Environmental Benefits from Nature (EBN) Tool - Beta Release Data Catalogue Update v1.1

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Smith, A.C., Baker, J., Berry, P.M., Butterworth, T., Chapman, A., Harle, T., Heaver, M., Hölzinger, O., Howard, B., Norton, L.R., Rice, P., Scott, A., Thompson, A., Warburton, C. and Webb, J.

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Updates: Andrew Thompson (2024).

Substantive updates marked (New). Universal updates to replace reference to Biodiversity Metric 3.0 with the Statutory Biodiversity Metric tool, and to reference to MAGIC/EA/Met Office data with links to the GI Mapping Portal, have been made throughout. Update contains other minor revisions to other areas.

Further information

This report can be downloaded from the Natural England Access to Evidence Catalogue: **http://publications.naturalengland.org.uk/** . For information on Natural England publications contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk**.

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EBNT User Community
Special thanks to all industry members of the EBNT community who have contributed to and helped shape the update.

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.

Landscape Character Assessment Database provided courtesy of Landscape Institute (NEW)

We are grateful to the Landscape Institute, who have provided permission to embed their Landscape Character Assessment (LCA) Database within the EBNT.

Please see https://www.landscapeinstitute.org/news/the-landscape-character-database-for-the-uk-and-ireland-is-now-available/for further details about the Landscape Character Assessment Database Project.

Users should refer to the above link for methodologies, caveats and the latest list of LCAs.

Foreword (NEW)

The Environmental Benefits from Nature Tool (EBNT) Data Catalogue provides important reference information on how data (required by EBNT v1-1) should be collected, accessed and measured. This document should be used having first read the EBNT User Guide and EBNT Principles document to ensure data is accessed, entered and interpreted correctly. The updated data catalogue has been significantly shortened to remove detailed instructions on how to locate required data from different Government websites. This has now been replaced by links to the central Green Infrastructure data mapping portal - which aggregates Open Government Licence (OGL) datasets (required for a BASIC assessment) into a central searchable repository. Updated links to Government servers containing spatial data are also provided. These can be accessed through the new EBNT QGIS template, which provides the easiest and most efficient means of access for QGIS users[1].

Existing users should note that, where possible, the data requirements and related impact on scores have been kept the same. Where changes have been made these are marked (NEW). Two ADVANCED modifiers requiring spatial analysis have been removed to improve simplicity. Some further indicators such as Rainfall and Water Quality have been tweaked to better match available OGL data. Users should note the method for calculation for Landscape Diversity has also changed. Details on how this should be assessed are included in Section 2 below. Existing users should also note that linear feature length should now be entered in KM to reflect units used by the Statutory Biodiversity Metric rather than metres, as used previously.

Should users identify difficulty accessing or entering any of the datasets set out below, please contact ebn@naturalengland.org.uk.

[1] Further information can be found in the accompanying documents on the JP038 site. These include a user guide covering step by step guidance.

Contents

Introduction (NEW)

This document lists details of all the condition and spatial indicators used within the Environmental Benefits from Nature (EBN) tool and required to complete different levels of assessment. It contains descriptions for each indicator, including instructions on how to ascertain the value of the indicator, and the rationale for selecting multiplier values based on each indicator.

The rationale for inclusion of spatial and condition indicators is covered in s.3.5 of the accompanying *Principles of the Environmental Benefits from Nature (EBN) tool approach* document. In line with the principles of the approach, datasets have been updated to be, wherever possible, open access to allow public use. The update to the tool now makes these datasets easier to access, via the Natural England Green Infrastructure Data Portal /EBNT QGIS Template systems. This now replaces the need to locate datasets from different Government websites.

The datasets below have been selected following expert review to best reflect spatial and condition factors that impact each ecosystem service, and their application has been tested to ensure proportionate results.

This guide should be used together with:

- **Principles of the EBN tool approach**, which explains the overall approach and summarises good practice principles, caveats and limitations. This is crucial in ensuring that the approach will be applied correctly as part of the biodiversity mitigation hierarchy and will not lead to perverse outcomes.
- **The EBN tool User Guide**, which explains how to use the spreadsheet tool, and new Green Infrastructure Data portal.
- **Green Infrastructure Data Portal,** which provides access to spatial information required to complete a BASIC assessment for small/simple sites.
- **EBNT QGIS Template (QGIS users ONLY),** which provides a pre-populated template that accesses and processes spatial information required to complete a BASIC assessment for large/ complex sites[2]. This works in conjunction with the Biodiversity Metric QGIS template to link related habitat information to contextual attributes from the required spatial dataset.

[2] This does not include Access of Population Density information, which is not held on servers, but can be viewed on the GI Data portal.

MAPPING TIP: For larger/more complex sites it is worth trying to obtain site plans and habitat survey maps as QGIS files and using the BNG & EBNT QGIS Templates. Converting from CAD (typically used by developers) to GIS files is possible but can be very difficult and time-consuming.

Please Note:

a) Both the GI Data Portal & QGIS template contain contextual data for England only. Further details on equivalent datasets for Wales is included below, where direct equivalents are available. Soils data is not included within the GI data portal or QGIS template - as these are not OGL datasets and must be considered separately (see relevant sections below).
b) The updated tool contains changes to landscape diversity, local distinctiveness, flowers, and resources for local species multipliers to reflect input from the Natural England landscape profession and improve consideration of cultural services.
c) Two ADVANCED data-led multipliers have been removed to simplify completion.

SECTION 1. Data types & data sources required by the EBNT

1. Getting started: types of data source required by the EBNT

Data can be obtained from several sources. A breakdown of these is set out in Table 1 (below). Data source requirements vary according to level of assessment, as set out in Table 2. The following pages contain summary lists relating to the information that needs to be collected for each level of assessment and how to collect related data. After that, section 2 details indicator-specific information to inform data entry and breaks down its multiplier impact on scoring.

Table 1. Breakdown of data sources

	Number of indicators
Online maps or documents	16
Site survey (expert)	5
Site survey (non-expert)	11
Locally obtained information (e.g. from aerial photos, local authorities, or wildlife trusts)	5

*Note that some indicators can be obtained from more than one type of source.

2. Choosing the right level of assessment - Basic, standard and advanced levels within the EBNT

Before starting data collection, users are encouraged to consider the correct level of EBNT assessment for their project. Recommended levels of assessment for different types of projects are set out in Table 2. The relationship between levels of assessment and data collection requirements are expanded on in Table 3. BASIC assessments are more closely associated with web-based assessment (as detailed in Section 1.4). This contextual data supplements habitat data (which may be taken from Statutory Biodiversity Metric – as detailed in Section 1.7/8) to form a BASIC assessment. STANDARD and ADVANCED assessments also make use of this information but require additional field data collection (as set out in Table 7-8).

Table 2. Levels of EBN assessment

Level	Use
BASIC	**Recommended for all assessments.** Generally, from freely available online maps and typically do not vary much, if at all, across the site.
STANDARD	May require a site survey or collection of local information, or simple GIS analysis. May vary across the site. **Recommended for developments >0.5 ha or where semi-natural habitats are being affected.**
ADVANCED	Typically require a site survey or complex GIS analysis and may vary for every habitat parcel. **Only recommended for developments >500 homes, where priority habitats are affected or where particular indicators are of interest.**

3.Understanding the different types of indicators within the EBNT and their association with different levels of assessment

Users will note that indicators are grouped within the EBNT according to level of assessment. BASIC indicators are shown by default within the main tool[3]. This list can be expanded by selecting the level of assessment on the Baseline, or Post intervention data entry tabs. Indicators below correspond to the columns found at the right side of each of these tabs.

[3] All tabs are shown in the macro-disabled version.

Table 3. List of EBN indicators and corresponding level of tool assessment

Indicator type	No.[4]	Indicator	Level
ALC	1	Agricultural Land Class (ALC)	BASIC
Flooding, water supply and water quality	2	Surface water availability	BASIC
	3	Groundwater availability	BASIC
	4	Natural Flood Management priority	BASIC
	7	Water quality: WFD status	BASIC
	8	Water quality management area?	BASIC
Soil and erosion	9	Rainfall	BASIC
	10	Slope	ADVANCED
	11	Soil drainage	BASIC
	12	Soil erodibility	STANDARD
	13	Soil compaction	ADVANCED
	14	Soil management	ADVANCED
	15	Peat quality	STANDARD
Vegetation	17	Canopy cover	STANDARD
	18	Tree size	STANDARD
	19	Ground cover	ADVANCED
	20	Tall or tussocky grasses	ADVANCED
	21	Shrub layer	ADVANCED
	22	Flowers	ADVANCED
	23	Invertebrate nest sites	ADVANCED
	24	Resources for local species	ADVANCED
Position	25	Position for water quality regulation	ADVANCED
	26	Position for erosion prevention	ADVANCED
	27	Air pollution barrier	ADVANCED
	28	Shading ability	ADVANCED
	29	Noise barrier	ADVANCED
Cultural and nature designations	30	Population density	BASIC
	31	Nature designation	BASIC
	32	Ancient habitat	BASIC

[4] Note: numbers are not consecutive as indicators 16, 40, 41 and 42 have not yet been implemented and are therefore omitted from this table. Advanced Indicators 5-6, which are based on spatial data have also been removed from v1.1 to improve simplicity and efficiency of completion. ADVANCED indicators now require site survey information only.

Indicator type	No.[4]	Indicator	Level
	33	Cultural or historic importance	BASIC
	34	Special recreation value	BASIC
	35	Public access	BASIC
	36	Educational use	BASIC
	37	Managed for nature	BASIC
	38	Local distinctiveness	STANDARD
	39	Landscape diversity	BASIC
Water bodies	43	Fish barriers	ADVANCED
	44	Water body naturalness	STANDARD

4. Finding Online maps and data sources

The following table summarises the indicators that can be obtained from online maps and how this data can be obtained. See the detailed information on each indicator provided in the section below for guidance. Should any of these sources change, resulting in a broken link, please report it to the following address EBN@naturalengland.org.uk.

Table 4. Indicators to be obtained from online maps and data sources

No.	Indicator	Indicator link
1	Agricultural Land Class (ALC)	Green Infrastructure Data Portal
2	Surface water availability	Green Infrastructure Data Portal
3	Groundwater availability	Green Infrastructure Data Portal
4	Natural Flood Management priority	Green Infrastructure Data Portal
7	Water quality: WFD status	Green Infrastructure Data Portal
8	Water quality management area	Green Infrastructure Data Portal
9	Rainfall	Green Infrastructure Data Portal
10	Slope	UK Soil Observatory
11	Soil drainage	LANDIS soilscapes
12	Soil erodibility	LANDIS soilscapes / MAGIC (non-commercial use)
30	Population density	Green Infrastructure Data Portal
31	Nature designations	Green Infrastructure Data Portal
32	Ancient habitat	Green Infrastructure Data Portal
33	Cultural or historic importance	Green Infrastructure Data Portal
34	Special recreational value	Green Infrastructure Data Portal
35	Public access	Green Infrastructure Data Portal

Users will note the majority of these datasets have been shared on the Green Infrastructure Data Portal .This is intended to allow greater convenience for users

providing access in one place to Open Government Licence data. The portal provides a stable platform for users, with custom search functionality to allow quick access to data.

Data on this portal was updated in 2023/4 and is planned to be updated periodically, Soils data and information on slope is subject to specific licences and therefore can only be accessed using the links below for non-commercial use. Metadata relating to the datasets can be found on the Green Infrastructure mapping guide.

Technical users may wish to access the latest versions of the data required directly for their own analysis, these are provided below and accessed via the EBNT QGIS template.

Table 5. Links to downloadable datasets/servers for GIS users (NEW)

Indicator	Data source webpage	Server Link
Agricultural Land Classification	https://www.data.gov.uk/dataset/952421ec-da63-4569-817d-4d6399df40a1/provisional-agricultural-land-classification-alc	https://environment.data.gov.uk/spatialdata/agricultural-land-classification-provisional-england/wfs
Agricultural Land Classification	https://www.data.gov.uk/dataset/c002ceea-d650-4408-b302-939e9b88eb0b/agricultural-land-classification-alc-grades-post-1988-survey-polygons	https://environment.data.gov.uk/spatialdata/agricultural-land-classification-grades-post-1988-survey-england/wfs
Surface Water Availability	https://www.data.gov.uk/dataset/b1f5c467-ed41-4e8f-89d7-f79a76645fd6/water-resource-availability-and-abstraction-reliability-cycle-2	https://environment.data.gov.uk/spatialdata/water-resource-availability-and-abstraction-reliability-cycle-2/wfs
Groundwater Availability	https://www.data.gov.uk/dataset/2a74cf2e-560a-4408-a762-cad0e06c9d3f/wfd-groundwater-bodies-cycle-2	https://environment.data.gov.uk/spatialdata/wfd-groundwater-bodies-cycle-2/wfs
Groundwater Availability	https://www.data.gov.uk/dataset/c5a3e877-12c3-4e81-8603-d2d205d52d7a/wfd-river-canal-and-surface-water-transfer-waterbodies-cycle-2	https://environment.data.gov.uk/spatialdata/wfd-groundwater-bodies-cycle-2-2019/wfs

Indicator	Data source webpage	Server Link
Natural Flood Management Priority	https://www.data.gov.uk/dataset/2a4bcf6e-3880-4c0b-9986-6cafbec89faf/spatial-prioritisation-of-catchments-suitable-for-using-natural-flood-management	https://environment.data.gov.uk/spatialdata/spatial-prioritisation-of-catchments-suitable-for-using-natural-flood-management/wfs
Water Quality WFD Status	https://www.data.gov.uk/dataset/d88923dc-a394-4bbb-9f99-ca9d2d55f689/wfd-lake-water-bodies-cycle-2-classification-2019	https://environment.data.gov.uk/spatialdata/wfd-lake-water-bodies-cycle-2-2019/wfs
Water Quality WFD Status	https://www.data.gov.uk/dataset/0f6c2aee-3f8e-476c-93df-e629881bd985/wfd-transitional-and-coastal-water-bodies-cycle-2-classification-2019	https://environment.data.gov.uk/spatialdata/wfd-transitional-and-coastal-water-bodies-cycle-2-2019/wfs
Water Quality WFD Status	https://www.data.gov.uk/dataset/c5a3e877-12c3-4e81-8603-d2d205d52d7a/wfd-river-canal-and-surface-water-transfer-waterbodies-cycle-2	https://environment.data.gov.uk/spatialdata/wfd-river-canal-and-swt-water-bodies-cycle-2-2019/wfs
Water Quality Management Area	https://data-forestry.opendata.arcgis.com/datasets/df71f328b77f42dca80691b77e01aae6_0/explore	https://services2.arcgis.com/mHXjwgl3OARRqqD4/arcgis/rest/services/EWCO_Water_Quality/FeatureServer/0
Rainfall	https://climatedataportal.metoffice.gov.uk/datasets/TheMetOffice::annual-precipitation-observations-1991-2020-12km/about	https://services.arcgis.com/Lq3V5RFuTBC9I7kv/arcgis/rest/services/Annual_Precipitation_Observations_1991_2020/FeatureServer/0

Indicator	Data source webpage	Server Link
Nature Designation	https://environment.data.gov.uk/dataset/c626e031-e561-4861-8219-b04cd1002806	https://environment.data.gov.uk/spatialdata/ramsar-england/wfs
Nature Designation	https://www.data.gov.uk/dataset/a85e64d9-d0f1-4500-9080-b0e29b81fbc8/special-areas-of-conservation-england	https://environment.data.gov.uk/spatialdata/special-areas-of-conservation-england/wfs
Nature Designation	https://www.data.gov.uk/dataset/174f4e23-acb6-4305-9365-1e33c8d0e455/special-protection-areas-england	https://environment.data.gov.uk/spatialdata/special-protection-areas-england/wfs
Nature Designation	https://environment.data.gov.uk/dataset/ff213e4c-423a-4d7e-9e6f-b220600a8db3	https://environment.data.gov.uk/spatialdata/national-nature-reserves-england/wfs
Nature Designation	https://www.data.gov.uk/dataset/acdf4a9e-a115-41fb-bbe9-603c819aa7f7/local-nature-reserves-england	https://environment.data.gov.uk/spatialdata/local-nature-reserves-england/wfs
Nature Designation	https://www.data.gov.uk/dataset/5b632bd7-9838-4ef2-9101-ea9384421b0d/sites-of-special-scientific-interest-england	https://environment.data.gov.uk/spatialdata/sites-of-special-scientific-interest-england/wfs
Nature Designation	https://environment.data.gov.uk/dataset/e819098e-e248-4a8f-b684-5a21ca521b9b	https://environment.data.gov.uk/spatialdata/national-parks-england/wfs
Nature Designation	https://www.data.gov.uk/dataset/80c075c3-1880-44a0-bffc-69e20f307c21/marine-conservation-zones-england	https://environment.data.gov.uk/spatialdata/marine-conservation-zones-england/wfs

Indicator	Data source webpage	Server Link
Ancient Habitat	https://www.data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodland-england	https://environment.data.gov.uk/spatialdata/ancient-woodland-england/wfs
Cultural or Historic Importance	https://environment.data.gov.uk/dataset/e819098e-e248-4a8f-b684-5a21ca521b9b	https://environment.data.gov.uk/spatialdata/national-parks-england/wfs
Cultural or Historic Importance	https://www.data.gov.uk/dataset/8e3ae3b9-a827-47f1-b025-f08527a4e84e/areas-of-outstanding-natural-beauty-england	https://environment.data.gov.uk/spatialdata/areas-of-outstanding-natural-beauty-england/wfs
Cultural or Historic Importance	https://environment.data.gov.uk/dataset/3c27e15d-e906-413b-8497-11c07a2230fe	https://environment.data.gov.uk/spatialdata/heritage-coasts-england/wfs
Cultural or Historic Importance - Scheduled Monuments	https://www.data.gov.uk/dataset/d53bd232-16e7-4867-8d10-b313ef41ac22/national-heritage-list-for-england-nhle	https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/7
Cultural or Historic Importance - Parks and Gardens	https://www.data.gov.uk/dataset/d53bd232-16e7-4867-8d10-b313ef41ac22/national-heritage-list-for-england-nhle	https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/7
Cultural or Historic Importance - Battlefields	https://www.data.gov.uk/dataset/d53bd232-16e7-4867-8d10-b313ef41ac22/national-heritage-list-for-england-nhle	https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/8

Indicator	Data source webpage	Server Link
Special Recreation Value	https://environment.data.gov.uk/dataset/e819098e-e248-4a8f-b684-5a21ca521b9b	https://environment.data.gov.uk/spatialdata/national-parks-england/wfs
Special Recreation Value	https://www.data.gov.uk/dataset/8e3ae3b9-a827-47f1-b025-f08527a4e84e/areas-of-outstanding-natural-beauty-england	https://environment.data.gov.uk/spatialdata/areas-of-outstanding-natural-beauty-england/wfs
Special Recreation Value	https://environment.data.gov.uk/dataset/3c27e15d-e906-413b-8497-11c07a2230fe	https://environment.data.gov.uk/spatialdata/heritage-coasts-england/wfs
Managed for Nature	https://www.data.gov.uk/dataset/78d77039-e3ae-4840-828f-82898ddc910e/countryside-stewardship-scheme-2016-management-areas-england	https://environment.data.gov.uk/spatialdata/countryside-stewardship-scheme-2016-management-areas/wfs

5. Using the GI Data Mapping Portal - EBN Data search tool

As outlined in Appendix 2 of the EBNT User Guide v1.1 the datasets listed in Table 4 can be simply accessed from the Natural England Green Infrastructure data portal using the EBNT data search tool. This tool will return the necessary attributes[5] from the available OGL datasets above in a form that can be directly exported into the MS Excel tool for small and simple sites. **This tool will not attribute indicator returns to particular habitats** therefore it is essential that this only be used on small sites/ or to analyse individual parcels (where results are expected to be the same). The EBNT QGIS Template repeats this process for complex sites that require matching habitats to their attributes.

[5] Please note Landscape Diversity Requires manual assessment, to supplement data search results and complete a BASIC assessment (see section 2 below). Soil drainage information is not OGL and must be considered separately.

6. Using Local data, site plans or aerial photos

In addition to spatial data detailed above, other information can be usefully assembled to assist with EBNT completion.

Table 6. Summary of indicators obtained from local data or aerial photos

No	Indicator	Type	Guidance
14	Soil management	Local knowledge	Are soil erosion management practices used on arable land (e.g. cover crops, crop residue, contour ploughing, no-till)?
17	Canopy cover	Aerial photos	Rough estimate of % canopy cover from site visit or quadrat analysis of a grid of points overlaid on aerial photos/ Google Earth.
36	Educational use	Local authority	Does the site have special educational value, e.g. use by school groups, use for scientific research, or an information centre?
39	Landscape diversity	Site plans/ LCAs	Landscape diversity should be determined into one of 4 categories, Uniform, Simple, Diverse, Complex (Definitions in section below indicator 39.)

7. Entering Baseline Site survey habitat information & ADVANCED field data collection

1. Habitat Area (NEW)

In most cases information on habitat area can be taken directly from the statutory biodiversity metric tool and pasted into the EBNT to form the basis of assessment. See EBNT User Guide section 3.4. *Copying data from the Statutory Biodiversity Metric Tool (SBMT)*. However, linear features require additional measurements to complete the tool (see below).

2.Linear and point features: hedges, rivers, streams, canals, ditches trees, green walls and paths (NEW)

The statutory biodiversity metric tool requires linear features such as hedgerows and watercourses to be recorded separately from other habitats. These linear habitats are recorded in length rather than area, entered as Km instead of Hectares.

The EBNT combines linear habitats with area-based habitats to perform service calculations. It is therefore necessary to convert km figures for these habitats to hectares. This requires the user to either a) enter in an actual width for the linear habitat b) enter an estimated width based on reasonable assumptions (see below) or c) calculate an area for the linear habitats themselves (for example, through use of GIS software).

We assume that larger linear features such as rivers will be recorded as an area that is distinct from surrounding habitats. However, for small linear and point features (hedges, streams) you may not know the area and will have to estimate it (see below).

You do not need to subtract the area of trees and hedges from the surrounding / underlying area. The tool will assign scores to the whole area, including the habitats underlying the trees or hedges, but will subtract the area of trees and hedges to obtain the correct site footprint area when working out scores per hectare (ha). This is done partly to match conventional surveying techniques, but also because the area under the tree or hedge may also deliver services in its own right, so this will enable us to distinguish between a tree on paving or a tree on grass, for example.

- **Hedges**: enter the length and width. If the width is variable, estimate an average. If there are large gaps in the hedge, adjust the length accordingly. Measure the surrounding land cover up to the mid-point of the hedge (i.e. as if the hedge wasn't there). (Figure 1). Where width measurements are not available (or unfeasible to measure) a reasonable average width should be determined, and assumptions noted in the comments column to the far right of the associated rows within the associated data entry tabs. Reference values are provided below to assist estimates where actual values are not available:
    - 1m - immature/ intensively managed hedgerow.
    - 1.5m - minimum width permitted for agricultural hedges under countryside stewardship[6].
    - 2m - typical UK hedgerow size[7].
    - 5-7m - overgrown hedgerow contains small/ juvenile trees or taller shrub-like species).
    - 7-15 m - overgrown hedge /line of trees contains mature trees.

- **Trees:** The statutory biodiversity metric tool contains a useful tree area calculator set up to estimate tree area for typical small, medium, or large trees. Where this has not been used enter the area calculated from the canopy diameter, estimated

[6] BE3: Management of hedgerows - GOV.UK (www.gov.uk)

[7] Britt, C., Sparks, T., Roberts, A. & Kirkham, F. Hedgerow management in England and Wales: current practice and factors influencing farmers' decisions. Asp. Appl. Biol. 133–143 (2011). 70. C J Barr, R C Stuart, S M Smart, L. G. F. RESULTS FROM MAFF-FUNDED WORK IN THE CS2000 PROGRAMME. (2001).

from a site survey or aerial photos[8]. Do not subtract the area of the trees from the surrounding area, i.e. enter the entire area of the field, grassland, paved area etc.

- **Green walls:** enter the area of the wall (not just its footprint on the ground). Again, this area will be subtracted automatically when working out the total land footprint area.
- **Rivers Priority Habitat /Other Rivers and Streams:** Enter Rivers either as an area (where larger), or as a length and width. You need to ensure that estimate of the surrounding land area does not include this area, because the EBN tool does not subtract this. This should be consistent with statutory biodiversity metric tool guidance. If the area of the streams is very small compared to the surrounding land area, you probably do not necessarily need to subtract the stream area if this will be complicated. However, in this case you may see small discrepancies in the results.
- **Canals:** are recorded as standing water within the tool. Length information from the tool should be supplemented by an estimate of width (e.g. 3metres). This width should not overlap with any other area habitat.
- **Ditches and Culverts** – the statutory biodiversity metric tool requires each of these to be recorded independently by length. Ditches should not be recorded where above 5m in width in accordance with biodiversity metric tool user guidance.
- **Paths.** If you are mapping at a fine scale, e.g. detailed plans for a housing development, you may have plans that explicitly include the areas of paths. In this case, enter the path area either as sealed surface or 'footpath / cycle path – green' if it is not a sealed surface. You can also estimate the path area by entering length and width separately. In either case, the surrounding habitats should not include the path area because the tool will not subtract it, though the discrepancy will be small. For larger rural areas, where the paths are mainly crossing fields, you do not need to enter paths separately. The impact of paths in enabling recreational access to the surrounding area can be taken into account via the access indicator (see indicator 37).

[8] Users working in urban environments should note that the BNG method of calculation differs from the measurements required for Tree measurement for Urban Greening Factor and areas obtained using this methodology will differ.

Figure 1. How to measure line and point features

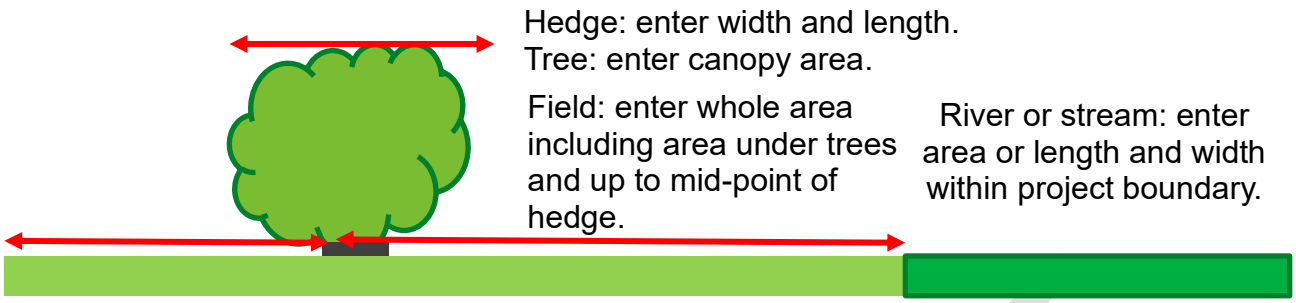


Table 7. Indicators to be collected during a site survey for an ADVANCED assessment: summary list

No.	Indicator type	Indicator	Information to be collected
13	**Soil**	Soil compaction	Heavily, locally / slightly, not compacted
15		Peat quality	Actively forming / degraded
18	**Vegetation**	Tree size	Largest class (saplings, poles, mature, veteran)
19		Ground cover (%)	Under 30%, 30-70%, over 70%
20		Tall or tussocky grasses	Under 5%, 5-33%, over 33%
21		Shrub layer	Under 5%, 5-33%, over 33%
22		Flowers	H/M/L (linked to condition/ abundance)
23		Invertebrate nesting sites	H/M/L (dead wood, veteran trees, etc)
24		Resources for local species	Weaker/Stronger
25	**Position and configuration**	Position for water quality regulation	Y/partial/N
26		Position for erosion prevention	Y/partial/N
27		Air pollution barrier	Y/partial/N
28		Shading ability	Y/partial/N
29		Noise barrier	Barrier/ Partial barrier/ Not barrier but tree or shrub near people/ Low vegetation near people/ Not near people
43	**Rivers and lakes**	Fish barriers	Impassable barriers/ Passable high impact/ Passable low impact/ No barriers
44		Water body naturalness	Salmonid/ Near natural/ Modified/ Heavily modified/ Artificial substrate/ Culvert

Table 8. Indicators to be collected during a site survey for an ADVANCED assessment: more detailed list

No.	Indicator type	Indicator
13	Soil compaction	Site survey, looking for signs of soil compaction such as bare, hard ground that does not absorb water when poured from a bottle, or vehicle tracks. Compaction could be inferred from land use to some extent, e.g. grazing density, use of heavy machinery / vehicles. Select from: Good condition / slightly compacted or locally compacted / highly compacted.
15	Peat quality	Is peat actively growing or degraded?
18	Tree size	Identify the largest class of trees present on site: saplings <7cm diameter at breast height (dbh), poles, 7-33cm, mature 33-80cm, very mature/veteran >80cm. Individual trees outside woodland should be identified separately (at least for veteran trees, >80 cm dbh).
19	Ground cover (%)	Estimate the rough percentage of ground that is covered by vegetation or thick leaf litter as opposed to bare patches (ignoring small bare patches a few cm wide). Select from the options: <30%; 30-70%; 70-100%; bare in winter (e.g. for arable land).
20	Tall or tussocky grasses	Estimate whether cover by tall or tussocky grasses is absent (<5% cover), present (5-33%) or extensive (>33%).
21	Shrub layer	Estimate the extent of any shrubby layer (understorey in woodland habitats; scattered shrub in open habitats such as grassland or heathland). Select from absent (<5% cover), present (5-33%) or extensive (>33%).
22	Flower	The estimate should be based on a site survey in summer, or prior knowledge of the site. Enter 'High' if the recorded habitat condition is Good/ Fairly Good or estimated abundance of flowering plants are greater than 66%, enter 'Low' if condition is recorded as Poor or abundance is lower than 33%. Otherwise enter 'Medium' for moderate condition/fairly poor condition
23	Invertebrate nesting sites	Enter 'high' if at least one of the following applies: • standing or fallen dead wood is visible from at least half of the walkover route (this includes dead trees or stumps over 1m tall and 20cm diameter, fallen logs or large dead branches at least 50cmm long and 20cm diameter and dead wood on live trees, following the Forestry Commission Woodland Condition Survey criteria): • beetle banks or dry earth are visible from at least a quarter of the walkover route,

No.	Indicator type	Indicator
		• the site includes one or more veteran trees with cavities, hollow trunks, crevices or loose or flaking bark, • tall or tussocky grasses cover at least 33% of the site, • a shrub layer covers at least 33% of the site. Enter 'medium' if some of these features are present but they do not meet the abundance criteria, and enter 'low' if none apply.
24	Resources for local species	Presence and abundance of specific resources for characteristic local species, e.g. larval food plants for specialist butterflies and other invertebrates; nesting sites for bats and birds should be considered alongside species associated with sense of place, such as waders or wildfowl. Establish which species are important locally, and what their habitat requirements are. Establish the degree to which requirements are present on the site, through a survey or through asking local experts. Enter Weaker or Stronger, based on this assessment. New developments might want to consider including these requirements in order to increase the value of their sites.
25	Position for water quality regulation	Is the habitat located on the flow path between a pollution source (arable field or road) and a water course?
26	Position for erosion prevention	Enter 'Yes' if the habitat is on the downwards side of (or level with) a habitat susceptible to erosion (arable field, improved grassland, horticulture, felled woodland, intensive orchard, biofuel crops, flower bed) AND it runs alongside part of the boundary with this erodible habitat or cuts across it roughly parallel to the contours of the slope, so that it is capable of trapping sediment washed off the field. Enter 'Partial ability' if the habitat is does not meet this criteria but you have another good reason to believe it is playing some role in reducing erosion. Otherwise enter 'No'.
27	Air pollution barrier	Enter 'Yes' if the habitat forms a barrier at least 3m tall and at least 3m wide, with reasonably thick vegetation, between a pollution source (e.g. a busy road) and an area used by people (homes, schools, offices, footpaths, parks etc). Enter 'Partial ability' if the barrier does not meet these criteria but you still think it has some value as a pollution barrier. Otherwise enter 'No'.
28	Shading ability	Enter 'Yes' if the habitat is located on the east, south or west side of a building exposed to sun, and close enough for the shadow to fall on the side of the building at least to half the height of the ground floor windows (assume 30m for trees and

No.	Indicator type	Indicator
		woodland; 3m for shrubs and hedges). Enter 'Partial ability' if this does not apply but you have another reason to believe that the habitat provides better shading and cooling ability than a typical habitat of this type, due to its position. Otherwise enter 'N'.
29	Noise barrier	Enter 'Barrier' if the habitat is at least 10m tall and at least 10m wide, with thick vegetation, between a noise source (e.g. road or rail) and an area used by people. Enter 'Partial barrier' if the habitat is at least 3m tall and at least 3m wide, with reasonably thick vegetation, between a noise source (e.g. road or rail) and an area used by people. Otherwise, if the habitat is trees or shrubs near people, enter 'Not barrier but tree/shrub near people', or if it is low vegetation near people (e.g. grass) enter 'Low vegetation near people'. Or if not near people enter 'Not near people'.
43	Fish barriers	Presence of fords, culverts, weirs or dams, classified as impassable to fish, passable high-impact or passable medium-impact (see entry in below, based on the height of any vertical drop, or the length and angle of sloping structures).
44	Water body naturalness	Enter whether the river is salmonid, near natural, modified, heavily modified or has an artificial substrate or flows in a culvert. See entry below for more info.

8. Entering post-intervention habitat information and conditions (NEW)

Post-intervention habitat information can be taken directly from the statutory biodiversity metric tool. This comes from a variety of tabs and should include both area and linear habitats that are retained, enhanced and created. For an ADVANCED assessment the user is required to articulate future conditions *aimed for* as part of their development (see Table 8) as this will not be available from site survey. This may include where they have made provision for particular habitats to act as barriers to address sources of pollution through strategic positioning. This may also include the target canopy cover for an area of woodland created or structure of proposed grassland. Completing such information helps improve the picture of the services that a development seeks to offer and form part of the calculations before addressing delivery risk.

Recording Enhancements (NEW)

Biodiversity net gain requires users to record habitat condition for biodiversity and planned enhancements in condition within the statutory biodiversity metric tool. This information is not automatically carried over into the EBNT. For ecosystem service benefits from enhancement to be captured within the EBNT, users must complete an ADVANCED level of assessment. This is required to capture the detail of proposed changes in habitat structure, as a result of enhancement, that will in turn have a bearing on service delivery.

For example, enhancement for biodiversity may require introduction of cutting/grazing regimes to create a shorter more open sward to increase botanical diversity, but this action could also reduce the coverage of tall, tussocky grassland and shrubs and lead to increases in bare ground. These changes will impact service scores, but are not captured by BASIC assessment, or the SBMT, so require additional user consideration to record anticipated changes from the baseline conditions.

Links with Habitat Management and Monitoring Plans (HMMPs)

While not a formal requirement, where evidence has been submitted relating to potential benefits of ecosystem service delivery (based on an ADVANCED EBN tool assessment) structural conditions for habitats (or specific positioning of habitats post-development) should be reflected within relevant Habitat Management and Monitoring Plan Prescriptions, as best practice. This can help ensure these conditions will be delivered as part of implementation, management and maintenance.

SECTION 2. Descriptions of individual condition indicators and spatial factors

The following sections provide descriptions for each indicator, including instructions on how to ascertain the value of the indicator, and the rationale for selecting each associated multiplier value.

1. Agricultural Land Classification (ALC)

Level	ES	Type	Source type	Link
BASIC	Food provision	**Supply**	Online map Shapefile	Green Infrastructure Data Portal https://www.data.gov.uk/dataset/952421ec-da63-4569-817d-4d6399df40a1/provisional-agricultural-land-classification-alc https://www.data.gov.uk/dataset/c002ceea-d650-4408-b302-939e9b88eb0b/agricultural-land-classification-alc-grades-post-1988-survey-polygons

Description. The Agricultural Land Classification classifies land into grades 1 (best) to 5 (worst) for the whole of England and Wales. Grade 1 land is highly productive and also versatile, so that many types of crop can be grown. Grade 5 land is typically bog or moorland suitable only for extensive grazing. The 'average' grade is 3b. Grades 1 to 3a are considered 'best and most versatile' land which should not be developed.

Applicable habitats: This indicator is used only for habitats where it is thought that the ALC could make a significant difference to the amount of food produced: arable fields, horticulture, orchards and improved grassland. The multiplier is not applied to lower-scoring habitats that could be used for grazing (e.g., semi-natural grassland, wood pasture, purple moor grass and rush pastures, bracken, heath, bog, vegetated dunes, saltmarsh), as these habitats are expected to have a lower ALC and this is accounted for when setting the basic scores. Similarly, it is unlikely that these habitats could produce a higher service if they were classified as having a high ALC, because of the nature of the habitat. Although woodland, scrub and hedgerows could also be used for gathering wild

food such as berries or mushrooms or for livestock, it is unlikely that the ALC would make much difference to food production, so the multiplier is not applied to these habitats either.

Determining the indicator value. An online map showing ALC attributes for England is available on the Green Infrastructure Data Portal. The values required by the EBNT can be accessed through the embedded EBN data search functionality or accessed manually by clicking on '*Agricultural Land Class'* located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu. The data displayed relates to The Agricultural Land Classification - Provisional (England), which covers the whole of England. Clicking on the map obtains the necessary value.

Limited additional areas have a more detailed classification available under 'Post-1988 Agricultural Land classification (England)' available from MAGIC which split the grades further to include 3a and 3b. These more detailed grades may be included for users wishing to make use of this data in areas covered.

Entering Data. Enter the grade for the different habitat areas (Grade 1, Grade 2, Grade 3a, etc) using the drop-down box in each cell. If the whole project area is the same grade, you can enter the grade in the top row and autofill the rest of the column (see User Guide for how to auto-fill). If a number of different grades apply, you may want to download the GIS shapefile from the link above/ use the EBNT QGIS template. If some of your habitat polygons fall into more than one ALC grade, you can either subdivide the polygons using the Identity function in GIS (see User Guide) or simplify by selecting the grade that covers most of the polygon. Non-applicable habitats will be greyed out and are not used in the calculation. You have the choice of setting them to 'NA' or leaving them auto-filled to the same grade as the other habitats. If the area is not farmed and not likely to be farmed in future, select 'Not farmable'.

Rationale for the multiplier values. The multipliers are based on a rough estimate of the difference in productivity between alternative grades. Grade 3b is assigned a value of 1, as it represents a typical value for England. We assume that grade 1 land could typically produce 14 tonnes per ha of wheat under 'good but not outstanding' management, and Grade 3 could produce the UK average of 6 tonnes per ha of wheat, whereas Grade 5 land (rough grazing) might produce only around 3 tonnes per ha of dry matter. An additional (provisional) multiplier is applied to Grades 1, 2 and 3a to reflect their additional benefits in terms of versatility, as well as the link to yield.

Table 9 ALC multipliers (highlighted yellow)

ALC	Potential yield (t/ha) of wheat or dry matter	Multiplier based on yield only	Normalised	Versatility multiplier	Multiplier adjusted for versatility	Normalised
1	14	2.33	*10.00*	1.2	2.80	*10.0*
2	12	2.00	*8.57*	1.1	2.20	*7.9*
3a	10	1.67	*7.14*	1.05	1.75	*6.3*
3	8	1.33	*5.71*	1	1.33	*4.0*
3b	6	1.00	*4.29*	1	1.00	*3.6*
4	4	0.67	*2.86*	1	0.67	*2.4*
5	3	0.50	*2.14*	1	0.50	*1.8*
Not farmable					0	*0*
Not applicable					1	*4.8*
Not known					1	*4.8*

2. Surface water availability

Level	ES	Type	Source type	Link
BASIC	Water supply	**Demand**	Online map or download	Green Infrastructure Data Portal or https://www.data.gov.uk/dataset/b1f5c467-ed41-4e8f-89d7-f79a76645fd6/water-resource-availability-and-abstraction-reliability-cycle-2

Description: The Environment Agency Catchment Abstraction Management Status for surface water is used as an indicator of water scarcity in a catchment. This information has been made available via the Green Infrastructure Data Portal. This indicator is used to apply a higher multiplier for the service of freshwater supply if water is scarce. In other words, the presence of a permeable surface that allows rainwater to percolate into the ground, where it could either recharge groundwater or gradually pass into surface water via subsurface flow, is more valuable in areas where groundwater or surface water supplies are not sufficient to meet current or expected future demand.

Applicable habitats: All except sealed surfaces (which score zero anyway). Any non-sealed surface will have some value for water supply.

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search functionality or accessed manually by activating *Surface Water Availability* located under the EBNT Ecosystem Services Supply and Demand Data Layers). Clicking on the map obtains the necessary value.

Rationale for the multiplier values. 'Water available' areas receive a multiplier of 1. This is because even if water is not currently scarce in the area, it could become scarce in future. Areas with restricted or unavailable water supply are allocated higher multipliers to show that permeable surfaces are particularly valuable in these areas[9].

[9] The actual values may be revised after testing. In theory, areas with ample water supply ('High hydrological regime') would receive a multiplier of less than one to indicate that it is less important to conserve water in these areas. However, there are very few water bodies in this category and on the online map they are rolled in together with 'Heavily modified water bodies', which are designated for water supply.

This multiplier is paired with the one for Groundwater Availability. The maximum of these two multipliers is used in the calculation. In other words, a multiplier over 1 is applied if either surface water or groundwater is scarce in the area.

Table 10. Surface water availability multipliers

Surface water availability	
High hydrological regime	0.8
Water available	1
Restricted water available	1.1
Water not available	1.2
Heavily modified water body	1
Not applicable	1
Not known	1

3. Groundwater availability

Level	ES	Type	Source type	Link
BASIC	Water supply	**Demand**	Online map Download	Green Infrastructure Data Portal https://www.data.gov.uk/dataset/2a74cf2e-560a-4408-a762-cad0e06c9d3f/wfd-groundwater-bodies-cycle-2

Description: This indicator is based on Groundwater Quantitative Status, which is reported as part of compliance with the Water Framework Directive. This information has been made available via the Green Infrastructure Data Portal. It indicates whether water abstraction from aquifers is sustainable or not, based on whether any of the following four tests are failed:

1. Saline intrusion – fail if over-abstraction is causing intrusion of poor-quality water into the groundwater body leading to sustained deterioration in groundwater quality.

2. Groundwater dependent terrestrial ecosystems (GWDTE) – fail if water abstraction is having a negative impact on plant communities in wetlands.
3. Water balance – fail if abstractions exceed the long-term average recharge and affect low flows.
4. Dependent surface water status – fail if groundwater abstractions affect the ecological status of surface water bodies.

Applicable habitats: All except sealed surfaces (which score zero anyway, so a multiplier would have no effect). Any non-sealed surface will have some value for water supply.

Determining the indicator value. An online map is located on the Green Infrastructure data portal. Values needed to complete the EBNT can be accessed either through the embedded EBN search tool functionality, or accessed manually by selecting *Ground Water Availability* located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Data entry.

Enter the overall groundwater quantitative status (high, good, moderate, poor, or bad) in the last year available (currently 2022 within the GI Portal/latest version available through server link above), in the drop-down box. You can autofill the whole column if the whole of your project site overlies the same groundwater unit.

Rationale for the multiplier values. If your project is in an area with 'high' quantitative status, we have applied a multiplier of less than one to indicate that it is less important to conserve water in these areas. Areas with 'good' status receive a multiplier of 1. This is because even if water is not currently scarce in the area, it could become scarce in the future. Areas with 'moderate', 'poor' or 'bad' status are allocated higher multipliers to show that permeable surfaces are particularly valuable in these areas. The actual values are arbitrarily chosen and may be revised after testing.

Table 11 Groundwater multipliers

Groundwater quantitative status (for water supply)	
High	0.8
Good	1
Moderate	1
Poor	1.1

Groundwater quantitative status (for water supply)	
Bad	1.2
Not applicable	1
Not known	1

This multiplier is paired with the one for Surface Water Availability. The maximum of these two multipliers is used in the calculation. In other words, a multiplier over 1 is applied if either surface water or groundwater is scarce in the area.

4. Natural Flood Management priority

Level	ES	Type	Source type	Link
BASIC	Flood regulation	**Demand**	Online maps Shapefile	Green Infrastructure Data Portal https://www.data.gov.uk/dataset/2a4bcf6e-3880-4c0b-9986-6cafbec89faf/spatial-prioritisation-of-catchments-suitable-for-using-natural-flood-management

This was originally one of three flood demand indicators (indicators 4-6) that were considered jointly: the highest level of demand was previously used to determine the multiplier. This has now been simplified to use indicator 4 as a single BASIC multiplier. Entries may still be manually adjusted to account for other datasets, as described below.

Description: The Natural Flood Management priority dataset has been developed by the Environment Agency to indicate which catchments offer the greatest opportunities for implementing natural flood management options in order to reduce flood risk. This is replicated within the GI data portal (above). It is geared towards targeting agri-environment (ELMs) funding. Catchments are ranked according to:

1. The number of flood risk receptors (houses and other properties at risk of flooding in the catchment, based on the EA flood risk receptor database).

2. The size of the catchment, assuming that there is greater potential for interventions to make a difference in smaller catchments.
3. The percentage of urban area within the catchment, assuming that if the catchment is more than half urban there will be no opportunity for NFM at a scale great enough to make a difference.
4. Coastal catchments are excluded on the grounds that there is little if any opportunity for habitats to intercept floodwater before it reaches properties at risk.

Because this dataset is aimed at targeting agri-environment funding it does not cover all situations of interest for the EBN tool. It excludes urban catchments where there could still be opportunities for sustainable drainage, and coastal catchments where protection from storm surges could be offered by dunes, reefs and saltmarshes. Also, it is recognised that some areas may have access to more detailed flood risk and opportunity mapping. Therefore, users are allowed to over-ride the ranking suggested by this dataset if they have access to better information. See below for guidance.

Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

For urban or coastal catchments that are not included in this dataset:

- **Urban areas.** Check the Environment Agency's online Flood risk from rivers and the sea and Flood risk from surface water maps, which identify the number of people, services (schools, hospitals etc), non-residential properties, airports and railways at high, medium or low risk of flooding. If there are properties or economic assets at risk of flooding within or downstream of your site (in the same catchment or the next catchment downstream), select High, Medium, or Low depending on the highest risk recorded in the flood maps.
- **Coastal areas**. For any dunes, reefs or saltmarshes, check the Environment Agency's online Flood risk from rivers and the sea map to see whether there are any properties or economic assets immediately inland which are at risk of flooding, and select High, Medium or Low depending on the highest risk recorded in the flood map.

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search tool functionality or accessed manually by selecting *Natural Flood Management Priority* under the located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Using local data. If you have access to a local flood risk or natural flood management opportunity assessment or other hydrological study that suggests a different priority to the one provided in the EA NFM priority dataset, you can use that assessment to determine the appropriate value (high, medium or low). Please enter the justification for over-riding

the EA NFM priority in the comments boxes on the data entry sheets and/or the Project Details sheet.

Rationale for the multiplier values. High priority indicates that there could be a benefit from natural flood management actions, and therefore equates to high demand. This is one of three flood demand indicators that are considered jointly: the highest level of demand will be used to determine the multiplier. Multipliers over 1 are applied to habitats where there is medium or high demand for flood protection. These multipliers are provisional/arbitrary and could be refined following further tests.

Table 12 Natural Flood Management priority multipliers

Overall flood protection demand (max of the three indicators)	
High	1.2
Medium	1.1
Low	1

7. Water quality: WFD status

Level	ES	Type	Source type	Link
BASIC	Fish production	**Supply**	Online map and Shapefile	Green Infrastructure Data Portal https://www.data.gov.uk/dataset/d88923dc-a394-4bbb-9f99-ca9d2d55f689/wfd-lake-water-bodies-cycle-2-classification-2019 https://www.data.gov.uk/dataset/0f6c2aee-3f8e-476c-93df-e629881bd985/wfd-transitional-and-coastal-water-bodies-cycle-2-classification-2019 https://www.data.gov.uk/dataset/c5a3e877-12c3-4e81-8603-d2d205d52d7a/wfd-river-

Level	ES	Type	Source type	Link
				canal-and-surface-water-transfer-waterbodies-cycle-2

Description: Under the Water Framework Directive (WFD), both ecological and chemical quality are assessed. We use the overall classification level. Ecological quality includes biological (plants and animals), physico-chemical (temperature, nutrients etc) and hydromorphological (water flow, sediment composition and movement, continuity (in rivers) and the structure of physical habitat). See here for details.

Note: this indicator is only used for the service of 'Fish production'. It is not used for the service of 'Water quality regulation', because that service is provided by soils and vegetation in a catchment surrounding a waterbody, not by the waterbody itself. Water quality could be used as a multiplier to indicate high demand for the service of water quality regulation, but this is done using Indicator 10 (Water Quality Management Area) instead, as that is a more accurate indicator of the demand for the service.

Applicable habitats: Freshwater (running water; standing water and canals), aquatic marginal vegetation, reedbeds and coastal saltmarsh.

Rationale for the multiplier values. Water quality is used as a multiplier for the service of fish production, as it affects fish populations. It also affects cultural values (aesthetic value, interaction with nature and sense of place) although it is not currently applied to those services (for simplicity). Typical water quality in England is Moderate, so this is assigned a multiplier of 1. Lower quality habitats have a multiplier <1 and higher quality have a multiplier >1 (high quality is very rare). The exact values are provisional/arbitrary.

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search tool functionality or accessed manually by selecting *Water Quality WFD Status* under the located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Table 13. WFD Status multipliers

Overall Water Framework Directive status for surface water	
High	1.2
Good	1.1

Overall Water Framework Directive status for surface water	
Moderate	1
Poor	0.75
Bad	0.5
Not applicable	1
Not known	1

8. Water quality management area (NEW)

Level	ES	Type	Source type	Link
BASIC	Water quality regulation	**Demand**	Online map	Green Infrastructure Data Portal https://data-forestry.opendata.arcgis.com/datasets/df71f328b77f42dca80691b77e01aae6_0/explore

Description: This indicator shows whether water quality regulation is particularly important in a certain area, depending on whether pollution is a problem. The Water Quality Priority Areas for Countryside Stewardship have been selected to indicate the demand for water quality regulation because they seem to cover all the sub-layers (areas with nitrate, phosphate, pesticide and sediment issues). The updated version uses the OGL FC EWCO - Water Quality" dataset based on the "2014 Countryside Stewardship Water Quality Priority Areas (Environment Agency)" used previously for this indicator.

Applicable habitats: All except for potential sources of pollution (cropland, sealed surfaces, flower bed, felled woodland) or those with little ability to regulate pollution (bare ground, footpaths) where it did not seem appropriate to allocate an extra score for being in a water quality management area. This is open to debate and further testing.

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the

embedded EBN search tool functionality or accessed manually by selecting *Water Quality Management Area* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers) heading in the left menu**.** Clicking on the map obtains the necessary value.

It is likely that the same value will apply to the whole site, so you can auto-fill the whole column from the first cell. Please note the updated version of this dataset does not include a medium or low priority attribution. Information on medium priority areas can be found by accessing the full Water Quality management dataset on MAGIC (if required).

Rationale for the multiplier values. High and medium priority areas have a provisional multiplier >1. Areas with no priority have a multiplier of 1, because they could still be playing an important role in protecting water quality, e.g. preventing water quality from deteriorating.

Table 14. Water quality management area multipliers

Water quality management area?	
High priority	1.2
Medium priority	1.1
Not classified	1
Not applicable	1
Not known	1

9. Rainfall (NEW)

Level	ES	Type	Source type	Link
BASIC	Erosion protection	**Demand**	Online data Shapefile	Green Infrastructure Data Portal Met Office Annual Precipitation Observations 1991-2020 12km | Annual Precipitation Observations 1991-

Level	ES	Type	Source type	Link
				2020 12km | The Met Office climate data portal (arcgis.com)

Description: This aims to capture the fact that the service of erosion protection is more valuable in areas with higher rainfall. The most important aspect is the frequency and magnitude of extreme rainfall events, especially in winter when vegetation is low, leaves have fallen and soils may be bare. Previously a static map was provided highlighting such areas, however, this dataset was not available under Open Government Licence. Annual rainfall data (provided by the Met Office) has now been used instead to provide online and download access. While not optimal, this represents a pragmatic balance between full accuracy and user efficiency.

Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search tool functionality or accessed manually by selecting *Rainfall* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Data entry. Rainfall data is likely to be the same across the whole site, in such cases the same value may be used across all rows. When doing so care should be taken to avoid simply dragging down on the bottom of the cell to replicate values as this results in sequential entries which will flag as an error under EBNT validation rules, producing values such as 800-1001, 800-1002 etc. Guidance on how to correct this is provided within the user guide.

Rationale for the multiplier values. Multipliers have changed from previous winter rainfall figures to improve efficiency of access for users. Values are provisional/arbitrary and will be reviewed.

Table 16. Rainfall multipliers

Rainfall	Average rainfall from 1991-2020 mm	Erosion protection
	1000+	1.1
	800-1000	1

Rainfall	Average rainfall from 1991-2020 mm	Erosion protection
	600-800	0.9
	NA	1
	NK	1

10. Slope

Level	ES	Type	Source type	Link
ADVANCED	Erosion protection	**Supply** and **Demand**	Online data	UK Soil Observatory

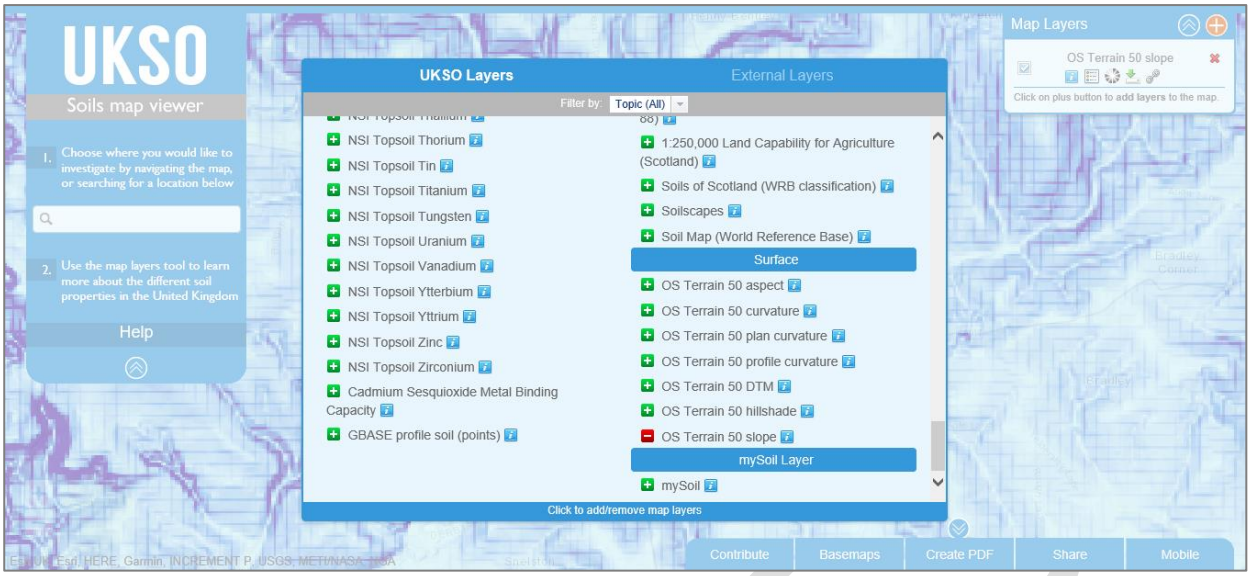
Description: Average or maximum slope in a habitat parcel such as a field, or across a site. Steeper slopes are more at risk of soil erosion, and they also provide less opportunity for groundwater to infiltrate into the ground, so they reduce the service of water supply. However, we only apply this multiplier to the demand for erosion protection.

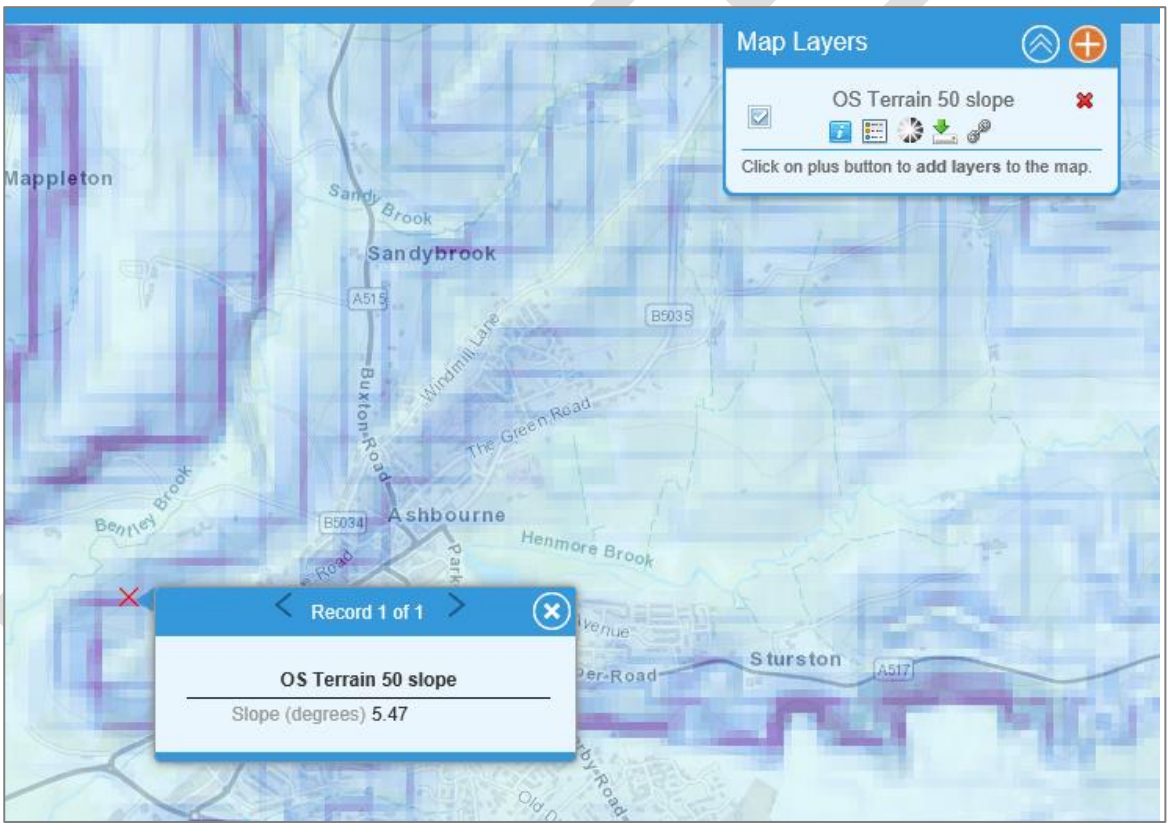
Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

Determining the indicator value. Find your site on the UK Soil Observatory website. Click on the plus button in the top right of the screen to add layers to the map. Scroll down to the bottom of the list of layers to find the 'Surface' group and add 'OS Terrain 50 Slope'. You can display the legend and adjust transparency using the icons in the 'Map Layers' box at top right of the screen.

The web map shows the slope in 50m pixels. You can click anywhere on the map and the slope will be displayed in a pop-up box. The slope will vary across the site but for small sites you can enter just the maximum slope range (0-3 degrees, 3-7 degrees or more than 7 degrees). Click on the darkest shaded pixel to find the maximum slope, then enter the appropriate range. You can autofill the whole column.

Figure 2. UK Soil Observatory Screen shots showing slope values





Rationale for the multiplier values. We apply a higher 'demand' multiplier for areas with steeper slopes, because protective ground cover is more valuable in these areas. This multiplier amplifies the impact of differences between habitat scores. In other words, if a higher value habitat such as semi-natural grassland replaces a lower value

one such as arable land, the increase in scores will be bigger as a result of this multiplier, even though scores for both habitats have increased.

Multiplier values are provisional/arbitrary and will be reviewed. For erosion, the maximum slope and the curvature can be more important than the average slope, so in future we could investigate use of the curvature layers in UKSO. Slope length (>150m) is also important.

Table 17. Slope multipliers

Slope	Erosion protection
<3 degrees	1
3-7 degrees	1.05
>7 degrees	1.1
Not applicable	1
Not known	1

11. Soil drainage

Level	ES	Type	Source type	Link
BASIC	Water supply (Flood regulation – not yet)	**Supply** and **Demand**	Online map	LANDIS Soilscapes or via MAGIC for Use by contractors and partners (check definitions on MAGIC) No download available (Licence required)

Description: Soil drainage determines how fast rainfall and overland flow soaks into the ground, which is important both for water supply (groundwater recharge) and flood protection.

Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

Determining the indicator value. The LANDIS Soilscapes national scale dataset is available online and available via MAGIC / Landscape / Geology and Soils for use by contractors and partners. A more detailed assessment for a specific site & commercial users attracts an additional cost. Zoom into your project area and click on the map to display a summary of soil characteristics. Drainage categories are: Freely draining/ Slightly impeded drainage / Impeded drainage / Surface wetness (peat) / Naturally wet (high groundwater) / Impermeable or sealed. Enter the appropriate classification into the dropdown box. If the whole area is a single drainage category, you can autofill the whole column. For larger and more complex sites, it may not be possible to easily enter this indicator unless you purchase the underlying Soilscapes GIS data from a recognised supplier (e.g. from Bluesky mapshop).

Data entry – As Soilscapes data is not covered by Government Open Licence it is not accessible through the Green Infrastructure Data Portal, or the associated EBN search tool/ EBNT QGIS tool. Users meeting the MAGIC permitted user requirements/ terms and conditions may supplement EBN search results with the above information to complete BASIC assessments.

Rationale for the multiplier values.

Freely draining soils are more valuable for both water supply and flood protection because they allow water to infiltrate into the ground where it will either recharge groundwater supplies or allow sustained recharge of surface water bodies via horizontal sub-surface flow. For water supply, we therefore apply lower multipliers to soils with slightly impeded or impeded drainage, because rain falling on these soils is likely to run off into nearby water courses and be carried out to sea. Sealing a soil in a freely draining area will therefore have a larger negative impact on water supply than in areas with impeded drainage.

Freely draining soils cover more of England than the other types (37% according to SoilScapes), so as this reflects the ‘typical’ score it is given a multiplier of 1, and soils with impeded drainage are assigned multipliers less than one. These multiplier values are provisional/arbitrary and will be reviewed.

Table 18. Soil Drainage multipliers

	Condition for water supply
Freely draining	1
Slightly impeded drainage	0.9
Impeded drainage	0.8

	Condition for water supply
Surface wetness (peat)	1
Naturally wet	1
Impermeable / sealed	0
Not applicable	1
Not known	1

Technical note: There are many complexities with this indicator, because soil drainage also reflects the 'demand' for the service. Planting woodland for flood protection or to improve infiltration to recharge groundwater is more useful on soils with impeded drainage, so new woodland should have a demand multiplier greater than 1 in these areas, though any existing habitat in those areas (including woodland) would have a lower condition multiplier because of the soil type. This depends partly on whether the new habitat has better root penetration than the old habitat (such as when a woodland replaces improved grassland).

For water supply, we do not apply a 'demand' multiplier to reflect the extra value of planting trees on land with poor drainage. This is because trees use water as well as improving infiltration, so the net effect may be small and could go in either direction. Also, the benefits of planting vegetation to improve infiltration are already accounted for via the separate soil compaction indicator.

Because of this complexity, the soil drainage multiplier is currently not applied for flood protection.). Trees may also not make much difference to infiltration on land with a high water table. Further work is needed to consider these complications in more detail.

12. Soil erodibility

Level	ES	Type	Source type	Link
STANDARD	Erosion protection	**Demand**	Online map	LANDIS Soilscapes

Description: This describes how easily erodible soil is. According to Evans (1990), much of the arable land in England (36%) is at moderate to very high risk of erosion, including much of the better drained and more easily worked land, especially sandy soils. In the

uplands thin soils or deep peats are most at risk. Habitats with dense ground cover can protect against soil erosion, and this service is more valuable in areas susceptible to erosion.

Applicable habitats: All except sealed surfaces (which score zero).

Determining the indicator value. The recommended way to determine soil erodibility is to refer to Evans (1990), which divides the 296 soil associations in England and Wales into five classes of susceptibility to erosion. However, in order to find out which soil associations are present on your site, you may need to pay to access the NSRI NATMAP either online or as printed copies, or purchase the data from a recognised supplier (e.g. from Bluesky mapshop). Enter 'High' for soils classes as high or very high susceptibility; 'Medium' for soils classed as moderate susceptibility and 'Low' for soils classed as low or very low susceptibility.

Alternatively, the LANDIS Soilscapes webmap includes limited information on erodibility. If erosion is an issue for a particular soil class, it may be mentioned under the section on water protection (note: this information is not available in the version of Soilscapes provided on MAGIC). For example, soilscape class 10 (Freely draining slightly acid sandy soils) is "Highly erodible under arable and vegetable crops, where sloping". If erosion problems are not mentioned, enter 'moderate'; if they are mentioned, enter 'high'. For larger and more complex sites it may not be possible to easily enter this indicator unless you purchase the underlying Soilscapes GIS data from a recognised supplier (e.g., from Bluesky mapshop).

Rationale for the multiplier values. A multiplier >1 is applied to soils with high or medium erodibility, and 1 soils with low or unknown erodibility. This is subject to review. Soil management probably has a greater impact on erosion than soil type, except for a small number of soils that are highly erodible.

Table 19. Soil erodibility multipliers

Soil erodibility	Erosion protection
High	1.1
Medium	1.05
Low	1
Not applicable	1
Not known	1

13. Soil compaction

Level	ES	Type	Source type	Link
ADVANCED	Water supply Flood regulation Water quality regulation	**Supply** and **Demand**	Site survey or local knowledge	n/a

Description: This aims to take account of whether soils are more or less compacted than would be expected for this type of habitat.

Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

This requires a site survey, looking for signs of soil compaction such as bare, hard ground that does not absorb water when poured from a bottle, or vehicle tracks. Compaction could be inferred from land use to some extent, e.g., grazing density, use of heavy machinery / vehicles.

Data entry. Select from: Good condition / slightly compacted or locally compacted / highly compacted.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed. The tool compares the recorded degree of compaction to what is expected for that habitat (expected values are shown on the 'Applicability' sheet in the spreadsheet, accessible from the Technical Menu). For example, the scores already assume that arable and improved grassland will be slightly or locally compacted, so a multiplier of 1.1 is applied if in fact the habitat is not compacted at all, or 0.9 if it is heavily compacted.

Table 20. Soil Compaction multipliers and associated services

Soil compaction	Water supply,	Flood protection and	Water quality regulation	
Actual value	**Expected value**			
	Not compacted	Locally or slightly compacted	Heavily compacted	Not applicable
Not compacted	1	1.05	1.1	1
Locally or slightly compacted	0.95	1	1.05	1
Heavily compacted	0.9	0.95	1	1
Not applicable	1	1	1	1
Not known	1	1	1	1

14. Soil management

Level	ES	Type	Source type
ADVANCED	Erosion protection Water quality regulation	**Supply**	Local knowledge

Description: This aims to record whether any special management approaches are applied to try to conserve soil and prevent erosion. It aims to reflect good soil management on arable land, so that fields which are managed well do not receive a zero score.

Applicable habitats: Arable fields.

Determining the indicator value. Enter ‘yes’ if soil erosion management practices are used on arable land (e.g., cover crops, crop residue, contour ploughing, no-till). Post-development entries for this multiplier are expected to be NA unless arable is retained.

Rationale for the multiplier values. If no soil management practices are applied, a multiplier of zero will be applied to arable land for erosion and water quality regulation. Otherwise, a multiplier of 1 will be applied.

Table 21. Soil Management multipliers

Soil management	Erosion and water quality regulation
Yes	1
No	0
Not applicable	1
Not known	0

15. Peat quality

Level	ES	Type	Source type	Link
STANDARD	Carbon storage Water quality Erosion protection	**Supply**	Site survey (expert) or local knowledge	n/a

Description: This indicator records whether peat is degraded or actively forming. This is important for carbon storage and also for water quality.

Applicable habitats: Bog. Not yet clear whether this should also be applied to fens and saltmarshes.

Determining the indicator value. Site survey (or pre-existing local knowledge) to determine whether peat is actively growing or degraded. Natural England hold data on moorland peat but it is not freely available. This is expected to be entered as NA for most habitats unless bog habitats are present/ enhanced as part of post-development.

Rationale for the multiplier values. For carbon storage, actively forming peat has a multiplier of 2. This is applied because the basic habitat scores are scaled. Peat bog receives the same score as broadleaved woodland (10), but peat bogs actually hold around twice as much carbon on average, when carbon in vegetation is added to carbon in the top 30cm of soil (based on a review by Cantarello et al (2011). Soil depth, soil

carbon and the amount of soil or peat removed makes a large difference to the change in carbon storage, but this has not yet been integrated into the tool.

Degrading peat on the other hand could be a net emitter of carbon. However, if restored, it could eventually become a carbon sink again. Therefore, we apply a multiplier of 0.5, to reflect the potential for restoration, because a multiplier of zero could encourage the destruction of degraded peat rather than restoration.

For water quality and erosion protection we apply a multiplier of 1 for actively forming peat and 0.2 for degraded peat.

17.Canopy cover

Level	ES	Type	Source type	Link
STANDARD	Water supply Flood regulation Erosion protection Carbon storage Air quality regulation	**Supply**	Aerial photos or site survey	n/a

Description: Percentage of woodland area covered by the tree canopy as opposed to clearings or gaps between tree canopies. If the canopy does not provide full cover, services such as flood protection and air quality regulation will be reduced.

Applicable habitats: Woodland, orchards, parks, cemeteries and churchyards, allotments.

Determining the indicator value. Rough estimate of % canopy cover (<25%, 25-50%, 50-75%, >75%) from either a site visit, inspection of aerial photos or quadrat analysis of a grid of points overlaid on aerial photos or Google Earth. For new habitats that are being created, enter the expected canopy cover after the ‘time to target condition’ (40 years).

Note: If canopy cover is less than 20% the habitat would not be classed as woodland. Target Canopy cover at maturity should be entered for post development woodland

habitats that will be created post-development. In most cases this will be expected to be >75%[10].

Rationale for the multiplier values. Multipliers are derived from the mid-point of the canopy cover range multiplied by the difference in scores between open grassland (i.e. zero canopy cover) and forest (100% cover) for each service (see Multipliers sheet if interested).

Table 22. Canopy cover multipliers

Canopy cover	Flood protection	Carbon storage	Air quality regulation	Shading and cooling
75-100% (high density)	1	1	1	1
50-75%	0.85	0.85	0.75	0.8
20-50% (low density)	0.7	0.7	0.5	0.6
Not applicable	1	1	1	1
Not known	1	1	1	1

Canopy cover is not used for the service of water supply (where it would have a negative impact due to rainfall interception) because deciduous trees lose their leaves in winter, which is when most recharge happens. Potentially it could be applied for coniferous forest, but probably most coniferous forest would have 100% cover (plantations), which is already reflected in the assumptions behind the scores.

Canopy cover is also not used for erosion and water quality: it is implicit in woodland scores to some extent, but there is no need to scale down if canopy <75%, so long as ground cover or leaf litter is present.

[10] Note that uncertainties about achievement of woodland creation are dealt with by delivery risk and time to target condition multipliers.

18. Tree size

Level	ES	Type	Source type	Link
STANDARD	Carbon storage Shading and cooling Aesthetic value Interaction with nature Sense of place	**Supply**	Site survey (non-expert)	n/a

Description: Tree size is measured as the diameter at breast height (dbh; 4.5 feet above ground) in cm. Note that this indicator is not used for the services of water supply and flood protection, because canopy cover was thought to be a more relevant indicator for those services. Note: the multipliers for Aesthetic value and Sense of Place have been retained and modified based on advice from Natural England landscape specialists. The contribution of large trees in the landscape could have a positive or negative effect on the landscape character depending on tree type and location. However, based on the definitions of each multiplier in the EBN Principles document, it is likely that large trees in the landscape would provide both these ecosystem services. EBNT does not currently require users to distinguish the tree type, in future iterations the tool will attempt to resolve this issue.

Applicable habitats: Woodland, hedgerows (as they may include trees), orchards, individual trees, parks, cemeteries and churchyards.

Determining the indicator value. Identify the largest size class of trees present on site. For simplicity, we are assuming that the largest trees, even if infrequent, will dominate the level of service delivery.

- saplings <7cm dbh.
- poles 7-33cm.
- mature 33-80cm.
- very mature or veteran >80cm.

The National Forest Inventory identifies areas of young or coppiced trees (class as saplings) and felled woodland (separate habitat type). Individual trees outside woodland should be identified separately (at least for veteran trees, >80 cm dbh).

For new habitats that are being created, enter the planted size i.e. 'saplings'. This is the only indicator for which you should enter the actual condition at the time of creation, rather than the target condition after 30 years (or 40 for woodland). This is because the tool has a separate mechanism for changing saplings (either existing or new) to poles after 10 years.

Rationale for the multiplier values. We assume that a 'typical' size of trees, matching the scores assumed for woodland habitats, is mature. This equates to a multiplier of 1. For carbon storage and cooling and shading, habitats with smaller trees get a multiplier of less than one because they will not deliver a full level of service.

For the cultural services, even young woodlands can deliver a good service. However very large trees are assumed to provide a significantly higher level of service so a multiplier above 1 is applied.

For 'Interaction with nature' and 'sense of place', we take the maximum of this multiplier and the 'Ancient habitat' multiplier to avoid double counting.

Table 23. Tree size multipliers

Tree size	Carbon storage	Cooling and shading	Aesthetic value	Education	Interaction with nature	Sense of place
Veteran	1.5	1.25	1.1	1.1	1.1	1.1
Mature	1	1	1.05	1.05	1.05	1.05
Poles	0.9	0.75	1	1	1	1
Saplings	0.8	0.5	0.9	0.9	0.9	0.9
Coppice	0.8	0.5	1	1	1	1
NA	1	1	1	1	1	1
NK	1	1	1	1	1	1

19. Ground cover (%)

Level	ES	Type	Source type	Link
ADVANCED	Erosion protection Water quality regulation	**Supply**	Site survey (non-expert)	n/a

Description: This indicator aims to capture the percentage of the ground that is covered by vegetation or thick leaf litter, as opposed to bare patches.

Applicable habitats: Wood pasture and parkland; orchards; grassland; cropland; bog; fen-marsh-swamp; coastal saltmarsh; vegetated dunes; all urban habitats except gardens and sealed surfaces. Not currently applied to woodland, for which canopy cover is assumed to be more important.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

Estimate the rough percentage of ground that is covered by low vegetation or thick leaf litter as opposed to bare patches (ignoring small bare patches a few cm wide). Shrub and tree cover only counts as ground cover if the lowest leaves are very close to the ground, i.e. within 15cm of the ground. Select from the options: <30%; 30-70%; 70-100%; bare in winter (e.g. for arable land). If the survey is not carried out in winter, it may be possible to check old Google Earth photos to find an aerial photo taken in a recent winter season.

Rationale for the multiplier values. If ground cover is less than 30%, erosion on arable land is severe because run-off can pass between the bare patches. Otherwise, the vegetation in between the bare patches can intercept runoff. Therefore, we apply a multiplier of zero for ground cover <30%; 0.5 for 30-70% and 1 for 70-100%. The same values are used for the service of water quality regulation because erosion is likely to affect water quality through the influx of eroded sediment (potentially including agrochemicals) into watercourses. These values and bounds will be reviewed.

Table 24. Ground Cover multipliers

Ground cover	Erosion protection	Water quality regulation
70-100%	1	1
30-70%	0.5	0.5
<30%	0	0
Bare in winter	0	0
NA	1	1
NK	1	1

20. Tall or tussocky grasses

Level	ES	Type	Source type	Link
ADVANCED	Flood regulation Erosion protection Water quality regulation Interaction with nature	**Supply**	Site survey (non-expert)	n/a

Description: This is an indicator of structural diversity. It describes the percentage of the habitat area that is covered with tall or tussocky grasses.

Applicable habitats: All except arable fields, water, bare and sealed surfaces (this could be reviewed).

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully. Estimate whether cover is absent (<5% cover), present (5-33%) or extensive (>33%).

Rationale for the multiplier values. Tall and tussocky grasses can provide a dense ground cover that helps slow down and retain water, protect from erosion and trap sediment and pollutants. They also provide habitat for wildlife such as invertebrates, with benefits for the service of ‘interaction with nature’. This indicator is also relevant for pollination and pest control, but this is currently covered by the separate data entry for 'invertebrate nesting sites'.

The basic habitat scores already include consideration of tall and tussocky grasses to some extent – for example, semi-natural grassland is assumed to have a rougher structure than amenity grassland. However, this indicator is useful to assess the condition in more detail because sward height and structure can vary between individual patches of grassland, and also some woodlands might have short grass and others might have tall or tussocky grass. All multipliers are provisional/arbitrary and will be reviewed, along with the selection of which habitats this multiplier is applicable to (to avoid overlap with the basic scores). For post-development entries an assessment of coverage of tall and tussocky grass should be completed in line with proposed conditions within the Biodiversity Management & Monitoring Plan.

Table 25. Tall & tussocky grass multipliers for associated services

	Flood protection	Erosion protection	Water quality regulation	Interaction with nature
Absent (<5%)	1	1	1	1
Present (5-33%)	1.05	1.05	1.05	1.05
Extensive (>33%)	1.1	1.1	1.1	1.1
Not applicable	1	1	1	1
Not known	1	1	1	1

21. Shrub layer

Level	ES	Type	Source type	Link
ADVANCED	Flood regulation Erosion protection Interaction with nature	**Supply**	Site survey (non-expert)	

Description: This is an indicator of structural complexity. It assesses the extent of any shrub layer – either as an understorey in woodland habitats or as scattered shrub on grassland and other open land.

Applicable habitats: All except scrub and hedgerows (which already consist of shrubs), arable fields, water, gardens and bare or sealed surfaces (this could be reviewed).

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

Estimate the extent of any shrubby layer (understorey in woodland habitats; scattered shrub in open habitats such as grassland or heathland). Select from absent (<5% cover), present (5-33%) or extensive (>33%).

Rationale for the multiplier values. A shrub layer can help to intercept rainfall, slow down and retain water, protect from erosion and trap sediment. It also provides habitat for wildlife such as birds and invertebrates, with benefits for the service of 'interaction with

nature'. This indicator is also relevant for pollination and pest control, but this is currently covered by the separate data entry for 'invertebrate nesting sites' (this could change).

Table 26. Shrub layer multipliers for associated services

	Flood protection	Erosion protection	Interaction with nature
Absent (<5%)	1	1	1
Present (5-33%)	1.05	1.05	1.05
Extensive (>33%)	1.1	1.1	1.1
Not applicable	1	1	1
Not known	1	1	1

22. Flowers (NEW)

Level	ES	Type	Source type	Link
ADVANCED	Pollination Aesthetic value Interaction with nature	**Supply**	Site survey (expert)	

Description: This indicator aims to provide a measure of the abundance and diversity of flowering plants, to support the services of pollination and pest control as well as being attractive and supporting interaction with nature.

Applicable habitats: All except water, sealed and bare surfaces. Arable fields are included as some can have rare arable plants.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

The estimate should be based on a site survey in summer, or prior knowledge of the site & linked to condition assessment for the statutory biodiversity metric tool. Enter 'High' if the recorded habitat condition is Good/ Fairly Good or estimated abundance of flowering

plants are greater than 66%, enter ‘Low’ if condition is recorded as Poor or abundance is lower than 33%. Otherwise enter ‘Medium’ for moderate condition/fairly poor condition

For post-development entries, entries should be entered based on target condition aimed for as part of your Biodiversity Management Plan. This will relate to proposed management, such as grazing/cutting routines and the habitats present.

For post-development entries, an estimate of flower coverage should be entered based on conditions aimed for as part of your Biodiversity Management Plan. This will relate to proposed management, such as grazing/cutting routines and the habitats present.

NOTE: It is recognised that diversity as well as abundance is important for pollination services, this relationship holds less strongly for other services listed above. A simpler replicable method is therefore favoured. Future work may consider separating aesthetic value which is less dependent on diversity.

Rationale for the multiplier values. All multipliers are provisional/arbitrary and will be reviewed.

Table 27. Flowering plants multipliers for associated services

Flowering plants richness and abundance	Pollination	Aesthetic value	Interaction with nature
High	1.1	1.1	1.05
Medium	1	1	1
Low	0.9	0.9	0.95
Not applicable	1	1	1
Not known	1	1	1

23. Invertebrate nest sites

Level	ES	Type	Source type	Link
ADVANCED	Pollination Pest control Interaction with nature	**Supply**	Site survey (non-expert)	

Description: This records the presence and abundance of suitable invertebrate nesting sites, including dead wood, bare dry ground, beetle banks, tree cavities, veteran trees and structurally diverse vegetation (tall or tussocky grass and shrubs).

Applicable habitats: All except arable fields, water, sealed and bare surfaces.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

This should be determined from a site walkover that passes within view of most parts of the site (by 'site' in this context we mean a habitat parcel, or group of parcels with identical habitat type and condition indicators, that will be entered as a single row in the EBN data entry sheet). We have based our criteria partly on the Woodland Wildlife Toolkit developed by Sylva, the Forestry Commission, Natural England and the Woodland Trust. Enter 'high' if at least one of the following applies:

- standing or fallen dead wood is visible from at least half of the walkover route (this includes dead trees or stumps over 1m tall and 20cm diameter, fallen logs or large dead branches at least 50cmm long and 20cm diameter and dead wood on live trees, following the Forestry Commission Woodland Condition Survey criteria).
- the site includes one or more veteran trees (larger than a hug) with cavities, hollow trunks, crevices or loose or flaking bark.
- beetle banks or dry earth are visible from at least a quarter of the walkover route.
- tall or tussocky grasses cover at least 33% of the site.
- a shrub layer covers at least 33% of the site.

Enter 'medium' if some of these features are present but they do not meet the abundance criteria and enter 'low' if none apply.

For post-development entries an estimate future invertebrate nest site availability should entered based on conditions aimed for as part of your Biodiversity Management Plan. This will relate to proposed management, such as grazing/cutting routines and the habitats present.

Rationale for the multiplier values. All multipliers are provisional/arbitrary and will be reviewed.

Table 28. Invertebrate nesting sites multipliers for associated services

Invertebrate nesting sites	Pollination	Pest control	Interaction with nature
High	1.1	1.1	1.05
Medium	1	1	1
Low	0.9	0.9	0.95
Not applicable	1	1	1
Not known	1	1	1

24. Resources for local species

Level	ES	Type	Source type	Link
ADVANCED	Interaction with nature Sense of place	**Supply**	Site survey and local knowledge	

Description: This indicator aims to capture areas that are particularly useful for characteristic local species. These may vary from presence of habitats suitable for localised species such as waders, wildfowl or sea birds, whose evocative calls contribute strongly to sense of place, to the presence of habitat/food sources for scarce specialist species, such as butterflies (e.g. blackthorn for Brown Hairstreak). Consideration may also include suitability of habitat for more widespread species such as skylarks where important locally to a sense of place/ they present valuable opportunities to interact with nature. Ideally this will be assessed by ecologists with input from landscape professionals to make the links with sense of place. Target local species linked to sense of place/interaction should be listed in project details.

Applicable habitats: All except sealed surfaces (which score zero, so the multiplier makes no difference).

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

Information collated on protected and notable species, collated as part of the BNG Habitat Management and Monitoring Plan (HMMP) template, can provide a useful starting point. Ideally, you will first need to establish which species are important locally, e.g. by talking to a county ecologist or local wildlife trust, and/or local communities and determine what their habitat requirements are. You will then need to establish whether these requirements are present on the site, through a survey or through asking local experts. New developments might want to consider including these requirements in order to increase the value of their sites.

Entries for this indicator have been changed from Yes/No to weaker/stronger to reflect the fact that resources for local species are likely to be found on a continuum, and that sense of place and interaction with nature may relate to local species that are not necessarily rare, and /or exacting in their habitat requirements/ locations.

For post-development entries an assessment should be made, based on any particular provision made for local species e.g., as part of an associated HMMP.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed.

Table 29. Local species multipliers

	Interaction with nature	Sense of place
Stronger	1.1	1.1
Weaker	1	1
Not applicable	1	1
Not known	1	1

25. Position for water quality regulation

Level	ES	Type	Source type	Link
ADVANCED	Water quality regulation	**Supply** and **Demand**	Site survey (non-expert), GIS, local knowledge, or online map.	Catchment Data Explorer

Description: This indicator aims to determine whether the habitat is in a good position to be able to affect water quality, i.e. is it located on the flow path between a pollution source (arable field or road) and a water course?

Applicable habitats: All except for potential sources of pollution (cropland, sealed surfaces, flower bed, felled woodland); those with little ability to regulate pollution (bare ground, footpaths); or freshwater habitats which are (by definition) on the flow path.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully. Draft criteria are listed below – these are open to revision.

Enter 'Yes' if the habitat is:

- On the downwards side (or level with) and within about 50m of arable land, improved grassland, horticulture, felled woodland, intensive orchard, biofuel crops, flower bed, road, car park or other potential source of pollution.
- AND above (or level with) and within about 50m of a water body.
- OR you have another good reason to believe it is playing an important role in water quality regulation.

Enter 'Partial ability' if the habitat is:

- On the downwards side (or level with) and within about 50m of arable land, improved grassland, horticulture, felled woodland, intensive orchard, biofuel crops, flower bed, road, car park or other potential source of pollution.
- OR above (or level with) and within about 50m of a water body.
- OR you have another good reason to believe it is playing some role in water quality regulation.

Otherwise enter 'No'.

This could be done through visual inspection during a site survey, or examination of a map or site plan with contours, or GIS analysis using a Digital Elevation Model (DEM).

In future, it could be useful to record whether the habitat is laid out in a strip parallel to contours, as this would indicate extra value, or indicate flow accumulation in some way.

Rationale for the multiplier values. If the habitat is in a good or partially in a good position, then it scores >1. Otherwise, if it does not meet the criteria or if it is 'Not known' or 'Not applicable' it scores 1, because it will still be delivering some level of service in comparison to polluting habitats. The multiplier values are provisional/arbitrary and require testing.

Technical note: It could be more appropriate to have multipliers less than 1 where the indicator is 'No'. If this was the case, existing, enhanced and retained habitats would be set to 1 if Not Known but newly created habitats would be set to the minimum value, to

avoid anomalies where low-scoring habitats of unknown condition can score more than high-scoring habitats in poor condition.

Table 30. Position for water quality multipliers

Is habitat in a good position and configuration to provide the service?	Water quality regulation
Yes	1.2
Partial ability	1.1
No	1
Not applicable	1
Not known	1

26. Position for erosion prevention

Level	ES	Type	Source type	Link
ADVANCED	Erosion protection	**Supply** and **Demand**	Local knowledge, site survey (non-expert), GIS, online map.	Environment Agency Catchment Data Explorer website.

Description: This indicator aims to determine whether the habitat is in a good position to be able to reduce soil erosion, i.e., is it located immediately below, within or cutting across a habitat susceptible to erosion (e.g., an arable field)?

Applicable habitats: All except for habitats susceptible to erosion (arable, flower bed, felled woodland) and those with little ability to intercept runoff and thus reduce soil loss through erosion (sealed surfaces, bare ground, footpaths, freshwater). This is open to debate and further testing.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

- Enter ‘Yes’ if the habitat is on the downwards side of (or level with) a habitat susceptible to erosion (arable field, improved grassland, horticulture, felled woodland, intensive orchard, biofuel crops, flower bed) AND it runs alongside part of the boundary with this erodible habitat or cuts across it roughly parallel to the contours of the slope, so that it is capable of trapping sediment washed off the field.
- Enter ‘Partial ability’ if the habitat does not meet this criterion but you have another good reason to believe it is playing some role in reducing erosion.
- Otherwise enter ‘No’.

This could be done through visual inspection during a site survey, or examination of a map or site plan with contours, or GIS analysis using a Digital Elevation Model (DEM). The EA Catchment Data Explorer could be useful – it shows watershed boundaries, which could help to determine flow paths, and the ‘reasons for not achieving good status’ could be used to confirm whether agricultural and land management is causing sediment loss.

Rationale for the multiplier values. If the habitat is in a good position, then it scores 1.25. If it is partially in in a good position, then it scores 1.1. Otherwise, if it does not meet the criteria or if it is ‘Not known’ or ‘Not applicable’ it scores 1, because it will still be delivering some level of service in comparison to lower scoring habitats (e.g., semi-natural grassland will still be better for erosion protection than arable fields). These multiplier values are provisional/arbitrary and require testing.

For post-development work, this should only be entered as good if specific action to position habitats for this purpose has been put in place.

Table 31. Position for erosion protection multipliers

Is habitat in a good position and configuration to provide the service?	Erosion protection
Yes	1.2
Partial ability	1.1
No	1
Not applicable	1
Not known	1

27. Air pollution barrier

Level	ES	Type	Source type	Link
ADVANCED	Air quality regulation	**Supply** and **Demand**	Site survey (non-expert)	

Description: This multiplier attempts to capture whether the habitat forms an effective barrier between a pollution source (e.g., a busy road) and an area used by people (homes, schools, offices, footpaths, parks etc). Note: a woodland area could be both a barrier and a receptor if it is used by people.

Applicable habitats: Woodland, hedges, orchards, scrub, parks, cemeteries and churchyards, individual trees, green wall, introduced shrub, woody biofuels.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

- Enter 'Yes' if the habitat forms a barrier at least 3m tall and at least 3m wide, with reasonably thick vegetation, between a pollution source (e.g., a busy road) and an area used by people (homes, schools, offices, footpaths, parks etc).
- Enter 'Partial ability' if the barrier does not meet these criteria but you still think it has some value as a pollution barrier. Otherwise enter 'No'.

Rationale for the multiplier values. Pollution such as ozone, nitrogen oxides and fine particles can drift a long way from roads, so vegetation anywhere in the country will perform a pollution removal function, as pollution is absorbed or filtered by the leaves. However, the service will be particularly valuable if the habitat forms a barrier protecting people from a specific pollution source. Therefore, a multiplier of 1.2 is applied for an effective barrier, 1.1 for a partial barrier and 1 otherwise. These values are provisional/arbitrary and will be reviewed.

Table 32. Air quality barrier multipliers

Is habitat in a good position and configuration to provide the service?	Air quality regulation
Yes	1.2
Partial ability	1.1

Is habitat in a good position and configuration to provide the service?	Air quality regulation
No	1
Not applicable	1
Not known	1

28. Shading ability

Level	ES	Type	Source type	Link
ADVANCED	Cooling and shading	**Supply** and **Demand**	Site survey (non-expert)	

Description: This indicator attempts to capture whether the habitat is located in a particularly good position to provide shade and cooling to a building, or an open space used by people (e.g. a street, footpath, or park). It is only intended to capture added value beyond that already captured in the basic scores for the habitat. Note: a woodland area (e.g. in a park) could be both a source of shade and an area used by people.

Applicable habitats: Woodland, scrub, hedgerows, orchards, tree, introduced shrub.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

Enter ‘Yes’ if the habitat is located on the east, south or west side of a building that would otherwise be exposed to sun, and close enough for the shadow to fall on the side of the building at least to half the height of the ground floor windows (assume 30m for trees and woodland; 3m for shrubs and hedges).

Enter ‘Partial ability’ if this does not apply but you have another reason to believe that the habitat provides better shading and cooling ability than a typical habitat of this type, due to its position. Otherwise enter ‘No’.

Rationale for the multiplier values. The basic habitat scores already take account of the ability of habitats to provide general shading and cooling, lowering the urban heat island effect. However, we apply an additional multiplier for habitats that are located in a

particularly good place, e.g., shading an office building or school and thus either improving comfort for the occupants, or saving on the energy costs of cooling the building with air conditioning or mechanical ventilation. Therefore, a multiplier of 1.2 is applied for a habitat in a good position, 1.1 for one classed as 'partial ability' and 1 otherwise. These values are provisional/arbitrary and will be reviewed.

Table 33. Shading ability multipliers

Is habitat in a good position and configuration to provide the service?	Shading ability
Yes	1.2
Partial ability	1.1
No	1
Not applicable	1
Not known	1

29. Noise barrier

Level	ES	Type	Source type	Link
ADVANCED	Noise reduction	**Supply** and **Demand**	Site survey (non-expert)	

Description: This indicator attempts to capture whether the habitat provides a noise reduction service by forming a dense or wide barrier between a source of noise (e.g., busy road or railway) and a place used by people (homes, offices, etc). However, even if vegetation does not form a physical barrier, it can still provide a damping effect compared to a hard surface. Note: some habitats could be both a noise barrier or damper and an area used by people (e.g., a park).

Applicable habitats: Habitats that can form a barrier (i.e. with trees, hedges, or shrubs): Woodland, scrub, hedgerows, orchards, parks and gardens, cemeteries and churchyards, tree, introduced shrub. All other habitats with low vegetation (i.e. different types of grassland, heath, or marsh) do not form barriers but can have a noise damping effect.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully.

- Enter **'Barrier'** if the vegetation is dense, at least 10m tall and at least 10m wide, and sited between a noise source (e.g., road or rail) and an area used by people.
- Enter **'Partial barrier**' if the vegetation is reasonably thick, at least 3m tall and at least 3m wide, and sited between a noise source (e.g., road or rail) and an area used by people.
- Enter '**Not barrier but tree/shrub near people**' if the habitat is trees or shrubs near people but is not dense enough or is not in the right position to form a barrier. This can include scattered trees, e.g., in parks and gardens or cemeteries.
- Enter '**Low vegetation near people**' for low vegetation (anything that is not trees or shrubs, e.g., grass, heath, marsh, or suburban mosaic, as that includes grass) near people, or beach / dunes. This captures the damping effect of vegetation or soft surfaces that do not form a physical barrier.
- If the habitat is not near people enter '**Not near people**'.
- Any other habitats that are near people but are not vegetated (e.g., sealed surface, bare ground, rock, or water) score zero and are not applicable for this service, so enter **'NA'**.

Rationale for the multiplier values. We assume that if a habitat is not near people, then it is unlikely to provide any noise reduction service, so we apply a multiplier of zero. Otherwise, we apply a multiplier of 1 for a physical barrier and 0.5 for a partial barrier. If trees or shrubs are not in a position to be a physical barrier but still might provide a damping effect, the multiplier is 0.25. This reduces the high score of trees and shrubs (6-10) to a much lower value of 1.5-2.5. For low vegetation such as grass, the basic score is only 1, so if it is near people, it is given a multiplier of 1 to reflect its ability to provide a damping effect. These values are provisional/arbitrary and will be reviewed.

Table 34. Noise barrier multipliers

Is habitat in a good position and configuration to provide the service?	Noise reduction
Barrier	1
Partial barrier	0.5
Not barrier but tree/shrub near people	0.25
Low vegetation near people	1

Is habitat in a good position and configuration to provide the service?	Noise reduction
Not near people	0
NA	0
Not known	0

30. Population density

Level	ES	Type	Source type	Link
BASIC	Recreation Education	**Demand**	Online data	Green Infrastructure Data Portal

Description: This indicator reflects demand for recreation and education about nature, based on a proxy of the population density in the local area. Population Density data is provided using Lower Super Output Area statistics from the Office for National Statistics which have been mapped on the Green Infrastructure Data Portal.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the EBN search functionality or accessed manually by activating *Population Density* under the located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Data entry. Population Density values are expected to be the same across the whole site. Make sure you fill in the first two cells then select both cells before auto-filling – otherwise the population density may increment by 1 in each row (see User Guide for tips on auto-filling). For new housing developments, the population may change after development.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed. These replace values previously used that were linked to the CAVAT tool.

Table 35. Population density multipliers

Population density (people/ha)	Population Density
<100	1
100-1000	1.1
>1000	1.2
NA	1
NK	1

31. Nature designations

Level	ES	Type	Source type	Link
BASIC	Education Interaction with nature Sense of place	**Supply**	Online map and local authority	Green Infrastructure Data Portal (England) or Lle (Wales) https://environment.data.gov.uk/dataset/c626e031-e561-4861-8219-b04cd1002806 https://www.data.gov.uk/dataset/a85e64d9-d0f1-4500-9080-b0e29b81fbc8/special-areas-of-conservation-england https://www.data.gov.uk/dataset/174f4e23-acb6-4305-9365-1e33c8d0e455/special-protection-areas-england https://environment.data.gov.uk/dataset/ff213e4c-423a-4d7e-9e6f-b220600a8db3 https://www.data.gov.uk/dataset/acdf4a9e-a115-41fb-bbe9-603c819aa7f7/local-nature-reserves-england

Level	ES	Type	Source type	Link
				https://www.data.gov.uk/dataset/5b632bd7-9838-4ef2-9101-ea9384421b0d/sites-of-special-scientific-interest-england https://environment.data.gov.uk/dataset/e819098e-e248-4a8f-b684-5a21ca521b9b https://www.data.gov.uk/dataset/80c075c3-1880-44a0-bffc-69e20f307c21/marine-conservation-zones-england

Description: This records whether the site has special value for nature, based on the number of designations.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the EBN search or manually by clicking on *Nature Designation* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers) heading in the left menu.

- Land-based designations /Statutory: Sites of Special Scientific Interest (SSSIs), Special Protected Areas (SPAs), Special Areas Conservation (SACs), National and Local Nature Reserves, National Parks, National Landscapes (previously known as Areas of Outstanding Natural Beauty)[11], RAMSAR sites.
- Land-based designations /Non-statutory: RSPB reserves (note these are not included within the web/QGIS server searches but may be added manually).
- Marine-based designations: Marine Protection Zones.
- Habitats and Species: Priority habitats; Important Bird Areas; Important Plant Areas; Great Crested Newts present. If there is more than one priority habitat, this counts as multiple designations. (note these are not included within the web/QGIS server searches, but may be added manually see below)

[11] Although not formally designated for nature, this designation is relevant to Government's 30x30 target and has strong associations with associated services, interaction with nature and sense of place (listed above)

Users may also Ask Local authorities for District Wildlife Sites, Local Wildlife Sites which can be manually added to counts based on the above.

Enter the number of designations in the dropdown box: 0, 1, 2, 3 or more. If you select '3 or more' and then autofill, it may increment to '4 or more', 5 or more' etc – so avoid this by selecting the first two rows before auto-filling.

Rationale for the multiplier values. This indicator is grouped with two others: cultural or historic importance, and 'managed for nature'. Rather than applying all these multipliers cumulatively, the maximum is taken. This is done in order to avoid a very large difference in score between a 'typical' habitat such as a woodland and a 'best possible' example of that habitat. Multiplier values are provisional/arbitrary and will be reviewed.

Table 36. Nature designations multiplier for associated services

Number of designations	Education /Interaction with nature	Sense of place
0	1	1
1	1.1	1.1
2	1.15	1.15
3 or more	1.2	1.2
Not applicable	1	1
Not known	1	1

32. Ancient Habitat

Level	ES	Type	Source type	Link
BASIC	Interaction with nature Sense of place	**Supply**	Online map	Green Infrastructure Data Portal https://www.data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodland-england

Description: This identifies ancient habitats. It currently applies only to ancient woodlands, veteran trees and hedgerows but could be extended to other habitat types if appropriate, e.g. ancient meadows.

Applicable habitats: Semi-natural woodland, hedgerows, traditional orchards, cemeteries and churchyards and individual trees. Bogs are assumed to be ancient by default and this is accounted for in the basic score.

Determining the indicator value.

An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search functionality or accessed manually by activating *Ancient Habitat* under the located under the EBNT Ecosystem Services (Supply and Demand Data Layers) heading in the left menu. Clicking on the map obtains the necessary value.

Veteran trees may be manually added to online searches: see Woodland Condition Survey criteria:

Veteran tree circumference at 1.5m height according to tree species (note that in upland areas, veteran trees may not reach large stem circumferences):

>150cm aspen, birch, hawthorn, hazel.
>225cm Cherry, field maple, goat willow, grey willow, holly, hornbeam, rowan.
>250cm Alder, Scots pine.
>300cm: Ash, oak, yew.
>450cm Beech, elm, Horse chestnut, limes, poplars, sweet chestnut, sycamore, other willows, other conifers.

Hedgerows, orchards, wood pasture and parkland, cemeteries: enter ‘Yes’ if there is evidence that the habitat is ancient, e.g. hedgerows are highly diverse, there are veteran trees, or there are historic records.

If the habitat is ancient enter ‘Yes’, otherwise enter ‘No’.

Rationale for the multiplier values. For ‘Interaction with nature’ and ‘sense of place’, we take the maximum of this multiplier and the ‘Tree size’ multiplier to avoid double counting. Multipliers are provisional/arbitrary.

Table 37. Ancient habitat multipliers of associated services

	Interaction with nature	Sense of place
Yes	1.1	1.1

	Interaction with nature	Sense of place
No	1	1
Not applicable	1	1
Not known	1	1

33. Cultural or historic importance

Level	ES	Type	Source type	Link
BASIC	Education Sense of place	**Supply**	Online map and local authority	Green Infrastructure Data Portal (England) Lle or NRW Evidence and Data (Wales) https://environment.data.gov.uk/dataset/e819098e-e248-4a8f-b684-5a21ca521b9b https://www.data.gov.uk/dataset/8e3ae3b9-a827-47f1-b025-f08527a4e84e/areas-of-outstanding-natural-beauty-england https://environment.data.gov.uk/dataset/3c27e15d-e906-413b-8497-11c07a2230fe https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/6 https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/7

Level	ES	Type	Source type	Link
				https://services-eu1.arcgis.com/ZOdPfBS3aqqDYPUQ/ArcGIS/rest/services/National_Heritage_List_for_England_NHLE_v02_VIEW/FeatureServer/8

Description: This records whether the site has special cultural or historic value, based on the number of designations. The site may either be located within, or contain an area designated as of cultural or historic importance, or it may be in the setting of one of these areas[12].

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value.

- An online map is located on the Green Infrastructure data portal and values needed to complete the EBNT can be accessed either through the embedded EBN search functionality or accessed manually by activating the following datasets under *Cultural of Historic importance* under the located under the EBNT (Ecosystem Services Supply and Demand Data Layers) heading in the left menu:
    - Land-based designations: Statutory: National Parks, National Landscapes (AONBs)
    - Historic statutory: Scheduled ancient monuments.
    - Non-statutory: Community Forests, Heritage Coasts, Green belt.
    - Historic non-statutory: Registered battlefields; Registered parks and gardens.
- Where Conservation Areas are present these may be manually added to the count of designations under this indicator, where appropriate to the historical setting of the site [13]. Conservation Areas have not, however, been included within the GI data portal/ QGIS dataset due to the dispersed nature of the dataset.
- Where listed buildings are present these may be added to the count of designations under this indicator where appropriate to the historical setting of the

[12] Note only designations within drawn polygons will be captured by the web tool/QGIS template.

[13] Locations of Conservation Areas can be checked on Local Authority websites.

site[14]. Listed buildings have not however, been included within the GI data portal / QGIS template due to the size of the dataset.

- For Wales:
  - AONBs in Wales
  - Landmap Historic Landscape; areas categorised as 'Rural environment' (not Built environment). Ratings of low, moderate, high and outstanding can be equated to the EBN tool options of 0, 1, 2 or >3 designations.
  - Landmap Cultural Landscape – exclude areas where the classification is related to built environment. There is no simple way of doing this from the categorisation though – it will require manual inspection of the descriptions.
  - Scheduled ancient monuments in Wales.

Local authorities may also be asked for archaeological constraint areas which can be included (see also https://www.heritagegateway.org.uk/gateway/chr/default.aspx)

Enter the number of designations in the dropdown box: 0, 1, 2, 3 or more. If you select '3 or more' and then autofill, it may increment to '4 or more', 5 or more' etc – so avoid this by selecting the first two rows before auto-filling.

Rationale for the multiplier values. This indicator is grouped with two others: nature designations, and 'managed for nature?'. Rather than applying all these multipliers cumulatively, the maximum is taken. This is done in order to avoid a very large difference in score between a 'typical' habitat such as a woodland and a 'best possible' example of that habitat. Multiplier values are provisional/arbitrary and will be reviewed.

Table 38. Cultural and historic designation multipliers for associated services

Number of designations	Education	Sense of place
0	1	1
1	1.1	1.1
2	1.15	1.15
3 or more	1.2	1.2

[14]This can be checked on the Historic England map and list at: Search the List - Find listed buildings, monuments, battlefields and more | Historic England

Number of designations	Education	Sense of place
Not applicable	1	1
Not known	1	1

34. Special recreational value

Level	ES	Type	Source type	Link
BASIC	Recreation	**Supply**	Online map	Green Infrastructure Data Portal

Description: This records whether the area has special value for recreation. This is intended to capture areas that are remote and therefore do not receive a high multiplier for population density, but are nevertheless very important areas for recreation, such as National Parks, coastlines and AONBs.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Mapped data can be located on the Green Infrastructure Data Portal accessed either through the EBN search or manually by clicking on *Special recreational value* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers) heading in the left menu.

- National Landscape (AONB) or National Park
- Heritage Coast

Enter 'Yes' if it is, or if you have another good reason to believe that it is strategically important for recreation (beyond the typical characteristics of the habitat that would already be taken account of in the basic scores and the other multipliers).

Rationale for the multiplier values. Areas with a special recreational value are assigned a multiplier of 1.2. It should be noted that there is a possible perverse effect where increasing the population density through development could increase the recreation score for a previously remote area such as a national park – potentially encouraging the loss of areas that have special recreational value partly because of their wildness and remoteness. This indicator helps to flag the special value of those remote areas, but it does not counteract the perverse impact of increasing the population multiplier.

Table 39. Special value for recreation multipliers

Special value for recreation?	Recreation
Yes	1.2
No	1
Not applicable	1
Not known	1

35. Public access

Level	ES	Type	Source type	Link
BASIC	Recreation Interaction with nature	**Supply**	Online Local authority, OS maps, site survey	Green Infrastructure Data Portal

Description: This records whether habitats are openly accessible, accessible via a footpath only (people have to stay on the path) or have restricted or private access.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. This needs to be determined individually for every applicable habitat parcel. If your data is aggregated into habitat types, you may find that you have to split it into habitat parcels to use this indicator meaningfully. See the User Guide for details of how to do this.

Use the mapped data located on the Green Infrastructure Data Portal which contains information on Accessible Green Spaces and accessed either through the EBN search or manually by clicking on *Public Access* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers) which contains information on Accessible Green Infrastructure and Public Rights of Way under the heading in the left menu. Alternatively, you may already know the access arrangements on your site or be able to find out simply by visiting the site or from local knowledge.

Data entry There are two ways of using footpath data. You can set the entire area of a parcel (e.g. a field) to 'footpath access' if it is crossed by a path. Alternatively, if you can use GIS, you can get a more nuanced assessment by creating a 50m buffer zone around

paths and setting the access just within that zone to ‘footpath access’. The 50m buffer distance is provisional/arbitrary but is intended to represent the benefits that people get from walking in a reasonable area of green space, rather than, for example, in an alleyway between walls.

Once you have established accessibility, enter the correct category of access for each parcel: Open access (go anywhere), footpath access (stay on the path), restricted access (e.g. school grounds, members only, guided tours only), private access (private gardens), no access for recreation (e.g. farmland).

Table 40. Access multipliers for associated services

Access	Recreation	Interaction with nature
Open access	1	1
Footpath access	0.75	0.9
Restricted public access	0.5	0.8
Private access	0.25	0.6
No access for recreation	0	0.5
Not applicable	1	1
Not known	1	1

Multipliers are provisional/arbitrary and will be reviewed. For Interaction with Nature we take account of the value of habitats for sustaining wildlife populations that can then be viewed elsewhere. In other words, a wildlife area may not have public access, but it could sustain populations of birds or butterflies that people then enjoy seeing in local parks or private gardens. Also, public access can sometimes be detrimental to wildlife so restricting access in some places or at certain times can help to preserve the long-term delivery of this service. For this reason, the multipliers for areas with no access are not as low as the recreation multipliers, where access is essential for the service to be delivered.

For education, there is no penalty if access is restricted to groups only so this is covered under a separate indicator 'educational use possible (Y/N)?'

For aesthetic value, 'access to view of habitat' could be relevant but this is too complex to assess at this stage.

36. Educational Use

Level	ES	Type	Source type	Link
BASIC	Education	**Supply**	Local authority	

Description: This indicator captures whether a site is accessible for formal education or research or informal learning.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Local enquiries e.g., ask the local authority education department. Does the site have special educational value, e.g., use by school groups (including any parts of school grounds that have a value for learning about nature, e.g., ponds, gardens or wilder areas), use for scientific research, or an information centre? If so, enter 'Special educational value', even if use is restricted to certain groups or to organised visits. If not, enter 'Public access' if it is accessible by the public, or 'No public access' if not (see above). Note the EBNT search tool contained with the GI Data portal will identify where public access is in place, but will not identify special educational value, due to lack of available data). This therefore provides a starting point only and could undervalue this service. Use the mapped data located on the Green Infrastructure Data Portal which contains information on Accessible Green Spaces and accessed either through the EBN search or manually by clicking on *Educational Access*.

Rationale for the multiplier values. The multiplier is over 1 if there is special educational value, e.g. use by school groups, even if access is restricted to those groups. It is 1 if there is public access, even if there is no special educational value, because there could still be opportunities for informal learning. It is zero if there is no access.

Table 41. Educational use multipliers

Educational use	
Special educational value	1.1
Public access	1
No public access	0
Not applicable	0

Educational use	
Not known	1

37. Managed for nature

Level	ES	Type	Source type	Link
BASIC	Pollination Pest control Education Interaction with nature Sense of place	**Supply**	Local knowledge and online map	Green Infrastructure Data Portal

Description: This records whether any special management is taking place to enhance the site for nature.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Use the mapped data located on the Green Infrastructure Data Portal which contains information on agri-environment scheme agreements and can be accessed either through the EBN search or manually by clicking on *Managed for Nature* under the located under the EBNT Ecosystem Services Supply and Demand Data Layers). This information can be supplemented by local enquiries. Is the site managed to conserve or enhance nature? This would include management by a Wildlife Trust or similar group, or other type of active management with a formal plan to boost biodiversity. Enter Yes or No.

Rationale for the multiplier values. This indicator is grouped with two others: cultural or historic importance, and nature designations. Rather than applying all these multipliers cumulatively, the maximum is taken. This is done in order to avoid a very large difference in score between a 'typical' habitat such as a woodland and a 'best possible' example of that habitat. Multiplier values are provisional/arbitrary and will be reviewed. [Note: reference to sense of place in relation to managing habitats for nature has been removed to focus on multipliers with a stronger correlation with this service].

Table 42. Managed for nature multipliers

Managed for nature?	Education	Interaction with nature
Yes	1.1	1.1
No	1	1
Not applicable	1	1
Not known	1	1

38. Local distinctiveness (NEW)

Level	ES	Type	Source type	Link
STANDARD	Sense of place	**Supply**	Local authority and local knowledge	Links to Local Landscape Character assessment (LCAs) can be found on the Project Details Tab.

Description: This aims to capture an area's local sense of identity and what makes it different from another place. It considers the cultural, emotional, or spiritual importance of the area to local people. Landscapes are the settings for our everyday lives, and each have a particular sense of place. All landscapes are important to someone either as places where they live or work, or as places to visit and enjoy.

This indicator captures aspects that are not reflected in the other multipliers. It uses the relevant Landscape Character Assessment(s) made available via the Landscape Institute (LCA) Database within the EBNT to assist in understanding the sense of place ecosystem service. See User Guide Section, 2.3 Project Details Sheet Box 1.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Find the relevant Landscape Character Assessment on the Local Authority (or other relevant authority) website using the link provided on the Project Details tab. Use this to identify key characteristics, habitats (a distinct combination

of landscape elements)[15] and species for the area which contribute to landscape character and make it distinctive.

Ideally, consult local communities to establish whether the area contains any habitats or natural features - or any cultural or spiritual connections - of particular additional local significance, or to which local people are strongly attached. Designation as a Local Green Space reflects special local value even for generic habitats such as amenity grassland.

Using the above, consider the habitats in place as part of the baseline and those that will form part of post-intervention work. Assess whether their relationship with local character is stronger (i.e. more aligned to the key characteristics and habitats (combination of landscape elements) of the area) or weaker (i.e. less aligned, for example consisting of habitat types and their constituent landscape elements not listed within the LCA as being characteristic of the area or mentioned as being detractors in the LCA).

The landscape changes over time; LCA is a tool to help assist in managing positive landscape change, by considering the key landscape elements and in this case habitats which make up that landscape. This ecosystem service considers the changes proposed and whether or not these changes will help to strengthen the sense of place of the area.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed.

Table 43. Local distinctiveness multipliers

	Sense of place
Stronger	1.2
Weaker	0.8
Not applicable	1
Not known	1

[15] Landscape elements are the individual components which make up the landscape. Therefore, habitats present in a landscape are made up of a particular combination of landscape elements. Landscape elements also include historic environment and geodiversity elements, as well as the cultural, perceptual and aesthetic elements, which all together make one place distinct from another.

39. Landscape diversity (NEW)

Level	ES	Type	Source type	Link
BASIC	Aesthetic value	**Supply**	Landscape Character Assessment, Site plans, local maps, or GIS	n/a

Description: This reflects the composition, structure and function of landscape elements (habitats) including land use, their spatial arrangement and their connectivity. The judgement should be made considering the site and its scale in the context of its wider landscape. The larger the site, the more likely it will influence the wider landscape diversity of the area. There is evidence that landscape diversity is important for aesthetic value, i.e. people like views of diverse landscapes, although this should be considered taking into account the characteristics of the site and the local context. There are some landscapes where the sensitivities of the key landscape elements are such, that adding landscape diversity would detract from the aesthetic value ecosystem service.

As part of considering the context of the site, a distinction should also be made between the edge of settlements and green field sites, and those sites within an urban area where the assessment of landscape diversity would be different.

Consult the relevant Landscape Character Assessment (or Townscape Assessment) to help understand the local context of the site and the landscape diversity of the area in which it is located.

Applicable habitats: All apart from sealed and artificial habitats.

Determining the indicator value. Determine which of the following applies to baseline and post intervention landscape composition, structure and function:

- **Uniform** – little variation in composition, structure and function of landscape elements in their wider sense, including land use, their spatial arrangement or their connectivity.
- **Simple** – some variation in composition, structure and function of landscape elements in their wider sense, including land use, their spatial arrangement or their connectivity.
- **Diverse** – notable variation in composition, structure and function of landscape elements in their wider sense, including land use, their spatial arrangement or their connectivity.

- **Complex** – considerable variation in composition, structure and function of landscape elements in their wider sense, including land use, their spatial arrangement or their connectivity.

Landscape elements (habitats) could comprise the following (this is not an exhaustive list):

- Broadleaved woodland,
- Native pine woodland,
- Shrubland,
- Native hedgerows,
- Wood pasture and parkland,
- Orchards,
- Semi-natural grassland,
- Fen, marsh and swamp,
- Bog,
- Inland rock,
- Heath,
- Running water,
- Standing water,
- Coastal rock,
- Coastal saltmarsh,
- Farmland (arable, improved grassland or biofuels),
- Arable field margins,
- Vegetated dunes, beach or other littoral sediment,
- Urban green infrastructure (parks, street trees, SUDs, allotments, cemeteries, green roofs, private gardens, etc).

For post intervention landscape composition, consider all **urban** green infrastructure elements as one landscape element when assessing landscape diversity changes.

Data entry

Once determined the matching entry should be repeated for each row in the Baseline & Post-intervention tabs, reflecting diversity before and after. Ensure that the landscape composition, structure and function that is typical of the surrounding landscape has also been entered into the Project details tab and is consistent with the above definitions. This would be determined using the relevant Landscape Character Assessments (or Townscape Assessments) modified by any additional knowledge from a site assessment undertaken by a landscape professional.

Rationale for the multiplier values. A multiplier of 1.1 is applied where landscape diversity matches the local pattern of landscape diversity (as entered on the Project Details tab); 1.1 for ‘Complex’, ‘Diverse’ and Simple; and 0.9 for ‘Uniform, unless matching the local pattern identified.

Table 44. Landscape diversity multipliers

	Landscape diversity
Matches local pattern of landscape diversity entered on Project Details tab	1.1
Complex	1.1
Diverse	1
Simple	1
Uniform	0.9
NA	1
NK	1

43. Fish barriers

Level	ES	Type	Source type	Link
ADVANCED	Fish production Interaction with nature	**Supply**	Site survey (non-expert)	

Description: Are there barriers across a water body that could prevent or reduce free movement of fish?

Applicable habitats: Freshwater, aquatic marginal vegetation, reedbeds and coastal saltmarsh.

Determining the indicator value. This requires a site survey or local knowledge to record the presence and size of fords, culverts, weirs or dams. These are classified as impassable to fish, passable high-impact or passable medium-impact based on the height of any vertical drop, or the length and angle of sloping structures. The criteria are loosely based on this guidance document: http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Annex%206%20Rivers%20Fish%20FCS2%20%26%20Fish%20Barrier.pdf

Classify the barrier as “Impassable” if it meets any of the following criteria:

- Vertical drop over 1m,
- Sloping structure with a slope of over 60º,
- Sloping structure over 3m long with a slope of over 40º,
- Sloping structure over 10m long with a slope of over 15º.

Classify the barrier as “Passable” – high impact if it meets any of the following criteria:

- Vertical drop between 30cm and 1m,
- Sloping structure up to 3m long with a slope of 40-60%.
- Sloping structure between 3m and 10m long with a slope of over 15º.

Classify the barrier as “Passable” – low impact if it meets any of the following criteria:

- Vertical drop between 15cm and 30 cm.
- Sloping structure up to 3m long with a slope of 15-40%.

Otherwise ignore the barrier. Note: ponds that are not part of a connected water network do not need to be marked as having a barrier.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed.

Table 45. Fish barrier multipliers

Barriers to fish passage	Fish production	Interaction with nature
Impassable barriers	0.5	0.8
Passable high-impact	0.75	0.9
Passable low impact	0.9	0.95
No barriers	1	1
Not applicable	1	1
Not known	1	1

44. Water body naturalness

Level	ES	Type	Source type	Link
STANDARD	Fish production Sense of place Interaction with nature Aesthetic value Flood protection Water quality regulation	**Supply**	Online map and data, site survey or local knowledge	Catchment Data Explorer (England)

Description: Naturalness of river. We have divided rivers into broad classes that can largely be determined by a non-expert. In future we hope to make use of the data gathered for the MoRPh (Modular river physical survey) assessment, which is a citizen science method that will be used to assess water body condition. MoRPh records features, such as type(s) of substrate present (boulders, cobbles, gravel, sand, silt, peat), presence of natural structures (riffles, meanders, shallows) and amount of vegetation, dead wood, or leaf litter.

Applicable habitats: Freshwater, aquatic marginal vegetation, reedbeds and coastal saltmarsh.

Determining the indicator value. You may need to subdivide water bodies into different lengths if they have very different characteristics.

1. Find the relevant water body in Catchment Data Explorer following the steps for the indicator on water quality, and check whether it is listed as being a Heavily Modified Water Body.
2. Check whether it is a salmonid river using local knowledge or the map here Salmonid rivers for England (unfortunately there are no place names on this map and you cannot zoom in – we will try to find a better source) or here for Wales.
3. Use a site survey to check whether there is a natural riverbed (substrate) of sand, gravel, mud or rocks, or an artificial substrate of concrete or similar, and whether the water body is enclosed within a culvert.
4. If the river is not salmonid, not heavily modified, not in a culvert and has a natural substrate then you can class it as either modified or near natural. For this, ideally, there would be a proper survey (e.g. using MoRPh), but a quick assessment could be made based on whether the river shows a mix of natural substrates (boulders,

cobbles, gravel, sand, silt, peat), natural structures (riffles, meanders, shallows) and aquatic vegetation, dead wood or leaf litter.

Rationale for the multiplier values. Multipliers are provisional/arbitrary and will be reviewed.

Table 46. Water barrier naturalness multipliers for associated services

Naturalness	Fish production	Flood protection	Water quality regulation	Aesthetic value	Education	Interaction with nature	Sense of place
Salmonid	1.2	1.1	1.1	1.1	1.2	1.2	1.1
Near natural	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Modified	1	1	1	1	1	1	1
Heavily modified	0.9	0.9	0.9	0.8	0.8	0.8	0.8
Artificial substrate	0.8	0	0	0.2	0.2	0.2	0.2
Culvert	0.2	0	0	0	0	0	0
Not applicable	1	1	1	1	1	1	1
Not known	1	1	1	1	1	1	1

Appendix 1: Slope GIS instructions

For larger sites where the slope varies significantly across the site, you may need GIS analysis to determine the value for different habitat parcels. These instructions are for ArcGIS, but similar functions exist in QGIS.

1. Follow the download link from the Soil Observatory page to reach the underlying elevation dataset at 50m resolution, which is the OS Terrain-50 dataset. Download this as the ASCII grid for the whole of GB (160 MB). (The OS 5m Terrain dataset would provide a much more accurate representation of slope, but this is not freely available from OS.)
2. Select and unzip just the tile(s) you require.
3. Use the GIS Slope function to convert the elevation grid to a slope, selecting Degree rather than Percent.
4. Multiply the raster values by 1000 then convert to integers using =Int(Slope_raster*1000) in Raster Calculator (where Slope_raster is the name of your slope dataset).
5. Convert the slope grid from a raster to a vector using Raster to Polygon, ticking 'Simplify' to get smooth polygon shapes.
6. Add a text field called 'Slope'. Select all rows where the slope is less than 3000 and set the range to "< 3 degrees". Then select all rows where the slope is over 7000 and set to "> 7 degrees". Finally select all the remaining empty rows and set to "3-7 degrees".
7. Dissolve the polygons according to the slope range.
8. Use the GIS Intersect function to assign slope ranges to your habitat map.
9. Export to Excel and paste the slope ranges into the EBN tool. (When copying slope data from QGIS it is important not to copy to excel using html format as some start with a <symbol. Go to paste special then choose Unicode.

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