



A response from the British Ecological Society to Defra's "Net Gain" consultation

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1. Should biodiversity net gain be mandated for all housing, commercial and other development within the scope of the Town and County Planning Act?

Yes.

The UK is considered to be a country with significantly degraded levels of biodiversity, compared to the rest of the world. Between 1970 and 2013, 56% species for which we have sufficient data were shown to have declined; of 8000 species assessed, 15% are extinct or threatened with extinction from Great Britain¹. The State of Nature Report identifies urban development as one of the drivers of this decline¹, and as the Impact Assessment shows, land use change from non-developed to developed uses is significantly higher for non-residential uses². Development related impacts stem from both large-scale developments, and smaller developments that individually do not threaten species' persistence, but that cumulatively lead to "death by a thousand cuts"³.

A robust and ambitious net-gain framework that captures all development requiring planning permission can, therefore, help prevent these losses and contribute to, for instance, 25 Year Environment Plan (25YEP) targets relating to habitat restoration and creation that feed into the delivery of a Nature Recovery Network.

It is also important that this approach is mandated. Currently biodiversity net gain is on a voluntary basis, which leads to an inconsistent approach. In the evaluation of the Defra offsetting pilots, all but one of the pilots concluded that within a voluntary system existing policy was not sufficient to support biodiversity offsetting, particularly for lower value habitats. All of the pilot hosts and Natural England advisers considered that a mandatory approach would be more likely to lead to no net loss being achieved.

2. What other actions could government take to support the delivery of biodiversity net gain?

Spatial plans to guide net-gains

There must be a careful balance between ecological and social objectives, although trade-offs may arise when deciding the location of net-gain sites. Nevertheless, improving ecological connectivity at a landscape scale is necessary to significantly improve the overall status of biodiversity in England. Therefore, to achieve the overarching objective of biodiversity net-gain across England, there must be a drive towards utilising some net-gain sites to create bigger, better, more and joined habitats that enhance ecological networks at both a local and national level⁴. Such an approach could help deliver aspirations within the 25YEP for habitat restoration and creation via a Nature Recovery Network and would need to be guided by spatial maps that identify target locations. To ensure that these maps are in place and covering the appropriate spatial scales, it may be necessary to amend planning legislation and/ or policy so that local authorities are required to do so and to work together where necessary. This may require amendments to planning legislation such as the Planning Act 2008, via the forthcoming Environment Act.

Local authority ecological expertise

As the arbiters of planning applications, local planning authorities must have the expertise to assess applications in respect of their potential harm or benefits to biodiversity, thereby ensuring

adherence to the mitigation hierarchy. However, most local authorities lack an in-house ecologist or ready access to one⁵. In the absence of sufficient ecological capacity and expertise, there is a serious risk that the mitigation hierarchy will be undermined resulting in worse outcomes for biodiversity. In addition, without ecological expertise, local planning authorities will also struggle to maximise any potential benefits from the strategic location of offsets in line with conservation priorities.

Access to data

It would be helpful if there were mechanisms to ensure that data collection organisations, such as Local Environment Record Centres (LERCs), the National Biodiversity Network, and the Biological Records Centre, provide core services to Local Planning Authority ecologists. The alternative would be to set very clear requirements for when a data search will be mandated and to make this part of the validation for an application.

6. Do you agree that the Defra metric should allow for adjustments to reflect important local features such as local sites? Should the Defra metric consider local designations in a different way?

It is important to ensure that nationally important habitats or sites hosting nationally important or threatened species are replaced with the same habitat, in the event that these sites are developed at all (in line with the requirements of the Nature Directives and the NPPF). Generally, there should be a presumption in favour of like-for-like net-gain habitats, where they relate to the loss of a high-value habitat. Where this is not possible the replacement habitat should be of at least the same value. To achieve this, there must be national guidance based on robust ecological evidence that sets out minimum values for a range of habitats. However, there may, for instance, be urban local authorities in which certain habitats are relatively more valuable by virtue of their local scarcity. In these circumstances, if there is robust evidence of scarcity and/ or local social value, it may be acceptable for local authorities to attribute higher values to certain habitats.

To ensure the robustness of this process, we would recommend that national guidance sets out clear criteria for locally 'uplisting' habitats. Furthermore, we would recommend that all local authorities are required to produce a Local Plan document that sets out any deviations from national standards, alongside spatial plans for delivery. These plans should be subject to the same levels of scrutiny and public consultation as all other Local Plan documents.

10. Is the Defra biodiversity metric an appropriate practical tool for measuring changes to biodiversity as a result of development?

A standard metric for net-gains would allow net-gain schemes across the country to be compared and evaluated, and improvements made to the metric over time. Metrics are used in compensatory projects around the world and, if well-designed and flexible to future change and development as knowledge progresses, they can be an effective way to quantify impacts on biodiversity. However, there remains a lack of evidence that the Defra metric can provide the desired outcome of net-gain to biodiversity as it is based on very general habitat criteria. Empirical evidence is still needed to demonstrate the improved metric's effectiveness at safeguarding biodiversity and increasing the distribution of wild species and their habitats, rather than simply its ability to be applied.

Despite its imperfection, the improved metric proposed by Defra represents a positive and progressive move towards addressing the serious issue of balancing economic development with the preservation of biodiversity.

Adhering to the mitigation hierarchy

Re-creating or restoring complex natural processes is inherently difficult and full of risk. We are unaware of any studies demonstrating either net-gain or no-net-loss from national offsetting or net-gain programmes, in contrast to numerous studies demonstrating net-losses of biodiversity^{6,7,8,9,10,11,12,13,14}. This is why it is so critical to adhere to the mitigation hierarchy, and why the first stage of impact avoidance is often considered to be the most important stage of the hierarchy^{15,16,17,18}. Furthermore, preventing harm in the first instance avoids the potential for negative social implications of removing nature from one location and replacing it elsewhere¹⁵.

Crucially, multipliers should not be used to compensate for situations where there is a risk of offset/net-gain failure. In such circumstances, the precautionary principle should be applied and where there is demonstrable loss of biodiversity, the proposal should be refused in line with the mitigation hierarchy. We recommend that future government guidance, in respect of net-gains, contains clear guidance on how to implement the mitigation hierarchy.

11. What improvements, if any, could we most usefully make to the Defra metric?

Simplifying biodiversity into a metric

Biodiversity is a broad term and includes multiple variables at different scales, including: genetic, individual species, population, habitat and ecosystem variables¹⁹. Cousins (2015)²⁰ found the variables used in the Defra metric failed to reflect the actual state of biodiversity, potentially leading to inaccurate assessments when offsetting.

Cross-correlations

Within a metric, it is important to exclude variables that convey the same information as another variable, as variables are redundant if they show high cross-correlation between each other. Analysis for cross-correlations²⁰ revealed a strong relationship between the basic form of the Defra metric (i.e. distinctiveness x condition) and the habitat condition component of the metric, suggesting the metric could be simplified to habitat condition only (i.e. the metric would still convey the same information). That said, the correlation disappeared when additional multipliers for delivery risk and time discounting were applied, suggesting the metric is valid overall. Although there are merits to the simplicity of the metric, a more intelligent approach is needed, where the component variables should accurately reflect the various components of biodiversity and should be statistically independent of each other (i.e. not convey the same information).

Habitat distinctiveness

Not all Section 41 (NERC Act) habitats should be classed as High or Very High distinctiveness. Most importantly, newly-created arable field margins, and any ponds and eutrophic standing waters that do not include fringing habitat (i.e. reservoirs as commonly understood), should be classed as Low or Medium distinctiveness habitat as they are not suitable replacements for other species-rich Section 41 habitats. Moreover, habitats such as field-margins are relatively inexpensive, easy and quick to create, meaning developers are likely to choose their creation over other Section 41 habitats if given the option.

Habitat condition

Cousins (2015)²⁰ found the habitat condition part of the pilot Defra metric to be insensitive to variation within certain habitats. Following extensive field studies, woodlands, saltmarsh and brownfields across a number of sites in Essex were ranked according to specific biodiversity variables, including their species richness, evenness of species distribution and connectedness. The order in which sites were placed, in terms of value to biodiversity, was not matched by the Defra metric. This demonstrated that the condition assessment under the Defra metric can cause habitats to be undervalued. If applied to a real net-gain proposal, this would likely lead to the post-intervention sites failing to provide the target net-gain. In this regard, we welcome the new intermediate scores, which could help in theory, but will need to be assessed in practice.

Another problem identified by Cousins (2015) was the absence of condition assessment protocols for certain habitats, such as brownfield sites. The intention to supersede the current FEP methods is, therefore, welcomed. Prior to implementation, there should be clear guidance for assessing all common habitats of value found in England.

Using the habitat condition variable: safeguards are needed

1. The 'good' condition multiplier must only be available for post-intervention habitat if its management for wildlife outcomes is legally secured and funded in perpetuity. Without secure management, post-intervention habitat will over time average out at the same 'medium' condition we can expect for the average pre-intervention habitat. The ability to claim a x3 'good' multiplier when existing habitat averages x2 'medium' could create a major systemic bias that does not reflect reality.
2. Condition multipliers should not be available for some low-value habitats, such as gardens, amenity grassland and improved grassland, given the difficulty of these habitats to host significant levels of biodiversity. At present these multipliers would allow smaller areas of relatively species-poor land to meet the net gain requirements for large developments. For example, as currently specified, the metrics could potentially allow 35-45ha of 'good condition' amenity grassland to meet the net gain targets in respect of 100ha of developed arable farmland.
3. Baseline nationwide mapping of habitat condition could help to remove the incentive to degrade habitat (using legal means) prior to development, in line with the approach already adopted by Warwickshire County Council.

Strategic location and connectivity

The 'strategic location' and 'connectivity' multipliers should not be applied to post-intervention habitat: these multipliers are quite likely to reduce the benefits and efficiency of the net gain system.

The principle that some pre-intervention habitats are effectively irreplaceable and that the metric process is not able to deliver net gain after their loss (for example Ancient Semi-Natural Woodland and long-standing peat habitats), is reiterated in the main consultation but needs to be reflected more clearly in the metric and to be prominent in its outputs.

Post-intervention risk factors

The proposed metric could account for uncertainty in a more sophisticated way. Extensive work has been carried out on uncertainty in conservation, and this has recently been extended to offsets^{3, 6-14, 21}. While the proposed metrics rely on the use of multipliers and habitat banking to address uncertainty, they appear to have a loose scientific base, despite restoration ecology being a thriving area of research that has been the focus of increased interest over the past four decades¹⁶. Indeed, much of this research has been focused on habitats in England, which will likely be subject to net-gain proposals, and it has been put into practice to restore a number of degraded and destroyed habitats.

Uncertainty may not be constant throughout the timescale of a net-gain scheme, and so it is generally appropriate to assess and manage risks and uncertainty at each stage of a project to improve the likelihood of success. Crucially, multipliers should not be used to compensate for situations where there is a risk of offset/ net-gain failure. In such circumstances, the precautionary principle should be applied and where there is demonstrable loss of biodiversity, the proposal should be refused in line with the mitigation hierarchy.

Although a lot of ecological knowledge is currently available, there are significant areas where further progress is needed to ensure net-gain proposals can be informed by robust evidence both now and in the future. This requires sufficient funding for restoration ecology as a whole, and the lines between research and practice need to be strengthened to ensure any restoration project is supported by a broad evidence base.

Grasslands and wetlands have been particularly focused on as offset areas across the world, and there have been successes in offsetting these habitats. These areas have also been the focus of ecological research. From 1983-2003, 25% of restoration ecology papers in the *Journal of Applied Ecology* looked at grasslands²². Other habitats, such as biodiverse brownfield and greenfield sites, have not been as well studied or monitored. Further work to provide solutions and evidence to develop a robust foundation for managing uncertainty is required^{3,15}.

Risk factors: Time to target condition

Research²⁰ showed that the Defra metric's time discounting element did not adequately reflect the age and maturity of habitats studied. This should be revisited and improved upon before any implementation. At present, the metrics undervalue slow-maturing habitats, and this would have the effect of incentivising the creation of fast-maturing habitats. Scoring that reflects the value of their interim successional stages would help redress this problem.

Missing variables in the Defra metric

Although statistically independent, many of the variables within the Defra metric are poorly defined and did not reflect biodiversity measures collected by Cousins (2015). Further work may be needed; for example, the calculation of difficulty of delivery may require soil and other environmental variables to be measured and assessed; spatial risk requires bio-geographical information and time discounts may well have to be *ad-hoc* considerations²³.

Species variables: Although the categorisation of habitat type is inferred largely through the identification of plant communities; of the data collated for the metric there is no requirement for information on species composition. Data of this type, often NVCs, are routinely collected for

development sites that require Ecological Impact Assessments (EIA). Scientifically gathered information of this sort would be useful for initial condition assessment and would also enable the success of net-gain delivery to be monitored.

Genetic variables: Novel techniques could help bridge some of these gaps and new techniques are emerging to characterise the genetic composition of plant and animal communities at a variety of taxonomic levels²⁴ and these could play an increasingly important part in defining target communities for net-gain interventions. These ‘metabarcoding’ techniques use DNA obtained from a variety of sources including whole organisms, water, soil and parasites^{24,25,26} and can provide extremely useful information regarding assessment of (1) pre and post impact biodiversity at a site (2) the ecological equivalence of a proposed net-gain site and (3) the success of habitat restoration efforts. As science progresses, it is important that such advancements in evidence bases are considered to ensure that policy development is as robust and up to date as possible.

Other habitat variables: In addition to species and genetic composition, spatial attributes such as buffer and connectivity can be quantified using simple indices. Again spatial, bio-geographic information is already incorporated within EIA documents (e.g. the number and proximity of designated sites within a 2km radius) and could be incorporated into assessments. There is scope for the metric to be expanded to include the indirect and cumulative impacts of a development on nearby habitat.

Legacy effects: an unaddressed risk factor

To assess the full effects of a proposal on biodiversity, there needs to be further work to understand the complexity of ecosystems, particularly in understudied areas such as soils. The stability and function of terrestrial ecosystems are strongly dependent on the chemical, physical and biological properties of the soil²⁷, and the interactions that develop between above and below ground communities²⁸. Successful restoration of ecosystems to provide the desired function and services therefore relies on successful restoration of the soil environment²⁹. Evidence suggests that management history can have long lasting effects on soil chemistry³⁰, biology^{31,32,33} and structure^{34,35} and that these legacy effects can influence subsequent plant species composition³⁶ and limit the success of restoration schemes^{37,38}. Guidance is therefore required to enable practitioners to identify and, if possible, minimise the likely magnitude and duration of legacy effects on soils undergoing specific land-use changes³⁹.

Future engagement on developing the metrics

The BES would welcome the opportunity to engage in any process to review and update the Defra metric following this consultation, and we would support a formal mechanism leading to regular reviews of the metric and its outcomes.

12. Would a mandatory 10% increase in biodiversity units be the right level of gain to be required?

There is little supporting evidence to justify the 10% net gain requirement. The Impact Assessment (IA) for the consultation notes that 10% is merely ‘the lowest level of net gain that the department could confidently expect to deliver genuine net gain, or at least no net loss’, and figures from the IA project the £63.8M/year annual net spending on the system would deliver less than 8% of the

500,000ha 'Nature Recovery Network' target set out in the 25 Year Environment Plan. This target is a critical part of government aims to reverse continued environmental degradation, and the social and ecological damage this causes. The 10% proposal is also lower than several current local authority policies, such as the 20% net-gain required by Lichfield District Council.

According to the projections in the IA, the cost of providing net-gains is covered by the uplift in value associated with the granting of planning permission. Furthermore, the IA states that the uplift "is largely due to 'scarcity rents' rather than new goods or services of economic value being produced. *Therefore, this uplift can be dampened with no deadweight loss to productive activity*". This would suggest that there is scope to increase the 10% figure without it negatively affecting the viability of developments, in line with the experience of local authorities such as Lichfield. Given the potential ecological benefits of, for instance, increased funding going towards the Nature Recovery Network, it would seem reasonable to increase the 10% figure.

20. The provision of compensatory habitats will need to be guided by habitat opportunity maps. At what scale should these maps be developed?

- a. Locally (e.g. local authority or National Character Area)
- b. Nationally (i.e. England) as a national framework to be refined, updated and amended locally

Successful spatial targeting can increase the population of priority species, such as micro moths⁴⁰ and wild bumblebees⁴¹, through habitat creation. Spatial data that are relevant to net-gain needs to be mapped in an open manner, using consistent and compatible approaches at an appropriate scale to reflect local and national values. These should seek to link spatial planning for net-gain with the delivery of the Nature Recovery Network. Achieving this is likely to require both a national spatial plan and local spatial plans that are embedded within Local Plans.

Local maps should include associated information regarding species occurrence, abundance and conservation needs – including climate change impacts. Climate change should be a major factor in the design and implementation of a spatial approach to net-gain delivery. Achieving no net loss in biodiversity in light of future changes will require close links with scientific research to ensure that proposed ecological networks remain resilient and supported by realistic overarching strategies. Data on soil, topography and hydrology can help guide habitat creation.

21. What other measures should be considered to identify biodiversity and natural capital priorities?

Biodiversity is a crucial component of natural capital, particularly within agricultural landscapes⁴². Despite this, England has suffered from considerable human-induced habitat loss for wild species⁴³, with this being perhaps the biggest driver of biodiversity decline¹. Net-gain delivery should seek to prioritise habitat restoration or creation in locations that increase ecological connectivity and ecosystem resilience, in line with the Lawton principles of Bigger, Better, More, and Joined (BBMJ)⁴³, and a broad scientific recognition that the maintenance and restoration of connectivity at landscape scales is crucial for biodiversity conservation^{3,44,45,46,47}. Improving ecological connectivity is complex, but there is an increasing body of literature^{44,48,49,50} that can help guide strategies and prioritisation for doing so.

Ideally, strategies would draw upon on empirical observations of the movements of particular focal species of concern, but where data of this nature are sparse or not available, connectivity analyses must rely on models, coupled with human judgement⁴⁴. These models have benefited from considerable technological improvements in recent years, and while they involve a range of different theoretical emphases they tend to reach similar conclusions despite different assumptions and it is now possible to project the dynamics of multiple species across real landscapes^{51,52} - thus there is a strong empirical and theoretical basis for planning ecological networks³. Both of these approaches should be utilised and monitored when identifying priority locations for net-gain delivery.

24. Should there be a minimum duration for the maintenance of created or enhanced habitats?

Net-gains must be created, maintained and protected over appropriate timescales⁵³. This could be for at least as long as the 'impacts of the development', or in 'perpetuity'⁵⁴. It will, therefore, be necessary to define the temporal impacts of a development, and what is meant by perpetuity⁹. It may also be necessary to develop a uniform system of protecting net-gain sites via conservation covenants^{55,56}.

26. Would conservation covenants be useful for securing long term benefits from biodiversity net gain or reducing process and legal costs?

Net-gains must be created, maintained and protected over appropriate timescales⁵³. This could be for at least as long as the 'impacts of the development', or in 'perpetuity'⁵⁴. It will, therefore, be necessary to define the temporal impacts of a development, and what is meant by perpetuity⁹. It may also be necessary to develop a uniform system of protecting net-gain sites via conservation covenants^{55,56}.

32. How should the tariff revenue be spent?

- a. Locally (e.g. through a local authority)
- b. Nationally (e.g. through Natural England or another national body)
- c. Through a blended model, allowing spending at both levels
- d. Other, please specify

A blended model, with a small proportion of tariff revenue being spent on nationally significant projects (i.e. those that will make a major contribution to improving the status of biodiversity in England), and the majority being spent locally by local authorities, perhaps in working in partnership, would seem like a sensible approach.

43. Are there any issues or measures, other than those outlined, that we should take into account when considering how to monitor biodiversity net gain?

We agree that there is a need for oversight and monitoring of the net gain system. Accreditation of both survey and habitat providers will help to ensure the credibility and robustness of assessments, especially in light of low levels of ecological expertise in local authorities.

Monitoring of baseline biodiversity levels will also be needed to prevent habitat degradation prior to planning applications, or before creating and selling 'biodiversity units'. This is the approach taken in the Warwickshire offsetting scheme, where the type and condition of all habitat in the county has been mapped.

Scientific research could be used more effectively in net-gain assessment and delivery if policies and protocols provided clearer definitions and guidelines. Standardised definitions would allow the potential of projects to be assessed objectively, and their progress monitored on a comparable level. The use of different concepts and definitions in the current peer-review literature leads to difficulties in comparing the success of different offsetting approaches. Clearer guidelines for net-gains delivery will also lead to a reduction in the number of value judgements that need to be made, allowing scientific evidence to be applied more effectively.

The choice of baseline can influence the outcomes of any net-gain policy in England in terms of whether or when the objective of no net loss is achieved^{57,58,59}. A standardised baseline definition from which biodiversity loss or gains are measured is therefore essential for offset schemes to be assessed objectively. This will allow achievements in offsets to be quantified, and areas for improvement identified to make any net-gain policies in England more robust in the future.

Random sampling of net gain sites is unlikely to be enough. Sampling will need to be systematic and risk-based, explicitly designed to allow regulators an overview of the sector (one of the main recommendations for land use regulators from the Dame Glenys Stacey Review). All sites and their targets could be published on a public register to allow stakeholders to check their performance.

45. What technological or other innovative mechanisms could facilitate the delivery and monitoring of biodiversity net gain?

Climate change will have major effects on the design and implementation of net-gain policy. Achieving no net loss in biodiversity in light of future changes will require close links with scientific research to ensure that proposed ecological networks remain resilient and supported by realistic overarching strategies.

Novel techniques could help bridge some of these gaps. New techniques are emerging to characterise the genetic composition of plant and animal communities at a variety of taxonomic levels²⁴ and these could play an increasingly important part in defining target communities for net-gain delivery. These 'metabarcoding' techniques use DNA obtained from a variety of sources including whole organisms, water, soil and parasites^{24-26,60,61,62} and can provide extremely useful information regarding assessment of (1) pre and post impact biodiversity at a site (2) the ecological equivalence of a proposed offset site and (3) the success of habitat restoration efforts in the offset site. As science progresses it is important that such advancements in evidence bases are considered to ensure that policy development is as robust and up to date as possible.

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