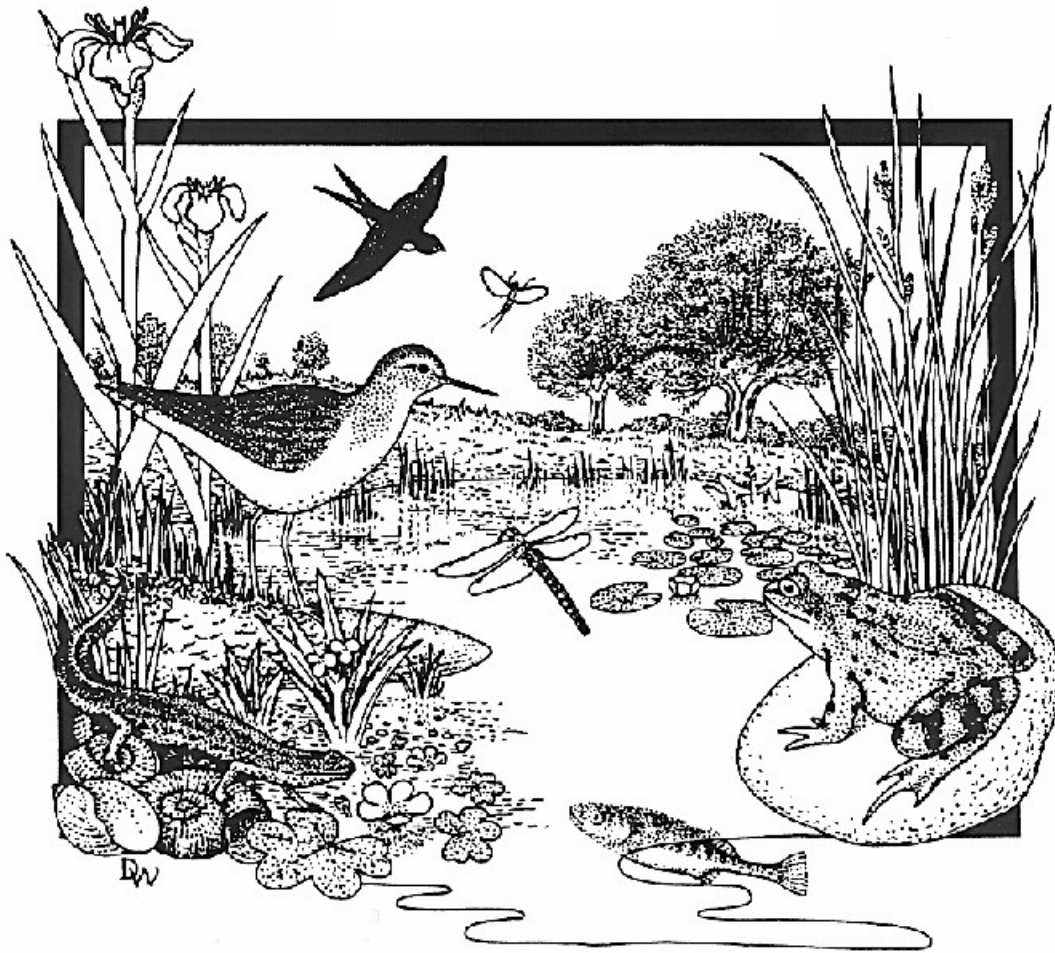


A guide to the methods of the National Pond Survey



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A guide to the methods of the National Pond Survey

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1. Introduction to the National Pond Survey methodology

1.1 About the guide and the National Pond Survey

This booklet describes a standard survey methodology which can be used to gather physical, chemical and biological data for ponds.

The method was originally developed for the National Pond Survey (NPS) initiated by Pond Action in 1989. It has subsequently been used as the basis for many other regional and national surveys, including the DETR¹ Lowland Pond Survey 1996², and Pond Action's national survey of degraded ponds which was undertaken during 1995-1998 with funding from the Natural Environment Research Council (NERC).

The aim of the survey method is to ensure consistent collection of biological and environmental data from ponds, thus:

- providing a checklist of environmental factors which can be important in describing pond types or explaining biological quality;
- enabling biological and physico-chemical data to be directly compared with the results of other regional and national surveys;
- enabling the biological *quality* of ponds to be assessed using Pond Action's assessment methods based on the plant and/or animal communities recorded from the pond; and
- providing data for the new National Pond Database collected using compatible methods.

1.2 Changes to the National Pond Survey field recording sheet

The original National Pond Survey field sheet, developed in 1989, has been progressively updated and modified over the last 9 years. Most changes have related to (i) additional areas of interest to pond recorders (such as amenity and leisure use), and (ii) measures which recent research suggests are important in determining the biological quality of ponds. The latter include factors such as 'isolation from other wetland habitats' and 'overall pollution rating'.

1.3 Background to the National Pond Survey

Ponds provide an important habitat for aquatic plants and animals in Britain: the protection of existing ponds and the construction of new ones are both believed to make a significant contribution to the conservation of freshwater communities².

The National Pond Survey was initiated by Pond Action in 1989, with the support of WWF-UK. The Survey has four main objectives:

- (i) to develop a classification of ponds in Britain based on the composition of their plant and macroinvertebrate communities;
- (ii) to investigate the principal biotic and abiotic factors influencing the composition of pond communities;
- (iii) to provide a descriptive basis for future studies of pond ecology (particularly those concerned with the management of ponds for wildlife conservation);
- (iv) to use the classification, with species distribution data, to develop a system for assessing the importance of individual ponds for nature conservation.

¹ DETR: Department of the Environment, Transport and the Regions.

² Williams, P.J., Biggs, J., Barr, C.J., Cummins, C.P., Gillespie, M.K., Rich, T.C.G., Baker, A., Baker, J., Beesley, J., Corfield, A., Dobson, D., Culling, A.S., Fox, G., Howard, D.C., Luursema, K., Rich, M., Samson, D., Scott, W.A., White, R. and Whitfield, M. (1998). *Lowland Pond Survey 1996*. Department of the Environment, Transport and the Regions, London.

2. Summary of pond survey procedure

2.1 Ponds included in the National Pond Survey

The definition of 'pond' which was used for the National Pond Survey is:

'A body of water, of man-made or natural origin, between 1m² and 2ha, which usually holds water for at least four months of the year'.

This definition is a broad one and potentially includes ponds of many different origins, such as: marl pits, quarry pools, heathland ponds, moats, small ornamental lakes, oxbow ponds and peat pools, together with temporary ponds like many pingos and dune slack pools.

2.2 Information gathered for the National Pond Survey

For a full National Pond Survey assessment, ponds are surveyed in **three seasons**: spring, summer and autumn. Only invertebrates and some water chemistry and environmental parameters need to be surveyed on all three visits: the following list gives a broad outline of the information gathered at each pond.

- A description of the main physical features of the pond and its surroundings, together with notes about its age, history and management (see enclosed field sheet).
- Water chemistry. The sheet shows the minimum data to be collected; normally laboratory analysis of a range of chemical determinands will be made e.g. pH, conductivity, potassium, chloride, alkalinity, suspended solids, ammonia, total nitrogen, total oxidised nitrogen, total phosphorus, soluble reactive phosphorus.
- A list of the wetland plant species found within the outer boundary of the pond, with estimates of abundance for vegetation stands occupying more than 5% of the pond.
- Lists of the aquatic macroinvertebrate species recorded from the pond, ideally for **three seasons** of the year: spring (March-May), summer (June-August) and autumn (September-November) with estimates of their abundance.
- Notes on the presence and approximate abundance of amphibians, water birds and fish.
- Desk study information describing the pond's location (grid reference), geology etc.

Table 1. Summary of the full National Pond Survey methodology

On-site survey of the pond in the first season

The basic procedure for surveying ponds is outlined below.

- (i) The pond perimeter is walked: the field recording sheet is filled in where appropriate, and macroinvertebrate microhabitats are chosen for sampling. Photographs are taken.
- (ii) It is also useful to draw a sketch map of the pond using a tape and compass. Alternatively, a large scale OS map of the site may be used as a base (although it is important to check the scale and accuracy of the outline, which may have changed since the map was drawn).
- (iii) Before disturbing the water:
 - (a) water chemistry measurements are made or water samples collected.
 - (b) a list of the wetland plants in and around the pond is compiled (see survey sheet). If the pond is large and/or deep, the plant survey can be combined with the collection of the macroinvertebrate sample.
- (iv) During the **summer or autumn** survey the extent of major vegetation stands is recorded.
- (v) Water and sediment depths are measured and the Field Recording Sheet is completed for that season.
- (vi) A 3-minute macroinvertebrate sample is collected and a quick additional search made for species such as whirligig beetles and leeches.

Laboratory analysis of invertebrate samples

- (i) Macroinvertebrate samples are sorted **live**, as soon as possible after collection. Samples which cannot be sorted immediately are kept in a refrigerator or refrigerated cold room and sorted within three days after collection. Samples are not frozen or preserved.
- (ii) The **whole** sample is sorted, with selective subsampling if necessary to estimate the abundance of extremely numerous taxa.
- (iii) Invertebrates are preserved in alcohol for subsequent identification, except for leeches and flatworms which are identified immediately from live material.

Second and third season of the survey

In both the second and the third season:

- (i) New plant species observed at the pond are added to the wetland checklist. Water chemistry parameters are measured and other seasonally variable environmental data collected (e.g. inflow information). Further 3-minute macroinvertebrate samples are collected.
 - (ii) The laboratory procedure is repeated.
-

3. Pond survey procedure: detailed description

3.1 Completing the field recording sheet

The field recording sheet provides a standard format on which to record basic physical and chemical data about the pond and its surrounds. A blank copy for photocopying is provided in Appendix 2.

3.2 Defining the pond outline

Identifying the 'outer edge' of the pond is important for many of the survey measurements including pond area, percentage drawdown, and wetland plant cover. For the National Pond Survey, the definition of 'outer edge' is 'the upper level at which water stands in winter'.

In practice, this line is usually readily discernible from the distribution and/or morphology of wetland plants. For example, it may be marked by a fringe of soft rush (*Juncus effusus*) or by thick bundles of fine, pink roots growing out of the trunks of willows etc., apparently several feet above water level but in fact fully submerged when the pond is at its deepest.

Alternatively, the line can often be seen as a 'water mark' on surrounding trees or walls and is sometimes evident as a break of slope. The outer boundary of the pond will usually, of course, be dry at the time of the survey.

3.3 Mapping the pond

Many measurements such as pond size and percentage of tree cover, are easier to estimate if a scale sketch map of the pond is made. For small or simply shaped ponds, compass and tape measurements alone are adequate for mapping the pond outline. For larger ponds, useful outlines can often be obtained from Ordnance Survey maps (1:10,000 scale enlarged on a photocopier): note, however, that the accuracy of these maps still needs to be checked in the field with a tape measure and compass.

3.4 Recording plant species and vegetation abundance

The aims of plant recording are:

- to make a complete list of wetland plants present within the outer boundary of the pond,
- to record the extent of emergent, floating-leaved and submerged plant stands, together with the approximate abundance of dominant species.

3.4.1 Recording wetland plants

Wetland plants growing within the outer boundary of the pond are noted on the field recording sheet. This gives a definitive list of the plant species regarded here as 'wetland'. In deep ponds aquatic plants are surveyed using a grapnel and/or boat. Terrestrial plants and wetland plants growing outside the pond boundary are not used in the analysis. Most wetland plants are readily identifiable using a hand lens. However, with a few species (especially fine-leaved *Potamogeton* and *Callitriche* spp.) it may be necessary to remove a small amount of plant material for later microscopic examination and confirmation.

Standard botanical texts such as Stace (1997) are adequate for most wetland plant identification. However, a number of additional guides are useful for specific groups and a list of these has been included in Appendix 1.

Table 2. Equipment needed for National Pond Survey work

General

- Chest waders or boat as appropriate
- Life jackets for use with chest waders or boat
- Camera and film
- Pencils and waterproof pens
- Labels
- Copy of the field recording sheet (if possible, on waterproof paper)

Mapping the pond

- Compass
- Tape (30m or 50m)
- Copy of large-scale OS map of the pond

Chemical survey

- Chemical test kits/meters
- Sample bottles and filtering equipment

Plant survey

- Grapnel
- Plastic bags and labels
- Plant identification guides

Sediment and water depths

- Draining rods (or equivalent)

Macroinvertebrate sampling

- Long-handled pond-net (1 mm mesh)
- Bucket (10 litre) with watertight lid
- Stopwatch (for companion)
- Label for bucket

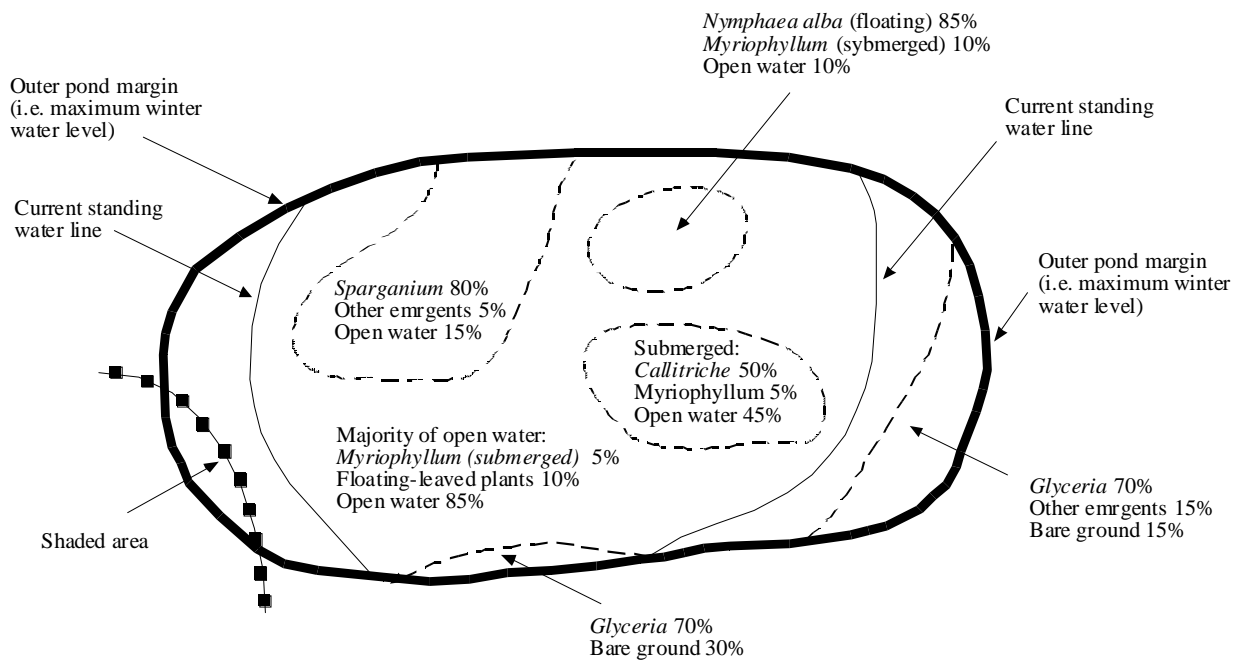
Sorting and identification of macroinvertebrate samples

- Large sieve (0.5 mm mesh)
- White sorting tray (about 40 x 40 cm)
- Fine 'watchmaker's' forceps (curved and straight)
- Small bottles for preserving samples
- Labels (made from waterproof paper if necessary)
- Industrial methylated spirits (IMS) (70%)
- Petri dishes, microscope slides and cover slips
- Binocular microscope (x30-50)
- High power microscope (x100-400)
- Invertebrate identification keys

3.4.2 Mapping stands of wetland vegetation

During the summer or autumn survey, major stands of **emergent, floating-leaved and submerged plants** are either noted on the field recording sheet or drawn on to the base map using the conventions shown in Figure 1. On the base map, sparse stands of vegetation are noted as a mixture of plants and open water or mud (e.g. 20% floating cover, 80% open water). Where **individual species** occupy a **total of more than 5%** of the pond then these are also noted on the base map.

Estimates of the plant cover are only required to an accuracy of about 5%, so it is not necessary to mark the exact position or size of every small plant stand.



Key

Callitriche
Glyceria
Myriophyllum
Sparganium

Callitriche hamulata
Glyceria fluitans
Myriophyllum spicatum
Sparganium erectum

--- Limit of plant stands
 ■■■ Overhanging trees/shrubs
 ——— Outer pond margin
 ——— Current standing water line

Figure 1. Conventions for mapping wetland vegetation

3.5 Sampling aquatic macroinvertebrates

3.5.1 Aims of invertebrate surveys

- To obtain, within the available sampling time (3 minutes in each of 3 seasons), **as complete a species list as possible for the pond.**
- To obtain information on the abundance of each species recorded.

3.5.2 Survey periods

Invertebrate surveys are undertaken in three seasons: **spring** (March, April or May), **summer** (June, July or August) and **autumn** (September, October or November). Surveys in adjacent seasons should ideally be two to three months apart.

3.5.3 Selecting mesohabitats for invertebrate surveys

All the main mesohabitats in the pond are sampled so that as many species are collected from the site as possible. Examples of typical mesohabitats are: stands of *Carex* (sedge); gravel- or muddy-bottomed shallows; areas overhung by willows, including water-bound tree-roots; stands of *Elodea*, or other submerged aquatics; flooded marginal grasses; and inflow areas. (As a rough guide, the average pond might contain 5-10 mesohabitats, depending on its size and variety.) It is important that vegetation **structure**, as well as plant species composition, is considered when selecting mesohabitats: it is better to identify habitats consisting of e.g. soft floating leaves, stiff emergent stems, etc. than to make each different plant species a separate habitat.

Mesohabitats are identified during the initial walk around the pond examining vegetation stands and other relevant features (this can be combined with the initial plant survey stage).

3.5.4 Method

- (i) The three-minute sampling time is divided equally between the number of mesohabitats recorded: e.g. for six mesohabitats, each will be sampled for 30 seconds. Where a mesohabitat is extensive or covers several widely-separated areas of the pond, the sampling time allotted to that mesohabitat is **further divided** in order to represent it adequately (e.g. into 6 x 5 second sub-samples).
- (ii) Each mesohabitat is netted vigorously to collect macroinvertebrates. Stony or sandy substrates are lightly 'kick-sampled' to disturb and capture macroinvertebrate inhabitants. **N.B.** deep accumulations of soft sediment are avoided, since this makes later sorting extremely difficult: the netted sample should be as clean and silt-free as possible. Similarly, large accumulations of plant material, root masses, and the like should not be taken away in the sample: the idea is to dislodge and capture the animals without collecting an unmanageable sample.

The sample is placed in the labelled bucket for later sorting in the laboratory. (The three-minute sampling time refers solely to 'net-in-the-water' time, and does not include time moving between adjacent netting areas.)

- (iii) Amphibians or fish caught whilst sampling are noted on the field recording sheet and returned to the pond. (It is worth making a quick search through the net and removing these: dead fish, tadpoles etc. in the sample make for a very unpleasant sorting session in the laboratory later!)

3.5.5 Additional invertebrate sampling

A further 1 minute (total time, **not** net-in-the-water time) is spent searching for animals which may otherwise be missed in the 3-minute sample. Areas which might be searched include the water surface (for whirligig beetles, pond skaters etc.), and under stones and logs (for limpets, snails, leeches, flatworms etc.). Additional species found are added to the main 3-minute sample. Note: the 1 minute search should ideally be undertaken before the hand-net sample (i.e. before you disturb the water) to improve the chance of catching species.

3.5.6 Storage of invertebrate samples prior to sorting

Samples are sorted **as soon as possible** after collection since they deteriorate quickly, and animals which have died in the bucket are (a) harder to spot and therefore more likely to be missed, and (b) likely to quickly begin rotting, and so be more difficult to identify. In addition, predators in the sample may eat their way through many of your other captured specimens. If the sample cannot be sorted immediately upon return from the field it must be kept in cold storage in a refrigerator or a refrigerated cold room. It is important that all samples are dealt with within three days of collection.

3.6 Sorting and identifying macroinvertebrate samples

Samples are not frozen or preserved prior to sorting since this reduces the potential recovery and identification of some invertebrate species. All samples are sorted fresh and 'live'.

3.6.1 Preparing the sample for sorting

The sample is washed gently in a fine sieve (0.5mm mesh or less), removing as much mud and fine detritus as possible whilst ensuring the retention of delicate bodied invertebrates such as mayflies. A white sieve is preferable.

3.6.2 Sorting the sample

A small amount (less than a handful) of material to be sorted is placed in a white tray with approximately 3-5mm depth of water. This material is sorted gradually and carefully using forceps. (Fine, curved forceps, as described in Table 2, will make the sorting - and subsequent identification - very much faster and easier.) Individual animals recorded for the survey are removed and placed in a labelled bottle of 70% Industrial Methylated Spirits ('70% alcohol') for later identification. The exceptions are **leeches and flatworms**, which are not readily identifiable after preservation in IMS: these should be placed in **water** in a **covered** petri dish to be identified alive. A list of invertebrate groups included in the NPS analysis is given in Table 3 (below).

In general, the aim of sorting the sample is to remove and identify **all** individual invertebrates. In samples where one or two species are present in large numbers (i.e. thousands of specimens), specimens of these species are counted in a subsample and numbers then extrapolated to the whole sample. **All specimens** of species which cannot be reliably identified in the sorting tray should be removed from the sample with the following **exceptions**: Baetidae, Caenidae, Leptophlebiidae, Nemouridae, Gammaridae and Asellidae. In the case of these families, it is adequate to remove about 100 individuals since this provides a reasonable chance of all the species likely to be present being removed. Take particular care with pairs of species which are similar and perhaps not distinguishable by eye, where small numbers of one species often occur amongst very large numbers of the other species (e.g. *Asellus meridianus* with *A. aquaticus*, *Cloeon simile* with *C. dipterum*, *Anisus leucostoma* with *A. vortex*, *Lymnaea auricularia* with *L. peregra*, *Sigara falleni* with *S. distincta* and so on).

3.6.3 Identification of invertebrates

Some species, particularly those which are large and distinctive, are immediately identifiable whilst sorting, and are noted on a temporary "sorting list" (e.g. *Ilyocoris cimicoides*, *Nepa cinerea* and many snails). Most others require use of biological keys and a microscope with a magnification of at least x30. Relevant keys are listed in Appendix 1. Many species (especially the larval stages of insects) cannot be identified below certain sizes. Appropriate sizes are given in identification keys.

Table 3. Macroinvertebrate groups recorded for the National Pond Survey

Group	English name	Notes
Tricladida	Flatworms	Identified live
Gastropoda	Water snails	
Bivalvia (except <i>Pisidium</i> spp.)	Freshwater cockles and mussels	
Hirudinea	Leeches	Identified live
Araneae	The Water Spider	
Malacostraca, Anostraca, Notostraca	Shrimps, slaters, crayfish	
Ephemeroptera (larvae)	Mayflies	
Plecoptera (larvae)	Stoneflies	
Odonata (larvae)	Dragonflies and damselflies	
Megaloptera & Neuroptera (larvae)	Alderflies and spongeflies	
Coleoptera (adults)*	Water beetles	*As defined by Friday 1988.
Hemiptera (adults)	Water bugs	
Trichoptera (larvae)	Caddis flies	

Others

Diptera (including Chironomidae) (flies) are identified to family level but may also be retained for identification at a higher taxonomic level, if necessary, at a later stage.

Oligochaetes (segmented worms) are identified to Class level but may also be retained for identification at a higher taxonomic level, if necessary, at a later stage.

Small bivalves not identified to species level (i.e. *Pisidium* spp.) may be retained for identification at a later stage.

Watermites, zooplankton and other micro-arthropods are not included in the survey.

Appendix 1 Identification guides used for National Pond Survey work

Plants

General

Clapham, A.R., Tutin, T.G. and Moore, D.M. (1988). *Flora of the British Isles* (3rd ed.). Cambridge University Press, Cambridge.

Haslam, S., Sinker, C. and Wolseley, P. (1975). British Water Plants. *Field Studies* 4, 243-351.

Rich, T.C.G. and Jermy, A.C. (1998). *Plant Crib 1998*. Botanical Society of the British Isles, London. (particularly useful for *Potamogeton*, *Ranunculus* and *Glyceria* spp.).

Stace, C. (1997). *New flora of the British Isles*. Second Edition. Cambridge University Press, Cambridge. (useful new data and key for *Callitriche* spp.).

Grasses and Sedges

Hubbard, C.E. (1968). *Grasses*. Penguin Books. Middlesex.

Jermy, A.C., Chater, A.O. and David, R.W. (1982). *Sedges of the British Isles*. Botanical Society of the British Isles, London.

Rose, F. (1989). *Colour identification guide to the grasses, sedges, rushes and ferns of the British Isles and north-western Europe*. Viking, London.

Charophytes

Moore, J.A. (1986). *Charophytes of Great Britain and Ireland*. Botanical Society of the British Isles, London.

Macroinvertebrates

General

Croft, P.S. (1986). *A key to the major groups of British freshwater invertebrates (AIDGAP Key)*. Field Studies Council Publication 181.

Fitter, R. and Manuel, R. (1994). *Collins Photo Guide: Lakes, rivers, streams and ponds of Britain and North West Europe*. Harper Collins, London.

Tricladida

Reynoldson, T.B. (1978). A key to the British species of freshwater Tricladids (2nd ed.). *Freshwater Biological Association Scientific Publication No. 23*.

Gastropoda

Macan, T.T. (1977). A key to the British fresh- and brackish-water Gastropods (4th ed.). *Freshwater Biological Association Scientific Publication No. 13*.

Whitfield, M. and Walker, D. (1994). *Freshwater Gastropoda of Britain. Some supplementary notes to the Freshwater Biological Association Scientific Publication No. 13*. Pond Action, Oxford.

Brown, D.S. (1977). *Ferrissia* - a genus of freshwater limpet new for Britain. *The Conchologist's Newsletter*, No. 62.

Bivalvia

Ellis, A.E. (1978). British freshwater bivalve Mollusca. Keys and notes for the identification of the species. *Synopses of the British Fauna (New Series)* No. 11.

Hirudinea

Elliott, J.M. and Mann, K.H. (1979). A key to the British freshwater leeches with notes on their life-cycles and ecology. *Freshwater Biological Association Scientific Publication No. 40*.

Crustacea

Gledhill, T., Sutcliffe, D.W. and Williams, W.D. (1993). British freshwater Crustacea Malacostraca: a key with ecological notes. *Freshwater Biological Association Scientific Publication No. 52*.

Ephemeroptera

Elliot, J.M., Humpesch, U.H. and Macan, T.T. (1988). Larvae of the British Ephemeroptera: a key with ecological notes. *Freshwater Biological Association Scientific Publication No. 49*.

Plecoptera

Hynes, H.B.N. (1977). A key to the adults and nymphs of the British stoneflies (Plecoptera) with notes on their ecology and distribution (3rd ed.). *Freshwater Biological Association Scientific Publication No. 17*.

Odonata

Hammond, C.O. (Revised by R. Merritt) (1983). *The Dragonflies of Great Britain and Ireland*. (2nd ed.). Harley Books, Colchester.

Miller, P.L. (1995). *Dragonflies*. (2nd ed.). *Naturalists' Handbook 7*. Richmond Publishing, Slough.

Megaloptera and Neuroptera

Elliott, J.M. (1977). A key to the larvae and adults of British freshwater Megaloptera and Neuroptera. *Freshwater Biological Association Scientific Publication No. 35*.

Elliott, J.M., O'Connor, J.P. and O'Connor, M.A. (1979). A key to the larvae of Sialidae (Insecta:Megaloptera) occurring in the British Isles. *Freshwater Biology*, 9, 511-514.

Coleoptera

Friday, L.E. (1988). *A key to the adults of British water beetles (AIDGAP Key)*. Field Studies Council Publication 189.

Olmi, M. (1976). Coleoptera; Dryopidae-Elminthidae. *Fauna D'Italia XII*. 286pp.

Hemiptera

Savage, A.A. (1989). Adults of the British aquatic Hemiptera Heteroptera: a key with ecological notes. *Freshwater Biological Association Scientific Publication No. 50*.

Trichoptera

Edington, J.M. and Hildrew, A.G. (1981). A key to the caseless caddis larvae of the British Isles. *Freshwater Biological Association Scientific Publication No. 43*.

Wallace, I.D. and Wallace, B. (1983). A revised key to the genus *Plectrocnemia* (Polycentropodidae: Trichoptera) in Britain, with notes on *Plectrocnemia brevis* McLachlan. *Freshwater Biology*, 13, 83-87.

Wallace, I.D., Wallace, B. and Philipson, G.N. (1990). A key to the case-bearing caddis larvae of Britain and Ireland. *Freshwater Biological Association Scientific Publication No. 51*.

Diptera

Stubbs, A. and Chandler, P. (1978). A dipterist's handbook. *The Amateur Entomologist No. 15*.

Appendix 2

Blank copy of National Pond Survey field recording sheet

National Pond Survey: field recording sheet (1 of 6)

Site name _____ Code _____ County _____
Nearest town _____ Survey _____ Altitude (m) _____
Map type & scale _____ 100 km code _____ Grid reference _____
Plant survey date _____ Plant surveyor _____ Invert. survey date _____ Invert. surveyor _____
Access/contact _____

Brief description of the pond

Pond size

Pond area m² Water area m² Maximum dimensions x m

Marginal complexity Rank the complexity of the margins on a scale of 1 to 10

1 = very simple i.e. circle, 2 = 10% greater length of margin (i.e. a square not a circle), 4 = length c. double bank length that pond would be if a circle, 7 = five times length of bank 10 = pool with an impossibly convoluted margin and/or many islands.

Seasonal water level fluctuation and permanence

Drawdown height cm The height difference between maximum and current water levels (cm)

Permanence Pond dries: 1 = never, 2 = rarely, 3 = sometimes, 4 = annually

If the pond dries, how much probably dries to a hard base? % How much dries to soft sediment? %

Overhanging trees & shrubs

Pond overhung % Water overhung %

Total pond margin overhung % Water margin overhung %

Sketch map of pond

National Pond Survey: field recording sheet (2 of 6)

Surrounding land-use Estimate the percentage of surrounding land-use within the following zones.

LAND-USE	<5m	0-100m	Surfacewater catchment	SIZE OF SURFACEWATER CATCHMENT
Deciduous trees & woodland				<input type="checkbox"/> 5 = Very large catchment >100,000m ² (>100m x 1000m)
Coniferous trees & woodland				
Scrub/hedge				<input type="checkbox"/> 4 = Large catchment 10,000m ² -100,000m ² (<100m x 1000m)
Moor/lowland heath				
Bog				<input type="checkbox"/> 3 = Moderate catchment 1,000m ² -10,000m ² (<100m x 100m)
Fen/marsh				
Rank vegetation				<input type="checkbox"/> 2 = Small catchment 100m ² -1,000m ² (<10m x 100m)
Unimproved grassland				
Semi-improved grass				<input type="checkbox"/> 1 = Tiny catchment <100m ² (=10m x 10m)
Improved grassland				
Arable				<input type="checkbox"/> Is the pond located in an area protected for nature conservation (e.g. reserve)? Type: _____
Gardens and parks				
Buildings and concrete				
Roads				
Paths and tracks				
Rock, stone, gravel				
Ponds and lakes				
Streams, ditches etc.				
Other _____				

Other adjacent wetlands & water bodies. Are there any other wetlands within 1km distance from of the pond (i.e. a 1km radius circle centered on the pond)?

If yes, record (i) the number (ii) the percentage land cover (iii) the length of stream/ditch or river for the following zones:

Wetland	0-5m (number)	0-5m (% area)	0-5m length (m)	0-100m (number)	0-100m (% area)	0-100m length (m)	0-1km (number)	0-1km (% area)	>1km length (m)
Pond									
Lake									
Ditch/stream									
River (>4m wide)									
Spring/flush (<25m long)									
Fen/marsh									
Bog									
Wet grassland									
Other _____									

Is the pond located on or near to a stream or river floodplain? Rank 0-3

Is the pond located in a traditionally watery or wetland area? Rank 0-3

How isolated is the waterbody? Rank 0-5

Water source

Estimate the importance of the following water sources (NB this is a very difficult estimation)

Water source	%	Water source	%	Water source	%
Groundwater/water table	_____	Runoff & near surface water	_____	Direct precipitation	_____
Spring (<25m long)	_____	Stream or ditch	_____	Other e.g land drains (state)	_____
Flood water	_____	Flush	_____		_____

National Pond Survey: field recording sheet (3 of 6)

Sediment and water depths

	Transect A (longest dimension)			Transect B (right angles to A)	
Water depths (cm)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Silt depths (cm)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Total depth (silt + water) (cm)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Geology

Geology underlying pond	<input type="text"/>	Rock type	<input type="text"/>
Geology of catchment	<input type="text"/>	Rock types	<input type="text"/>

Nature of pond base

Approximate % of the following

Clay/silt	<input type="text"/>
Butyl/synthetic	<input type="text"/>
Concrete	<input type="text"/>
Sand	<input type="text"/>
Gravel	<input type="text"/>
Pebbles and rocks	<input type="text"/>
Bed rock (specify)	<input type="text"/>
Peat	<input type="text"/>
Others	<input type="text"/>

Sediment

Approximate % of the following

Decomposing leaves and twigs	<input type="text"/>
Coarse organic debris (c.0.05mm-10mm diam)	<input type="text"/>
Ooze (i.e. non-particulate)	<input type="text"/>
Sand (often stream-borne)	<input type="text"/>
Gravel (often stream-borne)	<input type="text"/>
Pebbles and rocks	<input type="text"/>
Others	<input type="text"/>

Inflows and outflows Does the pond have any wet or dry: (i) inflows (ii) outflows

If yes, estimate their average width and depth. Where possible note the flow rate. Where this is difficult, estimate the flow category:
 1 = dry at time of survey 2 = 0-10cm/sec 3 = 11-50cm/sec 4 = 51-200cm/sec 5 = 201+cm/sec.

Inflows

Water width (cm) (if wet)	Water depth	Flow rate or flow category
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Outflows

Water width (cm) (if wet)	Water depth	Flow rate or flow category
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Banks type and naturalness

Bank angle to top of sediment only (over 1m from outer edge of pond)	Min. <input type="text"/> °	Max. <input type="text"/> °	Av. <input type="text"/> °
Bank angle to base of pond (i.e. below sediment), (over 1m)	Min. <input type="text"/> °	Max. <input type="text"/> °	Av. <input type="text"/> °
Water depth at edge (N.B. usually = 0 cm)	Min. <input type="text"/> cm	Max. <input type="text"/> cm	Av. <input type="text"/> cm

Bank type	%	Bank type	%	Bank type	%
Natural earth etc.	<input type="text"/>	Metal piling	<input type="text"/>	Stone	<input type="text"/>
Concrete	<input type="text"/>	Wood	<input type="text"/>	Other (state)	<input type="text"/>

Bare ground:	Upper banks	<input type="text"/> %	Reason for bare ground:	<input type="text"/>
Bare ground:	Drawdown area	<input type="text"/> %	Reason for bare ground:	<input type="text"/>

National Pond Survey: field recording sheet (4 of 6)

Pond management. Is there evidence that the pond has been recently managed? If yes, describe. Yes No

	How much (% pond)	How recently?
Marginal trees cut back		
Pond dredged		
Emergent or submerged plants cut back		
Surrounding vegetation trimmed/cut		
Edges mowed		
Other		

Livestock grazing. Is the pond grazed by livestock? Yes No

If yes, which animals graze the pond (tick) Cattle Sheep Horses Other

How much of the pond margin is grazed by livestock % % of pond grazed %

Rank the livestock grazing intensity for the pond as a whole
 1= 2= 3= 4= 5=
 Very light or periodic Light Moderate Heavy Very heavy

Duck and wildfowl grazing Is there evidence of duck or wildfowl? Yes No

Rank the duck and other wildfowl grazing intensity for the pond as a whole (tick)
 1= 2= 3= 4= 5=
 Very light or periodic Light Moderate Heavy Very heavy

Which duck/wildfowl graze the pond, and how many? _____

Describe any evidence of nesting: _____

Other grazing Is the pond grazed by other animals (e.g. deer)?

If yes, what % of the pond? % Intensity? _____

Fish Are fish present in the pond? Yes No Don't know

If yes, rank the fish impact for the pond as a whole (tick)
 1= 2= 3= 4= 5=
 Very light Light Moderate Heavy (stocked) Very heavy (stocked)

If yes, list species and/or how many if known? _____

Amphibians

Are amphibians present in the pond? Yes No Don't know

If yes, record the species and abundance _____

Pond age and history How old is the pond?

(Rank if not sure: 1=0-10 years, 2=11-100 years, 3=101-1000 years, 4=1000+ years)

What is the origin of the pond _____

National Pond Survey: field recording sheet (5 of 6)

Assessing amenity value

Is there a view of the pond from rights of way?

If yes, score each on a five point scale (1 = view almost obscured; 5 = clearly visible)

Footpath _____ Bridle path _____ A road _____ B road _____ Minor road _____

Area of open public access _____ Other public access (please state) _____

Private track, path or other access (e.g. golf course) (please state) _____

Is the pond located in an area of open public access?

Is there any evidence of formal amenity use?

If yes, tick as appropriate:

Fishing (e.g. fishing platforms, pegs, swims, embayments)

Pond dipping and other wildlife interests (e.g. dipping platforms, bird hides)

Shooting (e.g. hides, blinds)

Boating and other water sports (e.g. boat, boathouse)

Ornamental fish (e.g. goldfish, Koi carp)

Model boating

Ornamental and other pinioned wildfowl (e.g. nesting boxes, feeders)

Other (please state)

Water quality

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

Alkalinity (m mol^{-1})

Calcium (mg l^{-1})

pH

Temperature

Turbidity Secchi depth cm 1 = Clear 2 = moderately clear 3 = moderately turbid 4 = turbid

Water colour _____ Probable source of colour _____

Sources of pollution

Is there any evidence of rubbish or other pollutants (e.g. oils)?

If yes, estimate the % of the pond affected % Type of pollutants _____

Rank individual pollutant sources on a scale of 1-5 (1=little polluted or affected, 5=very polluted)

<input type="checkbox"/>	Farming land use quality	<input type="checkbox"/>	Stream quality	<input type="checkbox"/>	Stock
<input type="checkbox"/>	Urban areas	<input type="checkbox"/>	Ducks	<input type="checkbox"/>	Litter
<input type="checkbox"/>	Road runoff quality	<input type="checkbox"/>	Fish	<input type="checkbox"/>	Other _____

Give an **overall** rating of the extent to which the pond is likely to be polluted (from 0 = not polluted to 10 = as bad as it can get).

Describe pollutants _____

Describe any mitigating factors (e.g. buffering, groundwater inflows) _____

Photograph taken?

National Pond Survey: field recording sheet (6 of 6)

<p>Submerged plants</p> <p>Apium inundatum Aponogeton distachyos (I) Callitriche brutia Callitriche cophocarpa Callitriche hamulata Callitriche hermaphroditica Callitriche obtusangula Callitriche platycarpa Callitriche stagnalis Callitriche truncata (NS) Callitriche sp. (undetermined) Cabomba carolina (I) Ceratophyllum demersum Ceratophyllum submersum Crassula aquatica (RDB) Egeria densa (I) Elatine hexandra (NS) Elatine hypopiper (NS) Eleogeton fluitans Elodea callitricoides (i) Elodea canadensis (I) Elodea nuttallii (I) Eriocaulon aquaticum (RDB) Groenlandia densa Hippuris vulgaris Hottonia palustris Isoetes echinospora (NS) Isoetes lacustris Juncus bulbosus Lagarosiphon major (I) Littorella uniflora Lobelia dortmanna Ludwigia palustris (RDB) Myriophyllum alterniflorum Myriophyllum aquaticum Myriophyllum spicatum Myriophyllum verticillatum (NS) Najas flexilis (NS) Najas marina (RDB) Oenanthe aquatica Oenanthe fluviatilis Potamogeton acutiflorus (RDB) Potamogeton alpinus Potamogeton bertholdii Potamogeton coloratus (NS) Potamogeton compressus (NS) Potamogeton crispus Potamogeton ephedrus (RDB) Potamogeton filiformis (NS) Potamogeton friesii Potamogeton gramineus Potamogeton lucens Potamogeton nodosus (RDB) Potamogeton obtusifolius Potamogeton pectinatus Potamogeton perfoliatus Potamogeton praelongus Potamogeton pusillus Potamogeton rutilus (RDB) Potamogeton trichoides Potamogeton hybrid(s) Ranunculus aquatilis Ranunculus baudotii Ranunculus circinatus Ranunculus fluitans Ranunculus peltatus Ranunculus penicillatus Ranunculus trichophyllus Ranunculus tripartitus Sagittaria latifolia (I) Sagittaria rigida (I) Sagittaria sagittifolia Sparganium angustifolium Sparganium emersum Sparganium natans (S. minimum) Subularia aquatica Utricularia australis Utricularia intermedia Utricularia minor Utricularia vulgaris Zannichellia palustris</p> <p><i>Charophytes:</i> Chara sp. Nitella sp. Tolypella sp.</p> <p><i>Bryophytes:</i> Fontinalis antipyretica Riccia fluitans Ricciocarpus natans Sphagnum sp.</p> <p><i>Algae:</i> Enteromorpha sp Filamentous Planktonic</p> <p>% filamentous algae _____</p> <p><i>NS = Nationally Scarce RDB = Red Data Book I = Introduced</i></p>	<p>Floating-leaved plants</p> <p>Azolla filiculoides (I) Hydrocharis morsus-ranae Hydrocotyle ranunculoides (I) Lemna gibba Lemna minor Lemna minuta (I) Lemna trisulca Luronium natans (NS) Nuphar advena (I) Nuphar lutea Nuphar pumilia (NS) Nymphaea alba Nymphaeoides peltata Potamogeton natans Potamogeton polygonifolius Spirodela polyhriza Stratiotes aloides (NS) Wolffia arriza (NS)</p> <p>Emergent plants</p> <p>Achillea ptarmica Acorus calamus (I) Agrostis canina Agrostis stolonifera Alisma gramineum (RDB) Alisma lanceolatum Alisma plantago-aquatica Alopecurus aequalis Alopecurus borealis (NS) Alopecurus geniculatus Anagallis tenella Andromeda polifolia Angelica archangelica Angelica sylvestris Apium graveolens Apium nodiflorum Apium repens (RDB) Baldellia ranunculoides Berula erecta Bidens cernua Bidens connata (I) Bidens frondosa (I) Bidens tripartita Blysmus compressus Bolboschoenus maritimus Butomus umbellatus Calamagrostis canescens Calamagrostis epigejos Calamagrostis purpurea (RDB) Calamagrostis scotica (RDB) Calamagrostis stricta (RDB) Calla palustris (I) Caltha palustris Cardamine amara Cardamine pratensis Carex acuta Carex acutiformis Carex appropinquata (NS) Carex aquatilis Carex curta Carex diandra Carex disticha Carex echinata Carex elata Carex elongata (NS) Carex flacca Carex hostiana Carex laevigata Carex lasiocarpa Carex limosa Carex nigra Carex oedocarpa (C.demissa) Carex otrubae Carex panicea Carex paniculata Carex pendula Carex pseudocyperus Carex pulicaris Carex riparia Carex rostrata Carex spicata Carex vesicaria Carex viridula (C.lepidocarpa) Carex vulpina (RDB) Catabrosa aquatica Cicendia filiformis Cicuta virosa (NS) Cirsium dissectum Cirsium palustre Cladium mariscus Conium maculatum Corrigiola litoralis (RDB) Crassula helmsii Crepis paludosa Cyperus fuscus (RDB) Cyperus longus (NS) Dactylorhiza fuchsii Dactylorhiza incarnata Dactylorhiza lapponica Dactylorhiza maculata Dactylorhiza majalis Dactylorhiza praetermissa</p>	<p>Dactylorhiza purpurella Dactylorhiza traunsteineri (NS) Damasonium alisma (RDB) Deschampsia caespitosa Drosera anglica Drosera binata (I) Drosera capensis (I) Drosera intermedia Drosera rotundifolia Dryopteris cristata (RDB) Eleocharis acicularis (RDB) Eleocharis multicaulis Eleocharis palustris Eleocharis quinqueflora Eleocharis uniglumis Epilobium alsinifolium Epilobium anagallidifolium Epilobium brunnescens (I) Epilobium ciliatum (I) Epilobium hirsutum Epilobium obscurum Epilobium palustre Epilobium parviflorum Epilobium tetragonum Epipactis palustris Equisetum fluviatile Equisetum palustre Erica tetralix Eriophorum angustifolium Eriophorum gracile (RDB) Eriophorum latifolium Eriophorum vaginatum Eupatorium cannabinum Filipendula ulmaria Galium boreale Galium constrictum (G.debile) Galium palustre Galium uliginosum Geum rivale Glyceria declinata Glyceria fluitans Glyceria maxima Glyceria notata (G.plicata) Gnaphalium uliginosum Hydrocotyle vulgaris Hypericum elodes Hypericum tetrapterum Hypericum undulatum (NS) Impatiens capensis Impatiens glandulifera Impatiens noli-tangere (RDB) Iris pseudacorus Isoplepis setacea Isoplepis cernua Juncus acutiflorus Juncus ambiguus (J.ranarius) Juncus articulatus Juncus bufonis agg. Juncus compressus Juncus conglomeratus Juncus effusus Juncus foliosus Juncus inflexus Juncus pygmaeus (RDB) Juncus subnodulosus Lathyrus palustris (NS) Leersia oryzoides (RDB) Liparis loeselii (RDB) Lotus pedunculatus Luzula sylvatica Luzula luzuloides Lychnis flos-cuculi Lycopus europaeus Lysimachia nummularia Lysimachia terrestris Lysimachia thysiflora (NS) Lysimachia vulgaris Lythrum hyssopifolium Lythrum portula Lythrum salicaria Menyanthes trifoliata Mentha aquatica Mentha pulegium (RDB) Mimulus guttatus Mimulus luteus Minuartia stricta (RDB) Molinia caerulea Montia fontana Myosotis laxa Myosotis scorpioides Myosotis secunda Myosotis stolonifera (NS) Myosoton aquaticum Myrica gale Narthecium ossifragum Oenanthe aquatica Oenanthe crocata Oenanthe fistulosa Oenanthe fluviatilis Oenanthe lachenalii Oenanthe pimpinelloides Oenanthe silaifolia (NS) Osmunda regalis</p>	<p>Pedicularis palustris Parnassia palustris Persicaria amphibia (P.amphibium) Persicaria hydropiper Persicaria lapathifolia Persicaria mitis (P.mite) (NS) Persicaria maculosa (P.persicaria) Persicaria minor (P.minor) Petasites hybridus Petasites japonicus (I) Peucedanum palustre (NS) Phalaris arundinacea Phragmites australis Ptilularia globulifera (NS) Ptilularia alpina (RDB) Ptilularia lusitanica Pinguicula vulgaris Potentilla erecta Potentilla palustris Pulicaria dysenterica Pulicaria vulgaris (RDB) Ranunculus flammula Ranunculus lingua Ranunculus ophioglossifolius (RDB) Ranunculus hederaceus Ranunculus omiophyllus Ranunculus reptans (RDB) Ranunculus scleratus Rhynchospora alba Rhynchospora fusca (NS) Rorippa amphibia Rorippa islandica (RDB) Rorippa microphylla Rorippa nasturtium-aquaticum Rorippa palustris Rorippa sylvestris Rumex aquaticus (RDB) Rumex hydrolapathum Rumex maritimus Rumex palustris Sagina procumbens Sagittaria subulata Samolus valerandi Schoenoplectus lacustris Schoenoplectus pungens (RDB) Schoenoplectus tabernaemontani Schoenoplectus triquetter (RDB) Schoenus ferrugineus (RDB) Schoenus nigricans Scorzonera humilis (RDB) Scrophularia auriculata Scutellaria galericulata Senecio aquaticus Senecio fluviatilis Senecio paludosus (RDB) Sium latifolium (NS) Solanum dulcamara Sonchus palustris (NS) Sparganium erectum Stachys palustris Stellaria palustris Stellaria uliginosa (S.alsine) Symphytum officinale Teucrium scordium (RDB) Thalictrum flavum Thelypteris palustris (NS) Tofieldia pusilla Tricophorum cespitosum Triglochin palustris Typha angustifolia Typha latifolia Valeriana dioica Vallisneria spiralis (I) Veronica anagallis-aquatica Veronica beccabunga Veronica catenata Veronica scutellata Viola palustris Viola persicifolia (RDB)</p> <p>Trees and shrubs</p> <p>Alnus glutinosa Frangula alnus Populus sp. Salix sp.</p> <p>% cover of pond area (not water area)</p> <p>% Submerged spp _____</p> <p>% Floating-leaved spp. _____</p> <p>% Emergent spp. _____</p> <p>% Total cover _____</p>
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