Biodiversity metric 4 case study 1: Residential development

This case study demonstrates how biodiversity metric 4 can inform the design and layout of a residential development.

Overview

This case study is based on a hypothetical expansion of a medium-sized residential area. It demonstrates the use of biodiversity metric 4 to calculate changes in area habitat and hedgerow biodiversity units associated with on-site and off-site habitat loss, creation, and enhancement, to determine whether a biodiversity net gain has been achieved.

This case study shows the benefits of using biodiversity metric 4 when initially planning the layout of a development, as it can be used to inform decisions around habitat retention, creation, and enhancement.

This case study demonstrates:

- ✓ The use of biodiversity metric 4 to calculate changes in 'area habitat biodiversity units' and 'hedgerow biodiversity units'.
- ✓ The use of biodiversity metric 4 to inform a project's design choices.
- ✓ The use of off-site habitat creation and enhancement and the spatial risk multiplier in biodiversity metric 4.
- ✓ The application of the 70:30 ratio of 'developed land, sealed surface' to 'vegetated garden' within biodiversity metric 4 to account for residential development.

Note: All habitat data presented in the tables of this case study are taken directly from biodiversity metric 4.

The site

This case study covers a hypothetical residential development occurring at the edge of a town in north-west England, which is hereafter referred to as 'the proposed development'. All land within the project boundary of the proposed development classes as 'on-site'.

The habitats on-site are predominantly 'modified grassland', with small areas of 'bramble scrub' and 'other neutral grassland'. There are plantations of 'other woodland; broadleaved' located to the north and east of the site, and some 'species-rich native hedgerows' and 'lines of trees' forming the field boundaries in the south and west. This case study does not include any watercourse habitats.

Approach to biodiversity net gain assessment

Biodiversity metric 4 uses habitat data input into it to calculate the pre-development biodiversity units for a site, known as 'the baseline', and calculates the net changes in biodiversity units as a result of habitat loss, creation and enhancement which may result from a development. The three types of biodiversity unit for area habitats, hedgerows and watercourses are treated separately, and biodiversity metric 4 calculates whether a net gain has been achieved in each.

In this case study, only area habitat biodiversity units and hedgerow biodiversity units are present at baseline, therefore a biodiversity net gain is required for those types of biodiversity unit.

This case study presents two scenarios which have differing approaches and site designs:

- **Scenario 1:** Biodiversity metric 4 is not used at the design stage and off-site habitat creation and enhancement is required to achieve biodiversity net gain.
- **Scenario 2:** Biodiversity metric 4 is used early in the design process to guide the location of housing, enabling a biodiversity net gain to be achieved using on-site land only.

For Scenario 1, the location of the off-site land chosen is important because biodiversity metric 4 includes a spatial risk multiplier which varies based on the proximity of the off-site location to the on-site location. More biodiversity units are generated when the off-site location is within the same Local Planning Authority or National Character Area as on-site.

Assumptions

The following assumptions apply to both scenarios:

Habitats

- Approximately two thirds of the site will be developed into houses, gardens, roads, and shops. Approximately one third will be retained as open space and 0.1 ha of green roof will be created.
- Because the exact proportion of developed land to gardens is not known, the standard 70:30 ratio has been used for post-development, as stated in the User Guide.
- 0.05 km of 'species-rich native hedgerow' will be enhanced. All other hedgerows and 'lines of trees' habitats which are present at baseline will be lost. The lost hedgerows will be replaced by the creation of new hedgerows and lines of trees around the perimeter of the development.
- No habitats are to be created in advance or delayed after impacts.
- The target post-intervention condition of the proposed habitats will be reached. In practice this would require monitoring and oversight using ecological expertise to ensure it is achieved.

Biodiversity metric 4 multipliers

Any woodland, hedgerows and 'lines of trees' within the site are of high strategic significance as they are listed in the Local Plan. All other habitats present at the site are of low strategic significance.

Baseline biodiversity units

Using biodiversity metric 4, the biodiversity value of the on-site baseline is calculated to be 12.11 area habitat biodiversity units and 1.91 hedgerow biodiversity units in both scenarios, as shown in Table 1. Any expected biodiversity unit losses and gains are measured against this baseline.

Table 1. Number of biodiversity units for habitats on-site at baseline.

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 woodland; broadleaved	0.53	Medium	Poor	High	2.44
Other neutral grassland	0.52	Medium	Poor	Low	2.08
Other woodland; broadleaved	0.19	Medium	Moderate	High	1.75
Bramble scrub	0.16	Medium	Condition Assessment N/A	Low	0.64
Total habitat area	**4 ha**	**Total area habitat biodiversity units**			**12.11**
Species-rich native hedgerow	0.14	Medium	Moderate	High	1.29
Species-rich native hedgerow with trees	0.04	High	Moderate	High	0.55
Line of trees	0.01	Low	Good	High	0.07
Total hedgerow length	**0.19 km**	**Total hedgerow biodiversity units**			**1.91**

Post-development biodiversity units

Scenario 1: Biodiversity metric 4 is not used in the design process, and off-site habitat is required to achieve biodiversity net gain.

In this scenario, biodiversity metric 4 is not used to inform the on-site design. Consequently, the layout of the development will result in a biodiversity net loss. Losses and gains of biodiversity units are summarised in Table 2 below.

In Scenario 1, the placement of the 'developed land' and 'vegetated gardens' will result in the loss of all the medium distinctiveness habitats present at baseline, aside from 0.53 ha of 'other broadleaved woodland' which will be enhanced by improving its condition. A portion of the low distinctiveness 'modified grassland' will also be enhanced through condition improvement. A 0.1 ha 'intensive green roof' will be created and incorporated into the development. Despite these interventions, Scenario 1 proposals result in an on-site biodiversity net loss of 3.33 area habitat biodiversity units, or a 27.55% net loss.

The majority of hedgerows and 'lines of trees' will also be lost, with only 0.05 km of 'species-rich native hedgerow' being enhanced. An on-site net gain of 0.24 hedgerow biodiversity units, or 12.62%, will be achieved by creating new boundary hedgerows and 'lines of trees' around the perimeter of the proposed development.

In this scenario, it is not possible to meet biodiversity net gain requirements on-site, or meet the trading rules for medium distinctiveness woodland, scrub, or grassland habitats. Therefore, it is necessary to identify a suitable off-site location where habitat could be created or enhanced.

As off-site habitat creation or enhancement is required, the suitability of various plots of land close to the proposed development are assessed, and an area of 'modified grassland' is chosen which is located within the same Local Planning Authority. This 1.2 ha area of low distinctiveness 'modified grassland' had previously been utilised for open cast coal mining, and in recent years had been capped and restored to pasture, and it is considered to be suitable to enhance to 'other neutral grassland'. The additional creation of 'other woodland; broadleaved' and 'mixed scrub' are also proposed for this location. These habitats are delivered and maintained for a minimum of 30 years in an agreement with the landowner.

Because the off-site location is within the same Local Planning Authority as the on-site location, the Spatial Risk category *'Compensation inside LPA boundary or NCA of impact site'* is selected in biodiversity metric 4, so that the metric accounts for the proximity of the habitat interventions to the on-site location of impact.

Overall, the combination of on-site and off-site habitat creation and enhancement meets the trading rules and delivers a net gain of 1.43 area habitat biodiversity units, which is a 11.83% increase; and a net gain in 0.24 hedgerow biodiversity units, which is a 12.62% increase.

Table 2. Scenario 1 - Losses and gains of area habitat biodiversity units and hedgerow biodiversity units.

Biodiversity unit type	Description	Losses and gains of biodiversity units
Area habitat	**On-site** baseline area habitat biodiversity units	12.11
Area habitat	**On-site** enhancement and creation of area habitats Habitat enhancement: - 0.53 ha of 'other woodland; broadleaved' from poor to moderate condition, of high strategic significance - 0.77 ha 'modified grassland' from poor to moderate condition, of low strategic significance Habitat creation – all low strategic significance: - 0.78 ha of 'vegetated gardens' – 'Condition Assessment N/A' - 1.82 ha of 'developed land; sealed surface' – condition 'N/A – Other' - 0.1 ha 'intensive green roof' in good condition	+8.77
Area habitat	Net change in **on-site** area habitat biodiversity units	**-3.33**
Area habitat	**Off-site** baseline area habitat biodiversity units	+2.40
Area habitat	**Off-site** enhancement and creation of area habitats Habitat enhancement –all low strategic significance: - 0.7 ha of 'modified grassland' in poor condition to 'other neutral grassland' in moderate condition Habitat creation: - 0.4 ha of 'modified grassland' in poor condition to 'other woodland; broadleaved' in moderate condition, of high strategic significance - 0.1 ha of 'modified grassland' in poor condition to 'mixed scrub' in moderate condition	+7.17
Area habitat	Net change in **off-site** area habitat biodiversity units	**+4.77**
	Total net gain in area habitat biodiversity units	**+1.43**
Hedgerow habitat	Baseline hedgerow biodiversity units	1.91
Hedgerow habitat	Net on-site retained, creation and enhancement of hedgerows – all high strategic significance Hedgerow enhancement: - 0.05 km of 'species-rich native hedgerow' in moderate condition enhanced to good condition Hedgerow creation: - 0.07 km of 'species-rich native hedgerow with trees' in good condition - 0.08 km of 'species-rich native hedgerow' in good condition - 0.02 km 'line of trees' in moderate condition	+2.15
	Total net gain in hedgerow biodiversity units	**+0.24**

Area habitat	**Overall percentage net change in area habitat biodiversity units**	**+11.83%**
Hedgerow habitat	**Overall percentage net change in hedgerow biodiversity units**	**+12.62%**

Scenario 2: Biodiversity metric 4 is used early in the design process, allowing biodiversity net gain to be achieved on-site.

In this scenario, biodiversity metric 4 is used to aid decision-making early in the design process. It is used to inform the site design in a way that enables delivery of the proposed development whilst meeting the biodiversity net gain requirements. This is achieved by focussing the development on the 'modified grassland' as it is a low distinctiveness habitat, thereby avoiding losses of woodland, scrub and 'other neutral grassland' habitats which are of medium distinctiveness. The initial loss of area habitat biodiversity units is therefore reduced by avoiding habitats of medium distinctiveness.

As a result, it is possible to offset any losses in area habitat biodiversity units, and achieve an additional biodiversity net gain, by enhancing the existing medium distinctiveness habitats on-site by condition, as well as by creating 0.1 ha of 'intensive green roof'.

In this scenario, hedgerow habitats are treated the same as with Scenario 1, so it is possible to achieve the required net gain in hedgerow biodiversity units on-site.

Losses and gains of biodiversity units in Scenario 2 are summarised in Table 3 below.

Overall, the size of the development footprint remains at 2.7 ha, while the project meets trading rules, and achieves a net gain of 1.59 area habitat biodiversity units, which is a 13.15% increase; and a net gain of 0.24 hedgerow biodiversity units, which is an 12.62% increase.

Table 3. Scenario 2 - Losses and gains of area habitat biodiversity units and hedgerow biodiversity units.

Biodiversity unit type	Description	Losses and gains of biodiversity units
Area habitat	Baseline area habitat biodiversity units	12.11
Area habitat	Net on-site enhancement and creation of habitats Habitat enhancement: - 0.42 ha of 'other neutral grassland' from poor to good condition, low strategic significance - 0.16 ha of 'bramble scrub' to 'mixed scrub' from 'Condition Assessment N/A' to good condition, low strategic significance - 0.19 ha of 'other woodland; broadleaved' from moderate to good condition, high strategic significance - 0.53 ha of 'other woodland; broadleaved' from poor to moderate condition, high strategic significance Habitat creation – all low strategic significance: - 0.81 ha of 'vegetated gardens' – 'Condition Assessment N/A' - 1.79 ha of 'developed land; sealed surface' – condition 'N/A – Other' - 0.1 ha 'intensive green roof' in good condition	+13.15
	Total net gain in area habitat biodiversity units	**+1.59**
Hedgerow	Baseline hedgerow biodiversity units	1.91
Hedgerow	Net on-site retention, creation, and enhancement of hedgerows Hedgerow enhancement – high strategic significance: - 0.05 km of 'species-rich native hedgerow' in moderate condition enhanced to good condition Hedgerow creation: - 0.07 km of 'species-rich native hedgerow with trees' in good condition - 0.08 km of 'species-rich native hedgerow' in good condition 0.02 km 'line of trees' in moderate condition	+2.15
	Total net gain in hedgerow biodiversity units	**+0.24**

Area habitat	**Overall percentage net change in area habitat biodiversity units**	**+13.15%**
Hedgerow	**Overall percentage net change in hedgerow biodiversity units**	**+12.62%**

Conclusions

This case study highlights the importance of using biodiversity metric 4 early in the design process to inform the layout of a development. In Scenario 1, biodiversity metric 4 is not applied at the design stage, meaning that 1.2 ha of additional off-site land is required for habitat creation and enhancement to achieve a net gain in biodiversity units.

However, in Scenario 2, biodiversity metric 4 is used early in the process to inform discussions and careful designing of the development to avoid any losses of medium distinctiveness habitats. This means that the initial loss of area habitat biodiversity units is lower than in Scenario 1. As a result, it is possible to meet the trading rules and achieve a biodiversity net gain on-site by enhancing medium distinctiveness habitats on-site, as well as creating a green roof as part of the development.

By taking the approach set out in Scenario 2, the additional costs to the developer in Scenario 1 associated with securing the off-site land and management of off-site habitats over 30 years, can be avoided.

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Key messages and top tips

- Application of biodiversity metric 4 early in the process of development projects can inform an iterative design process and may enable net gain targets to be met through more cost-effective mechanisms, such as through avoiding the need to create or enhance habitats at off-site locations.
- When the exact proportions of developed land to gardens is not known in a proposed development, a 70:30 ratio can be used to calculate the area of each respectively. The exact area of habitats should be used where possible.
- Where it is necessary to create or enhance habitats off-site, it is important to consider the baseline biodiversity value of that site, apply the mitigation hierarchy to any existing habitats, and propose habitat interventions that are appropriate for the site, using ecological expertise. This will both maximise the gains in biodiversity units and avoid unintended loss or degradation of habitats with high biodiversity potential.
- The location of any off-site habitat creation or enhancement should be located as close to the on-site impacts as possible. Biodiversity metric 4 promotes the use of land that is close to the on-site location, and this will be reflected in the biodiversity units generated through the spatial risk multiplier.
- Area habitats and hedgerows are treated separately in biodiversity metric 4, therefore it is necessary to meet the trading rules and achieve the required biodiversity net gain in both area habitat biodiversity units and hedgerow biodiversity units, where these habitats are present in the baseline. They cannot be summed, traded, or converted.