

METHOD

Aims: To find out if Starfruit is i) present in the survey pond, ii) get an approximate idea of its location and abundance in the survey pond, iii) collect physical data about the survey 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 Starfruit is present or absent.

- **Equipment:** It's helpful to take a camera (e.g. mobile phone camera) to take confirmatory photos of Starfruit, 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:** Starfruit can be in flower from [May] June through to August, however, the plants are at their most distinctive phase when the fruits develop and we would suggest that June-July [August] is the optimum time for survey.
- **Where to look:** Starfruit is restricted to ephemeral ponds with naturally fluctuating water levels. Typically these ponds are found within traditionally grazed heathland commons on sandy or gravelly soils, where the poaching of animals creates exposed muddy margins. Search for it across all of the pond's dry marginal areas and in shallow water close to the edge of the pond.
- **Survey the pond:** The survey pond will have a previous record for Starfruit, although the plant may not have been recorded for some time. Search the pond margins and shallow edges for Starfruit plants, and if found, estimate the number of plants (see below). Draw a sketch map to show the location of Starfruit within the survey pond – this may help you and others in the future to search the same area. Fill out the pond habitat survey form for the survey pond.
- **How to estimate abundance:** If Starfruit plants are found in the survey pond, count the exact number of plants, or make an estimate of the number of plants present, and record the results as an abundance category (over page). It can sometimes be hard to estimate the number of plants, if they are small or very numerous, so if you can't count every plant, the best approach is to count the plants in a small area (e.g. 10 cm² or 1 m²), and multiply this by the area in which Starfruit plants are found. If Starfruit occurs in different areas or habitats in the pond, make separate calculations for each area, and sum them to give a total (see table over page). **Note, we only need the overall total for the pond.**

If Starfruit is **not found** at the pond, please record this, and **continue to fill out the environmental sheet**. 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 Starfruit 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 as many nearby ponds or pools to see if Starfruit is present. **If you find Starfruit in another pond on the same site, you can fill in a separate recording form for that pond as well.**

It will be helpful to revisit the other ponds you surveyed in future years, even if you don't find starfruit. So, to ensure they can be found again by yourself or others please (a) provide an accurate grid reference and/or mark the locations on a base map, or (b) make a sketch of the location of ponds around the survey pond and (c) take photos. Then, upload the maps and photos to the website.

What it looks like: Starfruit has broad leaves on long stalks. If the plant is submerged the leaves will float on the surface of the pond, and these may be somewhat narrower than the broad aerial leaves. If the plant is not submerged, the leaves will be aerial and robust. The flowers are white with three petals like other water plantains, however **Starfruit can easily be recognised by the ripened carpels, of which there are 6 arranged in a pointed star, hence the name Starfruit.**

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.



Starfruit: (a) ripened stamens in the shape of a 6 pointed star, (b) starfruit plant leaves and ripened stamens, (c) submerged starfruit in flower © Peter Wakely/Natural England

Your name <input style="width: 90%;" type="text"/>	Date <input style="width: 90%;" type="text"/>
Square: 4 figure grid ref e.g. SP1243 (see your map) <input style="width: 100%;" type="text"/>	Pond: 8 figure grid ref e.g. SP 1235 4325 (see your map) <input style="width: 100%;" type="text"/>
Survey Pond name (if known) <input style="width: 100%;" type="text"/>	
Determiner name (<i>optional</i> - if someone confirms the identity of the species you've recorded) <input style="width: 100%;" type="text"/>	Photograph taken? (Starfruit is on the WACA Sch8 and collecting material is <i>not permissible</i> without a licence. Voucher photographs are sufficient/recommended) <input style="width: 100%;" type="text"/>

Number of Starfruit in your Survey Pond

Record the number of Starfruit plants found in the focal pond using the **exact number** *or* one of the following **categories**: **1, 2-5, 6-10, 11-20, 21-50, 51-100, 101-200, 201-500, 501-1000, 1000+**. If there are many plants, count the number in a small area and multiply up. We've put a table below to help you keep track and make notes, but for the analysis we only need a total.
 If you find Starfruit please take a confirmatory photo, especially if it's the first time the pond has been surveyed for PondNet. 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.

Pond habitat type or areas where the plant is found (list): use this table to help with your number calculations, and so you / others can re-find plants	Number of plants
1. <input style="width: 90%;" type="text"/>	<input style="width: 100%;" type="text"/>
2. <input style="width: 90%;" type="text"/>	<input style="width: 100%;" type="text"/>
3. <input style="width: 90%;" type="text"/>	<input style="width: 100%;" type="text"/>
4. <input style="width: 90%;" type="text"/>	<input style="width: 100%;" type="text"/>
Total number of Starfruit (exact number or category)	<input style="width: 100%;" type="text"/>

Starfruit looked for, but not found: (tick box if none found)
 Note if you don't find evidence of Starfruit at the pond, this is an important result so please still enter these findings online

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

Sketch map: Use this box to show the location of Starfruit plants in your survey pond. Use shading if they covered a broad area, or x marks the spot if there were just a few plants. You can also use this map to mark the location of other ponds you've searched or continue onto a separate sheet.

Search other ponds and pools in the surrounds

Please search other ponds or pools in the area to see if Starfruit is present or absent. Then complete the following summary questions about the additional pond search.
 To help re-find these other pools: (a) mark their locations on a base map (in your site information pack) and indicate whether Starfruit was present or absent.

1. Was Starfruit 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: 100%;" type="text"/>	Number of additional ponds with a <u>positive</u> record for Starfruit. Excluding the survey pond, how many other ponds had Starfruit on this site?
<input style="width: 100%;" type="text"/>	Number of additional ponds with a <u>negative</u> record for Starfruit. Excluding the survey pond, how many additional ponds did not have Starfruit on this site?

FOCAL POND HABITAT SURVEY:

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

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

Year of creation? *date, decade, unknown*

Pond Altitude (m)

Pond area
 m²

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?

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

1 = Never dries,

2 = Rarely dries: no more than 2 years in any 10 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 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 for aquatic vegetation) 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.

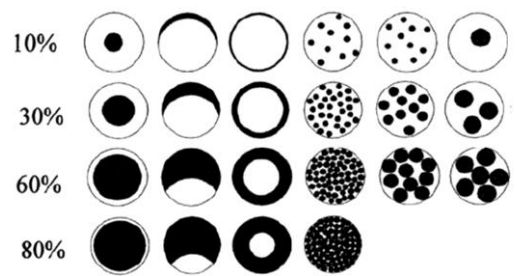
Aquatic vegetation: includes emergent, floating and submerged plants

 %

% 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

 %

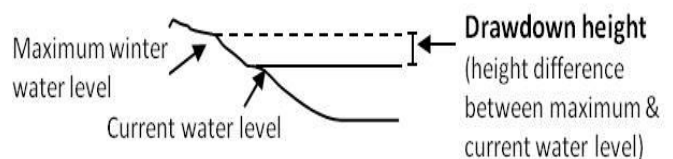
% of pond water surface area covered by all vegetation (emergent, floating (excl. duckweed) and submerged).


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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 (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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 +
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<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.