Environmental Benefits from Nature (EBN) Tool - Beta Release Data Catalogue

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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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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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Contents

Introduction

This document lists details of all the condition and spatial indicators used within the Environmental Benefits from Nature (EBN) tool. 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 selected that are open access to allow public use, and easy to access, largely via the government MAGIC system.

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.

MAPPING TIP: Use of the EBN tool will be much easier, especially for large or complex sites, if you can use a Geographic Information System (GIS) such as ArcGIS or QGIS. It is therefore worth trying to obtain site plans and habitat survey maps as GIS files. Converting from CAD (typically used by developers) to GIS files is possible but can be very difficult and time-consuming. See the User Guide for tips on how to import data from GIS into the tool.

Types of data source

Data can be obtained from several sources. These are colour coded in the tables and in the spreadsheet as follows:

Table 1. Breakdown of data sources

	Number of indicators*
Online maps or documents	18
Site survey (expert)	5
Site survey (non-expert)	11
Locally obtained information (e.g. from aerial photos, local authorities, or wildlife trusts)	6

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

The following pages contain summary lists of the indicators to be collected through each of these sources (though for some indicators several types of source are possible or needed). After that, there is a catalogue containing detailed information for each indicator in turn.

Basic, standard and advanced levels

Table 2. Levels of EBN assessment

BASIC	**Generally, from freely available online maps and typically do not vary much, if at all, across the site. Recommended for all assessments.**
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.**

Types of indicator

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

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
	5	Woodland for flood risk	ADVANCED
	6	WWNP target zone?	ADVANCED
	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
	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

Note: numbers are not consecutive as indicators 16, 40, 41 and 42 have not yet been implemented and are therefore omitted from this table.

Online maps and data sources

The following table summarises the indicators that can be obtained from online maps and data sources. See the detailed information on each indicator 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

1	Agricultural Land Class (ALC)	MAGIC
2	Surface water availability	Environment Agency Water resource availability and abstraction reliability cycle 2
3	Groundwater availability	Environment Agency Catchment Data Explorer website
4	Natural Flood Management priority	Defra Data Services Platform
5	Woodland for flood risk	MAGIC
6	WWNP target zone	Working with Natural Processes ArcGIS webmap
7	Water quality: WFD status	Environment Agency Catchment Data Explorer website
8	Water quality management area	MAGIC
9	Rainfall	Met Office
10	Slope	UK Soil Observatory
11	Soil drainage	LANDIS soilscapes
12	Soil erodibility	LANDIS soilscapes
30	Population density	CAVAT
31	Nature designations	MAGIC
32	Ancient habitat	MAGIC
33	Cultural or historic importance	MAGIC
34	Special recreational value	MAGIC
35	Public access	MAGIC

Local data, site plans or aerial photos

Table 5. 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.
33	Cultural or historic importance	Online map and local authority	Online maps of National Parks, AONBs, scheduled ancient monuments, historic parks and gardens, battlefields, etc. Ask Local Authorities for archaeological constraint areas.
35	Public access	Online map and local authority	Public rights of way data and online maps of open access (CROW) land, country parks, etc.
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?
37	Managed for nature	Local knowledge	Is the site managed to preserve or enhance nature? This would include management by a wildlife trust or similar group, higher level countryside stewardship and organic farming.
38	Local distinctiveness	Local authority and local knowledge	Local landscape character assessment on Local Authority webpage. If time and resources permit, community consultation can feed in here.
39	Landscape diversity	Site plans	Count the number of different habitat groups on the site, from the list of 19 categories (see detailed guidance).

Site survey information

Line and point features: Hedges, rivers, streams, trees, green walls and paths

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 and trees) 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. It 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).
- **Trees:** enter the area calculated from the canopy diameter, estimated from a site survey or aerial photos. Area = pi r^2 where pi is 3.142 and r is the radius of the canopy. The Defra biodiversity metric contains a useful tree area calculator set up to estimate tree area for typical small, medium, or large trees. 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:** Enter either as an area, or as a length and width. You need to ensure that the surrounding land area does not include this area, because the EBN tool does not subtract it.
- **Streams** are not currently separated from rivers in the EBN tool; this will be revised in a later version. So, for streams you should treat them as rivers, i.e. enter them as an area or as a length and width, and if necessary, subtract this area from the surrounding land. 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.
- **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).

Figure 1. How to measure line and point features

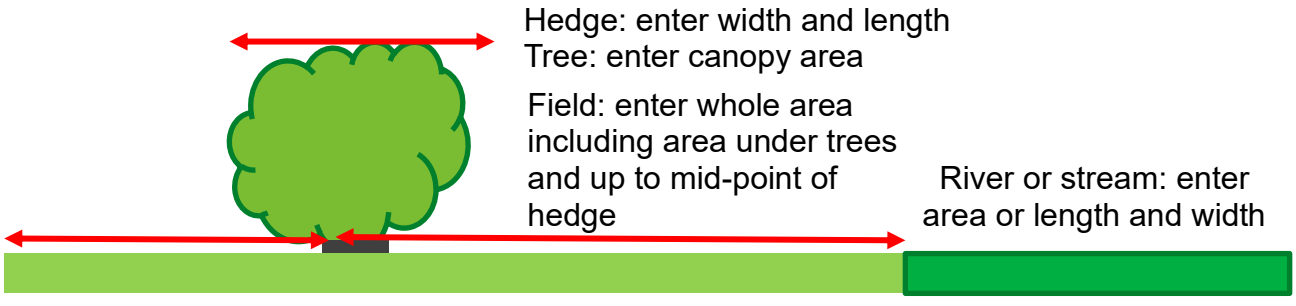


Table 6. Indicators to be collected during a site survey: summary list

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		Flowering plants	H/M/L (compared to expected)
23		Invertebrate nesting sites	H/M/L (dead wood, veteran trees, etc)
24		Resources for local species	H/M/L (need local info)
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 7. Indicators to be collected during a site survey: more detailed list

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 (larger than a can of beans), mature 33-80cm (hides a thin person), very mature/veteran >80cm (larger than a hug). 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	Flowering plants	The estimate should be based on a site survey in summer, or prior knowledge of the site. Enter 'High' if the abundance or diversity of flowering plants are greater than expected for a typical UK example of this type of habitat, or 'Low' if lower than expected. Otherwise enter 'Medium'. We are aware that these are not very precise instructions and will try to make them more precise in due course.
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 • the site includes one or more veteran trees (larger than a hug) 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. Establish which species are important locally, and what their habitat requirements are. 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
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? See entry in Catalogue.

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 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 Catalogue, 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 in Catalogue for more info.

Description of condition indicators and spatial factors

1. Agricultural Land Classification (ALC)

Level	ES	Type	Source type	Link
BASIC	Food provision	**Supply**	Online map	MAGIC (England) or Predictive Agricultural Land Classification Map 2 (Wales)
			Shapefile	provisional-agricultural-land-classification-alc-england (England) or Predictive Agricultural Land Classification Map 2 (Wales)

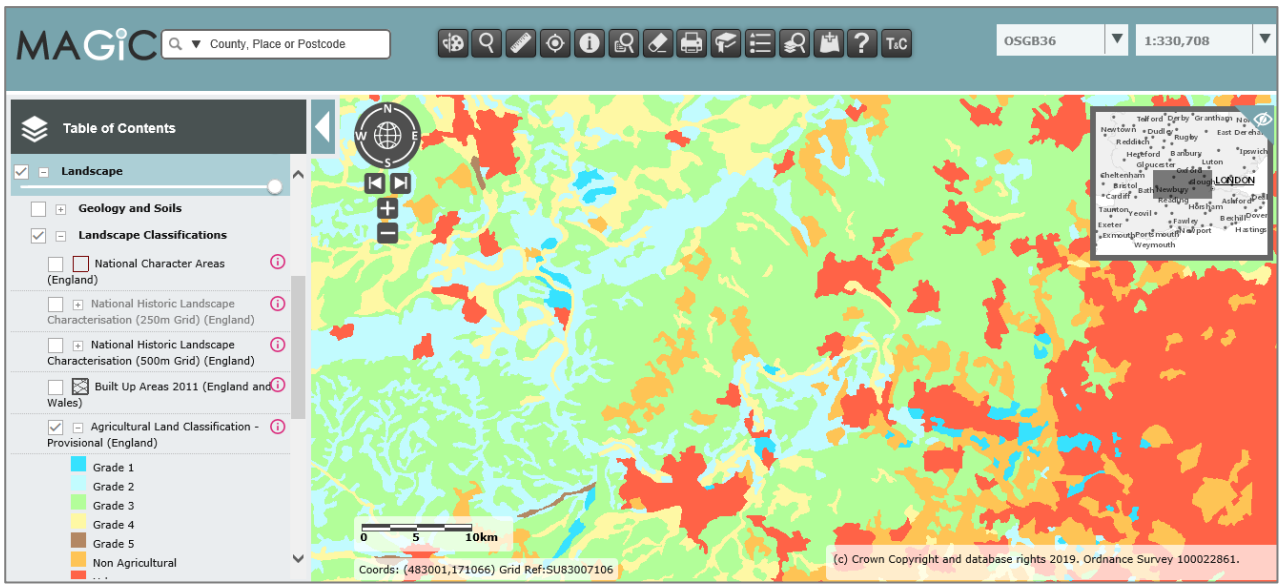
Description. The Agricultural Land Classification classifies land into grades 1 (best) to 5 (worst) for the whole of England and Wales. Grade 1 land is highly productive and also versatile, so that many types of crop can be grown. Grade 5 land is typically bog or moorland suitable only for extensive 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 is available from MAGIC. Select 'Landscape', then 'Landscape Classifications' and zoom into your project site. Each dataset can only be viewed at certain magnifications, so zoom in or out until the dataset appears. The Agricultural Land Classification - Provisional (England) covers the whole of England. Limited additional areas have a more detailed classification available under

'Post-1988 Agricultural Land classification (England)' which split the grades further to include 3a and 3b. If your area is covered, use these more detailed grades. 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. 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'.

Figure 2. Screenshot from MAGIC website displaying different grades of agricultural land



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 (arbitrary) 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 8 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	Environment Agency Water resource availability and abstraction reliability cycle 2 (online map or shapefile) or https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process (documents)

Description: The Environment Agency Catchment Abstraction Management Status for surface water is used as an indicator of water scarcity in a catchment. 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. From the webpage, if 'Preview on map' is available then examine the map (this does not work in Internet Explorer but is OK in Chrome); otherwise download the dataset using the link that says '*WaterResourceAvailabilityAndAbstractionReliabilityCycle2_Download*'. This shows the Environment Agency dataset 'Water resource availability and abstraction reliability cycle 2'. If previewing, look at the Q95 map (this shows water availability in a very dry year, when low flows are exceeded 95% of the time) and determine the water availability in the project area. Otherwise display the downloaded dataset in GIS and examine the camscdsq95 attribute for your area.

1. Green = water available
2. Yellow = restricted water available
3. Red = water not available
4. Grey = heavily modified water bodies (these are allocated for water supply) and/or discharge-rich catchments.

Select the appropriate category from the dropdown box. Unless your project area spans more than one catchment, the same value will probably apply to all cells, so the whole column can be auto filled from the top row. The dataset is also available for download as a shapefile or in other formats.

If GIS is not available and the option to preview the map is also not available, you can search for the Catchment Abstraction Management Strategy document for your area on the Environment Agency website https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process and find the map of water availability at Q95.

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. The actual values are arbitrarily chosen and 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 9. 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 or Excel	Environment Agency Catchment Data Explorer website

Description: This indicator is based on Groundwater Quantitative Status, which is reported as part of compliance with the Water Framework Directive. It indicates whether water abstraction from aquifers is sustainable or not, based on whether any of the following four tests are failed:

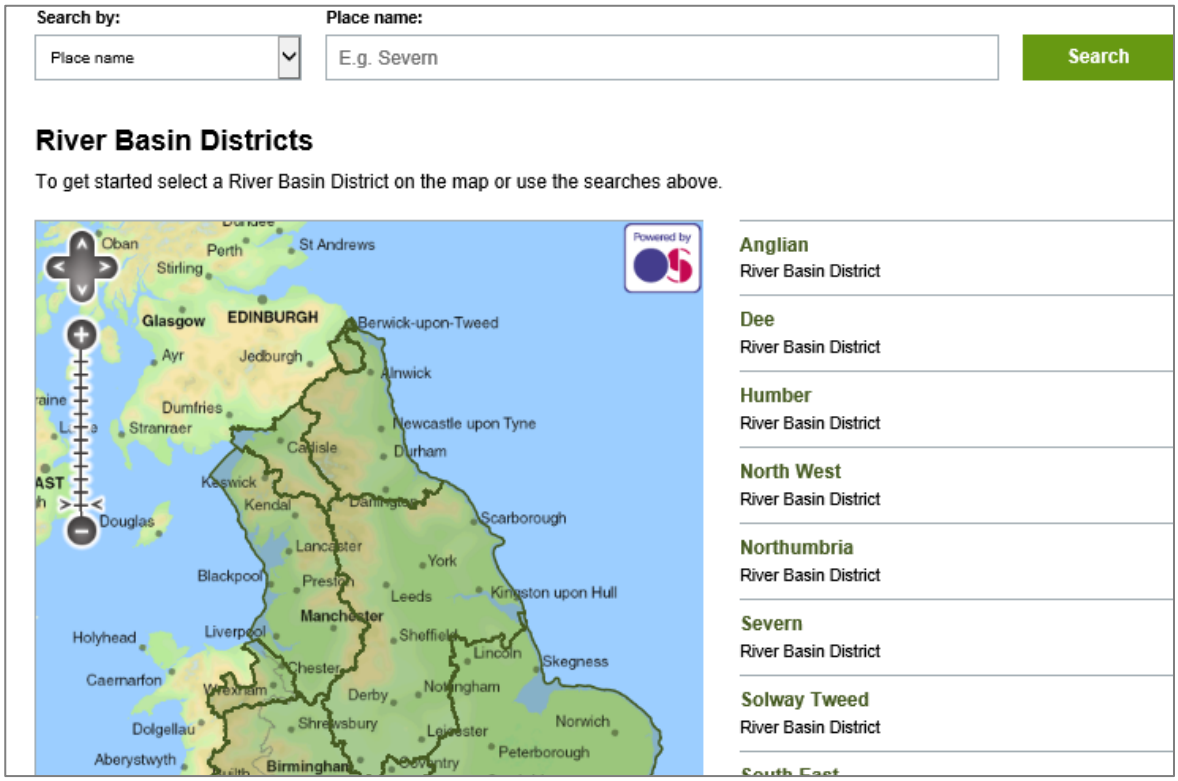
1. Saline intrusion – fail if over-abstraction is causing intrusion of poor-quality water into the groundwater body leading to sustained deterioration in groundwater quality.
2. Groundwater dependent terrestrial ecosystems (GWDTE) – fail if water abstraction is having a negative impact on plant communities 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.

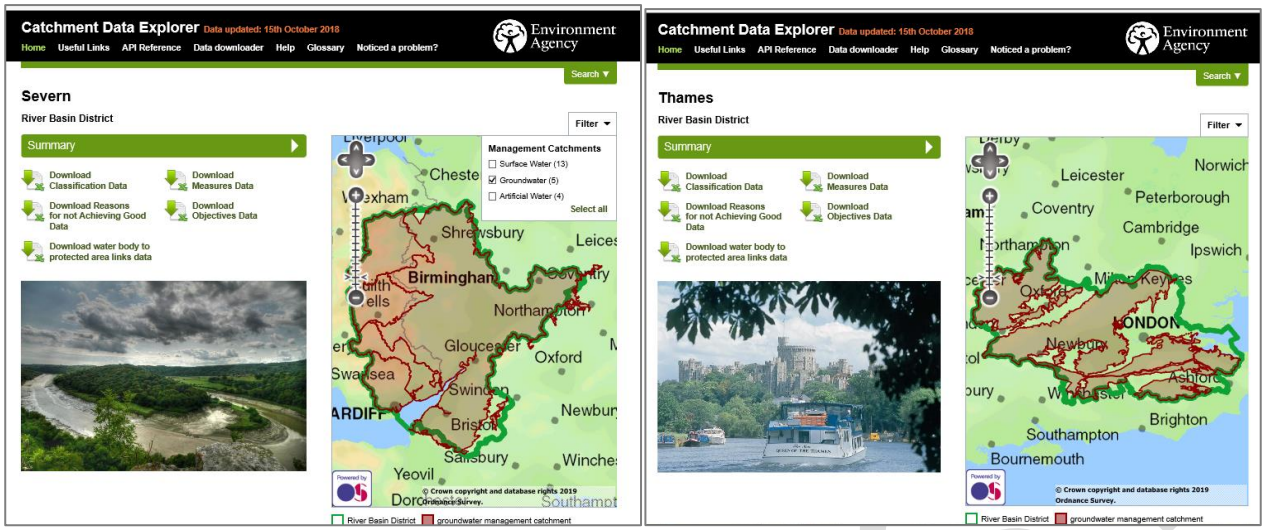
1. Go to the Catchment Data Explorer website and click on the map or enter a place name or post code to find the river basin that your project is located in.

Figure 3. River Basin Districts Map from EA Catchment Data Explorer website



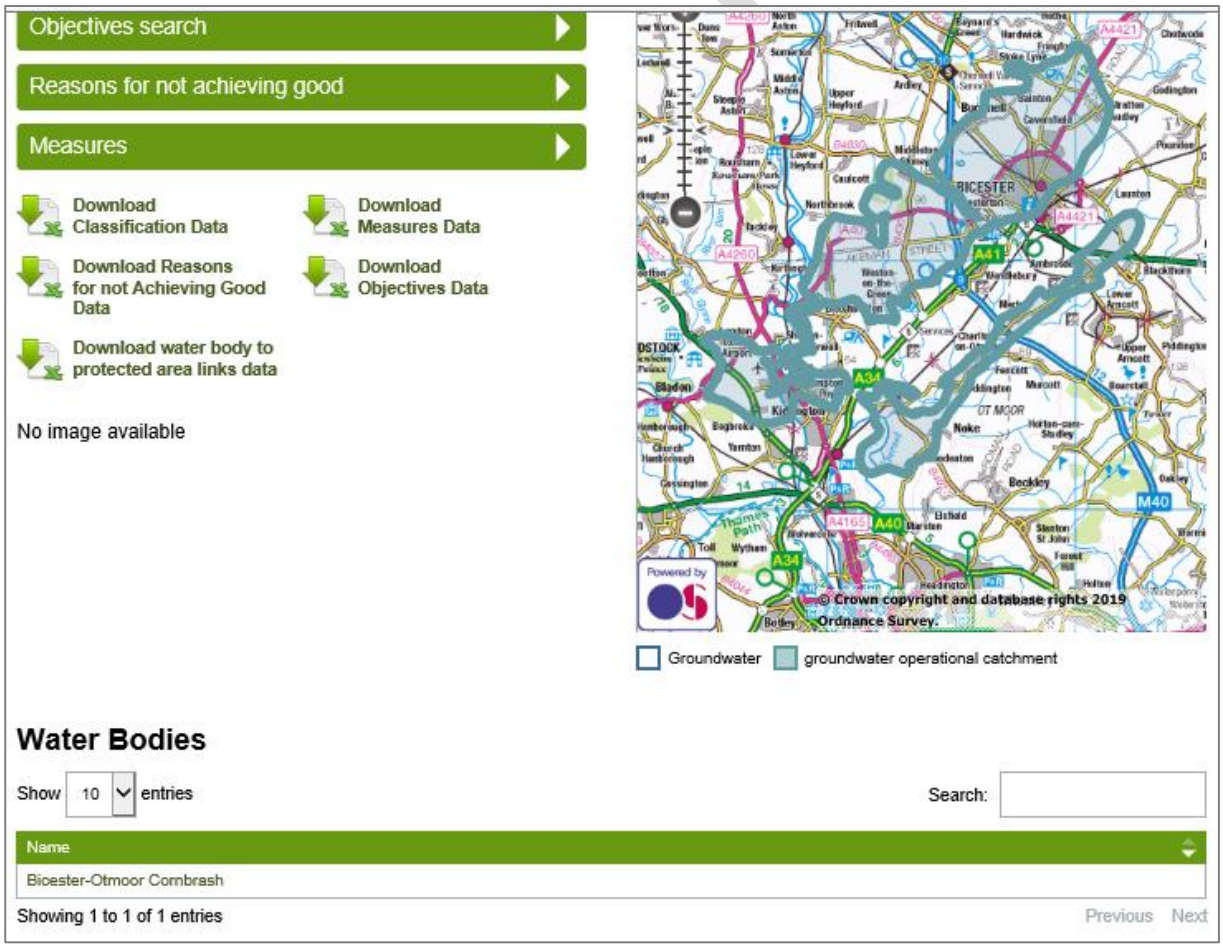
2. Click on the ‘Filter’ button in the top right corner of the river basin map and select ‘Groundwater’. The groundwater management catchments will be displayed on the map. Most river basins have only one, but some (e.g. Severn) have several. Select the management catchment that your project site is in.

Figure 4. Screenshots from individual River Basin Districts



3. It is possible that your project site does not overlie a groundwater aquifer, in which case you can select ‘not applicable’ (NA) in all cells and move on. Otherwise, click again to find the relevant operational catchment (groundwater body), which is the geological formation that forms the aquifer.

Figure 5. Screenshot of Operational Catchment View



4. Click on the name of the groundwater body in the box beneath the map. This will take you to a map of the groundwater body and tables showing its classifications. Enter the overall groundwater quantitative status (high, good, moderate, poor, or bad) in the last year available (currently 2019), in the drop-down box. You can autofill the whole column if the whole of your project site overlies the same groundwater unit.

Figure 6. Screenshot showing groundwater status

Bicester-Otmoor Cornbrash Overview

Download Water Body as CSV / GeoJSON

Overall classification for 2019
Poor

Id	GB40602G600800
Type	Groundwater Body
Hydromorphological designation	not applicable
NGR	SP5693316961
Groundwater area	8093.514 ha
Surface area	80.935 km2
Surveillance Water Body	No

Classifications

Cycle 2 classifications

Download as CSV

Classification Item	2013	2014	2015	2016	2019
Overall Water Body	Good	Good	Good	Good	Poor
Quantitative	Good	Good	Good	Good	Good
Chemical (GW)	Good	Good	Good	Good	Poor

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 10 Groundwater multipliers

Groundwater quantitative status (for water supply)	
High	0.8
Good	1
Moderate	1
Poor	1.1
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 (1st of 3 flood demand indicators)

Level	ES	Type	Source type	Link
BASIC	Flood regulation	**Demand**	Online maps Shapefile	Defra Data Services Platform Defra Spatial Data Download

This is one of three flood demand indicators (indicators 4-6) that are considered jointly: the highest level of demand will be used to determine the multiplier. Therefore, if the whole of the project area has already been identified as high demand through one of the other two flood demand indicators, you can ignore this indicator.

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. 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).

Determining the indicator value. Click on the link above and find the sub-catchment(s) containing your site. If using the online map:

1. Click on the Preview dataset link
2. Enter your location into the box top left.
3. Tick the Environmental Data WMS service box under operational layers in the layer list on the right-hand side. Click on the arrow beside it
4. Tick Spatial_Prioritisation_of_catchments_Suitable_for_using_NFM. Click on the arrow beside it.
5. Determine the NFM priority that applies to your project area (High, Medium, or Low). If no priority is shown mark as NK (Not Known) or follow the instructions below (as appropriate).
6. Enter this in the EBN dropdown box.

If your area is within two or more different sub-catchments, enter the relevant option for each habitat parcel. If no data appears on the map zoom in further using the + button on the left of the screen.

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.

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 arbitrary and could be refined following Beta tests. See Appendix 1 for more background information.

Table 11 Natural Flood Management priority multipliers

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

5. Woodland for flood risk (2nd of 3 flood demand indicators)

Level	ES	Type	Source type	Link
ADVANCED	Flood regulation	**Demand**	Online map (not available for download)	MAGIC

This is one of three flood demand indicators (indicators 4-6) that are considered jointly: the highest level of demand will be used to determine the multiplier. Therefore, if the whole of

the project area has already been identified as high demand through one of the other two flood demand indicators, you can ignore this indicator.

This indicator is very similar to indicator 6 (WWNP target zone) and therefore you do not need to enter both of them. Use this one if you prefer to look up the value on the online map in MAGIC (e.g. for small sites where the whole area falls within a single category). For larger or more complex areas where GIS analysis is necessary, you can download the GIS dataset for indicator 6 instead.

Description: This is a map created by the Forestry Commission in 2014 to target Countryside Stewardship (CS) grant aid for woodland creation, and also to target woodland planting for catchment management projects. The maps identify priority areas (at a scale of 1 km2) at risk from flooding from rivers and surface water and areas where runoff from soils is rapid. They identify opportunities to reduce flood risk by planting three types of woodland:

1. **Riparian woodland** – within 50m of smaller river networks.
2. **Floodplain woodland** – in Flood Zone 2 (areas with a 0.1% annual exceedance probability, AEP). **Please note that there is a potential conflict with biodiversity for floodplain woodlands**, as only 3% of the UK's flood plain meadows remain intact. Restoration of floodplain meadows to grassland and wetland mosaics would typically offer much greater biodiversity benefits than planting trees.
3. **Wider catchment woodland** – slowly permeable soils where woodland could break up naturally impermeable soils and reduce surface run-off. This is based on models which estimate which areas of land contribute most to the fast component of flood response of a river, based on standard percentage runoff (SPR) and Hydrology of Soil Types (HOST) data, both derived from National Soil Resources Institute maps.

Road, rail, urban areas, water, peat and **existing woodland** have been removed, because these constrain where new woodland can be planted. Therefore, we have to ensure that existing woodland receives the same score as the adjacent area – otherwise it could be undervalued (see step 4 below).

Applicable habitats: Woodland, grassland, farmland, bog, tree.

Not freshwater, wetland, coastal, bare ground, or urban habitats (except urban trees), because this indicator focuses on the impact of vegetation roots in breaking up poorly draining soil. Not sealed surfaces (which score zero anyway, so the multiplier makes no difference).

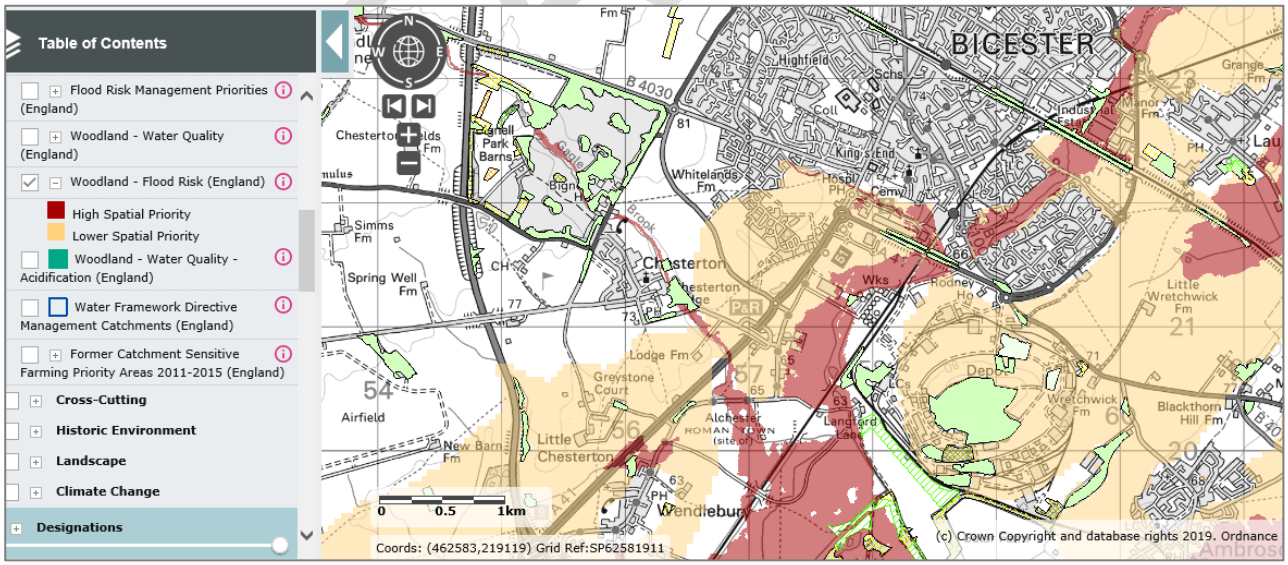
Determining the indicator value.

1. Go to MAGIC and select the Countryside Stewardship Targeting and Scoring / Water / '**Woodland – Flood risk**' layer, then zoom into your project area until the layer is no longer greyed out in the Table of Contents. (The map can also be found on the FC Land Information System website under Targeting and Scoring – CS

Water – Flood Risk, but the layer does not appear here until you are zoomed in to a very high magnification).

2. Add existing woodlands to the map by selecting ‘Habitats / Habitats / Woodland / National Forest Inventory.
3. Enter the appropriate priority in the dropdown box (high spatial priority for areas marked in maroon, lower spatial priority for areas shaded in light brown, or no priority if not shaded).
4. Existing woodlands have been removed from the dataset, so you need to add them back in again. We don’t know exactly what priority they were to start with, but if they adjoin a shaded area, enter the priority of that area. If there is a choice of two priorities, use the highest one. If they are within 50m of a small watercourse, within Flood Zone 2 or on a soil with impeded drainage (see indicator 11), they will also have high priority.
5. For this indicator it is possible that the whole area will not be the same priority, especially if rivers or streams pass through the site. So, you can’t just autofill the whole column – you will have to determine which habitat parcels are in which priority zones (except for non-applicable habitats – see above). If a parcel straddles two zones, enter the higher priority one (unless you feel the need to split the parcel into two parts). The easiest way to allocate the appropriate priorities this would be in GIS, but this layer is not available as a shapefile due to licensing restrictions. Therefore, if this looks like being an impossible task you can mark all cells as ‘Not known’ and move on. As noted above, you could use indicator 6 instead, as that can be downloaded as a GIS dataset.

Figure 7. MAGIC Screenshot showing the Woodland -Flood Risk Priority



Rationale for the multiplier values. The dataset identifies areas where planting woodland would be particularly beneficial for reducing flood risk – because drainage is poor (based on soil type), or because the area is on a flood plain or a stream bank. We are also using this as a proxy for other habitats – for example we are assuming that switching from arable land to tussocky semi-natural grassland would also have an extra benefit in these areas. Habitats in these areas will be given a multiplier greater than 1.

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 arbitrary and could be refined following Beta tests. See Appendix 1 for more background information.

Table 12. Woodland for flood risk multipliers

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

6.WWNP target zone. (3rd of 3 flood demand indicators)

Level	ES	Type	Source type	Link
ADVANCED	Flood regulation	Demand	Online map	Mapping potential for WWNP (ArcGIS online map by Environment Agency) https://www.arcgis.com/home/item.html?id=7315f943998847e2b3797a85665f5438
			Shape-files	WWNP GIS web mapping service

This is one of three flood demand indicators (indicators 4-6) that are considered jointly: the highest level of risk will be used to determine the multiplier. Therefore, if the whole of the project area has already been identified as high demand through one of the other two flood demand indicators, you can ignore this indicator.

The **Working with Natural Processes (WWNP)** maps were generated by JBA consulting, the Environment Agency and Lancaster Environment Centre (available via the EA here and via JBA here). They are a freely available alternative to the Woodlands for Water (WfW) data (indicator 6), because they use BGS geology instead of NSRI soil type data to infer soil drainage and runoff. As for WfW, they show the opportunity for:

1. **Riparian woodland** – a 50m buffer of riparian land on smaller river networks
2. **Floodplain woodland** – in Flood Zone 2 (0.1% annual exceedance probability, AEP). **There is a potential conflict with biodiversity for floodplain woodlands**,

as only 3% of the UK's flood plain meadows remain intact. Restoration of floodplains to grassland and wetland mosaics would typically offer much greater biodiversity benefits than planting trees. For that reason, we do not use this dataset to inform this indicator except for small areas of wet woodland with biodiversity value.

3. **Wider catchment woodland** – slowly permeable soils where woodland could break up naturally impermeable soils and reduce surface run-off. WWNP is based on the underlying geology from BGS, showing surface conditions likely to be associated with the formation of slowly permeable soil. WWNP identifies some areas missed by Woodlands for Water, where planting trees to break up slowly permeable soils could have local benefits.

In addition, WWNP uses national flood mapping datasets including the Environment Risk of Flooding from Rivers and Sea (RoFRS) and Risk of Flooding from Surface Water (RoFSW) maps to target areas of low connectivity between river and floodplain based on RoFRS maps, or areas of high flow accumulations based on RoFSW maps, where it would be effective to temporarily store and hold back water to reduce flood peaks further downstream. This identifies opportunities for:

1. **Enhanced floodplain reconnection**.
2. **Runoff attenuation features** (such as ponds or wetlands) to reduce 1/30 and 1/100 annual flows.

Road, rail, urban areas, water, peat and **existing woodland** have been removed, because these constrain where new woodland can be planted. Therefore, we have to ensure that existing woodland receives the same score as the adjacent area – otherwise it could be undervalued (see step 3 below).

Technical reports and supporting evidence are available https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-riskand downloadable maps are here.

Applicable habitats: All except sealed surfaces and bare ground.

Determining the indicator value.

1. Go to the Working with Natural Processes website and scroll down to 'Links'. From the list of options, select 'WebMap ArcGIS – full functionality'. From the next page, click on 'Open in map viewer', or, if you want to be able to download the datasets for use in GIS, 'Open in ArcGIS Desktop' (you will need ArcGIS for this). An alternative map viewer is available at 'An online webmap hosted by JBA consulting', which takes you to the JBA website, where you can click on 'Interactive map' and then 'Areas of potential'. To download the data as shapefiles for the individual opportunity layers (riparian woodland, catchment woodland, floodplain reconnection, runoff opportunities) click on 'Download or stream the layers for use online or offline GIS web mapping service'.

2. From the EA map viewer page or the JBA 'Interactive map', you can see all the different opportunity layers as well as the existing woodland areas. For any parts of the site that are within one of the woodland opportunity areas, select 'Woodland opportunity'. For areas that are within one of the runoff attenuation areas, select 'Runoff opportunity'. For areas that are partly in a woodland opportunity area and partly in a runoff opportunity area, select 'Both opportunity'. For other areas, select 'No opportunity' unless they are existing woodlands – see next step. Alternatively, if working with downloaded shapefiles in GIS for larger and more complex areas, you will need to merge the datasets and overlay them with your site map (see User Guide).

3. Existing woodlands have been removed from the dataset, so you need to add them back in again. We don't know exactly which woodlands would have been in the target zones to start with, but if they adjoin a woodland opportunity area, enter 'Woodland opportunity'. Alternatively, you can create your own version of this map following the WWNP criteria, by including any habitats within 50m of watercourses, or on areas with impeded or slightly impeded soil drainage (Indicator 13).

4. For this indicator it is likely that there will be quite a complex pattern of zones, and the boundaries will not line up with your habitat parcels, especially if rivers or streams pass through the site. So, you can't just autofill the whole column – you will have to determine which habitat parcels are in an opportunity area (except for non-applicable habitats – see above). If a parcel is partly in and partly out of an opportunity zone, consider it to be in the zone – unless you feel it is appropriate to subdivide it into two parcels. The easiest way to handle the determination of categories would be by using GIS. You can get access to full GIS functionality, including importing your own data or exporting layers, by using the 'Open in ArcGIS Desktop' option from the webmap page, or you can download the shapefiles here (see step 1).

Rationale for the multiplier values. The WWNP layers show where it would be most beneficial to create new woodlands or retain existing woodlands or create new runoff attenuation features such as ponds and wetlands. These habitats will therefore be given a higher multiplier if they occur in these zones. 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 arbitrary and could be refined following Beta tests. See Appendix 1 for more background information.

Table 13. WWNP 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 Excel.	Catchment Data Explorer

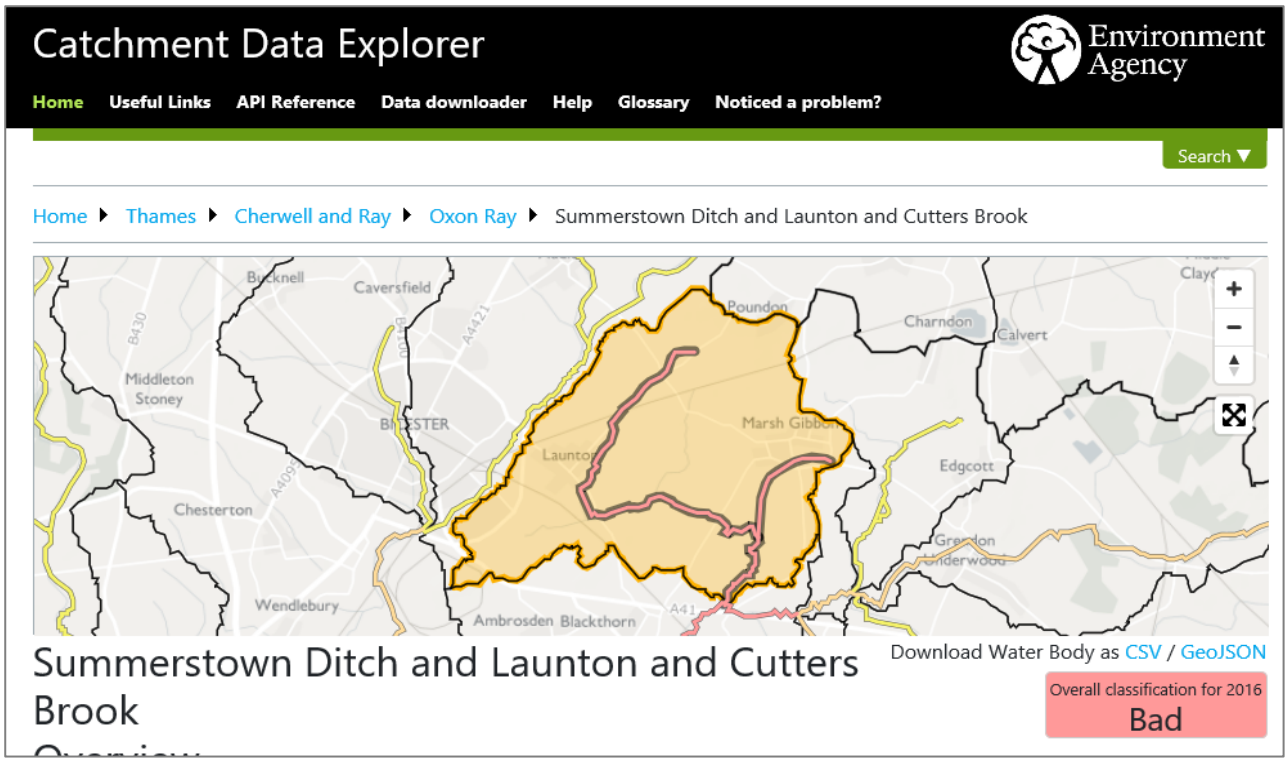
Description: Under the Water Framework Directive (WFD), both ecological and chemical quality are assessed. We use the overall classification level. Ecological quality includes biological (plants and animals), physico-chemical (temperature, nutrients etc) and hydromorphological (water flow, sediment composition 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.

Determining the indicator value. On the Catchment Data Explorer website, search for your project site and then click on it to reach the river basin, then the surface water management catchment, then the operational catchment and finally the relevant water body. Enter the most recent Overall Status in the dropdown boxes (this reflects a combination of ecological and chemical status). 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.

Figure 8. Catchment Data Explorer screenshot showing water quality status



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 and could be refined following Beta testing.

Table 14. WFD Status multipliers

Overall Water Framework Directive status for surface water	
High	1.2
Good	1.1
Moderate	1
Poor	0.75
Bad	0.5
Not applicable	1
Not known	1

8. Water quality management area?

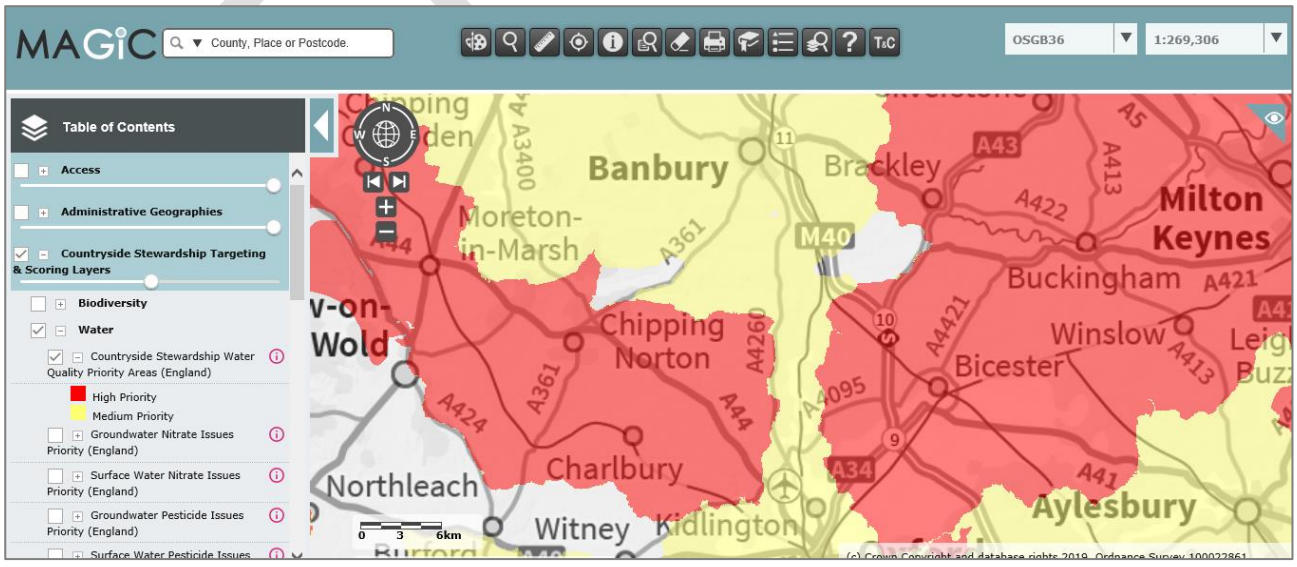
Level	ES	Type	Source type	Link
BASIC	Water quality regulation	**Demand**	Online map	MAGIC

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).

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. Go to MAGIC and select Countryside Stewardship Targeting & Scoring Layers / Water/ Countryside Stewardship Water Quality Priority Areas (England). Zoom in until the layer appears, and determine whether your site is high priority, medium priority or not classified. 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.

Figure 9. MAGIC Screenshot showing the Woodland – Water Quality Priority Areas



Rationale for the multiplier values. High and medium priority areas have an arbitrary multiplier >1, subject to testing in the pilots. 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 15. 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

Level	ES	Type	Source type	Link
BASIC	Erosion protection	**Demand**	Online data	Met Office

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. We are currently using a proxy indicator of the number of annual average winter days where rainfall is over 10mm. The web map is only available at national scale so you cannot zoom in to locate your project area precisely. We will aim to improve this indicator and make it available in an easier to use format in future (e.g. by importing the map into GIS).

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

Determining the indicator value. Either use the map below directly, or if you want to look at it online go to the Met Office 'UK Climate' website and click on the 'Averages Maps' tab. Select 'Days of Rain >= 10.0mm' from the 'Climate variable' dropdown box. If there is a choice of 'Averaging periods' use the most recent (currently 1981-2010). Select 'Winter' from the 'Seasons' boxes.

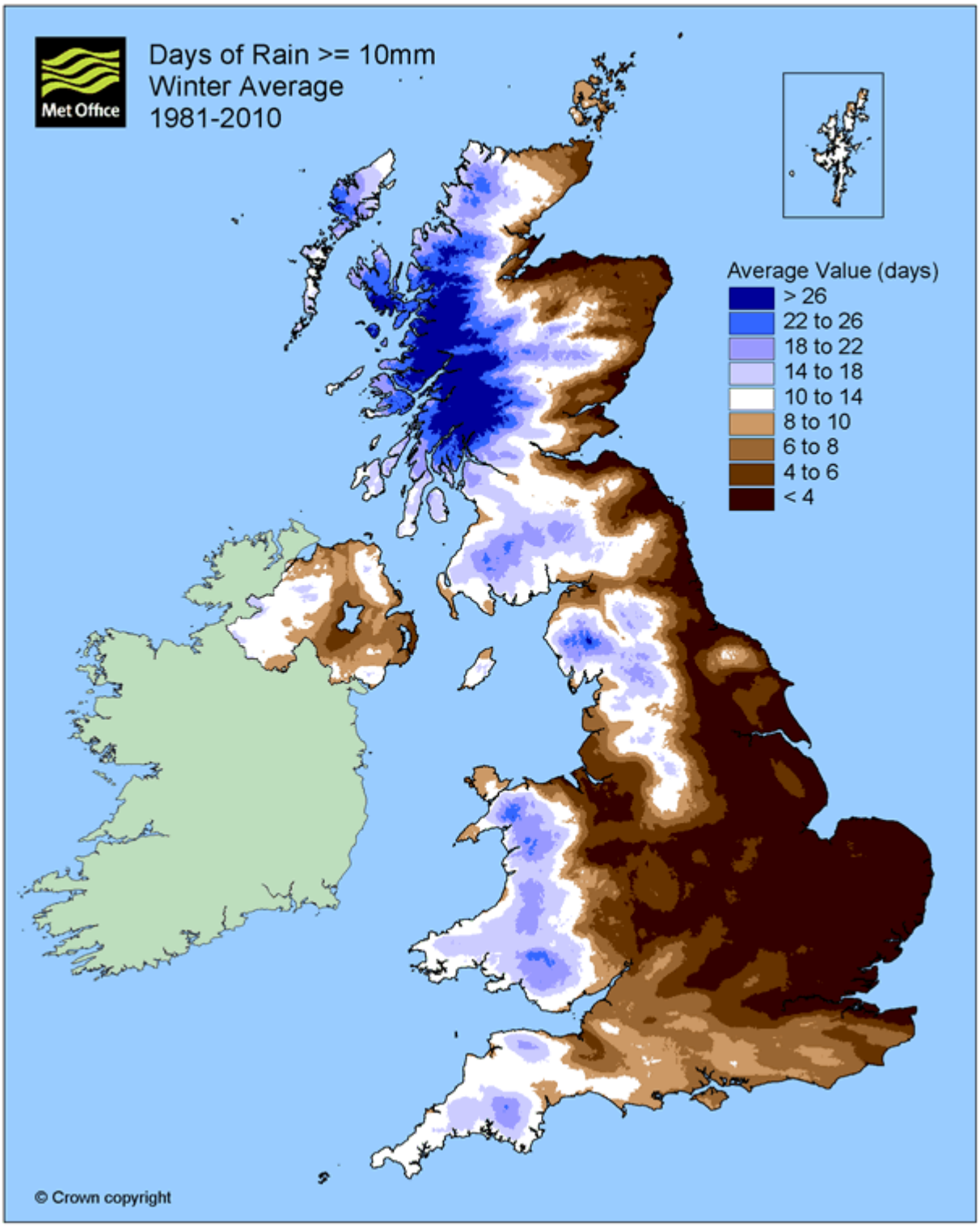
Attempt to identify your project site on the national scale map and determine how many days of rain over 10mm fall there on average in winter. (You will see a dropdown box where you can select a region of the UK for a closer view, but this climate variable is not available by region). Note that the option ‘4-9 days’ is intended to cover the 4-6, 6-8 and 8-10 bands, with ‘10 days or over’ for 10-12 and above.

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

Table 16. Rainfall multipliers

Rainfall	Average days of winter rain over 10mm	Erosion protection
High	10 days or over	1.1
Medium	4-9 days	1
Low	Less than 4 days	0.9
Not applicable		1
Not known		1

Figure 10. Met Office Screenshot showing average rainfall values



10. Slope

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

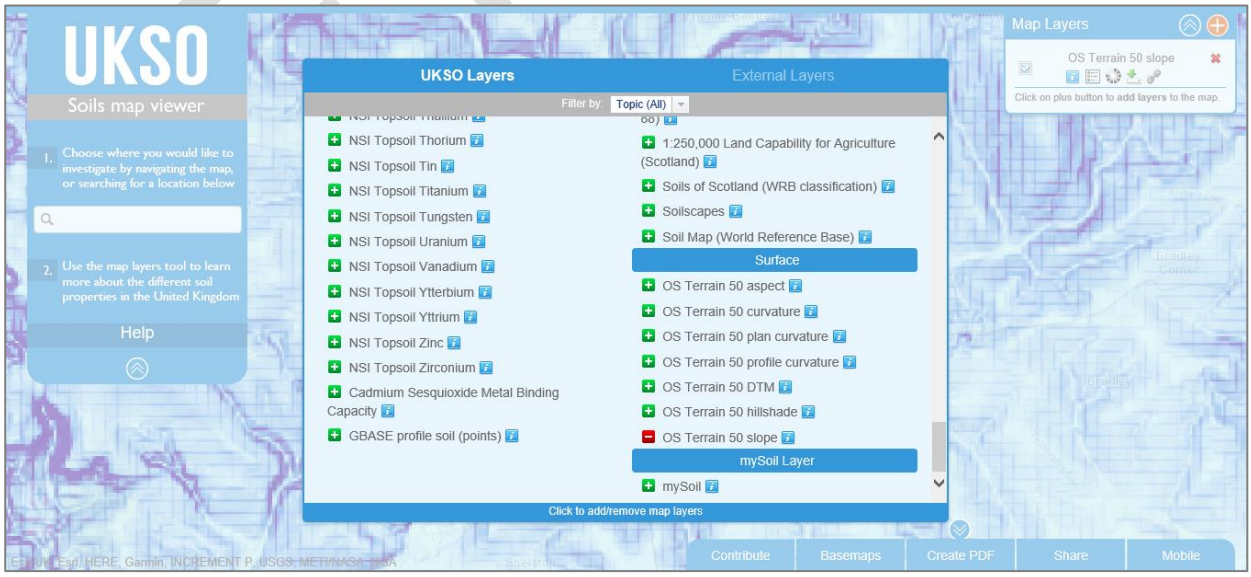
Description: Average or maximum slope in a habitat parcel such as a field, or across a site. Steeper slopes are more at risk of soil erosion, and they also provide less opportunity for groundwater to infiltrate into the ground, so they reduce the service of water supply. However, we only apply this multiplier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

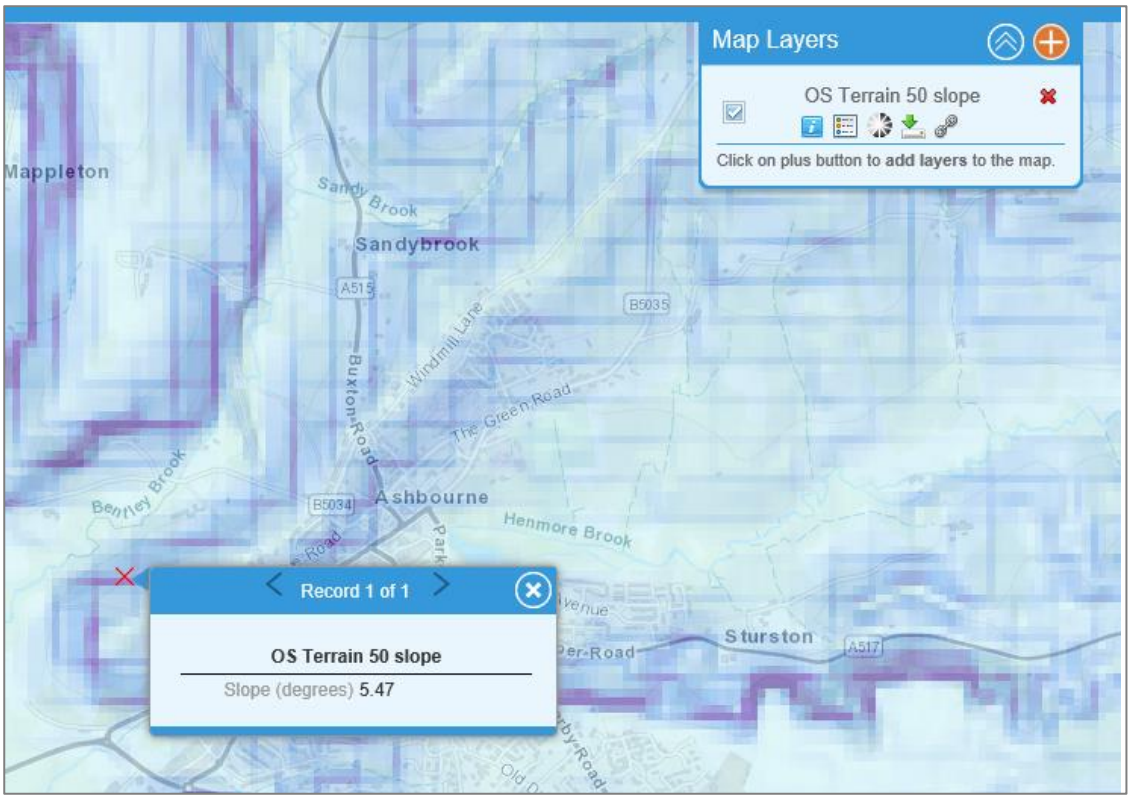
Applicable habitats: All except sealed surfaces (which score zero anyway, so the multiplier makes no difference).

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 11. UK Soil Observatory Screen shots showing slope values





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.

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 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

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 freely available online and is now also available via MAGIC / Landscape / Geology and Soils. A

more detailed assessment for a specific site currently costs £102 for a 5x5km area, though this is not necessary. 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).

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 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
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. However, two of the advanced flood demand indicators – the Woodlands for Water and WWNP maps - do take account of soil drainage, and these indicators are currently only applicable to woodland and other habitats that could improve soil infiltration (though the tool does not consider what habitat is being replaced). Also, trees may 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 anyway,).

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 (listed in Appendix 2, also available as a spreadsheet or GIS table). 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 freely available 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. 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).

Another alternative is to use the European Soil Data Centre (ESDAC) maps. However, the ESDAC maps are derived from European scale models and are therefore less suitable for site level assessments in the UK.

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	

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

Rationale for the multiplier values. Multipliers are 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	Link
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).

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	

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.

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	

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).

Could also use Bluesky tree map in GIS: https://www.blueskymapshop.com/products/national-tree-map(crown diameter, approx. £90/km^2).

Note: If canopy cover is less than 20% the habitat would not be classed as woodland, but in future we could use this to indicate the presence of scattered trees.

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.

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)	

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.

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 (larger than a can of beans)
- mature 33-80cm (hides a thin person)
- very mature or veteran >80cm (larger than a hug)).

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)	

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)	

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' (this could change).

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 arbitrary and will be reviewed, along with the selection of which habitats this multiplier is applicable to (to avoid overlap with the basic scores).

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

Level	ES	Type	Source type	Link
ADVANCED	Pollination Pest control 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. Enter 'High' if the abundance or diversity of flowering plants are greater than expected for a typical UK example of this type of habitat, or 'Low' if lower than expected. Otherwise enter 'Medium'. We are aware that these are not very precise instructions and will try to make them more precise in due course.

Rationale for the multiplier values. All multipliers are 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.

Rationale for the multiplier values. All multipliers are 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, such as larval food plants for specialist butterflies (e.g. blackthorn for Brown Hairstreak in parts of central and southern England), nesting sites for bats, or young scrub for Willow Tits.

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.

You will first need to establish which species are important locally, e.g. by talking to a county ecologist or local wildlife trust, and 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.

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

Table 29. Local species multipliers

	Interaction with nature	Sense of place
Yes	1.1	1.1
No	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. 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. 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). Catchment Data Explorer (see indicator 9) could be useful – it shows watershed boundaries, which could help to determine whether the habitat is between a pollution source and a water course, and the 'reasons for not achieving good status' could be used

to confirm whether agricultural and land management or urban / transport runoff is causing pollution.

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.

Figure 12. Catchment Data Explorer screenshot showing 'reasons for note achieving good status'

Reasons for not achieving good status and reasons for deterioration

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Reason Type	SWMI	Activity	Category	More	Classification Element
RNAG	Diffuse source	Poor nutrient management	Agriculture and rural land management	Details	Invertebrates
RNAG	Physical modification	Land drainage - operational management	Agriculture and rural land management	Details	Invertebrates
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Ammonia (Phys-Chem)
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Dissolved oxygen
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Phosphate
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Ammonia (Phys-Chem)
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Invertebrates
RNAG	Natural	Drought	No sector responsible	Details	Invertebrates
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Invertebrates
RNAG	Natural	Drought	No sector responsible	Details	Invertebrates
RNAG	Diffuse source	Poor nutrient management	Agriculture and rural land management	Details	Dissolved oxygen
RNAG	Point source	Sewage discharge (continuous)	Water Industry	Details	Phosphate
RNAG	Diffuse source	Poor nutrient management	Agriculture and rural land	Details	Dissolved oxygen

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 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). Catchment Data Explorer (see indicator 9) 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 arbitrary and require testing.

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 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
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 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 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
Not near people	0
NA	0
Not known	0

30. Population density

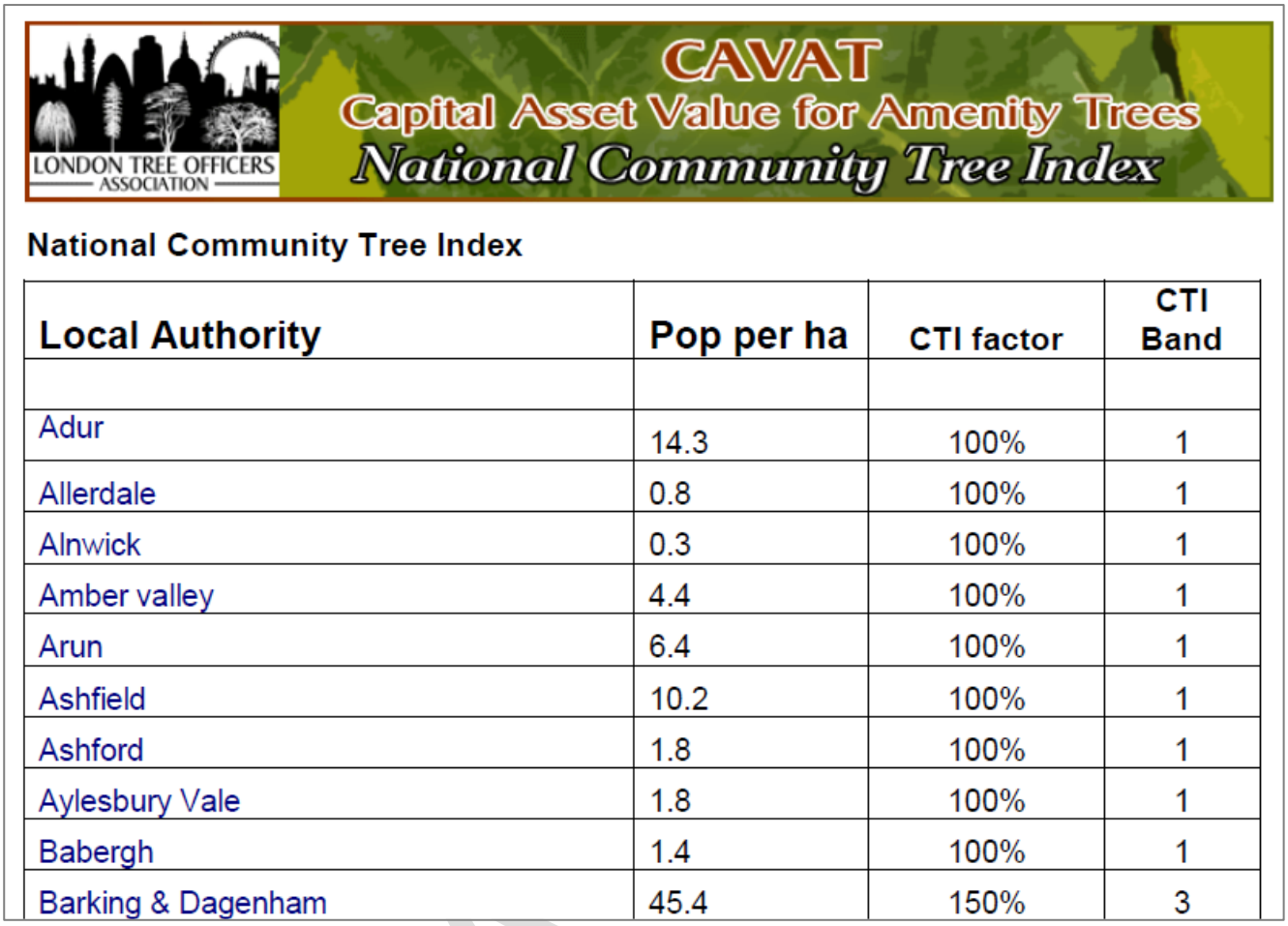
Level	ES	Type	Source type	Link
BASIC	Recreation Education	**Demand**	Online data	CAVAT or LSOA statistics

Description: This indicator reflects demand for recreation and education about nature, based on a proxy of the population density in the local area. We are using a freely available dataset compiled for use by the CAVAT (capital asset value) tool for assessing the amenity value of trees, which lists population density in each local authority area. This document is available online and is updated annually. Alternatively, you can use Lower Super Output Area statistics downloadable here, for a more accurate estimate.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Consult the CAVAT Community Tree Index Factor document and select the appropriate population density range for your local authority area in the drop-down box (<20 people per ha; 20-39; 40-59; etc.). Or use the LSOA statistics (see above). You can auto-fill the whole column, but 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.

Figure 13. CAVAT Screenshot showing population density by local authority



National Community Tree Index

Local Authority	Pop per ha	CTI factor	CTI Band
Adur	14.3	100%	1
Allerdale	0.8	100%	1
Alnwick	0.3	100%	1
Amber valley	4.4	100%	1
Arun	6.4	100%	1
Ashfield	10.2	100%	1
Ashford	1.8	100%	1
Aylesbury Vale	1.8	100%	1
Babergh	1.4	100%	1
Barking & Dagenham	45.4	150%	3

Rationale for the multiplier values. Multipliers are arbitrary and will be reviewed. We have chosen lower multiplier values than are used in the CAVAT tool.

Table 35. Population density multipliers

Population density (people/ha)	CAVAT Community Tree Index Factor	EBN tool indicator
<20	1	1
20-39	1.25	1.05
40-59	1.5	1.1
60-79	1.75	1.15
80-99	2	1.2
>100	2.25	1.2

31. Nature designations

Level	ES	Type	Source type	Link
BASIC	Education Interaction with nature Sense of place	**Supply**	Online map and local authority	MAGIC (England) or Lle (Wales)

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. Go to MAGIC Designations and find out if the habitat has any of the following designations:

- Land-based designations /Statutory: SSSIs, SPAs, SACs, National and Local Nature Reserves, National Parks, RAMSAR sites.
- Land-based designations /Non-statutory: RSPB reserves.
- Marine-based designations: Marine Protection Zones.
- Habitats and Species: Priority habitats and presence of priority species. If there is more than one priority habitat or species, this counts as multiple designations.
- Ask Local authorities for District Wildlife Sites, Local Wildlife Sites.

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 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	MAGIC

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.

Ancient woodland: Check if the site is included in MAGIC Habitats and species / Habitats / Woodland / Ancient woodland (Y/N).

Veteran trees: 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 (1 hug): aspen, birch, hawthorn, hazel
>225cm (1.5 hugs): Cherry, field maple, goat willow, grey willow, holly, hornbeam, rowan
>250cm (1.75 hugs): Alder, Scots pine
>300cm (2 hugs): Ash, oak, yew
>450cm (3 hugs): Beech, elm, Horse chestnut, limes, poplars, sweet chestnut, sycamore, other willows, other conifers

An approximate guideline to measure the circumference of tree trunks 1.5m from the ground is in the form of 'hugs'. A hug is where an average adult can reach around the tree trunk and their fingers just meet. One hug is approximately equivalent to a trunk circumference of 150cm. One and a half hugs would be equivalent to a circumference of 225cm, whilst half a hug (i.e. where it is possible to reach around the tree with one arm and touch your chest) is equivalent to a circumference of 75cm. It may be useful to measure the first few trees using a tape to help calibrate the size of a surveyor's hug.

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 arbitrary.

Table 37. Ancient habitat multipliers of associated services

	Interaction with nature	Sense of place
Yes	1.1	1.1
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	MAGIC (England) Lle or NRW Evidence and Data (Wales)

Description: This records whether the site has special cultural or historic value, based on the number of designations.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value.

1. Go to MAGIC Designations and find out if the site has any of the following designations (under designations tab):
    - Land-based designations: Statutory: National Parks, AONBs
    - Historic statutory: Scheduled ancient monuments.
    - Non-statutory: Community Forests, Heritage Coasts, Green belt.
    - Historic non-statutory: Registered battlefields; Registered parks and gardens.
- 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.

2. Ask Local authorities for archaeological constraint areas (see also https://www.heritagegateway.org.uk/gateway/chr/default.aspx)

3. Add National Trust areas.

4. 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 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
Not applicable	1	1
Not known	1	1

34. Special recreational value

Level	ES	Type	Source type	Link
BASIC	Recreation	**Supply**	Online map	MAGIC

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. Check MAGIC to see if the area is in any of the following:

- MAGIC/Designations / land-based designations / statutory / AONB or National Park
- MAGIC/Designations / land-based designations / non-statutory / 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**	Local authority, OS maps, site survey and MAGIC	MAGIC

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 using GIS.

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. Otherwise you can use the following sources.

- MAGIC / Access. This shows Countryside and Rights of Way (CRoW) Act 2000 Access Layer, which includes Section 15 land, Registered Common Land and other open access areas. It can be downloaded as a GIS layer at data.gov.uk (CRoW Act 200 Access layer)

- ORVal (University of Exeter) Parks and Paths, which can be viewed on the ORVal map or downloaded as a GIS dataset. This includes most of the openly accessible parks and other green spaces in England, including CROW land. However, it also includes some woodland areas which are not open access. Many but not all public rights of way are included in the Paths dataset.
- OS Open Greenspace is a downloadable GIS dataset that shows green spaces suitable for recreation (public parks, playing fields, sports facilities, play areas and allotments), which are thought to be publicly accessible, in rural areas as well as towns and cities.
- OS MasterMap GreenSpace is available under a Public Sector Mapping Agreement license or to academic users for research purposes via Edina Digimap. It is based on OS MasterMap and shows all types of green space, including gardens and roadside verges, but only for towns and cities. It includes public parks and gardens, playing fields, play spaces, bowling greens, golf courses, tennis courts, other sports facilities, natural land, campsites, institutional grounds, religious grounds, cemeteries, school grounds and allotments.
- Public rights of way (PROW) datasets should be available from your local authority although there may be licensing restrictions. A few local authorities have uploaded PROW GIS data to data.gov.uk.
- OS maps (paper copy or via Bing Maps) show public footpaths.
- OpenStreetMap also contains open spaces and paths, but includes those with no public access. There are user-supplied tags which sometimes indicate accessibility, but not always, so it can be hard to tell whether there is public access or not. Data can be downloaded as a GIS file (the Geofabrik download option is particularly useful for larger areas) but this does not include the access tags.

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 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. See the User Guide (Section 6.1, step 6) for details of how to do this with GIS.

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 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.

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
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	MAGIC

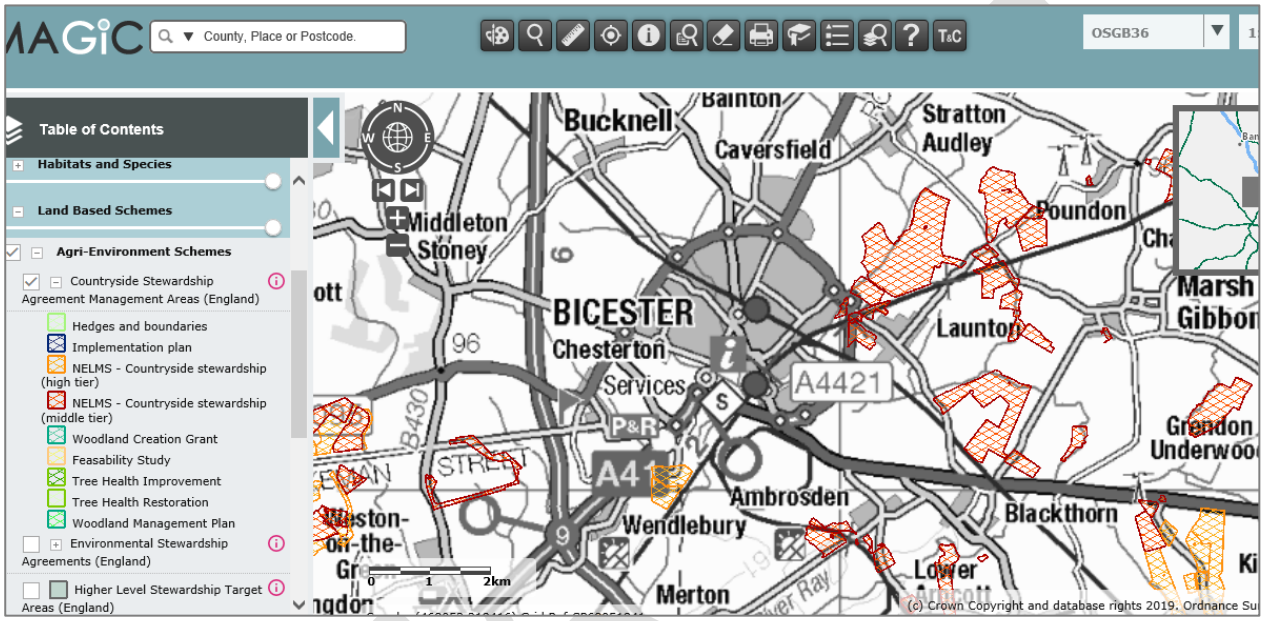
Description: This records whether any special management is taking place to enhance the site for nature.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Local enquiries. Is the site managed to conserve or enhance nature? This would include management by a wildlife trust or similar group, higher level countryside stewardship and organic farming. Enter Yes or No.

Countryside stewardship agreement areas are shown in MAGIC under Land Based Schemes / Agri-environment schemes / Countryside Stewardship Agreement Management Areas / NELMS – Countryside Stewardship (high tier) (the lighter orange hatching on the map below).

Figure 14. MAGIC Screen shot showing land under agri-environment schemes



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 and will be reviewed.

Table 42. Managed for nature multipliers

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

38. Local distinctiveness

Level	ES	Type	Source type	Link
STANDARD	Sense of place	**Supply**	Local authority and local knowledge	National Character Areas

Description: This aims to capture areas that have special importance because they help to provide a sense of identity and local distinctiveness, or because they have particular importance to local people for cultural, emotional, or spiritual reasons. It captures aspects that are not reflected in the other multipliers.

Applicable habitats: All except sealed and artificial surfaces.

Determining the indicator value. Start with National Character Areas (NCA): is the habitat characteristic of the area? Search also for local landscape character assessment on Local Authority webpage - this will incorporate more local input so is preferable to the NCA. If time and resources permit, community consultation can feed in here.

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

Table 43. Local distinctiveness multipliers

	Sense of place
Yes	1.1
No	1
Not applicable	1
Not known	1

39. Landscape diversity / habitat mosaic

Level	ES	Type	Source type	Link
BASIC	Aesthetic value	**Supply**	Site plans, local maps, or GIS	

Description: This reflects the mix of different habitats on a site. There is evidence that landscape diversity is important for aesthetic value, i.e. people like views of diverse landscapes.

Applicable habitats: All apart from sealed and artificial habitats.

Determining the indicator value. Count the number of different habitat groups on the site, from the list of 19 categories below. If there are 7 or more types present enter 'High'; if 4 to 6 enter 'Medium'; if three or less enter 'Low'. Autofill the whole column. For large areas (e.g. over 5,000 ha) you could subdivide into appropriate blocks, e.g. sub-catchments or MSOAs, and enter the diversity for each. It might be appropriate to ignore habitats that form a very small proportion of the whole area, e.g. <0.5% (except for hedgerows as these have a prominent impact on the landscape).

1. Broadleaved woodland
2. Native pine woodland
3. Shrubland
4. Native hedgerows
5. Wood pasture and parkland
6. Orchards
7. Semi-natural grassland
8. Fen, marsh and swamp
9. Bog
10. Inland rock
11. Heath
12. Running water
13. Standing water
14. Coastal rock
15. Coastal saltmarsh
16. Farmland (arable, improved grassland or biofuels)
17. Arable field margins
18. Vegetated dunes, beach or other littoral sediment
19. Urban green infrastructure (parks, gardens, allotments, cemeteries, green roofs etc)

Rationale for the multiplier values. A multiplier of 1.1 is applied for 'high'; 1 for 'medium' and 0.9 for 'low. This is a very basic approach, and the multipliers are arbitrary and will be reviewed. It would also be possible to calculate this indicator directly in the tool; this could be done in a future version.

Table 44. Landscape diversity multipliers

	Landscape diversity
High	1.1
Medium	1
Low	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 60^{o}
- Sloping structure over 3m long with a slope of over 40^{o}
- Sloping structure over 10m long with a slope of over 15^{o}

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 3 m long with a slope of 40-60%
- Sloping structure between 3 and 10m long with a slope of over 15^{o}

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

- Vertical drop between 15 and 30 cm
- Sloping structure up to 3 m 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 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 arbitrary and will be reviewed.

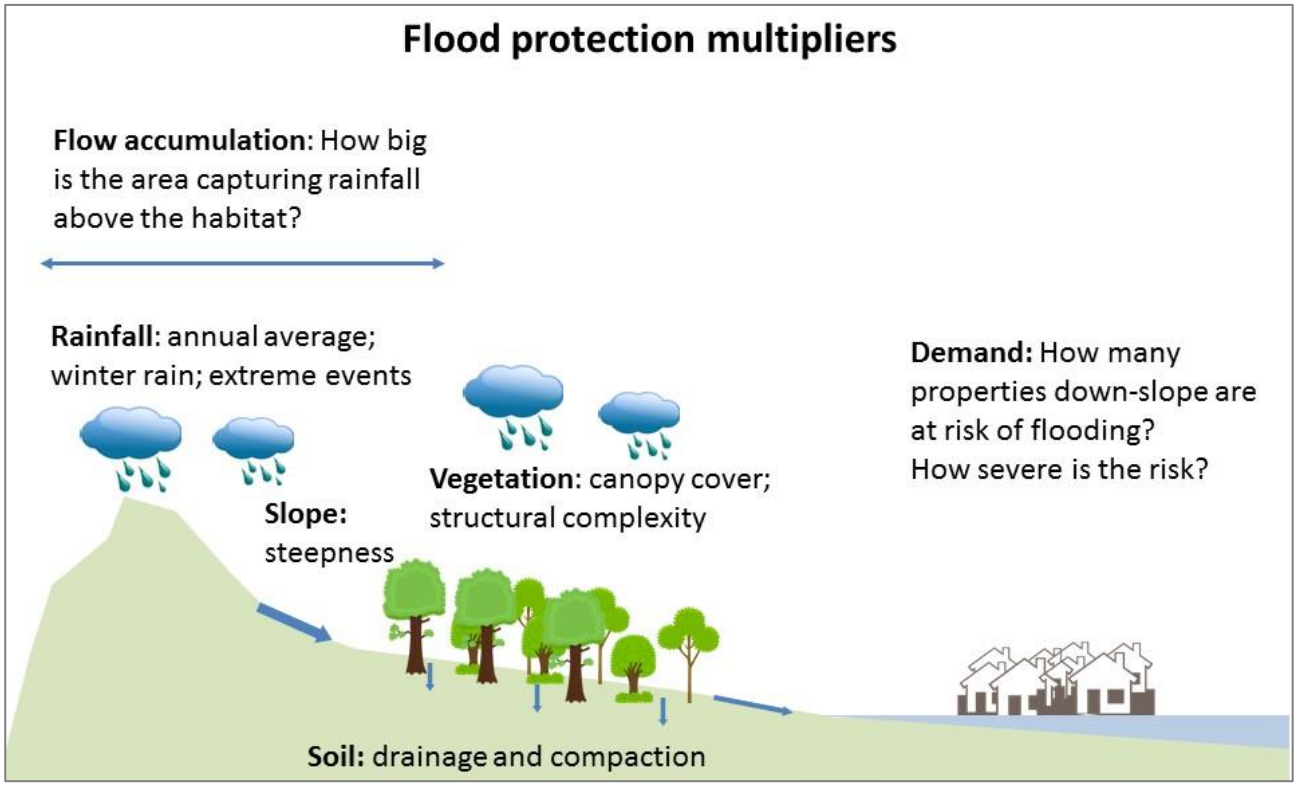
Table 46. Water barrier naturalness multipliers for associated services

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	1.05
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: Flood-related indicators

The ability of a habitat to provide a flood protection service depends on:

1. Condition factors:
    - canopy cover
    - vegetation structural complexity
    - soil compaction and drainage
    - river features such as meanders, gravel beds and presence of woody debris.
2. Demand / spatial factors:
    - Whether the habitat is located up-slope of a flood zone.
    - The flow accumulation at this point (i.e. how much water might be flowing through this location that could be slowed down or absorbed by the habitat).
    - The number of people and properties currently at risk that can be protected by a habitat at this location.
    - Soil compaction and drainage, because poorly drained soils pose greater flood risk.
    - Slope, because there will more runoff from steep slopes so more potential for habitats to intercept and reduce the flow.
    - Rainfall, because there will be greater flood risk in areas with high rainfall.



We have devised methods to apply the habitat condition indicators, but the demand indicators are more problematic. Various datasets are available, but they all pose problems with double-counting or gaps.

1. **Flood zones.** Simply identifying whether a habitat is in a flood zone (e.g. using the flood maps at https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) misses out the potential for habitats higher in the catchment to reduce flooding lower down. We would need to check whether the impacts of rainfall, slope and soil drainage are implicit in the flood zone maps, or whether they are based only on topology.
2. **Position**: Identifying whether the habitat is located up-slope of a flood zone could be done by just looking at the flood zone map and considering the slope direction, but where the topology is complex or the habitat is a long way from the flood zone it could require modelling of flow paths using GIS or a hydrological model.
3. **Flow accumulation** requires use of GIS or a hydrological model.
4. **Flood risk management plans** (https://www.gov.uk/government/collections/flood-risk-management-plan-frmp-scoping-reports) include estimates of the number of people and properties at risk of flooding for each river basin but do not show this information on a map, so there is no way of knowing how many properties could be affected by a habitat in a certain location.
5. **Catchment Flood Management Plans** (Environment Agency Catchment Flood Management Plans) contain a very useful summary indicator in the form of a Policy Type number for each sub-catchment. This appears to indicate the areas where habitat-related interventions could have an impact in the local catchment (Policies 4 and 5) or in the wider catchment (Policy 6). The advantage of this indicator is that it combines consideration of the magnitude of the flood risk, including the number of people and properties affected, with the potential of a habitat in a certain location to make a difference. This was used as an indicator in the first version of the tool, but the CFMPs are now becoming outdated and will be replaced with the FRMPs which do not include this information.

P1	Little or no flood risk
P2	Low to moderate flood risk – management can be reduced
P3	Low to moderate flood risk – doing OK
P4	Low, moderate or high flood risk – doing OK but more action needed to keep pace with climate change
P5	Moderate to high flood risk – further action needed
P6	Low to moderate flood risk – can store water or manage run-off to provide overall flood risk reduction

- **MAGIC Countryside Stewardship Targeting and Scoring Layers** include a 'flood risk management priority' layer for agri-environment schemes, originating with Natural England in 2014, but there is no information on how this layer was derived and it seems to cover very isolated sub-catchments (see Appendix 1, indicator 5).

- **Opportunity maps**: Two potentially useful datasets highlighting the best places to plant new woodland to reduce flood risk are:

    - the Countryside Stewardship Targeting and Scoring '**Woodland – Flood risk**' layer from the Forestry Commission (2014), which is on MAGIC and also on the FC Land Information System website (https://www.forestergis.com/Apps/MapBrowser/).

- The **Working with Natural Processes (WWNP)** maps generated by JBA consulting, the Environment Agency and Lancaster Environment Centre (available via the EA here and via JBA here).

Both these maps are based on identifying three types of woodland potential:

- Riparian woodland – a 50m buffer of riparian land on smaller river networks
- Floodplain woodland – in Flood Zone 2 (0.1% annual exceedance probability, AEP). However, note that tree planting on floodplains conflicts with the need to preserve and restore flood plain meadows, of which only 3% remain, and could therefore have an adverse impact on biodiversity.
- Wider catchment woodland – slowly permeable soils where woodland could break up naturally impermeable soils and reduce surface run-off. WWNP is based on the underlying geology from BGS, showing surface conditions likely to be associated with the formation of slowly permeable soil. Woodlands for Water (which is not freely available) uses standard percentage runoff (SPR) and Hydrology of Soil Types (HOST) data, both derived from National Soil Resources Institute maps, to estimate areas of land which contribute the most to the fast component of flood response of a river. WWNP identifies some areas missed by Woodlands for Water, where planting trees to break up slowly permeable soils could have local benefits. Woodlands for Water adds other areas where the conceptual models show a contribution to the rapid response part of the flood hydrograph, but without slowly permeable soils indicators present at the surface.

However, both these datasets have had constraints removed: road, rail, urban, water, **existing woodland** and peat. So, **they cannot be used to assign multipliers to reflect the value of existing woodland**. To get around this, we have to ask users to assign high priority to existing woodlands where the boundary adjoins a high priority area, or where those woodlands occur within riparian or floodplain areas or on soils with impeded drainage.

At the time of writing (June 2021) the Environment Agency is about to release a new dataset, Natural Flood Management Priority, which captures certain elements of the demand for flood risk reduction, and we are now incorporating this into the Beta Test version of the EBN tool (see Indicator 4). After evaluation, we may make further refinements to the flood indicators.

Appendix 2: Soil associations at risk of erosion

Evans (1990) 'Soils at risk of accelerated erosion in England and Wales'. Soil Use and Management 6:125.

See http://www.landis.org.uk/downloads/classification.cfm for descriptions of each class.

SoilAssoc	Erosion Risk	Reason	Erodibility
22	Very small	Water	Low
92a	Very small	Water	Low
92b	Small	Water	Low
92c	Moderate	Water	Medium
311a	High	Water wind frost fire and animals in the uplands	High
311b	Moderate	Water wind frost fire and animals in the uplands	Medium
311c	Moderate	Water wind frost fire and animals in the uplands	Medium
311d	Small	Water wind frost fire and animals in the uplands	Low
311e	High	Water wind frost fire and animals in the uplands	High
313a	Moderate	Water wind frost fire and animals in the uplands	Medium
313b	Small	Water	Low
313c	Moderate	Water wind frost fire and animals in the uplands	Medium
341	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
342a	Small	Water	Low
342b	Moderate	Water	Medium
342c	Small	Water	Low
342d	Very small	Water	Low
343a	Moderate	Water	Medium
343b	Moderate	Water	Medium
343c	Small	Water	Low
343d	Moderate	Water	Medium
343e	Small	Water	Low
343f	Small	Wind	Low
343g	Moderate	Water	Medium
343h	Moderate	Water	Medium
343i	Small	Water	Low
346	Very small	Water	Low
361	High	Wind	High
372	Moderate	Wind	Medium
411a	Very small	Water	Low
411b	Small	Water	Low
411c	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
411d	Small	Water	Low
421a	Very small	Water	Low
421b	Very small	Water	Low
431	Small	Water	Low
511a	Small	Water	Low
511b	Moderate	Water	Medium
511c	Small	Water	Low
511d	Small	Water	Low
511e	Moderate	Water	Medium
511f	Small	Water	Low
511g	Moderate	Water	Medium
511h	Very small	Water	Low
511i	Very small	Water	Low
511j	Small	Water	Low
512a	Very small	Water	Low
512b	Very small	Water	Low
512c	Very small	Water	Low
512d	Very small	Water	Low
512e	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
512f	Very small	Water	Low
513	Moderate	Water	Medium
521	Very small	Wind	Low
532a	Very small	Water	Low
532b	Very small	Water	Low
541a	Very small	Water	Low
541a	Very high	Water	High
541b	Very small	Water	Low
541b	High	Water	High
541c	Small	Water	Low
541c	Moderate	Water	Medium
541d	Small	Water	Low
541d	Small	Water	Low
541e	Moderate	Water	Medium
541f	Small	Water	Low
541g	Small	Water	Low
541h	Small	Water	Low
541i	Very small	Water	Low
541j	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
541k	Small	Water	Low
541l	Small	Water	Low
541m	High	Water	High
541n	Small	Water	Low
541o	Small	Water	Low
541p	Small	Water	Low
541q	Small	Water	Low
541r	Moderate	Water	Medium
541s	High	Water	High
541t	Moderate	Water	Medium
541u	Small	Water	Low
541v	Very small	Water	Low
541w	Very small	Water	Low
541x	Small	Water	Low
541y	Small	Water	Low
541z	Small	Water	Low
542	Small	Water	Low
543	Small	Water	Low
544	Moderate	Water	Medium

SoilAssoc	Erosion Risk	Reason	Erodibility
551a	Very high	Water	High
551b	Very high	Water	High
551c	High	Water	High
551d	Very high	Water	High
551e	High	Water	High
551f	Moderate	Wind	Medium
551g	Moderate	Water	Medium
552a	High	Wind	High
552b	Moderate	Water	Medium
554a	High	Water	High
554b	Very small	Wind	Low
555	Small	Water	Low
561a	Moderate	Water	Medium
561b	Very small	Water	Low
561c	Very small	Water	Low
561d	Moderate	Water	Medium
571a	Small	Water	Low
571a	Small	Water	Low
571b	Moderate	Water	Medium

SoilAssoc	Erosion Risk	Reason	Erodibility
571c	Moderate	Water	Medium
571d	High	Water	High
571e	High	Water	High
571f	Moderate	Water	Medium
571g	Small	Water	Low
571h	Moderate	Water	Medium
571i	Moderate	Water	Medium
571j	Moderate	Water	Medium
571k	Moderate	Water	Medium
571l	Small	Water	Low
571m	Small	Water	Low
571n	Small	Water	Low
571o	Moderate	Water	Medium
571p	Small	Water	Low
571q	Moderate	Water	Medium
571r	Small	Water	Low
571s	Small	Water	Low
571t	Small	Water	Low
571u	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
571v	Small	Water	Low
571w	Small	Water	Low
571x	Moderate	Water	Medium
571y	Moderate	Water	Medium
571z	Small	Water	Low
572a	Small	Water	Low
572b	Small	Water	Low
572c	Moderate	Water	Medium
572d	Small	Water	Low
572e	Moderate	Water	Medium
572f	Small	Water	Low
572g	Small	Water	Low
572h	Small	Water	Low
572i	Small	Water	Low
572j	Small	Water	Low
572k	Moderate	Water	Medium
572l	Small	Water	Low
572m	Moderate	Water	Medium
572n	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
572o	Small	Water	Low
572p	Moderate	Water	Medium
572q	Small	Water	Low
572r	Small	Water	Low
572s	Moderate	Water	Medium
572t	Very small	Water	Low
573a	Very small	Water	Low
573b	Moderate	Water	Medium
581a	Very small	Water	Low
581b	Very small	Water	Low
581c	Very small	Water	Low
581d	Very small	Water	Low
581e	Small	Water	Low
581f	Small	Water	Low
581g	Small	Water	Low
582a	Small	Water	Low
582b	Small	Water	Low
582c	Small	Water	Low
582d	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
582e	Moderate	Water	Medium
611a	Small	Water wind frost fire and animals in the uplands	Low
611b	Small	Water	Low
611c	Small	Water wind frost fire and animals in the uplands	Low
611d	Small	Water wind frost fire and animals in the uplands	Low
611e	Moderate	Water wind frost fire and animals in the uplands	Medium
612a	Very small	Water	Low
612b	Small	Water wind frost fire and animals in the uplands	Low
631a	Small	Water wind frost fire and animals in the uplands	Low
631b	Small	Water	Low
631c	Small	Water	Low
631d	Moderate	Water	Medium
631e	Small	Water	Low
631f	Small	Water	Low
633	Small	Water wind frost fire and animals in the uplands	Low
634	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
641a	Moderate	Water	Medium
641b	Very small	Water	Low
641c	Moderate	Wind	Medium
643a	Very small	Water	Low
643b	Small	Water	Low
643c	Very small	Water	Low
643d	Very small	Water	Low
651a	Moderate	Water wind frost fire and animals in the uplands	Medium
651b	Small	Water wind frost fire and animals in the uplands	Low
651c	Moderate	Water wind frost fire and animals in the uplands	Medium
652	Moderate	Water wind frost fire and animals in the uplands	Medium
654a	Moderate	Water wind frost fire and animals in the uplands	Medium
654b	Small	Water wind frost fire and animals in the uplands	Low
654c	Small	Water wind frost fire and animals in the uplands	Low
711a	Small	Water	Low
711b	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
711c	Very small	Water	Low
711d	Very small	Water	Low
711e	Small	Water	Low
711f	Very small	Water	Low
711g	Very small	Water	Low
711h	Very small	Water	Low
711i	Small	Water	Low
711j	Small	Water	Low
711k	Very small	Water	Low
711m	Very small	Water	Low
711n	Small	Water	Low
711o	Small	Water	Low
711p	Very small	Water	Low
711q	Small	Water	Low
711r	Very small	Water	Low
711s	Very small	Water	Low
711t	Very small	Water	Low
711u	Small	Water	Low
711v	Small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
711w	Small	Water	Low
712a	Very small	Water	Low
712b	Very small	Water	Low
712c	Very small	Water	Low
712d	Very small	Water	Low
712e	Very small	Water	Low
712f	Very small	Water	Low
712g	Very small	Water	Low
712h	Very small	Water	Low
712i	Very small	Water	Low
713a	Small	Water	Low
713b	Very small	Water	Low
713c	Very small	Water	Low
713d	Very small	Water	Low
713e	Very small	Water	Low
713f	Very small	Water	Low
713g	Very small	Water	Low
714a	Very small	Water	Low
714b	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
714c	Very small	Water	Low
714d	Very small	Water	Low
721a	Very small	Water wind frost fire and animals in the uplands	Low
721b	Very small	Water wind frost fire and animals in the uplands	Low
721c	Very small	Water wind frost fire and animals in the uplands	Low
721d	Very small	Water wind frost fire and animals in the uplands	Low
721e	Very small	Water wind frost fire and animals in the uplands	Low
811a	Very small	Water	Low
811b	Very small	Water	Low
811c	Very small	Water	Low
811d	Very small	Water	Low
811e	Very small	Water	Low
812a	Very small	Water	Low
812b	Very small	Water	Low
812c	Very small	Water	Low
813	Very small	Water	Low
813a	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
813b	Very small	Water	Low
813d	Very small	Water	Low
813e	Very small	Water	Low
813f	Very small	Water	Low
813g	Very small	Water	Low
813h	Very small	Water	Low
814a	Very small	Water	Low
814b	Very small	Water	Low
814c	Very small	Water	Low
815	Small	Wind	Low
821a	High	Wind	High
821b	Small	Wind	Low
831a	Very small	Water	Low
831b	Small	Wind	Low
831c	Very small	Water	Low
832	Very small	Water	Low
841a	Small	Water	Low
841b	Very small	Water	Low
841c	Very small	Water	Low

SoilAssoc	Erosion Risk	Reason	Erodibility
841d	Very small	Water	Low
841e	Small	Water	Low
851a	Moderate	Wind	Medium
851b	Small	Wind	Low
851c	Moderate	Wind	Medium
861a	Very small	Wind	Low
861b	Moderate	Wind	Medium
871a	Very small	Water wind frost fire and animals in the uplands	Low
871b	Very small	Water	Low
871c	Very small	Water	Low
872a	Small	Wind	Low
872b	Small	Wind	Low
873	Small	Wind	Low
1011a	Very small	Water	Low
1011b	High	Water wind frost fire and animals in the uplands	High
1013a	Moderate	Water wind frost fire and animals in the uplands	Medium
1013b	Moderate	Water wind frost fire and animals in the uplands	Medium

SoilAssoc	Erosion Risk	Reason	Erodibility
1021	Very small	Wind	Low
1022a	Moderate	Wind	Medium
1022b	Very small	Wind	Low
1024a	High	Wind	High
1024b	Moderate	Wind	Medium
1024c	Very small	Wind	Low
1025	Very small	Wind	Low

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