Natural England Joint Publication JP039

Biodiversity Metric 3.0

Auditing and accounting for biodiversity

USER GUIDE

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Biodiversity metric 3.0 is the culmination of more than 14-years' work to develop a practical metric to measure gains and losses of biodiversity in England. It builds on the model first proposed in the scoping study commissioned by Defra in 2008 (Treweek et al., 2009)[1], which was further developed to incorporate scores for habitat distinctiveness and condition (Treweek J., Butcher B. and Temple H (2010)[2] and used by Defra for their biodiversity offset pilots (Defra, 2012)[3] . It has been shaped by the knowledge and experience gained across a variety of different sectors since the offset pilots and the launch, in 2019, of a beta test version, biodiversity metric 2.0 (Crosher et al., 2019)[4].

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[1] DEFRA. 2009. Scoping study for the design and use of biodiversity offsets in an English Context. Written by Jo Treweek with contributions from Kerry ten Kate, Bill Butcher, Orlando Venn, Lincoln Garland, Mike Wells, Dominic Moran and Stewart Thompson. Defra, London.

[2] TREWEEK J., BUTCHER B. & TEMPLE H (2010) Biodiversity offsets: possible methods for measuring biodiversity losses and gains for use in the UK. CIEEM In Practice 69, pp29-32.Available at Researchgate

[3] DEFRA. 2012. Biodiversity offsetting pilots. Technical paper: the metric for the biodiversity offsetting pilot in England. Defra. March 2012. https://www.gov.uk/government/collections/biodiversity-offsetting

[4] The Biodiversity Metric 2.0 - JP029 (naturalengland.org.uk)

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The UK Habitat Classification System is used under licence from UKHab Ltd.
Please see https://ukhab.org/ for further details about the UK Habitat Classification System. Users should refer to https://ukhab.org/ for the published definitions and detailed methodologies on the recording of habitats.

Image credits

Box 2-1: Natural England (Matt Heydon, Peter Roworth & Julian Dowse)
Box 8-5: Cartographer Studios Ltd. (Lucy Shuker) & Environment Agency (Neale Hider).
Box 8-6: Environment Agency (Dave Webb)

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1: Introduction

Who is this guidance for?

1.1. This guidance is for anyone planning to use biodiversity metric 3.0 and anyone who wants to understand the outputs of the metric. This includes developers who have commissioned a biodiversity assessment using the metric, communities wanting to understand the impacts of a local development, and planning authority decision-makers interpreting metric outputs included in a planning application or land owners wishing to provide biodiversity units from their sites to others.

1.2. In this user guide we explain how to use biodiversity metric 3.0 and describe the principles and rules underpinning its use.

Why do we need a metric for measuring biodiversity?

1.3 Biodiversity is the term that is used to describe the variety of all life on earth. It includes all species of animals and plants – and everything else that is alive on our planet. Habitats are the places in which species live. These species and their habitats contribute to the ecosystem services that provide substantial benefits to people and the economy. For example, woodlands and saltmarsh can help prevent flooding whilst parks and greenspaces make our towns and cities healthier and more attractive places in which to live and work. Biodiversity is under threat, globally and at home. Habitats are being damaged or disappearing and species are declining. This is not just bad news for nature but also for our own health and well-being and that of future generations. Biodiversity and healthy habitats are vital for a well-functioning planet, but their value is often not taken into account in decision-making.

Scope of biodiversity metric 3.0

1.4 Biodiversity metric 3.0 is an updated version of the original Defra biodiversity metric[5]. It is the culmination of a Defra commissioned project to develop a metric that began in 2008 (Treweek et al., 2009)[6]. Biodiversity metric 3.0 builds upon the knowledge and experience gained across a variety of different sectors since Defra piloted a provisional metric in 2012 (Defra, 2012) and the consultation and feedback that has been since a revised beta version, Biodiversity metric 2.0[7], was launched as a beta test version in 2019 (Crosher, et al., 2019).This version builds upon the knowledge and experience gained across a variety of different sectors since the original Defra biodiversity metric was first launched as part of Defra's biodiversity offsetting pilots,

[5] DEFRA. 2012. Biodiversity offsetting pilots. Technical paper: the metric for the biodiversity offsetting pilot in England. Defra. March 2012. https://www.gov.uk/government/collections/biodiversity-offsetting

[6] DEFRA. 2009. Scoping study for the design and use of biodiversity offsets in an English Context. Written by Jo Treweek with contributions from Kerry ten Kate, Bill Butcher, Orlando Venn, Lincoln Garland, Mike Wells, Dominic Moran and Stewart Thompson. Defra, London 2009. Biodiversity Offsets FINAL REPORT Defra 12 May 2009.doc

[7] The Biodiversity Metric 2.0 - JP029 (naturalengland.org.uk)

and includes the consultation and feedback that was received on biodiversity metric 2.0.

1.5 Biodiversity metric 3.0 balances robustness with simplicity. It uses habitat as a proxy for wider biodiversity with different habitat types scored according to their relative biodiversity value. This value is then adjusted, depending on the condition and location of the habitat, to calculate '**biodiversity units**' for that specific project or development. Biodiversity metric 3.0 incorporates separate calculations for linear habitats that require a different method of measurement such as hedgerows and lines of trees, rivers and streams and urban trees.

1.6 Biodiversity metric 3.0 can be used to measure both on-site and off-site biodiversity changes for a project or development and can be used to measure the change in biodiversity achieved by different land management interventions. The metric also accounts for some of the risks associated whenever new habitat is created or existing habitat is enhanced. The metric calculates the change in biodiversity resulting from a project or development by subtracting the number of **pre-intervention** or 'baseline' biodiversity units (i.e. those originally existing on-site and off-site) from the number of **post-intervention** units (i.e. those projected to be provided after the development or change in land management). **It is important to note that achieving gains in biodiversity from the calculation does not necessarily mean a development meets any wider requirements of planning policy or law relating to nature conservation or biodiversity**.

1.7 Biodiversity metric 3.0 only accounts for **direct impacts** on habitats within the footprint of a development or project. It has been developed to be a simple assessment tool and only considers direct impacts on biodiversity through impacts on habitats Although Natural England acknowledges the importance of considering **indirect impacts** these have not been included in the metric.

1.8 The units generated by biodiversity metric 3.0, like all biodiversity unit calculations, come with a 'health warning'. The outputs of this metric are not absolute values but provide a proxy for the relative biodiversity worth of a site pre- and post-intervention. The quality and reliability of outputs will depend on the quality of the inputs. This user guide provides advice on how to use the biodiversity unit approach and where and when it is appropriate for use. **The metric is not a substitute for expert ecological advice. The metric does not override or undermine any existing planning policy or legislation, including the mitigation hierarchy (see section 1.10 below), which should always be considered as the metric is applied.**

1.9 Biodiversity metric 3.0 does not include **species** explicitly. Instead, it uses habitat types as a proxy for the biodiversity 'value' of the species communities that make up those different habitats. The metric does not change existing levels of species protection and does not replace the processes linked to species protection regimes.

1.10 To simplify and streamline the calculation process, biodiversity metric 3.0 comes with a free calculation tool[8] to calculate biodiversity units. A short user guide[9] for the calculation tool is also available.

[8] Biodiversity Metric 3.0 - Auditing and accounting for biodiversity: Calculation tool

[9] Biodiversity Metric 3.0 - Auditing and accounting for biodiversity: Calculation tool – short user guide

When can biodiversity metric 3.0 be used?

1.11 Biodiversity metric 3.0, when used with appropriate professional advice and ecological knowledge, enables biodiversity to be measured in a consistent and robust way. The metric can be used to inform and improve planning, design, land management and decision-making.

1.12 It can be used to:

- assess or audit **the biodiversity unit value** of an area of land
- **calculate the losses and gains** in biodiversity unit value resulting from changes or actions which affect biodiversity, such as from development or changing the conservation management of a land holding
- **predict** the likely effectiveness of creating new or enhancing existing habitats
- **compare** different plan and project proposals for a site allowing more objective assessments of alternative approaches to be made

1.13 The metric can be used throughout all stages of a project or scheme, from site selection and options assessment through to detailed design. The earlier it is applied the greater the opportunities for:

- optimising the design to deliver net gains within the project area
- determining whether the project is suitable for application of this metric
- testing whether the outcomes are as expect

1.14 This metric has been designed for application to UK terrestrial and intertidal habitats. These include freshwater habitats and linear habitat features. It can be applied at a range of scales from developments of a few houses or land management changes in individual fields to strategic allocations or entire land holdings.

Applying the mitigation hierarchy when using the metric

1.15 Biodiversity metric 3.0 supports and reinforces the application of the **mitigation hierarchy** which is an important principle of ecological good practice (see Figure 1-1). Applying the mitigation hierarchy means aiming to retain habitats in situ and avoiding or minimising habitat damage so far as possible, before looking to enhance or recreate habitats. This sequential approach is encouraged by biodiversity metric 3.0 because it allows overall biodiversity gains to be achieved more easily through the avoidance of on-site habitat losses, rather than relying solely on the creation of new habitat or the enhancement of existing habitat. It works this way because the metric applies multipliers that are based on the risks inherent in creating or restoring habitat, and which are not applicable when existing habitat is safeguarded.

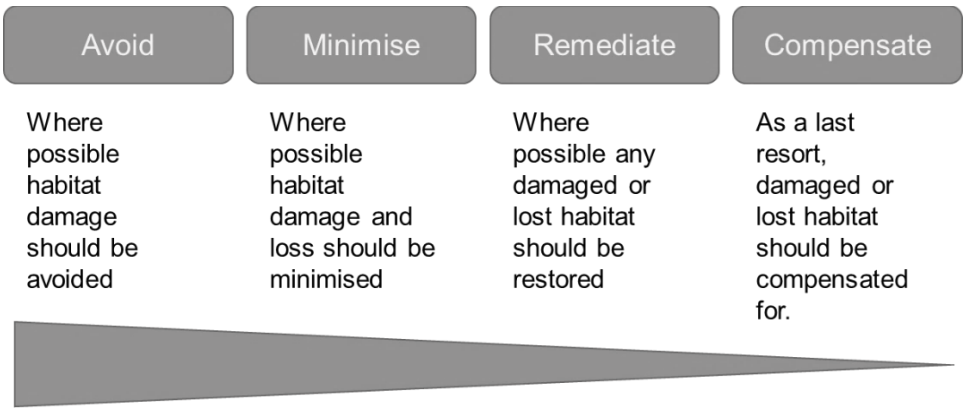


FIGURE 1-1: The Mitigation Hierarchy[10]

[10] Source: adapted from DEFRA, 2018, Net Gain Consultation Proposals. Defra, December 2018. https://consult.defra.gov.uk/land-use/net-gain/supporting_documents/netgainconsultationdocument.pdf (Accessed 20-06-2019)

2: Summary of how biodiversity metric 3.0 works

2.1. This chapter provides an overview of what biodiversity metric 3.0 measures and how, the key steps in the process and the principles and rules that must be applied. More detailed explanations of the metric's functions for frequent or technical users can be found in subsequent chapters and the Technical Supplement.

What the metric measures

2.2. Biodiversity metric 3.0 uses **habitats**, the places in which species live**,** as a proxy to describe biodiversity. These habitats are converted into '**biodiversity units**'. These biodiversity units are the 'currency' of the metric.

2.3. Biodiversity units are calculated using the **size** of a parcel[11] of habitat and its **quality**. The metric uses **habitat area** (measured in hectares) as its core measurement, except for linear habitats (hedgerows and lines of trees and rivers and streams) where **habitat length** (measured in kilometres) is used.

2.4. To assess the **quality** of a habitat biodiversity metric 3.0 scores:

a. Habitats of different types, such as woodland or grassland, according to their relative biodiversity value or **distinctiveness**. Habitats that are scarce or declining typically score highly relative to habitats that are more common and widespread.

b. The **condition** of a habitat. Scoring the biodiversity value of the habitat relative to others of the same type.

c. Being 'better' and 'more joined-up' are important facets of habitats that can contribute to halting and reversing biodiversity declines[12], so the metric also accounts for whether or not the habitat is sited in an area identified, typically in a relevant local strategy or plan, as being of **strategic significance** for nature.

2.5. Where new habitat is created, or existing habitat is enhanced, the difficulty and associated **risks** of doing so are taken into account by biodiversity metric 3.0. If habitat is created to compensate for losses elsewhere, then the metric also takes account of its proximity to the site of the losses.

The difference between area and linear habitat units in the metric

2.6. Biodiversity metric 3.0 includes separate calculations for area habitats (such as a woodland) and linear habitats (such as a hedgerow or stream). This is because habitat length is a more meaningful measure of linear habitats than their area.

2.7. There are therefore three broad categories of habitats and biodiversity units for which scores are calculated differently:

---

[11] Parcels are simply distinct portions of each habitat type present.

[12] Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra (2010)

- Area habitats (such as grasslands, woodlands and mudflats)
- Linear hedgerows and lines of trees
- Linear rivers and streams

2.8. It is an important rule of the metric that **the three types of biodiversity units described above are unique and cannot be summed, traded or converted** (Rule 4). When reporting biodiversity gains or losses with the metric, the three different biodiversity unit types must be reported separately and not summed to give an overall biodiversity unit value. For example, a scheme would report a gain of 3 area habitat units, a loss of 1 hedgerow unit and a loss of 1 river unit rather than an overall combined gain of 1 unit. The separate Calculation Tool provides a simple way of undertaking all three biodiversity unit calculations.

How area habitat biodiversity units are calculated

2.9. To measure the biodiversity value of habitats it is first necessary to define the site boundary and then divide it into appropriate habitat parcels as needed. The parcel size, habitat type and condition of each habitat parcel should then be recorded. The metric uses widely used classifications[13] for categorising habitats.

2.10. The metric operates by applying a score to each of the quality elements set out above in section 2.4:

Distinctiveness	A score based on the type of habitat present. e.g. modified grassland has a “Low” distinctiveness score, lowland meadows are “Very High”
Condition	A score based on the biodiversity value of the habitat relative to others of the same type. This is determined by condition criteria set out in the technical supplement
Strategic significance	A score based on whether the location of the development and/or off-site work or the habitats present/created have been identified as significant for nature

FIGURE 2-1: Quality components in biodiversity metric 3.0

2.11. The metric operates by applying a score to each of these elements. It then multiplies the size of each habitat parcel with each of these ‘quality’ scores to produce a

[13] Habitat classifications used in the metric include:
UK Habitat Classification, EUNIS, WFD Lakes typology.
Further detail is provided in Chapter 6 and Part 2 of the Technical Supplement

number that represents the **biodiversity unit** value of each habitat parcel (see Box 2-1).

2.12. The user would first calculate the '**baseline**' or '**pre-intervention'** value of a site in biodiversity units before any development or management change has occurred.

2.13. The calculation is normally then repeated for the '**post-intervention'** scenario. This calculation should include any retained or enhanced existing habitats and newly created habitats. At this stage, because the metric is measuring predicted changes rather than existing habitats, additional factors to account for the risk associated with creating, restoring or enhancing habitats are also considered. Figure 2-2 sets out the three risk factors incorporated into the metric.

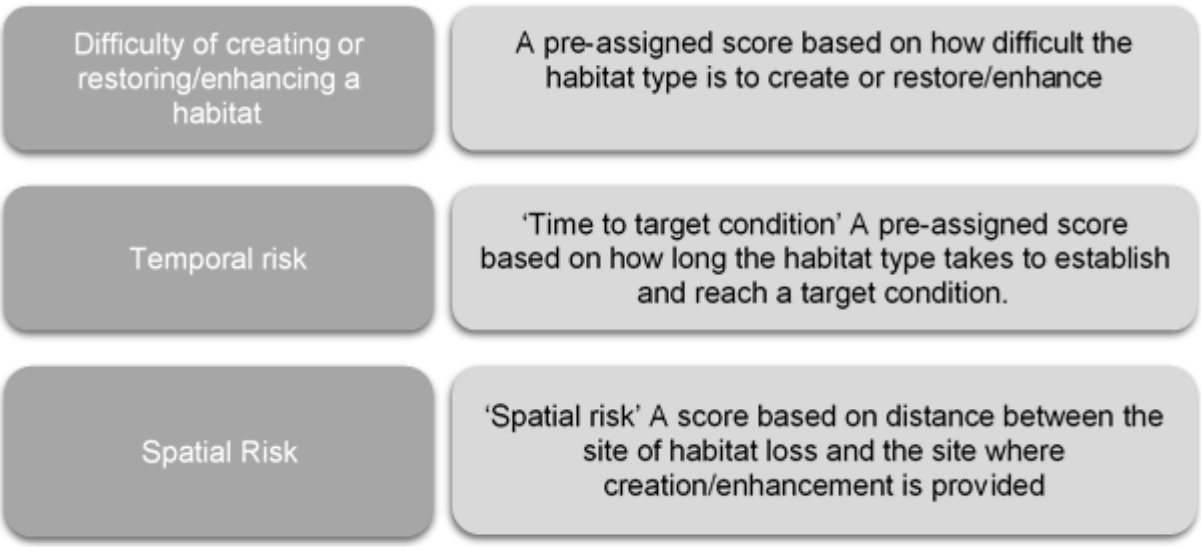


FIGURE 2-2: Risk components of biodiversity metric 3.0

2.14. The predicted value of the habitats in biodiversity units 'post-intervention' is then deducted from the baseline 'pre-intervention' unit score to give a net change in unit value. Biodiversity metric 3.0 can be used to calculate the numbers of units or the percentage net gain your design is predicted to deliver. The post-intervention proposals can be adjusted to revise the scheme design to improve the number of biodiversity units or percentage net gain obtained.

2.15. The metric can be used to measure off-site habitat changes, where this is required to achieve a net gain, usually when the metric is being applied in a development context. The processes for measuring on-site and off-site changes are very similar. The biodiversity unit value of the off-site habitats is calculated for the baseline 'pre-intervention' and 'post-intervention' stages. The 'pre-intervention' units are then subtracted from the 'post-intervention' units to work out how many biodiversity units will result from that off-site habitat change. For off-site changes, there is an additional 'spatial risk' multiplier which is applied to reflect the proximity of the off-site changes to the project site where the biodiversity loss is occurring. Biodiversity metric 3.0 then combines any off-site gains or losses of biodiversity units with the on-site results to show overall changes in biodiversity unit value and percentage change relative to the on-site baseline.

2.16. The examples in Box 2-1 and Box 2-2 illustrate the general approach used to calculate the biodiversity unit value for habitats, as described above. A more detailed explanation of this process is given in Chapter 5.

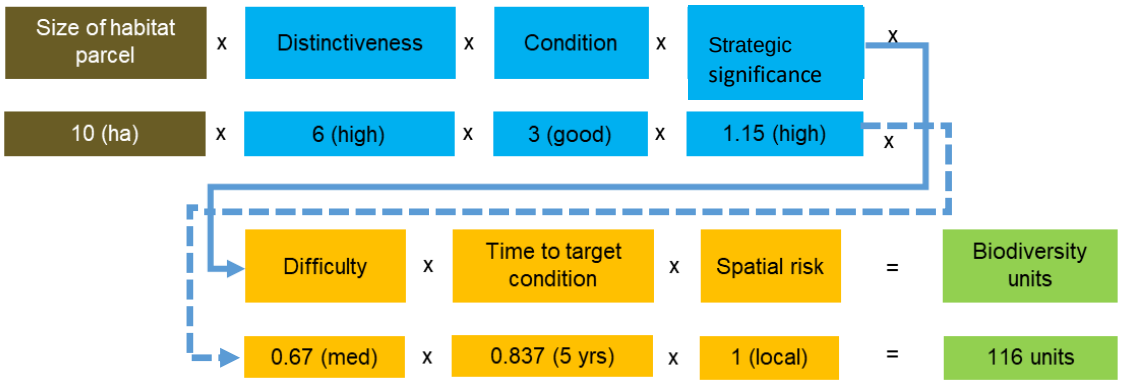
Box 2-1: Calculating the biodiversity unit value of a habitat

How we calculate biodiversity value for habitats is illustrated in the scenario below:

- The pre-intervention calculation establishes the baseline biodiversity unit value of a habitat. It is calculated by multiplying the size of a habitat parcel by measures of habitat 'quality', and
- The post-intervention calculation gives the biodiversity unit value of a habitat after it has been changed. This calculation uses the same size and quality measures but also takes account of risk factors in creating or enhancing habitats.

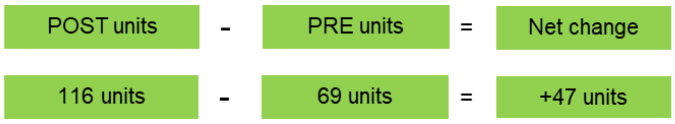
PRE-intervention biodiversity calculation (the baseline)

POST-intervention biodiversity calculation (for newly created or enhanced habitats)



Calculation of gains or losses

The net effect of an intervention (or a series of interventions) on biodiversity is calculated as follows:



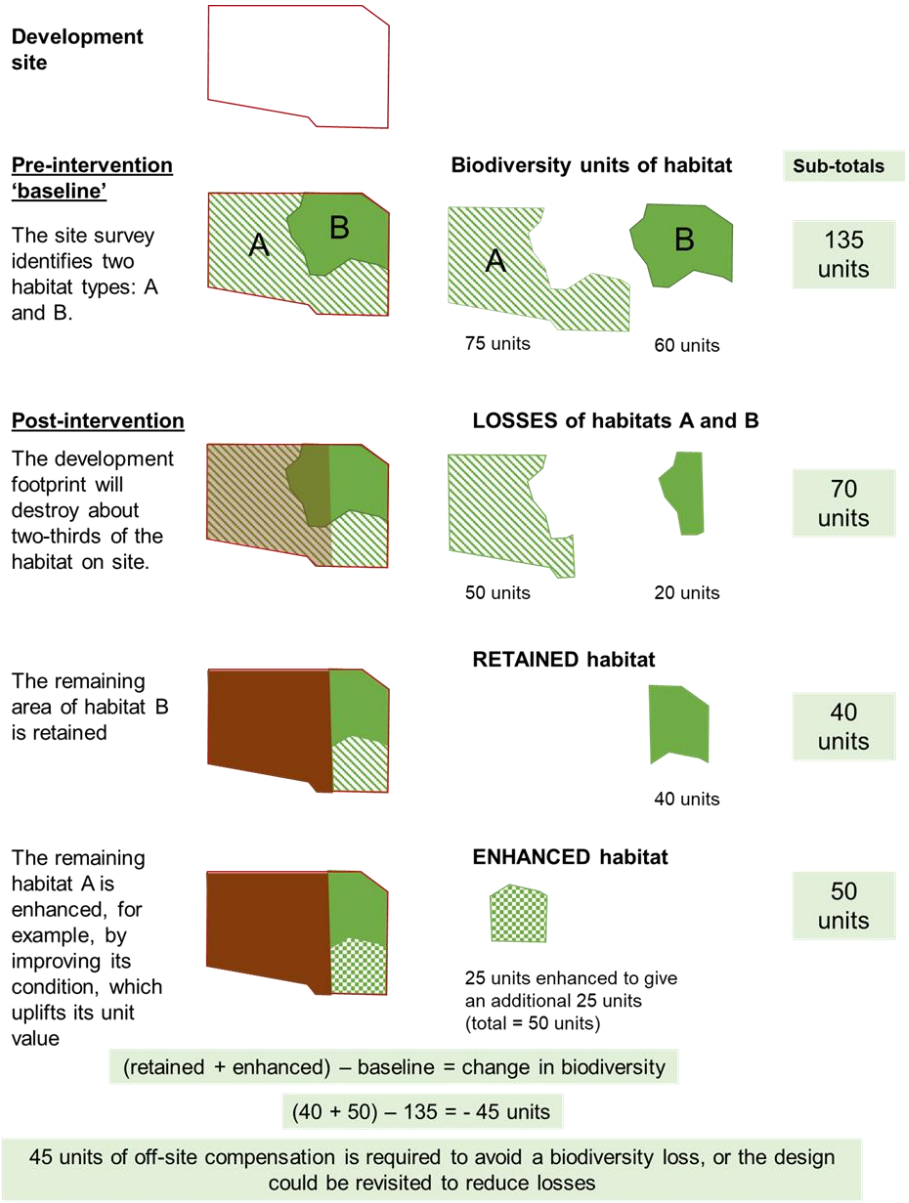
BOX 2-2: Practical application

To calculate the change in biodiversity unit value resulting from a development (or other intervention) you first survey and then divide the site up into distinct parcels of differing habitat type and condition (i.e. the same habitat type in different condition should be recorded separately within the metric).

Using this information, you can calculate the baseline (or pre-intervention) biodiversity unit value of each habitat parcel using the free calculation tool provided for use with biodiversity metric 3.0.

Next, using your design plans for the development you calculate the biodiversity unit value for the habitats that are expected to be retained, plus the values for any enhanced or newly created habitats (post-intervention).

The change in biodiversity is worked out by subtracting the site's baseline biodiversity unit value from the sum of post-intervention values for retained, created and enhanced habitats. This is then combined with any off-site gains to give a final biodiversity unit value from which net gain or loss for the scheme can be assessed. This is illustrated in the graphic below:



Key process steps

2.17. The key steps you need to follow to make practical use of the metric are outlined in Figure 2-1.

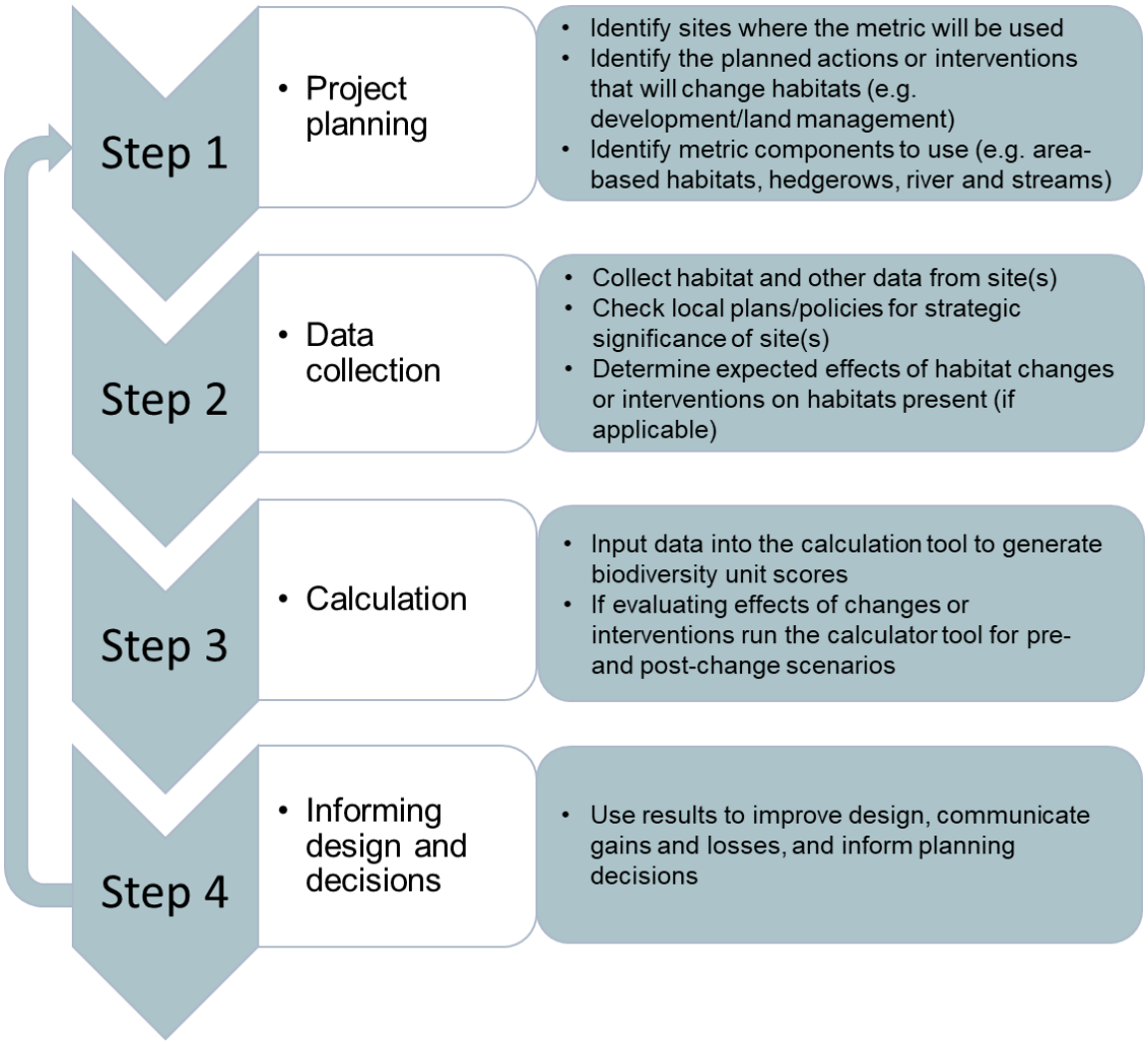


FIGURE 2-1: The 4 key steps to using biodiversity 3.0

Principles and rules for using the metric

2.18. The metric is a tool that can be used to help inform plans and decisions. It is important, however, to be aware of its limitations and to conduct assessments in accordance with the following principles and rules.

Limitations

2.19. The metric uses habitats as a proxy for biodiversity. Although this is a rational means of measuring biodiversity value, it is a simplification of the 'real world'. Furthermore, while the scoring of habitats is informed by ecological reasoning and the available evidence, the outputs of biodiversity unit calculations are not scientifically precise or

absolute values. The generated biodiversity unit scores are a proxy for the **relative** biodiversity worth of a habitat or site.

2.20. The metric and its outputs should therefore be interpreted, alongside ecological expertise and common sense, as an element of the evidence that informs plans and decisions. The metric is not a total solution to biodiversity decisions. The metric, for example, helps you work out how much new or restored habitat is needed to compensate for a loss of habitat, but it does not tell you the appropriate composition of plant species to use.

2.21. Assessments should be conducted with regard to a set of **key principles and rules**. These are set out below:

Principles

- **Principle 1: The metric does not change the protection afforded to biodiversity.** Existing levels of protection afforded to protected species and habitats are not changed by use of this or any other metric. Statutory obligations will still need to be satisfied.

- **Principle 2: Biodiversity metric calculations can inform decision-making where application of the mitigation hierarchy and good practice principles[14] conclude that compensation for habitat losses is justified.**

- **Principle 3: The metric's biodiversity units are only a proxy for biodiversity and should be treated as relative values.** While it is underpinned by ecological evidence the units generated by the metric are only a proxy for biodiversity and, to be of practical use, it has been kept deliberately simple. The numerical values generated by the metric represent relative, not absolute, values.

- **Principle 4: The metric focuses on typical habitats and widespread species; important or protected habitats and features should be given broader consideration.**
    - Protected and locally important species needs are not considered through the metric, they should be addressed through existing policy and legislation.
    - Impacts on protected sites (e.g. SSSIs) and irreplaceable habitats are not adequately measured by this metric. They will require separate consideration which must comply with existing national and local policy and legislation. Data relating to these can be entered into the metric, so as to give an indicative picture of the biodiversity value of the habitats present on a site, but this should be supported by bespoke advice.

- **Principle 5: The metric design aims to encourage enhancement, not transformation, of the natural environment.** Proper consideration should

[14] CIEEM, CIRIA, IEMA. 2016 Biodiversity Net Gain – Good Practice Principles for Development. https://www.cieem.net/data/files/Publications/Biodiversity_Net_Gain_Principles.pdf

be given to the habitats being lost in favour of higher-scoring habitats, and whether the retention of less distinctive but well-established habitats may sometimes be a better option for local biodiversity. Habitat created to compensate for loss of natural or semi-natural habitat should be of the same broad habitat type (e.g. new woodland to replace lost woodland) unless there is a good ecological reason to do otherwise (e.g. to restore a heathland habitat that was converted to woodland for timber in the past[15]).

- **Principle 6: The metric is designed to inform decisions, not to override expert opinion**. Management interventions should be guided by appropriate expert ecological advice and not just the biodiversity unit outputs of the metric. Ecological principles still need to be applied to ensure that what is being proposed is realistic and deliverable based on local conditions such as geology, hydrology, nutrient levels, etc. and the complexity of future management requirements.
- **Principle 7: Compensation habitats should seek, where practical, to be local to the impact.** They should aim to replicate the characteristics of the habitats that have been lost, taking account of the structure and species composition that give habitats their local distinctiveness. Where possible compensation habitats should contribute towards nature recovery in England by creating 'more, bigger, better and joined up' areas for biodiversity[16].
- **Principle 8: The metric does not enforce a mandatory minimum 1:1 habitat size ratio for losses and compensation but consideration should be given to maintaining habitat extent and habitat parcels of sufficient size for ecological function.** A difference can occur because of a difference in quality between the habitat impacted and the compensation provided. For example, if a habitat of low distinctiveness is impacted and is compensated for by the creation of habitat of higher distinctiveness or better condition, the area needed to compensate for losses can potentially be less than the area impacted. However, consideration should be given to whether reducing the area or length of habitat provided as compensation is an appropriate outcome.

[15] In which case the Open Habitats Policy would need to be followed to ensure suitability of the proposed change.

[16] Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra (2010)

Rules

- **Rule 1:** Where the metric is used to measure change, biodiversity unit values need to be calculated prior to the intervention and post-intervention for all parcels of land / linear features affected.

- **Rule 2:** Compensation for habitat losses can be provided by creating new habitats, or by restoring or enhancing existing habitats.

  Measures to enhance existing habitats must provide a significant and demonstrable uplift in distinctiveness and/or condition to record additional biodiversity units.

- **Rule 3:** 'Trading down' must be avoided. Losses of habitat are to be compensated for on a "like for like" or "like for better" basis. New or restored habitats should aim to achieve a higher distinctiveness and/or condition than those lost.

  Losses of irreplaceable or very high distinctiveness habitat cannot adequately be accounted for through the metric.

- **Rule 4:** Biodiversity unit values generated by biodiversity metric 3.0 are unique to this metric and cannot be compared to unit outputs from version 2.0, the original Defra metric or any other biodiversity metric.

  Furthermore, the three types of biodiversity units generated by this metric (for area, hedgerow and river habitats) are unique and cannot be summed.

- **Rule 5:** It is not the area/length of habitat created that determines whether ecological equivalence or better has been achieved but the net change in biodiversity units. Risks associated with creating or enhancing habitats mean that it may be necessary to create or enhance a larger area of habitat than that lost, to fully compensate for impacts on biodiversity.

- **Rule 6:** Deviations from the published methodology of biodiversity metric 3.0 need to be ecologically justified and agreed with relevant decision makers. While the methodology is expected to be suitable in the majority of circumstances it is recognised that there may be exceptions. Any local or project-specific adaptations of the metric must be transparent and fully justified.

Irreplaceable habitats[17] and biodiversity metric 3.0

2.27 Impacts on 'irreplaceable' habitats are not adequately measured by this metric (Principle 4 and Rule 3). They require separate consideration which must comply with relevant policy and legislation. Data relating to these habitats can be entered into biodiversity metric 3.0 to (i) give an indication of the biodiversity value of the habitats present on a site (the baseline), and/or (ii) allow actions to enhance or restore these important habitats to contribute towards the delivery of net gain. The metric can also

[17] National Planning Policy Framework (2019) Glossary provides a definition and examples of irreplaceable habitats

be used to give an indication of the minimum amount of replacement habitat that should be provided, however, it cannot and should not replace case specific assessments, and bespoke compensation should be agreed with the relevant decision maker for **any** losses or impacts to these habitats.

Ancient woodland and biodiversity metric 3.0

2.28 Ancient woodland[18] is a finite and irreplaceable resource and is protected by existing policy and legislation[19]. However, ancient woodland is not a discrete habitat type and, as such, is not listed in biodiversity metric 3.0. By definition, ancient woodland encompasses ancient semi-natural woodlands (ASNW) and plantations on ancient woodland sites (PAWS) and so could, correctly, be recorded as any of the metric 3.0 woodland habitat types. It is therefore essential to check the latest published version of the Ancient Woodland Inventory Database[20] to determine whether an area of woodland is ASNW or PAWS and hence, whether bespoke assessment and compensation is likely to be required. If a woodland is less than 2ha, please check against the criteria set out in the Ancient Woodland Inventory Handbook[21] for features that indicate whether it may be ancient.

Woodland cover

2.29 In England there is a presumption against the loss of woodland and a need to increase overall woodland cover[22,23]. The metric trading rules support the delivery of this policy through requiring 'like for like' habitat replacement for all high distinctiveness woodland types. There are, however, three situations where biodiversity metric 3.0's rules permit losses of woodland area:

- Loss of 'Other coniferous woodland' – This a 'low' distinctiveness habitat for which the trading rules require only that the same distinctiveness or higher distinctiveness habitat (i.e. not specifically woodland) is required. In this instance replacement of any losses with the same distinctiveness or higher distinctiveness woodland habitat should be considered, where appropriate, to avoid an overall loss of woodland cover.
- Loss of Other woodland; broadleaved, mixed or Scots pine woodland – These are 'medium' distinctiveness habitats for which the trading rules require replacement with habitat from the same broad habitat type (Woodland and forest) or any higher distinctiveness habitat. Again, replacement of any losses with the

[18] Ancient woodland is identified using presence or absence of woods from old maps, information about the wood's name, shape, internal boundaries, location relative to other features, ground survey, and aerial photography. (From: https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodland-england)

[19] E.g. S175(c) of National Planning Policy Framework (2019)

[20] Available on http://www.magic.gov.uk/ The Ancient Woodland Inventory Database is, at the time of publication, in a provisional state and it is intended that it will updated to include areas of woodland less than 2ha

[21] Ancient Woodland Inventory Handbook

[22] England Trees Action Plan 2021 to 2024

[23] UK Forestry Standard

same distinctiveness or higher distinctiveness woodland habitat should be considered to avoid an overall loss of woodland cover.

- If loss of woodland habitats, as described in the two bullet points above occurs, and if replacement of losses in woodland habitat are delivered solely through enhancement of existing woodland there will be a reduction in the area cover of woodland habitat. Woodland creation should be considered, alongside enhancement, to avoid an overall loss of woodland cover.

Hedgerows

2.30 Lost double hedgerows should be compensated with a double hedge, typically a path or track width apart.

3: Data Collection & Preparation for Use in the Metric

Introduction

3.1 This section sets out how to collect the data required for a biodiversity net gain assessment, and how to prepare this data for use in biodiversity metric 3.0.

3.2 To calculate area biodiversity units, the following data must be obtained for both existing and proposed habitat parcels (a habitat parcel is a contiguous area of habitat of the same type and condition):

- Habitat types (including artificial and sealed surfaces of no biodiversity value)
- Area of each habitat parcel (hectares)
- Condition of each habitat parcel (Good, Moderate, Poor)
- Strategic significance of each habitat parcel (High, Medium, Low)

3.3 To calculate hedgerow and line of trees biodiversity units, the following data must be obtained for both existing and proposed hedgerow habitat and for both on-site and off-site locations.

- Hedgerow/Line of trees type - based on the descriptions in Table TS1-2 in the Technical supplement
- Length of each Hedgerow/Line of trees parcel (kilometres)
- Condition of each Hedgerow/Line of trees parcel (Good, Moderate, Poor).
- Strategic significance of each Hedgerow/Line of trees parcel (High, Medium, Low)
- Spatial risk (off-site interventions only)

3.4 To calculate rivers and streams biodiversity units the following data must be obtained for both existing and proposed watercourse habitat and for both on-site and off-site locations.

- Priority Habitat classification, assessed using available data sets
- River classification: to be assessed as a main river, ordinary watercourse, ditch or canal using available data sets
- Culvert presence, meaning whether the watercourse is contained within a culvert
- Length of each watercourse within the site (kilometres)
- Condition of each watercourse (Good, Moderate, Poor)
- The extent of any interventions, encroachment into the riparian zone and watercourse channel
- Strategic significance of each watercourse (High, Medium, Low); and
- Spatial risk (off-site locations only).

Who and when?

3.5 A competent person must carry out the habitat survey and assessment. They should be able to confidently identify the positive and negative indicator species for the range of habitats likely to occur in a given geographic location at the time of year the survey is undertaken.

3.6 Habitat surveys can be undertaken year-round, though it is important to note that the optimal survey season is April to September inclusive for most habitat types. Surveys

outside of the optimal survey period should use a precautionary approach to assessing condition criteria which are not measurable at the time of year the survey is undertaken.

3.7 The rivers and streams condition assessment requires users to be trained and accredited[24].

Approach

3.8 The best approach to take for data collection will depend on the wider survey strategy and specific data requirements for the development or site being affected. However, the steps below set out some useful stages to consider when collecting and preparing data for use in the biodiversity metric.

Step 1: Before site visit – ecological desk study

a. Online data searches (such as using MAGIC) can help to identify the presence of any Priority Habitats, irreplaceable habitats, and statutory designated sites for nature conservation.

b. Searching for species records (such as using the NBN Atlas, MAGIC, or contacting Local Environmental Records Centres (LERCs)) can give an indication of how biodiversity rich the site and its surroundings might be. This will help determine any constraints or aspects of the site's biodiversity that may need more detailed consideration outside of the scope of biodiversity net gain.

c. It is also advisable to check that recent maps or aerial images of the habitats on the site are consistent with the state of the site now. This can identify whether any potential degradation or destruction of baseline habitats (e.g. the removal of habitat before development) has already occurred. Where it is apparent that a recent detrimental change has occurred, this recent habitat change should be communicated to the to the relevant decision maker and it might be appropriate to record the pre-degradation habitats as the baseline.

Step 2: Site visit – identifying and mapping habitats

a. An initial site walkover will help identify how the site might best be split into habitat parcels and surveyed most effectively. During the walkover, consider different land uses across the site and identify any areas of higher biodiversity interest (i.e. areas of Priority Habitat or features with potential to support protected species) which may require bespoke survey effort (see Figure 3-1).

b. Where practical, it is advisable to use digital mapping in the field, as this will typically allow more accurate recording of boundaries and make the process of revising maps easier. Using an appropriately scaled, geo-referenced plan or aerial image, the site should then be divided into habitat parcels (contiguous areas of habitats having the same type and condition) as appropriate and hedgerow/watercourse lengths (contiguous areas of hedgerow/watercourse having the same type and condition).

[24] Training details can be found at https://modularriversurvey.org/river-condition

c. For rivers and streams, the number of MoRPh (**Mo**dular **R**iver **Ph**ysical) surveys[25],[26] to complete will differ depending on the site and the character of the river. The string of MoRPh 5s should capture a minimum 20% length of the river within the on-site area; this will enable changes in riverine condition to be captured. Surveyors should choose the location of their survey sites where noticeable changes in river condition occur e.g. areas of high riverine/riparian quality, areas of physical modification, areas where restoration could occur, areas of potential impact. A walkover of the site before selecting the survey sites is essential.

d. When a ditch is present alongside a hedgerow it should only be recorded once in the metric. Ditches should EITHER be recorded as:

- a hedgerow or line of trees associated with a bank or ditch OR
- a ditch in the rivers and streams metric (See Box 3-1 below).

BOX 3-1: Hedges and lines of trees associated with ditches

For these purposes a ditch is defined as follows:

For inclusion in the Hedgerows metric, a ditch is 'a linear depression running adjacent to a hedge or Line of trees (<2m from the hedgerow centre) which may or may not hold water for part of the year.'

For inclusion in the rivers and streams Metric, a ditch is an 'Artificially created, linear water-conveyancing features that are less than 5 m wide and likely to retain water for more than 4 months of the year. Their hydraulic function is primarily for land drainage, and although partially or fully connected to a river system, they would not have been present without human intervention'.

When a ditch meets the definition for the rivers and streams metric it should be accounted for separately in the rivers and streams metric and, if it occurs adjacent to a hedge or line of trees, the hedgerow type should be determined and recorded separately without recognition of the ditch.

If surveying in the winter, the vegetation should indicate whether the ditch is of an ephemeral nature or not.

e. Hedgerows are mapped as linear features. Area habitats adjacent to hedgerows should be mapped to the centre line of the hedgerow (defined on OS maps by a black line). This will result in a slight overestimation of the area and resulting biodiversity units generated by habitats adjacent to hedgerows.

[25] SHUKER, L.J., GURNELL, A.M., WHARTON, G., GURNELL, D.J., ENGLAND, J., FINN LEEMING, B. & BEACH, E., 2017. MoRPh: a citizen science tool for monitoring and appraising physical habitat changes in rivers. Water and Environment Journal, 31(3): 418-424.

[26] GURNELL, A.M., ENGLAND, J., SHUKER, L., WHARTON, G. (in review). The contribution of citizen science volunteers to river monitoring and management: International and national perspectives and the example of the MoRPh survey.

f. Hedgerows bounding green lanes and double hedgerows should be recorded as two hedgerows rather than a single hedge. This distinction recognises that double hedges are known to be particularly important for wildlife[27,28].

g. Whilst there is no firm minimum or maximum parcel size, it is recommended that a proportionate approach is taken to avoid the recording of habitat types that cover a total area of less than one square meter (0.0001 ha), or recording extremely large areas that are likely to vary in their condition as one habitat parcel.

h. Habitats should be classified using either the UK Habitat Classification System[29], European Nature Information System (EUNIS)[30], Water Framework Directive (WFD) Lakes typologies[31] (see Box 3-2) or the hedgerows and lines of trees key in Box 8-2. A small number of habitats have definitions specific to biodiversity metric 3.0. This means that habitats are classified in a way which is widely recognised and that can be directly input into the biodiversity metric 3.0 calculation tool. **All habitats used in biodiversity metric 3.0 and their definition source are listed in Table TS2-1.**

i. Unique reference numbers should be assigned to each habitat parcel, hedgerow, line of trees or watercourse and any maps generated should clearly display the unique reference of each parcel or linear feature.

j. Any survey limitations (e.g. access constraints or seasonal constraints) should be noted at this point.

[27] WALKER, M.P., DOVER, J.W., HINSLEY, S.A. & SPARKS, TH. 2005. Birds and green lanes: Breeding season bird abundance, territories and species richness. Biological Conservation, 126: 540–547.

[28] WALKER, M.P., DOVER, J.W., SPARKS, T.H. & HINSLEY, S.A. 2006. Hedges and green lanes: vegetation composition and structure. Biodiversity and Conservation, 15:2595–2610

[29] UK Habitat Classification: http://ukhab.org

[30] European Nature Information System

[31] http://wfduk.org/sites/default/files/Media/Characterisation of the water environment/Lakes typology_Final_010604.pdf

Box 3-2: The UK Habitat Classification (UKHab)

The terrestrial area habitats in Biodiversity metric 3.0 are largely based on the UK Habitat Classification system, a free-to-use (open access), unified and comprehensive approach to classifying habitats that is fully compatible with other major existing classifications. It is designed to be suitable for digital or manual use in habitat metrics, impact assessment and sharing data between organisations.
The UK Habitat Classification system was chosen for use in the metric as it translates easily into Priority Habitat types and Habitats Directive Annex 1 types; has scope to incorporate assessments of condition, origin or management regime; and is compatible with digital mapping systems.
The habitat list within biodiversity metric 3.0 includes those derived from the UK Habitat Classification system, but also EUNIS, Water Framework Directive lakes typologies and Annex 1 habitat types. Additionally, some UKHab types have been omitted from the metric because they are better recorded as the actual habitat type presented on the site (e.g. a 'railway corridor' is better split into its individual artificial unsealed surface, grassland & scrub types).

If habitats have been classified using JNCC Phase 1 Habitat Survey typologies, the resulting habitat types can be translated into UKHab for use in the biodiversity metric. A translation table between Phase 1 and UKHab types is provided within the biodiversity metric 3.0. This translation table can be found via the 'Technical Data' button in the calculation tool.

Step 3: Site visit – assessing habitat condition

a. All habitat parcels, hedgerows and watercourses must be assigned a habitat condition score: this is a measure of the habitat's quality. Habitat condition can only be assessed after a land parcel, hedgerow or watercourse has been assigned a habitat type (see Table 3-1).

b. The full methodology for assessing habitat condition is set out within Part 1a of the Technical Supplement. The condition assessment criteria for Hedgerows and Lines of trees are set out within Part 1b of the Technical Supplement.

c. During a condition assessment, a habitat parcel, hedgerow length or watercourse may be deemed to contain areas of differing condition. If this is the case, the habitat parcel, hedgerow length or stretch of watercourse must be split accordingly to ensure each parcel represents habitat of the same type and condition.

d. On completion of condition assessments, all habitat parcels should be assigned one of three condition categories: Good, Moderate or Poor. The metric tool does allow for intermediate categories (Fairly Good and Fairly Poor) if it is not possible to distinguish between two main condition categories. Justification for use of either intermediate condition category should be noted during the site visit and recorded within the 'assessor comments' column of the metric tool.

e. If any habitats in the site have recently been destroyed or degraded and it is deemed appropriate to use pre-degradation habitats as the site's baseline, a precautionary approach should be taken to recording the habitat previously present. This approach

should make use of any evidence remaining on site, or from the desk-based assessment (see 3.9 Step 1, c), and assume high distinctiveness and good condition for lost or degraded habitats in the absence of evidence to the contrary. The approach should be agreed with the relevant decision maker for the site or project and should be justified in the 'assessor comments' section of the metric calculator. For example, if an area identified in the desk-based study is recorded as scrub habitat in credible recent mapping or aerial photography and upon arrival the site is now found to be cleared of all vegetation, it should normally be recorded as 'mixed scrub' in 'good' condition.

f. Any additional survey limitations (e.g. access constraints or seasonal constraints) should also be noted at this point.

Step 4: Site visit – opportunities for on-site habitat creation & enhancement

a. As well as collecting data on existing habitats, hedgerows, and watercourses it is also advisable to use any site visits to identify opportunities for enhancement of existing habitat or creation of new habitat. This may help inform development design, ecological mitigation, and ongoing habitat management and maintenance activities.

b. The River Condition Assessment Information System can be used to support scenario modelling of proposed changes to inform potential mitigation options. To forecast predicted post-intervention condition scores, re-run the river condition assessment with planned river restoration interventions and anticipated channel responses. Alternatively, look at the values of the 32 positive and negative 'Condition Indicator' scores to help understand which features can be changed to achieve net gain and then adjust the scores to take account of the impacts of the proposed interventions.

Step 5: After site visit – assigning strategic significance

a. All habitat parcels (both baseline and post-intervention) must be assigned a strategic significance score. Recognising strategic significance gives extra value to habitats that are located in optimal locations, or are of a type, that meet local objectives for biodiversity.

b. The approach taken to determine strategic significance is described in Sections 5.15 and 8.52. For development projects, the relevant local plans and strategies will be determined by the relevant local planning authority.

c. A score should be assigned to each habitat parcel according to the habitat type and what is identified as a priority in a particular area. The options for scoring each habitat parcel are:

- High - Within area formally identified in local strategy, plan or policy
- Medium - Location ecologically desirable but not identified in a local strategy, plan or policy
- Low - Not identified in a local strategy, plan or policy OR No strategy or plan is in place in the area

Step 6: After site visit – preparing data for use in biodiversity metric calculator tool

a. Baseline data should be assigned a habitat category from Table TS2-1 on collection or, if recorded using an alternative habitat typology, converted to one of these for entry into the metric calculation tool (see Box 3-2).

b. On-site post-intervention habitat data may be created using landscape habitat typologies but must also be converted to a habitat type in Table TS2-1 for entry into the metric calculation tool. This conversion should be based on proposed planting plans and collaboration with the landscape architect is recommended at this stage.

c. For both baseline and post-intervention data, ensure each habitat parcel, hedgerow or watercourse has been assigned a unique ID (this can be the row number in the metric calculation tool). Any maps generated to support the calculation should clearly display the unique ID of each parcel.

d. For both baseline and post-intervention data, ensure the total area being assessed is equal to the sum of all habitat polygons mapped. Include justification in the surveyor comments section if this is not the case (e.g. if the site contains a 5m wide river channel – see h. below). Ensure the sum of baseline & post-intervention habitat parcels are equal, or that any discrepancies are explained. Any overlaps, duplicates or gaps in digital mapping must be resolved before entering data into the metric calculator tool.

e. Where there is an overlap between the developed area (e.g. a building) and an urban habitat (for example a green roof) then only the surface (i.e. open to the sky) habitat should be recorded. In these scenarios the area of developed land/sealed surface should be reduced by the area of the green roof.

f. In the rare circumstances where there is overlapping habitat for example a cantilever green roof over a vegetated garden both can be recorded, and a justification made regarding the discrepancy in area. As GIS systems only record in 2D, the underlying vegetated garden would need to be entered manually (with appropriate justification) if using the QGIS data import template.

g. If you intend to use the QGIS data import template, you will also need to follow the accompanying guidance[32] relating to data format.

h. The area occupied by rivers and streams habitats greater than 5 metres wide can be recorded as areas as well as lengths. The length will be input into the metric in order to calculate river biodiversity units. The area the watercourse occupies should be noted and excluded from the area biodiversity unit calculation (pre-intervention and post-intervention). This means that, in some circumstances, the sum of the area habitats recorded in the metric will be less than the total site area.

[32] Biodiversity Metric 3.0 QGIS template and GIS import tool guidance – Beta test

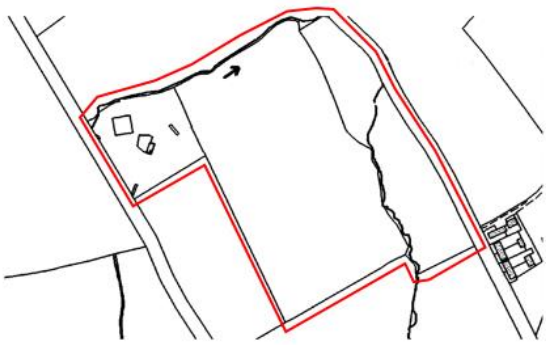
i. Newly excavated river channels will result in a loss in area habitats. Record the loss of area habitat type in the pre-intervention section of the biodiversity metric calculation tool. Similarly, the previous river channels (if a new one has been excavated) may be used to create new areas of habitat such as reedbed or wet woodland.

j. When recording a newly created river channel, the details should be entered as creation or enhancement as appropriate (see Table 8-9).

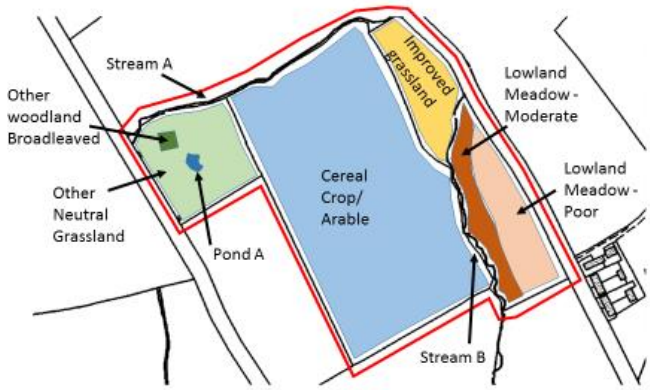
k. When a river restoration scheme restores a channel line, the length of the final river may be **longer** than the original river baseline. This may be due to increasing the number of meander bends or by including a by-pass channel. This can be accounted for in biodiversity metric 3.0 by entering this final restored length into the 'length enhanced' column (column U) of the baseline tab. This enhanced length is then automatically applied in the river enhancement tab.

l. When a scheme restores several channels, for example in a braided system, include the final length of restored river channel in the length enhanced column.

Site Plan



Map for Area Habitats



Map for Linear Habitats (hedgerows/lines of trees, rivers and streams)

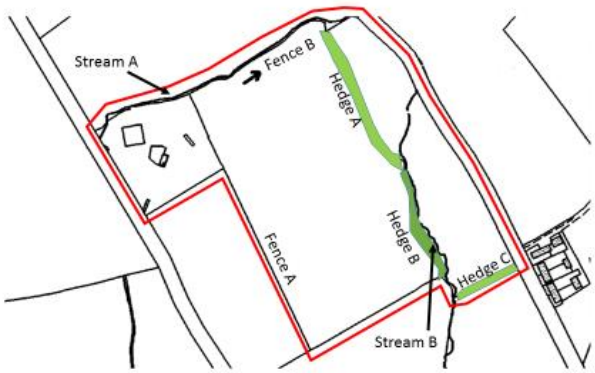


FIGURE 3-1: Examples of Data Collection Maps

TABLE 3-1: Simple data collection records for the maps shown in Figure 3-1

Ref:	Baseline Area Habitat Data	Condition	Size (Ha)	Notes
01	Modified Grassland	Poor	1.3	
02	Cereal Crops	N/A Agricultural	12.3	
03	Lowland Meadows	Poor	1.8	
04	Lowland Meadows	Moderate	1	
05	Pond (non-priority habitat)	Good	0.1	
06	Other Woodland; Broadleaved	Good	0.2	
07	Other Neutral Grassland	Moderate	2	
	etc			

Baseline Supplementary Habitat Data	Condition	Length (Km)	Notes
Stream A	Moderate	0.5	
Stream B	Poor	0.23	
Hedge A	Poor	0.18	
Hedge B	Moderate	0.130	
Hedge C	Poor	0.070	
etc			

4: How to use the Calculation Tool

4.1 The biodiversity metric 3.0 guidance is accompanied by a calculation tool. A short guide explaining how to use the calculation tool is also available.

4.2 To use the calculation tool, users will need access to data which covers:

- Habitat types
- Area/length of habitats
- Habitat condition
- Strategic significance of each habitat
- Area to be retained/enhanced
- Whether bespoke compensation has been agreed (when applicable)
- Timing of habitat creation (i.e. in advance of habitat loss or delayed)

4.3 The biodiversity metric 3.0 calculation tool is pre-populated with much of the key data that is needed for the calculation. There are separate data entry buttons for pre- and post-intervention for on-site and off-site data (see Figure 4-3) and. It provides headline results as well as detailed results, outputs and graphics.

4.4 Cells within the biodiversity metric 3.0 calculation tool are colour coded to aid data entry and interpretation (Figure 4-1).

Fixed	Fixed cells which do not change value/text
Pre-populated	Pre-populated cells with numbers or text depending on other data entry
Result	Results
Data entry	Editable drop-down lists and manual numeric entry
Check	Alert to users that the value entered is non-standard, trading rules not met or minimum target not reached.
Error	Error in data entry or bespoke agreement required
Satisfied	Trading rules and/or target satisfied

Figure 4-1: Key to interpreting the design of the metric

Step 1: Accessing and preparing the tool

4.5 Open the Calculation Tool on any computer with Microsoft Excel spreadsheet software installed. The tool opens on the “Introduction” tab.

4.6 The metric works best with macros and content enabled[33], and macros must be enabled upon opening the metric to use the navigation buttons.

4.7 From the Introduction page, click on the “Open Tool” button. This will open the tool with the “Start page” visible as in Figure 4-2 below.

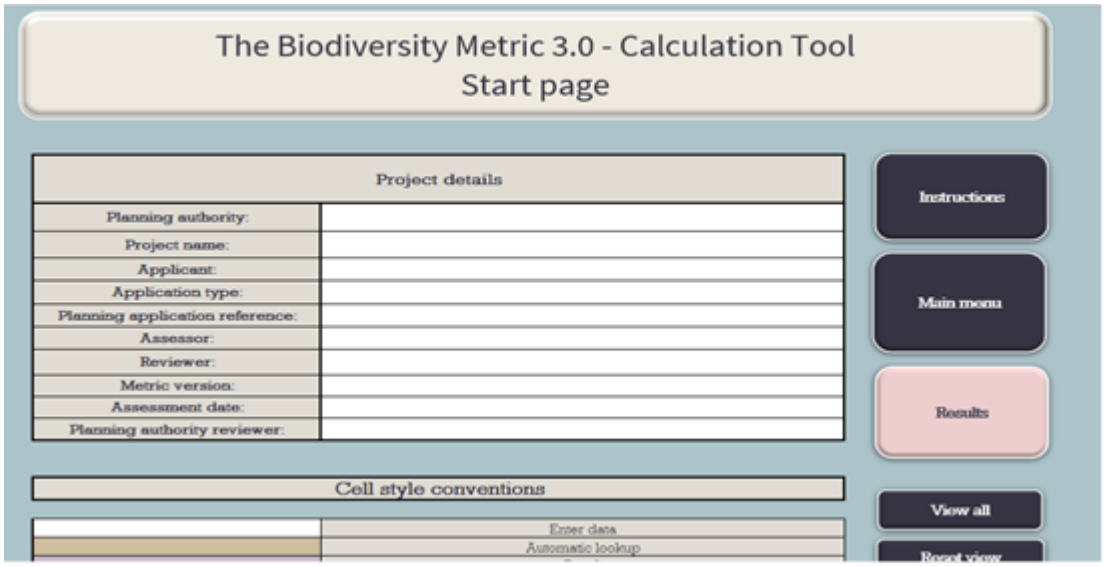


FIGURE 4-2: Calculation Tool start page

4.8 Instructions on using the tool can be accessed from the ‘Instructions’ button on the ‘Start menu’

4.9 Under the header ‘Project details’, enter the required information into the relevant rows.

- ‘Planning Authority’ means the determining authority for any decision being made in relation to the project (often a local planning authority).
- ‘Planning Application’ provides an opportunity to link the completed calculation tool to a specific planning application or conservation project reference code where applicable (See 4.11 below).
- The ‘Applicant’ is, where applicable, the person or organisation applying for permission or approval of a project recorded in the calculation tool.
- The ‘Reviewer’ is the person checking the quality of the data errors prior to submission to any planning authority or other determining authority.
- The ‘Metric version’ is your version reference for the option submitted (See 4.10 below). Multiple versions of the metric calculation may be carried out at the design stage and during the determination period and this box can help to distinguish between different versions (e.g. draft, final, final reviewed).
- The ‘Assessor’ is the ecologist, or other competent person, filling out the data entry of the metric.

[33] If your organisation has disabled macros or content in spreadsheets, a version of the metric tool is available without macros. The navigation buttons will not work in the version without macros but the software’s default mode of shifting between worksheets/tabs can be used.

4.10 Complete all relevant sections of the start page, including inserting illustrative design images of both the baseline and post development scenarios if these are available or required for the project.

4.11 When the start page data entry is complete, click the navigation button on the right labelled “Main menu” (See Figure 4.3).

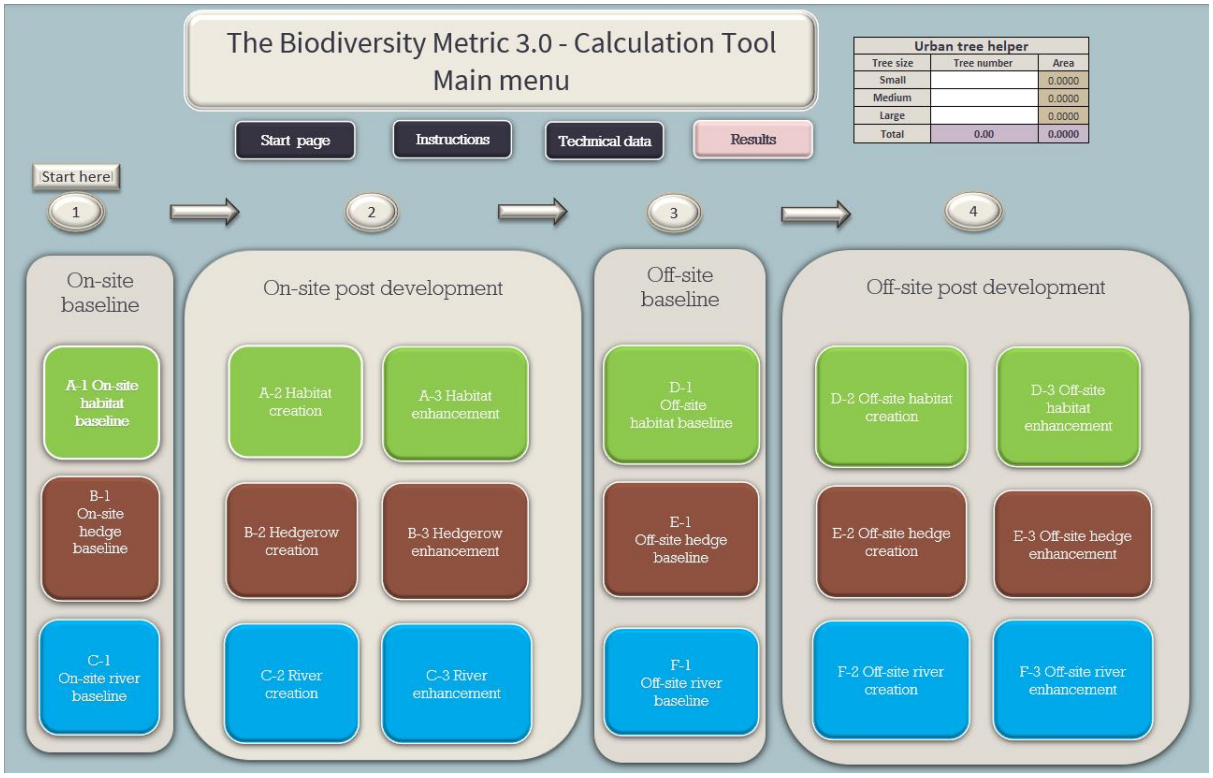


FIGURE 4-3: Calculation Tool Main menu

4.12 The ‘Main menu’ provides links to all tabs of the calculation tool, including those for data entry and those that will display the assessment’s results.

4.13 The ‘Main menu’ also hosts an ‘Urban tree helper’ tool to assist in calculating an area measurement in hectares for a given number of a small, medium and large trees. Simply enter the number of each size tree in the corresponding white editable cell in the ‘Urban tree helper’ on the ‘Main menu’ and this will generate a figure in hectares which should then be manually entered on the baseline sheet.

4.14 The tool is designed to expand according to the requirements of individual projects. Very few projects will need to use all the tabs in the tool, and many will use only a few.

4.15 To navigate between the tabs in the tool, click on the appropriate button on the “Main menu”. When finished entering/viewing data, click the “Main menu” button at the top of tab to return to the “Main menu” page (from which you can access every tab of the

tool). If you are using a macro-free version use the tabs shown at the bottom or the window.

Step 2: Baseline (pre-intervention) data entry

Entering baseline data

4.16 The baseline provides a proxy measure for the quality, quantity and type of habitat within the site boundary prior to an intervention (e.g. a development or conservation project).

4.17 The information you will need to enter to complete your baseline assessment will depend on the type of habitats you have on your site, and whether you are including any off-site habitat (also referred to as offsets).

4.18 The 'On-site baseline' tabs should always be completed for all present habitat types.

4.19 If the metric is being used to calculate the biodiversity units of an off-site intervention (e.g. an offset for a development project) 'Off-site baseline' tabs should also be completed for all habitat types present within the off-site boundary.

4.20 Providers of off-site interventions (e.g. a land manager providing an offset for a development elsewhere) should use the off-site baseline tab and start at step 4.

4.21 Once the relevant baseline data entry tab is open, the "Condense/show columns" buttons, and equivalents for rows, can be used at any time.

Completing the baseline calculation

4.22 This section of the tool allows you to describe the habitats as they are before the intervention (e.g. development or conservation project) takes place.

Top Tip: Prepare your data before completing the metric calculation tool. Think about how the individual parcels within the site will change after the intervention and which habitats will be lost, retained and enhanced.

4.23 The A-1 On-Site Habitat Baseline tab allows you to enter data for the area habitats that are already present on your site (See Figure 4-3). You will need to select or enter information about the following:

- Broad habitat
- Habitat type
- Habitat area
- Habitat condition
- Strategic significance
- Area to be retained/enhanced
- Whether bespoke compensation has been agreed (when applicable)
- Comments (optional)

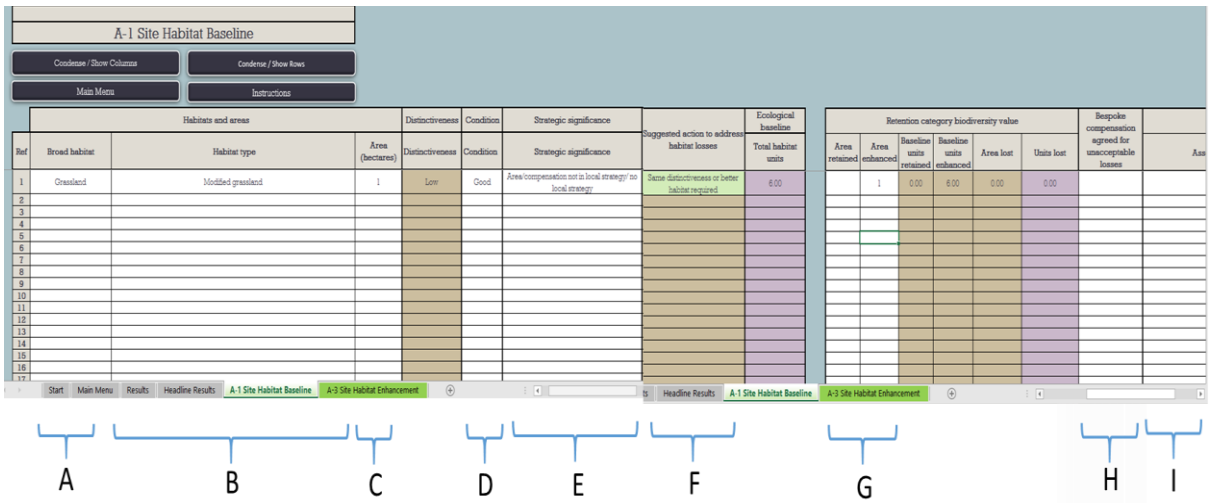


FIGURE 4-4: 'A-1 Site habitat baseline tab'

A: Broad habitat

4.24 Starting at the top of the broad habitat column, click the arrow to the right of each empty white cell to reveal the broad habitat categories available. Select the appropriate broad habitat that you wish to enter data for.

B: Habitat type

4.25 Under the column heading 'Habitat Type', use the arrow to the right of the cell to reveal the habitat type options within the broad habitat selected.

4.29 Once a habitat type has been selected, the distinctiveness and distinctiveness score of the habitat type will be displayed in the columns to the right.

4.26 It is good practice to put different habitat parcels on your site into different rows (e.g. recording two separate parcels of woodland on a site in two separate rows). However, multiple parcels of the same habitat on the same site and in the same condition can be amalgamated into one row provided that they are treated in the same way post development/intervention

Top Tip: The individual habitat dropdown list will be blank unless a broad habitat is entered, and you will not be able to select a habitat if a broad habitat is not selected first.

C: Area

4.31 Once the habitat type has been selected, enter the area, measured in hectares, of that habitat into the "Area" column of the same row.

4.32 Users can enter habitat area to more than two decimal places. There is no set limit to how many decimal places can be used in inputs, but the 'total area' at the bottom of the area columns will not display more than two decimal places.

4.33 If the development site includes Urban trees simply enter the number of each size tree in the corresponding white editable cell in the urban tree helper on the 'Main menu'. This will generate a figure in hectares which should then be manually entered

the baseline sheet in the same way as other habitats in order to calculate the biodiversity units. Note: This will need to be repeated for trees of different condition which will need to be entered on separate rows in the metric.

D: Condition

4.34 Using the relevant information (see 3.9, Step 3), select the habitat condition for each row of habitat using the dropdown list in the "Condition" column. The tool will then automatically apply the corresponding condition score.

4.35 The choice in the condition dropdown list is dependent on the type of habitat entered. The list of condition options will therefore not be revealed until a habitat type is selected

4.36 If two parts of the same habitat are of different condition, they should be split across two rows and recorded as two separate parcels.

Top Tip: If a score for condition is shown as "Not possible", it means that the habitat type is not compatible with the selected condition state. This can occur if the habitat type has been changed to one that is not compatible after assigning a condition. To remedy this, simply change your condition input and the error message will disappear.

E: Strategic significance

4.37 Under the column heading 'Strategic significance", use the arrow to the right of the cell to reveal the options.

4.38 Select the option for each habitat that best corresponds to information set out in local plans or policies for that particular habitat and its location. The tool will then automatically apply the corresponding strategic significance score.

4.39 Strategic significance should be considered separately for each individual habitat entry in the metric and not on a site wide basis. Habitat not specified in some form of strategy, map or plan for that area should not be considered strategically significant.

4.40 'Within an area formally identified in a local strategy' should only be selected for those specific habitats identified as being geographically important within relevant local strategies. For example if the development site or offset site contains a mixture of habitats and is within an area identified as strategically important for Lowland calcareous grassland it is only the Lowland calcareous grassland that should be recorded as 'Within an area formally identified in a local strategy'.

4.41 When a local strategy identifies an area as ecologically significant generically, such as a Local Site or strategic ecological corridor, all habitats occurring within that area should be identified as 'Within an area formally identified in a local strategy'.

4.42 When no such strategy exists, or the area in question does not fall within the local strategy, professional judgement may be used to determine whether a habitat should be identified as 'Location ecologically desirable but not in a local strategy' and justification provided. See 5.20 for guidance.

4.43 If no such strategy is available **and** there is no evidence to suggest that the habitat is of strategic significance (as outlined above), select 'Area/compensation not in local strategy/no local strategy'.

Top Tip: Consider 'Strategic significance' separately for each individual habitat entry in the metric and not in a blanket fashion on a site wide basis. Only habitat specified in some form of strategy, map or plan for that area should be identified. If a strategy, map, or plan identifies an area as ecologically significant without specifying particular habitats, all habitats occurring within that area should be identified as 'Within area formally identified in a local strategy'.

F: Suggested Action to address habitat losses (no input required)

4.44 The 'Suggested action' column gives indicative advice regarding action to take when habitats are lost. These are based on the distinctiveness band attributed to each habitat and the habitat trading rules associated with the metric (See Figure 4-5).

Distinctiveness	Suggested Action
Very High	Bespoke compensation likely to be required
High	Same habitat required
Medium	Same broad habitat or a higher distinctiveness habitat required
Low	Same distinctiveness or better habitat required
Very Low	Compensation Not Required

FIGURE 4-5: Suggested action based on habitat distinctiveness

4.45 Some particularly biodiverse (i.e. High Distinctiveness) habitats require 'like for like' compensation if lost, and trading down in distinctiveness should always be avoided(see 2.21, Rule 3); this means not replacing biodiverse habitats with large areas of less biodiverse habitats.

4.46 Biodiversity metric 3.0 is not designed to adequately address losses of Very High Distinctiveness habitat or irreplaceable habitat, which should be given wider consideration outside the scope of the metric.

4.47 If all the Very High Distinctiveness habitat can be retained or enhanced, enter the whole area of habitat to be retained or enhanced (see following section, G). The tool will then calculate the value of the retained or enhanced habitat.

4.48 If any Very High Distinctiveness habitat entered in the metric cannot be retained or enhanced, the habitat trading rules built into biodiversity metric 3.0 highlight that losses of Very High Distinctiveness habitats are likely to require a bespoke

assessment and compensation agreement and an 'Unacceptable Loss' error message will remain until a 'Yes' is entered into the Bespoke compensation agreed column.

Top Tip: An error flag will be generated if a Very High Distinctiveness habitat is entered into the metric unless it is retained, enhanced or it is confirmed that bespoke compensation has been agreed. To resolve this, enter the area to be retained/enhanced or if the habitat is being lost confirm that bespoke compensation has been agreed (See G and H below and Figure 4.3 above).

G: Enter area retained and enhanced

4.49 For each line where habitat data is entered on the baseline tabs, the metric will assume that they will be lost unless an area is entered in the retained or enhanced cells (see Figure 4-6).

4.50 Record how much, in hectares, of each habitat on the site is planned to be:

Area retained: Kept on the site and maintained in the same condition throughout any development or landscaping process and featuring in final site designs

Area enhanced: Kept on the site throughout any development or landscaping process but enhanced (i.e. improved for wildlife) as part of the site design

Suggested action to address habitat losses	Ecological baseline	Retention category biodiversity value					
	Total habitat units	Area retained	Area enhanced	Baseline units retained	Baseline units enhanced	Area lost	Units lost
Same habitat required	12.00		1	0.00	12.00	0.00	0.00
Same habitat required	6.00		1	0.00	6.00	0.00	0.00
Same broad habitat or a higher distinctiveness habitat required	6.60		1	0.00	6.60	0.00	0.00

FIGURE 4-6: Input cells for area retained or enhanced on 'A-1 Site habitat baseline' tab

4.53 The tool will use this information at later stages to automatically fill in baselines for habitat enhancement, so it is important to record these areas correctly.

Top Tip: If any of the habitat entered in the on-site or off-site baseline tabs is proposed for enhancement, ensure the expanded rows and columns view is used in the enhancement tab until all the baseline data is entered.

H: Bespoke Compensation Agreed (only applicable to Very High Distinctiveness habitat)

4.54 Unless all Very High Distinctiveness habitats can be retained or enhanced, bespoke compensation (or confirmation that it is not required) should be agreed with the relevant decision maker (e.g. a planning authority). Once this has been agreed, select 'Yes' on the dropdown list in the 'Bespoke compensation agreed' column.

4.55 See 2.27 before applying the metric calculation tool to any site that includes irreplaceable habitat.

I: Assessor and Local Authority Reviewer Comments

4.56 At the end (right) of each row there is a pair of comment boxes where optional text can be added. This provides an opportunity for assessors and reviewers to make any comments relating to a specific habitat parcel. It can be left blank if it is not needed.

Top Tip: Use this section to record any additional justifications for the assessment of habitat type, condition or location if needed.

Hedgerow, lines of trees and rivers and streams - baselines

4.57 If the site does not contain these habitats, proceed to Step 3. If the site contains hedgerows and/or lines of trees, or rivers, streams, canals or ditches, you should complete the relevant tabs of the metric calculation tool for these habitats. For lines of trees use the 'hedge baseline' buttons and tabs. Use the main menu to navigate to tabs B-1 and C-1.

4.58 Enter the relevant data for these habitats, as you would for area (non-linear) habitats. However, habitat extent should be recorded as length in kilometres of the habitat feature rather than the area in hectares.

Step 3: Post-intervention data entry

Navigating the post-intervention data entry tabs

4.59 Use the 'Main menu' in the tool to determine which post-intervention data entry tabs you will need to complete. The tabs you will need to complete will depend on the type of habitats you include in your designs, and whether you are creating habitats or enhancing habitats.

4.60 In most cases, the first post-intervention data entry tab to complete will be "A-2 Site Habitat Creation" found within the "On-site post development" section.

4.61 After entering data for the habitats that will be created return to the 'Main menu' and select the "A-3 Site Habitat enhancement" also found within the "On-site post development" section.

4.62 This section of the tool allows you to describe the habitats as they will be after the planned development or other intervention takes place and generate a biodiversity unit value.

On-site habitat creation

4.63 These tabs allow you to enter the data for the habitats which you plan to create in the same way as is done for the baseline assessment. The tool will then automatically apply the appropriate difficulty and temporal risk multipliers for each created habitat and calculate the number of biodiversity units generated.

4.64 You will need to select or enter information relating to the proposed:

- Broad habitat
- Habitat type
- Habitat area
- Habitat condition
- Strategic significance assessment
- Whether habitat creation has been undertaken in advance or will be delayed, relative to any losses of on-site habitats
- Comments (optional)

4.65 If a score for condition is shown as “Not possible” see Step 1 (D) above.

4.66 At the far right of each row there is a comments box which provides an opportunity for assessors and reviewers to make any observations or comments.

Top Tip: Use the comments box to provide a brief rationale for an action or some additional context. For example, to justify why a particular condition was chosen.

4.67 The Metric cross checks for discrepancies between the baseline and post development site areas. An error flag is triggered if the total areas for baseline post-intervention habitats do not match. A tolerance of 0.01 hectare has been built into the tool to avoid unnecessarily triggering an error message due to rounding errors and mapping inaccuracies.

Top Tip: If an error flag is triggered there is a discrepancy bigger than 0.01 ha that needs to be addressed.

Check the area of habitat entered for pre and post development to identify and correct any errors identified. Use the comments box for the relevant habitat to provide a brief rationale for an action or some additional context if there is a good reason why there is a discrepancy.

New habitat created in advance of loss

4.68 Biodiversity metric 3.0 rewards habitat creation in advance by reducing the difficulty and temporal risk multipliers applied. This reflects the lower delivery risk; there is less risk of failure when a habitat is already making progress towards its target condition.

4.69 If work to create a habitat parcel has been undertaken in advance of any impact it is compensating for, the number of full years between these dates should be entered the habitat created in advance column for that parcel's row. The tool then automatically reduces the timescale to reach target condition by this number of years and adjusts the temporal multiplier.

4.70 Once a habitat has been established for enough time to reach or exceed the predetermined timescale for poor condition for that specific habitat, the metric tool will apply the predetermined difficulty risk associated with enhancing rather than creating that habitat.

4.71 Once a habitat has been established for long enough to meet the predetermined timescale to reach the desired condition the temporal and risk multipliers are neutralised.

4.72 Evidence of the advance habitat creation work is likely to be required by the relevant determining authority/decision maker.

4.73 If no habitat creation works will be undertaken in advance, the cell can be left blank or '0' can be selected.

Delay in starting habitat creation

4.74 This function should be applied if there will be a significant delay in the creation of a habitat type relative to any losses of on-site habitats. For example, to account for delays due to phased developments and developments that temporarily require parts of the development site for construction purposes (which are not reinstated to their former condition within 2 years. See 5.55 regarding losses which may be considered temporary).

4.75 Enter the number of full years that the creation will be delayed into the 'Delay in starting Habitat Creation' column.

4.76 The number of years entered here will be added to the pre-populated time to target condition and increase the effect of the risk multiplier accordingly.

4.77 If the creation of habitats will not be delayed, the cell can be left blank or a '0' can be selected.

Top Tip: If a value greater than 0 is entered in both the advance creation and the delayed creation cells for the same row the metric will generate an error and will not proceed with the calculation. Select either the advance creation or the delayed creation but not both.

On-site habitat enhancement

4.78 These tabs allow you to enter the data for the habitats which you plan to enhance in the same way as is done for the baseline assessment. The tool will then automatically apply the appropriate difficulty and temporal risk multipliers for each habitat and calculate the number of biodiversity units generated.

4.79 When you enter the area of habitat being enhanced into the "Area enhanced" column of the on-site or off-site baseline tabs, the tool will automatically list the habitats you

plan to enhance on the corresponding habitat enhancement tab, using the data you first put into the baseline tabs (See Figure 4-4).

4.80 You will need to select or manually enter data for the proposed:

- Broad habitat
- Habitat type (if enhancing to a higher distinctiveness habitat type within the same broad habitat)
- Habitat condition
- Strategic significance assessment
- Habitat enhanced in advance of development or delayed
- Comments (optional)

Top Tip: If the baseline data is not appearing correctly in the enhancement tab, check that you entered an area in the corresponding "Area enhanced" column of the baseline sheets A-1 etc. (See Figure 4.4).

4.81 The existing habitat is the starting point for habitat enhancement and the tool tracks changes in both distinctiveness and condition between the baseline and the proposed outcome. If a trading down (See Rule 3) error occurs it will prevent the tool calculating a value until it is resolved.

Top Tip: If a trading error occurs in either the distinctiveness or condition change cells in the enhancement tab the tool will not calculate a value. To resolve the error, change the proposed habitat or proposed condition.

Condition must stay the same or improve, even when enhancement to a higher distinctiveness habitat is proposed, or an error will be generated.

4.82 The Broad habitat and Habitat type cells are pre-populated automatically with the habitats that were entered at the baseline, when a figure was inserted in the Area Enhanced cell on the baseline tab.

4.83 These cells are white and optionally editable should the user wish to enhance a habitat to a higher distinctiveness habitat within the same broad habitat.

4.84 Changing to a different broad habitat type would generally be considered as habitat creation not enhancement (See Box 5-3). If enhancement across broad habitats is recorded this must be ecologically justified as enhancement and the reasoning explained in the 'assessor comments' cell.

Top Tip: If the Broad habitat and Habitat type cells are not pre-populated it may be because you have over-ridden the pre-population function. Download a new version of the metric or manually enter the correct habitat.

Step 4: Off-site data entry

4.85 This tab can be used to calculate the contribution of any off-site changes towards a project's overall biodiversity change (loss or gain) calculation. If you need to use off-site tabs, you will first need to enter any baseline data for the off-site location. For example, if you were creating a woodland on an arable field away from the main (on-site) project site, you would need to record the arable field in the off-site baseline tabs.

4.86 To do this select the 'Off-site baseline' tab from the 'Main menu' and enter the baseline data for off-site habitats in the same way as for the on-site habitats by following the guidance at Step 2.

4.87 You will need to enter any data for off-site habitat creation or enhancement separately to that for on-site habitats but using the same process. Use the Main menu to find the appropriate off-site tabs.

4.88 For habitat creation and enhancement undertaken off-site, there is an additional spatial risk multiplier which takes account of the proximity of the on and off-site locations.

Step 5: Viewing and interpreting the results

4.89 From the main menu, select the 'Results' button located in the top right-hand side of the page. The results are presented in three ways: Headline results; Detailed results and Habitat trading summary.

4.90 Use the Headline results to see the overall net changes in biodiversity units and refer to the Detailed results and Habitat trading summary to understand the see the proposed changes in terms of habitats and areas.

> **Top Tip:** Results for habitats based on an area measure are not comparable with those based on a linear measure and therefore need to be accounted for separately.

Headline results tab

4.91 The Headline results tab provides a high-level summary and highlights whether biodiversity losses or gains have been achieved across the area and linear metrics relevant for the project.

4.92 It displays both on-site and off-site data in biodiversity units for baseline and post-intervention states. The Headline results also provide a summary of the project-wide change in both biodiversity unit value and percentage change.

4.93 'On-site net % change' identifies the net gain or loss as a percentage of the on-site baseline. The combined on and off-site net gain or loss is displayed under 'Total on-site net % change plus off-site surplus'.

4.94 When a habitat has no baseline unit value and new habitat is created, the percentage increase is displayed as 100% net change. In these scenarios check for locally defined unit targets which should be considered in addition to these percentage increases.

4.95 At the bottom of the headline results tab is a 'Trading summary met' box. If the trading summary is not met, see the detailed results and trading summary tabs to understand why.

4.96 The results for hedgerows and rivers are displayed separately from habitats based on an area measure and should be reported on separately.

Top Tip: If habitat enhancement units are not included in the Headline results check all the data in the enhancement tab has been entered correctly.

Detailed results tab

4.97 The detailed results provide a more comprehensive picture of the habitat changes. They also display both on-site and off-site data in biodiversity unit values and area/length.

4.98 Data for habitats based on an area measure are displayed at the at the broad habitat level and those for hedgerows and rivers are based on hedgerow type and river type.

Habitat trading summary tab

4.99 The trading summary tab provides details of trading between habitat types and an indication of whether the development has abided by the trading rules (See 2.21, Rule 3).

4.100 The trading summary avoids the need to track the changes in habitat type and condition on an individual parcel by parcel basis, which is not practical, particularly on larger sites.

4.101 Instead the trading summary draws aggregated data from other parts of the tool and presents the data in a way that allows assessors and reviewers to understand the habitat changes in each distinctiveness band and determine whether or not trading principles described in Rule 3 have been adhered to.

Top Tip: If a habitat is highlighted amber there are losses in that habitat type or broad habitat group. If the trading rules are not satisfied, amber highlighted habitats identify where the error is occurring.

Error checking

4.102 The tool contains several inbuilt error messages which are designed to identify errors in data entry. Typically, they can be resolved by checking the input data and common causes of errors include:

- inappropriate condition ratings
- habitat areas that do not match
- aiming to create a habitat or condition type that is not considered ecologically feasible
- Incomplete/missing data for example if an area of habitat is identified as being enhanced in the baseline, but no data has been entered in the enhancement tab.

Step 6 (optional): Understanding and checking supporting data in the tool

4.103 An understanding the full data sets that drive the tool is not required for normal use, but regular users of the tool might want to look at the underlying data to better understand the tool's outputs.

4.104 All the technical data and multipliers underpinning the calculation can be accessed by clicking the 'Technical data' button on the main menu.

4.105 This will open the 'Technical data' tab which is another menu to access tabs G-1 to G-9 of the calculation tool which provide details of the habitats within the metric and associated technical data such as distinctiveness bands and risk multipliers.

4.106 The 'Technical data' tab also contains a 'Translation tool' 'Translation tool' which enables the conversion of habitat types between Phase 1 and UKHab typologies.

5: Detailed description of biodiversity metric 3.0

5.1 This chapter describes the components of biodiversity metric 3.0, the values used for different multipliers, why those multipliers are used, and the assumptions and limitations around them. It also outlines some of the factors that can be considered when designing a project being assessed with the metric

5.2 This chapter focuses on the key components which apply to all three habitat unit calculations in biodiversity metric 3.0 – area habitats, hedgerows and lines of trees and rivers and streams. Chapter 6 provides further detail regarding area habitat biodiversity unit calculations. The urban tree component is detailed in Chapter 7 and Chapter 8 provides similar details and explanations for the linear units covering hedgerows and lines of trees and rivers and streams.

Components of biodiversity quality

Distinctiveness

5.3 Habitat types are each assigned to a distinctiveness band. The distinctiveness of a habitat is considered as a component of the quality of a habitat parcel. These are based on an assessment of the distinguishing features of a habitat or linear feature, including the consideration of species richness, rarity (at local, regional, national and international scales), and the degree to which a habitat supports species rarely found in other habitats.

5.4 The distinctiveness band of each habitat has been preassigned in biodiversity metric 3.0. A combination of simple rules and expert judgement have been used to assign each habitat type to the appropriate distinctiveness band. Their derivation and application to different habitats is explained in more detail in Part 2 of the Technical Supplement. The distinctiveness categories and scores used for area habitats, excluding intertidal habitats, are shown in Table 5-1.

TABLE 5-1: Area habitat distinctiveness categories and multiplier scores (excluding intertidal habitats)

Distinctiveness categories		
Category	**Score**	**Definition**
Very High	8	• Priority Habitats as defined in Section 41 of the Natural Environment and Rural Communities (NERC) Act that are highly threatened, internationally scarce and require conservation action, e.g. blanket bog. • Small amount of remaining habitat with a high proportion unprotected by designation. • Endangered or Critical European red list habitats.
High	6	• Priority Habitats as defined in Section 41 of the NERC Act requiring conservation action, e.g. lowland fens. • Remaining Priority Habitats not in very high distinctiveness band & other red list habitats.
Medium	4	• Semi-natural habitats not classed as a Priority Habitat but with significant wildlife benefit, e.g. mixed scrub. • One Priority Habitat (arable field margins).
Low	2	• Habitat of low biodiversity value e.g. temporary grass and clover ley. • Agricultural and Urban land of lower biodiversity value.
Very Low	0	• Little or no biodiversity value e.g. hard standing or sealed surface. • Urban – artificial structures which are un-vegetated, sealed surfaces or built linear features of very low biodiversity value.

Intertidal habitats

5.5 Distinctiveness bands are assigned to intertidal habitats at broad habitat[34] level and reflect their nature conservation importance and ability to support biodiversity. Most naturally occurring intertidal habitats are of high nature conservation value, whether or not they occur within the boundary of a protected site, and have therefore been assigned a distinctiveness level of **'high'** to reflect this.

5.6 In the intertidal zone, artificial habitats need to be considered within the metric and distinguished from the naturally occurring versions of those habitats. Hence, artificial counterparts of the natural habitats have been included within the metric with a distinctiveness score of **'low'** (or in the case of 'Artificial hard structures with

[34] Habitats descriptions based on the assertion that benthic communities are strongly influenced by the physical characteristics of the seafloor (e.g. type of sediment, or slope) and the water column (e.g. temperature or water movement). M. VASQUEZ, D. MATA CHACÓN, F. TEMPERA, E. O'KEEFFE, I. GALPARSORO, J.L. SANZ ALONSO, GONÇALVES J.M.S., L. BENTES, P. AMORIM, V. HENRIQUES, F. MCGRATH, P. MONTEIRO, B. MENDES, R. FREITAS, R. MARTINS, J. 2015. Populus Broad-scale mapping of seafloor habitats in the north-east Atlantic using existing environmental data. J. Sea Res., 100

Integrated Greening of Grey Infrastructure (IGGI)' **'medium'**) to reflect their origin. We acknowledge that in some circumstances these artificial habitats are only of slightly lower value than their naturally occurring counterparts and, in those cases, the condition parameter should be used to reflect this, by giving them a '**good**' condition score, to increase their overall biodiversity value in the metric. This should be justified in the 'assessor comments' column.

5.7 It is important to note that when intertidal habitats have been restored by re-establishing natural processes, the resulting habitat will be considered 'natural' (i.e. coastal lagoons, saltmarshes and saline reed beds). For example, managed realignments are largely created by breaching artificial sea defences, to restore tidal inundation and other processes that lead to the development of a range of natural intertidal and transitional habitats.

5.8 Table 5-2 shows the distinctiveness categories and scores for intertidal habitats in the metric.

Table 5-2: Intertidal habitat distinctiveness categories and scores

Category	Score	Habitat type
Very High*	8	Natural habitats on bedrock including peat, clay or chalk
High	6	Most other naturally occurring intertidal habitats
Medium	4	Artificial hard structures with Integrated Greening of Grey Infrastructure (IGGI) Littoral coarse sediment Littoral sand
Low	2	All other artificial habitats

Linear Habitats

5.9 The distinctiveness categories for 'hedgerows and lines of trees' and 'rivers and streams' are explained in Chapter 8.

Condition

5.10 Biodiversity metric 3.0 uses habitat condition as one of the measures of habitat **quality**. The condition assessment approach used in biodiversity metric 3.0 measures a habitat parcel against the ecological optimum state for that particular habitat. It is, therefore, a means of measuring variation in the quality of patches of the same habitat type (i.e. an 'intra-habitat' measure) rather than a measure of quality between habitat types (i.e. an 'inter-habitat' measure such as habitat distinctiveness). For example, a site may be assessed as calcareous grassland in poor condition due to a lack of management and presence of invasive non-native species, but by reintroducing grazing and eradicating the invasive species it could achieve good condition.

5.11 The process of assessing habitat condition for use in biodiversity metric 3.0 is tailored to habitat type and considers whether a habitat meets a number of criteria relating to

key physical characteristics of that habitat and its ability to support typical species. This is explained in detail in Part 1 of the Technical Supplement.

5.12 The condition categories available for all area habitats, including intertidal habitats, are as set out in table 5-3.

Table 5-3: Condition categories and multiplier scores for area habitats

Condition categories	
Category	**Score**
Good	3
Fairly Good	2.5
Moderate	2
Fairly Poor	1.5
Poor	1

Intertidal habitats

5.13 For intertidal habitats condition is assigned using a set of condition indicators for each broad habitat type: rocky shore, intertidal sediments, littoral biogenic reefs, littoral seagrass, coastal lagoons, saltmarsh and artificial hard structures. Condition is assessed against a generic set of criteria tailored to each habitat type. The scores achieved against each criterion are then summed to derive an overall condition score, as in Table 5-3 above.

Linear habitats

5.14 The condition categories for 'hedgerows and lines of trees' and 'rivers and streams' are explained in Chapter 8.

Strategic significance

5.15 The strategic significance of a habitat is treated as a component of the quality of a habitat parcel in the same way as distinctiveness and condition.

5.16 Strategic significance relates to the spatial location of a habitat parcel and works at a landscape scale. It gives additional biodiversity unit value to habitats that have been identified as habitats of strategic importance to that local area.

5.17 Strategic significance utilises published local strategies and objectives to identify local priorities for targeting biodiversity and nature improvement, such as Local Nature Recovery Strategies[35], local biodiversity plans, National Character Area[36] objectives

[35] See S97-101of Environment Bill 2020

[36] See National Character Areas

Local Planning Authority Local Ecological Networks[37], Shoreline Management Plans[38], estuary strategies and green infrastructure strategies.

5.18 Table 5-4 shows the multiplier scores that apply across all pre- and post-intervention and on- and off-site calculations, based on the habitat type and its location, depending on their status in a local plan, strategy or policy. These apply to all habitats except rivers and streams; the strategic significance categories for these are explained in Table 8-8.

TABLE 5-4: Strategic significance categories and scores

Strategic significance categories			
Category	**Score**	**Point applied to calculation**	
		Pre-intervention	**Post-intervention**
High strategic significance • High potential – Area/action formally identified within a local plan, strategy or policy	1.15	**Yes**	**Yes**
Medium strategic significance • Good potential - Location ecologically desirable but area/action not identified in local plan, strategy or policy	1.1	**Yes**	**Yes**
Low Strategic significance • Low potential - Area/action not identified in any local plan, strategy or policy • No local strategy in place	1	**Yes**	**Yes**

5.19 Strategic significance will be high if the habitat location is identified in local plans, strategies or policies. Medium strategic significance can be used where professional judgement is applied and the location is deemed ecologically desirable for a particular habitat type, whether recorded in the site baseline, being created or enhanced. Where professional judgement is applied in this way, the decision should be justified, and evidence provided.

[37] The National Planning Policy Framework (2018), requires Local Planning Authorities to plan strategically for nature, identifying and mapping ecological networks in order to deliver the protection, enhancement and maintenance of biodiversity. These local ecological networks can make a significant contribution to developing the Nature Recovery Network.

[38] A Shoreline Management Plan is a non-statutory document developed by Coastal Groups, local authorities and the Environment Agency for areas based at Policy Units. These units are defined on natural sediment movements and coastal processes, rather than administrative boundaries. SMPs offers guidance to recommend strategic and sustainable coastal defence policy options for reducing long term risks to people and natural environments.

5.20 For example, if woodland is planted in an area that has been identified in a Local Nature Recovery Strategy as a strategic corridor between two existing areas of woodland it would be of high strategic significance; if the same location was not recognised in a local plan or strategy but the woodland would still create a strategic corridor this would be of medium strategic significance; if the woodland was in a location not recognised in a local plan or strategy and was isolated from other woodland habitat it would be of low strategic significance.

5.21 Available datasets can be used to identify the relevance of a specific location for certain habitat types (Box 5-1).

5.22 When either high or medium strategic significance is used the user should complete the 'assessor comments' section of the metric calculation tool to justify why a habitat in a particular location warrants that level of strategic significance.

5.23 In the absence of any locally or nationally relevant strategic document indicating areas of significance for biodiversity, or robust ecological justification for a medium score, a **low** strategic significance score should be used by default in all pre- and post-intervention calculations. A low strategic significance score does not penalise a proposal as it results in a multiplier of x1 being applied and the score remaining unchanged.

Top Tip: If a habitat of the same type and condition is intersected by a boundary between two areas of differing strategic significance, the habitat parcel should be split into two

Box 5-1: Example datasets that could be used to determine Strategic significance

- **Identifying sites suitable for marine habitat restoration or creation** (MMO1135):

  A project managed by the Marine Management Organisation (MMO) to create a national dataset of sites that are suitable for habitat restoration or creation. This includes the Saltmarsh Restoration Potential Map, which identifies areas where managed realignments could take place to create new intertidal habitat.

- **REMEMARE – Restoring meadows, marsh and reef:**

  Restoration potential maps for native oyster habitat and seagrass beds. These maps predict areas where oyster and seagrass restoration are likely to be most successful based on physical parameters and seabed type.

Dealing with risk

5.24 There are uncertainties and a risk of failure in any action to create or improve the biodiversity unit value of a habitat. Where it is not possible to complete the habitat creation or improvements works in advance of the habitat losses occurring (sometimes referred to as habitat 'banking') risks need to be mitigated.

5.25 Risks are recognised in the metric by reducing the number of units generated by an area of compensation habitat. This is done using **multipliers** in the metric to account

for the predicted level of risk or uncertainty. The use of multipliers to account for the risks associated with habitat creation or enhancement has several benefits:

- it **provides flexibility** by allowing activities impacting habitats to proceed in advance of new or enhanced habitats being provided or attaining their target quality, in exchange for an increase in the number of biodiversity units required.
- it **incentivises** the creation of habitats in advance of loss. If the habitat is established before the impact, then there is no need to apply risk multipliers to manage delivery risks or to take account of time differences. More units will therefore be available from a specific parcel of land.
- it **creates a disincentive** against damaging habitats that are either difficult or take a long time to create or restore (the case for many habitats in the high distinctiveness band), by increasing the area of habitat needed to offset any loss. (N.B. See section 2.27 for application of the metric to irreplaceable or very high distinctiveness habitats.)

5.26 A typical consequence of applying risk multipliers is to increase the size (e.g. area or length of linear features) of habitat required to offset losses such that it exceeds the size of habitat lost or damaged. This is necessary to:

- preserve the incentives and disincentives referred to above.
- account for temporal losses of biodiversity (e.g. where there is a period of diminished biodiversity between the point in time when a habitat is impacted and when it is replaced by habitat of equivalent biodiversity value).
- avoid situations where habitats that are created, enhanced or restored fail to adequately offset the lost biodiversity.

5.27 The following three risks are recognised in this metric:

- Difficulty
- Time to target condition
- Spatial risk

Difficulty of creation and enhancement/restoration

5.28 This risk, associated with delivery of biodiversity creation or enhancement, is applied due to uncertainty in the effectiveness of management techniques used to restore or create habitat.

5.29 The level of risk differs between habitat types because of ecological factors (e.g. the different challenges posed by creating different habitat types) and due to the availability of techniques or knowledge of how to create habitats in a realistic timeframe. This uncertainty in achieving the target outcome for each habitat is addressed by a habitat-specific ‘difficulty’ multiplier based on available science and expert opinion. There are two separate difficulty multipliers assigned to each habitat, one for creation and one for enhancement/restoration, recognising that the technical challenges will not necessarily be the same for both.

5.30 There is a growing body of experience and expertise associated with habitat creation and enhancement[39]. Nevertheless, it is important to recognise that it is impossible to exactly replicate habitats lost, because of the unique physical and ecological features of every place. This point is of particular relevance to impacts on well-established, high quality semi-natural habitats and emphasises why it is so important that the mitigation hierarchy is adhered to, so that impacts on such habitats are minimised and occur only when there is no alternative. We have therefore taken a precautionary approach in the assessment of the difficulty of habitat creation based on the best available evidence.

5.31 The various difficulty categories and associated multiplier scores are shown in Table 5-5.

TABLE 5-5 Difficulty categories and multipliers

Difficulty categories	
Category	**Multiplier**
Very High	0.1
High	0.33
Medium	0.67
Low	1

Temporal risk

5.32 Delivery of biodiversity net gain may not be achieved before the impact occurs. This results in a deficit of biodiversity for a period of time. This issue can be managed by the creation of alternative habitat ahead of the impact taking place, e.g. by starting the offset work well ahead of a development, or through the creation of a bank of habitat units.

5.33 However, this is not always possible and, even where the management to create replacement habitat starts in advance, the time taken for habitats to mature means that there will almost inevitably be a time lag between the two. Where a time lag does occur, a temporal risk multiplier is applied. This is referred to as the '**Time to target condition'** multiplier.

5.34 The time period used in applying the Time to target condition multiplier to a metric calculation is the length of time (in years) between the intervention and the point in time when the habitat reaches the pre-agreed target quality (i.e. distinctiveness, condition). This time will vary between habitat types, between change scenarios (i.e. creation typically taking longer than enhancement) and due to how the habitat is managed. Time to target condition values, based on the **average time** taken to achieve a desired outcome, assuming good practice and typical conditions, are provided for all habitats used in biodiversity metric 3.0. These values are set out in detail in Part 3 of the Technical Supplement.

[39] As the evidence base on the effectiveness of creation and restoration techniques grows and is reviewed the risk multipliers may be modified and incorporated into future revisions to the metric.

5.35 These times to target condition have a 'discounting rate' applied to them to generate the multiplier value which is used in biodiversity metric 3.0. 'Discounting' over time is an economic technique used to compare costs and benefits that occur in different time periods based around the principle that, generally, people prefer to receive goods and services now rather than later. Where time discounting is used a standard discount rate is typically applied. Biodiversity metric 3.0 uses 3.5%, which is the value recommended in the Treasury Green Book[40]. Table 5-6 shows the multipliers for a number of time periods between one and 30 years, using a discount rate of 3.5 %. It is important to use precise figures (at least to three decimal places).

5.36 Biodiversity metric 3.0:

- **assumes a quality 'jump' from the baseline condition to the target condition** once the relevant number of years have elapsed. Metric calculations do not take into account incremental increases in quality of the habitat and do not need to be re-calculated annually, and
- **sets a limit on the discount rate used for temporal risk**. The metric sets a multiplier limit of x 0.320 to take account of temporal risk. This equates to a period of +30 years, which is the maximum time frame that most projects and plans can realistically plan ahead, and beyond which the multiplier reduces very slowly. This +30-year value is applied to all scenarios where the time required to reach the target condition exceeds 30 years. If the time for habitat to reach target condition exceeds 30 years consider if this is the most appropriate intervention.

5.37 Monitoring is required, to confirm the actual habitat type and condition achieved, and hence the number of biodiversity units delivered, matches that which was predicted.

[40] more details on discounting can be found in The Green Book Guidance, HM Treasury, 2020).

TABLE 5-6: Time to target condition: multipliers for different time periods using a 3.5% discount rate.

Time to target condition			
Time (years)	**Multiplier**	**Time (years)**	**Multiplier**
0	1.000	16	0.566
1	0.965	17	0.546
2	0.931	18	0.527
3	0.899	19	0.508
4	0.867	20	0.490
5	0.837	21	0.473
6	0.808	22	0.457
7	0.779	23	0.441
8	0.752	24	0.425
9	0.726	25	0.410
10	0.700	26	0.396
11	0.676	27	0.382
12	0.652	28	0.369
13	0.629	29	0.356
14	0.607	30	0.343
15	0.586	>30	0.320

Accounting for habitat creation in advance and delays in starting habitat creation

5.38 Biodiversity metric 3.0 recognises that there will be situations where there is a mismatch between a negative impact on biodiversity occurring and work to create or enhance the 'post-intervention' habitats commencing. This can either be in the form of habitat creation occurring in advance or being delayed beyond the point at which the baseline losses occur. Biodiversity metric 3.0 can account for both.

Habitat created in advance

5.39 When there is a mismatch between a negative impact on biodiversity occurring and replacement habitat reaching the required quality or level of maturity, there will be an overall loss of biodiversity for a period of time. This issue can be managed by creation of habitat ahead of the impact taking place, either through the setting up of habitat banks or, for projects with a long lead in time, by starting the offset work well ahead of any habitat losses.

5.40 The 'Habitat created in advance' function enables biodiversity metric 3.0 to account for a reduction in both the time remaining to reach the target condition and the risk of delivery being successful. This occurs when work to create or enhance habitats is begun in advance of an intervention/development occurring, including through 'habitat

banks'. It recognises that there will be a lower risk of failure following the initial establishment of a habitat.

5.41 The metric calculation tool reduces the time to target condition by the appropriate number of years since habitat creation or enhancement began and applies the adjusted multiplier. If the number of years created in advance is between one and the time to reach poor condition for that habitat the 'difficulty of creation' multiplier will continue to be applied. However, if the time to reach poor condition has already been reached or exceeded then the 'difficulty of enhancement' multiplier will be applied instead. If the final time to create the desired habitat type and target condition has already been reached, then both the time to target condition and the difficulty of creation risk multipliers will no longer be applied (see Box 5-2).

5.42 Evidence of the habitat advanced habitat creation or enhancement should be provided and approved by the determining authority and should be referenced in the 'assessor comments' cell in the metric. Particularly where the standard time to target condition for habitat creation is 30+ years evidence will be required to justify that the proposed condition can be reached in the reduced time.

5.43 This function is available for both on and off-site delivery and for area and linear habitats.

Delay in starting habitat creation

5.44 There will be circumstances where work to create or enhance the proposed 'post-intervention' habitats cannot commence at the time of the negative impact on biodiversity occurring. This is most likely to happen with on-site habitat creation, where the area of land allocated for habitat creation is unavailable due to a development taking place and the habitat creation/restoration cannot begin until the development is complete. For example, where the proposed habitat creation is on the route of an existing road which cannot be removed until the new road is completed or where it is being used as a site compound for a long period of time.

5.45 When habitat creation is delayed significantly beyond the point at which the baseline losses occur the 'Delay in starting habitat creation' function enables biodiversity metric 3.0 to account for the resulting increase in the time remaining to reach the target condition. This function recognises that the risk of failure remains the same as when habitat creation begins concurrently with the loss, so the difficulty risk multiplier is applied.

5.46 The metric calculation tool increases the 'time to target condition' by the appropriate number of years that the habitat creation is delayed and applies the adjusted multiplier. If the number of years delay, combined with the "standard' time to target condition applied in metric 3.0, exceeds 30 years then the 30+ years multiplier will be applied (see Box 5-2).

5.47 This function is available for both on and off-site delivery and for area and linear habitats.

(Note: Only one of these options may be used for any row in the metric. An error message will be generated if values are entered for both creation in advance and delay.)

Box 5-2: Examples of how the risk multipliers are applied for 'Habitat created in advance' and 'Delay in habitat creation' within biodiversity metric 3.0

Habitat created in advance

Habitat/Condition	'Standard' Time to target condition (TTC) (years)	Time habitat created in advance (years)	Residual TTC applied by metric 3.0	Time to poor condition reached	Difficulty multiplier applied
Lowland meadow/Good	15	2	13	No (5 years)	Creation multiplier
Modified grassland/Good	7	2	5	Yes (1 year)	Enhancement multiplier
Artificial littoral coarse sediment/Moderate	1	2	0	Yes (1 year)	None
Lowland heathland/Good	30+	5	25	No (10 years)	Creation multiplier

Delay in starting habitat creation

Habitat/Condition	'Standard' Time to target condition (years)	Time habitat creation delayed (years)	Combined TTC applied by metric 3.0	Difficulty of creation multiplier applied
Modified grassland/Moderate	4	5	9	Yes
Other broadleaved woodland/Moderate	15	5	20	Yes
Other broadleaved woodland/Good	30+	5	30+	Yes
Upland calcareous grassland/Good	25	10	30+	Yes

Accounting for temporary losses

5.55 Where a habitat is impacted for a short period of time before being restored back to the same habitat in its original condition or better this can be considered a temporary loss. For example, there may be situations where a habitat is impacted by an operation such as trenching for pipeline or cable laying or turf stripping and replacement and then restored back to its original state.

5.56 Biodiversity metric 3.0 only considers losses to be temporary when the original baseline habitat will be recreated in **the same or better condition within 2 years** from the date of the impact occurring. This requires the habitat creation/restoration to be complete, not just that seed has been sown or whips planted. This means that the temporary loss option is only available for habitats that can be restored to target condition (by recreation or enhancement) within 2 years.

5.57 In these situations, it will not be necessary to record the loss within the metric and the habitat should be recorded as 'retained'. Where the loss is for a period greater than 2 years, even when the same habitat is restored in the same location, you should record this as a loss of baseline habitat and creation of the replacement habitat.

Spatial risk

5.58 There are two spatial components in biodiversity metric 3.0. Firstly, strategic significance describes a site's location in relation to other habitats and is applied to both pre- and post-intervention calculations. Secondly, Spatial risk reflects the relationship between the location in which a biodiversity loss is occurring and that where the off-site habitat is being delivered. This risk factor is only applied to the off-site post-intervention calculations.

5.59 There are both ecological and social drivers for off-site habitat to be provided close to where losses occur: e.g. to avoid depleting biodiversity in local areas or to recognise the cultural ecosystem services provided by an area of land to a local community. For this reason, the metric penalises proposals where the off-site habitat is located at distance from the impact site. The Spatial risk multiplier is applied to those off-site habitats which are delivered outside either the local planning authority area (LPA), the same National Character Area (NCA)[41] or Marine Plan Area for intertidal habitats. For rivers and streams the waterbody or catchment is the defining boundary and WFD waterbody and catchment boundaries should be used to determine the Spatial risk created by delivering offsets in different locations[42].

5.60 Table 5-7 shows the different spatial categories and associated risk scores for different habitat groupings within biodiversity metric 3.0.

5.61 Those who only wish to use the metric to calculate the biodiversity value of proposed off-site habitat creation and enhancement, such as landowners wishing to offer biodiversity units for sale, should enter their data (baseline and post-intervention) into the on-site tabs in biodiversity metric 3.0. When these biodiversity units are identified as the off-site biodiversity units for a development or project the developer should enter this information into the off-site tabs in biodiversity metric 3.0 and must apply the appropriate spatial risk multiplier to reflect the distance from the site where the losses are occurring.

[41] Further information on NCAs can be found at: http://publications.naturalengland.org.uk/category/587130

[42] For those rivers and streams too small to form a WFD waterbody in their own right, the 'waterbody' would be defined as the waterbody that the tributary feeds into.

TABLE 5-7: Spatial risk categories

Variation in Spatial risk categories between habitat groups			
Score	**Area habitats** (excluding intertidal habitats) **Hedgerows and lines of trees**	**Intertidal habitats**	**Rivers and streams habitats**
1.0	Compensation inside LPA or NCA of impact site	Compensation inside same Marine Plan Area, or deemed to be sufficiently local, to site of biodiversity loss	Within waterbody
0.75	Compensation outside LPA or NCA of impact site but in neighbouring LPA or NCA	Compensation outside same Marine Plan Area but in neighbouring Marine Plan Area	Within catchment
0.5	Compensation outside LPA or NCA of impact site and beyond neighbouring LPA or NCA	Compensation outside Marine Plan Area of impact site and beyond neighbouring Marine Plan Area	Outside catchment

Biodiversity change scenarios

5.62 Different biodiversity change scenarios carry different levels of risk and the multipliers are applied differently to reflect this. Biodiversity metric 3.0 recognises two distinct habitat change scenarios:

- **Habitat creation** - Where one habitat type is replaced by another different habitat or a habitat is destroyed (e.g. by development works) and the same habitat is recreated elsewhere. An example of habitat creation is planting young native trees and shrubs on an area of arable land to create a new broadleaved woodland.
- **Habitat restoration or enhancement** - Where changes are made to an existing habitat to improve its distinctiveness and / or condition (see Box 5-2). Examples of restoration are the transformation of an abandoned calcareous grassland dominated by scrub and coarse grasses to a continuous area of calcareous grassland with isolated woody species and an abundance of fine-leaved grasses, or taking measures to remove mooring impacts from a seagrass bed.

5.63 Under the above scenarios different portions of the biodiversity value of a habitat may have different risk multipliers applied to it. As illustrated in Figure 5-8, in the case of a straightforward habitat creation, you lose all the original habitat, so the risks apply to the whole value of the habitat being created. In the case of restoration or enhancement the habitat already has, and retains, a certain biodiversity value that the enhancement interventions increase. In this scenario, the risk multipliers are only applied to this uplift (improvement) of the habitat.

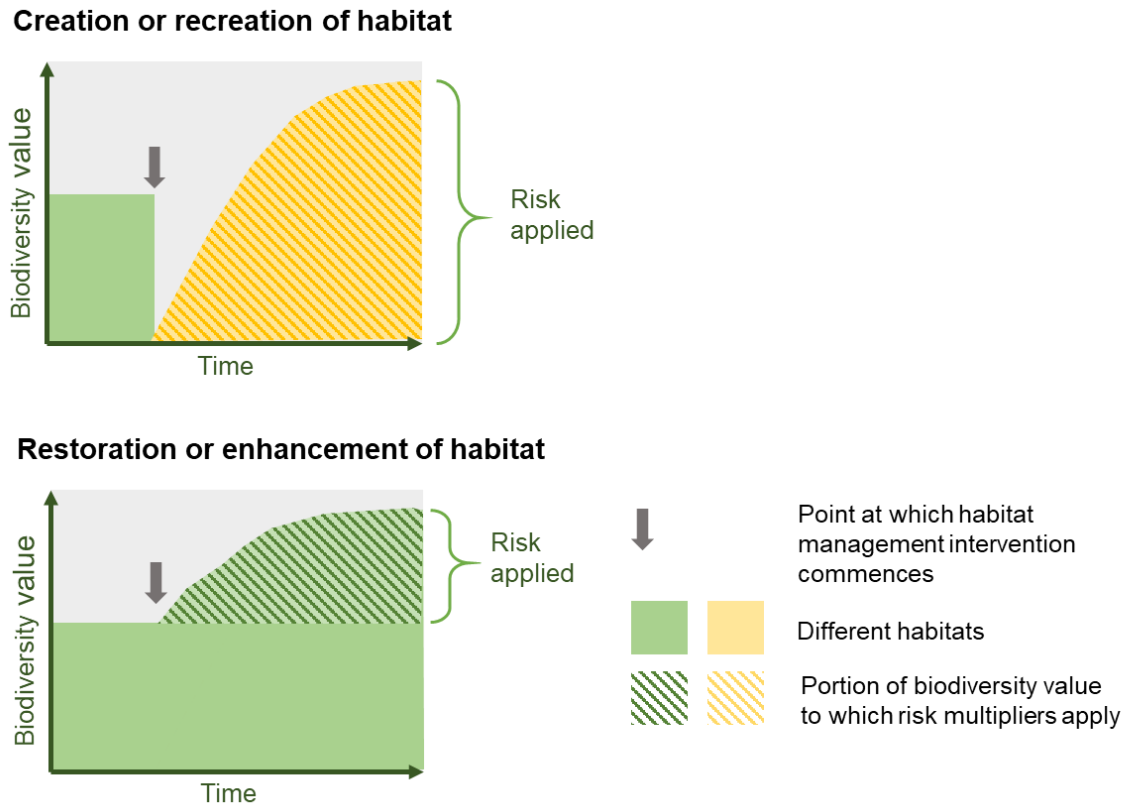


FIGURE 5-8: The two habitat change scenarios recognised in biodiversity metric 3.0

5.64 It is important to select the appropriate change scenario for each management intervention as biodiversity units are calculated differently for these two scenarios. This choice is an ecological judgement and is determined by the ecological consequences of the change, not where the habitat is located (see Box 5-3).

5.65 Habitats can be created, restored or enhanced, on-site as well as off-site. Measures taken to generate biodiversity units by improving existing habitats must provide a significant and demonstrable uplift in distinctiveness or condition.

5.66 Good management practice does not, by itself, constitute restoration or enhancement, though re-instating certain management practices may contribute to achieving it, for example by improving condition.

Box 5-3: When to use habitat creation vs habitat enhancement/restoration

When entering your post-development/intervention information into biodiversity metric 3.0 it is important that you chose the correct change scenario:

Habitat creation

This will be the change scenario applied to the creation of any new habitats. It will result in the total loss and replacement of the baseline habitat.

The following principles will generally apply:

- There is a change in broad habitat type from baseline to post-intervention (e.g. grassland to woodland, or cropland to urban)
- Requires significant ground preparation and/or seeding is required to establish the proposed habitat (e.g. placement of rocky substrate to facilitate creation of littoral biogenic reefs, or converting arable land to species rich grassland)
- A habitat which is being lost is recreated, whether on or off-site and regardless of whether its condition is better than that being lost.

Habitat enhancement/restoration

This change scenario should be applied when the proposed intervention will modify an existing habitat to improve its condition or quality.

It should only be used in the following three situations:

1. **Improving the condition** of an existing habitat (e.g. from moderate to good condition)

2. **Changing the distinctiveness** of a habitat to another higher distinctiveness habitat **in the same broad habitat type** (e.g. other neutral grassland to lowland meadow, other broadleaved woodland to lowland mixed deciduous woodland)

3. **Restoring a remnant high value habitat** - In specific circumstances, where there are sufficient remnant areas of a high distinctiveness habitat present on a site that it is clear that the habitat can be restored. (e.g. Where "other conifer woodland" has been planted over heathland or sand dunes[43], or where mixed scrub has developed over lowland calcareous grassland and the original habitat is clearly still present.)
   N.B. In these cases, evidence to justify the use of the enhancement option must be provided and referenced in the assessor comments cell in the metric and approved by the determining authority.

In all other habitat change scenarios the baseline habitat should be assumed to be lost and the replacement, post-intervention habitat created.

[43] In which case the Open Habitats Policy would need to be followed to ensure suitability of the proposed change

6: Area habitat biodiversity unit calculations

6.1 Areas habitats are perhaps the most familiar ecological currency in the UK. They are the woodlands, grasslands, wetlands, coastal, intertidal and other habitat types that are widely recognised by ecologists and the public alike. The habitats we recognise comprise a community of different species populations living in a place. There is usually a sub-group of those populations that give a habitat its defining characteristics, for example trees in a woodland or grasses in a meadow.

6.2 There are a variety of habitat classification systems available in the UK, for example Phase 1[44], UKHab[45] and EUNIS[46]. Biodiversity metric 3.0 uses a combination of these: UKHab for the majority of area habitats, EUNIS for intertidal habitats and WFD lakes typologies for lakes. There are a small number of habitats which have specific biodiversity metric 3.0 definitions (see Table TS2-1).

6.3 UKHab is a unified and comprehensive habitat classification coding system for all terrestrial, freshwater and marine habitats in the UK, designed to provide a simple and robust approach to survey and monitoring and which includes a detailed nomenclature for urban areas. It is flexible enough for use in a wide range of survey types from walkover surveys of small urban sites to regional and national scale rural habitat mapping.

6.4 EUNIS is a comprehensive system developed to facilitate the harmonised description and collection of data across Europe; it covers all habitats types from natural to artificial, and through to the marine (subtidal) environment. The EUNIS habitat classification system is the habitat classification used in reporting across the marine environment in Europe. Alkalinity is the basis of the WFD lakes typology along with peat and marl. Nearly all lakes above 2 ha have already been assigned to one of the WFD types using either measured or modelled data. These types can be found on the UK lakes portal[47].

6.5 Calculating the baseline biodiversity unit value of a site uses the area, distinctiveness, condition and strategic significance of each habitat.

Distinctiveness

6.6 As described in Chapter 5, distinctiveness refers to the relative scarcity of a habitat and its importance for nature conservation. The distinctiveness categories used for Area Habitats and examples illustrating the types of habitats assigned to each category are shown in Table 5-1. The distinctiveness category assigned to each habitat type used in biodiversity metric 3.0 is provided in part 2 of the Technical Supplement. (Tables TS2-6 to TS2-17 and summarised in Table TS3-1).

6.7 The distinctiveness band of a habitat will affect its biodiversity unit value. A higher distinctiveness has the effect of increasing the biodiversity unit score for a habitat in

[44] JNCC (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit (revised 2010)

[45] UK Habitat Classification: https://ukhab.org/

[46] European Nature Information System

[47] UK lakes portal

the baseline calculation. This will not always be the case for post-intervention creation and enhancement scores, where risk factors such as difficulty and time to target condition also influence the outcome.

6.8 Trading rules which are applied by the metric require that any loss of habitat is replaced on a 'like for like' or 'like for better' distinctiveness basis (Table 6-1)[48].

Table 6-1: Habitat distinctiveness trading rules in biodiversity metric 3.0

Baseline habitat distinctiveness	**Distinctiveness of replacement habitat required by trading rules** **(N.B. Applies to creation and enhancement)**
Very high	**Losses are not permitted** within the metric *(Principle 4 and Rule 3)* Bespoke assessment and compensation required
High	Must be replaced with biodiversity units of the **same habitat type** *(Rule 3)*
Medium	Must be replaced with: Medium distinctiveness habitat from **same broad habitat type** OR Any habitat from a **higher distinctiveness band** *(Principle 5)*
Low	Must be replaced with: **Same distinctiveness** habitat OR Any habitat from a **higher distinctiveness band** *(Principle 5)*
Very low	Replacement not required (Are of little/no biodiversity value - zero biodiversity unit score)

Condition

6.9 The condition categories used for area habitats are given in Table 6-2, while the detail of how condition should be assessed for each habitat type is explained in Part 1 of the Technical Supplement.

6.10 The condition of a habitat is directly linked to the area habitat biodiversity unit (AHBU) score; better condition habitats will have a higher biodiversity unit value at baseline. For post-intervention calculations the proposed habitat condition will also influence the AHBU score, however, better condition habitats may not always achieve the

[48] Note: Whilst it is important that the Rules and Principles (Chapter 2) are followed, ecological judgement should always be applied in determining the most appropriate replacement habitats, based on the nature of the habitats being lost and the location.

highest AHBU outcomes. This is because, in some cases, it will take a significant time to reach good condition, which brings additional risk factors (time to target condition and difficulty).

6.11 For example, the time to reach good condition within metric 3.0 ranges from 3 years for a bioswale to 30+ years for a range of woodland, wetland and heathland habitats.

TABLE 6-2: Condition categories used for area habitats.

Condition categories	
Category	**Multiplier**
Good	3
Fairly Good	2.5
Moderate	2
Fairly Poor	1.5
Poor	1
N/A – Agriculture	1
N/A - Other	0

Calculating area habitat biodiversity units (AHBUs)

6.12 Box 6-1 shows the formulae used to calculate biodiversity unit values for area habitats. (See Box 2-1 for schematic illustration.) A calculation tool is available to download which automates these metric calculations.

Box 6-1: Calculating area habitat biodiversity units (AHBUs)

Equation 1: Pre-impact (t_0) biodiversity value for baseline

$$t_0 \ \textit{Baseline AHBU} = \left(A^{t0} \times Q_D^{t0} \times Q_C^{t0}\right) \times \left(Q_{SS}^{t0}\right)$$

Equation 2: Post-impact (t_1) biodiversity value for habitat creation

$$t_1 \ \textit{Creation AHBU} = \left\{\left[A^{t1} \times Q_D^{t1} \times Q_C^{t1}\right] \times \left[R_D \times R_T\right] \times \left[Q_{SS}^{t1}\right]\right\} \times R_{OS}$$

Equation 3: Post-impact (t_1) biodiversity value for habitat restoration and enhancement

$$t_1 \ \textit{Enhancement AHBU} = \left[\left[\left(\left[\left\{A^{t1} \times Q_D^{t1} \times Q_C^{t1}\right\} - \left\{A^{t0} \times Q_D^{t0} \times Q_C^{t0}\right\}\right] \times \left\{R_D \times R_T\right\}\right) + \left\{A^{t0} \times Q_D^{t0} \times Q_C^{t0}\right\}\right] \times \left\{Q_{ss}^{t1}\right\}\right] \times R_{OS}$$

A	Area of habitat (hectares)	R_D	Difficulty (a risk factor)
Q_C	Condition (a quality measure)	R_T	Time to target condition (a risk factor)
Q_D	Distinctiveness (a quality measure)	R_{OS}	Spatial risk (off-site risk factor)
Q_{SS}	Strategic Significance (a quality measure)	t0	Pre-intervention (baseline)
		t1	Post-intervention

Applying multipliers to different interventions

6.13 To properly reflect the different risks which apply to habitat creation versus habitat enhancement/restoration, it is necessary for area habitat biodiversity unit calculations to distinguish between these two (see 5.62). The difference between the calculations and application of the risk multipliers is shown in Table 6-3.

6.14 A baseline (t_0) and post-intervention (t_1) calculation is needed for each habitat parcel within a scheme. Even though the full range of risk multipliers are applied in both post intervention (t_1) scenarios the detail of the calculations for creation and enhancement are different; for habitat creation they are applied to the whole value of the habitat whereas for enhancement/restoration they apply only to the improvement in the habitat. No risk multipliers are applied to retained habitats, but these residual area habitat biodiversity units are accounted for in the calculation (Fig. 5-8).

TABLE 6-3: Which scores and multipliers apply in calculations

	Area	Distinctiveness	Condition	Strategic Significance	Difficulty to create	Difficulty to enhance	Time to Target Condition	Spatial Risk
t_0 Baseline Units	Yes	Yes	Yes	Yes	**No**	**No**	**No**	**No**
t_1 Creation Units	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes*
t_1 Enhancement Units	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes*

*Only when the creation or enhancement is being delivered at an **off-site** location, i.e. away from the site where the impact is occurring

6.15 Parts 2 and 3 of the Technical Supplement include details of quality attributes and risk multipliers applied for each area habitat type.

Woodland creation and biodiversity metric 3.0

6.16 The time needed for "Woodland and forest" habitats to develop the structural complexity and features which are of the highest value for biodiversity is considerable, and is reflected in the time to target condition values assigned to them in biodiversity metric 3.0. (The time to reach 'good' condition is 30+ years for all woodland habitat types.) This, combined with the 'high' difficulty of creating the more complex, high value woodland types, can result in low biodiversity unit scores being generated for woodland creation.

6.17 To avoid this, when creating new woodlands, you should normally use the "Other woodland; broadleaved or "Other woodland; mixed" habitat type options available in metric 3.0, which have a 'low' difficulty of creation. Where a high distinctiveness woodland type is being lost and a 'like for like' replacement must be provided, the "Other" woodland types are not an option. In these situations you should aim to replicate the species composition and structure of the particular woodland type that is being lost, but aim for a realistic condition, that can be achieved in the timeframe of the net gain delivery. This may be limited to Poor condition.

6.18 Note: This is not an issue for enhancement/restoration of woodland habitats where the risk multipliers are significantly reduced (see Figure 5-1).

Recording habitat mosaics in biodiversity metric 3.0

6.19 Where it is not possible to map parcels of distinct habitat types within an area because they form a mosaic without clear boundaries, or where the habitat mix is at a scale too fine to map, you should estimate the proportion of each component habitat

that makes up the mosaic. These can then be entered into the metric as separate habitats. You will still need to assess the condition of the component habitats. (See Box 6-2, Example 1.)

6.20 Suburban housing is a mosaic of developed land and vegetated gardens habitats. When entering post-intervention predictions for areas where there will be a small scale mosaic of developed and natural surfaces, such as housing and gardens in suburban areas, you should use a similar approach to the above and assume the ratio of developed land; sealed surface to vegetated garden is in the proportion 70:30. For particularly high or low density developments it may be possible to vary this ratio. However, this must be evidenced, justified in the assessor comments, and agreed with the determining body. (See Box 6-2, Example 2.)

Box 6-2: Recording habitat mosaics in biodiversity metric 3.0

Example 1: Habitat mosaics

A site contains 1 ha of land which is a mosaic of calcareous grassland and mixed scrub of which approximately 75% is calcareous grassland and 25% is mixed scrub.

In the metric baseline you would record 0.75ha of calcareous grassland and 0.25ha of mixed scrub.

Accounting for condition: If the habitat condition varies this will need to be recorded in separate rows in metric 3.0. For example, if the calcareous grassland is mainly of moderate condition but has a number of patches with a total area of 0.1ha that are in good condition, record this as separate lines in the metric, as follows – 0.1ha calcareous grassland good condition and 0.65ha in moderate condition.

Example 2: Suburban residential development

A 10ha development will create a mixture of roads, public greenspace and housing. The roads (developed land; sealed surface) will occupy 1ha, the public greenspace (modified grassland with urban trees) will occupy a further 2ha and the remaining 7ha will be private houses and gardens.

In the metric you would record the 7ha of housing and gardens, by applying the 70:30 ratio, as 4.9ha of ‘developed land; sealed surface’ and 2.1ha of ‘vegetated garden’. The remaining habitats (1ha developed land; sealed surface and 2ha modified grassland with urban trees) would be recorded in the normal way.

7: Urban Tree (including street tree) biodiversity unit calculations

7.1 In biodiversity metric 3.0 the term 'Urban tree' applies to all trees in urban habitats such as private gardens, private land, institutional land and land used for transport functions, roads, streets, canals, rail, footpaths etc.

7.2 Trees in urban areas can, under the right conditions, provide a large range of habitat opportunities, supporting lichens, bryophytes, invertebrates and birds. Tree planting in urban areas has for over two hundred years also introduced non-native species into towns and cities. In the context of biodiversity, native species are the preferred option. However, non-native tree species can contribute positively to biodiversity richness particularly in relation to providing a seasonal food source for nectar feeders and other invertebrates as well as supporting vertebrates that feed on species that are hosted by non-native trees. Examples are early and late flowering species of Prunus and aphids on varieties of Acer providing food for species higher up the food chain.

7.3 Trees in urban areas provide opportunistic sites for biodiversity to colonise and re-colonise, increasing connectivity and contributing to biodiversity critical mass between already established patches or sites. This is especially so where transport corridors are populated with mixed native species.

7.4 The biodiversity metric 3.0 considers Urban trees to include individual street trees, lines of street trees and blocks of trees within the urban setting. Their definitions are explained in Table 7-1.

TABLE 7-1: Urban tree definitions

Urban tree categories	
Individual Trees	Young trees over 75mm in diameter measured at 1.5m from ground level and individual semi-mature and mature trees of significant stature and size that dominant their surroundings whose canopies are not touching but that are in close proximity to other trees.
Perimeter Blocks	Groups or stands of trees within and around boundaries of land, former field boundary trees incorporated into developments, individual trees whose canopies overlap continuously.
Linear Blocks	Lines of trees along streets, highways, railways and canals whose canopies overlap continuously

How urban trees are dealt with in biodiversity metric 3.0

7.5 The size and species of trees (native or non-native) together with the intensity and type of management they are subject to will determine the biodiversity value of the trees in question. As such, any removal of urban trees needs to be factored in biodiversity metric 3.0.

7.6 They require a slightly different approach to the area habitat biodiversity unit calculation.

7.7 The urban tree tool can also be used to obtain area and biodiversity unit values for trees outside the urban environment. For example, a tree in the middle of an arable or grassland field which is a common sight in the British landscape.

Distinctiveness and difficulty of creation and enhancement

7.8 Urban trees have a Medium distinctiveness score in biodiversity metric 3.0 as they vary in the species that are planted, sit in stressed environments and would only be considered a single component of a more complex habitat such as woodland.

7.9 They have also been attributed a low difficulty for both creation and enhancement.

Condition assessment

7.10 Urban trees are split into small, medium and large trees and are assessed using an Urban tree condition assessment proforma to score the trees as Poor (score of 1), Moderate (score of 2) or Good (Score of 3) condition (see Technical Supplement Part 1a).

7.11 It is important that both size and condition are recorded for each tree. Trees of the same size and condition can then be grouped together before entry into the ‘Urban tree helper’ to generate an area equivalent for each condition category. The number of small, medium and large trees is then automatically converted into a total area equivalent value which can be used in the metric calculation. (See Box 7-1).

BOX 7-1: Accounting for variation in condition when obtaining area equivalent values using the Urban tree helper

Step 1: Record the size and condition of each Urban tree present on your site

Step 2: Group trees of the same size and condition to derive a total number for each size/condition class

Step 3: Enter the number of trees of each size but the same condition into the 'Urban tree helper' to generate a total area equivalent for that condition state.

Step 4: Repeat for the other two condition states to obtain area equivalents for these.

Step 5: Enter a separate row in biodiversity metric 3.0 recording the area equivalent for each of the three condition states

Condition	No. of trees per size class			Area equivalent value (ha) generated by Urban tree helper
	Small	Medium	Large	
Good	10	50	0	0.2080
Moderate	50	10	0	0.0633
Poor	0	100	10	0.5200

7.12 The area calculation for Urban trees is worked out using a Root Protection Area (RPA)[49] formula. The Urban tree helper uses the RPA to generate an area equivalent value. (See Table 7-2.)

TABLE 7-2: Urban tree size by girth and their area equivalent

Size	Diameter at Breast Height (cm)	Stem Diameter (cm)	RPA (radius in metres)	Area equivalent (ha)	No. of Trees equivalent to 1 ha
Small	30cm	10cm	1.2m	0.0005 ha	2,000 trees
Medium	90cm	30cm	3.6m	0.0041 ha	244 trees
Large	150cm	50cm	6 m	0.113	89 trees

7.13 Once the area equivalent has been calculated Urban trees are treated in the same way as an area habitat within the metric, for pre- and post-intervention calculations, following the area habitat calculation approach described in Chapter 6. Their area

[49] For more information see: British Standard 5837 2012 Trees in relation to design, demolition and construction

does not need to be deducted from the total area of other habitats within the site boundary. It will not generate a total area error.

7.14 The mitigation hierarchy applies and where possible ‘like for like’ compensation is the preferred approach.

8: Linear habitat biodiversity unit calculations

8.1 Biodiversity metric 3.0 includes separate calculations for linear habitats:

- Hedgerows and lines of trees
- Rivers and streams

8.2 Treating these linear habitats like other habitats and accounting for their biodiversity value using the area habitat approach would undervalue their importance and would fail to ensure adequate provision for losses. It is therefore necessary to take separate account of these habitat types so that their contribution to biodiversity is properly acknowledged (see 2.7, 2.8 and Rule 4).

8.3 'Hedgerow and lines of trees biodiversity units' (HBUs) are the units used to measure the biodiversity value of hedgerows and lines of trees and to clearly differentiate from biodiversity units associated with area habitats (ABHUs) and river and streams habitats (RBUs).

Hedgerows and lines of trees

8.4 Hedgerows as a linear habitat are a feature almost unique to the British Isles. Biodiversity metric 3.0 further refines the approach taken for hedgerows in the Defra biodiversity metric (2012), and Biodiversity metric 2.0 (2019), which both separated hedgerows from area habitats. 'Lines of trees' are included since they display some of the same functional qualities as hedgerows.

8.5 Urban trees are considered separately to lines of trees in the wider environment, since they generally occur in an urban environment surrounded by developed land. For information on how urban trees are considered in biodiversity metric 3.0 see Chapter 7.

Calculating hedgerows and lines of trees biodiversity units (HBUs)

8.6 Box 8-1 shows the formulae used to calculate biodiversity unit values for hedgerows and lines of trees.

8.7 To properly reflect the different risks, it is necessary for hedgerow and line of trees biodiversity unit calculations to distinguish between creation and enhancement (see 5.62). A baseline (t_0) and post-intervention (t_1) calculation is needed for each hedgerow or line of trees within a scheme to determine the uplift in biodiversity value.

Box 8-1: Calculating Hedgerows and Lines of Trees biodiversity units (HBUs)

Equation 1: Existing (pre-intervention) (T_0) biodiversity value

$$\boldsymbol{T_0\ Baseline\ HBU = \left(L^{t0} \times Q_D^{t0} \times Q_C^{t0}\right) \times \left(Q_{SS}^{t0}\right)}$$

Equation 2: Post-intervention (T_1) biodiversity value for hedgerow creation

$$\boldsymbol{T_1\ Creation\ HBU = \left[L^{t1} \times Q_D^{t1} \times Q_C^{t1}\right] \times \left[R_D^{t1} \times R_T^{t1}\right] \times Q_{SS}^{t1} \times R_{OS}}$$

Equation 3: Post-intervention (T_1) biodiversity value for hedgerow restoration and enhancement

$$\boldsymbol{T_1\ Total\ HBU\ after\ Enhancement = \{\left[\left(\left[\{L^{t1} \times Q_D^{t1} \times Q_C^{t1}\} - \{L^{t0} \times Q_D^{t0} \times Q_C^{t0}\}\right] \times \{R_D \times R_T\}\right) + \{L^{t0} \times Q_D^{t0} \times Q_C^{t0}\}\right] \times Q_{ss}^{t1}\} \times R_{OS}}$$

L	Length of hedge (kilometres)	R_T	Time to target condition (a risk factor)
Q_C	Condition (a quality measure)	t0	Before intervention
Q_D	Distinctiveness (a quality measure)	t1	Post intervention
Q_{SS}	Strategic significance (a quality measure)	R_{OS}	Off-site (spatial) risk
R_D	Difficulty (a risk factor)		

Assessing the quality of hedgerows and lines of trees

Type and length

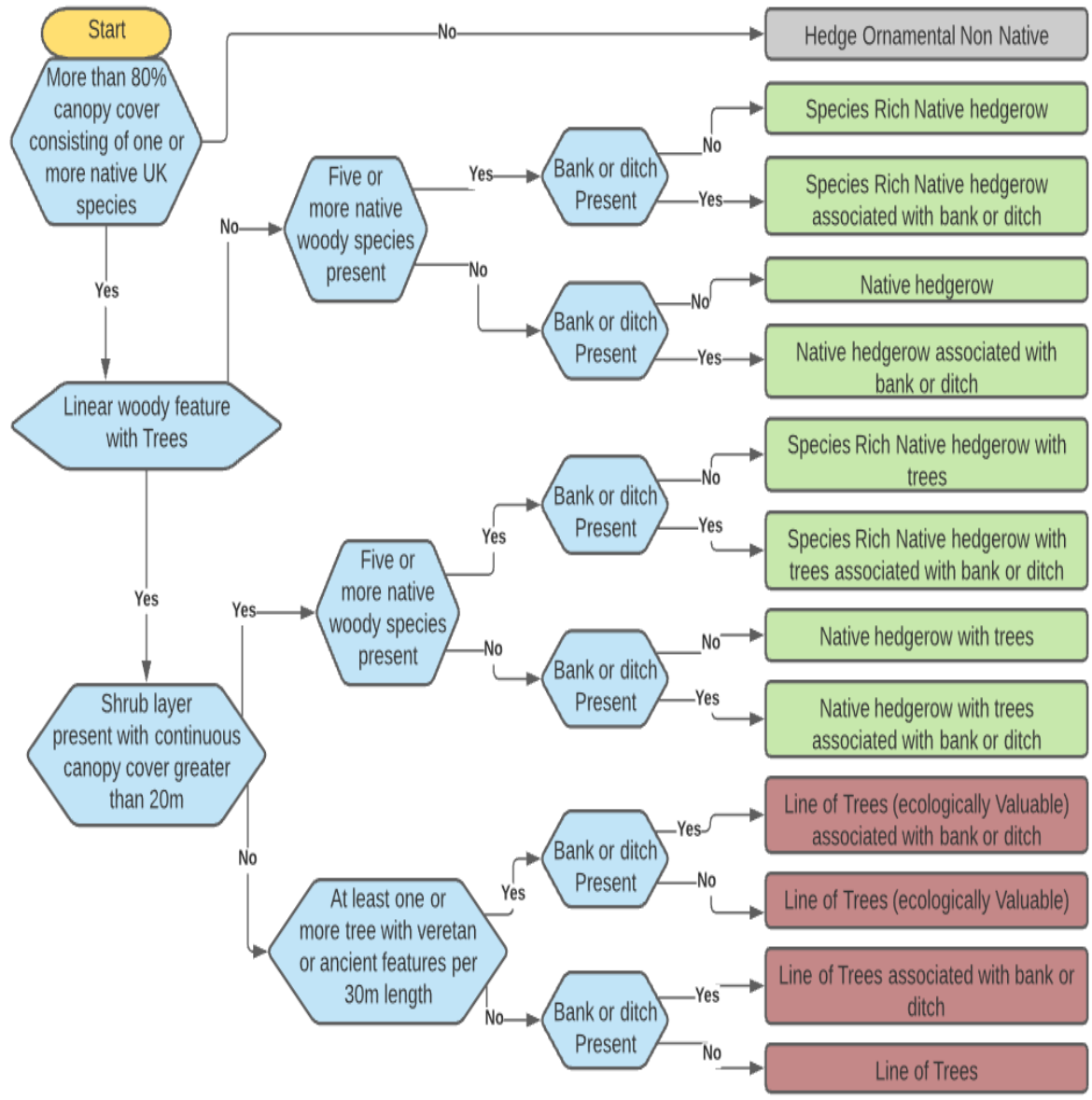
8.8 Type and length (in kilometres) of existing hedgerows must be recorded during a site survey.

8.9 The key and descriptions provided in the Defra 'Hedgerow Survey Handbook'[50] should be used to determine if a feature should be considered a hedgerow, hedgerow with trees, a line of trees or not a hedgerow at all.

8.10 The specific type of hedgerow can then be identified using the flow chart in Box 8-2, Detailed descriptions are given in Table TS1-2 in the biodiversity metric 3.0 Technical Supplement.

[50] DEFRA. 2007. Hedgerow Survey Handbook. A standard procedure for local surveys in the UK. Defra, London. PB1195.

Box 8-2: Key to determine hedgerow and line of trees habitat type



Distinctiveness

8.11 Hedgerows are assigned a ‘distinctiveness’ rating determined by the range of ecological niches likely to be present for each hedgerow type. The distinctiveness scores assigned to different hedgerow types are set out in Table 8-1.

8.12 There is no attempt to evaluate the biodiversity unit value of the ground flora associated with hedgerows, despite its potential relevance. This is because the

limited survey window and the level of botanical expertise required are incompatible with the aim of a simple and practical metric (Principle 3).

TABLE 8-1: Distinctiveness categories and scores

Distinctiveness categories		
Category	**Multiplier**	**Definition**
Very High	8	• Native species rich hedgerow with trees - with bank or ditch
High	6	• Native species rich hedgerow with trees • Native species rich hedgerow - with bank or ditch • Native hedgerow with trees - with bank or ditch
Medium	4	• Native species rich hedgerow • Native hedgerow - associated with bank or ditch • Native hedgerow with trees • Line of trees (ecologically valuable) • Line of trees (ecologically valuable) - with bank or ditch
Low	2	• Native hedgerow • Line of trees • Line of trees - with bank or ditch
Very Low	1	• Any hedgerow containing 20% or more canopy cover of a non-native species[51].

Condition

8.13 All hedgerows and lines of trees recorded on site must be assigned a habitat condition score. Habitat condition can only be assessed after habitat type has been determined (see Box 8-2).

8.14 To assess condition, the dimensions and other physical characteristics of a hedgerow or line of trees are assessed against a set of minimum requirements for the habitat to be considered in a good, moderate or poor condition with respect to its ability to support a diverse range of species. Hedgerows and lines of trees are assessed using separate criteria. The full methodology for assessing the condition of Hedgerows and Lines of trees is described within Part 1b of the Technical Supplement.

<u>Condition assessment of hedgerows and lines of trees</u>

8.15 A series of attributes, representing key physical characteristics, are used for the hedgerow condition assessment. The attributes, and the minimum criteria for achieving a good condition in each, are set out in the condition sheets in Part 1b of

[51] UKHAB

the Technical Supplement. They use similar condition criteria to the 'Hedgerow Survey Handbook' with additional detail taken from other sources.

8.16 The assessment for lines of trees is based on species composition, canopy continuity and the health and biodiversity value of individual trees.

Strategic significance

8.17 Strategic significance needs to be evaluated when calculating the biodiversity unit value for both existing and newly created or enhanced hedgerows and lines of trees. The approach taken to determine strategic significance is described in Section 5.15.

Dealing with risk

Applying risks to different interventions

8.18 Where new hedgerows are being created, or existing hedgerows restored/enhanced, difficulty, time to target condition and spatial risk multipliers are applied to account for the associated delivery risks.

Difficulty of creation and enhancement/restoration

8.19 The technical difficulty of creating and restoring hedgerows and lines of trees is given a default value of 'Low' (x 1 multiplier)[52]. Application of this risk multiplier does not, therefore, change the number of biodiversity units generated by a proposed intervention to compensate for losses.

8.20 While the 'Low' difficulty rating assigned to the creation and enhancement of hedgerows and lines of trees will be appropriate for most replacement schemes, there may be instances where a higher rating will better reflect the difficulty of recreating a particular type of hedgerow[53]. For example, to replace a particularly species-rich hedgerow, or to replace a local hedgerow type with features that are more difficult to recreate, such as the hedges associated with tall, steeped-sided, stone-faced banks commonly found in Devon and Cornwall, or where there are management challenges such as a high deer population. Expert ecological advice should be obtained where such an exception may apply.

Temporal risk – time to target condition

8.21 As described in Section 5.32 'Time to target condition' is the estimated average time it takes a habitat, in this case hedgerows and lines of trees, to achieve a pre-agreed target quality. Creation/enhancement options for hedgerows and lines of trees which include the addition of trees often have substantially longer times to target condition

[52] This is unchanged from Defra Biodiversity Metric (2012).

[53] The range of 'difficulty' categories available (and the relevant multipliers) are: Very High (x0.1); High (x0.33), Medium (x0.67) and Low (x1).

than those without the addition of new trees. This is necessary to allow for the trees to mature.

8.22 The temporal multipliers based on a 3.5% discounting rate set out in Table 5.6 are also applicable to the hedgerow component of the metric. The times to target condition for creating and enhancing through improving condition for different hedgerow types are given in Table TS3-6 of the biodiversity metric 3.0 Technical Supplement.

8.23 The times to target condition for enhancement through increasing the distinctiveness of a hedgerow or line of trees is determined by consideration of the combination of the changes in distinctiveness and condition between the baseline habitat and the proposed, post-intervention habitat. The time to target condition matrix for enhancement through increasing distinctiveness can be found in the Technical Supplement Part 3.

Habitat banking and delays in creation/enhancement of habitats

8.24 Biodiversity metric 3.0 enables the recording of habitat creation/enhancement in advance or delayed for all habitats including hedgerows and lines of trees. These either reduce or increase the time to target condition proportionately. (Section 5.38)

Rivers and streams

8.25 Rivers, streams and their associated floodplains are natural ecological networks used by multiple species. They are physically diverse and biologically rich, defined by their climate, geology and land cover. They are linear features with a high degree of landscape connectivity, as hydrological, geomorphological and biological processes create connectivity between channel, floodplain and terrestrial habitats. The channel, riparian zone (the land alongside the top of the riverbank) and the floodplain are all inter-connected in a naturally functioning river system. There are large varieties of river types in Britain, from active upland boulder-bed rivers to slower-flowing lowland systems, including internationally rare Chalk rivers.

8.26 Most British rivers have been significantly affected by human intervention, in the form of land drainage, flood defence structures, development and direct habitat loss. This has, in some cases, fragmented the river corridor and changed the structure and function of the river channel, riparian zone and floodplain.

8.27 For the purpose of biodiversity metric 3.0, 'rivers and streams' include those classified as 'Main River' and 'Ordinary Watercourse'[54]. These are watercourses through which water flows (i.e. with a hydraulic function), which includes canals, canalised rivers and rivers with an ephemeral (temporary) nature, such as winterbournes and headwaters. Coastal, tidal and inter-tidal reaches are not included within the rivers and streams component of the biodiversity metric. The habitats contained within intertidal reaches (above Mean Low Water) are included in the area habitats, subtidal habitats are not included in biodiversity metric 3.0.

8.28 For the rivers and streams component of biodiversity metric 3.0 'ditches' are defined as:

> 'Artificially created, linear water-conveyancing features that are less than 5 m wide and likely to retain water for more than 4 months of the year. Their hydraulic function is primarily for land drainage, and although partially or fully connected to a river system, they would not have been present without human intervention'.

8.29 Ditches are included as a linear feature within rivers and streams but have a separate condition assessment, see Part 1 of the Technical Supplement for more information.

Note: some heavily engineered ditches may actually be part of the river system (usually part of the headwater system). If there is uncertainty, consult historic maps, LIDAR data and riverine specialists.

Calculating Rivers and streams biodiversity units (RBUs)

8.30 River Biodiversity Units (RBUs) are the unit of measurement for rivers and streams. This is to differentiate the river values from the biodiversity units representing area habitats and other linear habitats.

8.31 The equations used to calculate river biodiversity unit values are given in Box 8-3.

[54] Main Rivers are regulated by the Environment Agency, Ordinary Watercourses are regulated by Lead Local Flood Authorities - these may be District councils, unitary authorities, and internal drainage boards.

8.32 It may be appropriate to exclude the area occupied by rivers and streams habitats greater than 5 metres wide from area habitat calculations. This is described in Chapter 3, Step 6 h.

Box 8-3: Calculating river biodiversity units (RBUs)

Equation 1: Existing (pre-intervention) (T_0) biodiversity value

$$T_0\ Baseline\ RBU = \left(L^{t0} \times Q_D^{t0} \times Q_C^{t0} \times Q_{SS}^{t0}\right) \times R_{RE}^{t0} \times R_{WE}^{t0}$$

Equation 2: Post-intervention (T_1) biodiversity value for river or stream creation

$$T_1\ Creation\ RBU = [L^{t1} \times Q_D^{t1} \times Q_C^{t1} \times Q_{SS}^{t1}] \times [R_D^{t1} \times R_T^{t1}] \times [R_{OS\times} \times R_{RE}^{t1} \times R_{WE}^{t1}]$$

Equation 3: Post-intervention (T_1) biodiversity value for river or stream enhancement

$$T_1\ Total\ RBU\ after\ Enhancement = \left\{\left[\left([\{L^{t1} \times Q_D^{t1} \times Q_C^{t1}\} - \{L^{t0} \times Q_D^{t0} \times Q_C^{t0}\}] \times \{R_D \times R_T\}\right) + \{L^{t0} \times Q_D^{t0} \times Q_C^{t0}\}\right] \times Q_{ss}^{t1}\right\} \times [R_{OS} \times R_{RE}^{t1} \times R_{WE}^{t1}]$$

L	Length of river or stream (kilometres)	R_T	Time to target condition (a risk factor)
Q_C	Condition (a quality measure)	t0	Before intervention
Q_D	Distinctiveness (a quality measure)	t1	Post intervention
Q_{SS}	Strategic Significance (a quality measure)	R_{OS}	Spatial (offsite) risk
R_D	Difficulty of creation or enhancement (a risk factor)	R_{RE} R_{WE}	Riparian Encroachment Unit modifier Watercourse Encroachment Unit modifier

Assessing the quality of Rivers and streams

Distinctiveness

8.33 The distinctiveness categories for rivers and streams are based on the Priority Habitats classification, as defined under Section 41 of the Natural Environmental and Rural Communities Act, 2006.

8.34 Priority River Habitats include a number of river types[55]:

- Riverine water bodies of high hydro-morphological/ecological status.
- Chalk rivers
- Watercourses with water crowfoot assemblages (Habitats Directive Annex I habitat H3260)
- Active shingle rivers

[55] See: https://hub.jncc.gov.uk/assets/01d6ab5b-6805-4c4c-8d84-16bfebe95d31#UKBAP-BAPHabitats-45-Rivers-2011.pdf

- Headwater streams

8.35 The distinctiveness assessment is a desk-based exercise, using existing information. The main search considers the classification of priority habitat. The secondary search considers the status of the river being either main river, ordinary watercourse, ditch or canal. Finally, the on-site query relates to whether the river is in a culvert, this information is not available from online sources (Figure 8-1, Table 8-2).

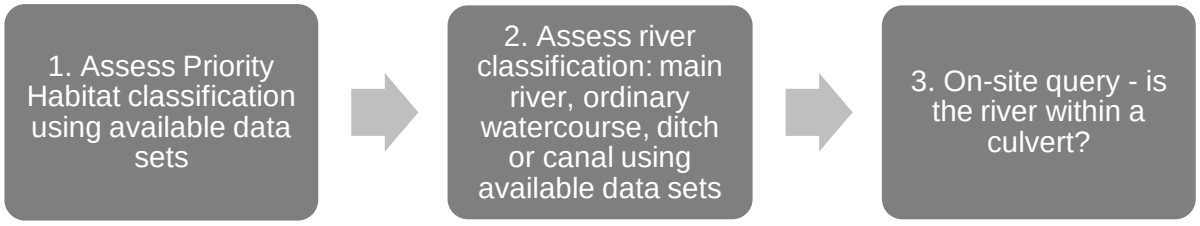


FIGURE 8-1: Recommended stages to follow when assessing Distinctiveness[56]

TABLE 8-2: Distinctiveness categories for rivers and streams

Distinctiveness	Metric Description	Weighting	Description
Very High	Is on the Priority Habitat Rivers map	8	Rivers – Priority Habitat Rivers and streams of high hydro-morphological & ecological status
High	Rivers and streams (Other)	6	All other rivers streams that are not classified as Priority River Habitat
Medium	Canals Ditch	4	Canal Ditch (see above)
Low	Culvert	2	A covered channel or pipe designed to prevent the obstruction of a watercourse or drainage path by an artificial construction[57].

[56] Links to guidance on each stage:

Stage 1: Priority habitat rivers - https://data.gov.uk/dataset/20019cdb-9fef-4024-81af-daf1d1b74762/priority-river-habitat-rivers

Stage 2: Main River - https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386 Ordinary watercourses: Local authority data sets available on request from local authorityhttps://www.gov.uk/find-local-council. Internal Drainage boards https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/AdministrativeBoundariesInternalDrainageDistrictsInEngland&Mode=spatial

[57] Flood and Water Management Act, 2010.

Condition

8.36 The rivers and streams condition assessment describes on-site physical habitat diversity. The condition assessment is not completed by using standard condition score criteria, as used across other areas of the metric[58]. Instead, river features have been assigned pre-determined weightings (both positive and negative). Features are assessed from a field survey. The surveyor generates a condition score by inputting all features into a web platform. This includes guidance documents which explain all elements of the calculations. (For further detail on the river condition assessment, please see Technical Supplement Part 1c.)

Note: the rivers and streams condition assessment requires users to be trained and accredited[59].

TABLE 8-5: Condition weightings for rivers and streams

Classification	Weighting
Good	3
Fairly Good	2.5
Moderate	2
Fairly Poor	1.5
Poor	1

Applying the river condition assessment

Improving/reducing riverine condition

8.37 River condition can be improved in two ways. Either through enhancing (improving) the **condition** of the same type of river (e.g. an “Other rivers and streams” river goes from poor to moderate condition). Alternatively, enhancing the river to a **higher distinctiveness river type** (e.g. a Culvert to an “Other rivers and streams” or an “Other R&S” to a “priority habitat” river), in this scenario the condition can be equivalent or better in the enhanced river type.

8.38 In situations where a reduction in condition or distinctiveness occurs (channel straightening, physical modification, altering the channel line), record the change in condition as a loss of the existing river (as recorded in the baseline) and enter the new channel length and condition as creation.

Default condition score

8.39 Only under one circumstance is a **default condition score** applied. A default condition score of 1 (Poor) is entered where the river is in a culvert.

[58] Ditches have a separate condition sheet, see Technical supplement 1.31

[59] Training details can be found at https://modularriversurvey.org/river-condition

On-site boundary

8.40 It is only necessary to apply the river condition assessment within the on-site boundary of the intervention site (on-site and off-site). Where sites are smaller than 5 contiguous MoRPh modules i.e. the full 5 units would extend beyond the on-site boundary. Surveyors will need to visually assess the required MoRPh features up-and-down stream as far as is reasonably practicable.

Variation in river condition

8.41 Where the condition of the river varies across the site, enter each distinct section of river as a separate row within the metric calculation tool. Each distinct section will have a separate condition score. For example, for a site that contains a river, which is part-culvert and part-open enter this as two separate lines:

(1) length of the river and condition score (in culvert)
(2) length of the river and condition score (open section)

BOX 8-5: Case Study - Improving condition

Tokynton Park, River Brent, River Restoration Project

	Habitat description	Condition Score	
Before	*Canalised section of river with no/limited in channel habitat diversity, hard revetment and low habitat diversity riparian zone.*	*Poor (1)*	
After	*Re-meandered channel re-instating varied flow types and in channel features, such as riffles and pools. Hard revetment removed and banks re - profiled.*	*Moderate (2)** **the presence of invasive species and some sections of hard revetment prevent this section achieving Good (3).*	

Riparian Zone encroachment

8.42 In biodiversity metric 3.0 the riparian zone is defined as a 10m zone from top of the riverbank. It would naturally be periodically flooded, and directly influences the

hydrological, geomorphological and biological functions and processes within the river channel. As the riparian zone is an intrinsic part of the river system it is not considered as a separate habitat within the rivers and streams calculation but as part of the linear feature.

8.43 Development within the riparian zone is termed 'riparian encroachment'.

In biodiversity metric 3.0 riparian encroachment is defined as:

A reduction in the quantity/ quality and 'use' of available habitat that forms a specific ecological function for riparian or aquatic specialist species. Whereby, 'use' is defined as the ability of a species to: commute, forage, rest/ dwell, or access as part of its life cycle between aquatic and terrestrial phases.

8.44 The loss of either quantity or quality of the riparian zone will have a bearing on its ecological use and function. Encroachment is considered as **minor**, **moderate** or **major** (Table 8-6). The bands reflect how far the development has encroached toward the river channel (distance) or how much of the 10m riparian zone (by % area) is covered by the development footprint (see Figure 8.2). The percentage area is measured as a percentage of the total riparian zone area within the development boundary.

8.45 In biodiversity metric 3.0, encroachment is considered in both the baseline and post-intervention scenario, allowing positive enhancements to the riparian zone to be reflected in river biodiversity unit scores.

Table 8-6 Description of riparian encroachment bands

Riparian encroachment band	Multiplier	Description
No encroachment	1.00	No development within 10m of bank top
Minor	0.95	Any development 8-10m from bank-top (up to 100% of area) **or** where development footprint occupies 0-10% of the riparian zone area 4-10m from bank-top.
Moderate	0.85	Any development where footprint occupies between 10-25% of the riparian zone area 4-10m from bank-top.
Major	0.75	Any development 0-4m from bank-top (*except a maximum of 5% footprint for amenity features*) **or** where development footprint occupies >25% of the total riparian zone area.

8.46 The riparian zone can be enhanced through reducing the extent of encroachment. For example, by removing hard-standing or other structures, reconnecting channel–riparian interactions. Beneficial measures such as providing appropriate planting that improves riparian habitat complexity, installing green roofs/walls, and/or the inclusion of wetland features such as backwaters and ponds can also be incorporated into the riparian zone and contribute to generating in area biodiversity units (See 8.49 below).

8.47 If you need to offset losses which are caused by encroachment into the riparian zone, then you are not restricted to delivering riparian betterment. Gains can also be achieved through improvements to the condition of the river or reducing in-channel encroachment. For example, removing toe boarding or installing in-channel woody debris.

8.48 The riparian zone is an intrinsic part of the river system and is assessed within the river condition assessment. To avoid double counting, river biodiversity units have been designed to work alongside area biodiversity units in the riparian zone. The area that the riparian zone occupies, and the habitats therein, are should also be recorded in the area habitats tab of the metric calculator tool. For example, a stand of wet woodland in the riparian zone that inputs large amounts of woody material into the channel would be an important aspect of how the river functions and the in-channel habitat features it generates but its area biodiversity unit value is also recorded in the area habitats tab of the calculation tool.

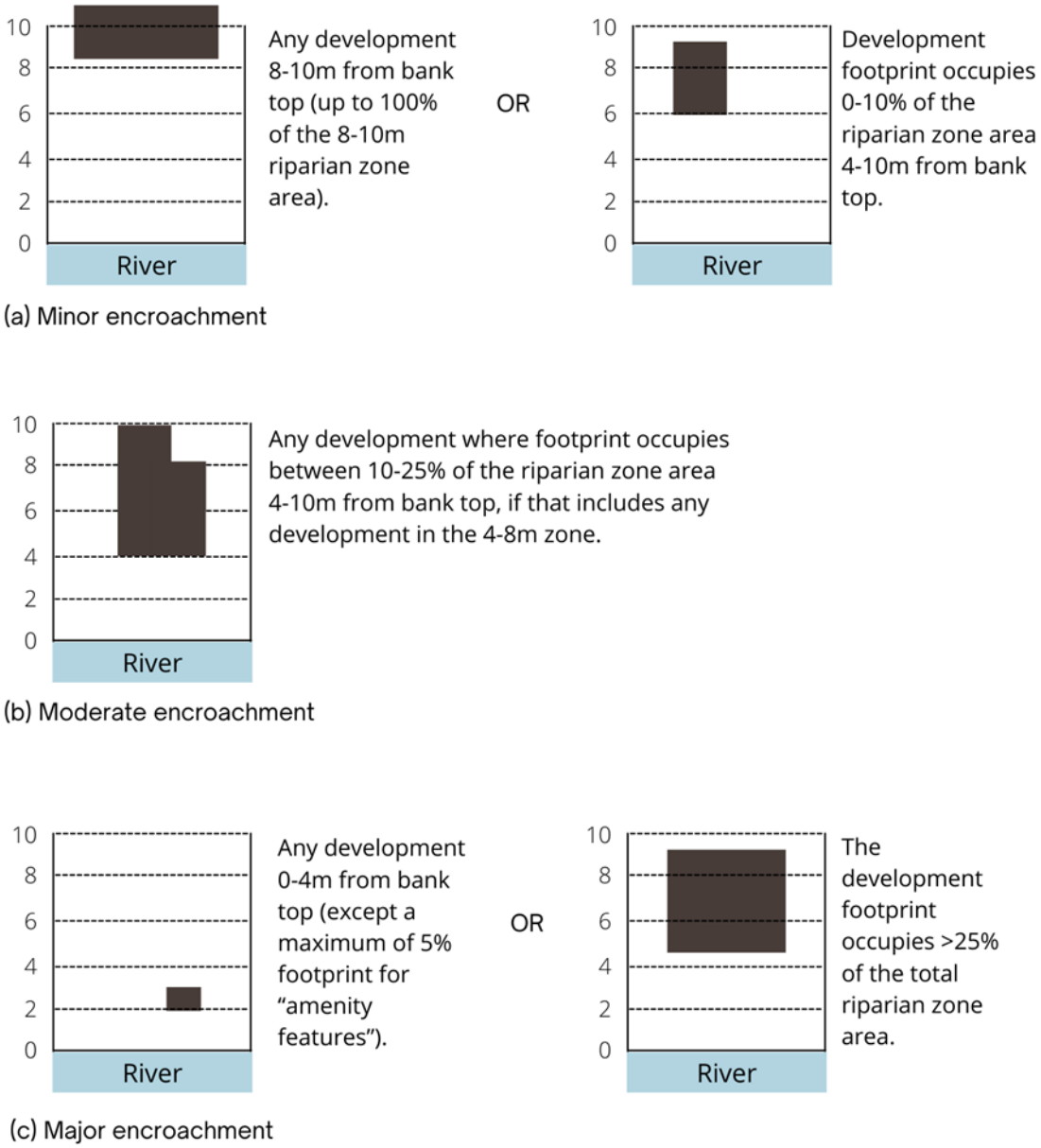


Figure 8.2: Riparian encroachment bands

In-Watercourse encroachment

8.49 The in-watercourse multiplier accounts for development that occurs within the banks or the river channel. The multiplier accounts for the impact of individual human interventions that affect the function of the river corridor.

In biodiversity metric 3.0 in-watercourse encroachment is defined as:

An intervention that adversely affects hydrological and geo-morphological processes, creating localised changes in flow (e.g. eddying, erosion) and/or sediment dynamics and riverine connectivity - longitudinal, lateral or vertical. The result is localised changes in habitat, species and the use of migratory pathways.

8.50 In-channel encroachment as considered **minor** or **major** (Table 8-7). The bands reflect how far the development has encroached into the river channel (% width) or along the bank (% length). The percentage length is measured as a percentage of the total length of the watercourse within the on-site boundary.

8.51 The in-watercourse encroachment multiplier does not apply to culverts. The 'No encroachment' option should be used.

TABLE 8-7 Description of in-watercourse encroachment bands.

In-watercourse encroachment band	Multiplier	Description	Examples
No encroachment	1.0	<5% bank length comprising an engineered bank revetment **and** no encroachment into channel	
Minor	0.8	5%-20% bank length comprising engineered bank revetment **or** encroachment up to 10% channel width	Small headwalls, jetties, pontoons
Major	0.5	>20% bank length comprising an engineered bank revetment **or** encroachment >10% of the channel width	Weirs, large headwalls, bank revetment.

Note: Interventions such as woody material dams, beaver dams, soft bank revetment, such as coir rolls or willow spilling, that have been included to improve the 'condition' of the river and reinstate natural riverine hydro-morphological and geomorphological processes, are **excluded** from in-watercourse encroachment multipliers.

Strategic significance

8.52 The purpose of the Strategic significance multiplier is outlined in Chapter 5. For Rivers and streams we use the delivery of identified actions within River Basin Management Plans, Catchment Plans and Local Plans to represent high strategic significance.

TABLE 8-8: Strategic significance multipliers for rivers and streams

	Description of multiplier	Strategic multiplier
High	Delivery of River restoration actions within: • Local Plans • River Basin Management Plan • Catchment Plans • Catchment Planning System • Priority Habitats for Restoration[60]	1.15
Low	Low potential/ action not identified in any plan.	1

Risks

Difficulty of creation and enhancement of rivers and streams

8.53 Rivers, by their nature, cannot be created. However, there can be circumstances where new artificial **river channels** are 'created'. In most instances, rivers will be enhanced through positive management and restoration.

8.54 Where new, engineered watercourses are created the difficulty of creation is high due to the complexity of the work. For culverts, canals and ditches difficulty of creation is low. Enhancement difficulty is defined as medium for all rivers and streams habitat types (See Table 8-10).

8.55 In Biodiversity metric 3.0 creation and enhancement for rivers and streams are defined in Table 8-9.

[60] Contact the local catchment partnership for information. Contribute restoration priorities data – Discovering Priority Habitats in England

TABLE 8-9 Definition of creation and enhancement

	Definition	Example
Creation	Creation of watercourses that do not promote natural functions and processes or the development of natural habitats.	Trapezoidal channels, culverts, diverted channels outside of their natural alignment.
Enhancement	Enhancement of watercourses to promote natural function, processes and the development of natural habitats.	Re-aligning rivers closer to their natural alignment, the introduction of large woody material, brash berms, improvement in the complexity or connectivity of the riparian zone.

TABLE 8-10: Difficulty of creation and enhancement multipliers for rivers and streams

Type of intervention	Difficulty Category	Multiplier
Creation of: Priority Habitat rivers Other rivers and streams	High difficulty	0.33
Enhancement of: All Rivers and streams habitat types	Medium difficulty	0.67
Creation of: Ditches Culverts Canals	Low difficulty	1

Applying river creation and enhancement through the metric: Accounting for losses of ‘area’ habitat and increases in the length of restored river channels

8.56 Excavated new channels will create a loss in ‘area’ habitats. Mitigating this loss can, for example, include using redundant river channels (if a new one has been excavated) to create an ‘area’ habitat such as reedbed or wet woodland.

8.57 Where a scheme restores a channel the length of the final river channel following enhancement may be longer than the original river baseline. This may be due to increasing the number of meander bends or by including a by-pass channel. See Step 6 (k-n) in Chapter 3 for details of how this can be accounted for in biodiversity metric 3.0.

Time to create, enhance or restore

8.58 Time to target condition is related to the condition classification, and how far restoration efforts change the condition status. The time is based on the complexity of intervention needed to raise condition and the lag time needed for the biological communities to re-establish. Table 8-11 shows the predicted time to target condition for the enhancement/restoration of river and streams habitats and Table 8-12 for their creation.

Table 8-11 Time to target condition for enhancement/restoration of rivers and streams habitats

Time to target condition for enhancement/restoration of Rivers and streams	
Condition change	**Time (years) to target condition**
Poor - Good	8
Poor - Fairly good Fairly poor - Good	6
Poor - Moderate Fairly poor - Fairly good Moderate - Good	4
Poor - Fairly poor Fairly poor - Moderate Moderate - Fairly good Fairly good - Good	2

Table 8-12 Time to target condition for creation of rivers and streams habitats

Condition Class	Time (years) to target condition
Good	**10**
Fairly good	**8**
Moderate	**5**
Fairly poor	**2**
Poor	**1**

Spatial risk

8.59 Use WFD waterbody and catchment boundaries to determine the spatial risk created by delivering offsets in different locations.

TABLE 8-13: Spatial risk multipliers for rivers and streams

Description of multiplier	Spatial risk multiplier
Within waterbody	1.0
Outside waterbody	0.75
Outside catchment	0.5

Trading within river type

8.60 Applying the trading rules of the metric (Rule 3) compensation needs to deliver benefits to the same river type as impacted (e.g. rivers and streams, canals, ditches). For example, if a river or canal is identified on site it would not be acceptable to generate biodiversity units based through creation/enhancement of ditches or vice versa. Only in situations where the enhancement/ creation of a ditch materially improves the overall condition or context of a river/canal this may be acceptable, but will need to be agreed with the determining authority.

8.61 Off-site delivery should be located on the same rivers and streams habitat type (i.e. river replaced with river, ditch with ditch, etc). The only exception to this is 'culvert' which can move habitat/distinctiveness type.

8.62 For rivers, offsetting should ideally be provided on reaches of the same waterbody/ catchment (see spatial risk multiplier). An offset should be on a section of river of a similar size, function and stream order, where the same hydrological and geomorphological processes give rise to similar river habitats in a natural state. For example, impacts on a headwater cannot be offset on large lowland rivers. Exceptions to this rule will need to be agreed with the determining authority.

BOX 8-6: Case Study - Results through Planning

Cornmill Gardens, River Ravensbourne

The river restoration scheme formed part of the 'Urban Renaissance in Lewisham' programme which aimed to create a new public open space within the Town Centre. The objective of the scheme was to remove the river from its concrete banks and create an attractive public open space. The river was restored by removing the concrete walls, regrading banks, improving riparian habitat and marginal planting, and installing gravels in the river channel. The scheme has improved this section of river for people, wildlife and flood risk.

Before

After

9: Using biodiversity metric 3.0 with other metrics

9.1. The three types of biodiversity units generated by biodiversity metric 3.0 (area, hedgerows and lines of trees, rivers and streams) are unique and the units are also different from those generated by other biodiversity metrics, including previous versions of this biodiversity metric (e.g. biodiversity metric 2.0). This means it is important that the same metric is used consistently throughout all elements and stages of a project, including for calculating any off-site habitat provision, to ensure consistency and comparability. You cannot sum across or between, nor can you compare the outputs from, different biodiversity metrics.

9.2. There may be situations where a project wishes to use a metric approach to quantify other environmental factors, such as ecosystems services or impacts on a specific species. It is perfectly acceptable to use the biodiversity metric 3.0 alongside other metrics so long as you to remember that each metric is a distinct entity and the units of each metric must be kept separate in any metric 'account'. You cannot sum the units of different metrics to give an overall value as the units are not equivalent and this could lead to double counting.

Species Metrics

9.3. Biodiversity metric 3.0 uses habitats as a proxy for wider biodiversity. It does not explicitly seek to measure or meet the needs of individual species, although many can expect to benefit from the creation of new or enhanced habitats.

9.4. Some projects may choose to use a separate metric, designed for a specific species, to calculate the scale of compensation needed to address impacts on a species. For example, a metric designed for great crested newts is used to calculate the number of ponds required to compensate for pond losses under Natural England's District Level Licensing schemes. Where a species metric is used in a project the rules set out below should be applied to ensure metric use is compatible with the biodiversity metric 3.0. Any habitat retained, enhanced or created to meet species licensing requirements can be evaluated using biodiversity metric 3.0 to provide a full account of biodiversity changes. Box 10-1 illustrates how a species metric can be used alongside biodiversity metric 3.0.

Species Rules

Species Rule 1	Species metric(s) are a distinct entity and an evaluation of 'species biodiversity units' must be kept separate in any 'account' of the effects of an intervention on biodiversity. You must not sum habitat and species units to derive a total biodiversity unit value.
Species Rule 2	Species metric(s) can be used as an additional source of information to complement information provided by biodiversity metric 3.0. It is important that the habitat-based metric is used as the primary tool for evaluating biodiversity change. Using a species metric in isolation can result in significant risk of net loss in biodiversity.
Species Rule 3	A species metric needs to be consistent with all key principles of the biodiversity metric 3.0, particularly the principle that the metric does not change the protection afforded to biodiversity (Principle 1).
Species Rule 4	The legal provisions that apply to protected species (and habitats) take precedence in designing and planning the approach used to mitigate or compensate for impacts on species. An acceptable design must satisfy these legal requirements, even if this does not result in the best possible biodiversity unit outcome (based on evaluation using the biodiversity metric 3.0).
Species Rule 5	It is acceptable for the same area of habitat to be separately scored using the biodiversity metric 3.0 and one or more species metrics. Because each metric describes the value of that habitat from a distinct perspective the corresponding outputs represent a different 'biodiversity currency' and must not be summed.

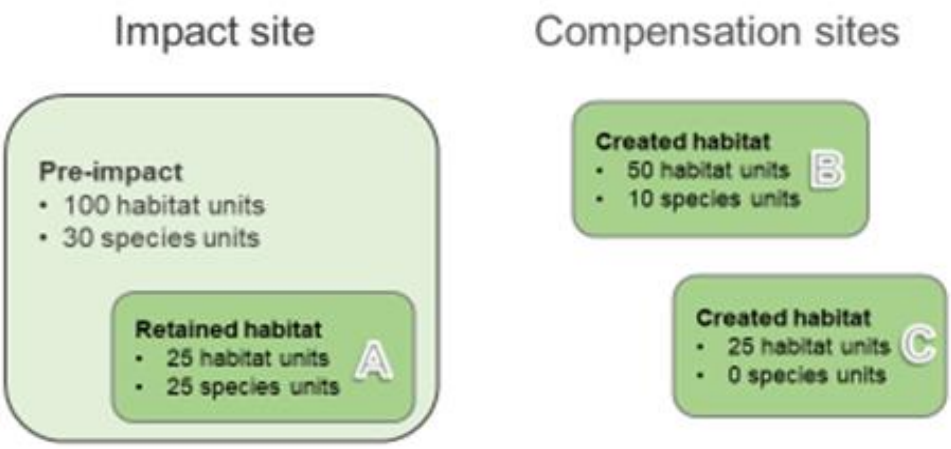
BOX 9-1: Using species and habitat metrics together

Where a species metric is used by a project, it should be used alongside biodiversity metric 3.0 to give a broad understanding of the impact of an intervention on biodiversity.

The effects of an intervention on both a species present on a site and on the habitats at that site should be scored separately using their respective metric. Although the outputs of the two metrics are recorded separately this does not increase the level of compensation required. The need to satisfy a target level of units for each (e.g. to achieve 'no net loss') may, however, have a bearing on design and location of compensation.

If, for example, a development destroys an area of grassland that provides an important terrestrial habitat for a protected species population, it may be that compensating for the grassland loss at an off-site location can satisfy the biodiversity metric 3.0 unit requirement to achieve no net loss, but be too remote or unsuitable for the protected species population. By the same measure, locating the new grassland habitat at a location that is ecologically more important to protected species could create a greater net benefit for the species for the same number of biodiversity metric units.

The example below illustrates how species and habitat metrics can work in parallel.



Biodiversity unit accounts	Pre-impact site units	Site A units	Site B units	Site C Units	Overall change Compensation – Impact	Outcome
Habitat units	100	25	50	25	(25+50+25)-100=0	NNL
Species units	30	25	10	0	(25+10+0)-30=+5	Net Gain

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Glossary

AHBU	Area habitat biodiversity unit. The unit of measurement used for “Area habitats” in biodiversity metric 3.0.
ADDITIONALITY	The need for a compensation measure to provide a new contribution to conservation, additional to any existing values, i.e. the conservation outcomes it delivers would not have occurred without it. *Source*: McKenney & Kiesecker (2010).
BIODIVERSITY	An abbreviation of ‘Biological diversity’.The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. *Source: Convention on Biological Diversity*
COMPENSATION	Measures to recompense make good for loss of biodiversity caused by a project. A more general term than biodiversity offset, which is one type of compensation. Compensation may achieve No Net Loss (in which case it is an offset) or it may involve reparation that falls short of achieving no net loss (and is therefore not an offset). *Source: adapted from IUCN (2016)*
ECOLOGICAL EQUIVALENCE	In the context of biodiversity offsets, this term is synonymous with the concept of ‘like for like’ and refers to areas with highly comparable biodiversity components. This similarity can be observed in terms of species diversity, functional diversity and composition, ecological integrity or condition, landscape context (e.g., connectivity, landscape position, adjacent land uses or condition, patch size, etc.), and ecosystem services (including people’s use and cultural values). *Source: BBOP (2012a).*
ECOLOGICAL FUNCTIONALITY	The role and function that a habitat and supporting processes play in supporting an ecosystem. A habitat may be considered to have achieved ecological functionality when it fully supports all of the typical or target species.
ECOSYSTEM	A biological community of interacting organisms and their physical environment
FEP	Farm Environment Plan
HABITAT	The place or environment in which plants and animals live
HBU	Hedgerow Biodiversity Unit. The unit of measurement used for hedgerows and lines of trees in biodiversity metric 3.0.
IRREPLACEABLE HABITATS	‘Habitats which would be technically very difficult (or take a very significant time) to restore, recreate or replace once

	destroyed, taking into account their age, uniqueness, species diversity or rarity.' Taken from NPPF
METRIC	A set of measurements that quantifies results
NET GAIN	Net gain is an approach to development, and/or land management, which aims to leave the natural environment in a measurably better state than beforehand.
NO-NET-LOSS NNL	Impacts caused by a project are balanced by biodiversity gains through compensation measures implemented in the locality of the project. The biodiversity changes need to be evaluated against a baseline (e.g. a reference point or trajectory without the project occurring, or prior to the project occurring) of the relevant biodiversity features (in this case the habitats) being impacted by the project. From a conservation perspective, achieving a NNL goal for a given project ultimately (i.e. in the long-term) means no net reduction in the: • diversity within and among species and vegetation types; • long–term viability of species and vegetation types; and • functioning of species assemblages and ecosystems, including ecological and evolutionary processes.
OFF-SETS	Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for ~~significant~~ residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation actions have been taken. The goal of biodiversity offsets is to achieve No Net Loss and preferably a Net Gain of biodiversity on the ground, with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity. Source: BBOP (2012).
RBU	River biodiversity unit
SSSI	Sites of Special Scientific Interest. Sites providing statutory protection for the best examples of the UK's flora, fauna, or geological or physiographical features.
WFD	Water Framework Directive