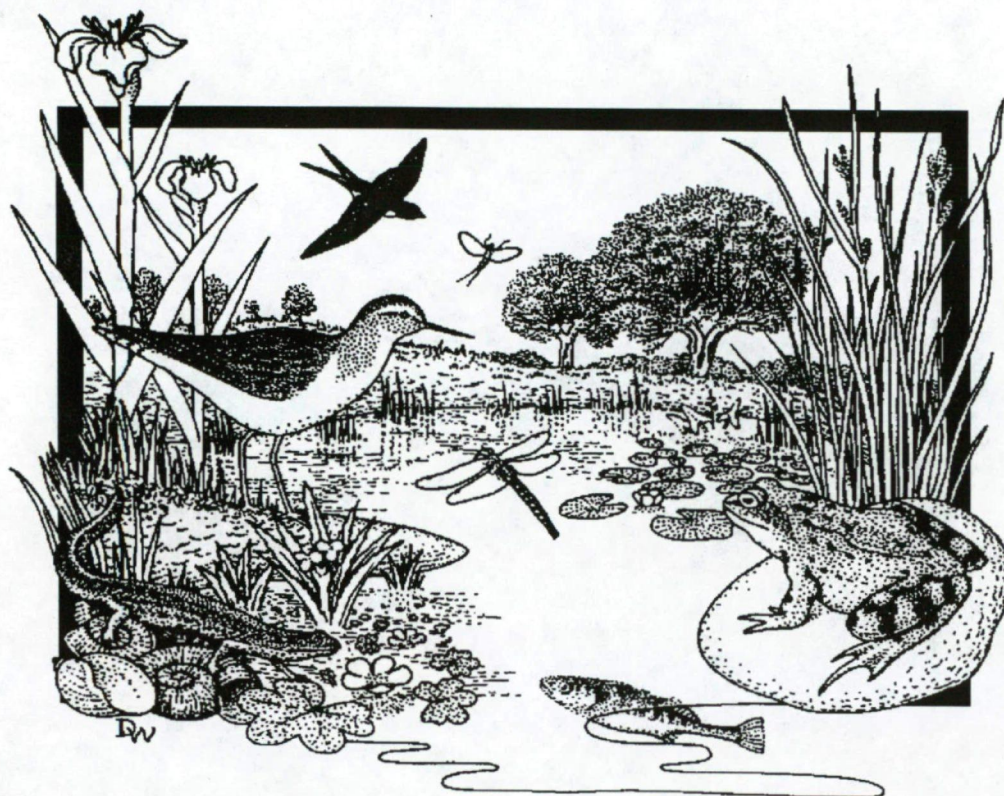


A survey of the wetland plants and macroinvertebrates of the Butts Pond, Staines Moor



A report for the National Rivers Authority

Pond Action

October 1993

A survey of the wetland plants and macroinvertebrates of the Butts Pond, Staines Moor

Summary

This report describes the results of survey work undertaken by Pond Action at the Butts Pond, Staines Moor (Surrey) as part of the Lower Colne Improvement: Staines Bypass Channel project. The aim of the work has been to assess the existing nature conservation value of the pond and predict the likely impact of the proposed flood defence scheme on the pond.

The survey results suggest that Butts Pond supports a rich wildlife community. The wetland plant community was particularly diverse, with a total of 53 wetland plant species recorded during the three survey visits. No nationally uncommon plant species were recorded, but 11 local species were present. Surveys of aquatic macroinvertebrates also suggest a rich community: in total 99 invertebrate species were recorded from the pond, and a further three species of dragonfly were observed as adults on the wing. The invertebrate community included 13 uncommon species, seven of which were Nationally Notable b status, with six local species. The most notable invertebrate recorded was the water beetle *Noterus crassicornis* which is considered to be a fenland relict species that is uncommon outside East Anglia.

The conservation value of the invertebrate and plant communities was assessed using (i) a species rarity index, and (ii) where possible, by comparing the number of species recorded with the results of other regional pond surveys.

The species rarity indices indicated that both the macroinvertebrate and wetland plant communities were of high conservation value (on a four-point national scale: low, moderate, high, very high).

The total number of invertebrate species recorded was similar to the maximum number of species recorded in any of the ponds included in the Oxfordshire Pond Survey (the only comparable data available). The number of wetland plant species recorded was higher than all other comparable surveys of ponds in Britain known to Pond Action. The plant community also included a very high number of uncommon species.

Limited information is available about the likely physical and chemical effects of the flood defence scheme on the pond. However, **potential** impacts of adding river flood water to ponds include: increased pollutant and sediment loads, physical damage of microhabitats, introduction of river plants and animals and changes in water levels. Because the Butts Pond is located on a floodplain and would naturally experience flood events, most of the physical effects of flooding are unlikely to be damaging. However, flood water carrying pollutants (or polluted sediments) could adversely affect the pond which is currently relatively well-protected from this type of pollution by a buffer of semi-natural grassland and scrub.

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A survey of the wetland plants and macroinvertebrates of the Butts Pond, Staines Moor

1. Report aims

This report describes the results of survey work undertaken by Pond Action at the Butts Pond, Staines Moor (Surrey) as part of the Lower Colne Improvement: Staines Bypass Channel project. The aim of the survey work was to assess the existing nature conservation value of the pond and predict the likely impact of the proposed flood defence scheme on the pond.

The work had four main components:

- To use existing data to assess the historic conservation value of the Butts Pond.
- To survey aquatic invertebrates, adult dragonflies and wetland plant species associated with the pond in three seasons (spring, summer and autumn).
- To evaluate the nature conservation value of the pond.
- To comment on the likely effects of water transfer from the Wraysbury River onto Staines Moor via Butts Pond.

2. Background information about the site

The Butts Pond lies close to the north eastern corner of Staines Moor SSSI (Grid ref: TQ030736) (Map 1). The pond is man-made, and was created when material was excavated to build the rifle butts, around 1860 (Geoff Dawes, personal communication). To the north, the pond is bordered by a hedgeline with gravel workings beyond (Figure 1). To the west lies a small belt of young woodland bordered in turn by Moor Lane, the Wraysbury River and the M25. To the south and east lies the neutral unimproved grassland of Staines Moor itself (Figure 1).

The pond is approximately 0.2ha in area and roughly L-shaped, with the short arm forming a southerly bay which is isolated from the main pond during periods of low water (Figure 1). The amount of edge habitat is increased by a number of spits which project into deep water. The pond also has extensive areas of shallows especially along the southern and eastern edges and around the southern embayment. Immediately south of the pond there is a small group of pools which were not included in the survey.

2.1 Geology and substrates

The near-surface geology of Staines Moor comprises Quaternary gravels overlain by variable thicknesses of alluvial silty clay. Both substrates are exposed in places in the pond. The alluvium forms mud flats, particularly in the area between the main pond basin and the southern bay where it creates a poached muddy shelf. Gravel substrates are mainly evident on the steeper pond margins; in deeper water the gravels are covered by organic pond silts.

2.2 Hydrology and drainage

The main source of water for the Butts Pond is likely to be groundwater from the shallow aquifer in the glacial sands and gravels. However near surface water flow, through the alluvium, may also be important. In the past the Butts Pond was also flooded regularly but river engineering works some 15 years ago are thought to have stopped this (Dr. Phil Crib, personal communication).

The Staines Moor Technical Report (Spelthorne Borough Council 1989) states that in the 1970s and 1980s changes in watertable levels associated with the drying out of the Butts Pond were considered to be linked to the infilling of the Yeoveney ditch (which used to run along the northern boundary of the Moor) and to the associated gravel extraction to the north. Construction of a remedial ditch 'was rapidly effective in reinstating groundwater levels local to the Butts Pond' (Spelthorne Borough Council 1989). However subsequent lowering of the sluice and leakage through siltation led to a further return to lower water levels across the Moor.

As with many ponds the water level in the Butts Pond fluctuates considerably during the year. Between May and October 1993, when the Pond Action survey was undertaken, the maximum difference in water levels was in the order of 0.5m.

Map 1. Butts Pond: location map

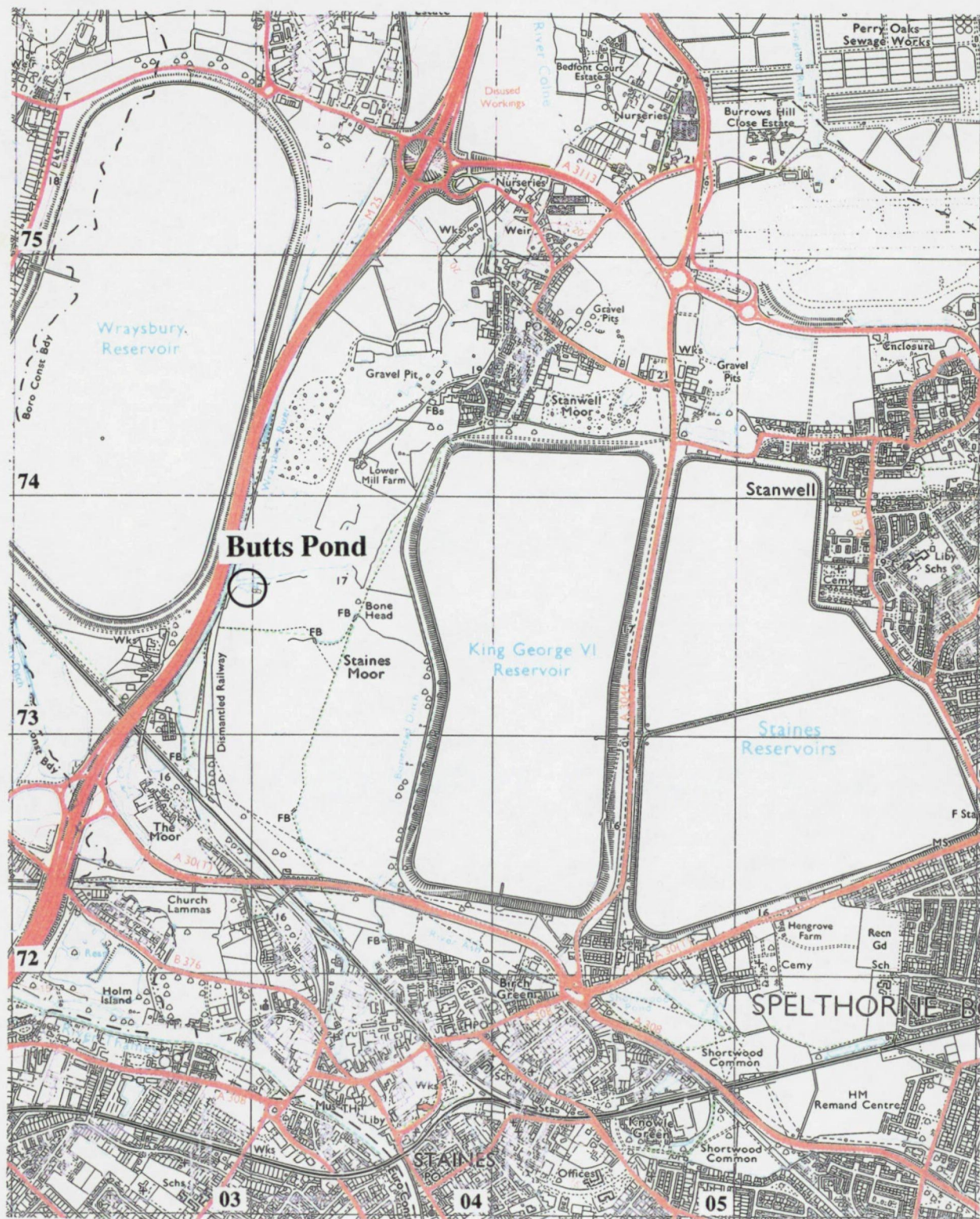


Figure 1. The Butts Pond (10th July 1993)



Photo 1. Eastern end of Butts Pond looking northwards towards the adjacent gravel workings



Photo 2. Southern embayment of Butts Pond, looking southwards across Staines Moor.

2.3 Water quality

A very rough assessment of water quality was made on site by Pond Action during the summer 1993 visit using Aquamerc test kits and field meters, following standard National Pond Survey methods (Biggs et al 1993). The results (Table 1) suggest that the pond is fairly typical of calcareous ponds in southern and central England. The water was moderately clear during the first visit to the pond in May, but during both July and October visits it was brown and turbid.

Table 1. Water chemistry results for the Butts Pond (July 1993)

pH	Calcium	Carbonate	Conductivity
7.8	112mg/l	4.6meq./l	650µS/cm

3. Existing ecological information about the Butts Pond

3.1 Sources of information

A range of organisations and individuals were contacted to locate ecological information relating to the pond¹. Information in the Staines Moor Technical Report (Spelthorne Borough Council 1989) was also reviewed. Despite the many people who have an interest in the Moor, very little information is available about the pond's ecology and only four specific sources of biological information relating to the pond were available:

- (i) records of five wetland plant species occurring in the Butts Pond made by the Surrey Flora Committee (part of general survey work on Staines Moor) on 6 July 1985.
- (ii) botanical observations by Dr. Phil Crib, who has known the Moor for about 20 years
- (iii) observations of dragonflies made by Dr. John Pontin from the late 1970s onwards.
- (iv) casual collections of water beetles made by Dr. Robert Angus from the early 1980s onwards.

In addition to this information the Department of Transport has commissioned survey work on the Butts Pond in association with the proposals to widen the M25, although this information is not yet in the public domain. This survey work is understood to deal with vegetation, invertebrates and amphibians.

No specific information on the Butts Pond is held by English Nature or the Surrey Wildlife Trust. River corridor surveys undertaken by the National Rivers Authority in the Staines Moor area do not deal specifically with Butts Pond. Local members of the British Dragonfly Society who were contacted were not aware of any surveys of dragonflies on the pond. Local members of the British Herpetological Society were not aware of any information relating to amphibians of the Butts Pond.

3.2 Existing records

The Surrey Flora Committee recorded the following plants at the Butts Pond: *Alisma lanceolatum* (narrow-leaved water-plantain), *Apium inundatum* (lesser marshwort), *Butomus umbellatus* (flowering-rush), *Veronica catenata* (pink water-speedwell) and *Veronica scutellata* (marsh speedwell). Comprehensive species lists for the pond were not made.

1. English Nature (Peter Tinning, SE Region); Surrey Flora Committee (Joyce Smith); British Dragonfly Society (local BDS members Mike Thumer, Don Tagg and David Baldock); Spelthorne Natural History Society (Dr. Phil Crib); Surrey Wildlife Trust; Dr. John Pontin (formerly of Royal Holloway University College, Egham); Dr. Robert Angus (Royal Holloway University College, Egham); Spelthorne Borough Council (Geoff Dawes); National Rivers Authority (Alastair Driver, Dave Elford, Kevin Patrick); British Herpetological Society (local BHS members Julia Wycherley and Howard Inns). Dr Tim Rich (consultant to DOT).

Of the species noted by the Committee, two, *Butomus umbellatus* (flowering-rush) and *Veronica catenata* (pink water-speedwell), were re-recorded in the 1993 survey (see Section 6 and Appendices 4 and 6). The record of *Apium inundatum* (lesser marshwort) may possibly be erroneous, resulting from confusion with the basal submerged leaves of *Oenanthe fistulosa* (tubular water-dropwort) which are morphologically similar to the aquatic leaves of *Apium inundatum* (Lesser marshwort). A specific search for *Apium inundatum* (lesser marshwort) was made at the site by Pond Action, but all of the 200 or so possible plants examined were *Oenanthe fistulosa* (tubular water-dropwort).

In addition to the Surrey Flora Committee records, Dr Phil Crib noted that *Hottonia palustris* (water-violet) used to occur in the pond some ten or fifteen years ago. This species was not re-recorded in the present survey. Surrey Flora Committee records indicated that *Hottonia palustris* (water-violet) occurred in the ditch adjacent to the pond in 1985 but not in the pond itself.

A limited amount of information on the dragonflies and water beetles of Butts Pond was obtained from Dr. John Pontin and Dr. Robert Angus (both are professional entomologists and experienced field naturalists). John Pontin, who has known the Moor for some years, does not recall seeing any uncommon dragonflies on his visits to the Butts Pond. Robert Angus recorded a variety of water beetles over a period of 10 years, including the fen relict species *Noterus crassicornis*. This species is generally associated with long-established fen habitats and was re-recorded in the Pond Action 1993 survey (see Section 4.3 and Appendix 3).

3.3 The historic conservation value of the Butts Pond

The limited amount of information available makes it difficult to assess the historic conservation value of the pond. The continued survival of the population of the water beetle *Noterus crassicornis* (see Section 4.3) and the data available on dragonflies, provides limited evidence that the pond invertebrate community may not have changed greatly since the 1970s. The most significant loss from the known plants list is that of two local species, *Alisma lanceolatum* (narrow-leaved water-plantain) and *Hottonia palustris* (water-violet). Butts Pond would still appear to provide typical and ideal habitat for *Alisma lanceolatum* (narrow-leaved water-plantain) (areas of periodically inundated shallows with little vegetation cover). Its absence may therefore be due to local factors such as grazing or high summer water levels. If so, the species may still be present and may appear from seed or the perennial root stock in future years. The absence of *Hottonia palustris* (water-violet) is difficult to explain: but the pond may now be too enriched with nutrients, and the water too turbid, to support this species which is generally characteristic of mesotrophic waters.

4. The macroinvertebrate community

4.1 Macroinvertebrate survey methods

Macroinvertebrate samples were taken during three seasons in 1993: spring (11th May), summer (9th August), and autumn (24th September). Sampling was undertaken following standard National Pond Survey methodology (Pond Action 1993) with the addition of extra time on-site (about 3 hours per season) searching for taxa that might not be collected in the three-minute sample.

The following groups were identified to species level: Tricladida (flatworms), Gastropoda (snails), Hirudinea (leeches), Araneae (spiders), Malacostraca (freshwater shrimps and slaters), Ephemeroptera (mayflies), Odonata (damselflies and dragonflies), Hemiptera (water bugs), Megaloptera (alder flies), Trichoptera (caddis flies), Lepidoptera (moths), and Coleoptera (beetles). Larvae of Diptera (true-flies) were identified to family level.

4.2 Macroinvertebrate survey results

The Butts pond supported a rich aquatic macroinvertebrate community with a total of 99 invertebrate species recorded from the three survey visits: 57 species were recorded in spring (11th May), 68 species in summer (9th August), and 82 species in autumn (24th September). In addition larvae from a total of 11 Diptera families were recorded. A list of all macroinvertebrate species and families recorded is given in Appendix 2.

The invertebrates recorded could be broadly divided into two types: those which reflected the shallow, muddy and weedy character of the pond (for example, the leech *Erpobdella testacea*, the mayfly *Caenis robusta* and the beetles *Helochaeres lividus* and *Rhantus suturalis*) and those which are more characteristic of rivers, lakes or gravel-pits (for example, the snail *Viviparus contectus*, the mayfly *Cloeon simile*, and the beetles *Anacaena bipustulata* and *Peltodytes caesus*). This pattern could be seen both amongst the uncommon species (see notes on local and Nationally Notable species in Appendix 3.) and amongst the more common species. The occurrence of the second group, with species typical of rivers and gravel-pits, may reflect the locally gravelly substrate of the pond, or the influx of invertebrates from previous flood events and/or the adjacent gravel-pit lakes.

4.3 Uncommon species

At a national level, uncommon invertebrate species are generally divided into five groups. With increasing degree of rarity these are: local, Nationally Notable b (NNb), Nationally Notable a (NNa), Red Data Book 3 (RDB3), Red Data Book 2 (RDB2) and Red Data Book 1 (RDB1). Definitions of each of these terms, as used in this report, are given in Appendix 7.3.

A total of 13 uncommon invertebrate species were recorded from the pond. Seven of these were Nationally Notable B species (the water beetles *Anacaena bipustulata*, *Enochrus melanocephalus*, *Helochaeres lividus*, *Hydroglyphus pusillus*, *Noterus crassicornis*, *Peltodytes caesus* and *Rhantus suturalis*) and six were local species (Lister's River Snail *Viviparus contectus*, the leeches *Erpobdella testacea* and *Glossiphonia heteroclita*, the mayflies *Caenis robusta* and *Cloeon simile*, and the caddis fly *Agraylea sexmaculata*).

The occurrence of the diving beetle *Noterus crassicornis*, which is usually associated with long-established fenland habitats, suggests that the pond may have some continuity with ancient wetland. This species is uncommon outside East Anglia.

5. Adult dragonflies and damselflies

5.1 Adult dragonfly and damselfly survey methods

Adult Odonata were recorded during visits to the pond on 11 May, 9 August, 15 August and 24 September. Only species observed either over the pond, or within 5m of the pond edge, were noted.

5.2 Results

A total of eight Odonata species were recorded as adults on the wing. Three of these species are additional to the list of records of larval dragonflies and damselflies from the pond.

On 11 May, only one dragonfly species, *Libellula depressa* (Broad-bodied Chaser) (one teneral individual), and one damselfly species, *Ischnura elegans* (Blue-tailed Damselfly) (many newly-emerged individuals, drying out on fence-posts), were recorded.

On 9 and 15 August, the dragonflies *Aeshna cyanea* (Southern Hawker), *Aeshna grandis* (Brown Hawker), *Aeshna juncea* (Common Hawker), *Anax imperator* (Emperor Dragonfly), *Libellula depressa* (Broad-bodied Chaser) and *Sympetrum striolatum* (Common Darter), and the damselflies *Enallagma cyathigerum* (Common Blue Damselfly) and *Ischnura elegans* (Blue-tailed Damselfly) were recorded on the wing. Of these, one species was observed mating and ovipositing: *Enallagma cyathigerum* (Common Blue Damselfly) (in very large numbers, on 9th August).

No dragonfly or damselfly species were recorded in September.

Overall ten dragonfly and damselfly species were recorded: seven of these were present as larvae with a further three recorded only as non-mating or ovipositing adults.

6. Wetland Plants

6.1 Plant survey methods

The wetland plant species associated with Butts Pond were recorded on three occasions during the growing season (11th May, 10th July and 9th September). Species which are considered here to be 'wetland' are listed in the Pond Action Wetland Plant List (see Appendix 1). This list was based originally on the NCC Wetland Plant List with modifications suggested by Dr Margaret Palmer and Dr Tim Rich.

On each occasion the field survey took approximately four hours. Critical taxa (eg *Chara* sp.) were returned to the laboratory for identification using a binocular microscope. Some individual plants could not be identified with confidence. For example, many *Nasturtium* (watercress) and *Myosotis* (forget-me-not) plants did not produce flowering or fruiting material in any season and the possibility remains that amongst the flowering plants of *Nasturtium officinale* (water-cress) and *Myosotis scorpioides* (water forget-me-not) there may be individuals of species such as *Nasturtium microphyllum* (narrow-leaved watercress) and *Myosotis laxa* (tufted forget-me-not). The relative abundance of each plant species was noted using the DAFOR system.

6.2 Results of plant surveys

The Butts Pond supports a rich wetland flora with a total of 53 plant species recorded over the three seasons (see Appendix 4). The number of species recorded at each visit increased progressively (May = 39, July = 47, September = 49 species), largely reflecting the typically late development of many wetland plants. Of the total number of plant species recorded, 41 were marginal/emergents, and 12 aquatic (ie floating or submerged) plant species. Duckweeds were particularly well represented with five of the six British species present, including the introduced and currently naturalizing species *Lemna minuta* (least duckweed).

The two most abundant species in the pond were *Phragmites australis* (common reed) which occurred predominantly as a single large stand in the north western quarter of the site and *Lemna minuta* (least duckweed) which occurred as a variably persistent floating mat over most of the open water areas (see Appendix 5).

Other emergent species which were locally dominant included *Sparganium erectum* (branched bur-reed), *Typha latifolia* (bulrush) and *Glyceria maxima* (reed sweet-grass). The grazed and poached margins supported a distinct community often dominated by *Iris pseudacorus* (yellow iris), *Glyceria fluitans* (floating sweet-grass), *Agrostis stolonifera* (creeping bent) and *Oenanthe fistulosa* (tubular water-dropwort). Areas of deeper poached muds supported *Glyceria fluitans* (floating sweet-grass), *Glyceria declinata* (small sweet-grass), *Callitriche* spp. and *Ranunculus trichophyllus* (thread-leaved water-crowfoot).

In deeper open water areas *Zannichellia palustris* (horned pondweed) was locally abundant, particularly in the northwestern quarter of the pond in areas surrounding the main *Phragmites* stand. *Groenlandia densa* (opposite-leaved pondweed) was also locally dominant in the southern embayment, but was uncommon elsewhere. In the spring survey *Chara vulgaris* (common stonewort) was recorded in open water along the south-western edge of the pond. However it had died back by summer, possibly because of the consistently increased turbidity of the water.

6.3 Uncommon plants

No nationally uncommon plants were recorded from the Butts Pond, but 11 local species were found. These are listed in Table 2 below. Further information about the national distribution of these species is given in Appendix 6. The majority of local plant species were widespread or abundant at the pond and some were locally dominant. The four main exceptions were *Bidens cernua* (nodding bur-marigold), *Butomus umbellatus* (flowering rush), *Lemna polyrhiza* (greater duckweed) and *Lemna gibba* (fat duckweed) where only a small number of specimens were found.

It was noticeable that although only 12% of the marginal/emergent plant species recorded were 'local' in terms of their national distribution, 50% of the submerged/floating species were 'local'. This may, in part, reflect general under-recording of aquatic species (making them seem more uncommon than they really are); however, it is also likely to reflect the scarcity of unpolluted freshwater habitats in Britain.

Table 2. Uncommon Plants recorded from Butts Pond

Aquatic species (submerged and floating plants):

Callitriche obtusangula	Blunt-fruited water-starwort ¹
Groenlandia densa	Opposite-leaved Pondweed
Lemna gibba	Fat Duckweed
Lemna polyrhiza	Greater Duckweed
Ranunculus trichophyllus	Thread-leaved Water-crowfoot
Zannichellia palustris	Horned Pondweed

Marginal/emergent species:

Bidens cernua	Nodding Bur-marigold
Butomus umbellatus	Flowering-rush
Glyceria declinata	Small Sweet-grass
Oenanthe fistulosa	Tubular Water-dropwort
Veronica catenata	Pink Water-speedwell

7. Conservation value of the plant and invertebrate communities

7.1 Methods of assessing conservation value

Assessment of the conservation value of Butts pond is based on:

- (i) Numbers of species present. Numbers of species recorded in the Butts Pond were compared with numbers of species recorded in individual ponds in the few regional pond surveys where comparable data has been collected. These surveys relate mainly to plants, although one survey (the Oxfordshire Pond Survey: Pond Action 1993), provides comparable invertebrate data.
- (ii) The occurrence of uncommon or rare species. Sites supporting uncommon or rare species are generally regarded as more valuable in nature conservation terms than those supporting common and widespread species. To make consistent comparisons between sites, rarity is assessed using an index of 'average rarity' of species recorded (the Species Rarity Index (SRI) - see Appendix 7 for detailed description).

The SRI is calculated in the following way:

- All species present are given a numerical value depending on their national rarity status (see Appendix 7.3).
- The values of all the species present are added together to give a total rarity score.
- The total rarity score is divided by the number of species present to give the Species Rarity Index .

Sites with a high proportion of uncommon species therefore generally have high index values; sites with few or no uncommon species have low values. The SRI system, whilst being relatively objective, should be regarded only as an aid to assessing conservation value, and **not** as an **absolute** measure. Hence it should not be used uncritically or in isolation, but always in conjunction with all other available information. Table 3, overleaf gives a list of categories used to group ponds by NCI according to the conservation value of their communities.

Table 3. Provisional system for assessing the nature conservation value of plant and aquatic macroinvertebrate communities

CONSERVATION CATEGORY	DESCRIPTION OF TYPE OF COMMUNITY
VERY HIGH	Typically supporting a very rich community of plant and/or macro-invertebrate species, including local and rare (RDB) species (though note that some sites with rare species can be relatively species-poor). Sites in this category would normally have Species Rarity Indices in excess of 1.5.
HIGH	Supporting a rich community of common plants and/or macro-invertebrate species. Generally an above-average number of local species recorded. No RDB species. Sites in this category would normally have Species Rarity Indices between 1.2 and 1.5
MODERATE	Supporting a moderately-rich or rich community of common plant and/or macroinvertebrate species with at least one local species. Sites in this category would normally have Species Rarity Indices between 1.01 and 1.19.
LOW	Supporting a species-poor community of common plants and macro-invertebrates. No rare or local species. Sites in this category will have Species Rarity Indices of 1.00.

7.2 Conservation value of the macroinvertebrate community

Numbers of invertebrate species in the Butts Pond were compared with results from the Oxfordshire Pond Survey (Pond Action 1993). In Oxfordshire the number of species in individual 3-minute samples from the ponds surveyed (like those collected in each season in the Butts Pond) varied between 2 and 60. Since the total number of species recorded in Butts Pond in each season was always close to or above 60, this suggests that the pond supports an unusually species-rich community.

The Species Rarity Index (SRI) of the macroinvertebrate community of the Butts Pond, based on the total number of species recorded in all three seasons, was 1.26 (The dragonfly species which were noted only as adults were not included in this calculation). This suggests that the macroinvertebrate community of the pond is of **HIGH** nature conservation value.

7.3 Assessment of the importance of the dragonfly community

The dragonfly community of the Butts Pond was good but not exceptional. A total of seven breeding species were recorded, with an additional three seen on the wing. None of these species were nationally or regionally uncommon. As a guide: in south-east England a site worthy of notification as an SSSI would need to support 15-17 or more breeding species (NCC 1989) although, in practice, this means that it is largely only heathland ponds which are likely to be considered as suitable for SSSI notification.

7.4 Conservation value of the plant community

7.4.1 Numbers of plant species

The Butts Pond wetland plant community can be compared with the results of a number of other regional surveys. The most comprehensive of these studies have been reviewed and, where necessary, modified so that species lists are directly comparable with the Pond Action Wetland Plant Recording List. Since most other surveys were based on single-season visits to ponds, the Butts Pond totals shown in this table are also presented as single season results rather than the combined total from all seasons.

Comparing the Butts Pond results with the results from other surveys (see Table 4) shows clearly that the Pond supported a very rich plant community. The number of species recorded at Butts Pond in both summer and autumn (47 and 49, respectively) exceeded the maximum number of species recorded from any other pond for which data is available (ie 44 species in one Oxfordshire pond).

Table 4. The number of plant species recorded from Butts Pond: comparison with pond surveys in other parts of Britain

	Number of ponds	Total no. of species: average range		No. of aquatic spp: average range		No. of marginal spp: average range	
Oxfordshire (Pond Action 1993)	36	17.7	1-44	4.4	0-11	13.3	1-33
Dorset (Friday 1988)	16	8	2-15	3	1-7	5	1-9
Cheshire ¹ (Brian et al. (1987)	153	9	0-23	2	-	7	-
Clwyd ¹ (Day 1981)	406	14	0-30	2.5	-	11.5	-
Milton Keynes ¹ (Ridge and Furniss 1985)	117	7.5	-	1.5	-	6	-
Butts Pond	1	45	39-49 ²	9.7	9-10	35.3	30-39

¹Species list modified to be consistent with Pond Action Wetland Plant List

²Seasonal totals.

7.4.2 Uncommon Species and Species Rarity Index

Relatively few of the pond surveys undertaken in other parts of Britain have data presented in a way which allows direct comparison of the number of uncommon plant species per pond. The data which is currently available is shown in Table 5. As with species number, the summer and autumn results indicate that Butts Pond supports a large number of uncommon species compared to the ponds in other surveys.

Table 6 shows the Species Rarity Index calculations for the plant community at Butts Pond. The community as a whole falls into the **HIGH** conservation value category. However since a large proportion of the aquatic flora (submerged and floating-leaved species) has a 'local' status (50% of all aquatic species were 'local') this gives the aquatic flora alone, an index of 1.5, suggesting it has a very high conservation value.

Table 5. The number of uncommon plant species recorded from Butts Pond: comparison with pond surveys in other parts of Britain

	Total number of uncommon species		Number of uncommon aquatic species		Number of uncommon marginal species	
	average	range	average	range	average	range
Oxfordshire (Pond Action 1993)	2.3	(0-9)	1.2	(0-6)	1.1	(0-5)
Dorset (Friday, 1988)	0.81	(0-2)	0.25	(0-2)	0.56	(0-2)
Butts Pond (seasonal results)	8	(5-10)	4.3	(3-5)	3.7	(2-5)

Table 6 Calculation of Species Rarity Index for the Butts Pond

	All Plants	Aquatic Plants	Marginal Plants
Number of plant species	53	12	41
Species Rarity Score	64	18	46
Species Rarity Index	1.2	1.5	1.1

8. Assessment of the likely effect of floodwater on the Butts Pond

The proposals for the Staines Bypass Channel project are likely to involve periodic flooding of the Butts Pond from the Wraysbury River. This section broadly assesses the potential impact of flooding from the existing data. Existing information about the physical and chemical effects on the pond are limited. However it is likely that the scheme will result in flood water spilling across Moor Lane, and moving as overland flow through the Butts Pond area onto Staines Moor. The flood return period is predicted to be approximately 1:25years¹.

There are few, if any, studies of the long term impact of periodic flooding on ponds but, theoretically, flood water has the potential to modify the physical, chemical and biological character of receiving waters in five main areas: increased pollutant loading, increased sediment loading, the introduction of river plants and animals, changes in water level and physical damage to habitats due to current scour. The nature of these processes and their likely impact on Butts Pond are summarised in Table 7.

The lack of empirical evidence about the effect of river flood water on still-water habitats and communities means that any assessment of flood impact on Butts Pond can only be an educated guess. However, overall, the balance of existing evidence suggests that periodic flooding is **most** likely to cause little or no significant damage to the pond or its community.

The main reason for this is that Butts Pond is already located on a floodplain, and in the past is known to have receive regular floodwater inputs (see Section 2.2). Indeed as noted in Section 4.2 some components of the invertebrate community currently resemble those of rivers and gravel pits in the area, and the existing richness of the pond's fauna and flora may in part result from the proximity of the river and wet floodplain. In essence, therefore, occasional flooding is known to have been a natural part of the pond's water regime and changes which result from flooding are likely to be within the normal range of perturbation for the pond.

Although flooding *per se* is unlikely to be damaging, flood water carrying pollutants could have adverse effects (see Table 7). At present the Butts Pond is moderately-well protected from surface water pollution because it is surrounded by a buffer of semi-natural grassland and scrub. Whether or not floodwater inputs have a significantly adverse effect on the pond will depend on the quality of flood water compared to the existing quality of the pond.

1. NRA Internal memorandum from John Pulsford (Projects) to Kevin Patrick (Landscape Architect) dated 22 February 1993 (reference TS/P4284/X/JNP/jnp).

Table 7. Potential impact of flood water inputs on the Butts Pond

Potential impact of flood water inputs	Likely effect on Butts Pond
Increased pollutant loads	<p>There is currently little information about the quality of flood water which is likely to be introduced into Butts Pond. However in principal, the greatest area of concern is likely to be the introduction of pollutants such as biocides, heavy metals and oils. Inputs of organics and nutrients are likely to be less problematic since the water in Butts pond is already likely to be eutrophic and already enriched by cattle and horse manure.</p>
Increased sediment load	<p>The likely effect of sediment inputs on Butts Pond will depend on the amount and character of the sediment deposited. However it should be noted that: (i) the pond already has a range of sediment types including alluvium, gravel and organic-rich muds (ii) the pond already seems to be highly turbid during a large portion of the year and it would be unlikely that very periodic inputs of turbid water would have any significant impact on the site.</p> <p>Inputs of flood-borne sediment will inevitably increase the infill rate of the pond, but the extent to which this is significant depends largely on unknowns (eg the existing infill rate and likely increase from floodwater sedimentation).</p>
Physical damage to microhabitats	<p>The existing information suggests that flood flows into the pond are likely to be relatively slow (0.1-0.2m/s for a 1:100 event¹) and non-channellised. If so, the impact on the pond is not likely to be significant.</p>
Introduction of river plants and animals	<p>Information about the ecological effect of introducing floodborne species into still waters is extremely poor. However Butts Pond already supports many species which can be found in adjacent rivers and gravel pits, and is known to have received irregular floodwater inputs in the past. Our best guess would therefore be that introduction of infrequent flood inputs would be unlikely to result in significant harm.</p>
Changes in water level	<p>Water levels in Butts Pond are known to show considerable annual and between-year fluctuation. Floods of relatively short duration, and infrequent periodicity are unlikely to be outside the natural perturbation for the system or to be a significant threat to the pond's flora and fauna.</p>

1. NRA Internal memorandum from John Pulsford (Projects) to Kevin Patrick (Landscape Architect) dated 22 February 1993 (reference TS/P4284/X/JNP/jnp).

9. References

- Ball, S. (1986). Terrestrial and Freshwater Invertebrates with RDB or Habitat Status. Invertebrate Site Register Report 66. Nature Conservancy Council.
- Biggs, J., Corfield, A., Walker, D.M., Whitfield, M. and Williams, P.J. (1993a). The National Pond Survey Methods booklet. Unpublished report.
- Biggs, J., Corfield, A., Walker, D.M., Whitfield, M. and Williams, P.J. (1993b). The Oxfordshire Pond Survey Unpublished report to Worldwide Fund for Nature (WWF-UK).
- Brian A.D., Price P.S., Redwood B.C. and Wheeler E. (1987) The flora of the marl-pits (ponds) in one Cheshire parish. *Watsonia* 16, 417-426.
- Clapham, A.R., Tutin, T.G. and Moore, D.M. (1987). Flora of the British Isles. 3rd edn. Cambridge University Press, Cambridge.
- Croft, J.M., Preston, C.D. and Forrest, W.A. (1991). Database of aquatic plants in the British Isles. National Rivers Authority, London.
- Day P. (1991) Ponds (marl pits) in the Lower Dee Valley of Clwyd - a preliminary appraisal. 45pp. NCC.
- Dony, J.G., Jury, S.L. and Perring, F.H. (1986). English names of wild flowers (2nd ed.). Botanical Society of the British Isles.
- Elliott, J.M., Humpesch, U.H. and Macan, T.T. (1988). Larvae of the British Ephemeroptera. Freshwater Biological Association Scientific Publication 49.
- Elliott, J.M. and Mann, K.H. (1979). A key to the British freshwater leeches. Freshwater Biological Association Scientific Publication 40.
- Elliot, J.M., O'Connor, J.P. and O'Connor, M.A. (1979). A Key to the larvae of Sialidae (Insecta: Megaloptera). *Freshwater Biology* 9: 511-514.
- Fitter, R. and Manuel, R. (1986). Collins Field Guide to Freshwater Life. Collins, London.
- Foster, G.N. (1981, 1983, 1984, 1985 and 1987). Atlas of British Water Beetles (preliminary edition), Parts 1, 2, 3, 4 and 5. The Balfour-Browne Club Newsletter 22, 27, 34, 35 and 40. Biological Records Centre, Institute of Terrestrial Ecology.
- Friday L.E. (1988). The conservation and amenity value of ball-clay ponds in the Isle of Purbeck, Dorset, UK. *Biological Conservation*. 43, 165-180.
- Friday, L.E. (1988). A key to the adults of British water beetles (AIDGAP Key). Field Studies Council Publication 189.
- Gledhill, T., Sutcliffe, D.W. and Williams, W.D. (1993). British freshwater Crustacea Malacostraca: a key with ecological notes. Freshwater Biological Association Scientific Publication 52.
- Hammond, C.O. (1983). The Dragonflies of Great Britain and Ireland. Harley Books.
- Macan, T.T. (1977). A Guide to the British Fresh- and Brackish Water Species of Gastropods (4th ed.). Freshwater Biological Association Scientific Publication 13.
- Maitland, P.S. (1977). A Coded Checklist of Animals occurring in Fresh Water in the British Isles. Natural Environment Research Council, Institute of Terrestrial Ecology.

- Miller, P.E. (1987). Dragonflies. Naturalist's Handbook No. 7. Cambridge University Press, Cambridge.
- Palmer, M. (1989). A botanical classification of standing waters in Great Britain. Nature Conservancy Council surveys in nature conservation. 11.
- Palmer, M.A. and Newbold, C. (1983). Wetland and riparian plants in Great Britain. An assessment of their status and distribution in relation to water authority, river purification board and Scottish islands areas. Focus on Nature Conservation 1. Nature Conservancy Council.
- Perring, F.H. and Farrell, L. (1983). British Red Data Books 1: Vascular Plants (2nd ed.). Royal Society for Nature Conservation, Lincoln.
- Perring, F.H. and Walters, S.M. (eds.) (1990). Atlas of the British Flora (3rd ed., revised). Botanical Society of the British Isles.
- Reynoldson, T.B. (1978). A key to the British species of freshwater triclads (2nd ed.). Freshwater Biological Association Scientific Publication 23.
- Ridge I. and Furniss P. (1986) Milton Keynes pond survey, 1985. Unpublished report for Milton Keynes Development Corporation.
- Savage, A.A. (1989). Adults of the British aquatic Hemiptera Heteroptera. Freshwater Biological Association Scientific Publication 50.
- Spelthorn Borough Council (1989) Staines Moor technical background document. Spelthorn Borough Council.
- Stace, C. (1991). New flora of the British Isles. Cambridge University Press.
- 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 51.
- Wallace, I.D. (1991). A review of the Trichoptera of Great Britain. Research and survey in nature conservation 32. Nature Conservancy Council.

APPENDICES

Appendix 1. Pond Action Wetland Plant List

Aquatic plants

Apium inundatum
Aponogeton distachyos
Azolla filiculoides
Callitriche hamulata
Callitriche hermaphrodita
Callitriche obtusangula
Callitriche platycarpa
Callitriche stagnalis
Callitriche truncata
Callitriche sp. (undetermined)
Ceratophyllum demersum
Ceratophyllum submersum
Crassula helmsii
Egeria densa
Elatine hexandra
Eleogiton fluitans
Elodea canadensis
Elodea nuttallii
Glyceria fluitans
Groenlandia densa
Hippuris vulgaris
Hottonia palustris
Hydrocharis morsus-ranae
Isoetes lacustris
Juncus bulbosus
Lagarosiphon major
Lemna gibba
Lemna minor
Lemna minuscula
Lemna polyrrhiza
Lemna trisulca
Littorella uniflora
Lobelia dortmann
Luronium natans
Menyanthes trifoliata
Myriophyllum alterniflorum
Myriophyllum aquaticum
Myriophyllum spicatum
Myriophyllum verticillatum
Nuphar lutea
Nymphaea alba
Nymphoides peltata
Oenanthe aquatica
Oenanthe fluviatilis
Potamogeton alpinus
Potamogeton bertholdii
Potamogeton coloratus
Potamogeton crispus
Potamogeton friesii
Potamogeton gramineus
Potamogeton lucens
Potamogeton natans
Potamogeton obtusifolius
Potamogeton perfoliatus
Potamogeton pectinatus
Potamogeton polygonifolius
Potamogeton praelongus
Potamogeton pusillus
Potamogeton trichoides
Ranunculus aquatilis
Ranunculus baudotii
Ranunculus circinatus
Ranunculus fluitans
Ranunculus hederaceus
Ranunculus ophiophyllus
Ranunculus peltatus
Ranunculus penicillatus
Ranunculus trichophyllus
Sagittaria sagittifolia
Sparganium angustifolium
Sparganium emersum
Sparganium minimum
Stratiotes aloides
Subularia aquatica
Utricularia australis
Utricularia intermedia
Utricularia minor
Utricularia vulgaris
Wolffia arriza
Zannichellia palustris

Bryophytes:

Fontinalis antipyretica
Riccia fluitans
Ricciocarpus natans
Sphagnum sp.

Algae:

Chara sp.
Nitella sp.
Tolypella sp.

Marginal and emergent plants

Achillea ptarmica
Acorus calamus
Agrostis stolonifera
Alisma lanceolatum
Alisma plantago-aquatica
Alopecurus aequalis
Alopecurus geniculatus
Anagallis tenella
Andromeda polifolia
Angelica archangelica
Angelica sylvestris
Apium nodiflorum
Baldellia ranunculoides
Barbarea intermedia
Barbarea vulgaris
Berula erecta
Bidens cernua
Bidens tripartita
Blysmus compressus
Butomus umbellatus
Calamagrostis canescens
Calamagrostis epigejos
Caltha palustris
Cardamine amara
Cardamine pratensis
Carex acuta
Carex acutiformis
Carex curta
Carex demissa
Carex diandra
Carex disticha
Carex flacca
Carex hostinana
Carex laevigata
Carex lasiocarpa
Carex lepidocarpa
Carex nigra
Carex otrubae
Carex panicea
Carex paniculata
Carex pendula
Carex pseudocyperus
Carex pulicaris
Carex riparia
Carex rostrata
Carex spicata
Carex vesicaria
Catabrosa aquatica
Cicuta virosa
Cirsium dissectum
Cirsium palustre
Cladium mariscus
Conium maculatum
Crepis paludosa
Cyperus longulus
Dactylorhiza fuchsii
Damasonium alisma
Deschampsia caespitosa
Drosera rotundifolia
Eleocharis acicularis
Eleocharis multicaulis
Eleocharis palustris
Eleocharis quinqueflora
Equisetum fluviatile
Equisetum palustre
Epilobium hirsutum
Epilobium nerteroides
Epilobium obscurum
Epilobium palustre
Epilobium parviflorum
Epilobium tetragonum
Epipactis palustris
Erica tetralix
Eriophorum angustifolium
Eriophorum latifolium
Eriophorum vaginatum
Eupatorium cannabinum
Filipendula ulmaria
Galium boreale
Galium palustre
Galium uliginosum
Geum rivale
Glyceria declinata
Glyceria fluitans
Glyceria maxima
Glyceria plicata
Hydrocotyle vulgaris

Hypericum elodes
Hypericum tetrapterum
Impatiens capensis
Impatiens glandulifera
Impatiens noli-tangere
Iris pseudacorus
Isolepis cernua
Isolepis setacea
Juncus acutiflorus
Juncus articulatus
Juncus bufonis agg.
Juncus compressus
Juncus conglomeratus
Juncus inflexus
Juncus subnodulosus
Juncus effusus
Lotus uliginosus
Lychnis flos-cuculi
Lycopus europaeus
Lysimachia nemorum
Lysimachia nummularia
Lysimachia vulgaris
Lythrum hyssopifolia
Lythrum portula
Lythrum salicaria
Mentha aquatica
Mimulus guttatus
Mimulus luteus
Molinia caerulea
Montia fontans
Myosotis laxa
Myosotis scorpioides
Myosotis secunda
Myosoton aquaticum
Myrica gale
Narthecium ossifragum
Nasturtium microphyllum
Nasturtium officinale
Oenanthe aquatica
Oenanthe crocata
Oenanthe fistulosa
Oenanthe lachenalii
Osmunda regalis
Parnassia palustris
Pedicularis palustris
Petasites hybridus
Phalaris arundinacea
Phragmites australis
Pilularia globulifera
Pinguicula vulgaris
Polygonum amphibium
Polygonum hydropiper
Polygonum lapathifolium
Polygonum persicaria
Potentilla erecta
Potentilla palustris
Pulcaria dysenterica
Ranunculus flammula
Ranunculus lingua
Ranunculus sceleratus
Rhynchospora alba
Rorippa amphibia
Rorippa palustris
Rorippa sylvestris
Rumex hydrolyapathum
Rumex maritimus
Rumex palustris
Sagina procumbens
Sagittaria sagittifolia
Schoenoplectus lacustris
ssp lacustris
ssp tabernaemontani
Schoenus nigricans
Scrophularia auriculata
Scutellaria galericulata
Senecio aquaticus
Senecio fluviatilis
Sium latifolium
Solanum dulcamara
Sparganium erectum
Stachys palustris
Stellaria alsine
Stellaria palustris
Symphytum officinale
Thalictrum flavum
Thelypteris palustris
Tofieldia pusilla

Tricophorum cespitosum
Triglochin palustris
Typha angustifolia
Typha latifolia
Valeriana dioica
Veronica anagallis-aquatica
Veronica beccabunga
Veronica catenata
Veronica scutellata
Viola palustris

APPENDIX 2. Aquatic macroinvertebrates recorded in the Butts Pond, Staines Moor in spring, summer and autumn 1993

(Note: * = Nationally Notable B; § = Local. English names are given where they exist.)

		Spring	Summer	Autumn
Tricladida (Flatworms)				
<i>Polycelis tenuis</i>		-	-	+
Bivalvia (Bivalves)				
<i>Sphaerium corneum</i>	An orb mussel	-	+	+
<i>Sphaerium lacustre</i>	An orb mussel	-	-	+
Gastropoda (Snails and Limpets)				
<i>Acroloxus lacustris</i>	Lake Limpet	+	+	+
<i>Anisus leucostoma</i>	Button Ramshorn	+	+	+
<i>Anisus vortex</i>	Whirlpool Ramshorn	+	+	+
<i>Armiger crista</i>	Nautilus Ramshorn	+	+	+
<i>Bathymphalus contortus</i>	A ramshorn snail	-	-	+
<i>Bithynia leachi</i>	Leach's Bithynia	+	+	+
<i>Bithynia tentaculata</i>	The Bithynia	+	+	+
<i>Gyraulus albus</i>	White Ramshorn	+	+	+
<i>Hippeutis complanatus</i>	Flat Ramshorn	+	+	+
<i>Lymnaea auricularia</i>	Ear Pond Snail	-	+	-
<i>Lymnaea palustris</i>	Marsh Snail	+	+	+
<i>Lymnaea peregra</i>	Wandering Snail	+	+	+
<i>Lymnaea stagnalis</i>	Great Pond Snail	+	+	+
<i>Lymnaea truncatula</i>	Dwarf Pond Snail	+	+	+
<i>Planorbarius corneus</i>	Great Ramshorn	+	+	+
<i>Planorbis carinatus</i>	Keeled Ramshorn	-	+	+
<i>Planorbis planorbis</i>	The Ramshorn	+	+	+
<i>Potamopyrgus jenkinsi</i>	Jenkins' Spire Shell	-	+	+
<i>Valvata cristata</i>	Flat Valve Snail	+	+	+
<i>Viviparus contectus</i> §	Lister's River Snail	+	-	+
Hirudinea (Leeches)				
<i>Erpobdella octoculata</i>		+	+	+
<i>Erpobdella testacea</i> §		+	+	+
<i>Glossiphonia heteroclita</i> §		+	+	+
<i>Helobdella stagnalis</i>		+	+	+
<i>Theromyzon tessulatum</i>		-	-	+

APPENDIX 2. Aquatic macroinvertebrates recorded in the Butts Pond, (continued) Staines Moor in spring, summer and autumn 1993

		Spring	Summer	Autumn
Araneae (Spiders)				
<i>Argyroneta aquatica</i>	Water Spider	+	-	+
Malacostraca (Slaters and freshwater shrimps)				
<i>Asellus aquaticus</i>	A water slater, or hog-louse	+	+	+
<i>Crangonyx pseudogracilis</i>	A freshwater shrimp	+	+	+
Ephemeroptera (Mayflies)				
<i>Caenis robusta</i> §	A 'white midge', or 'anglers' curse'	+	-	-
<i>Cloeon dipterum</i>	Pond Olive	+	+	+
<i>Cloeon simile</i> §	Lake Olive	-	-	+
Odonata (Damselflies and dragonflies: larvae in pond)				
<i>Aeshna cyanea</i>	Southern Hawker	-	+	-
<i>Aeshna grandis</i>	Brown Hawker	-	-	+
<i>Coenagrion puella/pulchellum</i>	Azure Damselfly/Variable Damselfly	+	-	+
<i>Enallagma cyathigerum</i>	Common Blue Damselfly	+	-	+
<i>Ischnura elegans</i>	Blue-tailed Damselfly	+	+	+
<i>Libellula depressa</i>	Broad-bodied Chaser	-	+	+
<i>Libellula quadrimaculata</i>	Four-spotted Chaser	-	-	+
Odonata (Damselflies and dragonflies: adults on the wing)				
<i>Aeshna cyanea</i>	Southern Hawker	-	+	-
<i>Aeshna grandis</i>	Brown Hawker	-	+	-
<i>Aeshna juncea</i>	Common Hawker	-	+	-
<i>Anax imperator</i>	Emperor Dragonfly	-	+	-
<i>Enallagma cyathigerum</i>	Common Blue Damselfly	-	+†	-
<i>Ischnura elegans</i>	Blue-tailed Damselfly	+	-	-
<i>Libellula depressa</i>	Broad-bodied Chaser	+	-	-
<i>Sympetrum striolatum</i>	Common Darter	-	+	-
† Mating and ovipositing in very large numbers.				
Heteroptera (Water bugs)				
<i>Callicorixa praeusta</i>	A lesser waterboatman	-	+	+
<i>Corixa punctata</i>	A lesser waterboatman	-	+	+
<i>Gerris lacustris</i>	A pond skater	+	+	+
<i>Gerris odontogaster</i>	A pond skater	-	-	+
<i>Hesperocorixa linnei</i>	A lesser waterboatman	+	+	+
<i>Hesperocorixa sahlbergi</i>	A lesser waterboatman	-	+	+
<i>Ilyocoris cimicoides</i>	Saucer Bug	-	+	+
<i>Nepa cinerea</i>	Water Scorpion	+	+	+

APPENDIX 2. Aquatic macroinvertebrates recorded in the Butts Pond, (continued) Staines Moor in spring, summer and autumn 1993

		Spring	Summer	Autumn
Heteroptera (continued)				
<i>Notonecta glauca</i>	A greater waterboatman	-	+	+
<i>Notonecta marmorea viridis</i>	A greater waterboatman	-	+	-
<i>Plea leachi</i>	Lesser Backswimmer	+	-	-
<i>Sigara distincta</i>	A lesser waterboatman	-	-	+
<i>Sigara dorsalis</i>	A lesser waterboatman	+	+	+
<i>Sigara falleni</i>	A lesser waterboatman	+	+	+
<i>Sigara lateralis</i>	A lesser waterboatman	-	+	+
<i>Sigara limitata</i>	A lesser waterboatman	-	-	+
<i>Sigara nigrolineata</i>	A lesser waterboatman	-	+	+
Note: nymphs of the following additional water bug genus (identifiable only as adults) were also noted:				
<i>Micronecta</i> sp.	Lesser waterboatmen	+	-	-
Megaloptera (Alderflies)				
<i>Sialis lutaria</i>		-	+	+
Trichoptera (Caddis flies)				
<i>Agraylea multipunctata</i>		-	+	-
<i>Agraylea sexmaculata</i>		-	-	+
<i>Limnephilus flavicornis</i>		+	-	-
<i>Limnephilus lunatus</i>		+	-	-
Lepidoptera (Moths and butterflies)				
<i>Nymphula nymphaea</i>	Brown China-mark Moth	-	+	-
<i>Cataclysta lemnata</i>	A moth	-	-	+
Coleoptera (Beetles)				
<i>Agabus nebulosus</i>		-	-	+
<i>Agabus sturmii</i>		-	+	+
<i>Anacaena bipustulata</i> *		+	+	-
<i>Anacaena globulus</i>		+	-	-
<i>Anacaena limbata</i>		+	+	+
<i>Coelambus impressopunctatus</i>		+	+	+
<i>Dytiscus marginalis</i>	A great diving beetle	-	-	+
<i>Enochrus melanocephalus</i> *		+	-	-
<i>Enochrus testaceus</i>		+	+	-
<i>Haliplus flavicollis</i>		-	+	+
<i>Haliplus immaculatus</i>		-	+	+
<i>Haliplus lineatocollis</i>		-	+	+
<i>Haliplus ruficollis</i>		+	+	+
<i>Haliplus wehnckei</i>		-	-	+

APPENDIX 2. Aquatic macroinvertebrates recorded in the Butts Pond, (continued) Staines Moor in spring, summer and autumn 1993

	Spring	Summer	Autumn
Coleoptera (continued)			
<i>Helochares lividus</i> *		+	+
<i>Helophorus brevipalpis</i>		-	+
<i>Hydrobius fuscipes</i>		+	+
<i>Hydroglyphus pusillus</i> *		+	-
<i>Hydroporus palustris</i>		-	+
<i>Hydroporus planus</i>		+	-
<i>Hydroporus pubescens</i>		-	+
<i>Hydroporus tessellatus</i>		-	+
<i>Hygrobia hermanni</i>	Screech Beetle	-	+
<i>Hygrotus inaequalis</i>		+	+
<i>Hyphydrus ovatus</i>		+	+
<i>Ilybius ater</i>		-	+
<i>Laccobius bipunctatus</i>		+	-
<i>Laccobius minutus</i>		+	+
<i>Laccophilus hyalinus</i>		-	+
<i>Laccophilus minutus</i>		+	+
<i>Noterus clavicornis</i>		+	+
<i>Noterus crassicornis</i> *		+	+
<i>Peltodytes caesus</i> *		+	+
<i>Rhantus suturalis</i> *		+	+

Diptera (True-flies)

Larvae of the following families were recorded, but were not identified to species level:

Ceratopogonidae	Biting midges	+	+	+
Chaoboridae	Phantom midges	+	-	-
Chironomidae	Plumed gnats, non-biting midges	+	+	+
Culicidae	Mosquitoes	+	+	+
Dixidae	Meniscus midges	+	+	-
Muscidae	'House-flies'	+	-	+
Ptychopteridae	Phantom crane-flies	+	+	+
Sciomyzidae	'Snail-flies'	+	-	+
Stratiomyidae	Soldier-flies	+	-	+
Syrphidae	Hover-flies	-	-	+
Tipulidae	Crane-flies, daddy-long-legs	+	+	+

APPENDIX 3. Notes on Nationally Notable and local macroinvertebrate species recorded during spring, summer and autumn 1993

Nationally Notable B: Scarce: recorded from only 31 - 100 10-km grid squares in Britain.

Local: Species not falling into Red Data Book or Nationally Notable categories, but usually either (a) confined to certain limited geographical areas where they may, however, be present in large numbers; (b) of widespread distribution, but present only in small numbers where they occur; or (c) restricted to a very specialised habitat of which, however, the species may be a common component.

Note: References to 'Britain' below are to mainland Britain, and do not include Ireland.

***Viviparus contectus* (GASTROPODA: Viviparidae). Lister's River Snail§.**

Recorded in Spring and autumn.

Local. Found in rivers, and also in lakes and large ponds. Rather local, and restricted in range to the centre and east of England, with a few sites on the western English coast; completely absent from Wales, Scotland, the south-west and the southern coast of England. (Macan, 1977; Kerney, 1976.)

***Erpobdella testacea* (HIRUDINEA: Erpobdellidae). A leech.**

Spring, summer and autumn.

Local. This species is restricted to England and Wales, where it is widespread but uncommon. Typically found in small, poorly-oxygenated and overgrown ponds, though it may occasionally be found in stagnant, overgrown sections of rivers. (Elliott and Tullett, 1982.)

***Glossiphonia heteroclita* (HIRUDINEA: Glossiphoniidae). A leech.**

Spring, summer and autumn.

Local. A predator of molluscs, oligochaetes and insect larvae which is found chiefly in lakes, ditches and ponds, but also among the marginal vegetation of slow-flowing streams and rivers (never occurring in fast-flowing waters). Widespread but local and uncommon in most of Britain, but apparently completely absent from northern Scotland. (Elliott and Mann, 1979; Elliott and Tullett, 1982.)

***Caenis robusta* (EPHEMEROPTERA: Caenidae). A mayfly ('white midge' or 'angler's curse').**

Spring.

Local The larvae are locally common and widespread, both in running and still waters. Found in the pools and margins of rivers and in ponds and canals, chiefly in mud or silt that is rich in organic matter. (Elliott, Humpesch and Macan, 1988.)

(Continued)

APPENDIX 3. Notes on Nationally Notable and local macroinvertebrate species recorded during spring, summer and autumn 1993

***Cloeon simile* (EPHEMEROPTERA: Baetidae). The Lake Olive.**

Autumn.

Local. Widespread, but rather less common than *C. dipterum* (the Pond Olive), although the two species are similar in appearance and may, as here, occur together. The nymphs are found in the margins and pools of slow-flowing sections of streams and rivers, and in the deeper water of larger ponds and lakes. (Elliott, Humpesch and Macan, 1988.)

***Agraylea sexmaculata* (TRICHOPTERA: Hydroptilidae). A cased caddis fly.**

Autumn.

Local and scarce throughout Britain in ponds, lakes and slow-flowing waters. The larva is dependent upon filamentous algae (blanket-weed), from which it makes its case and upon which it feeds. Often shares its habitat with the more common *A. multipunctata* - as here, where larvae of the latter were recorded in summer, and larvae of *A. sexmaculata* in autumn. (Wallace, 1991; Pond Action, unpublished data.)

***Anacaena bipustulata* (COLEOPTERA: Hydrophilidae). A water scavenger beetle.**

Spring and summer.

Nationally Notable B. Frequent in the south of England and in the eastern part of the Midlands, with a few sites in the extreme south of Wales; completely absent from the rest of Britain. Usually occurs in streams, rivers and pits. (Friday, 1988; Foster, 1987.)

***Enochrus melanocephalus* (COLEOPTERA: Hydrophilidae). A water scavenger beetle.**

Spring.

Nationally Notable B. Usually a coastal species frequenting brackish water in southern England (though it may occasionally be found in the north of England), but in south-east England it may occur, locally, inland. (D. Bilton, pers. comm.; Friday, 1988.)

***Helochaeres lividus* (COLEOPTERA: Hydrophilidae). A water scavenger beetle.**

Spring, summer and autumn.

Nationally Notable B. Typically found in ponds with some plant cover. More likely to occur in the south-east than in other parts of Britain, and apparently absent altogether from Scotland. May well have been under-recorded in the past, since the two less rare *Helochaeres* species (i.e. *H. lividus* and *H. punctatus*) are by no means always easy to distinguish, and may occasionally occur together. (Friday, 1988; Pond Action, unpublished data.)

(Continued)

APPENDIX 3. Notes on Nationally Notable and local macroinvertebrate species recorded during spring, summer and autumn 1993

***Hydroglyphus pusillus* (COLEOPTERA: Dytiscidae). A diving beetle.**

Spring and autumn.

Nationally Notable B. Found in heath pools, mossy ditches, and (most characteristically, and often in abundance) in new, man-made ponds, where it is often one of the earliest colonisers. Locally distributed in the south of England, where it is fairly common, and the Midlands. (Foster, 1981; Friday, 1988; Pond Action, unpublished data.)

***Noterus crassicornis* (COLEOPTERA: Noteridae). A water beetle.**

Spring, summer and autumn.

Nationally Notable B. A relict species with a strongly localised distribution: records are scattered sparsely throughout most of Britain, with the exception of the north of Scotland, but tend to be most concentrated in eastern England. (Foster has pointed out that much confusion has arisen because of 'the confusing nomenclature', since this species was until recently known as *N. clavicornis*, which is now the name given to the larger, and much commoner, species. Hence many old records are unacceptable.) Restricted to still water, often in fens. (Foster, 1981; Friday, 1988).

***Peltodytes caesus* (COLEOPTERA: Haliplidae). A water beetle.**

Spring, summer and autumn.

Nationally Notable B. A beetle of fenland drains and quarry ponds. 'This appears to be a declining fenland species, but it is still common where it occurs.' Its range, however, has receded since 1950 to a few sites in the far south of England. (Foster, 1981.)

***Rhantus suturalis* (COLEOPTERA: Dytiscidae). A diving beetle.**

Spring, summer and autumn.

Nationally Notable B. Locally distributed over most of England, but more especially in the south. Prefers silt and detritus pools. (Foster, 1985; Friday, 1988.)

APPENDIX 4. Occurrence of wetland plants in the Butts Pond: summary of three seasons observations (spring, summer, autumn 1993).

Plant species	English name	Spring	Summer	Autumn
<i>Agrostis stolonifera</i>	Creeping Bent	+	+	+
<i>Alisma plantago-aquatica</i>	Water-plantain	+	+	+
<i>Alopecurus geniculatus</i>	Marsh Foxtail	+	+	+
<i>Apium nodiflorum</i>	Fool's Water-cress	+	+	+
<i>Bidens cernua</i>	Nodding Bur-marigold	-	-	+
<i>Butomus umbellatus</i>	Flowering-rush	+	+	+
<i>Callitriche stagnalis</i>	Common Water-starwort	+	+	+
<i>Cardamine pratensis</i>	Cuckooflower	+	+	+
<i>Carex flacca</i>	Glaucous Sedge	+	+	+
<i>Carex otrubae</i>	False Fox-sedge	+	+	+
<i>Chara vulgaris</i>	Stonewort	+	-	-
<i>Eleocharis palustris</i>	Common Spike-rush	+	+	+
<i>Epilobium hirsutum</i>	Great Willow-herb	+	+	+
<i>Epilobium parviflorum</i>	Hoary Willow-herb	-	+	+
<i>Galium palustre</i>	Common Marsh-bedstraw	+	+	+
<i>Glyceria declinata</i>	Small Sweet-grass	-	+	+
<i>Glyceria fluitans</i>	Floating Sweetgrass	+	+	+
<i>Glyceria maxima</i>	Reed Sweet-grass	+	+	+
<i>Groenlandia densa</i>	Opposite-leaved Pondweed	+	+	+
<i>Impatiens glandulifera</i>	Indian Balsam	-	-	+
<i>Iris pseudacorus</i>	Yellow Iris	+	+	+
<i>Juncus articulatus</i>	Jointed-rush	+	+	+
<i>Juncus ranatus</i>	Frog Rush	-	+	+
<i>Juncus inflexus</i>	Hard Rush	+	+	+
<i>Juncus effusus</i>	Soft-rush	+	+	+
<i>Lemna gibba</i>	Fat Duckweed	-	-	+
<i>Lemna minuscula</i>	Least Duckweed	+	+	+
<i>Lemna minor</i>	Common Duckweed	+	+	+
<i>Lemna polyrhiza</i>	Greater Duckweed	-	+	-
<i>Lemna trisulca</i>	Ivy-leaved Duckweed	+	+	+
<i>Lycopus europaeus</i>	Gipsywort	+	+	+
<i>Mentha aquatica</i>	Water Mint	+	+	+
<i>Myosotis scorpioides</i>	Water Forget-me-not	+	+	+
<i>Nasturtium officinale</i>	Water-cress	+	+	+
<i>Oenanthe fistulosa</i>	Tubular Water-dropwort	+	+	+
<i>Phragmites australis</i>	Common Reed	+	+	+
<i>Polygonum hydropiper</i>	Water-pepper	+	+	+
<i>Polygonum persicaria</i>	Redshank	-	+	+
<i>Ranunculus flammula</i>	Lesser Spearwort	+	+	+
<i>Ranunculus sceleratus</i>	Celery-leaved Buttercup	+	+	+
<i>Ranunculus trichophyllus</i>	Thread-leaved Water-crowfoot	+	+	+
<i>Rorippa palustris</i>	Marsh Yellow-cress	+	+	+
<i>Sagina procumbens</i>	Procumbent Pearlwort	-	+	+
<i>Scrophularia auriculata</i>	Water Figwort	-	+	+
<i>Senecio aquaticus</i>	Marsh Ragwort	-	+	+
<i>Solanum dulcamara</i>	Bittersweet	+	+	+
<i>Sparganium erectum</i>	Branched Bur-reed	+	+	+
<i>Typha latifolia</i>	Bulrush	+	+	+
<i>Veronica catenata</i>	Pink Water-speedwell	-	+	+
<i>Zannichellia palustris</i>	Horned Pondweed	+	+	+
	Filamentous algae	+	+	+

APPENDIX 5. Abundance and conservation scores of wetland plants recorded in the Butts Pond: summary of three seasons observations (spring, summer, autumn 1993).

Key: **Abundance:** d = dominant a = abundant f = frequent o = occasional r = rare
Distribution: w = widespread l = local

Aquatic plant species	English name	Abundance	Conservation score*¹
Callitriche stagnalis	Common Water-starwort	o-lf	1
Callitriche obtusangula	Blunt-fruited water-starwort* ²	o	2
Chara vulgaris	Stonewort	o	1
Groenlandia densa	Opposite-leaved Pondweed	f-la	2
Lemna gibba	Fat Duckweed	r	2
Lemna minuscula	Least Duckweed	w&ld	1
Lemna minor	Common Duckweed	o	1
Lemna polyrhiza	Greater Duckweed	r	2
Lemna trisulca	Ivy-leaved Duckweed	o	1
Ranunculus trichophyllus	Thread-leaved Water-crowfoot	o-lf	2
Zannichellia palustris	Horned Pondweed	o-lf	2
	Filamentous algae	w&f	1
Marginal plant species	English name	Abundance	Conservation score
Agrostis stolonifera	Creeping Bent	w&f	1
Alisma plantago-aquatica	Water-plantain	o	1
Alopecurus geniculatus	Marsh Foxtail	o	1
Apium nodiflorum	Fool's Water-cress	o	1
Bidens cernua	Nodding Bur-marigold	r	2
Butomus umbellatus	Flowering-rush	r	2
Cardamine pratensis	Cuckooflower	o	1
Carex flacca	Glaucous Sedge	o	1
Carex otrubae	False Fox-sedge	r	1
Eleocharis palustris	Common Spike-rush	lf	1
Epilobium hirsutum	Great Willow-herb	r	1
Epilobium parviflorum	Hoary Willow-herb	r	1
Galium palustre	Common Marsh-bedstraw	r	1
Glyceria declinata	Small Sweet-grass	o-la	2
Glyceria fluitans	Floating Sweetgrass	f-la	1
Glyceria maxima	Reed Sweet-grass	w&f-lf	1
Impatiens glandulifera	Indian Balsam	r	1
Iris pseudacorus	Yellow Iris	w&f-la	1
Juncus articulatus	Jointed-rush	lf	1
Juncus ranatus	Frog Rush	o	1
Juncus inflexus	Hard Rush	o	1
Juncus effusus	Soft-rush	o	1
Lycopus europaeus	Gipsywort	o	1
Mentha aquatica	Water Mint	r	1
Myosotis scorpioides	Water Forget-me-not	o	1
Nasturtium officinale	Water-cress	o	1
Oenanthe fistulosa	Tubular Water-dropwort	w&o-lf	2
Phragmites australis	Common Reed	d	1
Polygonum hydropiper	Water-pepper	o	1
Polygonum persicaria	Redshank	r	1
Ranunculus flammula	Lesser Spearwort	o	1
Ranunculus sceleratus	Celery-leaved Buttercup	o	1
Rorippa palustris	Marsh Yellow-cress	r	1
Sagina procumbens	Procumbent Pearlwort	o	1
Scrophularia auriculata	Water Figwort	r	1
Senecio aquaticus	Marsh Ragwort	o	1
Solanum dulcamara	Bittersweet	r	1
Sparganium erectum	Branched Bur-reed	w&f-lf	1
Typha latifolia	Bulrush	f-lf	1
Veronica catenata	Pink Water-speedwell	lf	2
Veronica beccabunga	Brooklime	r	1

*¹ See Appendix 7.3 for details.

*² Identification from leaves alone, fruiting material is needed for confirmation.

APPENDIX 6. Notes on the national distribution of uncommon plant species recorded at Butts Pond

Information on plant distribution presented here is taken from Clapham, Tutin and Moore (1987), Croft, Preston and Forrest (1991) and Stace (1991).

Note: References to "Britain" are to mainland Britain and do not include Ireland.

Local aquatic species

***Callitriche obtusangula* (MYRTALES: Callitracheae). Blunt-fruited Water-starwort.**

Rather scattered throughout the British isles. Locally frequent in the south of England, but rare in the north (recorded from 222 10km squares in Britain since 1950): Found in a wide variety of habitats but most frequently from calcareous or eutrophic ponds, ditches, lakes and slow-flowing streams.

Groenlandia densa (NAJADALES: Potamogetonaceae). Opposite-leaved Pondweed.

Locally frequent in England scattered in wales and ireland, very rare and introduced in Scotland (recorded from 27110km squares in Britain since 1950. Perhaps declining because of eutrophication and a falling water table. generally occurs in shallow, usually calcareous water in ponds, ditches, streams, rivers and canals, but rarely in lakes and reserviors.

***Lemna gibba* (ARALES: Lemnaceae). Fat Duckweed.**

A species of duckweed which has "gibbous", swollen leaves. Locally abundant on ditches, ponds and canals, also occasionally at the edge of slow-flowing streams and rivers. Often abundant on the surface of eutrophic waters, sometimes to the exclusion of other species in sites polluted by agricultural run-off. Absent from the extreme south-west, but otherwise throughout England as far as north-east Yorkshire and south Lancashire; in the eastern half of Wales; almost absent from Scotland. Recorded from 354 10km squares in Britain since 1950.

***Lemna polyrrhiza* (ARALES: Lemnaceae). Greater Duckweed.**

Local on still waters in ditches, ponds, canals and sluggish rivers, where it is often found floating amongst other *Lemna* spp. Almost completely confined to the Midlands and the south in England (though absent from the south-west), the eastern half of Wales, and a handful of sites in Scotland; it is rather uncommon throughout most of its range. Recorded from 274 10km squares in Britain since 1950.

***Ranunculus trichophyllus* (RANUNCULALES: Ranunculaceae). Thread-leaved Water-crowfoot.**

Found in at least moderately nutrient-rich ponds, ditches and slow streams, usually in shallow water. Throughout Britain, but most frequent in south-east England; at present becoming very local in the west and north. Recorded from 587 10km squares in Britain since 1950.

***Zannichellia palustris* (NAJADALES: Zosteraceae). Horned Pondweed.**

Occurs in a number of distinct habitats: clear water in shallow streams over chalk and limestone, eutrophic ditches, ponds and lakes, and also brackish waters. Found throughout Britain, but much more frequent in England. Recorded from 590 10km squares in Britain since 1950.

APPENDIX 6. Notes on the national distribution of uncommon plant species recorded at Butts Pond

Local emergent species

***Bidens cernua* (ASTERALES: Compositae). Nodding Bur-marigold**

A locally common plant of ponds and streamsides, especially of places with standing water in winter but not during the growing season. Throughout Britain to Angus and Argyll.

***Butomus umbellatus* (ALISMATALES: Butomaceae). Flowering-rush.**

Found in ditches, ponds and canals; also on river margins. Rather local in England, rare in Wales, and not native in Scotland.

***Glyceria declinata* (POALES: Gramineae) Small sweet-grass.**

In swamps and muddy margins of ponds. Fairly widely distributed though less common in most localities than other sweet-grasses.

***Oenanthe fistulosa* (UMBELLALES: Umbelliferae). Tubular Water-dropwort.**

Occurs in shallow water and marshy places, mainly in the eastern half of England; very local in Scotland and Wales.

***Veronica catenata* (SOLANALES: Scrophulariaceae). Pink Water-speedwell.**

Ponds, wet meadows and wet muds in areas of little or no flowing water. Locally frequent in eastern, central and southern England, uncommon in the South-west, the north and in Wales, rare in Scotland.

Appendix 7. Species Rarity Indices (SRI's)

A7.1 Use of species rarity indices.

Species rarity indices provide an objective method of comparing the conservation value of the animal and plant communities of different sites and have been used to good effect in other studies (e.g. Foster, G.N. et al. (1992), Ball, S.G. (1990), Ball, S.G. (1992)).

SRI's have several advantages over other systems of conservation assessment:

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| 1. Objectivity. | The SRI method is one of a very small number of systems available for objectively comparing community value. |
| 2. Effort independence | Random variation of sampling will affect species-richness results, whereas an SRI, because it represents average rarity, is able to be largely independent of the actual numbers of plants or animals recorded. |
| 3. Site type | Comparisons of species-richness between sites can give misleading information on independence community value, as certain types of community, e.g. those of oligotrophic waters, will tend to be naturally less diverse than other types, e.g. those of eutrophic waters. |
| 4. Analytical simplicity | The SRI of a community is a single datum which makes it ideal for use in subsequent statistical analysis. |

Species Rarity Indices should be used with caution. When using them it is necessary to be aware of the following qualifications:

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| 1. Tourist species | Some specimens present in a sample from a site might be 'tourists', i.e. individuals which have recently arrived at a site but which would not breed there. In some cases the site might provide a valuable 'stopover' for a species, and this habit might be quite normal for that species. If this were the case, then it would be correct to consider the site as, in some way, supporting that species, and the species should be considered when evaluating the site. However, some records will be of 'strays' which have been blown far from their natural habitat. For example, Pond Action, during the course of the National Pond Survey, recorded the endangered Lesser Silver Water Beetle (<i>Hydrochara caraboides</i>) from a site in Cheshire. This was almost certainly a specimen which had been blown from the Somerset Levels, which were drying out at the time (Biggs et al. 1991). It would have been wrong to use this record as part of an SRI to estimate the conservation value of the macroinvertebrate community of that pond. Therefore, the inclusion of individual species, which have a large influence on the SRI, should be reviewed critically. |
| 2. Types of sampling | Though SRI's are largely independent of sampling effort, they are not independent of the type of sampling used. For example, a survey which was directed at recording water bugs would inevitably yield lower SRI's than would one directed at recording water beetles, the simple reason being that most water bugs are fairly widespread and hence do not score as highly as many of the water beetles. |
| 3. Species poor | SRI's compensate for differences in community type. However, the SRI's of species-poor communities will be affected considerably by single species, and due to sampling variability the SRI method is inherently prone to variation in these sites. |
| 4. Viable populations | SRI's take no account of abundance data, and so give no indication of the viability of the species which are being used to derive the index. |

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| 5. 'Writing off' sites | A low SRI should not be used to 'write off' a site, as this would assume that a complete record of species at that site had been obtained, which would be unlikely to be the case. |
| 6. Distribution | The SRI relies on having up accurate information on the national distribution of information species. The groups surveyed during the OPS were chosen partly for this reason. |
| 7. Distribution | Species inhabiting small, fragmented habitats, (e.g. ponds) with a relatively wide distribution are apparently less rare than species inhabiting large, unfragmented, habitats which have a less widespread distribution (e.g. Lizard heathland). The threats to the smaller, fragmented habitats, however, may well be greater than those to the larger, unfragmented, habitats. For the rarer plants and animals, this type of information may be taken into account when assessing status, but this is rarely the case for local and notable species. |

A7.2 Calculation of the Species Rarity Index

The SRI is calculated in the following way:

- i) All species present are given a numerical value depending on their national distribution pattern (see section (a) below).
- ii) The values of all the species present are added together to give a total rarity score.
- iii) The total rarity score is divided by the number of species present to give the Species Rarity Index.

(a) All species present are given a numerical value depending on their national distribution patterns
Common species are given the value of 1, local species the value of 2 and so on, culminating with the most endangered species (RDB 1) which are given a value of 64. See Appendix Table 7.3 (over page).

Statuses given to individual species are derived mainly from JNCC invertebrate species reviews and Red Data Books. Within this system, a level of discretion is required when interpreting the literature on species distribution. For example, The Atlantic Stream Crayfish (*Austropotamobius pallipes*) is, technically, a local species. However, the species is currently under threat due to a number of factors (see notes on the species in Appendix 3) and is, therefore, upgraded (for the purposes of calculating SRI) to Nationally Notable B.

(b) The values of all the species present are totalled to give a total rarity score
Were the communities being compared of the same type (e.g. communities of large fishponds) and individual sites of the same size (and, therefore, expected to support similar numbers of species), then it would be valid to use the total rarity score to assess the relative conservation value of the sites.

However, different types of site often differ in the number of species they support: temporary ponds, acidic ponds and gravel-pit lakes are all likely to have different types of macroinvertebrate community and, therefore, likely to support different numbers of species. To make comparisons, therefore, an index must be used which corrects for differences in species numbers.

(c) The total rarity score is divided by the number of species present to give the SRI
The SRI gives a good comparison between sites of any type. It should also be relatively independent of sampling effort. The SRI is, in effect, a measure of the 'average rarity' of the species recorded.

In sites with low numbers of species, the presence of one or two local or notable species can have a large effect on the SRI. For this reason, it is particularly important to be cautious in the interpretation of SRI's of small sites (particularly those with less than 16 species).

Appendix 7.3 Definition of terms used for plant and invertebrate species in this report and conservation scores for each category.

Description	Score	Plants	Invertebrates
Common	1	Recorded from >700 10x10km grid squares in Britain.	Generally regarded as common.
Local	2	Recorded from between 101 and 700 grid squares in Britain.	Generally regarded as local (see Appendix 3.5)
Nationally Scarce B	4	Nationally Scarce. Recorded from 31-100 grid squares in Britain.	Nationally Notable B. Recorded from 31-100 grid squares in Britain.
Nationally Scarce A	8	Nationally Scarce. Recorded from 16-30 grid squares in Britain.	Nationally Notable A. Recorded from 16-30 grid squares in Britain.
RDB 3	16	Red Data Book: Category 3 (rare), Perring and Farrell (1977).	Red Data Book: Category 3 (rare), Shirt (1987), Bratton (1991).
RDB 2	32	Red Data Book: Category 2 (vulnerable), Perring and Farrell (1977).	Red Data Book: Category 2 (vulnerable), Shirt (1987), Bratton (1991).
RDB 1	64	Red Data Book: Category 1 (endangered), Perring and Farrell (1977).	Red Data Book: Category 1 (endangered), Shirt (1987, Bratton (1991).

Notes:

Distribution information is derived from the following sources:

Plants:

Aquatic plants: Croft, Preston and Forrest (1991).

Emergent wetland plants: Palmer and Newbold (1983), Perring and Farrell (1983) Perring and Walters (1990).

Aquatic macroinvertebrates:

Ball (1986), Elliott and Tullett (1982), Bratton, (1990, 1991), Wallace (1991), Hyman and Parsons (1992), Kirby (1992), Shirt (1987), Kerney (1976), Foster (1981,1985, 1987), Elliott (1977), Elliott et al. (1988), Friday (1988), Goddard and Hogger (1986), Hammond (1983), Reynoldson (1988), Savage (1989).