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Eyes on Ecology

Biodiversity Net Gain: Biodiversity Simplified?

Biodiversity Net Gain (BNG) was introduced this year by the English Government and proclaimed as the solution to building houses while still protecting the environment. As the Scottish government gears up to adopt some aspects of the policy, it is worth asking whether BNG is really the panacea it claims to be. Can this policy really be the key to building new roads, solving the housing crisis, all while halting or even reversing biodiversity decline? Academics across the UK have been asking questions and the results suggest that the policy needs at least a little more work.

The basic premise of BNG is to require almost all new developments, from roads to housing to renewable energy developments, to provide a mandatory minimum of 10% biodiversity net gain secured for a period of 30 years. This biodiversity gain can be delivered onsite within the footprint of the development, offsite which includes all land outside the site boundary regardless of ownership, or through a new statutory credit scheme where biodiversity credits can be bought off the government to fulfil the 10% net gain requirement.

The first issue arises when we consider how to actually measure biodiversity. Biodiversity cannot be measured directly, instead we must infer from single attributes (e.g. invertebrate biomass and species richness), or more commonly from combinations of multiple attributes associated with biodiversity. These combination metrics are never perfect - they cannot capture all biodiversity so one must choose the most important factors, therefore becoming biased from the very beginning. However, there is no other way to measure biodiversity, an imperfect system is better than none.

In England, a national metric for biodiversity accounting, which will be used in the BNG policy and possibly adopted in Scotland, has been in development for over a decade. This metric uses area, distinctiveness and condition of habitats as a proxy for overall diversity. Habitats will include areas like woodlands and grasslands as well as linear features such as hedgerows and watercourses. The pre-development baseline calculation will then be compared to a future unit value. Higher values will be assigned to future

Importance of Invertebrates

There are over 1.25 million recorded invertebrate species in the world, which comprises 95% of the species in the animal kingdom. This is not simply a big group of species but also an important group. Many of the systems we rely on are provided by invertebrates. Without them, agriculture and the production of our food would cease. Invertebrates provide pollination (mostly by bees), and pest control through predators like spiders and beetles. They also drive decomposition and nutrient cycling by breaking up dead plant material or by feeding on microorganisms. Just think of earthworms – they are nicknamed gardeners' friends for a reason.

Yet despite the importance of these species many invertebrate groups are in decline. Terrestrial insects have declined by around 9% per decade since 1960. This is why it is so important the Biodiversity Net Gain policy takes the diversity and conservation of invertebrates seriously.

habitats which are easier to achieve, which will establish quickly after the end of construction, and are on, or close to, the development footprint. The projected post-development value must be at least 110% of the pre-development value. Concerns have already been raised about the extent to which the biodiversity metric accurately captures and represents the most important features of biodiversity. Many have pointed out the habitat approach will disproportionately negatively impact invertebrates, which are an important and broad taxonomic group providing us with irreplaceable processes such as pollination, nutrient cycling and decomposition.

One of the key problems of BNG is the simplistic approach to measuring habitat quality. Each habitat unit is defined on a scale from poor to good based on a checklist of habitat features, however this can oversimplify habitats. Many of the habitat condition checklists do not consider availability of flowers even though this is a key indicator of flower-visiting insect abundance and overall insect species richness. While other habitat checklists define features which are beneficial for invertebrates as poor. Under the grassland checklist, a habitat must have less than 5% cover of the following species to be considered a 'good' grassland - white clover, creeping buttercup, creeping thistle, common nettle and bramble. This fails to recognise the importance of these species to invertebrates; creeping thistle, bramble and creeping buttercup are among the most nectar productive plants on pasture and support pollinators throughout the season, while common nettle is associated with 123 invertebrate species in the UK. Yet, grasslands without these species are classified under the biodiversity metric as more valuable than those with them. Repeatedly the habitat condition checklists simply do not recognise features which support and increase the biodiversity of invertebrates, despite the fact that this group is already experiencing rapid decline.

Meanwhile, other important habitats are not assessed at all. Many habitats are deemed to not require condition assessments and have their conditions fixed at poor, but these habitats are not always areas of low diversity. This includes cropland habitats such as arable field margins, bracken grasslands and low distinctiveness urban areas. This is justified within BNG as the condition is said to have negligible effects on the overall value of these habitats. However, this does not seem to reflect the variety of biodiversity which can be supported in these areas. Any ecologist will tell you that arable field margins support important plant and insect assemblages, and even important assortments of scarce or declining farmland birds. Under some conditions, Bracken

Creating Diverse Arable Field Margins

Creating biodiverse field margins next to crops can be a less labour intense way to increase biodiversity in agricultural areas. On either side of the fence a 1-3m area should be left unploughed and unplanted, where tall grasses and wildflowers are allowed to grow. The field edge should contain tussocky grass and be cut about once every five years, only to control scrub encroachment. The use of pesticides in this area should be kept to a minimum.

The field edges will support birds, pollinators attracted by the wildflowers, and hedgehogs which will use the area to forage for invertebrates.

grasslands can have a mean species richness equal to that of a neutral grassland. There are many examples where habitats of these types are poor and do not support much if any biodiversity, but to say every example is poor is to ignore important complexity.

This is not the only complexity BNG overlooks. BNG has no mechanism to consider transitional and mosaic habitats. This type of heterogeneity is extremely important for the diversity of mobile species like birds, butterflies and other insects, but is barely accounted for in the metric. There is some allowance for small scale variability for example plant height in grasslands and woodlands, but there is no allowance for large scale transitions or mosaics. Even a relatively simple mosaic – grassland, tall herb, brambles and scrub, has the potential to support more species than its constituent parts, containing not only grassland specialists, tall herb specialists and so on but also species which require two or more of these habitat elements to survive. This latter subsection contains most birds, mammals, reptiles, amphibians, and almost all pollinators. While pollinators require floral and nectar resources as adults, their immature stages require different resources, for example some hover fly species larvae require nutrient-enriched water sources, while the fringe-horned mason bee requires dead wood. These differing resources need to be close together to allow these species

Bracken: Good and Bad

Bracken can be, and usually is, a highly invasive and dominant species. Bracken spreads very quickly, shading out all other species reducing them to just a scattering of puny individuals. Not only does the spread of bracken reduce biodiversity and cause the loss of agricultural land, it can also increase sheep ticks and produce powerful poisons.

However, when bracken occurs in or on the edge of forests it can be a very different beast. Other species can subsist between the fronds, and the bracken itself provides shelter for small mammals and insects, while also improving soil stability and texture.

Stinging Nettles and Biodiversity

Stinging nettles may be unpleasant for us, but they do support a range of species. Shaded beds of nettles found in scrub, and within hedges, can increase the humidity of the area. This then increases the diversity and abundance of invertebrates, in turn benefiting their predators such as bats and birds. The increased humidity can also increase fungi diversity, and in droughts and heatwaves can be an important source of shelter for many species. Lastly, nettles are important for many well-loved butterfly species whose caterpillars feed on the nettles, including small tortoiseshell, peacock, and red admiral.

to complete their lifecycles. While for other species transitions between different habitat types constitutes an important habitat in its own right, for instance transition from grassland to tall grass and scrub habitats supports over 2600 invertebrate species in the UK. Thus, even the relatively simple mosaic outlined above can support much more diversity than those habitats alone, yet there is no consideration of this in the BNG metric. Other biodiversity metrics currently used in the UK take this into account, including the Ratcliffe criteria which has long been used for designation of Sites of Special Scientific Interest (SSSIs). The approach taken by BNG seems like a step backwards, set to create isolated islands of habitats divorced from natural settings and unable to provide the diversity promised.

BNG also allows large areas of low distinctiveness or poor condition habitat to be exchanged for smaller areas of high distinctiveness and good condition. This allows developers to scrap large habitat units and replace them with 'better' smaller units. In local council areas where BNG was rolled out early, this approach has been associated with a 38% reduction in green space post-development. These smaller habitats may be of higher quality on paper, but this does not translate to real world biodiversity. Small sites support smaller populations which are less resilient to random events (e.g. droughts, floods, or fires) and environmental changes. The small habitats also experience increased edge effects, less environmental heterogeneity, and thus support less biodiversity in the long term than larger poorer habitats. Creating these smaller 'high quality' habitats seems to be an easy way for developers to reach the 10% biodiversity net gain goal, however this does not reflect actual biodiversity increase. Once again, the BNG metric is too simplistic to capture this complexity.

BNG suffers from the most important and oldest difficulty of studying biodiversity – it is a difficult thing to measure. Years of hard work by academics has tried to provide mechanisms to measure it. However, the BNG metric does not seem to learn from these studies. It does not consider the detrimental effects of small habitats or the benefits of diverse heterogeneous mosaic and transition habitats. Although invertebrates seem to be most at risk from this metric, they are not the only group of species which could suffer from it. Of course, this policy operates under many constraints: it must be complex enough to capture biodiversity but simple enough to be used by all developers no matter their size. It aims to be ambitious but must still be enforceable by local councils. Yet, even within these confines BNG is not good enough, and it does not go far enough. In order to achieve it's goals, and the world's goals, of increasing biodiversity while still allowing developments of housing and infrastructure, BNG must try harder. It is a bold policy, but somehow in it's ambition it has forgotten basic principles of biodiversity.

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