are alternative terms for plot types – agree they should be consistent.

(3) Amended 'main' and 'habitat' for 'X plot' and 'Y plot' in Table 9.

(1) Similar question for Table 4: where did the 'Broad Habitat' categories come from? As in table 4, apparently most of the information in table 6, other than a few columns of a few select rows, comes from the Countryside Survey? But in table 4 the footnote indicates that only the all-England values (columns 2 and 3) derive from CS. If true, where does all the additional information conveyed in tables 4 and 6 come from? If this information shows the integration of CSS within CS, the authors should make that point more clearly? Here we finally might gain some context for the CSS work but the authors withhold that information from us?

(2/3) We have updated information regarding Broad Habitats throughout. Captions edited.

(1) Figures 3, 4: dismal. Evidently copied straight from prior reports. Exert some graphical effort and creativity here? Redraw Figures 2, 3 and 4 to some new combination that shows us X-plots, X plots, Y plots, S/W features, etc. You would need to move some text from narrative to figure legend but by doing so you would improve both the narrative and the figures?

(2) New figure created.
(3) Figure 2.