The
UK Terrestrial Biodiversity Surveillance Strategy

A model of levels of sampling to drive the evolution of sampling schemes

A model of levels of sampling to drive the evolution of sampling schemes

1. How sophisticated a model do we need to help influence sampling choices?

1.1 The 'Vegetation Sampling Workshop' participants recognised that the several scales of vegetation/plant sampling undertaken in the UK interact, and made several attempts to design a 'hierarchy' that could help the investors/users involved to make good judgements as to what the different scales could deliver, and where to modify, change or put effort in future.

1.2 The expectation of a hierarchy could be that it operates in considerable detail, looking at the actual deployed sampling and uses analytical techniques to see how well it performs at answering different questions, or it could be a logical tidying up of the current sampling to present it as a linked whole.

1.3 The purpose of this paper is to test the hypothesis that we can develop a set of levels that bring together scientific principles, and the experience of sampling so far, to provide a fairly simple tool for testing proposals and the approach to existing sampling to see if modification or addition would help meet need rather than duplicate or prove to be an inefficient way of answering questions.

2. Questions we (collective sum of policy/conservation) are trying to answer

2.1 Which pressures are impacting on biodiversity? how significant is the impact? and what are the most likely drivers of these pressures? This is a horizon scanning task to extract from the observed change in biodiversity the actual impacts of each generation of driver causing pressure in the environment.

2.2 The question following 'detection' becomes: is the link to pressure/driver clear enough for the people best-placed to act, with a scale of policy response best-suited to tackling the driver? *i.e.* have we localised, characterised, quantified the impact enough to allow policy action to occur or be planned?

2.3 For practical land management knowing the general pressures may not be enough; individual land use decisions and people involved in them may still need site-specific evidence to support the decisions. Here the question is: if the desired condition for the land is not being achieved, which pressures are acting, and what specific action should we take?

2.4 Focussing on managing the impacts of change in the environment is accompanied by needing to know if we get the conservation outcomes we are aiming for – retaining semi-natural habitats in reasonable quality, both as patches, and at landscape scales, and retaining species (allowing for a range change under climate change). This requires a broader scale of sampling than site-specific management decisions, and hence the requirements will sit at a higher point within the sampling hierarchy.

3. A suggestion for a model

3.1 *Level 1* Discovering what is happening at the habitat patch and landscape levels. Gross change related to questions under sect. 2.1.

- As a context to species and habitat sampling we need to know if the impact of any drivers is either gross land use conversion or changes in patch size, connectivity needs, densities of different habitats at different scales *etc.*

- The first level of sampling is to pick out this habitat land cover change signal, preferably across the land surface as it would give great flexibility for sub-sampling at other levels.

- The test is whether we are getting a repeatable reasonable resolution (*e.g.* 25m accuracy) picture of habitat land cover (at reasonable habitat class level), including mosaics, transitions, whether through sampled or more extensive (*e.g.* satellite techniques).

3.2 *Level 2* Change discovery and first-cut attribution level. This relates to a finer level of detail within the sect. 2.1 questions.

- The job of this level is to find the cheapest effective way of getting reasonable correlations across pressure gradients, within habitat types, and to pick up and eliminate seasonal/year differences. Its purpose is discovery or confirmation of predicted change (given prediction will build up as a tool).

- It is the level at which you try and build in the sampling replicates for habitat, and environmental gradients to have something very likely to provide evidence whatever the change.

- This may be best done by high numbers of sample locations, based on cheap repeatable samples, with a high frequency (annual to 5 yearly), using a broad basket of species but optimised by identification reliability/repeatability, time in field cost.

- The discovery level aims to sample things that do not yet have any known indicator value, *i.e.* a basket of species, so that we do not miss effects that have not been anticipated (*e.g.* bramble in woodlands *etc.*).

- The discovery level may need the ability to pick up the surprise effects of combinations of pressures on the environment – *i.e.* some element of many variable sampling, but unless this can be significantly cheapened many variable sampling can never be representative of the multiple habitat/pressure combination likely to occur.

3.3 *Level 3* 'The condition assessment level'. This relates to the questions posed within sect. 2.4.

- The next most pressing need for information after ensuring we can pick up change is knowing the condition of semi-natural habitats and how this changes, similarly some condition and change is needed in intensive landscapes as we need them to retain some biodiversity.

- At this level the state of biodiversity is closely related to questions about priorities in action and whether responses (*e.g.* SSSI , agri-environment, BAP) are having an impact.

- The third level is mainly about stratified repeatable sampling of habitat groupings ensuring appropriate representation of land affected by the different responses (SSSI, agri-environment, *etc.*)

- The third level does not have to take into account being able to pick up widespread pressures as the first level is doing that.

- So the third level can focus on cut down sampling more targeted at picking up useful ecological states of the sampled habitat – *i.e.* closer to the idea of the small number of sensitive species, and frequency in the sampled surveys.

3.4 *Level 4* Confirming pressure/driver/biodiversity relationships to back or obtain a policy response. This level aims to answer the questions within sect. 2.2, and depends on the requirements of a particular policy.

- Providing better evidence of the scale and impact of a particular pressure to support a policy (excluding specific site-based response).

- The first step looks like a synthesis of available evidence, and if necessary a re-analysis, or combined analysis of any sampling (biodiversity and pressure) data sets that could help provide evidence.

- If the first step does not provide sufficient evidence the next step is to consider how to get the evidence and options include the following. The decision is informed by the nature of the question/evidence so far, and the cost of these alternatives.

  1. Looking at an obvious gradient for the pressure and doing short duration surveys to pick up variation along the gradient and use this to understand relationships. We can consider using Europe *i.e.* not just UK to find a gradient along which we can measure.

  2. Experimentation.

  3. Supplementing the first two levels of sampling for a short time.

3.5 *Level 5* Supporting site level decisions. This supports answering the questions within sect. 2.3.

- Providing evidence to support action at a site level *i.e.* proving that a particular pressure, or set of pressures (management actions *etc.*) are the ones driving change at that place.

- This is deploying the most cost effective sampling to pick apart the problem at the site and should rely heavily on indicator species – things closely associated with the way each pressure might be expressed.

- The key point is that site level proof is not a long term sampling problem.