

Information pack on the habitat assessment framework underpinning [Defra indicator B6 – Natural functions of water and wetland ecosystems](#)

Natural England/UKCEH, May 2023

Purpose: *This information pack is intended to support Defra’s publication of an interim version of the B6 indicator, as part of the annual update of its [Outcome Indicator Framework](#). It is divided into three parts: 1) explanatory notes; 2) assessment outputs; and 3) attribute information sheets. The primary storage location of this pack is presently the [Document store](#) on the [Discovering priority habitats website](#).*

Access to underlying data: *A supplementary Excel workbook (available on the same Document store) provides all of the aggregated naturalness scores on which this information pack is based. A geodatabase is being prepared that will indicate spatial variations in naturalness scores across England, as far as this can be shown with available datasets. The primary data used to generate naturalness scores for different attributes comes from multiple sources, explained in detail in Part 3 of this information pack.*

PART 2 – ASSESSMENT OUTPUTS

[Headline B6 dashboard - high-level information on broad ecosystems](#)

[Detailed B6 dashboard - high-level information on detailed habitat types](#)

[Introduction to detailed assessments of individual ecosystem/habitat types](#)

[Detailed assessment of broad ecosystems](#)

[Detailed assessment of detailed habitat types](#)

[Attribute codes](#)

Headline B6 dashboard (broad ecosystems only)

This dashboard provides a high-level summary that is included in [Defra's reporting on the B6 indicator](#). It operates at the level of key components of naturalness (hydrological, physical, chemical, biological). **For this interim version of the B6 indicator, assessments are only available for larger rivers, headwater streams, lakes and ponds.** Assessments of other broad ecosystem types will be added as the assessment framework is finalised. Trends cannot be included at present – for some attributes it will be possible to incorporate historical data to generate trends, but for others it will only be possible once further data are collected and updated scores are generated.

Broad habitat	Habitat type	Naturalness components					Combined
		Hydrological	Physical	Chemical	Biological	X-cutting	
Running waters	Large rivers	●	●	●	●	○	●
	Headwater streams	●	●	●	●	●	●
Standing waters	Lakes	●	●	●	●	○	●
	Ponds	○	●	●	●	○	●
Wetlands	Bogs						
	Fens						
Estuaries & coasts	Estuaries						
	Coastal						

Legend

- Class 1 (Highest naturalness, i.e. best in ecological terms) - aggregate naturalness score <1.5
- Class 2- aggregate naturalness score 1.5-<2.5;
- Class 3 - aggregate naturalness score 2.5-<3.5;
- Class 4 - aggregate naturalness score 3.5-<4.5.
- Class 5 (Lowest naturalness, i.e. worst in ecological terms) - aggregate naturalness score >=4.5;
- Data not currently available.

When trend data become available these will be indicated as follows:

- ↑ – increase in naturalness of more than 0.1 aggregate naturalness score from previous assessment
- ↓ – decrease in naturalness of more than 0.1 aggregate naturalness score from previous assessment
- ↔ - no change in naturalness of more than 0.1 aggregate naturalness score from previous assessment

Detailed B6 dashboard (detailed habitat types)

The dashboard below drills down into the broad ecosystems in the headline B6 dashboard, providing information on a range of detailed habitat types requiring consideration in biodiversity assessment and reporting processes. For this interim version of the B6 indicator only example assessments of detailed types are provided (chalk streams/rivers and oligotrophic lakes). Assessments of other types will be added as the assessment framework is finalised.

Broad habitat	Habitat type	Naturalness components					Combined
		Hydrological	Physical	Chemical	Biological	X-cutting	
Running waters	'Ranunculus rivers' (HD H3260)						
	Chalk streams/ivers	●	●	●	●	●	●
	Active shingle rivers/streams						
	High energy (Red List C2.2a)						
	Moderate energy (Red List C2.2b)						
	Low energy (Red List C2.3)						
	Tidally influenced						
	Temporary						
Standing waters	Naturally dystrophic						
	Naturally oligotrophic	●	●	●	●	○	●
	Naturally mesotrophic						
	Naturally eutrophic						
	Marl						
Wetlands	Blanket bog						
	Raised bog						
	Base-rich fens						
	Acidic/base-poor fens						
Estuaries & coasts	Estuaries (HD 1130)						
	Large shallow inlets and bays (HD1160)						
	Permanently submerged sandbanks (HD1110)						
	Inter-tidal sandflats and mudflats (HD1140)						
	Reefs (HD1170)						
	Atlantic salt meadows (1330)						

Legend

- Class 1 (Highest naturalness, i.e. best in ecological terms) - aggregate naturalness score <1.5
- Class 2 - aggregate naturalness score 1.5-<2.5
- Class 3 - aggregate naturalness score 2.5-<3.5
- Class 4 - aggregate naturalness score 3.5-<4.5
- Class 5 (Lowest naturalness, i.e. worst in ecological terms) - aggregate naturalness score ≥ 4.5
- Data not currently available.

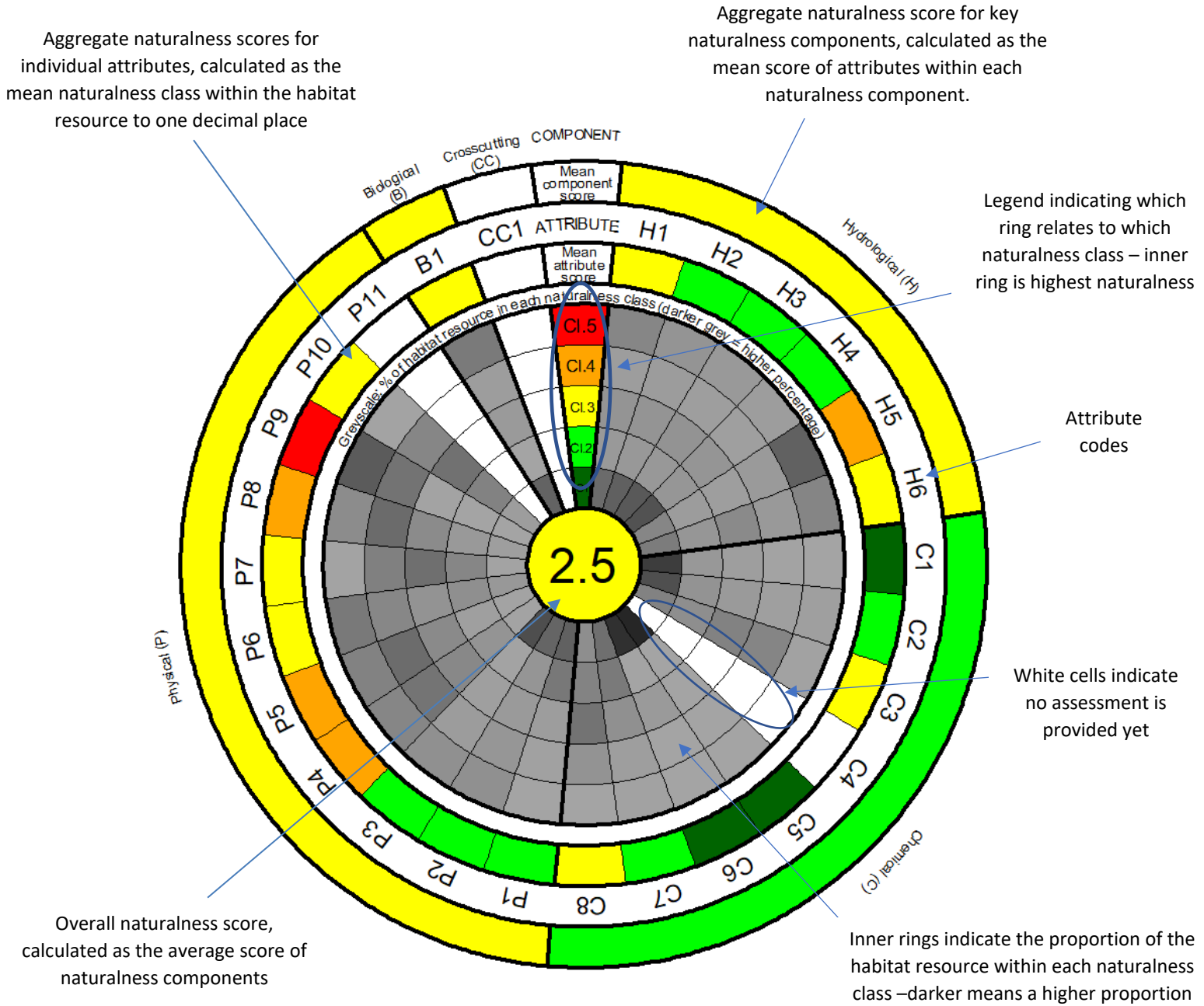
When trend data become available these will be indicated as follows:

- ↑ - increase in naturalness of more than 0.1 aggregate naturalness score from previous assessment
- ↓ - decrease in naturalness of more than 0.1 aggregate naturalness score from previous assessment
- ↔ - no change in naturalness of more than 0.1 aggregate naturalness score from previous assessment

Introduction to detailed assessments of individual habitat types

Assessments of habitat types are laid out in a standard form, describing the habitat type and its spatial distribution, the status of the habitat resource according to the B6 assessment, trends (not available as yet) and the level of confidence in the assessment. In addition to an **attribute-level dashboard** there are also **wheel diagrams** summarising attribute information at different levels of data aggregation.

Detailed explanation of wheel diagrams



Legend

- Class 1 (Highest naturalness, i.e. best in ecological terms) - aggregate naturalness score <1.5
- Class 2- aggregate naturalness score 1.5-<2.5
- Class 3 - aggregate naturalness score 2.5-<3.5
- Class 4 - aggregate naturalness score 3.5-<4.5
- Class 5 (Lowest naturalness, i.e. worst in ecological terms) - aggregate naturalness score >=4.5
- Data not currently available.

Detailed assessment of broad ecosystems

[Rivers \(excluding headwater streams\)](#)

[Headwater streams](#)

[Lakes](#)

[Ponds](#)

Bogs

Fens

Estuaries

Coastal

Rivers (excluding headwater streams)

Brief description of status

A very mixed picture of impacts on naturalness. **Hydrological** attributes suggest relatively low impacts on flow regime other than under low flow conditions, but impacts on natural flooding regime and groundwater inputs are substantial. **Chemical** attributes indicate considerable elevation of phosphorus levels (no data are available on nitrogen) and impacts on macroinvertebrate and plant assemblages. **Physical** attributes indicate widespread and substantial modification to natural processes, including interactions with trees. In terms of **biological** impacts on naturalness, non-native species are affecting considerable areas of the habitat resource although many parts still appear to be free of influence at present.

Description of trends

No trends can be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, e.g. attributes relating to River Habitat Survey where earlier representative national surveys have been undertaken, and chemical attributes where historical versions of the WFD Reporting Database are available.

Confidence of assessment

The current assessment is judged to be **LOW CONFIDENCE** for various reasons. Some attributes are missing, others require refinement (e.g. Specific pollutants), and some impacts are not properly represented in the attribute list (e.g. siltation). Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes. See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Brief description of habitat resource

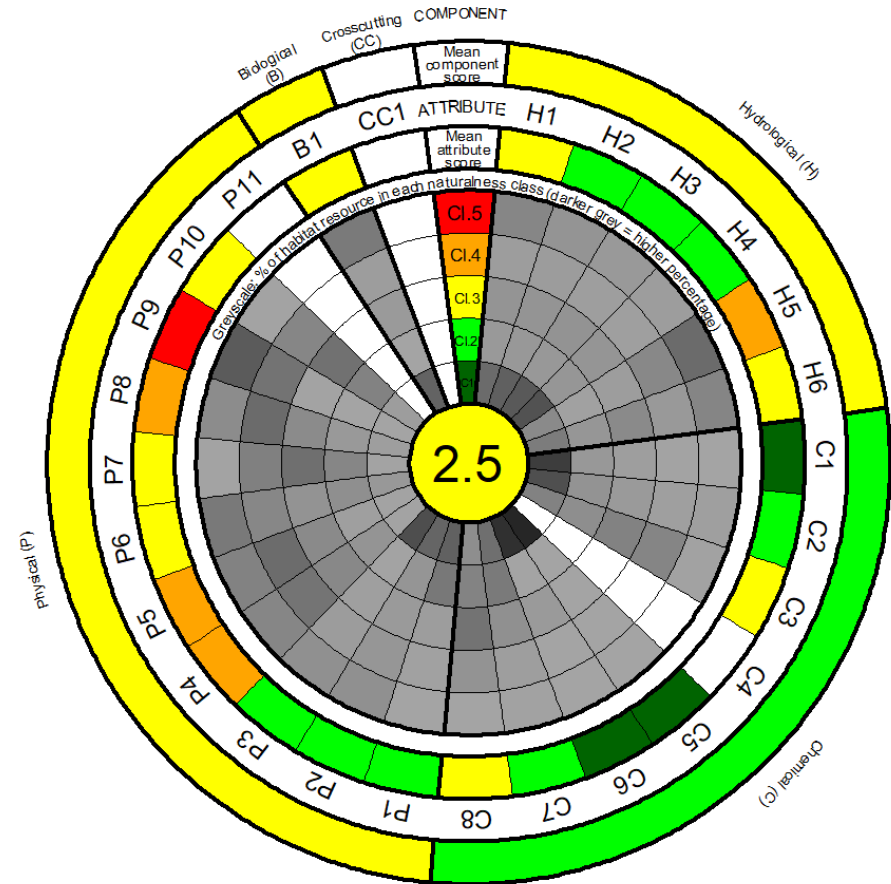
Comprises all naturally occurring watercourses with a catchment area of >10km², roughly equivalent to the entire river network excluding headwater streams. Rivers exhibit very large national variation in habitat character, from energetic to sluggish flows and from very high to very low alkalinity, with biological assemblages reflecting that variation.



Rivers (excluding headwater streams) continued

Click [here](#) for explanation of wheel diagrams

Code	Attribute	Status	Trend
H1	River flows at Q95	●	
H2	River flows at Q70	●	
H3	River flows at Q50	●	
H4	River flows at Q30	●	
H5	Flooding regime	●	
H6	Groundwater inputs	●	
C1	Ammonia	●	
C2	Dissolved oxygen	●	
C3	Phosphorus	●	
C4	Nitrogen	○	
C5	pH	●	
C6	Specific pollutants	●	
C7	Macroinvertebrates	●	
C8	Macrophytes and diatoms	●	
P1	Fragmentation	●	
P2	Impoundment	●	
P3	Strategic connectivity	●	
P4	Streampower	●	
P5	Channelisation	●	
P6	Habitat Modification Score	●	
P7	Flow Habitat Mosaic	●	
P8	Riparian Trees	●	
P9	In-channel woody debris	●	
P10	Riparian vegetation complexity	●	
P11	FBA physical assessment	○	
B1	Non-native species	●	
CC1	Native invertebrate assemblage	○	



Headwater streams

Brief description of status

Far less information is available on the headwater stream network than for larger rivers but available data indicate a mixed picture of impacts on naturalness. **Hydrological** attributes suggest impacts on natural flooding regime and groundwater inputs are substantial. **Chemical** attributes indicate considerable elevation of phosphorus levels (no data are available on nitrogen) and impacts on macroinvertebrate and plant assemblages. **Physical** attributes indicate widespread and substantial modification to natural processes, including interactions with trees. In terms of **biological** impacts on naturalness, non-native species are affecting considerable areas of the habitat resource although many parts still appear to be free of influence at present, helped by the more remote nature of many headwater streams.

Description of trends

No trends can be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, e.g. attributes relating to River Habitat Survey where earlier representative national surveys have been undertaken, and chemical attributes where historical versions of the WFD Reporting Database are available.

Confidence of assessment

The current assessment is judged to be **LOW CONFIDENCE** for various reasons. Some attributes are missing, others require refinement (e.g. Specific pollutants), and some impacts are not properly represented in the attribute list (e.g. siltation). Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes. See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Description of habitat resource

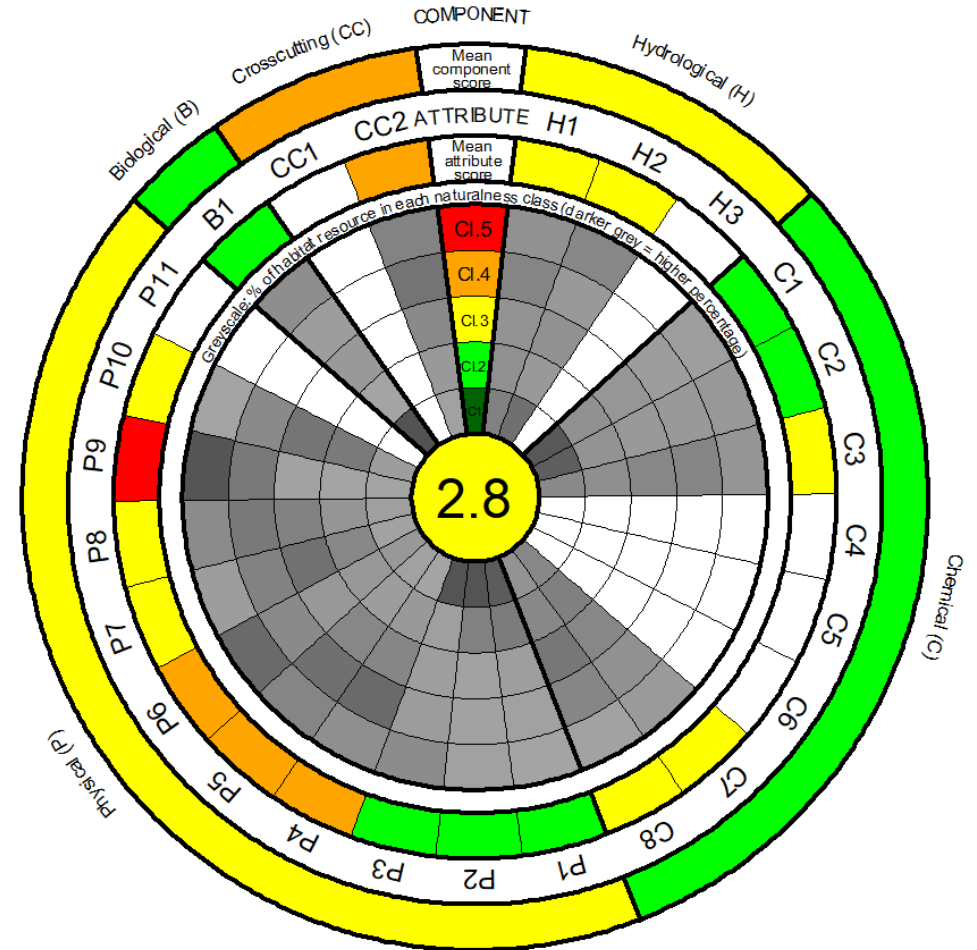
Intended to encompass all naturally occurring watercourses with a catchment area of <math><10\text{km}^2</math>, roughly equivalent to the headwater stream network (UK BAP definition of headwater streams is watercourses <math><2.5\text{km}</math> from source on a 1:50 scale map). Headwater streams constitute about 70% of the river network by length at 1:50,000 map scale and exhibit very large variation in habitat character, from energetic to sluggish flows, very high to very low alkalinity, and various levels of flow permanence.



Headwater streams continued

Code	Attribute	Status	Trend
H1	Flooding regime	●	
H2	Groundwater inputs	●	
H3	FBA hydrological assessment	○	
C1	Ammonia	●	
C2	Dissolved oxygen	●	
C3	Phosphorus	●	
C4	Nitrogen	○	
C5	pH	○	
C6	Specific pollutants	○	
C7	Macroinvertebrates	●	
C8	Macrophytes and diatoms	●	
P1	Fragmentation	●	
P2	Impoundment	●	
P3	Strategic connectivity	●	
P4	Streampower	●	
P5	Channelisation	●	
P6	Habitat Modification Score	●	
P7	Flow Habitat Mosaic	●	
P8	Riparian Trees	●	
P9	In-channel woody debris	●	
P10	Riparian vegetation complexity	●	
P11	FBA physical assessment	○	
B1	Non-native species	●	
CC1	Native invertebrate assemblage	○	
CC2	Catchment land cover	●	

Click [here](#) for explanation of wheel diagrams



Lakes

Brief description of status

There is a very mixed picture of impacts on naturalness. **Chemical** attributes indicate elevation of phosphorus and nitrogen levels, and impacts on macrophyte, diatom and fish assemblages. **Hydrological** attributes suggest greatest impact at outflows under low and very low flow, with relatively low impacts under moderate and high flow conditions. **Physical** attributes indicate broad and substantial modification to natural processes, particularly to emergent vegetation in mesotrophic and eutrophic lakes. In terms of **biological** impacts on naturalness,

Description of trends

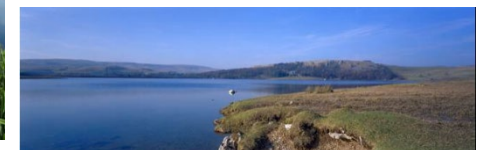
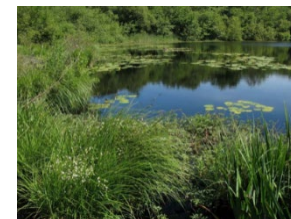
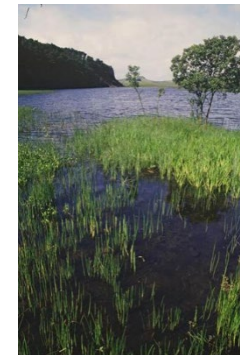
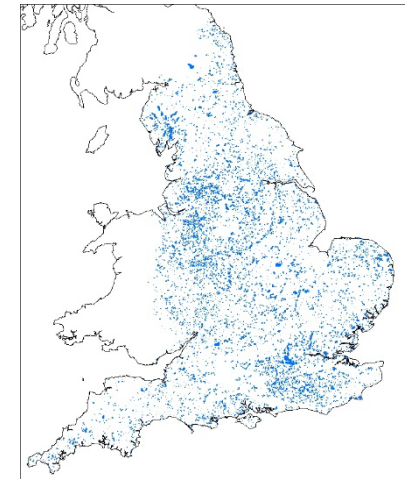
Trends in nutrient concentrations show a mixed picture over time, with some improvements due to programmes of discharge infrastructure resulting in reductions, future focus needs to be on smaller, more numerous and diffuse inputs. Other trends cannot be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, e.g. attributes relating to Lake Habitat Survey where earlier representative national surveys have been undertaken, and chemical attributes where historical versions of the WFD Reporting Database are available. Data portrayal, and therefore trend representation, will be limited until data are available from the Environment Agency's new lake surveillance programme (part of the NCEA programme).

Confidence of assessment

The current assessment is judged to be of **VARIABLE CONFIDENCE** for various reasons. Some attributes are missing and others require refinement (e.g. lake hydrology attributes). Historic datasets for standing waters are less comprehensive than for running waters, and tend to focus on larger and more modified water bodies. There is **GOOD CONFIDENCE** for chemical attributes including nutrients. Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes, and including improvements in monitoring for lake hydrological and biological attributes See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Brief description of habitat resource

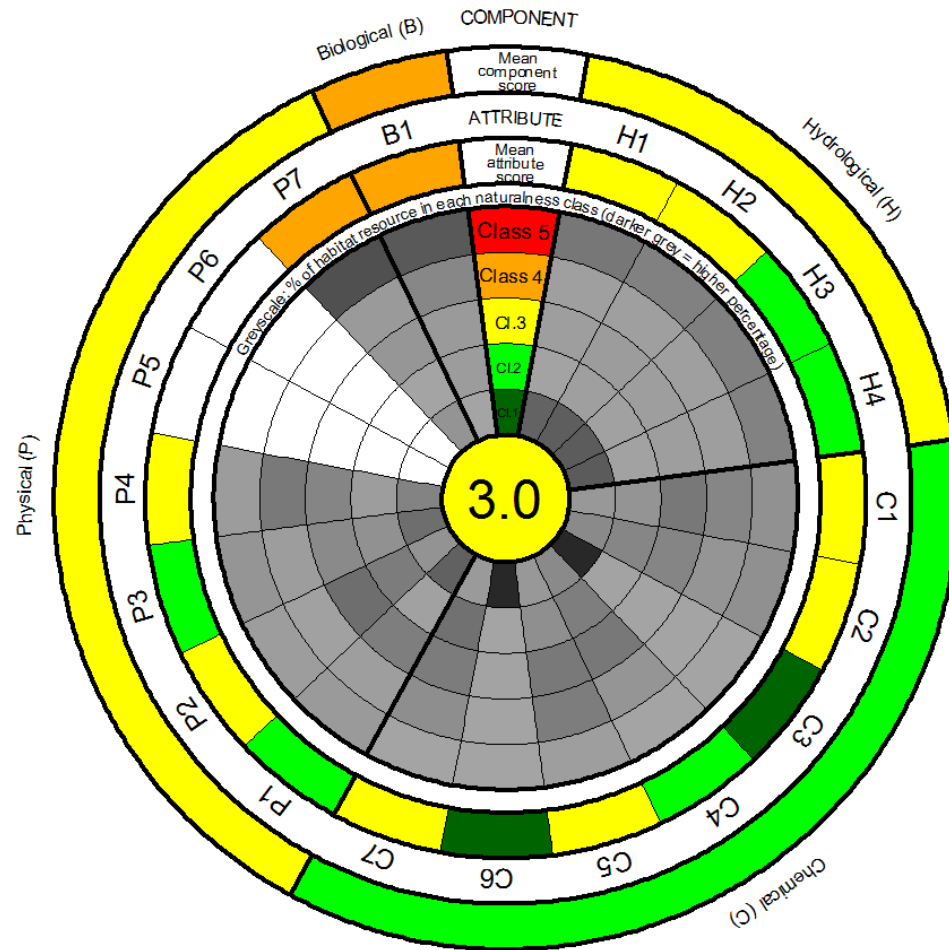
Comprises all waterbodies over 2 ha of both natural and artificial origin and includes the whole lake habitat resource for England, although distribution will not be even, as some areas will contain a greater proportion of a particular lake type than others. This is based on natural trophic type, not current state. Lakes exhibit national variation in habitat character, including a range of natural hydrological regimes and connectivity, depth, colour, alkalinity (trophic status), and acidity, with vegetation types and other biological assemblages reflecting that variation.



Lakes continued

Click [here](#) for explanation of wheel diagrams

Code	Attribute	Status	Trend
H1	Outflows at Q95	●	
H2	Outflows at Q70	●	
H3	Outflows at Q50	●	
H4	Outflows at Q30	●	
C1	Total Phosphorus	●	
C2	Total Nitrogen	●	
C3	ANC	●	
C4	Chlorophyll	●	
C5	Macrophytes and diatoms	●	
C6	Specific pollutants	●	
C7	Fish e-DNA	●	
P1	Hydrological structures	●	
P2	Artificial shoreline	●	
P3	Sediment fluxes	●	
P4	Riparian habitat	●	
P5	Riparian trees	○	
P6	FBA physical assessment	○	
P7	Marginal fringe emergent vegetation	●	
B1	Non-native species	●	



Ponds

Brief description of status

There is a mixed picture of impacts on naturalness, and there is current patchiness in the availability of pond data to make these assessments, including **hydrological** attributes, some physical and the cross-cutting connectivity attribute. Water quality is key to good quality pond habitat. **Chemical** attributes indicate elevation of phosphorus at more sites than nitrogen. The **physical** attributes shading and grazing intensity are based on the pond resource as a whole and not individual ponds and indicate more naturalness for shading with more impact on grazing. In terms of **biological** impacts on naturalness, there are impacts on the invertebrate and macrophyte assemblages as well as non-native species affecting considerable areas of the habitat resource.

Description of trends

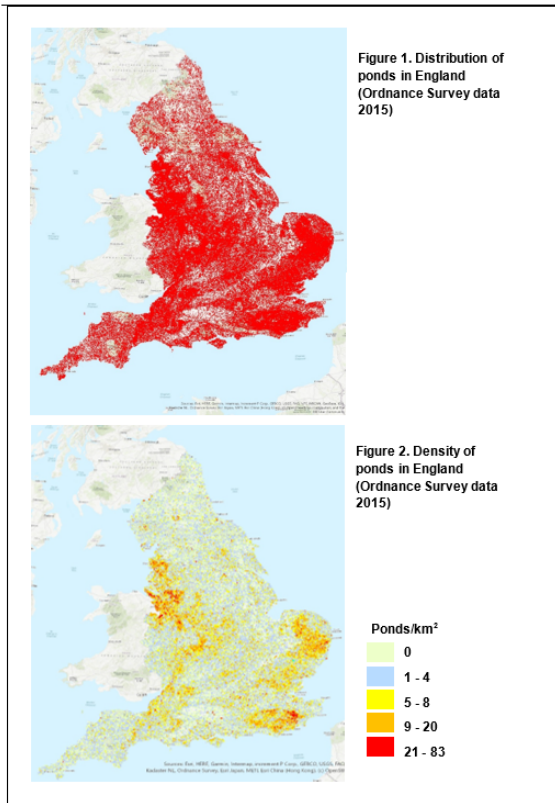
Historic data shows a declining trend in pond quality over time (including water quality and over shading). More detailed trends cannot be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, although this is more difficult for ponds where there is much less previous systematic data collection on all attribute classes, including chemical. Data portrayal, and therefore trend representation, will be limited until data are available from the Environment Agency's NCEA programme.

Confidence of assessment

The current assessment is judged to be of **VARIABLE CONFIDENCE** for various reasons. Some attributes are missing and others require refinement and development (e.g. semi-natural land use, non-native species). There is **HIGH CONFIDENCE** in previous datasets indicating the condition of ponds, although they did not cover all attributes and only cover a relatively small proportion of the habitat resource. Historic datasets for standing waters are less comprehensive than for running waters, and tend to focus on larger and more modified water bodies, with less systematic data collection for ponds. Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes. See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Brief description of habitat resource

Comprises all ponds under 2 ha of both natural and artificial origin, permanent or seasonal. Ponds are highly variable in character, both at a national and local level, from water chemistry to shading and permanence, and the species they support. Collectively ponds are critical to maintaining freshwater biodiversity, and density is a key factor in that. Approximately 20 % of ponds are priority habitat.



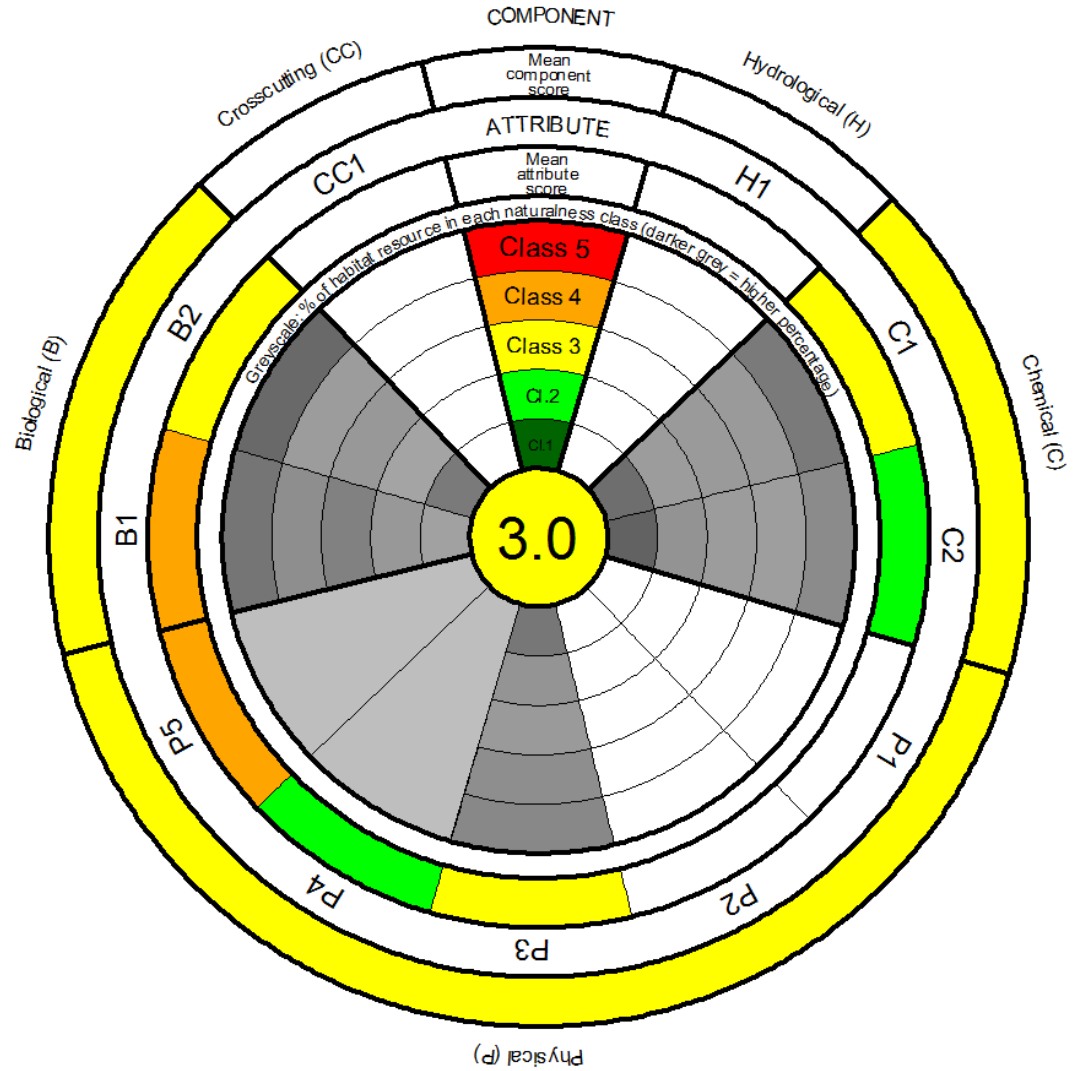
Maps courtesy of the Freshwater Habitats Trust



Ponds continued

Click [here](#) for explanation of wheel diagrams

Code	Attribute	Status	Trend
H1	Artificial influences	○	
C1	Phosphorus	●	
C2	Nitrogen	●	
P1	Natural pond base	○	
P2	Natural shoreline	○	
P3	Semi-natural land-use	●	
P4	Shading	●	
P5	Grazing intensity	●	
B1	PSYM	●	
B2	Non-native species	●	
CC1	Landscape connectivity	○	



Detailed assessment of detailed habitat types

Running waters	'Ranunculus rivers' (HD H3260)
	Chalk streams/rivers
	Active shingle rivers/streams
	High energy (Red List C2.2a)
	Moderate energy (Red List C2.2b)
	Low energy (Red List C2.3)
	Tidally influenced
	Temporary
Standing waters	Naturally dystrophic
	Naturally oligotrophic
	Naturally mesotrophic
	Naturally eutrophic
	Marl
Wetlands	Blanket bog
	Raised bog
	Base-rich fens
	Acidic/base-poor fens
Estuaries and coastal	Estuaries (HD 1130)
	Large shallow inlets and bays (HD1160)
	Permanently submerged sandbanks (HD1110)
	Inter-tidal sandflats and mudflats (HD1140)
	Reefs (HD1170)
	Atlantic salt meadows (1330)

Chalk streams/ivers

Brief description of status

Far less information is available on the headwater stream network than for larger rivers but available data indicate a mixed picture of impacts on naturalness. **Hydrological** attributes indicate greater impacts on natural flow regime groundwater inputs than seen in the river and stream network generally. **Chemical** attributes indicate considerable elevation of phosphorus levels (no data are available on nitrogen) and particular impacts on plant assemblages. **Physical** attributes indicate higher levels of physical modification than typical in the wider river network. In terms of **biological** impacts on naturalness, non-native species are affecting the majority of chalk rivers, although headwater chalk streams appear to be faring better.

Description of trends

No trends can be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, e.g. attributes relating to River Habitat Survey where earlier representative national surveys have been undertaken, and chemical attributes where historical versions of the WFD Reporting Database are available.

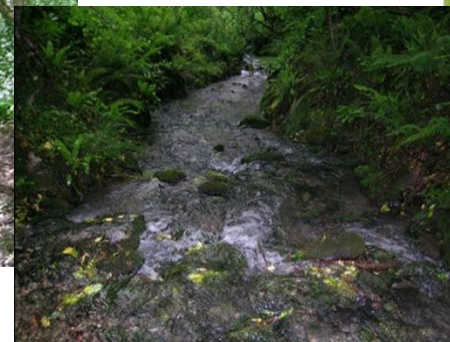
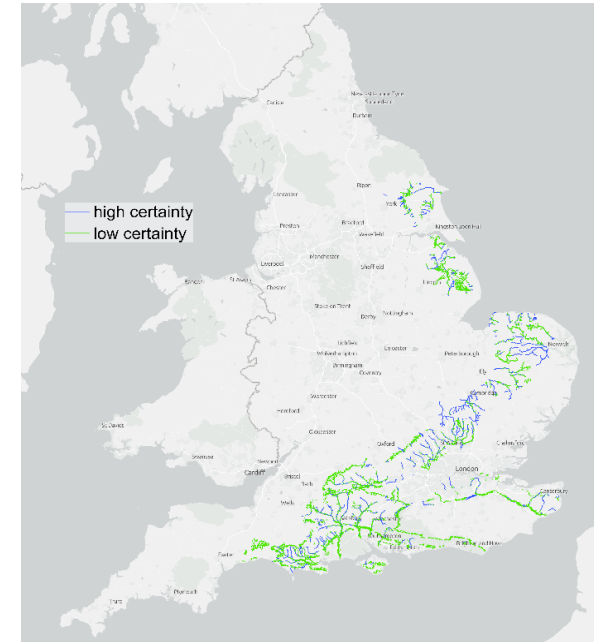
Confidence of assessment

The current assessment is judged to be **LOW CONFIDENCE** for various reasons. Some attributes are missing, others require refinement, and some impacts are not properly represented in the attribute list (e.g. siltation), and spatial filtering of datasets is somewhat coarse at present. The assessment of winterbournes is currently the same as all headwater chalk streams – a new predictive map of temporary streams will allow future differentiation. Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes. See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Description of habitat resource

Encompasses all natural watercourses with a dominant chalk character, including headwater perennial and seasonally flowing (winterbourne) streams. Distribution is based on a revised UK BAP layer constructed in collaboration with chalk stream partners and available for download [here](#). For this assessment the habitat resource has been restricted to watercourses with high certainty of being chalk streams/rivers. The map is subject to further refinement.

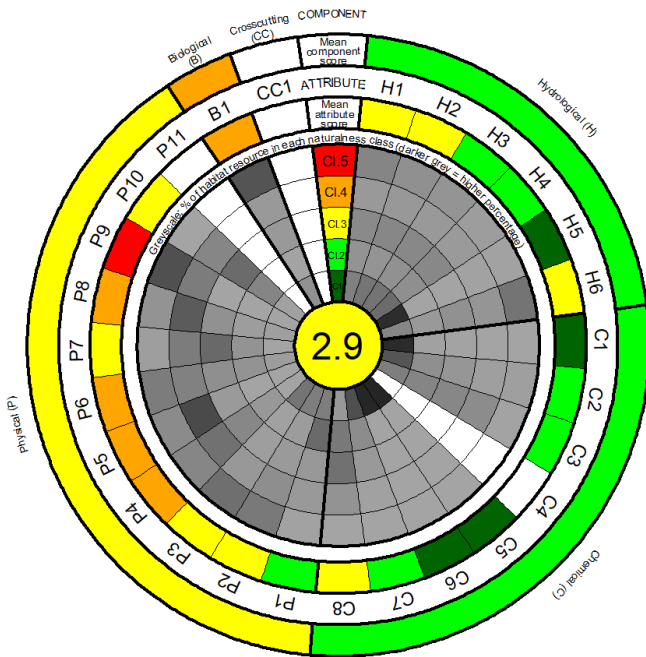
Naturalness component	Status		Trend	
	Rivers	Streams	Rivers	Streams
Hydrological	●	●		
Chemical	●	●		
Physical	●	●		
Biological	●	●		
Cross-cutting	○	●		



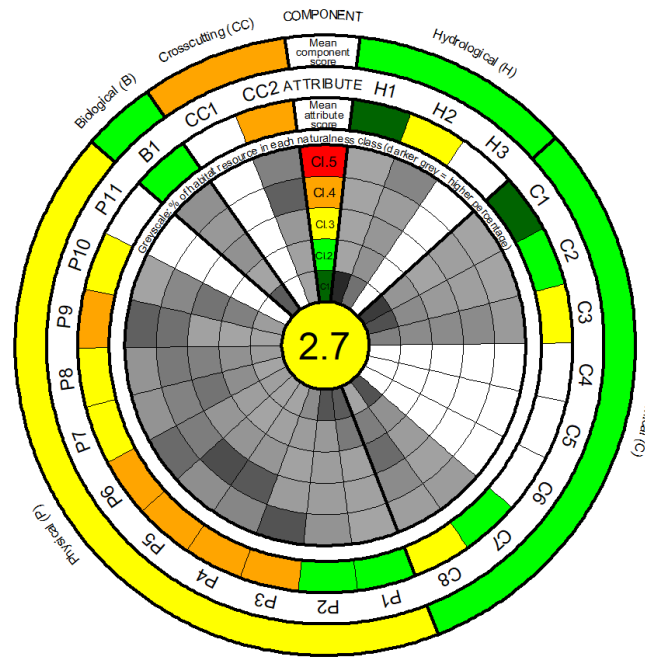
Chalk streams/ivers continued

Click [here](#) for explanation of wheel diagrams

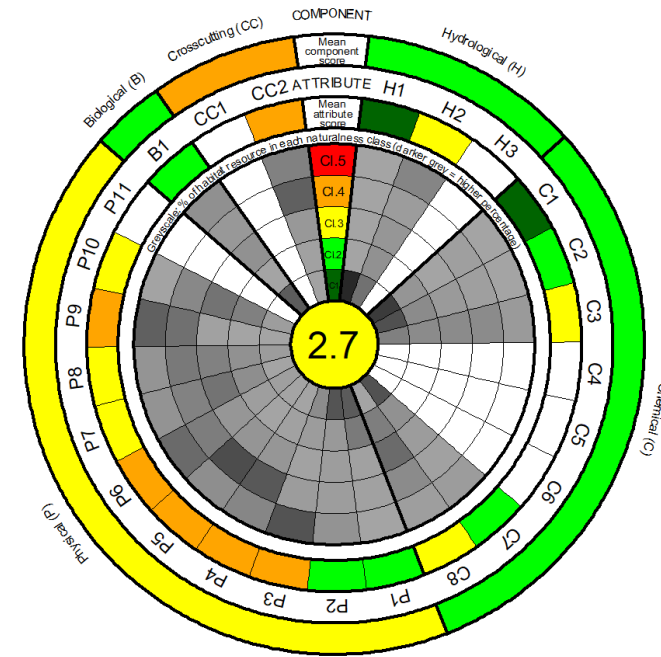
Chalk rivers (excluding headwater streams)



Headwater chalk streams



Winterbournes



Naturally oligotrophic lakes

Brief description of status

Naturally oligotrophic lakes exhibit very similar patterns of naturalness to the broad ecosystem lakes assessment. **Chemical** attributes indicate elevation of phosphorus levels, and impacts on macrophyte, diatom and fish assemblages. **Hydrological** attributes suggest greatest impact at outflows under low and very low flow, with relatively low impacts under moderate and high flow conditions. **Physical** attributes indicate broad and substantial modification to natural processes, particularly to emergent vegetation in mesotrophic and eutrophic lakes. In terms of **biological** impacts on naturalness, non-native species are affecting considerable areas of the habitat resource.

Description of trends

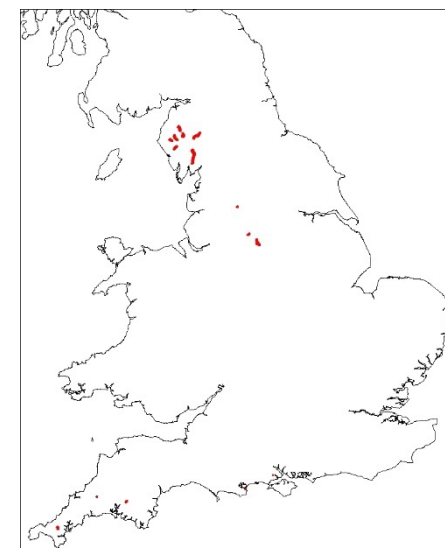
Trends in nutrient concentrations show a mixed picture over time, with some improvements due to programmes of discharge infrastructure resulting in reductions, future focus needs to be on smaller, more numerous and diffuse inputs. Other trends cannot be displayed at this time. Historical data exist for some attributes which could be processed for trend analysis, e.g. attributes relating to Lake Habitat Survey where earlier representative national surveys have been undertaken, and chemical attributes where historical versions of the WFD Reporting Database are available (although more limited for naturally oligotrophic lakes than the broad lakes habitat resource). Data portrayal, and therefore trend representation, will be limited until data are available from the Environment Agency's new lake surveillance programme (part of the NCEA programme).

Confidence of assessment

The current assessment is judged to be of **VARIABLE CONFIDENCE** for various reasons. Some attributes are missing and others require refinement (e.g. lake hydrology attributes). Historic datasets for standing waters are less comprehensive than for running waters (particularly when assessing more detailed habitat types such as naturally oligotrophic lakes), and tend to focus on larger and more modified water bodies. There is **GOOD CONFIDENCE** for chemical attributes including nutrients. Future confidence will depend on a combination of factors, including the spatial coverage/density of sites for attributes served by representative surveillance programmes, and including improvements in monitoring for lake hydrological and biological attributes See Part 3 of the Information pack for detailed information on the robustness of individual attributes.

Brief description of habitat resource

Comprises naturally oligotrophic lakes (over 2 ha) of both natural and artificial origin. Distribution is clustered and predominantly split into upland and lowland. This is based on natural trophic type, not current state, with those lakes in the lowlands being more impacted than those in the uplands. The habitat resource is limited to Cumbria and the New Forest, Cheshire, Dorset and Somerset



Naturally oligotrophic lakes continued

Click [here](#) for explanation of wheel diagrams

Code	Attribute	Status	Trend
H1	Outflows at Q95	●	
H2	Outflows at Q70	●	
H3	Outflows at Q50	●	
H4	Outflows at Q30	●	
C1	Total Phosphorus	●	
C2	Total Nitrogen	●	
C3	ANC	●	
C4	Chlorophyll	●	
C5	Macrophytes and diatoms	●	
C6	Specific pollutants	●	
C7	Fish e-DNA	●	
P1	Hydrological structures	●	
P2	Artificial shoreline	●	
P3	Sediment fluxes	●	
P4	Riparian habitat	●	
P5	Riparian trees	○	
P6	FBA physical assessment	○	
P7	Marginal fringe emergent vegetation	○	
B1	Non-native species	●	

