

Biodiversity metric 3 case study 1:

Residential development

This case study demonstrates how biodiversity metric 3 can be used to inform the design and layout of a residential development.

Overview

This case study is based on a medium-sized urban extension.

It is intended to demonstrate how biodiversity metric 3 can be used to calculate changes in biodiversity units associated with on-site and off-site delivery of habitat creation/enhancement.

When initially planning the layout of a development, biodiversity metric 3 can be used to avoid or reduce any net gain deficit.

This case study demonstrates:

- ✓ How the biodiversity metric 3 calculation tool can be applied to calculate changes in area habitat and hedgerow (linear) biodiversity units.
- ✓ How the biodiversity metric 3 calculation tool can be used to inform changes to the design of a scheme.
- ✓ How off-site habitat creation/enhancement can be used to achieve a biodiversity net gain.
- ✓ The application of the 70:30 ratio of 'developed land, sealed surface': 'vegetated garden' to account for residential development in the biodiversity metric 3 calculation tool.

The site

This is a hypothetical urban extension at the edge of a town in north-west England ('the proposed development'). The habitats on site are mainly modified grassland with small areas of mixed scrub and 'other neutral grassland', with plantation broadleaved woodland to the north and east, and with some native species-rich hedgerows/lines of trees field boundaries in the south and west.

Approach to biodiversity net gain assessment

Biodiversity metric 3 calculates how many biodiversity units a site scores prior to development (the baseline), how many biodiversity units will be lost because of the proposed development and how many additional biodiversity units would need to be delivered (on-site and/or off-site) to achieve a 10% net gain in biodiversity, relative to the baseline.

This case study presents two scenarios:

- **Scenario 1:** Where the metric is not used at the design stage and off-site habitat is required to achieve a biodiversity net gain.
- **Scenario 2:** Where the metric is used early in the design process to guide the location of housing and enable a net gain to be delivered on-site.

Assumptions and limitations

Within this case study it is assumed that:

- In both scenarios:
 - Two thirds of the site will be taken up with the development (houses, gardens, roads, shops, etc), one third retained as open space, and 0.1ha of green roof is created – only the layout is different.
 - All hedgerows and lines of trees habitats that are present at baseline will be lost, apart from 0.05km of native species-rich hedgerow in moderate condition, with medium strategic significance. These are replaced by creating new, native species-rich hedgerows around the perimeter of the development.
- 0.53ha of woodland and 0.14km of hedgerow within the site are of medium strategic significance (i.e. location ecologically desirable but not in local strategy), due their connectivity with adjoining woodlands and hedgerows to the east and west.
- Remaining habitats are of low strategic significance.
- The target post-intervention condition of the proposed habitats is reached. (In practice this would require monitoring and oversight by an ecologist to ensure it was achieved).

Baseline biodiversity units – both scenarios

Using biodiversity metric 3, the biodiversity value of the site baseline was calculated to be 11.77 area habitat biodiversity units (AHBUs) and 1.83 hedgerow biodiversity units (HBUs) (see Table 1). This baseline represents the 'reference scenario' against which losses and gains will be measured.

Table 1. Number of biodiversity units for habitats within the site at baseline. Data extracted from biodiversity metric 3 calculation tool.

Habitat type	Area (ha) / length (km)	Habitat Distinctiveness	Habitat Condition	Strategic Significance	Baseline biodiversity units
Modified grassland	2.6	Low	Poor	Low	5.20
Other neutral grassland	0.52	Medium	Poor	Low	2.08
Mixed scrub	0.16	Medium	Poor	Low	0.64
Other woodland; broadleaved	0.19	Medium	Moderate	Low	1.52
Other woodland; broadleaved	0.53	Medium	Poor	Medium	2.33
Total habitat area	4.0ha	Total habitat units (AHBUs)			11.77
Native species rich hedgerow with trees	0.04	High	Moderate	Low	0.48
Native species rich hedgerow	0.14	Medium	Moderate	Medium	1.23
Line of trees (ecologically valuable)	0.01	Medium	Good	Low	0.12
Total hedgerow length	0.19km	Total hedgerow units (HBUs)			1.83

Post-development biodiversity units

Scenario 1: The metric is not used in the design process, and off-site habitat is required to achieve a net gain.

In this scenario, the metric was not applied at the design stage. Consequently, the layout of the built development will result in the loss of all the medium distinctiveness habitats apart from 0.53ha of 'other broadleaved woodland'. This is retained and will be enhanced. 0.77ha of 'modified grassland' is also retained and enhanced. The majority of hedgerows and lines of trees are also lost with the remaining 0.05km enhanced.

Despite the retained woodland and grassland habitats being enhanced by improving their condition from poor to moderate and incorporating 0.1ha of 'biodiverse green roof' into the development it will still result in an on-site loss of 3.06 AHBUs or -26%. An on-site gain of 0.21 HBUs or 11% is achieved by creating new boundary hedgerows around the perimeter of the development.

Losses and gains of biodiversity units are summarised in Table 2 below.

Because neither a net gain in AHBUs nor compliance with the trading rules for medium distinctiveness woodland, scrub or grassland habitats is achieved within the development boundary, it is necessary to identify a suitable off-site location where habitat could be created or enhanced.

The spatial risk multiplier in biodiversity metric 3 supports off-site delivery close to the location where the losses are occurring (i.e. within the same Local Planning Authority area or National Character Area) so the suitability of various plots of land close to the proposed development were assessed. Factors considered include current ecological value,

current and future land management agreements, land ownership and public access.

An area of grazed modified grassland was identified to the south-west of the proposed development site. These fields had previously been utilised for open cast coal mining, and in recent years had been capped and restored to pasture. An agreement was made with the landowner to deliver additional habitat enhancement and habitat creation, enabling a 10% net gain to be achieved.

1.2ha of modified grassland (a low distinctiveness habitat), in poor condition, was identified as being suitable for enhancement to 'other neutral grassland' and creation of 'other woodland; broadleaved' and 'mixed scrub' habitats. The combined habitat creation and enhancement resulted in an increase in the relative biodiversity value of this off-site land from 2.40 to 6.89 AHBUs.

Overall, the combination of on-site and off-site habitat creation and enhancement delivers a net gain of 1.42 AHBUs (approx. 12% net gain) and 0.21 hedgerow biodiversity units (approx. 11% net gain) relative to the baseline reference scenario.



Scenario 2: Where the metric is used early in the design process to allow a net gain to be delivered on site.

In this scenario the metric is applied early in the design process. It is used to identify a layout that enables delivery of the proposed development whilst meeting the biodiversity net gain requirement within the proposed development. This is achieved by focussing the development on the areas of modified grassland (which is a low distinctiveness habitat), thus avoiding losses of woodland, scrub and other neutral grassland habitats (medium distinctiveness habitats), and then enhancing the retained habitats. Overall, the size of the development footprint remains the same, at 2.7ha, with 0.1ha of 'biodiverse green roof'. However, because the medium distinctiveness habitats are retained and enhanced the development will result a net gain of 1.40 AHBUs (approx. 11% net gain) and 0.21 hedgerow biodiversity units (approx. 11% net gain) relative to the baseline reference scenario.

Losses and gains of biodiversity units are summarised in Table 3 below.



Table 2. Scenario 1 - Losses and gains of habitat and hedgerow biodiversity units. Data extracted from biodiversity metric 3 calculation tool.

Biodiversity unit type	Description	Losses and gains of biodiversity units
Area habitat	On-site baseline area habitat biodiversity units	+11.77
Area habitat	On-site enhancement and creation of area habitats Habitat enhancement <ul style="list-style-type: none"> - 0.53ha of 'other woodland; broadleaved' from poor to moderate condition, of medium strategic significance - 0.77ha modified grassland from poor to moderate condition Habitat creation (all low strategic significance) <ul style="list-style-type: none"> - 0.81ha of vegetated gardens ('condition assessment N/A') - 1.89ha of developed land; sealed surface (condition 'N/A – other') - 0.1ha biodiverse green roof in good condition 	+8.71
Area habitat	Net change in on-site area habitat biodiversity units	-3.06
Area habitat	Off-site baseline area habitat biodiversity units	+2.40
Area habitat	Off-site enhancement and creation of area habitats (all low strategic significance) Habitat enhancement <ul style="list-style-type: none"> - 0.7ha of modified grassland in poor condition to other neutral grassland in moderate condition Habitat creation <ul style="list-style-type: none"> - 0.4ha of modified grassland in poor condition to 'other woodland; broadleaved' in moderate condition - 0.1ha of modified grassland in poor condition to mixed scrub in moderate condition 	+6.89
Area habitat	Net change in off-site area habitat biodiversity units	+4.49
	Total net gain in AHBUs	+1.42
Hedgerow	Baseline hedgerow biodiversity units	+1.83
Hedgerow	Net on-site retained, creation and enhancement of hedgerows Hedgerow enhancement <ul style="list-style-type: none"> - 0.05km of native species rich hedgerow in moderate condition enhanced to good condition and medium strategic significance Hedgerow creation <ul style="list-style-type: none"> - 0.11km of native species rich hedgerow in good condition and medium strategic significance - 0.04km of native species rich hedgerow in good condition and low strategic significance - 0.02km of native species rich hedgerow in moderate condition and low strategic significance 	+2.04
	Total net gain in HBUs	+0.21
Area habitat	Overall percentage net gain/loss of habitat biodiversity units	+12.09%
Hedgerow	Overall percentage net gain/loss of hedgerow biodiversity units	+11.28%

Table 3. Scenario 2 - Losses and gains of habitat and hedgerow biodiversity units. Data extracted from biodiversity metric 3 calculation tool.

Biodiversity unit type	Description	Losses and gains of biodiversity units
Area habitat	Baseline habitat biodiversity units	+11.77
Area habitat	<p>Net on-site enhancement and creation of habitats</p> <p>Habitat enhancement</p> <ul style="list-style-type: none"> - 0.42ha of other neutral grassland from poor to good condition, low strategic significance - 0.16ha of mixed scrub from poor to good condition, low strategic significance - 0.19ha of 'other woodland; broadleaved' from moderate to good condition, medium strategic significance - 0.53ha of 'other woodland; broadleaved' from poor to moderate condition, low strategic significance <p>Habitat creation (all low strategic significance)</p> <ul style="list-style-type: none"> - 0.81ha of vegetated gardens ('condition assessment N/A') - 1.89ha of developed land; sealed surface (condition 'N/A – other') - 0.1ha biodiverse green roof in good condition 	+13.17
	Total net gain in habitat units	+1.40
Hedgerow	Baseline hedgerow units	+1.83
Hedgerow	<p>Net on-site retention, creation, and enhancement of hedgerows</p> <p>Hedgerow enhancement</p> <ul style="list-style-type: none"> - 0.05km of native species rich hedgerow in moderate condition enhanced to good condition and medium strategic significance <p>Hedgerow creation</p> <ul style="list-style-type: none"> - 0.11km of native species rich hedgerow in good condition and medium strategic significance - 0.04km of native species rich hedgerow in good condition and low strategic significance - 0.02km of native species rich hedgerow in moderate condition and low strategic significance 	+2.04
	Total net gain in hedgerow biodiversity units	+0.21
Habitat	Overall percentage net gain/loss of habitat biodiversity units	+11.91%
Hedgerow	Overall percentage net gain/loss of hedgerow biodiversity units	+11.28%

Conclusions

This case study demonstrates how using the biodiversity metric 3 calculation tool early in the design process can help to inform the layout of a development to reduce losses and enable a net gain (or smaller net loss) to be delivered on site. When the biodiversity metric was not applied at the design stage, 1.2ha of additional off-site land was required to provide habitat creation and enhancement, to achieve a net gain in biodiversity units.

Securing this additional land and management of the habitats over 30 years would result in an additional cost to the development, that could have been avoided. Changing the layout to retain and enhance more of the medium distinctiveness habitats enabled a net gain to be achieved on-site.



Key messages / top tips

- Application of the biodiversity metric 3 calculation tool early can help inform an iterative design process, and avoid or reduce the need for off-site mitigation.
- Where it is necessary to provide off-site mitigation, it is important to consider the baseline biodiversity value of that site and apply the mitigation hierarchy to any existing habitats of biodiversity value. This will both maximise the gains in biodiversity units and avoid unintended loss or degradation of the more biodiverse habitats. In this case study, the off-site baseline habitat was of low distinctiveness and the habitats created or enhanced were of medium distinctiveness.
- Hedgerow and woodland creation improved habitat connectivity within the wider landscape, and this was acknowledged within the biodiversity metric 3 by selecting medium strategic significance ('ecologically desirable but not identified in a local strategy').
- Area habitats measured in hectares generate area habitat biodiversity units (AHBUs) and the hedgerow/line of trees habitats measured in kilometres generate hedgerow biodiversity units (HBUs). These units are unique and cannot be summed, traded or converted.



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