METHOD (complete one survey form per pond)

Aims: To find out if Pillwort is i) present, ii) get an approximate idea of its location and abundance, iii) collect physical data 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.

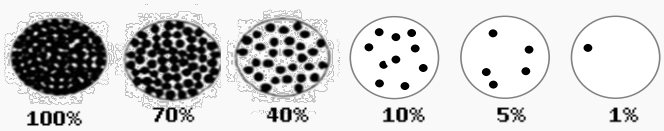
- **Equipment:** It's helpful to take a camera (e.g. mobile phone camera) to take confirmatory photos of Pillwort, to take photos of your survey pond for the record, and to take a photograph of your sketch maps if you don't have access to a scanner – alternatively you can post your survey forms to Freshwater Habitats Trust.
- **Survey timing:** Pillwort is best surveyed in late summer, August and September, when water levels are 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 area indicated on your map:** The pond may have a previous record for Pillwort**,** although the plant may not have been recorded for some time, or it may be a new site. Search the area indicated in your site pack for Pillwort plants, and if found, *estimate abundance* (see below), draw a sketch map to show *the location and extent of Pillwort* and, *fill out the habitat survey form overleaf*.
- **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 standardised these estimates we are using two measures of abundance, the area in m^2 and the percentage of the pond occupied.

Measurement 1. Area covered by Pillwort: The aim is to record the total ***area*** of the Pillwort (in m^2). To do this, record the size of each patch of plants, e.g. (1m x 1m) + (1m x 2m) = $3m^2$. 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

Pillwort may *occur at 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 below).

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 (right), or imagine that the plants are grouped together at their maximum *natural* density in one part of the pond.



- **Recording absence:** If Pillwort *is not* found, please record this, and continue to fill out the environmental sheet. The findings will help identify reasons for the plant's absence.
- **Check other likely habitats in the surrounds:** Finding out if Pillwort occurs in other likely habitats within the same site helps us to understand if the species is part of a larger population, which may be important for its survival. Visit other likely habitat patches within the site to see if Pillwort is present. **Complete a new form for each pond searched.**
- **Mark the location:** It will be helpful to revisit these areas in future years. To ensure they can be found again by yourself or others please (a) provide an accurate grid reference, or (b) make a sketch of the ponds where you have searched and (c) take lots of photos!

Once completed, enter your results online: 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: info@freshwaterhabitats.org.uk.

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.

(a) Pillwort fronds and pills growing at natural density, (b) pond drawdown zone with Pillwort lawn.

Your name		**Date**	
Square: 4 figure grid ref e.g. *SP1243* (see your map)		**Pond: 8 figure grid ref** e.g. *SP 1235 4325 (see your map)*	
Pond name (if known)			
Determiner name (*optional* - if someone confirms the identity of the species you've recorded)		**Voucher material** (*optional* - comment if you've taken a photo to confirm identification)	

If you find Pillwort please take a confirmatory photo. You can also take a photo of your pond or your maps (or scan them if you have a scanner) and upload them with the record www.freshwaterhabitats.org.uk/projects/waternet.

Abundance of Pillwort in your pond

Record the area of Pillwort 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 are several different patches of Pillwort in the same pond, use the table below to record the abundance in a small area and add them up - for the analysis **we only need a total**.

Areas where Pillwort was found (list): use this table to help with your area calculations, and so you/others can re-find plants on future visits.	**Area of Pillwort (m^2)**	**Area of Pillwort (%)**
1.		
2.		
3.		
4.		
5.		

Total area covered by Pillwort plants (m^2)
Provide a single total for the whole pond based on an actual or estimated area of plants recorded

Total area covered by Pillwort plants (%)
Provide a single total for the whole pond based on an actual or estimated area of plants recorded

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)

Area of bare ground
% of the whole pond where bare ground has been created by disturbance from people/livestock should include both wet and dry areas of the pond

%

Pond sketch map: Make a sketch map of your pond and draw on the location of Pillwort: use shading if they cover a broad area, or 'x' marks the spot if there are just a few plants.

Location map: Use this box to show the location of the pond and surrounding ponds you searched (or mark the information on the base map included in your site information pack).

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Please complete a HABITAT SURVEY sheet at <u>each pond</u> surveyed.

This is a really important part of the survey. Please complete this form whether Pillwort is present or absent. Each variable provides information known to be linked to site quality and community type, and can be used to investigate reasons for change in Pillwort occurrence. If you are surveying non-pond habitat – complete all variables that apply.
Go to: **www.freshwaterhabitats.org.uk/projects/pondnet/survey-options/habitats** for survey guides and more information.

Is the pond new? (less than 10 yrs old) *yes, no, unknown* ☐

Year of creation? *date, decade, unknown* ☐

Pond Altitude (m) ☐

Area

☐ m^2

Note: This is the *surface area of the pond when the <u>water is at its highest level</u> (usually in early spring)*. It will <u>probably *not* be the current water level of the pond</u>. 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?

☐
1 = never dries
2 = rarely dries
3 = sometimes
4 = annually

1 = Never dries, **2 = Rarely dries**: no more than two years in any ten year period, or only in drought, **3 = Sometimes dries:** dries between three years in ten to most years, **4 = Dries annually.** 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.

Overhanging trees & shrubs

☐ % of pond overhung by trees and shrubs

☐ % pond margin overhung to at least 1m 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.

Disturbance by dogs

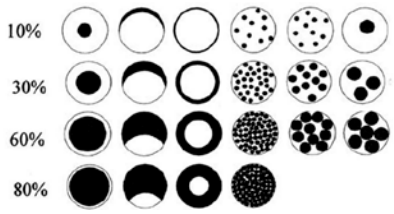
☐
1 = major
2 = minor
3 = none

Major = dogs repeatedly use the pond, compacted edges with little vegetation, water very turbid; **Minor** = dogs use the pond, but little impact on pond vegetation, pond still supports submerged plants and banks are not denuded of vegetation; **None** = no evidence that dogs are using the pond.

Aquatic vegetation: includes emergent, floating and submerged plants

☐ % of the <u>whole pond</u> (wet and dry) occupied by <u>emergent vegetation</u> – incl. plants like grasses, water mint and rushes, but not floating (e.g. pondweed) or submerged (e.g. water-crowfoot) species.

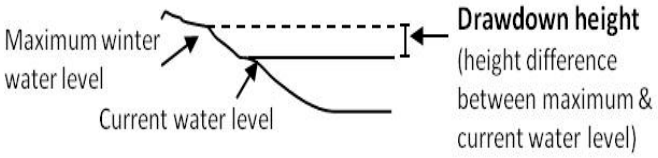
☐ % of pond <u>water surface area</u> covered by all vegetation (<u>emergent, floating (excl. duckweed) and submerged</u>).



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. The height drop from the maximum winter water level to current level (see diagram).



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

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

Add other or more detail ☐

Water quality:

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**

Water chemistry: If suitable kits and meters are available (or leave blank)

[ ] **pH** [ ] **Conductivity (µS cm-1)**

Nitrate (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 +

Phosphate (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 +

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*)

New Zealand Pigmyweed *Crassula helmsii*: This non-native weed may have an impact on this species.

[ ] % of drawdown zone occupied by New Zealand Pigmyweed

Identification of New Zealand Pigmyweed:

- Can be submerged, emergent and terrestrial.
- Forms dense mats below and above the water surface.
- The flowers it has, if any at all, are very small (less than 1cm) whitish-green to slightly pink with 4 petals.
- Leaves are up to 2cm long in opposite pairs - fleshy for emergent plants, but flatter for submerged parts of the plant.
- Similar species (such as the Water-starworts) do not have fleshy leaves. Water-starworts also have a notch at the leaf tip which is absent in New Zealand Pigmyweed.

Other invasive non-native species:
(tick all that apply)

[ ] Floating Pennywort *Hydrocotyle ranunculoides*

[ ] Non-native Pondweed, e.g.:
Canadian Pondweed *Ellodea canadensis*,
Nuttall's Pondweed *Elodea nutallii*,
Curly Waterweed *Lagarosiphon major*

[ ] Parrot's Feather *Myriophyllum aquaticum*

[ ] Water Fern *Azolla filiculoides*

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 about the pond or survey species.