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Biodiversity Offsetting Pilots

Technical Paper: the metric for the biodiversity offsetting pilot in England

March 2012

Department for Environment Food and Rural Affairs

This document/publication is also available on our website at:

[redacted]

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PB 13745

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Technical Paper – metric for the biodiversity offsetting pilot in England

1. Biodiversity offsets are conservation activities designed to deliver biodiversity benefits in compensation for losses, in a measurable way. Biodiversity offsets are distinguished from other forms of ecological compensation by the requirement for measurable outcomes: the losses resulting from the impact of the development and the gains achieved through an offset are measured in the same way.

2. A metric is a tool that allows biodiversity losses and compensation to be measured. This technical paper describes the metric that will be used in the biodiversity offsetting pilots in England. It has developed by Natural England in consultation with a range of experts.

3. This is version 2 of this paper. It updates an earlier version that was published in July 2011. The changes to the paper have been made in the light of ongoing discussions with stakeholders and potential participants in the biodiversity offsetting pilots. The paper also reflects the new strategy for Biodiversity in England – Biodiversity 2020[1].

4. This paper:

- explains what a metric is and describes the metric we will use in the biodiversity offsetting pilots
- explains what 'multipliers' are, and how they can be used to manage risks involved in expanding and restoring habitats
- explains how multipliers can be used to take account of the difference in time between the impact of a development and the delivery of biodiversity benefits in an offset project
- sets out our approach to dealing with hedgerows and species.

5. This paper explains the rationale and thinking behind the approach we have taken, setting out the issues that we have considered in developing the metric and our conclusions.

6. Separate guidance is available for offset providers and developers that would like to participate in the biodiversity offsetting pilot. This separate guidance is a step-by-step guide to using the metric. This guidance, and other background papers, can be found at: http://www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting/.

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[1] http://www.defra.gov.uk/publications/2011/08/19/pb13583-biodiversity-strategy-2020/

Background

7. Biodiversity offsets are conservation activities designed to deliver biodiversity benefits in compensation for losses, in a measurable way. Biodiversity offsets are distinguished from other forms of ecological compensation by the formal requirement for measurable outcomes: the losses due to impact, and gains achievable through the offset, are measured in the same way, even if the habitats concerned are different.

8. Biodiversity in its entirety is impossible to measure so a 'metric' is used to represent, and provide a measure of, overall biodiversity.

9. Metrics are surrogates[2], or combinations of measurements, that together provide an assessment of the biodiversity value of a particular area. The metric allows the biodiversity impact of a development to be quantified so that the offset requirement, and the value of the compensatory action, can be clearly defined. Metrics are transferable between sites and habitats, allowing an impact on one habitat type to be offset with conservation action elsewhere, or involving a different habitat type and/or quality of habitat.

10. There are a number of different types of metrics used in offsetting schemes around the world. Some use single attributes but most use multiple attributes. In many cases, metrics also make use of a quantity measurement, for example land area adjusted in some way for quality (Eftec, 2010). There are no "off the shelf packages" suitable for all situations. The mechanism used depends on the characteristics of the biodiversity interests and the scheme's objectives.

11. Examples of single-attribute metrics (or surrogates) include measures of vegetation density; cover, or biomass; density of seedlings; index of vegetation structural diversity. Multiple attribute metrics make use of a number of different measures to come up with a single figure or index. Multiple attribute metrics by their nature are more complex and potentially more accurate as a measure of biodiversity value.

12. Perhaps the best known metric system is "habitat hectares". This approach was originally developed for use in Victoria, Australia and is described in Parks, Newell & Cheal, (2003), and forms the basis for a number of different metrics currently being developed and used. Habitat hectares is an example of a multiple attribute metric that has been developed specifically for offsetting. The attributes measured in the habitat hectares approach are: large trees, tree (canopy) cover, understory strata, lack of weeds, recruitment, organic litter, logs, patch size, neighbourhood, and distance to core area.

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[2] "Surrogates are measurements that act as a substitute for a complete measurement of the total biodiversity found within a particular area.

Habitat hectares assesses these various attributes against ‘benchmarks’ representing the average characteristics of mature stands of native vegetation of the same community type in a ‘natural’ or ‘undisturbed’ condition.

13. The habitat hectares system used in Australia is intensive in terms of the input required to assess the habitat. It requires trained operators to ensure the required levels of consistency. Consultants have to pass an exam before they are allowed to submit assessments (Cara Reece pers. com.).

14. In the USA, where offsets schemes have been running for 30 years, there are a broad range of metrics in use. The majority of assessments in offsetting schemes in the USA make use of an area measurement and a multiplier, and sometimes an approximate quality assessment based on expert opinion (Briggs et al. 2009, BOPP 2009).

Metrics for biodiversity offsetting in England

15. Biodiversity offsetting, where conservation activities are designed to deliver biodiversity benefits in compensation for losses, in a measurable way, are one way of providing compensation for biodiversity loss. We believe that a consistent framework for biodiversity offsetting has the potential to improve the implementation of planning policy requirements for biodiversity compensation.

16. Applying biodiversity offsetting in this way in England would be a new and innovative approach, and there are many aspects which we don’t fully understand yet. There are a number of issues that need to be clarified before we decide exactly whether, and how, we can make best use of biodiversity offsetting in England. That is why we are working with local authorities and other partners to test biodiversity offsetting in 6 pilot areas.

17. The principles we have used to develop an approach to biodiversity offsetting in England are set out in the Guiding Principles for Biodiversity Offsetting Document, available on Defra’s website. The principles include the following:

Offsetting should:

- not change existing levels of protection for biodiversity
- expand and restore habitats, not merely protect the extent and condition of what is already there
- contribute to enhancing England’s ecological network by creating more, bigger, better and joined areas for biodiversity (as discussed in *Making Space for Nature*[3])
- be managed at the local level as far as possible

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[3] [redacted]

- be as simple and straightforward as possible, for developers, local authorities and others

- be transparent, giving clarity on how the offset calculations are derived and allowing people to see how offset resources are being used.

18. The approach to the metric we will use for the biodiversity offsetting pilot is described in these papers, and reflects these principles.

19. The proposed system is a variation of the habitat hectares approach and draws heavily on the work done by Treweek et al. for the Defra scoping study on offsets (2009).

Habitat type

20. The metric we propose for the biodiversity offsetting pilots is based on habitats. Development sites need to be mapped and divided into habitat parcels. The offset requirement can then be worked out on a habitat basis. The same basic approach can then be used to work out what level of compensation an offset project is able to deliver.

21. Habitats are pre-assigned to one of three habitat type bands (**Figure 1** below). Habitats are assigned to these bands on the basis of their distinctiveness. Distinctiveness includes parameters such as species richness, diversity, rarity (at local, regional, national and international scales) and the degree to which a habitat supports species rarely found in other habitats (Treweek et al 2010). Details of the distinctiveness bands can be found in **Appendix 1 - Distinctiveness Bands for the Biodiversity Offsetting Pilot**, which is available on Defra's website.

22. One of the guiding principles for developing our approach to offsetting is that it should result in an improvement in the extent or condition of the ecological network. To do this the focus of habitat restoration or creation through offsetting should be on priority habitats[4]. Where development is taking place on habitats in the low distinctiveness band, the offset actions should result in expansion or restoration of habitats in the medium or, preferably, high distinctiveness band. At no time should an offset result in "trading down", for instance in the replacement of habitat of high distinctiveness with creation or restoration of a habitat of medium distinctiveness. Habitats that are of high distinctiveness would generally be expected to be offset with "like for like" i.e. the compensation should involve the same habitat as was lost.

23. Some very valuable habitats are either very rare, difficult/impossible to recreate, or both. Whilst development on these habitats would be unlikely, if a local planning authority did decide that a development should go ahead on this type of habitat, any compensation

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[4] Section 41(S41) of the Natural Environment and Rural Communities (NERC) Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. Further information about this list can be found here: [redacted]

would have to be bespoke, and managed on a case by case basis. It would be for the local planning authority to decide if the offsetting mechanism could be used.

24. **Figure 1** shows the habitat bands we are using for the biodiversity offsetting pilots.

Figure 1: Habitat type bands

Habitat type band	Distinctiveness	Broad habitat type covered	Type of offset
High	High	Priority habitat, as defined in Section 41 of the NERC Act[5]	Same band type, and ideally like for like
Medium	Medium	Semi natural	Within band type or trade up
Low	Low	E.g. Intensive agricultural– but may still form an important part of the ecological network in an area.	Trade up

25. As per the guiding principles, decisions about exactly where offsets should be targeted geographically, and towards which conservation priorities, should be taken at the local level as far as possible. In line with this principle, local authorities in pilot areas, working with their partners, could decide to add conditions to the metric to reflect their particular circumstances and priorities, as part of the development of their offsetting strategy. For example, they may decide that a particular habitat is especially important in their area, and therefore would like any offsets provided to compensate for loss of that particular habitat to comprise expansion or restoration of that habitat. They may decide that in their area a particular habitat is in a higher distinctiveness band than that suggested by the national guidance. Where changes to the standard approach are made, the rationale would have to be clearly set out, and the information about the difference available to all potential participants, at the start of the process.

5 [redacted]

26. In the pilot we want to learn more about how often local authorities want to make these kinds of adjustments, and how it might work in practice.

27. Each band of habitat distinctiveness has a number associated with it as in **Figure 2** below. This is the starting point for calculating the number of "units" of biodiversity per hectare a particular habitat is worth.

Figure 2: Habitat distinctiveness[6]

Habitat distinctiveness	
High	6
Medium	4
Low	2

Habitat condition

28. Different sites and habitats will be in different conditions when they are lost to development, and in addition, offsetting projects will not always involve taking a habitat in poor condition and improving it to good condition. We therefore propose that the metric we use for the biodiversity offsetting pilots takes account of habitat condition, as well as habitat distinctiveness.

29. Condition assessment requires that we have agreed standards and a related methodology for measuring habitat condition. There is currently no standard habitat condition assessment tool, although various methods are used for specific purposes.

30. Perhaps the best known condition assessment tool is Common Standards Monitoring (CSM). This methodology has been devised specifically for monitoring Sites of Special Scientific Interest (SSSIs) and as such it is (a) based around a subset of the most important habitats and (b) is designed to give a very specific output – namely to answer the question "is the site in favourable condition?". It categorises sites into 'favourable', 'favourable recovering' and 'unfavourable'.

31. Whilst suitable for assessing SSSIs, these categories would not work well in the metric described here. They are not evenly spread, and there can be a very wide range within the favourable recovering category. In addition, they may describe the management of the site, rather than the actual condition of the habitat.

[6] [6] Based on the paper "Biodiversity Offsets", Treweek et al.

32. The Higher Level agri-environment Scheme (HLS) has a condition assessment tool which better meets the design criteria for our approach to offsetting. The condition assessment for HLS is based on habitat condition, rather than management, and the categories are spread evenly in a way which fits with the design of the offsetting metric. For most habitat types the HLS Farm Environment Plan handbook provides a clear and transparent methodology which divides condition into one of 3 categories. The methodology was widely consulted on when it was devised. We therefore propose to use this methodology to assess the habitat condition in the offsetting pilot. Part of the aim of the pilot will be to see how this works in practice.

33. An assessment of the condition of the habitat can be combined with the distinctiveness band to give an overall score in biodiversity units per hectare, as set out in **Figures 3** and **4** below.

Figure 3: Condition weighting[7]

Habitat Condition	
Good	3
Moderate	2
Poor	1

Figure 4: Matrix showing how condition and distinctiveness are combined to give the number of biodiversity units per hectare[8]

		Habitat distinctiveness		
		Low (2)	**Medium (4)**	**High (6)**
Condition	**Good (3)**	6	12	18
	Moderate (2)	4	8	12
	Poor (1)	2	4	6

[7] Based on the paper "Biodiversity Offsets", Treweek et al.

[8] Based on the paper "Biodiversity Offsets", Treweek et al.

Using the metric to measure compensation provided

34. The measurement of the biodiversity value of impacted sites determines the offsetting requirement. It is also necessary to measure the offsetting potential of proposed offset sites, so that providers can calculate how many units they can offer.

35. Offset providers can either expand[9] or restore[10] habitat to deliver units of biodiversity.

36. In consultation with stakeholders, the definition of “restore” that we are using for the offsetting pilot has been expanded beyond the definition used under the previous England Biodiversity Strategy to include “restoration” as the term might more commonly be interpreted, i.e. improve the condition (where it is poor) of the existing habitat resource.

37. The rationale for expanding the definition in this way is:

- that a site in poor condition might continue deteriorating for ever because there was no requirement or incentive for a change in management - and yet in conservation terms putting that site into better management would be a key priority
- that it is likely that an offset (particularly those covering a relatively large area, able to act as compensation for more than one development) would often be something more complex than a single action on a single unit of land - for example it might contain a mosaic of habitats and parcels across which a number of actions may have been undertaken including recreation and restoration. Excluding restoration that aimed to improve condition would make this very complex.

38. The number of units of biodiversity an offset can provide could be based on either:

(a) a **future target value**, i.e. you have a piece of land and a management plan for conservation action you will take on it. In this case, the number of units available would be the difference between the current condition and the target future condition. We expect that this type of offset is what will be offered in the biodiversity offsetting pilots.

(b) the habitat’s **current condition**, i.e. you have already implemented the conservation work needed. In this case there would need to be a record of the initial condition of the habitat, before the work was undertaken, so that additionality could be demonstrated, and the number of units provided could be calculated. This is the approach that a ‘habitat bank’ would take – creating a ‘bank’ of habitat, from which units could be sold to developers as and when they were needed.

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[9] expansion (creation): establish priority habitat on land where it is not present and where no significant relicts of the habitat currently exist

[10] restoration: improve the condition of the existing habitat resource

39. On the offset provision side therefore ,the value of an offset site in terms of biodiversity units is a function of:

- the size of the site,
- the habitat type band it is assigned to (distinctiveness) and,
- its quality: the condition of the habitat at the start of the offset project, and its condition at the end.

40. Where an offset provider is undertaking work for a third party, and charging them for it, they will need to agree a fee. This should cover the cost of the work being undertaken, and management that lasts at least as long as the impact of the development, and ideally in perpetuity.

Differences in size between the impacted site and the offset

41. In international literature about biodiversity offsetting, “currency based multiplier” is the term commonly used to describe the difference between the size of an area of an impacted site and the size of an area covered by the offset. This difference comes about because of the difference in quality between the site impacted, and the offset provided. For example, if a habitat of low distinctiveness is impacted and is offset with action on a habitat of high distinctiveness, theoretically the area needed to offset can be less than the area impacted.

42. As a simple example, if the impacted site is worth 10 biodiversity units per hectare, and the offset site worth 30 units per hectare, 3 hectares of impacted site could be offset with 1 hectare of offset. This is referred to as a ‘fraction multiplier’.

43. The Business and Biodiversity Offsets Partnership (BBOP)[11] recommend that, because of the number of uncertainties in terms of currency and what is being exchanged, the area ratio should never go below 1:1. However their guidance is aimed at particular situations and it may be that it is not applicable to England. For instance where a development is taking place on 20 hectares of habitat of low distinctiveness, it does not seem reasonable to expect a developer to have to contribute 20 hectares of habitat to a habitat creation or restoration scheme where the biodiversity value per hectare may be considerably greater than the impacted site.

44. Discussions with stakeholders support the view that fraction multipliers are acceptable in the English situation, and that we should not enforce a minimum 1:1 ratio.

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[11] The Business and Biodiversity Offsets Partnership (BBOP) is a partnership between companies, governments and conservation experts to explore biodiversity offsets. See [redacted] for more information.

Dealing with Risk

45. Offset providers will be required to deliver the number of biodiversity units they have committed to provide, and will bear the risk of failing to do so. There are two main types of risk that offset providers may face:

Delivery risks: The risks associated with the actual delivery of the offset due to, for instance, uncertainty in the effectiveness of restoration or habitat creation/management techniques.

Spatial risks: These reflect ecological risks deriving from the change in location of the habitat or resource. For example, it may be that recreating a type of habitat in a new location may reduce its biodiversity value.

46. Where risks cannot be mitigated, some form of insurance is likely to be needed. This could take the form of an increase in the area of habitat creation/restoration provided for a given number of units. Or, where an increase in the area of land available for the offset is not possible, you could reduce the number of units available on a given hectare of land. Where a change in the number of units/area provided is used to manage risk a **multiplier** can be used to determine the number of units available from a given area.

Multipliers

47. The aim of a multiplier is to correct for a disparity or risk. In practice this is very difficult to achieve, not least because of uncertainty in the measurement of the parameters and the complexity of gathering the required data. This means that multipliers are a complex element of offsetting. There are a great number of different views on how and when they should be used.

48. The use of multipliers is discussed in a BBOP consultation document (Ekstrom et al., 2008). The main findings of that document were:

- that multipliers have received very little attention in the ecological literature to date, (particularly those dealing with spatial risk) although this is now starting to change. Where research has been undertaken it tends to suggest that the multipliers used to date are too low to achieve no net loss.

- that multipliers are widely considered in offsetting systems around the world, and tend to based on rules of thumb loosely based on some science.

49. As an example of a piece of research that argued that multipliers used are often too low, a paper by Moilanen et al. (2009) concluded that for some ecological restoration and reconstruction very high ratios were needed. However, the conclusion of the BBOP paper is that where there are real risks around the methods and certainty of restoration or creation then the Moilanen framework is applicable; but for some other situations, (averted risk, habitat banks and where restoration techniques are tried and tested), lower ratios can be used.

Delivery risks and multipliers

50. As discussed above, offsets will involve either restoration or expansion of habitats, and both are likely to have risks associated with them. Some habitats are more difficult than others to restore or expand, and there will therefore be different levels of risk for different habitats. However, for any particular habitat, restoration is likely to be lower risk than expansion.

51. Development on areas of habitat that fall into the high habitat distinctiveness band will often need to be offset with conservation action to expand or restore the same habitat type (like for like compensation). These habitats are likely to be more difficult to expand or restore than others, and as a result avoiding development on such habitats can effectively reduce the risks associated with habitat creation.

52. There is a developing body of evidence about the likelihood of success or failure of expansion or recreation projects for a number of different habitats, including the time that such habitats would take to develop (TEEB 2009, Rey Benayas et al., 2009, Fagan et al., 2008, for instance). Once there is an estimate of the failure risk, it is possible to work out the necessary multiplier to achieve a suitable level of confidence (Butcher pers. com., Moilanen 2009, Treweek & Butcher, 2010). The work of Moilanean provides a basis for different multipliers of various levels of risk. We have used this work to come up with categories of difficulty of restoration/expansion, and associated multipliers, as set out in **Figure 5** below.

53. At **Appendix 1** below we have assigned habitats to these broad categories using expert opinion. These assignments have had some input from Natural England specialists but it is important to note that this is meant purely as an indicative guide. The starting position with regard to substrate, nutrient levels, state of existing habitat etc will have an impact on the actual risk factor, which may need to be taken into account.

Figure 5: Multipliers for different categories of delivery risk

Difficulty of recreation/restoration	Multiplier
Very High	10
High	3
Medium	1.5
Low	1

The limits of multipliers in managing delivery risks

54. If the worst case risk is realised (i.e. the restoration or expansion fails to deliver), a multiplier will not solve the problem. In terms of the overall outcome it will make little difference whether the offset is the same, twice or five times the size of the impacted site, if the offset fails to develop into the target habitat or required condition. A simple multiplier is therefore not going to be appropriate in all cases, and some projects will require a more complex approach to ensuring the biodiversity outcomes are delivered.

55. For example, Moilanen et al. (2009) recommend that where the uncertainly is high, to achieve a more reliable outcome a 'hedge betting' solution should be applied where by a number of different restoration or offsetting solutions are used across a number of different sites.

Spatial risks and multipliers

56. Offsets are likely to deliver greatest benefits if they are positioned strategically. In the biodiversity offsetting pilot, this means offset projects that are in line with the strategies for using offsetting developed by the local planning authorities working with their partners. These will identify the priority habitats for the area, and priority locations for contributing to the ecological network, as outlined in the Natural Environment White Paper and Making Space for Nature. Locating offsets strategically will greatly reduce the risk of an offset being delivered in a spatially less favourable location than the impacted site.

57. In situations where, for whatever reason, an offset is delivered in a location which doesn't contribute to the ecological network as indentified in the local offsetting strategy, a local authority could choose to require offset providers to apply a multiplier to manage the risk of the compensation failing to deliver the required level of compensation for biodiversity loss. (They could also decide that the project wasn't acceptable as compensation). Figure 6 sets out a suggested approach for offset providers to follow if they choose to use a multiplier to manage this risk.

Figure 6: Proposed multipliers to deal with spatial risk

Location parameters	Multiplier
Offset is in a location identified in the offsetting strategy	No multiplier required
Offset is buffering, linking, restoring or expanding a habitat outside an area identified in the offsetting strategy	2
Offset is not making a contribution to the offsetting strategy	**3**

Insurance

58. A further approach to managing risks is insurance. An offset provider could take out insurance against their failure to deliver the right number of units, in addition to, or instead of, using multipliers.

59. Financial insurance would provide a source of funds for re-attempting the offset project that had failed, thus still allowing the offset provider to meet their obligation in terms of units of biodiversity. The insurance premiums paid by offset providers would likely reflect the type of habitat creation/restoration scheme being undertaken, and therefore its specific risk of failure. In **Appendix 1** to this document, habitats have been assigned to broad risk categories both for expansion (recreation) and restoration.

60. The pilot will help us to learn more about how offset providers choose to manage their risks.

Multipliers and time

61. In delivering offsets there may be a mismatch in the timing of impact and offset, i.e. the difference in time between the negative impact on biodiversity and the offset reaching the required quality or level of maturity, which results in loss of biodiversity for a period of time.

62. This issue could be managed by encouraging the creation of offsets ahead of the impact taking place, either though the setting up of habitat banks or, for projects with a long lead in, by starting the offset work well ahead of the development.

63. However, particularly in the early stages of introducing a new approach to offsetting, many offsets are likely to be developed concurrently with the impact taking place. This will be the case in the biodiversity offsetting pilots. Even where the offset has been started in advance, the time taken for habitats to mature means that there will almost inevitably be a time lag. Where a time lag does occur, a multiplier can be applied to take account of it.

64. 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 (more details on discounting can be found in the Treasury Green Book Guidance[12]). Whilst for individuals the evidence for a preference to consume today is good, the evidence as to why society should do this, the ecological basis for it is more complex (for discussion see Annex 5 REMEDE 2008, NOAA 2006).

12 [redacted]

65. Discussions with stakeholders indicate that they support the use of a multiplier to account for the temporal risk in the approach to offsetting we use in England. This is because it would:

- incentivise habitat banking: if the habitat is established there is no need to apply multipliers to manage delivery risks, and to take account of time differences. So more units will be available from a particular area of land.

- create a disincentive for damaging habitats that take a long time to recreate or restore (i.e. many habitats in the 'high' distinctiveness band), by increasing the area of offset needed to compensate for the loss.

66. Where time discounting is used in offset or compensation schemes, for instance in the US and in Defra's Environmental Liability Directive guidance, they tend to use a standard discount rate, for example 7% or 3%, discussed in NOAA 2006 and 3.5%, Defra, 2009. In England, the Treasury Green Book recommends a discount rate of 3.5% to reflect the value society attaches to 'consumption' (i.e. enjoyment of goods and services) at different points in time. It is therefore recommended that this is the rate (3.5%) that should be used for time discounting calculations within an English offsetting scheme.

67. **Figure 7** shows the multipliers that derive for a number of time periods using a discount rate of 3.5 %

Figure 7: Multipliers for different time periods using a 3.5% discount rate

Years to target condition	Multiplier
5	1.2
10	1.4
15	1.7
20	2.0
25	2.4
30	2.8
32	3

68. The following are the parameters within which the time discounting should operate for the biodiversity offsetting pilot.

69. The number of years that time discounting should take into consideration is from the point of impact to the estimated time that it will take for the habitat to reach the pre-agreed target quality (i.e. the point at which the agreed number of units is delivered). For simplicity and to allow upfront estimates of the offsetting provision this will require some guidelines. TEEB 2009 provides a good starting point, and **Appendix 2** has a table of estimated timescales from that publication. The actual figure will need to be calculated on a case by case basis for each offset management plan, taking into account the habitat type, and the amount of restoration or expansion being undertaken.

70. The calculations around the time discount multiplier should cover the whole period concerned. The calculations should assume that there is a quality jump from the baseline condition to the target condition once the relevant number of years has elapsed. The calculations therefore do not need to take into account increasing quality in the habitat, and do not need to be re-done annually.

71. Offsets should last at least as long as the impact of the development, and ideally in perpetuity. However, to be practical, there needs to be a limit on application of the discount rate used for time preference. We therefore propose that the maximum multiplier used to take account of temporal risk is x3.

72. We think that offset providers participating in the pilot should apply a temporal multiplier to their projects when calculating how many units of biodiversity they are able to offer.

Hedgerows

73. Hedgerows are a feature almost unique to the UK and there is no experience of dealing with them in offset schemes elsewhere that we can draw on. Hedgerows' contribution to biodiversity in the landscape is far greater per unit of area than even the most biodiversity rich habitats because of their role in provision of nest sites, corridors, feeding sites, shelter belts etc. They cannot simply be treated as other habitats and accounted for on a hectarage basis. It is therefore necessary to come up with a mechanism to account for hedgerows in our approach to offsetting that both recognises their unique contribution to biodiversity whilst at the same time meeting our guiding principle of simplicity.

74. Although this description is written to describe how we deal with hedgerows the conclusions and approach could equally apply, in theory, to other field boundary features such as hedge banks and rows of trees.

75. There is little if any science to draw on that compares the value of a hedgerow to other habitats. Even if such evidence did exist, it is likely that the exact value would be so dependent on a wide range of factors as to make its use as a generalisation difficult. Consequently it is recommended that hedgerows are treated as a separate case out with the main metric system.

76.	Hedgerows are in the high distinctiveness habitat type band, and we believe there should be a requirement for “like-for-like” offsetting.

77.	It is proposed that in the offsetting pilot, the hedgerow offset is treated as a separate habitat type band alongside the main offset requirement i.e. an area of grassland with hedgerows being developed on might have an offset requirement of XX units of grassland offset plus YY metres of hedgerow offset.

78.	In terms of the offset requirement, for most habitats it is proposed that the offset should be either expansion or restoration. For hedges it is proposed that only expansion (in effect planting new hedges) is appropriate. This is because of the complexity of defining restoration and assigning metres of offset requirement to hedge restoration work.

79.	The amount of hedgerow required to offset each metre of hedgerow destroyed will depend, just as with habitats, on the quality of the hedgerow lost as a result of development.

80.	The Higher Level agri-environment Scheme Farm Environmental Plan handbook provides a good model for condition assessment for hedgerows that assigns hedges to one of three quality bands (see **Appendix 3**). Any difference in the quality of hedgerow in the offset and the hedgerow lost would be dealt with by a simple multiplier as shown in **Figure 8** below:

Figure 8: Multiplier required for different conditions of offset provision

Condition of hedgerow lost	Multiplier applied
Good	3
Moderate	2
Poor	1

81.	Unless you are dealing with a well-established habitat bank, (and this will not be the case in the pilots) this will apply to all hedgerows provided as offsets.

82.	Finally it is worth considering green lanes/double hedgerows. Whilst they are likely to be impacted only very rarely, partly on account of their association with rights of way, if they are the offset should be a double hedge rather than a single hedge. The reason for making this distinction is that double hedges are known to be particularly important for wildlife (Walker et al., 2005, Walker et al., 2006).

Species and offsets

83. Some stakeholders have expressed a desire to see species treated more explicitly in the metric. This approach has not been taken for the offsetting pilot. The reasons for this are:

- One of the guiding principles for our approach to the offsetting pilot is that there will be no change to existing levels of protections for our biodiversity. So existing protections for habitats and species (such as those made under the EU Habitats and Species Directive), and the processes that go with them, are not part of the offsetting pilot.

- It is apparent that most of the species issues that arise are localised. Different species will be the main issue in different areas. We have sought to avoid designing details that will apply in very few situations, and which would require a significant degree of local interpretation.

84. With this as background the way species are dealt within the biodiversity offsetting pilot is as follows:

- Where there is an existing legal process for protecting species this takes precedent (as with habitats) and is the mechanism by which impacts are addressed. Local discretion could then be used to decide whether the mechanisms in place for offsets provision (habitat banks etc) can be harnessed as a way of delivering any required compensation.

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Appendix 1: Risk factors for restoring or recreating different habitats

* N.B: These assignments are meant purely as an indicative guide. The starting position with regard to substrate, nutrient levels, state of existing habitat etc will have a major impact in the actual risk factor. Final risks should be agreed locally as part of setting up the offset.

Habitats	Technical difficulty of recreating	Technical difficulty of restoration
Aquifer Fed Naturally Fluctuating Water Bodies	Very high/impossible	Medium
Arable Field Margins	Low	n/a
Blanket Bog	Very high/impossible	High
Calaminarian Grasslands	High	Medium
Coastal and Floodplain Grazing Marsh	Low	Low
Coastal saltmarsh	Medium	Medium
Coastal Sand Dunes	Very high/impossible	Medium
Coastal Vegetated Shingle	High	High
Eutrophic Standing Waters	Medium	Medium
Hedgerows	Low	Low
Inland Rock Outcrop and Scree Habitats	Very high/impossible	Medium
Limestone Pavements	Very high/impossible	High
Lowland Beech and Yew Woodland	Medium	Low
Lowland Calcareous Grassland	Medium	Low

Lowland Dry Acid Grassland	Medium	Low
Lowland Fens	Medium	Low
Lowland Heathland	Medium	Medium
Lowland Meadows	Medium	Low
Lowland Mixed Deciduous Woodland	Medium	Low
Lowland Raised Bog	Very high/impossible	Medium
Maritime Cliff and Slopes	Very high/impossible	High
Mountain Heaths and Willow Scrub	High	Medium
Oligotrophic and Dystrophic Lakes	Medium	Medium
Open Mosaic Habitats on Previously Developed Land	Low	Low
Ponds	Low	Low
Purple Moor Grass and Rush Pastures	High	Medium
Reedbeds	Low	Low
Saline lagoons	Low	Low
Traditional Orchards	Low	Low
Upland Calcareous Grassland	High	Medium
Upland Flushes, Fens and Swamps	High	Medium
Upland Hay Meadows	Medium	Low

Upland Heathland	Medium	Medium
Upland Mixed Ashwoods	Medium	Low
Upland Oakwood	Medium	Low
Wet Woodland	Medium	Low
Wet Heath	High	High
Wood-Pasture & Parkland	Medium	Low

Appendix 2: Feasibility and timescales of restoring: examples from Europe

Ecosystem type	Time-scale	Notes
Temporary pools	1-5 years	Even when rehabilitated, may never support all pre-existing organisms.
Eutrophic ponds	1-5 years	Rehabilitation possible provided adequate water supply. Readily colonised by water beetles and dragonflies but fauna restricted to those with limited specialisations.
Mudflats	1-10 years	Restoration dependent upon position in tidal frame and sediment supply. Ecosystem services: flood regulation, sedimentation.
Eutrophic grasslands	1-20 years	Dependent upon availability of propagules. Ecosystem services: carbon sequestration, erosion regulation and grazing for domestic livestock and other animals.
Reedbeds	10-100 years	Will readily develop under appropriate hydrological conditions. Ecosystem services: stabilisation of sedimentation, hydrological processes.
Saltmarshes	10-100 years	Dependent upon availability of propagules, position in tidal frame and sediment supply. Ecosystem services: coastal protection, flood control.
Oligotrophic grasslands	20-100 years +	Dependent upon availability of propagules and limitation of nutrient input. Ecosystem services: carbon sequestration, erosion regulation.
Chalk grasslands	50-100 years +	Dependent upon availability of propagules and limitation of nutrient input. Ecosystem services: carbon sequestration, erosion regulation.
Yellow dunes	50-100 years +	Dependent upon sediment supply and availability of propagules. More likely to be restored than re-created. Main ecosystem service: coastal protection.
Heathlands	50-100 years +	Dependent upon nutrient loading, soil structure and availability of propagules. No certainty that vertebrate and invertebrate assemblages will arrive without assistance. More likely to be restored than re-created. Main ecosystem services: carbon sequestration, recreation.
Grey dunes and dune slacks	100-500 years	Potentially restorable, but in long time frames and depending on intensity of disturbance Main ecosystem service: coastal protection, water purification.
Ancient woodlands	500 – 2000 years	No certainty of success if ecosystem function is sought – dependent upon soil chemistry and mycology plus availability of propagules. Restoration is possibility for plant assemblages and ecosystem services (water regulation, carbon sequestration, erosion control) but questionable for rarer invertebrates.
Blanket/Raised bogs	1,000 – 5,000 years	Probably impossible to restore quickly but will gradually reform themselves over millennia if given the chance. Main ecosystem service: carbon sequestration.
Limestone pavements	10,000 years	Impossible to restore quickly but will reform over many millennia if a glaciation occurs.

Appendix 3: Condition assessment for high environmental value hedges from FEP handbook

No condition assessment is required for hedgerows that have been planted, laid or coppiced within the last five years.

Criteria:

1. Height: The hedgerow must meet a minimum threshold of 2 min height. Assess the height of the woody component of the hedgerow from the base of the stems to the top of the shoots of the woody species. This should be assessed along the whole length of the hedgerow and the most common height used. Gaps are not included, nor are hedgerow trees. Where a bank is present, the height of the bank must be excluded.

2. Width: The hedgerow must meet a minimum threshold of 1.5 m in width. Assess the width of the woody component between the shoot tips at the widest point. This should be assessed along the whole length of the hedgerow and the most common width used. Gaps are not included.

3. Gappiness: Assess the horizontal gappiness of the woody component. Gaps are complete breaks in the woody canopy of the hedgerow (see **Figure below**). No more than 10% of the hedgerow length should be occupied by gaps and no one gap should be greater than 5 m wide (this excludes access points and gates).Where dormice or target species of bat are present in the hedgerow there must be no gaps.

Number of missed/failed criteria	Condition assessment category	Probable management level
0	A	Maintain
1	B	Maintain or restore
2 or more	C	Resore