Priority Pond Assessment Manual

© Freshwater Habitats Trust
Oxford
2023

For further information please contact:
Freshwater Habitats Trust
Bury Knowle House
North Place
Headington
Oxford, OX3 9HY

This report should be cited as:

Biggs J, Williams P. 2023. Priority Pond Assessment Manual. Freshwater Habitats Trust, Oxford.

Acknowledgements

Ruth Hall (Natural England) created the idea for the Priority Pond Assessment system. The development was undertaken as partnership between Freshwater Habitats Trust and Natural England as part of the Natural Capital and Ecosystem Assessment Programme (NCEA).

Contents

1 Introduction

1.1 Overview

The **P**riority Pond **Ass**essment (PASS) system has been developed to provide a way to rapidly identify whether a pond is likely to qualify as a priority pond (now a 'habitat of Principal importance').

The system uses physical variables, such as the land use around the pond, to predict whether the pond would be likely to have priority status if it was surveyed using the biological criteria traditionally used to identify priority ponds (BRIG 2008).

PASS can be used to assess ponds in mainland England and Wales and the Isle of Wight, using survey data collected during the period from early Summer (mid June) through to early Autumn (early October), i.e. the period when most wetland plants are visible in ponds.

The method requires data for the following environmental metrics to be collected during a summer field survey of the pond:

- **Grid reference**
- **Shade**
- **Inflow**
- **Isolation**
- **Plant cover**
- **Grazing**
- **Surrounding land use**

A fieldsheet for collecting PASS data is provided in Annex 1. Support for recording PASS variables is given in Section 4.

Method development for PASS was undertaken as a partnership project between Freshwater Habitats Trust and Natural England as part of the Natural Capital and Ecosystem Assessment Programme (NCEA).

1.2 Why was the method developed?

The UK Biodiversity Action Plan (UK BAP) identifies high quality ponds as priority habitat type. The criteria for identifying priority ponds, originally developed in 2008, generally requires a field survey of the species present in the pond[1]. Skilled and trained surveyors need to undertake this survey which restricts the potential to identify these habitats. As a result, relatively few priority ponds have been identified, simply because insufficient ponds have been surveyed by sufficiently experienced surveyors.

PASS has been developed to increase the accuracy of mapping of the priority pond resource, by making priority pond identification simpler, and more accessible. This will allow larger numbers of ponds to be identified, helping to protect these sites and better understand their distribution.

Method development

PASS was developed using similar approaches to Freshwater Habitat Trust's PSYM system (the Predictive System for Multimetrics). Discriminant Analysis, was used to create an algorithm that predicts the probability of a pond being either a priority or non-priority habitat.

The data used to create the model were drawn from the National Pond Survey database, with approximately half the ponds minimally impaired and half variably degraded waterbodies. The data for each pond included standard surveys of wetland plants, aquatic macroinvertebrates and a wide range of physical and chemical variables. More detailed information is given in Biggs et al. (2005).

The priority status of 298 ponds was assessed on the basis of priority pond criteria 1-4 (BRIG 2008). Discriminant Analysis was undertaken using predictive variables suitable for measurement by non-specialists. Specifically, physical attributes that:

- are simple and quick to measure
- require no specialist equipment
- are potentially identifiable from maps or aerial images.

Water chemistry variables were avoided because, at minimum, they require equipment such as pH meters and nutrient test kits.

The probability of the sites being classified into priority or non-priority pond categories took account of the expected real-world probability of ponds being priority habitats (i.e. c20%). The *a priori* probability of a site being a priority pond was therefore adjusted to 0.2 vs 0.8 priority to non-priority probability.

The final set of environmental attributes used to predict priority status is listed in Section 1.1. Using these variables, the algorithm is expected to correctly predict:

- 58% of priority ponds
- 97% of non-priority ponds

In developing the algorithm, we deliberately took an approach that errs on the side of caution by minimising false positives at the expense of false negatives. Hence, although the algorithm will miss around 42% of waterbodies that would classify as priority ponds using biological measures, it should make few errors by falsely identifying a non-priority pond as a priority pond. The low level of false positives is important to ensure that when the algorithm predicts that a pond has priority status, this prediction is highly credible.

It is important to state that the algorithm should be seen as an adjunct to biological measures for assessing priority ponds, not a replacement. No prediction methods will ever be completely successful at identifying priority ponds and, particularly where ponds are under threat, expert-based biological surveys will remain essential.

There is a risk that when a pond that is evaluated, and PASS predicts it does not have priority status, then that pond is dismissed on this basis alone. It is important that this is not the case. Hence a negative result does not mean the pond does not have priority status, but that further biological assessments need to be carried out to assess whether it is a priority pond.

2 Assessing priority ponds using PASS

2.1 What is a pond?

The definition of a pond used here is: *a body of standing water between 1m^2 and 2 ha in area which hold water for at least 4 months of the year.*

2.2 Which waterbodies can be assessed using PASS?

PASS can be used for a wide range of pond types. This includes permanent ponds and most seasonal ponds (i.e. ponds that dry up for part of the year). Note, however, that the database that underlies the PASS algorithm includes few *highly* seasonal ponds which dry for long periods (e.g. more than 6 months of the year). Predictions for highly seasonal ponds may, therefore, underestimate their value.

2.3 Survey timing

PASS should be applied to data collected during the summer period (Mid June to early October), because it relies on an assessment of plant cover which can only be evaluated adequately during this period.

3 Field data collection

3.1 Defining the pond boundary and the winter water line

Identifying the 'outer edge' of the pond is important for calculating many of the survey metrics.

In all cases, the definition of pond 'outer edge' is 'the upper level at which water stands *when the pond is full'* i.e. water levels are at their highest (excluding flooding events after heavy rainfall). Normally this is the level at which water sits in late winter or early spring, so when you visit apond in summer, the water level will usually be lower than the outer boundary, and you will need to determine where it lies.

Clues to finding the maximum water level (the winter water line)
Change in vegetation is usually the most reliable way to determine the winter water line; marked by a distinct change from wetland plants to dry-ground species. Often the line itself is marked by a fringe of Soft or Hard Rush (*Juncus* species). This change is *sometimes* alsoaccompanied by a break in slope, caused by winter wave wash.

In shaded ponds with few plants, the upper water level can often be judged from discoloration marks on rocks or trees – particularly willows or alder that grow in the pond itself. Bundles of fine roots growing out from willow and alder trunks are another clue, because these usually only develop below the winter water level.

Ponds with outflows usually have less variation in water level than other ponds, because the outflow controls the maximum water level. Discoloration marks on an outflow pipe or the stones at the edge of an outflow stream can be good places to find the upper water line.

Interestingly the upper water level is usually not the bottom of the pipe but some way up it, because water typically backs-up in the pond in winter.

Winter water line shown on a rock face (arrowed top left), by the growth line of aquatic mosses on a dry stone wall (above) and inthe distinct change from wetland plant to dry ground species (bottom left).

Winter water line marked by the line of rushes (Juncus species, arrowed) at the outer edge of two ponds.

3.2 Variables required for PASS calculation.

3.2.1 Grid reference

The grid reference for a pond is recorded in two ways:
(i) An eight (or more) figure grid reference, which is used to locate the pond accurately.
(ii) Easting and Northing co-ordinates: which are used in the PASS calculation.

On this map of Melchett Mere, Pont K represents the approximate centre of the pond. The grid reference for this marker is SJ 7498 8112.

Grid reference
The pond's grid reference should be located in the approximate centre (the middle) of your chosen pond. It should be at least 8 figures e.g. SJ 7498 8112, to ensure that the pond can be accurately identified

The pond's grid reference be can be found from a range of sources:

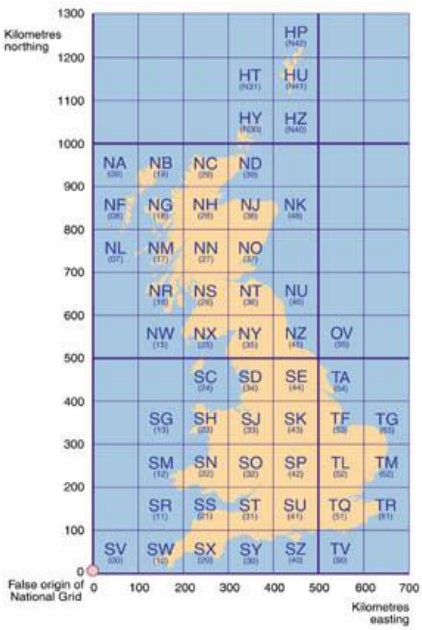
- By hand, using an Ordinance Survey map. If you are rusty, there are online guides to finding a grid reference 'along the corridor and up the stairs'.
- On site, using a hand GPS, or a mobile phone app. Note that you may be standing some distance from the pond when you take this grid reference, so it should be adjusted later to ensure it marks the correct location of the pond.
- On-line, using a website such as UK Grid Reference Finder at www.gridreferencefinder.com (rightclick the map).

Northing
Only northing is required, not easting. For reference, northing is the second set of numbers in a grid reference, the vertical axis on the figure opposite, or the y value.

Northings should be recorded as 4 figures (though note that ponds in the very south of England will have a 3 figure northing if the first digit is zero).

Northings use the 100 km cell reference *number* rather than the *letter* code (e.g. the reference number for square TQ is 5,1). So the grid reference TQ 343 286 would be entered as northing 1286.

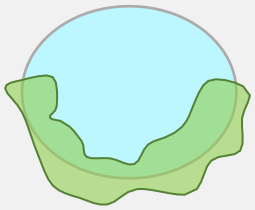
You can use the grid opposite to convert from grid references to northings, or use a website. UK Grid Reference Finder https://gridreferencefinder.com/ is particularly useful for converting grid references. Where you have multiple sites use their 'Coordinate Batch Conversion Tool' https://gridreferencefinder.com/batchConvert/batchConvert.php To find this link on the UK Grid Reference Finder website, go to the footer, where batch convert options are shown in small white text. Note that the footer is sometimes hidden under advert popups which need to be removed to see the links.



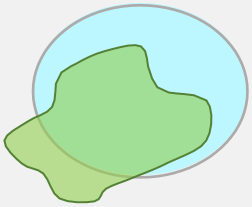
Grid reference conversion to eastings and northings
Source: Ordinance Survey 2018 (no longer available from the OS website)

3.2.2 Pond name

This box provides a quick way for you to identify your pond; particularly helpful if you are surveying a number of sites. You can add a pre-existing name (e.g. a locally used name or the name given on an OS map), or create your own pond name. Try to make this name memorable, avoid only using a number e.g. Pond 1, since, if you identify a priority pond and later record it on the priority pond map, there could many of these in the database. If you do want to use a number, combine it with the name of the site, e.g. Pond 1 Black Park



20% of the pond is overhung



50% of the pond is overhung

3.2.3 Shade from overhanging trees and shrubs

This is an estimate of how much of the pond is *directly* overhung by trees and shrubs, i.e. the proportion of the pond that would be shaded if the sun was directly overhead.
The estimate is made as a percentage of the whole pond area (not the current water area, see Section 4.2). The estimate can include tall shrubs and brambles, but does *not* include shading from emergent pond plants, like Bulrush.

3.2.4 Inflow

This includes inflow streams, ditches, springs or wet seepage that drains into the pond. It can also include large drainage pipes. Include an inflow as present, even if ditches or streams happen to be dry at the time of your survey.

3.2.5 Isolation

Isolation refers to the extent to which the pond is isolated from other waterbodies and wetlands. Waterbodies to consider include ponds, lakes, rivers, streams and ditches. Wetlands include a wide range of waterlogged habitats from marsh, fen and bog to wet heath and wet woodland. Consideration should be given to the presence of historic wetlands (e.g. the Thames Valley, and arable fenland), which may be degraded but still retain strong elements of their freshwater heritage. Isolation is scored on a 0 - 5 point scale, where 0 is a pond that is highly isolated, and 5 is a pond located in middle of major wetland.
It is possible to use intermediate values (e.g. 3.5), for landscapes that fall between the categories given. Assessments should preferably be made using a 1:25,000 scale map, and can be supplemented by local observations.

Score	Isolation levels
0	The pond is highly isolated: lying in an area with virtually no waterbodies or wetland areas for 2-3 kilometres e.g. some areas of chalk downland.
1	There are few waterbodies or wetlands within approximately1 km e.g. arable areas with small ditches but few ponds or streams.
2	The surrounding landscape has scattered waterbodies e.g. occasional ponds and/or streams within approximately 1 km of the pond.
3	The surrounding landscape has many waterbodies e.g.12+ small ponds, and/or many small streams, rivers or areas of wetland within approximately 1 km of the pond. This category includes ponds located in historic wetlands e.g. large river valleys
4	Ether: (a) waterbodies and/or wetlands cover an extensive area within 0.5 km of the pond, or (b) the pond is located in a traditional wetland area with many waterbodies e.g. Somerset Levels.
5	Pond is completely surrounded by extensive areas of waterbodies or wetland areas e.g. located within a peat bog or fen.

3.2.6 Plant cover

This is an estimate of the percentage of the pond area that is covered by wetland vegetation. This includes:

- Submerged plants growing in the water (like pondweeds).
- Emergent wetland plants like Bulrush, Soft Rush, sedges, and lower growing plants like Water Mint and wetland grasses like Sweet-grass and Creeping Bent.
- Floating-leaved plants like Waterlily.

However, the estimate *excludes* the area covered by filamentous algae as well as duckweed and the alien Water Fern (*Azolla* species), both of which are tiny free-floating leaved plants. They are excluded because these species are generally indicative of poorer ponds. If, as in the photo below, there is other vegetation growing underneath the floating carpet of duckweed, that vegetation can be counted.

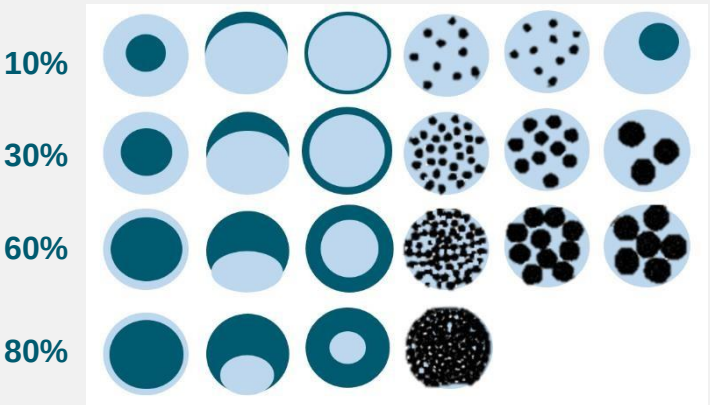
The estimate does not include areas covered by more terrestrial species such as Creeping Buttercup. A full list of species that qualify is given in the wetland plant survey list on Freshwater Habitat Trusts PondNet web pages. However, for non-botanists, as a rule of thumb, it is sufficient to estimate the **percentage of all of the plants growing in the area of the pond excluding algae and tiny free-floating plants.**

The surface cover of duckweed is not included in estimates of plant cover, however there are other wetland plants growing across most of the pond so its plant cover

Estimates of the percentage cover of wetland plants should be made for the whole area within the outer edge of the pond, not the current water area (see Section 4.2). The cover of sparsely growing stands of plants (e.g. occasional bulrush plants with much open water between), should be estimated as if they were growing closely together. The easiest way of doing this is to imagine all emergent plants pushed together on one side of the pond, with an estimate then made of what proportion of the pond this covers.

Estimating the percentage cover of plants. This estimate needs some thought, especially if plant stands are scattered around the pond, growing at different densities.

A trick that can help is to **imagine if all the plants were pushed up into one end of the pond: how much of the pond would they then occupy?**



3.2.7 Grazing

Grazing intensity refers to the extent of grazing and trampling (poaching) by livestock e.g. cattle, sheep, horses that haveaccess to the pond. It can include grazing by other hooved animals e.g. wild deer, but it *excludes*, rabbits, grazing by ducks and geese or other disturbance, for example by people or dogs.

If grazing animals are not currently visible, use indirect evidence such as: grazed grassland vegetation at the pond edge, signs of hoof poaching and trampling in pond mud, or the presence of animal dung in the pond or surrounds.

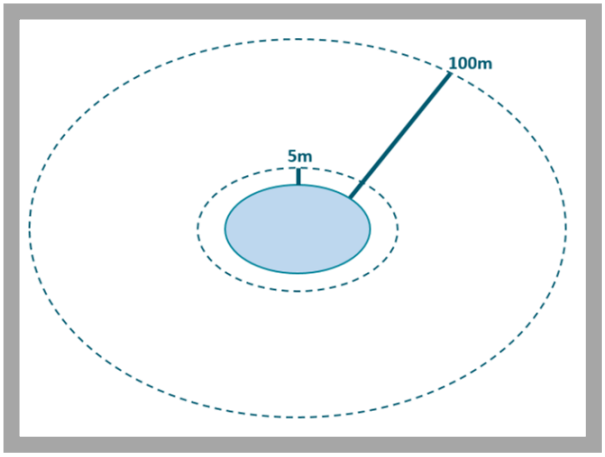
The intensity of grazing is ranked from **0** (not grazed) to **5** (heavily poached and almost bare). If the pond is fenced off so that only *parts* of the pond banks are accessible to animals, please average out the grazing intensity across/over the whole pond.

It is possible to use intermediate values (e.g. 3.5), for landscapes that fall between the grazing categories given.

Score	Grazing levels
0	No grazing
1	Infrequent or low intensity grazing, for example, ponds that can be accessed by animals, but the surrounding grassland is tall and shows few signs of grazing
2	Clear evidence of grazing, and probably poaching, on the pond banks and margins, but not sufficient to create extensive areas of bare ground in these areas (<5%)
3	Ponds that have short-grazed vegetation on the pond banks and/or significant evidence of hoof poaching with 0% to 20% of the margins exposed as trampled mud.
4	Pond banks and margins heavily grazed and poached so that between 20% and 90% of the pond banks and margins are bare poached mud
5	Pond margins so heavily poached and grazed that they are almost bare of vegetation (i.e pond margins are at least 90% mud).

3.2.8 Surrounding land use

Calculating the land use zones



The percentage of different land use is recorded in two distance zones from the edge of the pond. In both cases ‘edge of the pond’ refers to the winter water line (see Section 4.2). Hence the **0-5 meters** zone is usually a record of the **vegetation on the upper pond banks**. Note that the **0-100 m** zone also includes this bank area.

The 0-5 meter zone is easily defined by pacing (a single pace is generally around 1m). You can also pace the 0-100m zone, especially for your first surveys, to give an idea of this distance.

Alternatively, it may be easier to use the 1km squares on an OS map: to estimate the distance: 100m is 1/10th of 1km. For most people, a combination of map (including satellite

image) and field evidence works best to calculate both distance and land-use percentage. Field assessment of grassland type (e.g. intensive or non-intensive) is particularly helpful because this is often hard to identify from map and satellite images alone.

Definitions of different habitat types within land use

Trees, woodland and scrub: This includes both deciduous and coniferous woodland, individual trees,scrub and hedgerows.

Heath and moorland: Includes lowland and upland heathland, moorland and mountain vegetation (includes bracken).

Unimproved grassland: Only unimproved grassland is included (not rank grass, improved or semi-improved grassland) This is the sort of unfertilized grasslands typically found in nature reserves or national parks of other unenclosed lands. The grass is mixed with a wide variety of broadleaved plants (good quality plant indicators are usually present). There will be a low percentage of agricultural grasses such as rye grass. It can include both calcareous and acid grassland.

Arable: Includes all crop land (wheat, oilseed rape, beans etc. It includes commercially grown flowers, vegetable and soft fruit crops (e.g. strawberries and orchards), as well as fallow land (land left after ploughing: either bare or with weedy plants)

Ponds and lakes**:** Both permanent and seasonal waterbodies including trackway pools.

Bog, fen, marsh and flush**:** Areas of wet ground and wetland vegetation.

Streams and ditches**:** Any linear waterway (wet or dry), including rivers, streams, ditches, springs and canals.

Other semi-natural: E.g. maritime vegetation, saltmarsh, sand-dune, Cliffs, rock-outcrops, gravel-pits, quarries, areas of rock, sand and gravel or stone, River, stream, ditch and spring, canals, bog, fen, marsh & flush.

All semi-natural: Total of all categories above, *excluding* arable.

4 Enter your data

Once you've gathered your environmental data, please enter them into the Freshwater Habitat Trust PASS database to calculate whether the pond qualifies as a priority pond.

5 Further information

Biggs, J., Williams, P., Whitfield, M., Nicolet, P. and Weatherby, A., 2005. 15 years of pond assessment in Britain: results and lessons learned from the work of Pond Conservation. Aquatic conservation: marine and freshwater ecosystems, 15(6), pp.693-714.

BRIG (ed. A. Maddock) 2008.UK Biodiversity Action Plan; Priority Habitat Descriptions. https://data.jncc.gov.uk/data/dec49c52-a86c-4483-90f2-f43957e560bb/UKBAP-BAPHabitats-42-Ponds.pdf

PSYM Manual, Freshwater Habitats Trust
https://freshwaterhabitats.org.uk/projects/surveys/psym-method/

ANNEX 1. Priority Pond Assessment Fieldsheet

Your name(s) | **Date**

Pond grid reference (8 fig Minimum e.g. SP 1235 4325) | **Northing (**4 fig e.g. 2432)

Pond name

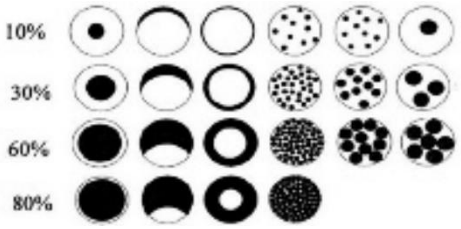
Inflows

1=inflow is present, 0= no inflow

Overhanging trees & shrubs

%

% of pond overhung by trees and shrubs This is an estimate of how much of the pond is *directly* overhung by trees and shrubs, i.e. that would be shaded if the sun was directly overhead



Aquatic and wetland vegetation cover, *excluding duckweed, water fern and filamentous algae*

%

% of the whole pond (wet and dry) occupied by water plants like grasses, water mint and rushes, submerged (e.g. water-crowfoot) species and floating species e.g. waterlily But exclude filamentous algae, duckweeds and water fern (e.g. *Lemna*, *Spirodela* and *Azolla* species).

Grazing intensity

Rank 1-5 (1=infrequent or low intensity to 5 = margins heavily poached and almost bare). Intermediate scores e.g. 3.5 can be used.

Isolation

Rank 1-5 (1=highly isolated from other waterbodies and wetlands to 5 = located in the middle of a major wetland area). Intermediate scores e.g. 3.5 can be used.

Surrounding land use: Estimate the *percentage* of surrounding land-use in distance zones outward from the pond *outer* edge (i.e. the maximum winter water level). In many ponds the 0-5m zone will be dominated by the vegetation on the pond's upper banks. Greyed-out boxes indicate information that is not required.

Land use type	0-5m %	0-100m %	Examples
Trees, woodland & scrub			Deciduous and coniferous woodland, individual trees, scrub and hedgerows (exclude commercial orchards)
Heath & moorland			Lowland and upland heath and moorland; includes bracken
Unimproved grassland			Herb-rich, calcareous, acid or moorland grassland (plant quality indicators usually present). Low percentage of agricultural grasses. Not fertilised, little or no drainage
Ponds & lakes			Permanent and seasonal standing waterbodies
Other seminatural			E.g. maritime vegetation, saltmarsh, sand-dune, cliffs, rock-outcrops, gravel-pits, quarries, areas of sand, gravel or stone, river, stream, ditch and spring, canals, bog, fen, marsh & flush
All semi-natural			Total of all categories above (i.e. *excludes* arable)
Arable			All crops (except grass). Includes flower, vegetable and soft fruit crops and ploughed or fallow arable land

Enter your data

Once you've collected your data, please enter the results on the Freshwater Habitat Trust website to identify whether the pond qualifies as a priority pond using this method.

NCEA Natural Capital and Ecosystem Assessment

NATURAL ENGLAND

Freshwater Habitats Trust