# Ecological Survey of freshwaters at Alderney Recreation Ground, Poole, Dorset


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## Table of Contents

# 1. Introduction

This report describes the results of wetland plant and aquatic invertebrate surveys undertaken by Robert Aquilina at Alderney Recreation Ground, Poole, Dorset. The surveys were carried out on the pond, its two inflow streams and an area of wetland that has been developing for the last couple of years. The surrounding ditches were not included in this assessment because at the time of the surveys (September 2005) they were dry.

The current work was commissioned by the Borough of Poole (Leisure Services) in order to give information about the ecological value of the site, its potential as an area of wildlife conservation value and to help provide the basis for decisions about the future development and management of the freshwater environments. The recommendations given in this report should also feed into the management plans for the site as a whole.

# 2. Methods

The streams were surveyed on 4 September 2005 with the pond and wetland area being surveyed on the 9 September 2005. Wetland plants and aquatic macroinvertebrates were surveyed using standard techniques. A range of physico-chemical variables was also recorded for pond and streams and environmental data collected for a PSYM analysis on the pond (see Appendix 3.5 for an explanation of this technique). The wetland area was similarly assessed although there is no standard approach against which comparisons can be made as there is with the stream and pond.

## 2.1 Survey methods

The methods used for the wetland plant survey were based on the standard techniques developed for the National Pond Survey (NPS), described in detail in Pond Action (1998). The physical characteristics of the pond were recorded in the field, including factors such as the amount of shade and the pond surface area. Conductivity and pH were measured with field meters. Wetland plants[1] were surveyed by walking and wading the perimeter and open water areas less than 1 m deep noting the species present.

Aquatic invertebrates were collected using a standardised, timed method, using a hand net from the major habitats in the pond (stands of different wetland plants, distinctive substrates, tree roots etc.). This technique was also used to survey the streams where kick sampling was employed to disturb the streambed with the dislodged invertebrates being washed downstream into the net. The material collected was returned to the laboratory for sorting and identification using a binocular microscope. All major macroinvertebrate groups were recorded to species level, where life-history stage allowed, except for True Flies (Diptera), for which there is little information on species level identification and national distribution, and Worms (Oligochaeta). The invertebrate groups recorded were: Bivalvia (bivalves, excluding *Pisidium* sp.),

[1]The term ‘wetland plant species’ refers to species defined as wetland plants on the National Pond Survey field recording sheet list. Terrestrial plant species are not recorded.

Coleoptera (water beetles), Crustacea (slaters and shrimps), Ephemeroptera (mayflies), Gastropoda (snails), Hemiptera (water bugs), Hirudinea (leeches), Megaloptera (alderflies), Odonata (dragonflies and damselflies), Plecoptera (stoneflies), Trichoptera (caddisflies) and Tricladida (flatworms).

### 2.2 Conservation assessment

The conservation value of the pond was assessed on the basis of: (i) the total number of species recorded (species richness), and (ii) the number of uncommon species present (species rarity). A Species Rarity Index (SRI) was calculated to give a measure of average rarity (See Appendix 3).

A second approach was also adopted using the PSYM analysis, which is based on the families of aquatic invertebrates collected and scored using BMWP (Biological Monitoring Working Party) scores. These are industry standard and have the advantage of being used in the stream assessments as well. The scores reflect the sensitivity of the families to pollution. The higher the score the cleaner the site.

For wetland plants, comparisons were made with similar data gathered from other UK sites surveyed using the same methodology. The method used for collecting macroinvertebrate data in both the pond and streams was a standardised 3-minute timed sample. The data can therefore be interpreted in the context of other pond surveys for which data is available, but not for the streams as there is no equivalent database.

In the absence of standard survey techniques for wetlands, this area was surveyed by searching until no new plant or invertebrate species were noted.

## 3. Alderney Recreation Ground freshwater environments

### 3.1 Summary of physico-chemical characteristics

Alderney Recreation Ground Pond (SZ047939) is an oval pond with a small island, located in an urban area but immediately surrounded by grassland, woodland and further away, a heathland SSSI. The island is completely shaded by trees, but overall only 10% of the water was overhung. There are two inflowing streams that are referred to as the north and south streams (*Figure 1*), which join the pond separately at the western end. Both these streams run through deciduous woodland and appear to run all year round. There is an outflow at the southern end of the pond leading straight into a culverted section of stream, which then runs for some 0.5 km underground until reappearing alongside the heathland SSSI.

Alderney Recreation Ground Pond is c. 750 $m^2$ in area. The edges slope rapidly to about 1 metre water depth with a considerable layer of silt (average sediment depth recorded during this survey was 0.3 m), but it proved unnecessary to enter the pond further than a few metres in order to sample all the mesohabitats therefore the depth nearer the centre of the pond was not measured.

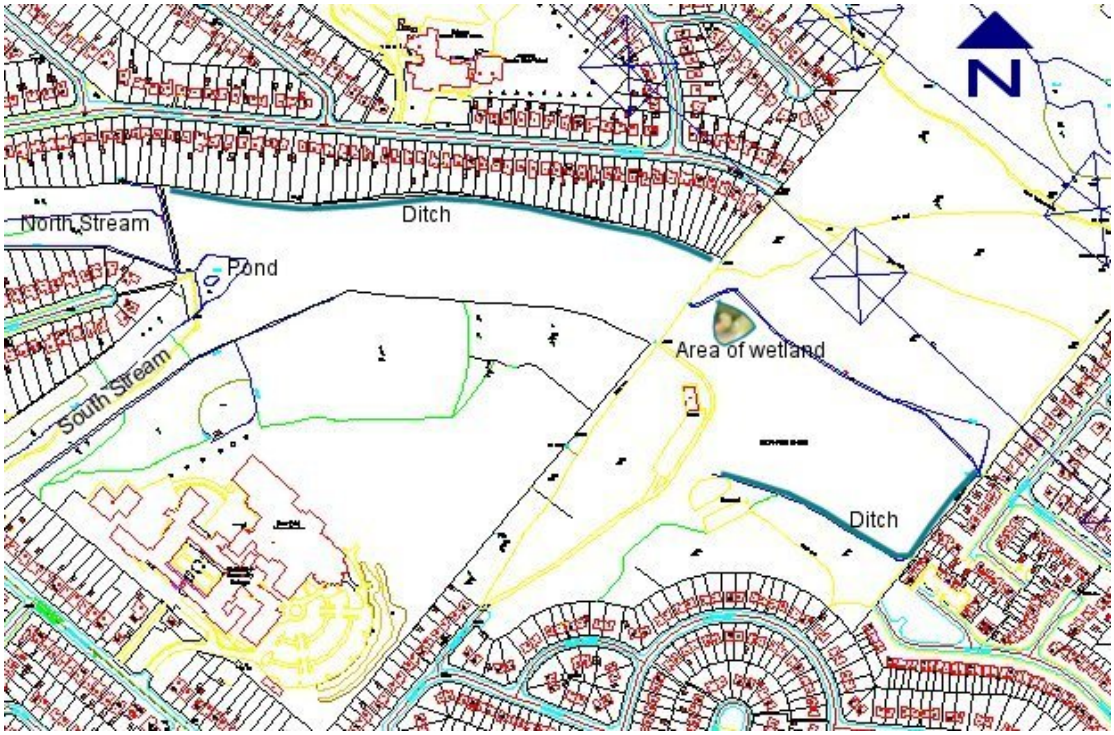


*Figure 1. Map of Alderney Recreation Ground*

The banks are all more or less vertical although of relatively small drop and the inflows and outflows are such that the water level appears relatively consistent, i.e. no drawdown zone.

The pH (7.3) showed that the pond was neutral and the conductivity (371 $\mu Sm^{-1}$) showed that it had moderate solute levels as would be expected from a stream-fed pond on sands and gravels. The water was reasonably clear showing no obvious signs of pollution, although a certain amount of urban litter is present.

The inflowing streams both have weirs a few metres upstream of entering the pond, which trap silt and provide some oxygenation of the water. They both run through the area of woodland to the west of the pond. The south stream (sampled at SZ04746 93887) gave a pH of 7.1 and conductivity of 213 $\mu Sm^{-1}$, indicating neutral water with no unusual levels of solutes. This stream was the larger of the two and was more open and exposed to light, as it runs alongside a path for some of its course. It had a number of features recognised as of value to wildlife such as earth cliffs, riffles and some woody debris.

The north stream was sampled at SZ04719 93957 and gave a pH of 6.9 and a conductivity of 266 $\mu Sm^{-1}$, indicating similar water chemistry to the south stream. This stream was more meandering in its course and more shaded by trees throughout its length. The catalogue of natural features of high wildlife value was greater than that of the south stream, consisting of earth cliffs, riffles, side bars, exposed gravel and sand, extensive woody debris and debris dams. These features are of great conservation value and should be retained.

The wetland area is a triangular area of approximately 1000m$^2$, situated 0.5 km to the south of the pond, by the heathland SSSI and a short distance from where the culverted stream reappears above ground. It appears to have developed naturally as a result of waterlogging of topsoil as the groundwater levels are some 1 – 1.5 metres below the surface. The centre (SZ05242 93854) has developed some open water, which gave a pH of 5.7 and a conductivity of 215 $\mu Sm^{-1}$. This was much more acid than the other areas sampled.

### 3.2 Wetland plant results

Alderney Recreation Ground Pond supported a moderate number of wetland plant species with a total of 18 species recorded during the current survey (Appendix 1). This total is lower than the average plant richness of high quality, unpolluted ponds protected from human impacts (mean number of wetland plant species in unpolluted ponds = 23). It is higher than most ponds in the wider countryside which, because of the widespread effects of pollution and other damaging impacts, support only 10 wetland plant species on average (see data in Appendix 3).

The pond had previously been dominated by emergent vegetation, mainly Bulrush, *Typha latifolia*, but a significant area was cleared last year and the resulting open water has allowed other emergent and submerged species to expand. Although Bulrush is still the dominant species it does provide a nesting environment for Moorhen, *Gallinula chloropus*. Water plantain, *Alsima plantago-aquatica*, has developed quite extensive stands but most other species are present in small amounts. They are Great Willowherb (*Epilobium hirsutum*), Meadowsweet (*Filipendula ulmaria*), Floating Sweet-grass (*Glyceria fluitans*), Yellow Iris (*Iris pseudacorus*), Sharp-flowered rush (*Juncus acutiflorus*), Soft rush (*Juncus effusus*), Greater Birdsfoot Trefoil (*Lotus pedunculatus*), Water Forget-me-not (*Myosotis scorpioides*), Water Pepper (*Persicaria hydropiper*), Greater Spearwort (*Ranunculus lingua*) and Branched Bur-reed (*Sparganium erectum*). These are all common species with the exception of the Greater Spearwort, which is local, although it is sometimes planted as an impressive native addition to a pond flora.

The pond's aquatic plant community (i.e. submerged and floating-leaved species) was average for undegraded ponds, with five species recorded during the survey (see Appendix 3). The dominant submerged species found were Nuttall's waterweed, *Elodea nuttallii*, and Parrot's feather, *Myriophyllum aquaticum*, both common, non-native species. In addition there were small patches of Common Water-starwort, *Callitriche stagnalis*, a water lily, *Nymphea* sp., probably introduced as a garden pond throw-out, and Duckweed, *Lemna minor*.

Overall, Alderney Recreation Ground Pond has a Moderate conservation value for wetland plants based on its species richness and rarity. There were no naturally occurring uncommon species recorded from the pond giving a Species Rarity Index (SRI) of 1.06 (see Appendix 3).

There is no equivalent approach for streams that can be used to assess their conservation status based solely on macrophytes, therefore, although the streams were surveyed for their plant species, the results can only be discussed qualitatively.

The north stream had no submerged or emergent vegetation growing in the streambed, probably due to the high level of shade from the trees and the erosive nature of the streambed. This is not a problem as the stream does have vegetated banks and is of interest from the macroinvertebrate point of view (see below).

The south stream contained five species of aquatic plants growing within the bed of the stream (see Appendix 1b). Of these, two are found in the pond (*Callitriche stagnalis* and *Elodea nuttallii*) and one (Round-leaved water crowfoot, *Ranunculus omiophyllus*) is local. The other two are Bog pondweed (*Potamogeton polygonifolius*), which was present in the wetland area, and Lesser spearwort (*Ranunculus flammula*). This stream also has extensive areas of overhanging grasses, sedges and broad-leaved herbs along the banks.

There is similarly no standard comparative method for assessing wetland areas, so the species found are also discussed qualitatively. The area has been unmown for the past couple of years and is beginning to develop typical wetland vegetation as a result. Considering the short length of time, the resulting list of species (see Appendix 1c) is impressive and demonstrates the potential for the site if allowed to develop. The species list includes species that are not found elsewhere:- Jointed rush (*Juncus articulatus*), Toad rush (*J. bufonius*), Hard rush (*J. inflexus*) and the Marsh horsetail (*Equisetum palustre*). The proximity of this site to the heathland SSSI is probably a factor in the development of this vegetation as the SSSI has wet heath amongst its components.

### 3.3 Macroinvertebrate results

Alderney Recreation Ground Pond supported a good invertebrate assemblage with 34 species recorded during the current survey (Appendix 2a). This total is similar to the average for unpolluted ponds in semi-natural areas (mean number of species per sample = 32), and richer than most ponds in the wider countryside (mean number of species per sample = 26, see data in Appendix 3).

The macroinvertebrate assemblage was not dominated by any one group with molluscs, water bugs and water beetles accounting for the top three groups recorded, as in often the case. All the other groups expected to be found in ponds, except Caddis flies, were represented, which is not always the case especially in degraded ponds. The majority of macroinvertebrate species were recorded from vegetation stands, although other important habitat included leaf litter, woody debris and tree roots.

No rare species were found although one of the water boatman (*Notonecta marmorea viridis*) is local.

The conservation value of Alderney Recreation Ground Pond for macroinvertebrates was High based on the number of species. The Species Rarity Index for the site was Moderate (SRI=1.03, see Appendix 3). Therefore the overall assessment of the conservation value for the pond for macroinvertebrates was High.

The PSYM analysis uses environmental data to predict the flora and fauna of a similar unimpacted pond and then compares this expected with the observed data to give an

index of biotic integrity. The results are 83% match with expectation, which places Alderney Recreation Ground pond in the High category for conservation value.

Streams cannot be directly compared with ponds because they are different environments and would be expected to hold a smaller set of species (Williams *et al*., 2003). Comparison is however valid between the two streams. It is apparent that the north stream has the greater number of groups (10 versus 8), greater number of species (21 versus 18), the higher BMWP score (71 versus 69) and higher ASPT score ( 4.18 versus 3.83). The north stream had one local species (*Gerris gibbifer*), although the south stream does have 2 dragonfly and damselfly families to the north streams one, probably because of the presence of vegetation. Although measurements did not reveal any significant differences between the water chemistry of the streams, there is a clear difference between the physical environments. The north stream is heavily shaded, erosive, and somewhat smaller than the south stream. The south stream is vegetated, more open to light, depositional in parts and probably more impacted. The evidence for this is two-fold in that expectation would be for it to have a greater diversity of macroinvertebrates because of the vegetation, and there appears to be an accumulation of sewage fungus close to the outfall at Herbert Avenue (essentially the source as the stream is derived from underground drainage pipes beyond this point). This is a matter of concern and should be investigated further.

The wetland area supported a number of macroinvertebrate species in the small patches of open water that have developed, especially between grass tussocks. Although the list is restricted, it does include a couple of local species (the water boatman, *Notonecta marmorea viridis* , and the water skater, *Gerris gibbifer*), probably derived from the heath close by.

### 3.4 Other wildlife

Surveys for Amphibia should be ideally carried out in the spring and were not specifically undertaken during this assessment (Sutherland, 1996). Palmate newt larvae (*Triturus helveticus)* were caught in the pond during invertebrate sampling and released again. Conversation with local people indicated a high number of newts were present on the site and a specific survey carried out at the appropriate time would be of benefit.

No bird surveys were carried out although Moorhen (*Gallinula chloropus*) were noted on the pond. The diversity of freshwater habitats, together with the proximity of woodland, grassland and heath would make the site potentially very rich for bird life.

## 4. Conservation assessment

The current evaluation indicates that Alderney Recreation Ground Pond has a Moderate conservation value for wetland plants and a High conservation value for macroinvertebrates (see Appendix 3). From a conservation perspective, the presence of non-native plants is a matter of concern although they are currently not posing a threat. The current management of the pond vegetation is appropriate and could be targeted to include reduction of the Parrots feather (*Myriophyllum aquaticum*) in the

future. The moderate diversity of wetland plants is probably due to the past dominance by Bulrush (*Typha latifolia*) and the lack of time for vegetation to develop since management intervention has occurred. It is anticipated that the current strategy is likely to allow greater plant diversity to develop.

The streams provide nicely contrasting environments for a different set of invertebrates to inhabit. The north stream in particular is rather good as a stream of its kind, with a large number of features that promote diversity along its short course. The south stream appears to be slightly impacted and the cause of this should be investigated. This will be a matter of concern if not resolved as it potentially could pollute the pond and have an impact further downstream.

The wetland is a good demonstration of nature left to its own devices, very quickly developing a habitat of interest and conservation value. It contributes to the overall diversity of features within the whole site.

# 5. Management recommendations

The recommendations for the site are based on two elements that need to be considered side by side. One is the management of existing features and the other is the development of the site as a whole as proposed by Poole Council. The plans for the development of the site consist of excavating the currently culverted outflow from the pond and reinstating the stream as an open feature with flood terraces and the construction of two new ponds at about the point that the existing culvert appears above ground. The first of these would be a balancing pond for floodwater and would develop a wildlife interest. The second would be a community pond stocked initially with fish for local youth anglers. Because of the presence of fish this is unlikely to develop as much of a conservation value as the balancing pond but is none-the-less a valuable addition to the site as a whole.

## 5.1 Management recommendations for the existing features

### *5.1.1 Alderney Recreation Ground pond*

The existing pond is being managed by selective vegetation clearance and silt removal. This is appropriate but should not be carried out too frequently to allow the reestablishment of vegetation and recovery of invertebrate populations. It should, if possible include the reduction of the non-native species, especially Parrots feather (*Myriophyllum aquaticum*), which is potentially invasive, but not currently a problem.

The pond would benefit from some reprofiling of the banks to create a shallow margin with a drawdown zone. The current banks do not provide the shallow edge environments that are so important to invertebrates and some plants. The area does not have to be extensive but would provide additional mesohabitat diversity.

### *5.1.2 Inflowing streams*

The streams themselves are not currently subject to management although the woodland through which they flow is being renovated through rhododendron

clearance. The north stream should be unmanaged as much as possible and any vegetation clearance should be minimal around the stream itself so as not to remove the current shade. The current diversity of features that it offers is excellent and should be a model for the proposed stream.

The water quality of the south stream should be investigated and resolved if possible. The consequences for all the freshwater habitats downstream are potential impact to their water quality. It does offer vegetation to the stream invertebrates and thus another different habitat to that elsewhere on the site.

### *5.1.3 Wetland*

The existing wetland is unfortunately positioned where the new fishing pond is planned, therefore is likely to be destroyed. Consideration should be given to incorporating it into the design of the fishing pond, perhaps as a wetland edge along one side. Alternatively a new wetland area could be created if a suitable area of waterlogged ground can be found from those that are already present on the site. The development is likely to be rapid and not require much more than a cessation of mowing and perhaps slight clearance of topsoil to create a shallow scrape, as demonstrated by the existing wetland. These conditions should give rise to a wetland community of slightly different character to the streams and ponds and therefore will add to the diversity of the site. The existing wetland is already very attractive to dragonflies and the Libellulids, in particular, like newly created shallow muddy scrapes. Proximity to the heath is a benefit as a potential source of immigrant species.

### *5.1.4 Ditches and surrounding environments*

Whilst it was not possible to sample the ditches at the time of the survey, it is anticipated that they would contain no species that were not found elsewhere on the site. However their value should not be underestimated as they provide a refuge and a corridor for newts and other wildlife to travel around the site. Newts, in particular, require woodland or scrub in which they overwinter and the ditches provide cover and access to such environments. It is therefore recommended that these ditches be retained in the new design. It is not necessary to connect them to other freshwater environments on the site.

The surrounding environments are potentially rich sources of wildlife and add diversity to the site as a whole. The presence of unmown grassland and woodland adjacent to the pond are of value and should be managed as at present. There is a small amount of the alien invasive species, Japanese knotweed (*Fallopia japonica*) that should be treated as soon as possible.

## 5.2 Management recommendations for the planned features

### *5.2.1 New ponds*

The proposal for the creation of two new ponds will add to the conservation value of the site as a whole as well as of being of benefit to the local community. The balancing pond will become a wildlife pond through natural colonisation, a

process that should happen quickly as there is a vast potential reserve of colonist species in the existing site and the surrounding area. The fishing pond will also be of wildlife value although its potential is not as great as that for the balancing pond due to the presence of fish, which predate most macroinvertebrates. However, with good design, both the needs of the fish and the anglers, and wildlife can be balanced. This design requires features that act as refuges for invertebrates such as shallows and vegetation beds, especially submerged vegetation. These features also act as refuges for fish fry, which is important for the long-term viability of the fish population.

Choice of fish stock is an important factor as inappropriate species such as carp and tench, which are bottom feeders, stir up the sediment, causing the water to become turbid and thereby reducing light to plants. This leads to their elimination and thereby to the elimination of invertebrate food. Fish should be limited to surface feeding (e.g. Roach, *Rutilius* sp.) or midwater feeding fish (e.g. Perch, *Perca fluviatilis*).

As mentioned above, there would be benefit from incorporating a wetland area as a pond edge or adjacent area as this would increase diversity of habitat and thereby biodiversity.

### *5.2.2 New stream*

The proposed excavation of the culverted section of the stream is an inspired piece of landscape design and will have immense impact on the site. With its line of site running the course of the stream from the existing pond to the new ponds and the heathland on the horizon, framed by trees either side, the site should be transformed from a monotonous area of mown grass to an attractive landscape of great variety.

The inclusion of terraces either side of the stream will enable some flood control to be introduced and will have the benefit of providing a number of layers of differing hydrology for different vegetation types to develop. The stream itself should be encouraged to develop meanders and to incorporate as many features as possible such as riffles, gravel bars and pools, which are important in creating diversity.

The stream is also likely to colonise quickly through upstream movement in the existing stream, downstream washout from the pond and from aerial colonisation from nearby sites such as the Bourne stream running through the SSSI, which is a site of high conservation value and diversity.

### *5.2.3 Surrounding environments*

The proposed landscaping includes planting trees on one side of the stream as a new copse. This is important as a potential environment for newts, as winter quarters, as well as for birds.

Another aspect is the creation of a mound of spoil from the excavation of the stream, which will enable the line of site to be extended all along the stream.

This presents an opportunity to extend the current rough grassland, which will be of benefit to terrestrial invertebrates such as butterflies.

There is an opportunity to enhance people's understanding of the site and its ecology by providing focussed environmental information about the value of the different freshwater environments, the dangers of introduction of alien species (both plant and animal) and the value of this site in terms of its diversity. These can be achieved through the use of notice boards, community newsletters, and the creation of a friends group of volunteers. The involvement of local youth through the fishing pond and by tapping the interest there is in newts, will hopefully encourage a wider understanding and appreciation of wildlife and conservation.

## 6. References

Pond Action (1998) *The National Pond Survey (NPS) methods*. The Ponds Conservation Trust, Oxford.

Pond Action (2002) *A guide to monitoring the ecological quality of ponds and canals using PSYM*. Pond Conservation, Oxford

Sutherland (1996) *Ecological Census Techniques.* Cambridge University Press, Cambridge.

Williams, P., Whitfield, M., Biggs, J., Bray, S., Fox, G., Nicolet, P., Sear, D. (2003) *Comparative biodiversity of rivers, streams, ditches and ponds in an agricultural landscape in Southern England.* Biological Conservation 115, 329-341.

# 7. Appendix 1a. Wetland plant species recorded at Alderney Recreation Ground Pond

| English name | Latin binomial | National status |
|---|---|---|
| **Submerged species** | | |
| Common Water-starwort | *Callitriche stagnalis* | Common |
| Nuttall's waterweed | *Elodea nuttallii* | Common |
| Parrot's feather | *Myriophyllum aquaticum* | Common (invasive alien) |
| **Floating-leaved species** | | |
| Common duckweed | *Lemna minor* | Common |
| Water lily | *Nymphea sp.* | Common (introduced) |
| **Emergent species** | | |
| Water plantain | *Alisma plantago-aquatica* | Common |
| Great Willowherb | *Epilobium hirsutum* | Common |
| Meadowsweet | *Filipendula ulmaria* | Common |
| Floating Sweet-grass | *Glyceria fluitans* | Common |
| Yellow Iris | *Iris pseudacorus* | Common |
| Sharp-flowered rush | *Juncus acutiflorus* | Common |
| Soft rush | *Juncus effusus* | Common |
| Greater birdsfoot trefoil | *Lotus pedunculatus* | Common |
| Water foget-me-not | *Myosotis scorpioides* | Common |
| Water pepper | *Persicaria hydropiper* | Common |
| Greater spearwort | *Ranunculus lingua* | Local |
| Branched bur-reed | *Sparganium erectum* | Common |
| Bulrush | *Typha latifolia* | Common |
| **Submerged plant species** | **3** | |
| **Floating-leaved plant species** | **2** | |
| **Emergent plant species** | **13** | |
| **Total plant species** | **18** | |

# 8. Appendix 1b. Wetland plant species recorded in the Alderney Recreation Ground south stream

| English name | Latin binomial | National status |
|---|---|---|
| Common Water-starwort | *Callitriche stagnalis* | Common |
| Nuttall's waterweed | *Elodea nuttallii* | Common |
| Bog Pondweed | *Potamogeton polygonifolius* | Common |
| Lesser spearwort | *Ranunculus flammula* | Common |
| Round-leaved water crowfoot | *Ranunculus omiophyllus* | Local |
| **Total plant species** | **5** | |

# 9. Appendix 1c. Wetland plant species recorded at Alderney Recreation Ground wetland area

| English name | Latin binomial | National status |
|---|---|---|
| **Floating-leaved species** | | |
| Common duckweed | *Lemna minor* | Common |
| Bog Pondweed | *Potamogeton polygonifolius* | Common |
| **Emergent species** | | |
| Creeping bent | *Agrostis stolonifera* | Common |
| Tufted hair-grass | *Deschampsia caespitosa* | Common |
| Great Willowherb | *Epilobium hirsutum* | Common |
| Marsh horsetail | *Equisetum palustre* | Common |
| Jointed rush | *Juncus articulatus* | Common |
| Toad rush | *Juncus bufonius* | Common |
| Soft rush | *Juncus effusus* | Common |
| Hard rush | *Juncus inflexus* | Common |
| Branched bur-reed | *Sparganium erectum* | Common |
| Bulrush | *Typha latifolia* | Common |
| **Submerged plant species** | **0** | |
| **Floating-leaved plant species** | **2** | |
| **Emergent plant species** | **10** | |
| **Total plant species** | **12** | |

# 10. Appendix 2a. Macroinvertebrate species recorded at Alderney Recreation Ground Pond

| English name | Latin binomial | Family | BMWP score |
|---|---|---|---|
| **Flatworms** | | | |
| A flatworm | *Dugesia polychroa* | Planariidae | 5 |
| **Leeches** | | | |
| none | *Erpobdella octoculata* | Erpobdellidae | 3 |
| **Snails** | | | |
| none | *Bithynia tentaculata* | Hydrobiidae | 3 |
| Jenkins spire snail | *Potamopyrgus antipodarum* | Hydrobiidae | |
| Marsh snail | *Lymnaea palustris* | Lymnaeidae | 3 |
| Wandering snail | *Lymnaea peregra* | Lymnaeidae | |
| Great ramshorn | *Planorbarius corneus* | Planorbidae | 3 |
| Keeled ramshorn | *Planorbis carinatus* | Planorbidae | |
| White ramshorn | *Gyraulus albus* | Planorbidae | |
| Bladder snail | *Physa sp.* | Physidae | 3 |
| Lake orb mussel | *Musculium lacustre* | Sphaeriidae | 3 |
| Pea mussel | *Pisidium sp.* | Sphaeriidae | |
| **Shrimps and slaters** | | | |
| A water slater | *Asellus aquaticus* | Asellidae | 3 |
| A freshwater shrimp | *Crangonyx pseudogracilis* | Gammaridae | 6 |
| **Water bugs** | | | |
| A water measurer | *Hydrometra stagnorum* | Hydrometridae | 5 |
| A water skater | *Gerris lacustris* | Gerridae | 5 |
| Water stick insect | *Ranatra linearis* | Nepidae | 5 |
| A greater water boatman | *Notonecta glauca* | Notonectidae | 5 |
| A greater water boatman | *Notonecta maculata* | Notonectidae | |
| A greater water boatman | *Notonecta marmorea viridis* | Notonectidae | |
| A lesser water boatman | *Corixa punctata* | Corixidae | 5 |
| **Mayflies** | | | |
| Mayfly (Pond olive) | *Cloeon dipterum* | *Baetidae* | 4 |
| **Dragonflies and damselflies** | | | |
| Emperor dragonfly | *Anax imperator* | Aeshnidae | 8 |
| Broad-bodied chaser | *Libellula depressa* | Libellulidae | 8 |
| Large red damselfly | *Pyrrhosoma nymphula* | Coenagriidae | 6 |
| **Water beetles** | | | |
| A diving beetle | *Agabus bipustulatus* | Dytiscidae | 5 |
| A diving beetle | *Hydroporus memnonius* | Dytiscidae | |
| A scavenger beetle | *Anacaena limbata* | Hydrophilidae | 5 |
| A scavenger beetle | *Anacaena globulus* | Hydrophilidae | |
| A scavenger beetle | *Laccobius bipunctatus* | Hydrophilidae | |

| | | |
|---|---|---|
| **Flies and others** | | |
| Non-biting midges | Chironomidae | 2 |
| Crane flies | Tipulidae | 5 |
| Hover flies | Syrphidae | 0 |
| Moth flies | Psychodidae | 0 |
| Worms | Oligochaeta | 1 |
| **Total number of macroinvertebrate species** | | **34** |
| **Total number of scoring taxa** | | **23** |
| **Total BMWP score** | | **101** |
| **Average score per taxon** | | **4.39** |
| **Number of Odonata and Megaloptera families** | | **3** |
| **Number of Coleoptera families** | | **2** |

# 11. Appendix 2b. Macroinvertebrate species recorded at Alderney Recreation Ground north stream

| English name | Latin binomial | Family | BMWP score |
|---|---|---|---|
| **Leeches** | | | |
| none | *Helobdella stagnalis* | Glossiphoniidae | 3 |
| **Snails** | | | |
| Jenkins spire snail | *Potamopyrgus antipodarum* | Hydrobiidae | 3 |
| Dwarf pond snail | *Lymnaea truncatula* | Lymnaeidae | 3 |
| Great ramshorn | *Planorbarius corneus* | Planorbidae | 3 |
| Bladder snail | *Physa sp.* | Physidae | 3 |
| Pea mussel | *Pisidium sp.* | Sphaeriidae | 3 |
| **Shrimps and slaters** | | | |
| A water slater | *Asellus aquaticus* | Asellidae | 3 |
| A freshwater shrimp | *Crangonyx pseudogracilis* | Gammaridae | 6 |
| **Water bugs** | | | |
| Water cricket | *Velia caprai* | Velidae | 0 |
| A water skater | *Gerris gibbifer* | Gerridae | 5 |
| **Caddisflies** | | | |
| none | *Micropterna lateralis* | Limnephilidae | 7 |
| **Stoneflies** | | | |
| Stonefly | *Nemurella picteti* | Nemouridae | 7 |
| Stonefly | *Nemoura erratica* | Nemouridae | |
| **Mayflies** | | | |
| Mayfly (Pond olive) | *Cloeon dipterum* | *Baetidae* | 4 |
| **Dragonflies and damselflies** | | | |
| Golden-ringed dragonfly | *Cordulegaster boltonii* | Cordulegasteridae | 8 |
| **Water beetles** | | | |
| A scavenger beetle | *Anacaena globulus* | Hydrophilidae | 5 |
| **Flies and others** | | | |
| Non-biting midges | | Chironomidae | 2 |
| Mosquitoes | | Culicidae | 0 |
| Meniscus midges | | Dixidae | 0 |
| Black flies | *Simulium sp.* | Simuliidae | 5 |
| Worms | | Oligochaeta | 1 |
| **Total number of macroinvertebrate species** | | | **21** |
| **Total number of scoring taxa** | | | **17** |
| **Total BMWP score** | | | **71** |
| **Average score per taxon** | | | **4.18** |
| **Number of Odonata and Megaloptera families** | | | **1** |
| **Number of Coleoptera families** | | | **1** |

# 12. Appendix 2c. Macroinvertebrate species recorded at Alderney Recreation Ground south stream

| English name | Latin binomial | Family | BMWP score |
|---|---|---|---|
| **Leeches** | | | |
| none | *Erpobdella octoculata* | Erpobdellidae | 3 |
| none | *Glossiphonia heteroclita* | Glossiphoniidae | 3 |
| **Snails** | | | |
| Jenkins spire snail | *Potamopyrgus antipodarum* | Hydrobiidae | 3 |
| Wandering snail | *Lymnaea peregra* | Lymnaeidae | 3 |
| Great ramshorn | *Planorbarius corneus* | Planorbidae | 3 |
| Bladder snail | *Physa sp.* | Physidae | 3 |
| Pea mussel | *Pisidium sp.* | Sphaeriidae | 3 |
| **Shrimps and slaters** | | | |
| A water slater | *Asellus aquaticus* | Asellidae | 3 |
| A freshwater shrimp | *Crangonyx pseudogracilis* | Gammaridae | 6 |
| **Caddisflies** | | | |
| none | *Lype reducta* | Psychomyiidae | 8 |
| **Mayflies** | | | |
| Mayfly (large dark olive) | *Baetis rhodani* | *Baetidae* | 4 |
| **Dragonflies and damselflies** | | | |
| Golden-ringed dragonfly | *Cordulegaster boltonii* | Cordulegasteridae | 8 |
| Large red damselfly | *Pyrrhosoma nymphula* | Coenagrionidae | 6 |
| **Water beetles** | | | |
| A scavenger beetle | *Anacaena globulus* | Hydrophilidae | 5 |
| **Flies and others** | | | |
| Non-biting midges | | Chironomidae | 2 |
| Mosquitoes | | Culicidae | 0 |
| Black flies | *Simulium sp.* | Simuliidae | 5 |
| Worms | | Oligochaeta | 1 |
| **Total number of macroinvertebrate species** | | | **18** |
| **Total number of scoring taxa** | | | **18** |
| **Total BMWP score** | | | **69** |
| **Average score per taxon** | | | **3.83** |
| **Number of Odonata and Megaloptera families** | | | **2** |
| **Number of Coleoptera families** | | | **1** |

# 13. Appendix 2d. Macroinvertebrate species recorded at Alderney Recreation Ground wetland area

| English name | Latin binomial | Family | |
|---|---|---|---|
| **Flatworms** | | | |
| A flatworm | *Dugesia polychroa* | Planariidae | |
| **Shrimps and slaters** | | | |
| A water slater | *Asellus aquaticus* | Asellidae | |
| **Water bugs** | | | |
| A water skater | *Gerris gibbifer* | Gerridae | |
| Water scorpion | *Nepa cinerea* | Nepidae | |
| A greater water boatman | *Notonecta maculata* | Notonectidae | |
| A greater water boatman | *Notonecta marmorea viridis* | Notonectidae | |
| **Dragonflies and damselflies** | | | |
| Chaser | *Libellula sp.* | Libellulidae | |
| **Water beetles** | | | |
| A scavenger beetle | *Laccobius bipunctatus* | Hydrophilidae | |
| **Flies and others** | | | |
| Non-biting midges | | Chironomidae | |
| Biting midges | | Ceratopogonidae | |
| Mosquitoes | | Culicidae | |
| Moth flies | | Psychodidae | |
| Crane flies | | Tipulidae | |
| **Total number of macroinvertebrate species** | | | **13** |

# 14. Appendix 3. Methods for assessing conservation value

The first four sections of this appendix are taken from *The National Pond Survey (NPS) methods*. Pond Action (1998). The Ponds Conservation Trust, Oxford.

**1. Assessment of conservation value**

The conservation value of plant and invertebrate communities can be assessed on the basis of:

- species richness (the number of plant and invertebrate species recorded from the site).
- the presence of uncommon species, which can also be measured as Rarity Scores and Indices.

Species richness and rarity totals are usually recorded separately for plants and invertebrates.

**2. Method for assessing species rarity**

Species rarity can be quantified for a site by allocating a numerical rarity score to each plant and invertebrate species. The scores used for plants and invertebrates and their definition is given in the table below.

**Table 1. Species rarity terms and scores**

| Status | Score | Status |
|---|---|---|
| Common | 1 | Species generally regarded as common. |
| Local | 2 | Species not falling into any of the categories 'Rare' (i.e. RDB) or 'Scarce', but usually either: (a) confined to certain limited geographical areas within which, however, they may be present in large numbers; (b) widespread in distribution, but present only in small numbers where they occur; or (c) restricted to a specialised habitat of which, however, the species may be a common component. |
| Nationally scarce | 4 | Recorded from 16-100 10x10 km grid squares in mainland Britain. |
| RDB3 | 8 | Red Data Book: Category 3 (rare). |
| RDB2 | 16 | Red Data Book: Category 2 (vulnerable). |
| RDB1 | 32 | Red Data Book: Category 1 (endangered). |

***2.1 Calculation of the Species Rarity Index***

The Species Rarity Index (SRI) is the average rarity value of the species at a site. It is calculated in the following way:

1. All species present are given a numerical value depending on their national rarity status in Table 1 above.
2. The values of all the species present are added together (to give a total rarity score).
3. The total rarity score is divided by the number of species present at the site to give the SRI.

## 3. Method for assessing pond conservation value

The conservation value of plant and invertebrate assemblages can be assessed using Table 2 (plants) and Table 3 (invertebrates) below. These simply allow ponds to be placed in one of four conservation value categories (Very High, High, Moderate and Low). When assessing conservation value the pond is placed into the *highest* conservation category it can go into using *any* of the measures.

**Table 2. Wetland plants: provisional categories for assessing the conservation value of ponds**

| | |
|---|---|
| Low | Few wetland plants (less than or equal to 8 species) and no local species (i.e. SRI = 1.00). |
| Moderate | Below average number of wetland plant species (9-22 species) or SRI of 1.01-1.19. |
| High | Above average number of wetland plant species (more than or equal to 23 species) or a SRI of 1.20-1.49. No Nationally Scarce or Red Data Book (RDB). |
| Very High | Supports one or more Nationally Scarce or RDB species or a SRI of 1.50 or more, or an exceptionally rich plant assemblage (more than or equal to 40 species). |

**Table 3. Aquatic macroinvertebrates: provisional categories for assessing conservation value of permanent and semi-permanent lowland ponds (single season 3 minute sample)**

| | |
|---|---|
| Low | Few invertebrate species (0-10 species) and no local species (i.e. SRI = 1.00). |
| Moderate | Below average number of invertebrate species (11-32 species) or a SRI of 1.01-1.19. |
| High | Above average number of invertebrate species (33-49 species) or a SRI of 1.20-1.49. No Nationally Scarce or Red Data Book (RDB). |
| Very High | Supports one or more Nationally Scarce or RDB species or a SRI of 1.50 or more, and/or an exceptionally rich invertebrate assemblage (more than or equal to 50 species). |

## 4. Comparison with other national survey data

The following information gives a range of data about the conservation value of *other* ponds in Britain. This information indicates the *typical* species richness of ponds in Britain. National Pond Survey data give results from ponds located in semi-natural areas, and suggest the sort of species richness that should be expected from ponds if they have not been damaged by pollution and other forms of impairment. Data from the Realising our Potential Award (ROPA) and Department of the Environment, Transport and the Regions (DETR) surveys come from ponds located in the wider countryside: many of which have been damaged and degraded by human activities. All data were collected using standard National Pond Survey methods.

**Table 4. Number of plant species recorded from UK ponds**

| | *Number of species of:* | *Marginal plants* | *Aquatic plants*[1] | ***Total plants*** |
|---|---|---|---|---|
| **National Pond Survey** (all ponds were | *Average* | 18 | 5 | **23** |
| high quality, i.e. in semi-natural areas) | *Range* | (1-42) | (0-14) | (1-46) |
| **Wider countryside ponds** | *Average* | 8 | 2 | **10** |
| (DETR Lowland Pond Survey) | *Range* | (0-30) | (0-10) | (0-35) |
| **Wider countryside ponds** (ROPA) | *Average* | 11 | 3 | **14** |

[1] Aquatic plants are both submerged and floating-leaved species.

**Table 5. Number of aquatic macroinvertebrate species recorded from other UK ponds**

| | | *Number of invertebrate species** |
|---|---|---|
| **National Pond Survey** (All ponds were high | *Average* | 32 |
| quality i.e. located in semi-natural areas). | *Range* | (6-98) |
| **Wider countryside ponds** (ROPA Survey) | *Average* | 26 |
| | *Range* | (2-64) |

*All results are from a single season 3-minute hand-net sample.

## 5. PSYM methodology

An alternative but complimentary method of assessing the conservation value of a pond is to apply the PSYM (Predictive SYstem for Multimetrics) developed by Pond Action (now Pond Conservation). The model predicts the species richness for both plant and macroinvertebrate species based on environmental parameters and then assesses the degree of compliance against the observed numbers. An index is then calculated which allows a description of the conservation value of the pond to be derived.

The evaluation of macroinvertebrate species is carried out to family level only, which makes it a more appropriate tool for comparing with other freshwater environments on the site.

## 6. Methodology for assessing streams

The evaluation of the conservation value of streams is similar to that for ponds but uses macroinvertebrates only (plants are not used in the assessment). The level to which identification is made is typically higher to family level only. The BMWP (Biological Monitoring Working party) scores are then used to generate an index for the site. These scores reflect the sensitivity of the families of macroinvertebrates to oxygen depletion and thus to either organic (BOD) or chemical pollution (COD) that reduces the oxygen levels in the environment.

The BMWP score and its associated calculation of Average Score per Taxa (ASPT) can then be used to assign a quality category to the stream based on a scale from 0 – 100 where scores less than 10 indicate heavily polluted (poor) environments and scores over 100 indicate unpolluted (very good) environments. Ideally these scores should be related to a predictive system similar to PSYM for ponds or RIVPACS for rivers where the score is expressed as a fraction of the predicted for a pristine stream with that set of environmental parameters. Unfortunately no system exits for such small streams as yet.

## 7. Methodology for assessing the wetland area

There is no formal methodology for assessing the quality of wetlands in a similar manner to that for streams or ponds. Therefore the assessment is based on a qualitative sample of plant and macroinvertebrate species and is therefore more indicative than the quantitative methods used for the other freshwater environments at Alderney Recreation Ground.