

**METHOD**

**Aims:** To find out if Pillwort is i) present in the focal pond, ii) get an approximate idea of its location and abundance in the focal pond, iii) collect physical data about the focal pond that can be used to assess the reasons for any change recorded on future visits, and iv) look in any adjacent ponds to see if Pillwort is present or absent.

- **Equipment:** It's helpful to take a camera (e.g. mobile phone camera) to take confirmatory photos of Pillwort, to take photos of your survey pond for the record, and to take a photograph of your sketch maps if you don't have access to a scanner – alternatively you can give your survey forms to your regional officer.
- **Survey timing:** Pillwort is best surveyed in late summer, August and September, when water levels are moderately low.
- **Where to look:** Pillwort typically grows in the pond's drawdown zone – the area that is wet in winter, but progressively dries out in summer. Search for it across all of the pond's dry marginal areas and in shallow water.
- **Survey the pond:** The Focal Pond will have a previous record for Pillwort, although it may not have been recorded since the 1980s. Search the pond margins and shallow edges for Pillwort and if found, *estimate the area occupied by the plants* (see below). Draw a sketch map to show *the location of Pillwort within the focal pond* – this may help you and others in the future to search the same area. *Fill out the pond habitat survey form* for the focal pond.
- **How to estimate abundance:** Pillwort has creeping runners with many upright fronds, so it is impossible to count individual plants. Abundance therefore needs to be an **estimate of plant cover**. To help standardise these estimates we are using two measures of abundance, the area in square metres and the percentage of the pond occupied.

**Measurement 1. Area covered by Pillwort:** The aim is to record the total **area** of the Pillwort growing in the pond (in m<sup>2</sup>). To do this, record the size of each patch of plants, e.g. (1m x 1m) + (1m x 2m) = 3m<sup>2</sup>. It can help to record a number of patches by imagining them grouped together to make a square or rectangle. **Note: We only need to know the total area of Pillwort to monitor the pond**, but the space overleaf can help you to add up the different patches.

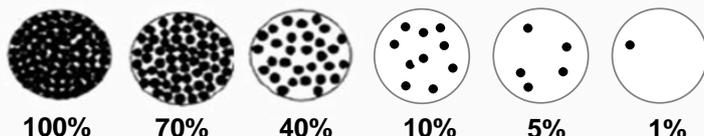
Group-up small patches to make them easier to record



1m Patch = 2m<sup>2</sup>

Pillwort may occur at very different **densities** in each patch: sometimes growing close together, and at other sites more widely separated. You need to *standardise the density*. To do this imagine more sparsely growing plants are pushed together to grow at their maximum *natural* density (see photo).

**Measurement 2. Percentage of the pond occupied by Pillwort:** The aim is to estimate the percentage of the pond that Pillwort occupies. Use the density chart below, or imagine that the plants are grouped together at their maximum *natural* density in one part of the pond.



NOTE: Measurements 1 and 2 are, of course, related. You can use one to double check the other as follows:

**(i) Calculating the area of plants from % cover.** Example: for a pond which is 600m<sup>2</sup> in area, and 25% covered in Pillwort, the area of Pillwort is 150m<sup>2</sup> (i.e. 600/100 x 25 = 150).

**(ii) Calculating the % cover of plants from plant area.** Example: for a pond which is 800m<sup>2</sup> and has a 5m<sup>2</sup> area of Pillwort, the percent of pond covered is 0.6% (i.e. 5/800 x100 = 0.6). **Note: At very low abundance record the percentage as 1%.**

If Pillwort is **not found** at the pond, please record this, and continue to fill out the environmental sheet and search other ponds in the surrounds. The findings will help identify reasons for the plant's absence from the pond.

- **Check other ponds and pools in the surrounds:** Finding out if Pillwort occurs in other nearby ponds helps us to understand if the species is part of a larger population, which may be important for its survival. Visit nearby ponds and pools to see if Pillwort is present. You don't need to record numbers, or environmental data at these other ponds.

It will be helpful to revisit these other ponds in future years. So, to ensure they can be found again by you or others please (a) provide an accurate grid reference and/or mark the locations on your PondNet base map, or (b) make a sketch of the location of ponds around the focal pond and (c) take photos. Then, upload the maps and photos to the website.

- **What it looks like:** Pillwort is a small lime green grass-like fern. It typically grows 1-3cm high, but individual fronds can reach 8cm. The most characteristic features are: (i) its creeping form, with fronds arising from a horizontal rhizome, (ii) the slightly wavy stems, (iii) the curled form of young fronds and (iv) the spore cases (or pills) that develop in late summer.

We have produced a "Species Information Sheet" if you need some more hints and tips to recognise Pillwort from other plants which occur in the same habitat [www.freshwaterhabitats.org.uk/projects/pondnet](http://www.freshwaterhabitats.org.uk/projects/pondnet). **Once completed, enter your results online:** [www.freshwaterhabitats.org.uk/projects/waternet](http://www.freshwaterhabitats.org.uk/projects/waternet), or give your recording forms and maps to your regional project officer and we can enter data for you.

<b>Your name</b>	<input style="width:95%;" type="text"/>	<b>Date</b>	<input style="width:95%;" type="text"/>
<b>Square: 4 figure grid ref</b> e.g. SP1243 (see your map)	<input style="width:95%;" type="text"/>	<b>Pond: 8 figure grid ref</b> e.g. SP 1235 4325 (see your map)	<input style="width:95%;" type="text"/>
<b>Focal Pond name</b> (if known)	<input style="width:95%;" type="text"/>		
<b>Determiner name</b> ( <i>optional</i> - if someone confirms the identity of the species you've recorded)	<input style="width:95%;" type="text"/>	<b>Voucher material</b> ( <i>optional</i> - comment if you've taken a photo to confirm identification)	<input style="width:95%;" type="text"/>

**Abundance of Pillwort in your Focal Pond**

(NB Record plants from the *whole* pond, not just the water area, i.e. include areas in the drawdown zone that would be wet in winter, but may be dry in summer). If there is a large area of Pillwort, estimate the abundance in a small area and multiply up. If you find Pillwort please take a confirmatory photo, especially if it's the first time the pond has been surveyed.

<input style="width:95%;" type="text"/>	Abundance measurement 1. <b>Area</b> covered by Pillwort in square metres (e.g. 3 m <sup>2</sup> )
<input style="width:95%;" type="text"/>	Abundance measurement 2. <b>Percentage</b> of the pond occupied by Pillwort (e.g. 20% or 1%)

Space for calculations:

**Pillwort looked for, but not found:**

Note if you don't find evidence of Pillwort at the pond, this is an important result so please still enter these findings online

(tick box if none found)

**Species notes:** Please add any views on pond condition for Pillwort, and thoughts on why it may be abundant / declining / absent.

**Sketch map:** Use this box to show the location of Pillwort plants in your focal pond. Use shading if they covered a broad area, or x marks the spot if there were just a few plants.

**Search other ponds and pools in the surrounds**

Please search other ponds or pools in the area to see if Pillwort is present or absent. Then complete the following summary questions about the additional pond search.

To help re-find these other ponds: (a) mark their locations on your PondNet base map (in your site information pack) and indicate whether Pillwort was present or absent.

1. Was Pillwort found in any additional ponds?

Yes  No (tick)

2. How many additional ponds did you search (if no other ponds were searched put a zero in both these boxes)?

<input style="width:95%;" type="text"/>	<b>Number of additional ponds with a <u>positive</u> record for Pillwort.</b> Excluding the focal pond, how many other ponds <b>had</b> Pillwort?
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<input style="width:95%;" type="text"/>	<b>Number of additional ponds with a <u>negative</u> record for Pillwort.</b> Excluding the focal pond, how many additional ponds <b>did not have</b> Pillwort?
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### FOCAL POND HABITAT SURVEY:

**This is a really important part of the survey at your focal pond.** Please complete this Pond Habitat Survey for your focal pond, whether or not you find Pillwort at the site.

Each variable provides information known to be linked to pond quality and community type, and can be used to investigate the reason for change in Pillwort occurrence.

<b>Is the pond new?</b> (less than 10 yrs old) yes, no, unknown	<input style="width: 80%; height: 20px;" type="text"/>	<b>Year of creation?</b> date, decade, unknown	<input style="width: 80%; height: 20px;" type="text"/>	<b>Pond Altitude</b> (m)	<input style="width: 80%; height: 20px;" type="text"/>
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### Pond area

 m<sup>2</sup>

**Note:** This is the *surface area of the pond when the water is at its highest level (usually in early spring)*. It will probably *not* be the current water level of the pond. The high water level line should be evident from wetland vegetation like rushes at the pond's outer edge. Measure by pacing (single pace = 0.8-1m) or use online maps.

### Pond dries?

- |  |  |
|--|--|
| <p>1 = never dries<br/>2 = rarely dries<br/>3 = sometimes<br/>4 = annually</p> | <p><b>1 = Never dries,</b><br/><b>2 = Rarely dries:</b> no more than 2 years in any 10 year period, or only in drought,<br/><b>3 = Sometimes dries:</b> dries between three years in ten to most years,<br/><b>4 = Dries annually.</b> Deduce pond permanence from local knowledge (e.g. landowner) and personal judgement e.g. water level at the time of the survey. Ponds that dry out annually usually have a hard base.</p> |
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### Overhanging trees & shrubs

% of pond overhung by trees and shrubs

% pond margin overhung to at least 1m out from the pond margin

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 overhead (use the diagram (below) as a guide).

### Waterfowl impact

- 1 = major  
2 = minor  
3 = none

**Major** = severe impact of waterfowl e.g. few or no submerged plants, water turbid, pond banks have patches where vegetation removed, feed put down; **Minor** = waterfowl present, but little impact on pond vegetation, pond still supports submerged plants and banks are not denuded of vegetation; **None** = no evidence of waterfowl impact (moorhens may be present).

### Fish presence

- 1 = major  
2 = minor  
3 = possible  
4 = absent

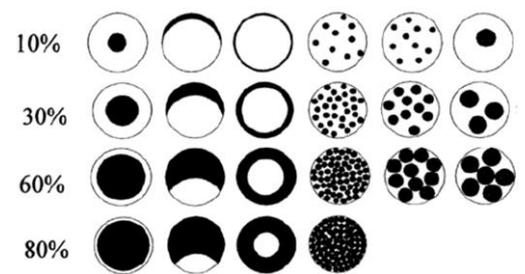
**Major** = dense populations of fish known to be present; **Minor** = small numbers of Crucian Carp, goldfish or stickleback known to be present; **Possible** = no evidence of fish, but local conditions suggest that they may be present; **Absent** = no records of fish stocking and no fish revealed during survey.

### Aquatic vegetation:

includes emergent, floating and submerged plants  
% of the whole pond (wet and dry) occupied by emergent vegetation – incl. plants like grasses, water mint and rushes, but not floating (e.g. duckweeds) or submerged (e.g. water-crowfoot) species - to see a list of emergent species look at the survey guide [www.freshwaterhabitats.org.uk/projects/pondnet/survey-options/habitats](http://www.freshwaterhabitats.org.uk/projects/pondnet/survey-options/habitats)

 %

% of pond water surface area covered by all vegetation (emergent, floating (excl. duckweed) and submerged).

 %


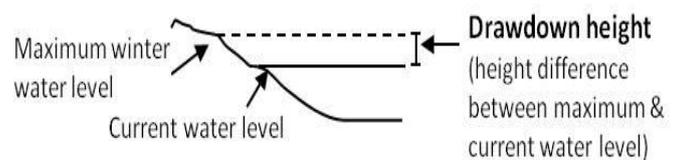
### Water left in the pond

 %

% of water area in pond relative to maximum water level – This can be 0% if the pond has dried out.

 cm

Drawdown (height drop from maximum winter water level to current level).



### Grazing

Tick if there is evidence the pond is grazed by livestock. If **yes** complete the following boxes:

 %

% of whole pond grazed (note: stock can wade into shallow ponds to graze).

 %

% of pond perimeter grazed (note: stock can wade into shallow ponds to graze otherwise inaccessible edges).

Grazing intensity: rank 1-5 (1=infrequent or low intensity to 5 = margins heavily poached and almost bare).

**Pond management (tick):**

Use the tick boxes to list management within the last 12 months. Use 'other' box for any extra info.

<input type="checkbox"/> Fully dredged	<input type="checkbox"/> Partly dredged	<input type="checkbox"/> >5% vegetation removed	<input type="checkbox"/> <5% vegetation removed
<input type="checkbox"/> Trees planted	<input type="checkbox"/> Trees clear-felled	<input type="checkbox"/> Trees cut back / coppiced	<input type="checkbox"/> Pond changed shape / size
<input type="checkbox"/> Plants introduced	<input type="checkbox"/> Bank plants mown	<input type="checkbox"/> Structural work e.g. to dam	<input type="checkbox"/> Straw added

Add other or more detail

**Water chemistry:** Complete this section if suitable kits and meters are available (or leave blank):

 pH

 Conductivity ( $\mu\text{S cm}^{-1}$ )

**Nitrate ( $\text{NO}_3^-$ -N ppm):** PPW kits provided by FHT  
 (tick one from the following range categories)

<0.2	0.2-0.5	0.5-1	1-2	2-5	5-10	10 +
<input type="checkbox"/>						

**Phosphate ( $\text{PO}_4^{3-}$ -P ppm):** PPW kits provided by FHT  
 (tick one from the following range categories)

<0.02	0.02-0.05	0.05-0.1	0.1-0.2	0.2-0.5	0.5-1	1 +
<input type="checkbox"/>						

**Turbidity / water clarity:** Estimate turbidity looking down into c.20cm depth of water in the pond.

 1 = clear; 2 = moderately clear; 3 = moderately turbid; 4 = turbid

**Inflows and outflows:** (tick if inflow or outflow present or leave blank)

 Inflow present

 Outflow present

**Pond base:**

 This refers to the *geology* (i.e. rock-type) that immediately underlies the pond. You may know, or be able to see the underlying geology in the base or banks of the pond, especially in new ponds. If not, check a geology map or leave this section blank.

 Choose one of the following to categorise the % composition of **each** of pond base: 1= 0-32%, 2= 33-66%, 3= 67-100%

 Silt/ clay  
  Sand, gravel, cobbles  
  Hard rock  
  Peat  
  Other (please specify)

**Surrounding land use:**

 Estimate the percentage of surrounding land-use in distance zones from the pond perimeter (i.e. the maximum winter water level) used to assess pond area. In many ponds the 0-5m zone will include surrounding trees/scrub.

Habitat	0-5m	0-100m	Examples
Trees, woodland & scrub	%	%	Deciduous and coniferous woodland, individual trees, scrub and hedgerows.
Heath & moorland			Lowland and upland heathland, moorland and mountain; includes bracken.
Rank vegetation			Unmanaged grass, neglected and abandoned land, set-aside, verges and buffer strips.
Unimproved grassland			Herb-rich, calcareous and acid grassland (good quality plant indicators usually present). Low percentage of agricultural grasses. Not fertilised, little or no drainage.
Semi-improved grassland			A transition category. Grasslands modified by fertilisers, drainage, herbicides or intensive grazing, but retaining elements of natural grassland types in the area.
Improved grassland			Fertile agricultural grass, often bright green and lush; including parks and golf greens.
Arable			All crops. Includes flower and fruit crops (e.g. strawberries) and ploughed land.
Urban buildings & gardens			Areas in curtilage (associated with buildings); including glass-houses and farm yards.
Roads, tracks & paths			Including car-parks and footpaths.
Rock, stone & gravel			Cliffs, rock-outcrops, gravel-pits, quarries, areas of sand and gravel or stone.
Bog, fen, marsh & flush			Wetland vegetation and blanket bog.
Ponds & lakes			Permanent and seasonal waterbodies; including trackway pools.
Streams & ditches			Rivers, streams, ditches, springs and canals.
Other (state)			E.g. maritime vegetation, saltmarsh, sand-dune, orchards and railways.

 **Is the pond in a protected area?** (e.g. nature reserve, SSSI, etc.)

(choose one option - yes, no, unknown)

**How much of pond perimeter could be surveyed?** Note areas of pond not accessible.

**Comments box:** e.g. new ownership, changes since previous visit, any other information.