



Pond surveillance network

Field survey methods

**Penny Williams, Corey Cannon, Naomi Ewald, Jeremy Biggs**

**Draft**

March 2012

**Report to Natural England**

**© Pond Conservation, Oxford 2012**

**For further information please contact:**

Pond Conservation  
Oxford Brookes University  
Headington  
Oxford OX3 0BP

**This report should be cited as:**

Williams, P, Cannon C, Ewald N, Biggs J. (2012) Pond surveillance network - field survey methods. Report to Natural England. Pond Conservation, Oxford.

**Acknowledgements**

We would like to thank the following people and organisations for their contribution to the development of the strategy outlined in this report:

Tony Gent, John Wilkinson and Dorothy Wright (Amphibian and Reptile Conservation); John Baker and David Orchard (Amphibian and Reptile Groups of the UK); Kevin Walker (Botanical Society of the British Isles); Steve Prentice and Dave Smallshire (British Dragonfly Society); Andy Musgrove and David Noble (British Trust for Ornithology); Vicky Kindemba and Margaret Palmer (Buglife); David Roy (Centre for Ecology and Hydrology/Biological Records Centre); Jim Bacon (Biological Records Centre), Martin Willing (Conchological Society of Great Britain), Dylan Lloyd (Countryside Council for Wales), Bill Brierley (Environment Agency); Mike Dobson (Freshwater Biological Association); Deborah Procter (Joint Nature Conservation Committee); Ben le Bas, Keith Porter, Andy Webb and Katharine Woods, (Natural England); Ian Wallace (Trichoptera Recording Scheme).

# Contents

<b>1</b>	<b>Introduction .....</b>	<b>2</b>
1.1	Aim of this document.....	2
1.2	Background .....	2
1.3	Surveillance species and habitats.....	3
1.4	Report structure.....	5
<b>2</b>	<b>Amphibian surveys .....</b>	<b>7</b>
2.1	Background .....	7
2.2	Strategic approach .....	7
2.3	Field survey methods .....	7
<b>3</b>	<b>Plant surveys .....</b>	<b>12</b>
3.1	Background .....	12
3.2	Strategic approach .....	12
3.3	Methodologies .....	12
<b>4</b>	<b>Invertebrates.....</b>	<b>16</b>
4.1	Aims .....	17
4.2	Strategic approach .....	17
4.3	BAP species surveillance .....	17
4.4	Biotic measures of water quality .....	17
4.5	Widespread taxa and families.....	17
<b>5</b>	<b>Environmental data .....</b>	<b>25</b>
5.1	Aims .....	25
5.2	Strategic approach .....	25
5.3	Measures .....	25
<b>6</b>	<b>References .....</b>	<b>28</b>
	<b>Annex 1. Range of environmental data collected by other surveillance scheme.....</b>	<b>29</b>

# 1 Introduction

---

## 1.1 Aim of this document

This document shows the methodologies developed for surveying pond-associated plants, animals and environmental data as part of a volunteer-based pond surveillance network (PondNet).

The methods will undergo initial trials during the 2012 field season, and more extensive trials during 2013.

## 1.2 Background

The overall aim of the project, '*Developing a structured surveillance of small standing water bodies*', is to explore the feasibility of a habitat-centred approach to surveillance monitoring. Small water-bodies are being used as an initial test of this approach which, if successful, could be applied to other habitats.

The project aims to establish the principles for establishing a strategic network of ponds across England that can provide a focus for volunteer recording activity across taxonomic groups. Specifically, the project aims to:

- Make use of existing networks and initiatives
- Cover the interests of each key taxonomic group
- Optimise the use of existing volunteers
- Provide the basis for feedback products to recorders
- Contain enough sites to provide statistically valid information on status and change
- Provide the basis for reporting on biodiversity outcomes for regional, national and European purposes
- Support the work of the recorder community through the development of new web-based tools and interfaces.

The initial development of the surveillance network will cover England, and provide national-level data. However, there is scope to extend the approach to other UK countries.

Regional Trials will be established in three areas (New Forest, Cheshire and NE Yorkshire), as part of Defra funded work (2012-13), to test the potential to develop the network to fulfil these aims.

### 1.3 Surveillance species and habitats

Key taxa for the project, are species of conservation concern that have widespread or localised occurrence in England. This includes Habitat's Directive Annex I and V species, and BAP priority species. These are taxa listed in Table 1 below.

**Table 1. Widespread and localised species of conservation concern that are the main focus of the project**

Species	Designation	Distribution in England
Common Frog	HD Annex V	Widespread
Common Toad	BAP	Widespread
Grass Snake	BAP	Widespread
Great Crested Newt	HD Annex II	Widespread
Flat-sedge	BAP	Localised
Marsh Clubmoss	BAP	Localised
Marsh Stitchwort	BAP	Localised
Pillwort	BAP	Localised
Tassel Stonewort	BAP	Localised
Tubular Water-dropwort	BAP	Widespread
Yellow Centaury	BAP	Localised
Mud Snail	BAP	Localised
White-clawed Crayfish*	HD Annex II, BAP	Widespread
European Eel*	BAP	Widespread
Water Vole	BAP	Widespread
Otter*	HD Annex II, BAP	Widespread

\* Species of lower importance in the project either because of survey difficulties or because ponds are not the primary habitat for the species.

In addition, the network aims to encompass the surveillance of a range of widespread species and taxon groups, as well as habitats of conservation concern. Habitats of particular interest include (i) BAP Priority Ponds and (ii) Habitats Directive Annex I habitat types (see Table 2).

**Table 2. Habitats Directive Annex I habitat types that occur in the three trial regions**

Habitat Directive Annex I habitat type	Project trial region
3110 Oligotrophic waters containing very few minerals of sandy plains ( <i>Littorelletalia uniflorae</i> )	New Forest
3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i>	New Forest
3140 Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	New Forest*, NE Yorkshire*
3150 Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation	Cheshire*
3160 Natural dystrophic lakes and ponds	New Forest*, NE Yorkshire*
3170 Mediterranean temporary ponds	New Forest (sub-optimal for this HD type)

\* Likely to occur, but not currently recognised

### 1.3.1 Integrating with other surveys

To work effectively, the new network needs to integrate with existing and developing schemes wherever possible (e.g. those run by BSBI, British Dragonfly Society, Amphibian and Reptile Conservation). This reduces the risk of diverting interest from current NGO initiatives and maximises synergy by, for example, maximising the potential recruitment of volunteers.

There are a range of parallel volunteer-based initiatives with which the current project also aims to interact. This includes the current Defra funded BSBI/CEH research project and JNCC initiatives linking habitats, species, and environmental change, and Natural England piloting of structured habitat surveillance.

### 1.3.2 Choosing survey ponds in the monitoring network

An outline of the proposed structure for the monitoring network is given in Williams *et al* (2012). In outline, pond surveys will be based on a stratified random selection of 1km squares. Some surveys will be undertaken at a number of ponds within the survey square (e.g. amphibian surveys). For most other surveys, one monitoring pond will be selected within the 1 km square. This pond will be chosen non-randomly by selecting a site with the best access. Using this approach minimises likely issues with landowner fatigue resulting from multiple visits to a pond through the year by a range of different groups.

Choosing sites non-randomly inevitably raises concerns that this will bias the type of the sites chosen. The main concern is that sites near to rights of way may be better, or worse, than typical countryside ponds.

To investigate this, an analysis of Countryside Survey 2009 data was undertaken to look at the relationship between (i) proximity to rights of way, and (ii) view of the pond from rights of way and pond quality metrics including Plant Species Richness and PSYM score. The results showed no significant relationship between pond quality and rights of way.

Overall, therefore, we believe that selecting sites on the basis of ease of access, is a pragmatic compromise to avoid landowner fatigue.

The main exception to the single pond principle is amphibians, where as many ponds as possible in the 1 km square will be surveyed. This enables amphibian species to be monitored with a sufficient sample size to detect acceptable levels of change (especially Great Crested Newt, Common Toad) (see companion report '*Developing a national pond surveillance strategy for widespread and localised species*' (Williams *et al* 2012).

## 1.4 Report outline

This report focuses on methodologies to survey key species and habitats, other biota (e.g. dragonflies) and environmental attributes. The groups, habitats and environmental measures covered are:

- Amphibians
- Plants
- Invertebrates
- Environmental attributes

Survey methods for birds are also currently being developed by the British Trust for Ornithology (BTO).

Table 3 summarises the optimal survey period for key species and groups considered in the report.

**Table 3. Survey period for key species and groups**

		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
<b>Amphibians</b>	<b>Great Crested Newt</b>								<b>Key</b> Survey season Optimal					
	Bottle trapping													
	Egg searching													
	Torching													
	Netting													
	<b>Common Toad</b>													
	Torching													
	Eggs													
	Netting													
	<b>Common Frog</b>													
	Torching													
	Eggs													
Netting														
<b>Plants</b>	<b>Tubular Water-dropwort</b>													
	<b>Marsh Stitchwort, Flat-sedge</b>													
	<b>Pillwort, Marsh Clubmoss</b>													
	<b>Yellow Centaury, Coral Necklace</b>													
	<b>Tassel Stonewort</b>													
	<b>Macrophytes (general)</b>													
<b>Freshwater invertebrates</b>	<b>Mud Snail</b>													
	<b>Freshwater invertebrates (general)</b>													
<b>Terrestrial invertebrates</b>	<b>Dragonfly exuviae</b>													
	<b>Dragonfly transects</b>													
<b>Birds</b>	<b>Breeding water birds</b>													



## 2 Amphibian surveys

---

### 2.1 Background

Amphibians are a key target group for the network. Data describing stock and trends in Great Crested Newt and Common Frog are required for European Habitats Directive reporting (Annex II and Annex V respectively). Both Great Crested Newt and Common Toad are also BAP species.

### 2.2 Strategic approach

A national strategy for amphibian surveillance has been developed for the current project in discussion with Amphibian and Reptile Conservation (ARC). The approach is based on the results of an *a priori* power analysis to identify the most effective basis for a volunteer monitoring network that is able assess stock and change in key amphibian species (Williams *et al* 2012).

This analysis showed that it was not possible to develop a random monitoring approach for amphibians because the size of the network required was too large to be viable for a volunteer network (>2000 ponds). The approach adopted was, therefore, to target a proportion (50%) of surveys at ponds in 1 km grid squares where either Great Crested Newt (GCN) or Common Toad were already known to occur, enabling trends in known populations to be monitored. The remaining 50% of sites were selected at random from squares where the species has not been recorded, to look at trends (e.g. new sites for the species) in the wider countryside.

The full amphibian network comprises c550 1km grid squares, combining two sub-networks, one each for Great Crested Newt and Common Toad. Of these 170 squares are known to support Common Toad, 190 support Great Crested Newts and in 190 squares neither are known.

Ideally, all ponds in each square should be surveyed for amphibians. However where more than three or four ponds are present in a square, it is sufficient to survey a proportion of sites, as long as the same ponds are re-surveyed in future years.

Note that the current methodology has been derived from amphibian distribution data, based on optimal survey methodologies. It does not take into account uncertainties and variability introduced through survey methods e.g. the number of site visits or different methods used. A separate analysis, undertaken by David Sewell and colleagues, will be undertaken this year (2012) to address this.

### 2.3 Field survey methods

Amphibian field survey methods (shown over-page) are based on the National Amphibian and Reptile Recording Scheme (NARRS) methodology, developed by ARC. Modifications have been made in line with the PondNet protocol outlined above, and through consultation with regional Amphibian and Reptile Groups (ARGs) and ARG-UK. The most significant changes from a standard NARRS survey are (i) the need to survey all (or most) ponds across a grid square and (ii) recording *presence* of a species (rather than abundance) as the main measure.

The amphibian field survey form includes an assessment of the Great crested Newt Habitat Suitability Index (HSI) which can also be used to assess pond quality for GCN and, indirectly, as a proxy for GCN abundance.



## PondNet AMPHIBIAN SURVEY – PROTOCOLS SUMMARY

**Aim of the survey** – To gather data on the occurrence and status of widespread amphibian species across the UK. Participants are allocated a randomly-selected 1 km grid square with a focal pond. However, within the square visits should be made to as many ponds as possible. The survey collects information about the pond habitat, any amphibians detected, and other environmental variables. All data gathered through PondNet will feed into NARRS.

**Grid square allocation** – A square with a focal pond will be allocated randomly to each surveyor. Write your grid square on the form.

**Pond selection** – A pond is a water body between one square metre and two hectares (100 x 200 m). Pond area is the surface area of the pond when water is at its highest level (excluding flooding events). This is usually in the spring. If the pond is being measured at another time of year the spring time area should still be evident from vegetation types and evidence of a draw down zone around the pond. **Please survey as many ponds in the 1 km square as possible. You DON'T need to survey ALL ponds – just the number that is comfortable.** Ideally choose the ponds you will survey from the map, before you visit. Don't just select ponds that look nice or the results will show that countryside ponds are better than they really are!

**Access permission** – We will make every effort to prearrange access before you are allocated a square. If we are unable to do so we would ask that you identify the landowner/tenant and ask permission to survey the pond. Simple verbal permission can often be achieved after knocking doors locally. It is helpful to ask the landowner about access points, safety issues, the pond and its wildlife. If access is denied or the pond no longer exists, identify another pond in your square. If there are no other ponds in your square, find the nearest pond in the neighbouring squares. Tell us on your survey form if you had to select an alternative pond.

**Great Crested Newt Habitat Suitability Index (HSI)** – These ten questions about the pond help to predict its suitability for great crested newts. We are trying to gather as much HSI data as we can nationally. For more information see [http://www.narrs.org.uk/Documents/nasdocuments/HSI\\_guidance.pdf](http://www.narrs.org.uk/Documents/nasdocuments/HSI_guidance.pdf).

**Survey visits** – If only **one** visit is possible, please make this visit in **May** to record Great Crested Newt and other newts. If you can make two or more visits, then make at least one visit in March / April for Common Toad and Common Frog, and at least one in late-April / May for newts. **In subsequent years it is very important to return to the same ponds.**

**Visual search** – Walk around the pond edge as far as you can, looking for amphibians and their spawn/eggs. Look especially for submerged aquatic plants with folded leaves where newts have laid their eggs. Carefully unfold a few leaves to see if they contain a white/yellowish egg (great crested newt) or grey/brownish egg (smooth or palmate newt).

**Netting** – Newts tend to hide in aquatic vegetation by day. If the pond has submerged vegetation, work your way around the edge with a strong net, making vigorous sweeps through the vegetation at roughly two metre intervals. You may catch newts (especially the smaller

species) or tadpoles. Inspect your catch, taking care not to harm anything, then release any animals caught and continue around the pond.

Torchlight survey – Newts become very active after dark and a powerful torch is very effective for spotting them in open water. Circumnavigate the pond, stopping every two metres or so to make torch sweeps outwards and back again. Work your way around the bank and keep note of the amphibians you see. Great crested newts are much larger than the other two species, and males are easily recognisable by the white tail flash. Smooth and palmate newts are harder to distinguish, but you might be able to separate them by presence/absence of webbed feet, tail filament and jagged crest in the males. The torchlight survey is optional, as safety allows.

**Bottle-trapping** – a way to increase the “detectability” of newts in your survey pond is to bottle trap but this is ONLY for use if you are fully trained, licensed and very confident of the method.

**Note – your survey results are very valuable however many visits or methods you can use!**

**Health & safety** – Take care and refer to our risk assessment and lone working advice.

**Amphibian disease** - Chytrid fungus is present in the UK. As a precautionary measure, disinfect footwear and equipment thoroughly between sites with bleach spray or agricultural Virkon solution.

**Licensing** – Where great crested newts or natterjack toads might be present, you will need a licence accreditation letter from ARC. Always carry this with you, or bring your own licence if you have one.

PondNet [www.pondconservation.org.uk/pondnet](http://www.pondconservation.org.uk/pondnet) is being coordinated by Amphibian and Reptile Conservation and Pond Conservation.

<b>Recorder Name</b>	
<b>Recorder contact details</b>	

**Pond details**

<b>Pond grid reference</b> e.g. (SP 1234 4321)		<b>Nearest town</b>	
<b>Pond name/address/reference number (and source)</b>			
<b>If the pond no longer exists please tick here</b>			

**Landowner details** *If the pond is on private land you must have the landowner/manager's permission to visit the site. If the pond is in a public access area it is still useful to know who owns the land.*

<b>Name</b>		<b>Phone number</b>	
<b>Address</b>			
		<b>Post code</b>	
<b>Is the landowner/manager willing to be contacted if any follow-up is required?</b>			<b>Yes / No</b>

**Habitat Suitability Index** (refer to notes below)

1. Map Location. Score: A (optimal), B (marginal) or C (unsuitable) (see map below)		6. Waterfowl impact. Score: 1 = major, 2 = minor, 3 = none.	
2. Pond area in m <sup>2</sup> . Estimate.		7. Fish presence. Score: 1 = major, 2 = minor, 3 = possible, 4 = absent.	
3. Number of years in ten pond dries up. Estimate or ask landowner.		8. Number of other ponds within 1 km (1: 25 000 maps) not separated by barriers to dispersal.	
4. Water quality. Score: 1 = bad, 2 = poor, 3 = moderate, 4 = good.		9. Terrestrial habitat. Score: 1 = none, 2 = poor, 3 = moderate, 4 = good.	
5. Percentage perimeter shaded (to at least 1 m from shore). Estimate.		10. Percentage of pond surface occupied by aquatic vegetation (March-June). Estimate.	

**Water quality: Bad** = clearly polluted, only pollution-tolerant invertebrates, no submerged plants; **Poor** = low invertebrate diversity, few submerged plants; **Moderate** = moderate invertebrate diversity; **Good** = abundant and diverse invertebrate community.

**Waterfowl impact: Major** = severe impact of waterfowl i.e. little or no evidence of submerged plants, water turbid, pond banks showing patches where vegetation removed, evidence of provisioning waterfowl; **Minor** = waterfowl present, but little indication of 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: 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(s).

**Terrestrial habitat:** Within c250 m of the pond, but not including areas on the far side of any major barriers (e.g. major roads). **None** = clearly no suitable habitat within immediate pond locale; **Poor** = habitat with poor structure that offers limited opportunities for foraging and shelter (e.g. amenity grassland); **Moderate** = offers opportunities for foraging and shelter, but may not be extensive; **Good** = extensive habitat that offers good opportunities for foraging and shelter completely



**1. Map Location**

**Score:**  
 A (optimal),  
 B (marginal) or  
 C (unsuitable)

**SURVEY VISITS:** Please **survey as many ponds in the 1 km square as possible**. You DON'T need to survey ALL ponds just the number that is comfortable. Ideally choose the ponds you will survey from the map, before you visit. Don't just select ponds that look nice or the results will show that countryside ponds are better than they really are!

If only **one** visit is possible, please make this visit in **May** to record Great Crested Newt and other newts. If you can make two or more visits, then make at least one visit in March / April for Common Toad and Common Frog, and at least one in late-April / May for newts.

In subsequent years it is important to return to the same ponds.

In the boxes below, please note the method(s) (VISUAL SEARCHING, NETTING, TORCHLIGHT SURVEY) used on each visit, and enter the survey details. Use bottle traps only if trained, licensed and confident to do so. **The survey results are valuable however many methods you can use!**

Please record any dead or sick amphibians you see in the Notes box.

<b>VISIT 1</b>	Date:	Method(s) used:				
	Number				Time: to	
	Adults	Immatures	Larvae	Eggs/spawn	Air temperature °C	
Common frog					Water temperature °C	
Common toad					Water clarity (score 1-3)*	
Great crested newt					Rain (score 0, 1, 2, 3) #	
Palmate newt					Wind disturbing water	(tick)
Smooth newt					Bright moonlight	(tick)
Other species					% Shoreline surveyed	%
					Number of traps used	
Notes						

<b>VISIT 2</b>	Date:	Method(s) used:				
	Number				Time: to	
	Adults	Immatures	Larvae	Eggs/spawn	Air temperature °C	
Common frog					Water temperature °C	
Common toad					Water clarity (score 1-3)*	
Great crested newt					Rain (score 0, 1, 2, 3) #	
Palmate newt					Wind disturbing water	(tick)
Smooth newt					Bright moonlight	(tick)
Other species					% Shoreline surveyed	%
					Number of traps used	
Notes						

<b>VISIT 3</b>	Date:	Method(s) used:				
	Number				Time: to	
	Adults	Immatures	Larva	Eggs/spawn	Air temperature °C	
Common frog					Water temperature °C	
Common toad					Water clarity (score 1-3)*	
Great crested newt					Rain (score 0, 1, 2, 3) #	
Palmate newt					Wind disturbing water	(tick)
Smooth newt					Bright moonlight	(tick)
Other species					% Shoreline surveyed	%
					Number of traps used	
<u>Notes:</u>						

\* Water clarity: 1 = good, pond bottom visible, 2 = intermediate, bottom visible in shallows (<20 cm), 3 = turbid, bottom not visible.

# Rainfall: 0 = none, 1 = yesterday, 2 = immediately prior, 3 = during survey

## 3 Plant surveys

---

### 3.1 Background

A range of plant data will be collected within PondNet to obtain four main types of information:

1. **Species population data**, used to monitor stock and change in widespread and localised BAP species, i.e.:
  - Tubular Water-dropwort
  - Marsh Stitchwort
  - Flat-sedge
  - Yellow Centaury
  - Marsh Clubmoss
  - Pillwort
2. **Indicator species data** used to identify Habitats Directive Annex I habitat types
3. **Wetland plant survey data** (e.g. species richness and rarity) used to provide information on plant biodiversity trends
4. **Plant metric data** (species data and other measures e.g. plant cover) used to provide pond quality indicators (e.g. PSYM, Ellenberg scores) to look at changes in pond quality, and give biotic indices (e.g. Trophic Ranking Score) that can help to establish the reasons for change.

### 3.2 Strategic approach

A strategy for gathering plant surveillance data to achieve these ends has been developed as part of the wider PondNet Network.

BAP plant species (Aim 1 above), will be monitored by targeting known sites and measuring abundance. However the approach used for monitoring in the field will vary depending on the plant's growth form (see below).

Wetland plant monitoring more generally (Aims 2-4 above) will be based on a survey network of c200 ponds, with a single survey pond selected within each of 200 randomly allocated 1 km grid squares. Species data will also be collected at Priority Ponds (c 50-100 ponds including ponds from the random and amphibian networks).

At each pond, a standard list of wetland species will be recorded. However, this list is extensive and not suitable for novice volunteers. A range of approaches will be tested to establish how it is best to obtain these plant data. This is likely to include trials of (i) a professional-level pre-survey to provide a baseline species list, and (b) use of entry and intermediate-level species lists undertaken in collaboration with BSBI. The species list is currently available in both Latin and English alphabetical order. The Latin version is given over-page.

### 3.3 Methodologies

#### 3.3.1 BAP species surveillance

Different methods will be needed to monitor target BAP species depending on: (a) the plant's growth habit and (b) the size of the population. Plant abundance is not an easy attribute to measure reliably so trials will be needed to establish a robust methodology.

The standard methodology to be initially trialled for BAP species is:

1. Record the target species within a 200 x 200 m area of the grid square in which it occurs.
2. For each pond within this area record (i) the available niche within the pond (% of pond) (ii) the percentage cover of the species, within the available niche.

Where cover is low i.e. less than 5% cover or fewer than 100 plants, then a more detailed assessment is undertaken.

- For plants with an erect habit (e.g. Tubular Water-dropwort, Tassel Stonewort) the number of plants is counted
- For plants that are creeping (Pillwort, Coral Necklace) plant patches are counted and measured in square centimetres.

### **3.3.2 Wetland plant species lists**

Botanical surveys will be undertaken using a standard proforma to note (i) presence of wetland plant species (% cover for each species optional) and (ii) total plant cover.

These data can be analysed to provide a range of measures and metrics for assessing change in pond biodiversity value and biological quality, as well as biotic measures (e.g. Trophic Ranking Score) which can be used to support evidence of environmental change.

### **3.3.3 Habitats Directive assessment**

The presence of a key Habitat's Directive plant indicator species (e.g. stoneworts, Shoreweed, Frogbit) on the wetland list for a site will be used to trigger further assessment to establish whether the pond fits the definition of a Habitat's Directive habitat type. If so, an additional Common Standards Monitoring compatible methodology will be invoked.



**Cross through all wetland plants within the outer boundary of the pond (upper winter water level). For each species present record its abundance as % cover within the pond as a whole**

## Submerged

Apium inundatum	(Lesser Marshwort)	Sagittaria latifolia	(Duck-potato)
Aponogeton distachyos	(Cape-pondweed)	Sagittaria rigida	(Canadian Arrowhead)
Cabomba caroliniana	(Fanwort)	Sagittaria sagittifolia	(Arrowhead)
Callitriche brutia (s.s.)	(Pedunculate Water-starwort)	Sparganium angustifolium	(Floating Bur-reed)
Callitriche hamulata (s.l.)	(Intermediate Water-starwort)	Sparganium emersum	(Unbranched Bur-reed)
Callitriche hermaphroditica	(Autumnal Water-starwort)	Sparganium natans (S. minimum)	(Least Bur-reed)
Callitriche obtusangula	(Blunt-fruited Water-starwort)	Sphagnum sp.	(Bog Moss species)
Callitriche palustris	(no english name)	Stratiotes aloides	(Water Soldier)
Callitriche platycarpa	(Various-leaved Water-starwort)	Subularia aquatica	(Awlwort)
Callitriche stagnalis (s.l.)	(Common Water-starwort)	Utricularia australis	(Bladderwort)
Callitriche sp.	-	Utricularia intermedia (s.s.)	(Intermediate Bladderwort)
Callitriche truncata	(Short-leaved Water-starwort)	Utricularia stygia	(Nordic Bladderwort)
Ceratophyllum demersum	(Rigid Hornwort)	Utricularia ochroleuca	(Pale Bladderwort)
Ceratophyllum submersum	(Soft Hornwort)	Utricularia intermedia (s.l.) incs Stygia & ochroleuca	(Intermediate Bladderwort)
Crassula aquatica	(Pigmyweed)	Utricularia minor	(Lesser Bladderwort)
Crassula helmsii	(New Zealand Pigmyweed )	Utricularia vulgaris (s.l.) (inc australis)	(Greater Bladderwort)
Egeria densa	(Large-flowered Waterweed)	Utricularia vulgaris (s.s.)	(Greater Bladderwort)
Elatine hexandra	(Six-stamened Waterwort)	Vallisneria spiralis	(Tapegrass)
Elatine hypodiper	(Eight-stamened Waterwort)	Zannichellia palustris	(Horned Pondweed)
Eleogiton fluitans	(Floating Club-rush)	Chara spp. (list)	-
Elodea callitrichoides (E.ernstiae)	(South American Waterweed)	Nitella spp.	-
Elodea canadensis	(Canadian Waterweed)	Chara aspera	(Rough Stonewort)
Elodea nuttallii	(Nuttall's Waterweed)	Chara baltica	(Baltic Stonewort)
Eriocaulon aquaticum	(Pipewort)	Chara canescens	(Bearded stonewort)
Fontinalis antipyretica	(Willow Moss)	Chara connivens	(Convergent stonewort)
Groenlandia densa	(Opposite-leaved Pondweed)	Chara contraria	(Opposite Stonewort)
Hippuris vulgaris	(Mare's-tail)	Chara curta	(Lesser Bearded Stonewort)
Hottonia palustris	(Water-violet )	Chara denudata	(Naked Stonewort)
Hydrilla verticillata	(Esthwaite waterweed)	Chara fragifera	(Strawberry Stonewort)
Isoetes echinospora	(Spring Quillwort)	Chara globularis	(Fragile stonewort)
Isoetes lacustris	(Quillwort)	Chara hispida	(Bristly Stonewort)
Juncus bulbosus	(Bulbous Rush)	Chara intermedia	(Intermediate Stonewort)
Lagarosiphon major	(Curly Waterweed)	Chara muscosa	(Mossy Stonewort)
Littorella uniflora	(Shoreweed)	Chara pedunculata	(Hedgehog Stonewort)
Lobelia dortmanna	(Water Lobelia)	Chara rudis	(Rugged Stonewort)
Ludwigia palustris	(Hampshire-purslane)	Chara tormentosa	(Coral Stonewort)
Myriophyllum alterniflorum	(Alternate Water-milfoil)	Chara virgata	(Delicate stonewort)
Myriophyllum aquaticum	(Parrot's-feather)	Chara vulgaris	(Common Stonewort)
Myriophyllum spicatum	(Spiked Water-milfoil)	Lamprothamnium papulosum	(Foxtail Stonewort)
Myriophyllum verticillatum	(Whorled Water-milfoil)	Nitella capillaris	(Slimy-fruited Stonewort)
Najas flexilis	(Slender Naiad)	Nitella confervacea	(Least stonewort)
Najas marina	(Holly-leaved Naiad)	Nitella flexilis	(Smooth Stonewort)
Oenanthe fluviatilis	(River Water-dropwort)	Nitella gracilis	(Slender Stonewort)
Potamogeton acutifolius	(Sharp-leaved Pondweed)	Nitella hyalina	(Many-branched Stonewort)
Potamogeton alpinus	(Red Pondweed)	Nitella mucronata	(Pointed Stonewort)
Potamogeton berchtoldii	(Small Pondweed)	Nitella opaca	(Dark Stonewort)
Potamogeton coloratus	(Fen Pondweed)	Nitella spanioclema	(Few-branched Stonewort)
Potamogeton compressus	(Grass-wrack Pondweed)	Nitella tenuissima	(Dwarf Stonewort)
Potamogeton crispus	(Curled Pondweed)	Nitella translucens	(Translucent Stonewort)
Potamogeton epihydrus	(American Pondweed)	Nitelopsis obtusa	(Starry Stonewort)
Potamogeton filiformis	(Slender-leaved Pondweed)	Tolypella glomerata	(Clustered Stonewort)
Potamogeton friesii	(Flat-stalked Pondweed)	Tolypella intricata	(Tassel Stonewort)
Potamogeton gramineus	(Various-leaved Pondweed)	Tolypella nidifica	(Bird's-nest Stonewort)
Potamogeton lucens	(Shining Pondweed)	Tolypella prolifera	(Great Tassel Stonewort)
Potamogeton nodosus	(Loddon Pondweed)	<b>Floating</b>	
Potamogeton obtusifolius	(Blunt-leaved Pondweed)	Azolla filiculoides	(Water Fern)
Potamogeton pectinatus	(Fennel Pondweed)	Hydrocharis morsus-ranae	(Frogbit )
Potamogeton perfoliatus	(Perfoliate Pondweed)	Hydrocotyle ranunculoides	(Floating Pennywort)
Potamogeton praelongus	(Long-stalked Pondweed)	Lemna gibba	(Fat Duckweed)
Potamogeton pusillus	(Lesser Pondweed)	Lemna minor	(Common Duckweed)
Potamogeton rutilus	(Shetland Pondweed)	Lemna minuta	(Least Duckweed)
Potamogeton trichoides	(Hairlike Pondweed)	Lemna trisulca	(Ivy-leaved Duckweed)
Ranunculus aquatilis	(Common Water-crowfoot)	Luronium natans	(Floating Water-plantain)
Ranunculus baudotii	(Brackish Water-crowfoot)	Menyanthes trifoliata	(Bogbean)
Ranunculus circinatus	(Fan-leaved Water-crowfoot)	Nuphar advena	(Spatter-dock)
Ranunculus fluitans	(River Water-crowfoot )	Nuphar lutea	(Yellow Water-lily)
Ranunculus peltatus	(Pond Water-crowfoot)	Nuphar pumila	(Least Water-lily)
Ranunculus penicillatus	(Stream Water-crowfoot)	Nymphaea	(Water-lily (non native spp))
R. penicillatus subsp. Penicillatus	(Stream Water-crowfoot)	Nymphaea alba	(White Water-lily)
Ranunculus trichophyllus	(Thread-leaved Water-crowfoot)	Nymphaeoides peltata	(Fringed Water-lily)
Ranunculus tripartitus	(Three-lobed Crowfoot)	Persicaria amphibia (Polygonum amphibium)	(Amphibious Bistort)
Ranunculus sp.	-		
Ruppia cirrhosa	(Spiral Tasselweed)		
Ruppia maritime	(Beaked Tasselweed)		



**Floating cont.**

Potamogeton natans  
Potamogeton polygonifolius  
Riccia fluitans

(A floating liverwort)  
(A floating liverwort)  
(Greater Duckweed)  
(Rootless Duckweed)

Ricciocarpos natans  
Spirodela polyrhiza  
Wolffia arrhiza

(Sneezewort)  
(Sweet-flag)  
(Velvet Bent)

**Emergent plants**

Achillea ptarmica  
Acorus calamus  
Agrostis canina  
Agrostis stolonifera  
Alisma gramineum  
Alisma lanceolatum  
Alisma plantago-aquatica  
Alopecurus aequalis  
Alopecurus borealis  
Alopecurus geniculatus  
Anagallis tenella  
Andromeda polifolia  
Angelica archangelica  
Angelica sylvestris  
Apium graveolens  
Apium nodiflorum  
Apium repens  
Baldellia ranunculoides  
Berula erecta  
Bidens cernua  
Bidens connata  
Bidens frondosa  
Bidens tripartita  
Blysmus compressus  
Bolboschoenus maritimus  
Bryum calophyllum  
Bryum knowltonii  
Bryum warneum  
Butomus umbellatus  
Calamagrostis canescens  
Calamagrostis epigejos  
Calamagrostis purpurea  
Calamagrostis stricta  
Calamagrostis scotica  
Calla palustris  
Caltha palustris  
Cardamine amara  
Cardamine pratensis  
Carex acuta  
Carex acutiformis  
Carex appropinquata  
Carex aquatilis  
Carex curta  
Carex diandra  
Carex dioica  
Carex disticha  
Carex echinata  
Carex elata  
Carex elongata  
Carex flacca  
Carex hostiana  
Carex laevigata  
Carex lasiocarpa  
Carex limosa  
Carex magellanica  
Carex maritima  
Carex nigra  
Carex otrubae  
Carex panicea  
Carex paniculata  
Carex pendula  
Carex pseudocyperus  
Carex pulicaris  
Carex riparia  
Carex rostrata  
Carex spicata  
Carex spp.  
Carex vesicaria  
Carex viridula ssp. Brachyrrhyncha  
Carex viridula ssp. oedocarpa  
Carex viridula ssp. viridula  
Carex vulpina

(Creeping Bent)  
(Ribbon-leaved Water-plantain)  
(Narrow-leaved Water-plantain)  
(Water-plantain)  
(Orange Foxtail)  
(Alpine Foxtail)  
(Marsh Foxtail)  
(Bog Pimpernel)  
(Bog-rosemary)  
(Garden Angelica)  
(Wild Angelica)  
(Wild Celery)  
(Fool's-water-cress)  
(Creeping Marshwort)  
(Lesser Water-plantain)  
(Lesser Water-parsnip)  
(Nodding Bur-marigold)  
(London Bur-marigold)  
(Beggarticks)  
(Trifid Bur-marigold)  
(Flat-sedge)  
(Sea Club-rush)  
(Matted bryum)  
(Knowlton's Thread-moss)  
(Sea bryum)  
(Flowering-rush)  
(Purple Small-reed)  
(Wood Small-reed)  
(Scandinavian Small-reed)  
(Narrow Small-reed)  
(Scottish Small-reed)  
(Bog Arum)  
(Marsh-marigold)  
(Large Bitter-cress)  
(Cuckooflower)  
(Slender Tufted-sedge)  
(Lesser Pond-sedge)  
(Fibrous Tussock-sedge)  
(Water Sedge)  
(White Sedge)  
(Lesser Tussock-sedge)  
(Dioecious Sedge)  
(Brown Sedge)  
(Star Sedge)  
(Tufted Sedge)  
(Elongated Sedge)  
(Glaucous Sedge)  
(Tawny Sedge)  
(Smooth-stalked Sedge)  
(Slender Sedge)  
(Bog Sedge)  
(Tall Bog-sedge)  
(Curved Sedge)  
(Common Sedge)  
(False Fox-sedge)  
(Carnation Sedge)  
(Greater Tussock-sedge)  
(Pendulous Sedge)  
(Cyperus Sedge)  
(Flea Sedge)  
(Greater Pond-sedge)  
(Bottle Sedge)  
(Spiked Sedge)  
(Carex species)  
(Bladder Sedge)  
(Yellow-sedge ssp.)  
(Yellow-sedge ssp.)  
(Yellow-sedge ssp.)  
(True Fox-sedge)

Catabrosa aquatica  
Cephaloziella dentata  
Chrysosplenium alternifolium  
Chrysosplenium oppositifolium  
Cicendia filiformis  
Cicuta virosa

(Broad-leaved Pondweed)  
(Bog Pondweed)

Cirsium dissectum  
Cirsium palustre  
Cladium mariscus  
Conium maculatum  
Corrigiola litoralis  
Crepis paludosa  
Cyperus eragrostis  
Cyperus fuscus  
Cyperus longus  
Dactylorhiza fuchsii  
Dactylorhiza incarnata subsp. cruenta  
Dactylorhiza incarnata subsp. ochroleuca  
Dactylorhiza incarnata  
Dactylorhiza lapponica  
Dactylorhiza maculata  
Dactylorhiza majalis subsp. cambrensis  
Dactylorhiza majalis  
Dactylorhiza praetermissa  
Dactylorhiza purpurella  
Dactylorhiza purpurella subsp. cambrensis  
Dactylorhiza traunsteinerioides  
D. traunsteinerioides subsp. lapponica  
Damasonium alisma  
Deschampsia caespitosa  
Deschampsia caespitosa subsp. alpina  
Drosera anglica  
Drosera binata  
Drosera capensis  
Drosera intermedia  
Drosera rotundifolia  
Dryopteris cristata  
Eleocharis acicularis  
Eleocharis mamillata subsp. austriaca  
Eleocharis multicaulis  
Eleocharis palustris  
Eleocharis palustris subsp. palustris  
Eleocharis quinqueflora  
Eleocharis uniglumis  
Epilobium alsinifolium  
Epilobium anagallidifolium  
Epilobium brunnescens (E. nerteroides)  
Epilobium ciliatum  
Epilobium hirsutum  
Epilobium obscurum  
Epilobium palustre  
Epilobium parviflorum  
Epilobium sp.  
Epilobium tetragonum  
Epipactis palustris  
Equisetum fluviatile  
Equisetum palustre  
Erica tetralix  
Eriophorum angustifolium  
Eriophorum gracile  
Eriophorum latifolium  
Eriophorum vaginatum  
Eupatorium cannabinum  
Filipendula ulmaria  
Galium boreale  
Galium constrictum (debile)  
Galium palustre  
Galium uliginosum  
Geum rivale  
Glyceria declinata  
Glyceria fluitans  
Glyceria maxima  
Glyceria notata (G. plicata)  
Gnaphalium uliginosum  
Hammarbya paludosa  
Hydrocotyle vulgaris  
Hypericum elodes  
Hypericum tetrapterum  
Hypericum undulatum

(Hemlock)  
(Strapwort)  
(Marsh Hawk's-beard)  
(Pale Galingale)  
(Brown Galingale)  
(Galingale)  
(Common Spotted-orchid)  
(Early Marsh-orchid)  
(Early Marsh-orchid)  
(Early Marsh-orchid)  
(Early Marsh-orchid)  
(Lapland Marsh-orchid)  
(Heath Spotted-orchid)  
(Western Marsh-orchid)  
(Southern Marsh-orchid)  
(Northern Marsh-orchid)  
(Narrow-leaved Marsh-orchid)  
(Starfruit)  
(Tufted Hair-grass)  
(Great Sundew)  
(No english name)  
(No english name)  
(Oblong-leaved Sundew)  
(Round-leaved Sundew)  
(Crested Buckler-fern)  
(Needle Spike-rush)  
(Northern spike rush)  
(Many-stalked Spike-rush)  
(Common Spike-rush)  
(Few-flowered Spike-rush)  
(Slender Spike-rush)  
(Chickweed Willowherb)  
(Alpine Willowherb)  
(New Zealand Willowherb)  
(American Willowherb)  
(Great Willowherb)  
(Short-fruited Willowherb)  
(Marsh Willowherb)  
(Hoary Willowherb)  
(Willowherb)  
(Square-stalked Willowherb)  
(Marsh Helleborine)  
(Water Horsetail)  
(Marsh Horsetail)  
(Cross-leaved Heath)  
(Common Cottongrass)  
(Slender Cottongrass)  
(Broad-leaved Cottongrass)  
(Hare's-tail Cottongrass)  
(Hemp-agrimony)  
(Meadowsweet)  
(Northern Bedstraw)  
(Slender Marsh Bedstraw)  
(Common Marsh-bedstraw)  
(Fen Bedstraw)  
(Water Avens)  
(Small Sweet-grass)  
(Floating Sweet-grass)  
(Reed Sweet-grass)  
(Plicate Sweet-grass)  
(Marsh Cudweed)  
(Bog Orchid)  
(Marsh Pennywort)  
(Marsh St Johns-wort)  
(Square-stalked St Johns-wort)  
(Wavy St Johns-wort)

**Emergent plants cont.**

Illecebrum verticillatum  
Impatiens capensis  
Impatiens glandulifera  
Impatiens noli-tangere  
Iris pseudacorus  
Isolepis cernua  
Isolepis setacea  
Juncus acutiflorus  
Juncus ambiguus (J. ranarius)  
Juncus articulatus  
Juncus bufonius (s.l.)

Juncus bufonius (s.s.)	(Jointed Rush)	Ranunculus omiophyllus	(Ivy-leaved Crowfoot)
Juncus compressus	(Toad Rush)	Ranunculus ophioglossifolius	(Greater Spearwort)
Juncus conglomeratus	(Toad Rush)	Ranunculus reptans	(Round-leaved Crowfoot)
Juncus effusus	(Round-fruited Rush)	Ranunculus sceleratus	(Adder's-tongue Spearwort)
Juncus foliosus	(Compact Rush)	Rhynchospora alba	(Creeping spearwort)
Juncus inflexus	(Soft Rush)	Rhynchospora fusca	(Celery-leaved Buttercup)
Juncus pygmaeus	(Leafy Rush)	Riccia bifurca	(White Beak-sedge)
Juncus subnodulosus	(Hard Rush)	Riccia canaliculata	(Brown Beak-sedge)
Lathyrus palustris	(Pigmy Rush)	Rorippa amphibia	(Lizard Crystalwort)
Leersia oryzoides	(Blunt-flowered Rush)	Rorippa microphylla	(Channelled Crystalwort)
Limosella aquatica	(Marsh Pea)	Rorippa nasturtium-aquaticum (s.l.)	(Great Yellow-cross)
Liparis loeselii	(Cut-grass)	Rorippa nasturtium-aquaticum (s.s.)	(Narrow-fruited Water-cross)
Lobelia urens	(Mudwort)	Rorippa palustris	(Water-cross)
Lotus pedunculatus	(Fen Orchid)	Rorippa islandica	(Water-cross)
Luzula luzuloides	(Heath Lobelia)	Rumex aquaticus	(Marsh Yellow-cross)
Luzula sylvatica	(Greater Bird's-foot-trefoil)	Rumex hydrolypatham	(Northern Yellow-cross)
Lychnis flos-cuculi	(White Wood Rush)	Rumex maritimus	(Scottish Dock)
Lycopodiella inundata	(Great Wood Rush)	Rumex palustris	(Water Dock)
Lycopus europaeus	(Ragged-Robin)	Sagina procumbens	(Golden Dock)
Lysimachia nummularia	(Marsh Clubmoss)	Sagittaria subulata	(Marsh Dock)
Lysimachia terrestris	(Gipsywort)	Samolus valerandi	(Procumbent Pearlwort)
Lysimachia thysiflora	(Creeping-Jenny)	Scheuchzeria palustris	(Narrow-leaved Arrowhead)
Lysimachia vulgaris	(Lake Loosestrife)	Schoenoplectus lacustris	(Brookweed)
Lythrum hyssopifolia	(Tufted Loosestrife)	Schoenoplectus pungens	(Rannoch-rush)
Lythrum portula	(Yellow Loosestrife)	Schoenoplectus tabernaemontani	(Common Club-rush)
Lythrum salicaria	(Grass-poly)	Schoenoplectus triquetrum	(Sharp Club-rush)
Mentha aquatica	(Water-purslane)	Schoenus ferrugineus	(Grey Club-rush)
Mentha pulegium	(Purple-loosestrife)	Schoenus nigricans	(Triangular Club-rush)
Mentha suaveolens	(Water Mint)	Scirpoides holoschoenus	(Brown Bog-rush)
Mimulus guttatus	(Pennyroyal)	Scleranthus annuus	(Black Bog-rush)
Mimulus luteus	(Round-leaved mint)	Scleranthus annuus subsp. annuus	(Round-headed Club-rush)
Mimulus moschatus	(Monkeyflower)	Scleranthus annuus subsp. polycarpus	(Annual Knawel)
Minuartia stricta	(Blood-drop-emlets)	Scorzonera humilis	(Annual Knawel)
Molinia caerulea	(Musk)	Scrophularia auriculata	(Annual Knawel)
Montia fontana	(Teesdale Sandwort)	Scrophularia umbrosa	(Viper's-grass)
Myosotis laxa	(Purple Moor-grass)	Scutellaria galericulata	(Water Figwort)
Myosotis scorpioides	(Blinks)	Scutellaria minor	(Green Figwort)
Myosotis secunda	(Tufted Forget-me-not)	Senecio aquaticus	(Skullcap)
Myosotis stolonifera	(Water Forget-me-not)	Senecio fluviatilis	((Lesser Skullcap))
Myosoton aquaticum	(Creeping Forget-me-not)	Senecio paludosus	(Marsh Ragwort)
Myrica gale	(Pale Forget-me-not)	Sium latifolium	(Broad-leaved Ragwort)
Narthecium ossifragum	(Water Chickweed)	Solanum dulcamara	(Fen Ragwort)
Oenanthe aquatica	(Bog Myrtle)	Sonchus palustris	(Greater Water-parsnip)
Oenanthe crocata	(Bog Asphodel)	Sparganium erectum	(Bittersweet)
Oenanthe fistulosa	(Fine-leaved Water-dropwort)	Sphagnum balticum	(Marsh Sow-thistle)
Oenanthe lachenalii	(Hemlock Water-dropwort)	Stachys palustris	(Branched Bur-reed)
Oenanthe pimpinelloides	(Tubular Water-dropwort)	Stellaria palustris	(Baltic Bog-moss)
Oenanthe silaifolia	(Parsley Water-dropwort)	Stellaria uliginosa	(Marsh Woundwort)
Osmunda regalis	(Corky-fruited Water-dropwort)	Symphytum officinale	(Marsh Stitchwort)
Parnassia palustris	(Narrow-leaved Water-dropwort)	Teucrium scordium	(Bog Stitchwort)
Pedicularis palustris	(Royal Fern)	Thalictrum flavum	(Common Comfrey)
Persicaria hydropiper	(Grass-of-Parnassus)	Thelypteris palustris	(Water Germander)
Persicaria lapathifolia	(Marsh Lousewort)	Tofieldia pusilla	(Common Meadow-rue)
Persicaria minor	(Water-pepper)	Trichophorum cespitosum	(Marsh Fern)
Persicaria mitis	(Pale Persicaria)	T. cespitosum subsp. cespitosum	(Scottish Asphodel)
Petalophyllum ralfsii	(Small Water-pepper)	Triglochin palustre	(Deergrass)
Petasites hybridus	(Tasteless Water-pepper)	Typha angustifolia	(Deergrass)
Petasites japonicus	(Petalwort)	Typha latifolia	(Marsh Arrowgrass)
Peucedanum palustre	(Butterbur)	Valeriana dioica	(Lesser Bulrush)
Phalaris arundinacea	(Greater Butterbur)	Vallisneria spiralis	(Bulrush)
Phragmites australis	(Milk-parsley)	Veronica anagallis-aquatica	(Marsh Valerian)
Physcomitrium eurystomum	(Reed Canary-grass)	Veronica beccabunga	(Tapegrass)
Pilularia globulifera	(Common Reed)	Veronica catenata	(Blue Water-Speedwell)
Pinguicula alpina	(Norfolk Bladder-moss)	Veronica scutellata	(Brooklime)
Pinguicula lusitanica	(Pillwort)	Viola palustris	(Pink Water-Speedwell)
Pinguicula vulgaris	(Alpine Butterwort)	Viola persicifolia	(Marsh Speedwell)
Potentilla erecta	(Pale Butterwort)	<b>Trees and shrubs:</b>	(Marsh Violet)
Potentilla palustris	(Common Butterwort)	Alnus glutinosa	(Fen Violet)
Pulicaria dysenterica	(Tormentil)	Frangula alnus	
	(Marsh Cinquefoil)	Populus spp. (list)	(Alder)
	(Common Fleabane)	Salix spp. (list)	(Alder Buckthorn)
(Coral-necklace)			(Poplar)
(Orange Balsam)	Pulicaria vulgaris		(Willow)
(Indian Balsam)	Pyrola rotundifolia subsp. maritima		
(Touch-me-not Balsam)	Pyrola rotundifolia subsp. rotundifolia	(Small Fleabane)	
(Yellow Iris)	Pyrola rotundifolia subsp. maritima	(Round-leaved Wintergreen)	
(Tufted Club-rush)	Ranunculus ficaria	(Round-leaved Wintergreen)	
(Bristle Club-rush)	Ranunculus flammula	(Round-leaved Wintergreen)	
(Sharp-flowered Rush)	Ranunculus flammula	(Lesser Celendine)	
(Frog Rush)	Ranunculus hederaceus	(Lesser Spearwort)	
	Ranunculus lingua		

## 4 Invertebrates

## **4.1 Aims**

Invertebrate surveillance within PondNet has three main aims:

1. To monitor key BAP invertebrate species
2. To provide a biotic measure of waterbody quality change, through invertebrate family level recording to give waterbody quality indices (e.g. use of PSYM)
3. To provide a focus for wider surveillance of invertebrate groups and species.

## **4.2 Strategic approach**

BAP invertebrate species (Aim 1 above) will be monitored by targeting known sites and measuring abundance. However, the approach used for monitoring in the field will vary depending on the species. The number of sites that need to be visited for surveillance of these species cannot currently be estimated because there are too few data on abundance to enable power analysis to be undertaken. Additional data will be gathered during the 20012/13 trials.

Invertebrate monitoring more generally (Aims 2-3 above) will be based on a survey network of c200 ponds, with a single survey pond selected within each of 200 randomly allocated 1 km grid squares. Species data will also be collected at Priority Ponds (c 50-100 ponds including ponds from the random and amphibian networks).

## **4.3 BAP species surveillance**

BAP species monitoring in the trial areas will focus on Mud Snail. The methodology for this species will be based on gathering abundance data at known sites, and searching other likely waterbodies within the 1 km square.

There is currently no accepted survey method for Mud Snail. There are also few knowledgeable amateurs who can identify the species, though it identification is relatively straightforward. To assist in the trials a draft survey methodology has been developed in association with Martin Willing. An information sheet has also been created to aid species identification.

## **4.4 Biotic measures of water quality**

Where possible, knowledgeable surveyors will be encouraged to record invertebrate taxa at family level. This enables a calculation of PSYM to be made, so that pond quality can be assessed based on biotic water quality, and habitat structure related metrics.

## **4.5 Widespread taxa and families**

Dragonfly (Odonata) methodologies have been discussed with the British Dragonfly Society (BDS). The trial methodology will broadly follow the BDS Dragonfly Monitoring Scheme 2010 pilot. This requires monthly visits to identify adults and record behaviour (e.g. mating, ovipositing). Additional survey approaches have also been discussed with BDS to get more meaningful breeding data including recording dragonfly exuviae. These will not be widely trialled by volunteers in 2012. However, it is anticipated that a small-scale trial will be undertaken to look at the relationship between larvae, exuviae and adult recording to identify whether recording adult behaviour is an adequate surrogate measure of 'evidence of breeding'.

Caddis-fly methods are being developed in association with Ian Wallace. Because of the difficulty of recording for this group, a picture-guide to caddis cases will be developed during 2012. The main aim will be to increase the number of recorders interested in working with this animal group.





## BAP SPECIES (MUD SNAIL) RECORDING FORM 20\_\_

<b>Recorder Name</b>	
<b>Recorder contact details</b>	

**Pond details**

<b>Pond grid reference</b> e.g. (SP 1234 4321)		<b>Nearest town</b>	
<b>Pond name/address/reference number (and source)</b>			
<b>If the pond no longer exists please tick here</b> <input type="checkbox"/>			

**Landowner details** *If the pond is on private land you must have the landowner/manager's permission to visit the site. If the pond is in a public access area it is still useful to know who owns the land.*

<b>Name</b>		<b>Phone number</b>	
<b>Address</b>			
			<b>Post code</b>
<b>Is the landowner/manager willing to be contacted if any follow-up is required?</b>			<b>Yes / No</b> <input type="checkbox"/>

**SURVEY METHOD:**

The best way to survey for aquatic invertebrates is to use a standard long-handled pond net with a 0.5mm mesh:

- i) Using the net sweep different areas of the water body near to the surface, in mid-water and close to the bottom
- ii) Work your way around the margin of the pond, sweeping the net every 4 meters or so (you may want to have a shorter or longer gap between sweeps depending on the size of the water body)
- iii) After each sweep empty the contents of your net into a water filled tray, ready for sorting
- iv) Once you have finished netting, count the number of individuals recovered, and make a record of the abundance class for that water body. **NB- For each pond please record an abundance class (see below).**

**If < 30 individuals per pond please indicate how many e.g. F 15**

**Mud Snail (*Omphiscola glabra*)**



© Paul Baker

**No. of ponds in the 1 km square**

	Number of snails per pond	
	R/F/A/X	Number
Pond 1	<input style="width: 40px;" type="text"/>	<input style="width: 40px;" type="text"/>
Pond 2	<input style="width: 40px;" type="text"/>	<input style="width: 40px;" type="text"/>
Pond 3	<input style="width: 40px;" type="text"/>	<input style="width: 40px;" type="text"/>
Pond 4	<input style="width: 40px;" type="text"/>	<input style="width: 40px;" type="text"/>

- R = Rare (1 - 2 specimens recovered)
- F = Frequent (3 - 30 specimens recovered)
- A = Abundant (> 30 specimens recovered)
- X = Dead shell only found

**Estimate the percentage of surrounding land-use in distance zones from the pond perimeter**

Habitat	0 - 5 m	0-100 m
Trees & woodland		
Heath & moorland		
Unimproved grassland		
Rank vegetation		
Improved grassland		
Arable		
Urban buildings & gardens		
Roads, tracks, paths		
Rock, stone, gravel		
Bog, fen, marsh, flush		
Ponds & lakes		
Streams & ditches		
Other (state)		

# Pond PSYM Fieldsheet



## Site and sample details

Site name \_\_\_\_\_ Code No. \_\_\_\_\_ Grid ref. ( ) \_\_\_\_\_  
Recording format: (SU)345 678 or (41)345 678

Location \_\_\_\_\_

Site access details \_\_\_\_\_

Survey date \_\_\_\_\_ Surveyor \_\_\_\_\_

Notes \_\_\_\_\_

## Environmental data

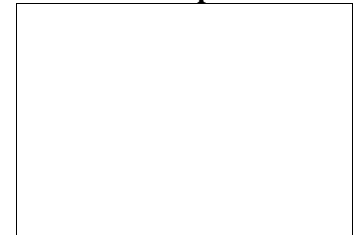
Altitude (m)  pH

Shade: % pond overhung  % emergent plant cover

Inflow (absent = 0, present = 1)  Pond area (m<sup>2</sup>)

% of pond margin grazed

## Sketch of pond



Pond base: categorise into one of three groups: 1=0%-32%, 2=33%-66%, 3=67%-100%

Clay/silt \_\_\_\_\_ Sand, gravel, cobbles \_\_\_\_\_ Bed rock \_\_\_\_\_  
Peat \_\_\_\_\_ Other \_\_\_\_\_

## MACROINVERTEBRATE LIST

### Group 1 taxa (BMWP:10 ASPT OM Cole.)

Siphonuridae			
Heptageniidae			
Leptophlebiidae			
EphemereIIDae			
Potamanthidae			
Ephemeridae			
Taeniopterygidae			
Leuctridae			
Capniidae			
Perlodidae			
Perlidae			
Chloroperlidae			
Aphelocheiridae			
Phryganeidae			
Molannidae			
Beraeidae			
Odontoceridae			
Leptoceridae			
Goeridae			
Lepidostomatidae			
Brachycentridae			
Sericostomatidae			

No. of taxa

### Group 2 taxa

Astacidae			
Lestidae			
Calopterygidae			
Gomphidae			
Cordulegasteridae			
Aeshnidae			
Corduliidae			
Libellulidae			
Philopotamidae			
Psychomyiidae			

No. of taxa

### Group 3 taxa (BMWP:7)

Caenidae			
Nemouridae			
Rhyacophilidae			
Polycentropodidae			
Limnephilidae			

No. of taxa

### Group 4 taxa (BMWP:6)

Neritidae			
Viviparidae			
Ancylidae (Acroloxidae)			
Hydroptilidae			
Unionidae			
Corophiidae			
Gammaridae (Crangonyctidae)			
Platycnemididae			
Coenagriidae			

No. of taxa

### Group 5 taxa (BMWP:5)

Planariidae (Dugesiidae)			
Dendrocoelidae			
Mesovelidae			
Hydrometridae			
Gerridae			
Nepidae			
Naucoridae			
Notonectidae			
Pleidae			
Corixidae			
Halipidae			
Hygrobiiidae			
Dytiscidae (Noteridae)			
Gyrinidae			
Hydrophilidae (Hydraenidae)			
Dryopidae			
Elmidae			
Hydropsychidae			
Tipulidae			
Simuliidae			

No. of taxa

### Group 6 taxa (BMWP:4)

Baetidae			
Sialidae			
Piscicolidae			

No. of taxa

### Group 7 taxa (BMWP:3)

Valvatidae			
Hydrobiidae (Bithyniidae)			
Lymnaeidae			
Physidae			
Planorbidae			
Sphaeriidae			
Glossiphoniidae			
Hirudinidae			
Erpobdellidae			
Asellidae			

No. of taxa

### Group 8 taxa (BMWP:2)

Chironomidae			
--------------	--	--	--

No. of taxa

### Group 9 taxa (BMWP:1)

Oligochaeta			
-------------	--	--	--

No. of taxa

TOTAL NO. OF TAXA

TOTAL BMWP SCORE

ASPT

NO. OF OM TAXA

NO. COLEOPT. TAXA

Plant recording sheet (score through each species present)

RS = Rarity Score, TRS = Trophic Ranking Score

R	TRS	Emergent plants	R	TRS		RS	TRS		RS	TRS	Submerged plants
1		<i>Achillea ptarmica</i>	1		<i>Epilobium hirsutum</i>	1	7.3	<i>Phragmites australis</i>	2	6.3	<i>Apium inundatum</i>
1		<i>Acorus calamus</i>	1		<i>Epilobium obscurum</i>	4	5.5	<i>Pilularia globulifera</i>	1		<i>Aponogeton distachyos</i>
1		<i>Agrostis canina</i>	1		<i>Epilobium palustre</i>	2		<i>Pinguicula lusitanica</i>	1		<i>Cabomba caroliniana</i>
1	LP	<i>Agrostis stolonifera</i>	1		<i>Epilobium parviflorum</i>	1		<i>Pinguicula vulgaris</i>	2		<i>Callitriche brutia</i>
32		<i>Alisma gramineum</i>	2		<i>Epilobium tetragonum</i>	1		<i>Potentilla erecta</i>	1	6.3	<i>Callitriche hamulata</i>
2		<i>Alisma lanceolatum</i>	2		<i>Epipactis palustris</i>	1	5.3	<i>Potentilla palustris</i>	2	8.5	<i>Callitriche hermaphroditica</i>
1	9	<i>Alisma plantago-aquatica</i>	1	LP	<i>Equisetum fluviatile</i>	1		<i>Pulicaria dysenterica</i>	2		<i>Callitriche obtusangula</i>
2		<i>Alopecurus aequalis</i>	1		<i>Equisetum palustre</i>	16		<i>Pulicaria vulgaris</i>	2		<i>Callitriche platycarpa</i>
4		<i>Alopecurus borealis</i>	1		<i>Erica tetralix</i>	1		<i>Ranunculus ficaria</i>	1	7.3	<i>Callitriche stagnalis</i>
1		<i>Alopecurus geniculatus</i>	1	2.5	<i>Eriophorum angustifolium</i>	1	LP	<i>Ranunculus flammula</i>	4		<i>Callitriche truncata</i>
2		<i>Anagallis tenella</i>	16		<i>Eriophorum gracile</i>	2	10	<i>Ranunculus hederaceus</i>	1		<i>C. stagnalis/platycarpa agg.</i>
2		<i>Andromeda polifolia</i>	2		<i>Eriophorum latifolium</i>	2*		<i>Ranunculus lingua</i>	1		<i>C. hamulata/brutia agg.</i>
1		<i>Angelica archangelica</i>	1		<i>Eriophorum vaginatum</i>	2		<i>Ranunculus omiophyllus</i>	1		<i>Callitriche sp. (undet.)</i>
1		<i>Angelica sylvestris</i>	1		<i>Eupatorium cannabinum</i>	32		<i>Ranunculus ophioglossifolius</i>	2	10	<i>Ceratophyllum demersum</i>
2		<i>Apium graveolens</i>	1		<i>Filipendula ulmaria</i>	32		<i>Ranunculus reptans</i>	2		<i>Ceratophyllum submersum</i>
1	10	<i>Apium nodiflorum</i>	2		<i>Galium boreale</i>	1	10	<i>Ranunculus sceleratus</i>	2	7.3	<i>Chara sp.</i>
32		<i>Apium repens</i>	8		<i>Galium constrictum</i>	2		<i>Rhynchospora alba</i>	1		<i>Egeria densa</i>
2		<i>Baldellia ranunculoides</i>	1		<i>Galium palustre</i>	4		<i>Rhynchospora fusca</i>	4	7	<i>Elatine hexandra</i>
2	10	<i>Berula erecta</i>	2		<i>Galium uliginosum</i>	2		<i>Rorippa amphibia</i>	4		<i>Elatine hypodipiper</i>
2		<i>Bidens cernua</i>	1		<i>Geum rivale</i>	8		<i>Rorippa islandica</i>	2		<i>Eleogeton fluitans</i>
1		<i>Bidens connata</i>	2		<i>Glyceria declinata</i>	2	10	<i>Rorippa microphylla</i>	1		<i>Elodea callitricheoides</i>
1		<i>Bidens frondosa</i>	1	LP	<i>Glyceria fluitans</i>	1	10	<i>Rorippa nasturtium-aquaticum</i>	1	7.3	<i>Elodea canadensis</i>
2		<i>Bidens tripartita</i>	1	10	<i>Glyceria maxima</i>	1	10	<i>Rorippa (undet.)</i>	1	10	<i>Elodea nuttallii</i>
2		<i>Blysmus compressus</i>	2		<i>Glyceria notata</i>	1		<i>Rorippa palustris</i>	8		<i>Eriocaulon aquaticum</i>
2		<i>Bolboschoenus maritimus</i>	1		<i>Gnaphalium uliginosum</i>	2	10	<i>Rumex hydrolapathum</i>	1	6.3	<i>Fontinalis antipyretica</i>
2*		<i>Butomus umbellatus</i>	1	LP	<i>Hydrocotyle vulgaris</i>	2		<i>Rumex maritimus</i>	2		<i>Groenlandia densa</i>
2		<i>Calamagrostis canescens</i>	2		<i>Hypericum elodes</i>	2		<i>Rumex palustris</i>	2	7.7	<i>Hippuris vulgaris</i>
2		<i>Calamagrostis epigejos</i>	1		<i>Hypericum tetrapterum</i>	1		<i>Sagina procumbens</i>	2		<i>Hottonia palustris</i>
8		<i>Calamagrostis purpurea</i>	4		<i>Hypericum undulatum</i>	1		<i>Sagittaria subulata</i>	4		<i>Isoetes echinospora</i>
8		<i>Calamagrostis stricta</i>	2		<i>Impatiens capensis</i>	2		<i>Samolus valerandi</i>	2	5	<i>Isoetes lacustris</i>
16		<i>Calamagrostis scotica</i>	1		<i>Impatiens glandulifera</i>	2	7.7	<i>Schoenoplectus lacustris</i>	1		<i>Lagarosiphon major</i>
1		<i>Calla palustris</i>	4*		<i>Impatiens noli-tangere</i>	32		<i>Schoenoplectus pungens</i>	2	6.7	<i>Littorella uniflora</i>
1	7	<i>Caltha palustris</i>	1	LP	<i>Iris pseudacorus</i>	2		<i>Schoenoplectus tabernaemontani</i>	2	5	<i>Lobelia dortmanna</i>
1		<i>Cardamine amara</i>	1		<i>Isolepis setacea</i>	32		<i>Schoenoplectus triquetrum</i>	8		<i>Ludwigia palustris</i>
1		<i>Cardamine pratensis</i>	1		<i>Juncus acutiflorus</i>	16		<i>Schoenus ferrugineus</i>	1	6.7	<i>Myriophyllum alterniflorum</i>
2		<i>Carex acuta</i>	1		<i>Juncus articulatus</i>	2		<i>Schoenus nigricans</i>	1		<i>Myriophyllum aquaticum</i>
1	10	<i>Carex acutiformis</i>	1		<i>Juncus bufonius agg.</i>	16		<i>Scorzonera humilis</i>	2	9	<i>Myriophyllum spicatum</i>
4		<i>Carex appropinquata</i>	1	5.3	<i>Juncus bulbosus</i>	1		<i>Scrophularia auriculata</i>	4		<i>Myriophyllum verticillatum</i>
2		<i>Carex aquatilis</i>	2		<i>Juncus compressus</i>	1		<i>Scutellaria galericulata</i>	4		<i>Najas flexilis</i>
2		<i>Carex curta</i>	1		<i>Juncus conglomeratus</i>	1		<i>Senecio aquaticus</i>	2	6.7	<i>Nitella sp.</i>
2		<i>Carex diandra</i>	1	LP	<i>Juncus effusus</i>	1		<i>Senecio fluviatilis</i>	2		<i>Oenanthe fluviatilis</i>
1		<i>Carex disticha</i>	2		<i>Juncus foliosus</i>	32		<i>Senecio paludosus</i>	16		<i>Potamogeton acutifolius</i>
1		<i>Carex echinata</i>	1		<i>Juncus inflexus</i>	4		<i>Sium latifolium</i>	2	5.5	<i>Potamogeton alpinus</i>
2	10	<i>Carex elata</i>	32		<i>Juncus pygmaeus</i>	1	10	<i>Solanum dulcamara</i>	2	7.3	<i>Potamogeton bertholdii</i>
4		<i>Carex elongata</i>	2		<i>Juncus subnodulosus</i>	4		<i>Sonchus palustris</i>	4		<i>Potamogeton coloratus</i>
1		<i>Carex flacca</i>	4		<i>Lathyrus palustris</i>	1	8.5	<i>Sparganium erectum</i>	4		<i>Potamogeton compressus</i>
1		<i>Carex hostiana</i>	32		<i>Leersia oryzoides</i>	1		<i>Stachys palustris</i>	1	10	<i>Potamogeton crispus</i>
2		<i>Carex laevigata</i>	32		<i>Liparis loeselii</i>	2		<i>Stellaria palustris</i>	16		<i>Potamogeton ephedrus</i>
2	4	<i>Carex lasiocarpa</i>	1		<i>Lotus pedunculatus</i>	1		<i>Stellaria uliginosa</i>	4	10	<i>Potamogeton filiformis</i>
2	4	<i>Carex limosa</i>	1		<i>Luzula luzuloides</i>	1		<i>Symphytum officinale</i>	2	10	<i>Potamogeton friesii</i>
1	5	<i>Carex nigra</i>	2		<i>Luzula sylvatica</i>	16		<i>Teucrium scordium</i>	2	7	<i>Potamogeton gramineus</i>
1		<i>Carex oedocarpa</i>	1		<i>Lychnis flos-cuculi</i>	2		<i>Thalictrum flavum</i>	2	10	<i>Potamogeton lucens</i>
1		<i>Carex otrubae</i>	1		<i>Lycopus europaeus</i>	4		<i>Thelypteris palustris</i>	8		<i>Potamogeton nodosus</i>
1		<i>Carex panicea</i>	1		<i>Lysimachia nummularia</i>	2		<i>Tofieldia pusilla</i>	2	8	<i>Potamogeton obtusifolius</i>
2	10	<i>Carex paniculata</i>	1		<i>Lysimachia terrestris</i>	1		<i>Trichophorum cespitosum</i>	1	10	<i>Potamogeton pectinatus</i>
1		<i>Carex pendula</i>	4		<i>Lysimachia thyrsoiflora</i>	1		<i>Triglochin palustre</i>	2	7.3	<i>Potamogeton perfoliatus</i>
2	10	<i>Carex pseudocyperus</i>	2		<i>Lysimachia vulgaris</i>	2	10	<i>Typha angustifolia</i>	2	8.5	<i>Potamogeton praelongus</i>
1		<i>Carex pulicaris</i>	16		<i>Lythrum hyssopifolium</i>	1	8.5	<i>Typha latifolia</i>	2	9	<i>Potamogeton pusillus</i>
1	10	<i>Carex riparia</i>	2		<i>Lythrum portula</i>	2		<i>Valeriana dioica</i>	8		<i>Potamogeton rutilus</i>
1	5.3	<i>Carex rostrata</i>	1		<i>Lythrum salicaria</i>	1		<i>Vallisneria spiralis</i>	4	10	<i>Potamogeton trichoides</i>
2		<i>Carex spicata</i>	1	7.3	<i>Mentha aquatica</i>	1		<i>Veronica anagallis-aquatica</i>	2	10	<i>Ranunculus aquatilis</i>
2		<i>Carex vesicaria</i>	16		<i>Mentha pulegium</i>	1	10	<i>Veronica beccabunga</i>	2	10	<i>Ranunculus baudotii</i>
1		<i>Carex viridula</i>	1	5.3	<i>Menyanthes trifoliata</i>	2		<i>Veronica catenata</i>	2	10	<i>Ranunculus circinatus</i>
16		<i>Carex vulpina</i>	1		<i>Mimulus guttatus</i>	1	5.5	<i>Veronica scutellata</i>	2		<i>Ranunculus fluitans</i>
1		<i>Carex sp.</i>	1		<i>Mimulus luteus</i>	1		<i>Veronica sp. (undet.)</i>	2	7	<i>Ranunculus peltatus</i>
2		<i>Catabrosa aquatica</i>	16		<i>Minuartia stricta</i>	1		<i>Viola palustris</i>	2	8.5	<i>Ranunculus penicillatus</i>
4		<i>Cicuta virosa</i>	1		<i>Molinia caerulea</i>	32		<i>Viola persicifolia</i>	2	8.5	<i>Ranunculus trichophyllus</i>
2		<i>Cirsium dissectum</i>	1		<i>Montia fontana</i>	1		<i>Unknown exotic</i>	16		<i>Ranunculus tripartitus</i>
1		<i>Cirsium palustre</i>	1	7.7	<i>Myosotis laxa</i>	1			1		<i>Ranunculus sp. (undet.)</i>
2		<i>Cladium mariscus</i>	1	9	<i>Myosotis scorpioides</i>	1			1		<i>Sagittaria latifolia</i>
1		<i>Conium maculatum</i>	1		<i>Myosotis secunda</i>	1			1		<i>Sagittaria rigida</i>
1		<i>Crassula helmsii</i>	4		<i>Myosotis stolonifera</i>	2			2		<i>Sagittaria sagittifolia</i>
1		<i>Crepis paludosa</i>	1		<i>Myosotis sp. (undet.)</i>	1			2	4	<i>Sparganium angustifolium</i>
16		<i>Cyperus fuscus</i>	2		<i>Myosoton aquaticum</i>	2			1	10	<i>Sparganium emersum</i>
4*		<i>Cyperus longus</i>	1		<i>Myrica gale</i>	1			2		<i>Sparganium natans</i>
2		<i>Dactylorhiza sp. (undet.)</i>	1		<i>Narthecium ossifragum</i>	1			1	2.5	<i>Sphagnum sp.</i>
32		<i>Damasonium alisma</i>	2		<i>Oenanthe aquatica</i>	1	10		4*		<i>Stratiotes aloides</i>
1		<i>Deschampsia cespitosa</i>	1		<i>Oenanthe crocata</i>	4			2	4	<i>Subularia aquatica</i>
2		<i>Drosera anglica</i>	2		<i>Oenanthe fistulosa</i>	1					<i>Tolypella sp.</i>
1		<i>Drosera binata</i>	2		<i>Oenanthe fluviatilis</i>	1			2		<i>Utricularia australis</i>
1		<i>Drosera capensis</i>	2		<i>Oenanthe lachenalii</i>	2	8.5		2	4	<i>Utricularia intermedia</i>
2		<i>Drosera intermedia</i>	2		<i>Oenanthe pimpinelloides</i>	4	7		2	4	<i>Utricularia minor</i>
1		<i>Drosera rotundifolia</i>	4		<i>Oenanthe silaifolia</i>	2*	6.7		2	5	<i>Utricularia vulgaris</i>
16		<i>Dryopteris cristata</i>	2		<i>Osmunda regalis</i>	1			1		<i>Vallisneria spiralis</i>
2		<i>Eleocharis acicularis</i>	2		<i>Parnassia palustris</i>	4*			2	10	<i>Zannichellia palustris</i>
8		<i>Eleocharis austriaca</i>	1		<i>Pedicularis palustris</i>	1					
2		<i>Eleocharis multicaulis</i>	1	10	<i>Persicaria thyridipiper</i>	1	LP				
1	LP	<i>Eleocharis palustris</i>	1		<i>Persicaria maculosa</i>	1	3.7				
2		<i>Eleocharis quinqueflora</i>	2		<i>Persicaria minor</i>	2					
2		<i>Eleocharis uniglumis</i>	4		<i>Persicaria minor</i>	2					
2		<i>Epilobium alsinifolium</i>	1		<i>Petasites hybridus</i>	2					
2		<i>Epilobium anagallidifolium</i>	1		<i>Petasites japonicus</i>	4					
1		<i>Epilobium brunnescens</i>	4		<i>Peucedanum palustre</i>	1					
1		<i>Epilobium ciliatum</i>	1	8.5	<i>Phalaris arundinacea</i>	1					

Floating-leaved plants	
1	<i>Azolla filiculoides</i>
2	<i>Hydrocharis morsus-ranae</i>
1	<i>Hydrocotyle ranunculoides</i>
2	<i>Lemna gibba</i>
1	<i>Lemna minor</i>
1	<i>Lemna minuta</i>
1	<i>Lemna trisulca</i>
4	<i>Luronium natans</i>
1	<i>Menyanthes trifoliata</i>
1	<i>Nuphar advena</i>
2	<i>Nuphar lutea</i>
4	<i>Nuphar pumila</i>
2*	<i>Nymphaea alba</i>
1	<i>Nymphaea sp. (exotic)</i>
4*	<i>Nymphoides peltata</i>
1	<i>Persicaria amphibia</i>
1	<i>Potamogeton natans</i>
1	<i>Potamogeton polygonifolius</i>
2	<i>Riccia fluitans</i>
2	<i>Ritidocarpus natans</i>
2	<i>Spirodela polyrhiza</i>
4	<i>Wolffia arrhiza</i>

	Number of emergent & submerged species
	Number of uncommon species (with a rarity score of 2 or more)
	Trophic Ranking Score

\* = uncommon species often introduced to sites (see Preston *et al.* 2002 for details), if so score species as 1.

LP = species exhibiting little nutrient preference





## **PondNet DRAGONFLY SURVEY – PROTOCOLS SUMMARY**

**Aim of the survey** – To gather data on the occurrence and status of widespread Odonata species across the UK, identify key sites for rarer species and gather more breeding data at sites. Participants are allocated a randomly-selected 1 km grid square and, instead of walking a linear transect, participants walk a transect of the pond, recording the species they see, and any evidence of breeding (copulating pair, female ovipositing, exuviae). The survey also collects information about the pond habitat, and other environmental variables. All data gathered through PondNet will feed into the British Dragonfly Society database.

**Method** – monitoring is done by counting adults systematically which should allow us to detect change (negative and positive). Recording environmental data from the same pond should help us establish why change is occurring. Everyone with a reasonable knowledge of dragonflies can participate.

**Grid square allocation** – A square with a focal pond will be allocated randomly to each surveyor.

**Access permission** – We will make every effort to prearrange access before you are allocated a square. If we are unable to do so we would ask that you identify the landowner/tenant and ask permission to survey the pond. Simple verbal permission can often be achieved after knocking doors locally. It is helpful to ask the landowner about access points, safety issues, the pond and its wildlife. If access is denied or the pond no longer exists, identify another pond in your 1km square. If there are no other ponds in your square, find the nearest pond in the neighbouring 1km squares. Tell us on your survey form if you had to select an alternative pond.

**Survey visits** – The pond can be visited and counted every week, two weeks, or monthly during the flight season, depending on how much time you can spare. All visits can add to the dataset, including those where not many species are found. **In subsequent years it is important to return to the same ponds.**

*The dragonfly element of PondNet is being coordinated by BDS and Pond Conservation. Please enter your records at [www.pondconservation.org.uk/pondnet](http://www.pondconservation.org.uk/pondnet).*





## DRAGONFLY RECORDING FORM 20\_\_

Recorder name  Date

Pond grid reference (SP 1234 4321)  Nearest village / town

Pond name /reference number

If the pond no longer exists please tick here  Is the pond new?  If yes – give approx age

**Landowner details** *If the pond is on private land you must have the landowner/manager's permission to visit the site. If the pond is in a public access area it is still useful to know who owns the land.*

Name  Phone number   
 Address   
 Post code

**SURVEY VISITS:** The pond can be visited and counted every week, two weeks, or monthly during the flight season, depending on how much time you can spare. Please complete at least 1 visit every month between May - September (note that information supplied from fewer visits is still useful).

VISIT 1							Date	
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time		
						% area surveyed	%	
VISIT 2							Date	
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time		
						% area surveyed	%	
VISIT 3							Date	
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time		
						% area surveyed	%	

VISIT 4							Date
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time	
						% area surveyed	%

VISIT 5							Date
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time	
						% area surveyed	%

VISIT 6							Date
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time	
						% area surveyed	%

VISIT 7							Date
Species	Ad (Adults)	Co (Copulating)	Ov (Ovipositing)	Ex (Exuviae)	La (Larvae)	Time	
						% area surveyed	%

## 5 Environmental data

---

### 5.1 Aims

It is essential that environmental data are gathered through PondNet in order to provide measures that can be used to interpret the network's biotic data and provide information that can be used to explain trends.

### 5.2 Strategic approach

The aim is that a core range of environmental variables will be recorded at all PondNet sites. Amphibian recording will also include assessment of GCN Habitat Suitability Index measures. A small set of additional environmental attributes (e.g. temperature) will be measured for specific species and taxon groups where these are relevant.

### 5.3 Choice of measures

The list of attributes chosen to be included on the core environmental data sheet were identified in a two-stage process.

#### Stage 1

- (i) The range of environmental data collected by existing surveillance schemes were collated,
- (ii) This range of variables was analysed in terms of ability to provide diagnostic information likely to be relevant to assessing the causes of change in pond biota.

A table summarising this information is given in Annex 1.

#### Stage 2

The principles used to choose (a) the final attributes (b) ways to measure those attributes were:

- (i) Keep attributes to the minimum necessary (to avoid surveyor fatigue)
- (ii) Keep recording techniques as simple and equipment-free as possible
- (iii) Maximise compatibility with other widely used methodologies (e.g. GCN HSI)

The core environmental recording sheet developed using these principles is given over page.

This sheet will be appended to all species and biotic group recording sheets, to maximise the potential likelihood that environmental data will be gathered.



ENVIRONMENTAL DATA  
RECORDING FORM 20\_\_

Recorder name  Date

Pond grid reference (SP 1234 4321)  Nearest village / town

Pond name /reference number

If the pond no longer exists please tick here  Is the pond new?  If yes – give approx age

**Landowner details** *If the pond is on private land you must have the landowner/manager's permission to visit the site. If the pond is in a public access area it is still useful to know who owns the land.*

Name  Phone number   
Address   
Post code

**Pond area**

m<sup>2</sup>

Pond area in m<sup>2</sup> (estimate) This is the surface area of the pond when water is at its highest level (excluding flooding events). This is usually in the spring. If the pond is measured at another time of year, the spring time area should still be evident from vegetation types and evidence of a drawdown zone around the pond.

**Pond dries?**

1 = never, 2 = rarely, 3 = sometimes, 4 = annually. Pond permanence should be deduced from local knowledge and personal judgement. The landowner may know how often a pond dries. However, if not, then try and make a judgement based on water level at the time of the survey.

**Overhanging trees & shrubs**

% Pond overhung by trees and shrubs  
% Total pond margin shaded to at least 1m from the shore

**Waterfowl impact**

Score: 1 = major, 2 = minor, 3 = none. **Major** = severe impact of waterfowl i.e. little or no evidence of submerged plants, water turbid, pond banks showing patches where vegetation removed, evidence of provisioning waterfowl; **Minor** = waterfowl present, but little indication of 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**

Score: 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(s).

**Amphibians**

Tick if present

Record, as far as possible, amphibian species, life stage and approximate number

**Number of ponds**

Number of ponds within your 1 km grid square (1:25,000 maps)

Number of ponds within 1km m of the pond (not separated by barriers to amphibian dispersal)

**Inflows and outflows (tick where relevant)**

Inflow present

Outflow present

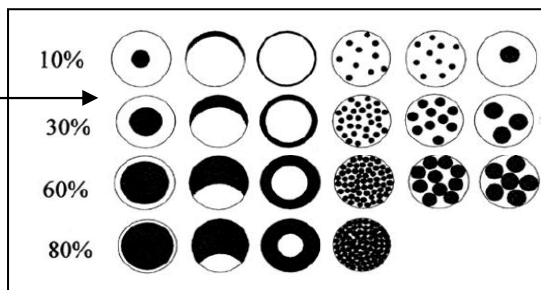
**Turbidity**

1=Clear 2=Moderately clear 3=Moderately turbid 4=Turbid

Estimate turbidity by looking down into c.20cm depth of water in the pond.

### Aquatic vegetation

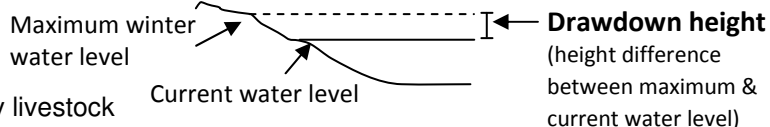
% cover Percentage of pond surface occupied by aquatic vegetation (March-May). This includes emergent, floating plants and submerged plants reaching the surface.



### Water left in the pond

% % of pond relative to max level

cm Water height relative to max level



### Grazing

Tick if there is evidence that the pond is grazed by livestock

% of pond perimeter grazed

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

### Pond management (tick where relevant):

Fully dredged

Partly dredged

>5% vegetation removed

<5% vegetation removed

Trees planted

Trees felled

Trees partly cut back

Pond changed in shape/size

Plants introduced

Bank plants mown

Structural work e.g. to dam

Straw added

Other (list or describe in more detail)

### Surrounding land use *Estimate the percentage of surrounding land-use in distance zones from the pond perimeter*

Habitat	0-5m	0-100m	Examples
Trees & woodland			Deciduous and coniferous woodland, individual trees, scrub, hedgerow
Heath & moorland			Dwarf shrub heath, sub arctic montain
Unimproved grassland			Herb-rich, calcareous, acid and moorland grassland (plant quality indicators usually present)
Rank vegetation			Unmanaged grass, neglected & abandoned land, set-aside, verges, golf course roughs, buffer strips
Improved grassland			Fertile agricultural grass, mown grass, golf course greens (plant quality indicators absent)
Arable			All crops. Includes flower and fruit crops (e.g.strawberries) and ploughed land
Urban buildings & gardens			Areas in curtilage, includes glass-houses, farm yards
Roads, tracks, paths			Including car-parks and footpaths
Rock, stone, gravel			Cliffs, rock-outcrops, gravel-pits, quarries, areas of sand, gravel or stone
Bog, fen, marsh, flush			Wetland vegetation, blanket bog
Ponds & lakes			Permanent and seasonal waterbodies
Streams & ditches			River, stream, ditch, spring
Other (state)			E.g. maritime vegetation, saltmarsh, sand-dune, orchard, bracken, canal, railway

### OPTIONAL

#### Amphibian habitat

**None** = clearly no suitable habitat within immediate pond locale; **Poor** = habitat with poor structure that offers limited opportunities for foraging and shelter (e.g. amenity grassland); **Moderate** = offers opportunities for foraging and shelter, but may not be extensive; **Good** = extensive habitat that offers good opportunities for foraging and shelter completely surrounds pond e.g. rough grassland, scrub or woodland.

#### Water quality for amphibians

Score: 1 = bad, 2 = poor, 3 = mod, 4 = good

**Bad** = clearly polluted, only pollution-tolerant invertebrates, no submerged plants; **Poor** = low invertebrate diversity, few submerged plants; **Moderate** = moderate invertebrate diversity; **Good** = abundant and diverse invertebrate community.

#### pH and/or conductivity

pH

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

**Photo of pond** Tick to confirm

## 6 References

---

Williams P, Ewald E, Cannon C, and Biggs J. (2012). Developing a national pond surveillance strategy for widespread and localised species. Report to Natural England. Pond Conservation, Oxford.

## Annex 1. Range of environmental data collected by other surveillance schemes

	Driver	Explanatory variable								
	Attributes to record		JNCC	NARRS	National Pond Survey	HSI (Habitat suitability index)	Sewell et al., 2010	BDS	CSM Habitats (HD)	BTO (WBBS)
Species richness/composition	<b>Shade</b>	Impacts on species richness/composition. Landuse changes - increase in arable = increase in shade. Co-variable with intensity	NA	Percentage perimeter shaded (to at least 1 m from shore). Estimate.	Percentage of pond area overhung by trees or woody vegetation.	Estimate percentage pond perimeter shaded, to at least 1m from the shore. Shading should not include emergent pond vegetation. The estimate should be made during the period from May to the end of September.	The percentage of the pond perimeter affected by trees and other sources of shade.			
	<b>Pond management</b>	What effect if any is it having on species richness/composition. Amphiban people are also interested in gathering this data.	NA	NA	Evidence of all pond management: analysed as a categorical variable (1/0). Tick boxes for pond management in prescribed categories (e.g. dredging, trees planted).	NA	NA	NA	NA	
	<b>Pond area</b>	Relationship with species richness/composition. compare data from ponds of similar size. e.g are small ponds effected in the same	NA	Pond area in m2. Estimate.	Surface area of the pond lying within pond's outer boundary defined as the maximum standing winter water level.	measuring axes of regularly shaped ponds, either by pacing out in the field, or taking measurements from a map. Irregularly shaped ponds may have to be	size of the surface area of the pond in square metres, measured in early spring. .	NA	NA	
Climate change	<b>Drawdown zone (water level)</b>	Trend over time, increase or decrease. Relate to cliamte change?- Water depth indicator of climate change if we have trend data e.g draw down zone	NA	NA	Drawdown is measured as the difference between maximum and current water levels in terms of (a) vertical height (cm), and (b) % of water area remaining in the pond. Permanence	NA	NA	NA	NA	
	<b>Climate change</b>	number of hot days, number of cold days, annual mean temp., seasonality of precipitation	Mean July temp/Major Biome Vegetation composition and abundance of	NA	NA	NA	NA	NA	NA	

Annex 1. Continued

	Driver	Explanatory variable								
	Attributes to record		JNCC	NARRS	National Pond Survey	HSI (Habitat suitability index)	Sewell et al., 2010	BDS	CSM Habitats (HD)	BTO (WBBS)
<b>Water quality</b>	<b>Turbidity</b>	Measures of water transparency and underwater penetration of light. Important for determining plant growth. Correlated with pond quality	In lakes turbidity is measured with a secchi disk		Estimated in one of four categories (clear, moderately clear, moderately turbid, turbid). Analysed using ranked variables (1=turbid, 4 = clear). Estimate the turbidity of the water by looking down into c.20cm depth of water in the pond.		on a scale of 1 (water clear and bottom visible) to 3 (totally turbid).			
	<b>pH</b>	measure of acidification/ will also have a relationship with species composition. long-term reductions in pH are related principally to increasing acidification.			(i) pH and conductivity: measured in the field with a portable meter. (iii) TON, soluble reactive phosphorus, alkalinity: filtered samples collected in the field and laboratory-analysed.				pH is an important variable to measure as it influences all chemical and biological processes e.g. P	
	<b>water quality</b>	Indicator of pollution.		Water quality. Score: 1 = bad, 2 = poor, 3 = moderate, 4 = good. Bad = clearly polluted, only pollution-tolerant invertebrates, no submerged plants;		The assessment of water quality is subjective and should be based on invertebrate diversity, the presence of submerged water plants and knowledge of the water sources feeding the pond.	Water quality: a subjective score based on a 4-point scale derived from invertebrates observed during the surveys.		Water quality parameters of major importance in determining macrophyte species composition are pH, alkalinity and hardness, phosphorus (P) and nitrogen (N).	
	<b>conductivity</b>	Major ions give a measure of the basic chemical composition of the water. This may be altered by changes in terrestrial and/or atmospheric inputs.				(i) pH and conductivity: measured in the field with a portable meter. (iii) TON, soluble reactive phosphorus, alkalinity: filtered samples collected in the field and laboratory-analysed.				



Annex 1. Continued

	Driver	Explanatory variable								
	Attributes to record		JNCC	NARRS	National Pond Survey	HSI (Habitat suitability index)	Sewell et al., 2010	BDS	CSM Habitats (HD)	BTO (WBBS)
Pond quality	Livestock grazing	Reductions in the removal of standing biomass leading to increased above-ground competition (alien species able to invade). Over grazing can have	Canopy height Localised area of species occupancy reduced/lack of species regeneration/change in % cover of		Presence, or evidence, of grazing analysed as a categorical variable (1/0), and percentage of the pond perimeter grazed. Data used as a variable in PSYM predictions.					
	Pond age/permanence	Predictor of community type and PSYM		Number of years in ten pond dries up. Estimate or ask landowner.	age of the pond	should be deduced from local knowledge and personal judgement. Landowner may know how often a pond dries. judgement based on water level at the time of the survey,	Years dry: the number of years per decade when the pond was likely to dry up entirely, based on observations over the two study years and local			
	Vegetation cover/type	Amount of floating leaved, submerged etc. Increase in floating leaved e.g duckweeds may be a result of increased pollution, at the same time you will see a decrease in emergent and submerged plants		Percentage of pond surface occupied by aquatic vegetation (March-May). Estimate.		Estimate the percentage of the pond surface area occupied by macrophyte cover. This includes emergents, floating plants (excluding duckweed) and submerged plants reaching the surface. Make an estimate between March and the end of September.	the cover of submerged, floating or emergent water		Within biological communities, pressures on the habitat result in changes in structure, abundance and biomass before species are lost. A measure of abundance, in terms of the number of points at which a species is recorded, and structure of the macrophyte community, can therefore be examined as indicators of change for condition assessment.	
Aminity value	Duck and wildfowl grazing	Ponds are vulnerable to degradation, and can be strongly impacted by biological stresses which have less impact on larger waters, such as high densities of waterfowl and fish (look at relationship)		Waterfowl impact. Score: 1 = major, 2 = minor, 3 = none. Major = severe impact of waterfowl i.e. little or no evidence of submerged plants, water turbid, pond banks showing patches where vegetation removed	Evidence of presence analysed as a categorical variable (1/0), intensity of impact ranked 1-5, species information where known.		number of waterfowl seen on the pond, or for larger water bodies the number per 1000 m2, during the survey period.			
	Fish	Same as above		Fish presence. Score: 1 = major, 2 = minor, 3 = possible, 4 = absent.	Evidence of presence analysed as a categorical variable (1/0), intensity of impact ranked 1-5, species information where known.		based on a four-point scale, the occurrence and abundance of fish (species not specified)			

Annex 1. Continued

	Driver	Explanatory variable								
	Attributes to record		JNCC	NARRS	National Pond Survey	HSI (Habitat suitability index)	Sewell et al., 2010	BDS	CSM Habitats (HD)	BTO (WBBS)
Pollution	Surrounding land use	CS data suggests that surrounding land use is one of the best predictors of change and linked to pollution risk specifically linked to: · high nitrogen levels in pond water · presence of road-			Measured as the percentage cover of each of 12 land cover types around pond (including waterbody and wetland types), within two concentric zones around the pond (0-5m, 0-100m).	terrestrial habitat				Measured as the percentage cover of each of 12 land cover types around the waterway up to 500m
	Inflow/outflow	Risk of pollution.			outflow (i) Inflow or outflow present: recorded as a categorical variable (1/0).					
Other	Pond count	important for amphibians				Needed for HSI	density of ponds within 1 km of the survey site, excluding ponds beyond barriers such as major roads			
	Habitat data	important for amphibians		Number of ponds within 1 km (1: 25 0000 maps) not separated by barriers to dispersal. Terrestrial habitat for amphibians			based on a four-point scale, the proportion of terrestrial habitat judged suitable for amphibians within a 500 m radius of the pond.	This is the only environmental data they ask volunteers to record as part of their monitoring scheme		This is the only environmental data they ask volunteers to record as part of their monitoring scheme
	Weather conditions	Must survey when the weather conditions are right important for Odonata						Count during sunny weather, with cloud cover less than 60%.Do not count if the wind is stronger than force 4 on the Beaufort scale etc.		