Lake Naturalness Assessment Guidance

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Acknowledgements

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Purpose

This assessment system has been developed to allow all stakeholders to contribute to our understanding of the naturalness of lakes in England. Data collected using this system will be used to periodically update the priority lake habitat map for England, and will also be used in discussions to update the associated map of lake restoration priorities. Over time these national maps will more accurately reflect local circumstances and priorities. Whilst the biggest data gap is for small lakes this assessment can still be applied to larger lakes.

Naturalness classes

The main part of the assessment involves assigning a naturalness class to the four elements of lake functioning;

- physical
- hydrological
- chemical
- biological

Coming to a judgement on which class best describes the lake you observe may involve looking at a variety of things in the lake. You may find some elements trickier than others or you might only observe some aspects on your visit. **Don't worry if you can only fill in part of the form, the important thing is to contribute what you can to the data portal.** Do not feel you have to have observed everything described in the class descriptions. All observations help to build a picture of the lake and by putting different people's information together we can see the big picture. So please just contribute what you can, be that everything or information on a few aspects.

Describing the level of confidence in your assessment

A simple 3 class system is used to describe how certain you are about your assessment of each naturalness component.

- **High** – Very confident that the naturalness class description reflects the naturalness of the lake.
- **Moderate** – Fairly confident that the naturalness class description reflects the naturalness of the lake.
- **Low** – Not confident that the naturalness class reflects the naturalness of the lake.

Timing of visits

Assessments can be based on visits at any time of the year, and data collected at any time of the year is valuable. However, some elements of the assessment may be easier to undertake at certain times, and this may alter the confidence you have in your results. You record the date of your visit in cartographer with the rest of your assessment, so we can take that into account. If you want to increase the confidence in your judgements you can also make multiple visits to the same site to inform your assessment. If you want to know the best time of year to observe particular elements of the lake here is a quick guide:

- The best time to look at aquatic plants is from June to the end of September
- You are most likely to observe algal blooms from March to October
- Water chemistry tests are most representative when undertaken in winter or early spring.
- Natural fluctuations in water-level are most easily observed in summer, when levels tend to be lower.

How much of the lake do you need to visit?

The assessments are made for the lake as a whole, so if you only visit a small part of a lake this may alter your confidence assessment, but all information even if you only have access to a small part of the lake is valuable. When it is difficult to access and/or observe a whole lake it may be useful to have a look at aerial photographs online such as those in google earth to inform your judgement. The important thing is to contribute your judgement and record how you have done this.

The naturalness components

<u>Physical naturalness</u>

The physical naturalness component considers any artificial shorelines, the morphology (shape) of artificial lakes and their capacity to support wildlife and the riparian (lake side) land use. For the purpose of these assessments riparian land is considered as the land from a lakes high water line to 10m away from this. Lakes with naturally fluctuating water levels may have bare shorelines in summer or marginal fringes often composed of reeds, but it is where these end and the fully terrestrial land begins which is the start of the riparian land. In the physical naturalness assessment the proportion of this which is semi natural is referred to. A list of semi-natural habitats is provided in Table 1.

Identifying semi-natural habitats is relatively easy, perhaps with the exception of grasslands. The difference between improved and unimproved grasslands is not whether they are grazed or not, but whether additional nutrients have been applied. Consequently improved grasslands are often brighter green, continuing through winter, and they tend to have fewer species. Plantations can be distinguished from semi-natural woodlands in that the trees are planted in lines with equal distances between the trees, which are the same age and therefore size and often all the same species.

Table 1 Semi-natural habitats

Semi-natural	Not semi-natural
Semi-natural woodlands	Arable
Unimproved grassland	Improved grassland
Fen - marsh - flush	Roads tracks paths
Rank (tall non-woody) vegetation	Urban - buildings - gardens
Heathland -moorland	Orchard
Bracken	Plantations
Ponds - lakes	Recreational parks
Streams - rivers	
Rock -stone - gravel	
Coastal habitat	
Scrub and Shrub	

A single naturalness class is required for the physical naturalness component. To help you form a judgement of what that should be the table below splits physical naturalness into three sub-categories that you can consider, you only need to consider lake morphology if it is an artificial lake e.g. a gravel pit. When assigning your final class assign the lowest class rating from all the physical naturalness sub-categories you have assessed. For example if a natural lake was class 2 for shoreline modification but class 1 for riparian land use, the overall physical naturalness class would be 2 as that is the lowest class that had been assigned across the sub-categories.

Table 2 Physical naturalness class descriptions

Class	Physical naturalness		
	Sub-categories		
	Shoreline condition	Riparian land up to 10 m from high water mark	Lake morphology if artificial
1 Natural	No evidence of human physical modifications of the shoreline. A marginal fringing wetland is likely, particularly in lowland lakes.	Riparian land is all semi-natural.	The edges shelve gently allowing colonisation by plants
2	Physical modifications of limited spatial extent - no more than 5% of shoreline. A marginal fringing wetland is likely, particularly in lowland lakes	Riparian land is predominantly semi-natural (90%).	Colonisation by plants should be possible at least 10m from the edge
3	Physical modifications and non-natural riparian land use of moderate spatial extent – no more than 1/3 of the shoreline. Marginal fringing wetlands are restricted in perimeter extent and depth.	Riparian land semi-natural for at least 2/3 of its extent	Colonisation by plants should be possible at least 3m from the edge.
4	Physical modifications extensive up to 2/3 of the shoreline	Riparian land semi-natural for at least 1/3 of its extent	The edges may be steep resulting in little habitat that can be colonised by plants. Only a very narrow strip of emergent, floating or submerged plants may exist.
5 Least natural	Modification of the shoreline is widespread with more than 2/3 of the shoreline reinforced. Marginal fringing wetlands are absent.	Riparian land semi-natural for less than 1/3 of its extent	If the site is artificial the edges may be steep resulting in little or no habitat that can be colonised by plants. Only a very narrow strip of emergent, floating or submerged plants may exist.

Hydrological naturalness

Hydrological naturalness includes considerations of the ability of the water level to fluctuate naturally, abstractions, alterations to inflows and outflows and hydrological integrity of the surrounding land. This is likely to be the hardest element to assess as it may be difficult to determine water level fluctuations, including extent of drawdown, without repeat visits. Annex III includes information and pictures to help detect water level fluctuations. The presence of structures controlling water levels, be they weirs, sluices or dams, can be relatively easily observed, as can the presence of a fish pass to make them passable by fish. The river obstacles app whilst designed for rivers allows you to report the presence of obstacles on lake outflows and the data is collated by the EA. Changes to inflows and outflows and the presence of ditches draining surrounding land can be observed on the ground, modified inflows and ditches are suspiciously straight. Ditches and drains can also be observed on OS maps and aerial photos and changes in lake extent can be detected by looking at historical maps. Due to the difficulty involved in observing hydrological naturalness the confidence of assessments may be low, but as before, any information helps to draw a picture of the lake.

As a single naturalness class is required for the hydrological naturalness component, be guided by the worst performing sub-category. So if you assigned class 2 for structures and water level fluctuations, but inflows and outflows are assigned class 3 due to the ditches entering the lake the overall hydrological naturalness class should be a 3 as the lowest performing sub-category.

Table 3 Hydrological naturalness class descriptions

Class	Hydrological naturalness		
	Sub-categories		
	Structures	Water level fluctuations	Inflows and outflows
1 Natural	No structures affecting water levels or creating barriers	Natural seasonal water level fluctuations are expected.	Any inflows and outflows are natural, the surrounding land is not drained and ditches are absent.
2	Structures such as sluices and impoundments may be present, but are passable to most fish species, most of the time. This may be due to the presence of a fish pass or because the structure does not present an insurmountable obstacle.	Water levels naturally fluctuate or mimic a naturally fluctuating regime in a seasonal fashion (water levels higher in winter than in summer) and only moderate in extent. This may occur via active management of the water levels or naturally behind a structure if water levels can fall below its height in summer.	No additional ditches enter the lake, but inflows and outflows may have some modifications
3	A structure is present which is impassable to most fish species, most of the time	Water levels fixed and unable to fluctuate naturally.	Outflows may have been modified to reduce lake extent. Alternatively surrounding land may have been drained with ditches forming artificial inflows
4	Large impassable (all fish species, at all times) structure is present	Water levels are heavily depleted by abstraction resulting in considerable drawdown (but by less than 2m depth).	
5 Least natural	Very large impassable structures present	Drawdown of more than 2m depth annually.	Lakes in this category are likely to be water supply reservoirs or part of hydro-electric schemes.

Chemical naturalness

The most accurate way to determine chemical naturalness is to undertake repeat water sampling throughout the year, but this is not available for all lakes. Instead a range of techniques and observations can be used to form a judgement about chemical naturalness. The most common impact on chemical naturalness is nutrient enrichment, which leads to increases in algal growth. Consequently most of the methods to assess this involve either observing algal growth or assessing water clarity which deteriorates with algal growth and sediment loads. Direct chemical water quality testing can also be used when resources are available. All of these different ways of looking at chemical naturalness help build a picture of the lake, so you can chose whichever one fits with your knowledge and experience, equipment or ability to access a lake. If you wish to use a combination of methods to come to a judgement that is also fine.

Water clarity

At this point it must be noted that there are some lakes which naturally have peat stained water, so the water is less clear and the plants distribution is limited because of this. You can tell the difference because peat stained water bodies and those with water quality problems because the former tend to look like the colour of tea (before you add the milk) whereas those with sediment issues are a more opaque brown (see Annex IV). Additionally, not surprisingly, peat stained waters only occur in peaty catchments. If you have a lake of this type the water clarity indicators cannot be applied.

There are a range of ways of looking at water clarity, feel free to use any that are available to you. One way is to use a Secchi disc, you lower this into the water and record the depth at which you can no longer see it. Because this requires letting the disc go quite deep into the water, this method is only really possible if you go out in a boat or dangle it into deep water off a structure like a jetty. You can also just look through the water or fill a clear plastic bottle with water and look at how coloured it is or put a white-painted stick in the water and see at what depth you can see it.

Submerged plant distribution

A similar method is to look at the maximum depth at which plants can grow, this gives a similar picture to the Secchi disc method and you still need access to deep water. It can be more reliable than a Secchi disc because the plants will be responding to the conditions throughout the growth season and not just reflect the conditions on the day you visit. You would want to know the maximum depth of submerged plants, so you would need to throw a plant collecting device such as a grapnel to see if plants were present.

In addition class 3 describes a situation when only plant species indicative of nutrient enrichment are present, typical submerged species indicative of nutrient enrichment are fennel leaved pondweed, horned pondweed, rigid hornwort and nuttall's waterweed.

Presence of algae

Algae can take many forms and can be present for varying lengths of time. When we are looking at algae as an indicator of poor water quality, we do not include the stoneworts, which are a structurally complex algae that look more like higher plants and are indicators of good water quality

(see Annex IV). The rest of the algae can be considered, these may colour the water, form scums on top of the water, join together in colonies, grow over the surfaces of rocks or plants, or even form tufts, balls and hair like strands. The abundance of algae depends on nutrient conditions, but also climatic conditions and consequently blooms can be relatively short lived. Consequently if you visit a lake once and don't observe much algae, and that is your only assessment of water quality, your confidence in this assessment will be quite low. If you do see algal growth your assessment confidence may be moderate.

Species indicative of nutrient enrichment

The presence or absence of various species can also be used as indicators of water quality. You are more than welcome to use these to inform your judgement.

Water quality tests

Single use water quality tests are increasingly available and are being used for a range of conservation projects. If these are available to you they are an excellent way to inform the assessment of chemical naturalness. They are best used in winter or early spring before the nutrients are locked up in the algae and plants.

A single naturalness class is required for the chemical naturalness component, the different methods for looking at this should draw a similar picture. Use which ever method suits you best. If you do use multiple methods, assign the chemical naturalness class based on the worst performing method.

Table 4 Chemical naturalness class descriptions

Class	Chemical naturalness			
	Method			
	Water clarity	Algae	Submerged plant distribution	Water quality or biological sampling
1 Natural	The lake substrate or Secchi disc will be visible through > 3m of water.	Algal growth of any type will be negligible	Submerged plants will grow to at least 3m depth or the max depth of the lake if it is less than 3m and wherever the substrate is not too coarse to enable plant growth	Water quality test kits do not register any positive results. Biological sampling indicates no evidence of pollution
2.	The lake substrate or Secchi disc will be visible through >1 ≤ 3m of water.	Noticeable algal growth may occasionally occur particularly in lowland lakes, but this will not be persistent or widespread. Filamentous and epiphytic algae will be rare.	Submerged plants may be limited to a depth of less than 3 m but greater than 1 m.	Water quality test kits register positive results but at low concentrations. Biological sampling indicates low levels of pollution
3	The lake substrate or Secchi disc will be visible through >50 ≤1m of water. Water maybe clear at certain times of the year but not others.	There may be moderate extent of filamentous algae and algal blooms may occur particularly in spring and autumn, but will not be persistent. Plants may have a heavy epiphytic burden.	Some submerged plants will be present but these are unlikely to be abundant or grow to great depths unless they are species tolerant of nutrient enrichment. Alternatively there may be an abundance of submerged plant growth early in the growth season but this will have crashed by August.	Water quality test kits register moderate levels of pollution. Biological sampling indicates moderate impacts on water quality.
4	Water will be brown or green. The lake substrate or Secchi disc will be visible through >25≤50cm of water.	There may be frequent algal blooms or large extents of filamentous algae.	Submerged plants will be very sparse if present	Water quality test kits register high levels of pollution. Biological sampling indicates high impacts on water quality
5 Least natural	Water will be brown or green. Unable to see the bottom under 25 cm of water..	Frequent algal blooms. There may be extensive filamentous algae.	No submerged plants are present.	Water quality test kits register very high pollutant concentrations. Biological sampling indicates major pollution issues

Biological naturalness

Biological naturalness refers to the presence of non-native species. You may observe these on your visit directly or know of their presence due to reports or online databases. In some instances signs have been erected to inform visitors about the presence of these species and anglers are an excellent source of information on the fish in a lake. The plant species are the easiest to spot, but if you know about animal species this information should be included too. If you have observed an invasive species, but have not undertaken a search for others you can assign the class which best relates to the species you have observed, but give it low confidence. Guidance on identifying the most invasive non-native plant and animal species is provided on this website and in the mobile phone apps PlantTracker and AquaInvaders. Although it is of note that the latter does not include carp, which is a very widespread non-native species in lakes with well-known implications for water quality and biodiversity so is worthy of consideration.

A single biological naturalness class is required. If you have just observed plants or just observed animals that is fine, if you have observed both base the biological naturalness class on the total extent of invasive species.

Table 5 Biological naturalness class descriptions

Class	Biological naturalness	
	Non-native plant species	Non-native animal species
1 Natural	No evidence of non-native species in the lake or on the riparian land.	No evidence of non-native species in the lake or on the riparian land.
2	Non-native plants should occupy no more than 5% of shoreline or lake area.	Non-native animals should rarely be encountered and not be creating an obvious impact. For some species such as carp their impact may be more easily spotted than the individuals. When the water is constantly a muddy opaque brown, only floating plants remain and there is no other form of sediment disturbance such as boat traffic, carp are likely to be the cause.
3	Non-native plants occupy up to 25% of the shoreline	At least one non-native animal found when appropriate search technique is used.
4	Non-native plants occupying up to 60% of the shoreline	Multiple non-native animals found when searched for.
5 Least natural	Non-native plants occupying more than 60% of the shoreline or lake area	Non-native animals are numerous, individuals found with little effort.

Supplementary information

a) Photographs

Photographs of the lake will help us to understand your assessment. Take at least one photograph of the lake, preferably including the open water and the riparian zone. This can be difficult, especially in large lakes, in which case take two. Other photographss can focus on particular features of the lake, e.g. water quality, non-native species or hydrological modifications.

b) Notes

Provide a short description in relation to each naturalness component, drawing attention to any particular features of interest, impacts of concern, or difficulties with the assessment.

c) Plant functional groups

The presence of different plant functional groups can tell us quite a lot about a lake and it is easier to identify a plant functional group than individual species. You do not need to undertake an extensive plant survey, just record what you observe when you visit a lake. If that is from a boat using a grapnel that is great, but you can also record what you observe from the shoreline. Many plants are washed up on the shoreline and are a useful source of information on what is in the rest of the lake.

- **Rosette forming short stiff leaves**
  Plants with short stiff narrow tapering leaves joined together at the base e.g. shoreweed, water lobelia and quillwort.
- **Floating leaved and rooted**
  Plants are rooted in the lake bed and the leaves lie flat on the water surface, the leaves can be any shape. Examples include water lilies and floating bur-reed.
- **Free floating**
  Plants are not rooted in the lake bed, they may float on the water surface or below it e.g. duck weeds.
- **Submerged linear leaves**
  Plants are rooted to the lake bed, the plant is predominantly submerged although the upper parts may reach the surface. The leaves often look grass like in their dimensions and shape e.g. small pondweed and horned pondweed.
- **Submerged broad leaves**
  Plants are rooted to the lake bed, the plant is predominantly submerged although the upper parts may reach the surface e.g. clasping-leaved pondweed and waterweeds
- **Submerged fine/dissected leaves**
  Plants are rooted to the lake bed, the plant is predominantly submerged although the upper parts may reach the surface. The ‘leaves’ are very fine and may be branched, e.g. fennel leaved pondweed, stoneworts and water milfoils.
- **Emergent broad leaves**
  Broad-leaved plants rooted to the lake bed with leaves and flowers held above the water level. The leaves do not look like blades of grass and if you look carefully the leaf veins branch in different directions. E.g. fool’s watercress and bogbean.
- **Emergent narrow leaves**

These are rooted to the lake bed and the narrow leaves and flowers are held above the water. The leaf veins don't branch and all go in one direction. This includes reeds, sedges , rushes and horsetails.

- **Filamentous algae**
  These are algae that grow as long threads that can interweave to form a mat that resembles wet wool. It can grow attached to substrates or floating.

d) Species of interest

Recording species is not essential, but helps us to draw a picture of the lake you have visited. A list of relatively widespread and easy to recognise species are included on the form. A further list of species is available in annex VI, these species are less widespread and may require considerable practice or specialist expertise, particularly mosses and invertebrates. If you can identify any of these species please do record your observations and submit them to irecord, but don't worry if you can't. We will use the data to help demonstrate the importance of lake naturalness to both characteristic and rare/threatened species.

e) Habitat features

In assessing the physical and hydrological naturalness you will have considered these habitat features. This section allows you to record more specific information on rarely monitored habitat features, it will help us to understand the situation across England and, over time, understand trends in these features. You may observe these whilst visiting the lake or from maps and online resources such and google earth.

- **Shoreline modification**
  This includes any of the shoreline that has been altered, often through reinforcing the banks and building structures.
- **Riparian zone up to 10m from the bank edge**
  The same definition of the riparian zone and semi natural habitat is used as described under the physical naturalness assessment.
- **Perimeter trees**
  This describes the extent of trees that are on the lake edge, so it is the percentage of the lake perimeter where trees are present, regardless of whether they are scattered, in a thin line or part of an extensive woodland.
- **Fringing marginal emergent vegetation**
  This describes the extent of any emergent vegetation as a percentage of the lake perimeter. In most lowland lakes this will easily be observed as tall reeds. In more upland situations it may be less obvious but some emergent vegetation may still be present, such as rushes.
- **Number of ditches**
  This is a count of the number of ditches draining into the lake. This can often be observed on a map, but additional ditches may be found if you are able to walk around the perimeter of the lake.
- **Presence of any outflow structures**
  This can include weirs, sluices, dams or any other structure.

List of annexes

Annex I – Printable lake naturalness survey form to use in the field

[See separate file]

Annex II – Physical naturalness photographs

[See separate file]

Annex III – Hydrological naturalness photographs

[See separate file]

Annex IV – Chemical naturalness photographs

[See separate file]

Annex V – Plant functional groups photographs

[See separate file]

Annex VI – Further species recording

[See separate file]