Ecological Survey of a pond at XXXXXX, Fontmell Magna

Report prepared by Robert Aquilina

November 2009

Habitat surveys Environmental Quality Assessment Species identification SUDS and freshwater ecology www.aquilina-environmental.co.uk	Robert Aquilina MSc MIEEM 69 Richmond Park Avenue Bournemouth BH8 9DN 01202 302065 07879 201677 robert.aquilina@btopenworld.com

Robert Aquilina MSc MIEEM is an independent consulting ecologist specialising in freshwater ecology. He is a Full member of the Institute of Ecology and Environmental Management and abides by their Code of Professional Conduct. For further details see

www.ieem.net
www.aquilina-environmental.co.uk

Table of contents

Summary

An ecological survey of the pond at XXXXXX, Fontmell Magna was carried out. The purpose was to determine its conservation status and make management recommendations for the control of blanket weed.

The pond was found to be of high conservation value with a nationally scarce species of water beetle, *Haliplus laminatus*, being found. The macroinvertebrate species richness was also high. Reasons for the presence of blanket weed are explored and recommendations for control suggested.

Introduction

The pond at XXXXXX was created two years ago and is fed by a piped water supply from a spring emerging further uphill between chalk and greensand layers. The water was previously used as a private supply to the house but was discontinued some years ago as a result of higher than desirable nitrate levels for drinking water.

In common with many new ponds, algae (in this case blanket weed – *Spirogyra*) has developed and dominates the pond making it unsightly.

The site was visited by Robert Aquilina on Wednesday 18th November 2009. The weather conditions were windy but otherwise suitable. The purpose of the visit was to assess the pond for its conservation value and to make management recommendations for the control of blanket weed. Basic environmental parameters were measured in the field and plants and macroinvertebrates were surveyed. Such a single season survey is best carried out in the summer months to optimise species counts, however spring or autumn visits are acceptable. Autumn visits may reflect slightly lower overall counts as the early life history stages of many invertebrates make identification to species level more difficult or not possible. Industry standard sampling methods were used to survey the pond as described below. Conservation assessment was achieved by comparison with comparable published data and through analysis with the PSYM model.

Methods

Environmental parameters were measured in the field using a Hanna HI98129 Combo meter for pH, conductivity and temperature. Physical characteristics of the pond were recorded in the field, including factors such as inflows and the amount of shade, whilst the pond surface area was estimated by pacing.

Wetland plants were surveyed using the National Pond Survey standard technique described in detail in Pond Action (1998). Wetland plants (species defined as wetland plants on the National Pond Survey field recording sheet list - terrestrial plant species are not recorded) were surveyed by walking and wading the perimeter and open water areas less than 1 metre deep noting the species present.

Aquatic macroinvertebrates were collected using a standardised, timed (three minute) method (Environment Agency, 1997), using a standard size FBA pond net from the major habitats in the waterbody (stands of different wetland plants, distinctive substrates, tree roots etc.). All the different habitats present were allocated a proportion of the overall time and different areas of the same mesohabitat were subsampled to ensure that as great a range as possible was sampled. The three minutes refers only to netting time and does not include travel between sample locations or processing the sample in any way (eg gently washing silt out of the net).

Further material was collected by hand up to a limit of one minute per site (searching the object itself, not searching for appropriate objects). So stones were picked up and

searched for attached organisms, and surface waters scanned for Whirligig beetles and Pond skaters which were then captured with 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 are few published keys to species level identification and little information on national distribution. The invertebrate groups recorded were: Tricladida (flatworms), Gastropoda (snails and bivalves), Crustacea (slaters and shrimps), Hirudinea (leeches), Megaloptera (alderflies), Plecoptera (stoneflies), Ephemeroptera (mayflies), Odonata (dragonflies and damselflies), Hemiptera (water bugs), Coleoptera (water beetles) and Trichoptera (caddisflies).

Amphibians were noted if they were seen during the macroinvertebrate netting. Given the geographical location, it is likely that Great Crested Newts (*Triturus cristatus*) are present in the area. A full amphibian survey would have required a range of different techniques (bottle trapping, torching, egg-searching and netting) and would have taken both considerably longer and require more visits. However a spring visit either to search for eggs or a night visit to torch for adults should be sufficient to determine the species of newts present.

Results

Environmental parameters

The following table provides a summary of the environmental parameters that were measured on the day of the survey.

Location	GR of pond	pH	Conductivity (µS/cm)
XXXXXX pond	XXXXXX	7.9	645

Table 1. Environmental parameters

These environmental parameters are merely indicative of the overall conditions and status of the water body at the time of sampling. The water is alkaline as would be expected from groundwater emerging from chalk. The conductivity shows a reasonably high level of ions present but does not identify the constituents. It is reasonable to suppose that a good proportion is associated with carbonates and bicarbonates from the chalk, however some nitrates are present as determined by historical water testing on the private household supply (now used to feed the pond).

Some quantification of the water quality would normally be determined through alkalinity and nitrate testing. However, it is clear that the water supply to the pond is base-rich and has some nutrient enhancement. This has clearly supported the growth of blanket weed – a filamentous algae that requires both these factors.

Plants

The list of species found is presented below.

Common name	Latin binomial	Rarity score	Trophic ranking score
Emergent plants			
Fools water cress	*Apium nodiflorum*	1	10
Lesser water parsnip	*Berula erecta*	2	10
Pendulous sedge	*Carex pendula*	1	
Floating sweet-grass	*Glyceria fluitans*	1	
Yellow flag	*Iris pseudacorus*	1	
Soft rush	*Juncus effusus*	1	
Hard rush	*Juncus inflexus*	1	
Purple loosestrife	*Lythrum salicaria*	1	
Common reed	*Phragmites australis*	1	7.3
Reedmace	*Typha latifolia*	1	8.5
Brooklime	*Veronica becca-bunga*	1	10
Floating-leaved plants			
Duckweed	*Lemna minor*	1	9
White water-lily	*Nympaea alba*	1	

Table 2 Plant species recorded

The results are discussed in terms of their overall richness and the rarity and trophic status of species found. An attempt to place the conservation value of the pond in context is made by comparing richness and rarity with published data and through the PSYM model.

Site	Species richness	Uncommon species	Introduced species	Trophic score
XXXXXX pond	11	1 (*Berula erecta*)	1 (*Nymphaea sp*)	9.13

Table 3. Summary of plant survey statistics

The pond has a moderate number of plants but considering its age, this is not surprising. More would be expected to arrive and establish over time. A number have been introduced. It is suggested that, because of these factors, not too much emphasis be placed on these scores.

The trophic score is derived for those plant species that are known to exhibit a preference for nutrient status; it is calculated as an average for those species only. The result is slightly greater than predicted by the PSYM model (*q.v.*) which suggests some nutrient enrichment but this is indicative only as some of these species have been introduced intentionally.

The overall plant diversity indicates a moderate conservation value based on the table below.

Wetland plants: 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 4. Assessing the conservation value of ponds

Macroinvertebrate species richness and diversity

A full list of species recorded is presented in Appendix 1. Overall measures of species richness and diversity are summarised in the following table :-

Site	**Total species**	**BMWP score**	**# taxa**	**ASPT**	**# OM taxa**	**# coleoptera taxa**
XXXXXX pond	34	101	23	4.39	3	3

Table 5. Macroinvertebrate species richness assessments

Species richness at 34 species recorded is high. An average pond in the wider countryside is likely to hold 26 species and have a BMWP score of up to 100 (DETR, 1998). Ponds in more natural settings will have a higher number of species as in Table 5. However these figures are based on a summer survey and the autumn survey undertaken here will underestimate the numbers. Furthermore a nationally scarce water beetle, *Haliplus laminatus*, was found. This 'crawling water beetle' is small (only 3 mm long) and feeds on algae especially blanket weed. It requires base-rich, slow-moving water with little vegetation except algae and is usually found in the east of the country. In fact this appears to be the first record for Dorset since the 1930s, and is only the seventh record in total for the county.

Haliplus laminatus

Overall the pond is considered to be of high conservation interest with potential to become very high.

Aquatic macroinvertebrates: categories for assessing conservation value based on a 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).
NB. Ponds assessed were semi-natural or natural ponds in relatively unimpacted state and so the average number of species is higher than for ponds in the wider countryside (Pond Action, 1998) .	

Table 6. Conservation Status definitions

PSYM methodology

PSYM is a predictive model for analysis of ponds and operates from a database of correlations for sites across England and Wales, based on environmental and geographical parameters. Biological inputs for plants are number of emergent and

submerged plant species, number of uncommon species and trophic ranking score. Inputs for invertebrates are ASPT score, overall number of Odonata and Megaloptera families scored and the number of Coleoptera families scored. The assessment compares the presence of the expected invertebrate families with their actual occurrence and generates scores accordingly.

The predictive nature of the analysis is based on environmental parameters (pH, grazing, shade, emergent plant cover, inflow and substrate) and geographical factors (grid reference and altitude).

The results of the PSYM analysis shows that the pond is in the highest category of conservation value with a score of 78%. This suggests a reasonable match with the number of species that might theoretically be found in a pristine pond in this location. The model suggests that the number of plant species and the number of uncommon plant species found were lower than expected but that all other categories were as good as they could be.

The PSYM model does not cater specifically for new ponds and therefore this score probably underestimates the value as it is based on more established ponds.

Incidental observations

A common frog (*Rana temporaria*) was disturbed during the survey and newts are known to be present in the pond. These could potentially be any of the three newt species that we have in this country.

Conclusions

The conservation value of this pond is high (on a scale from poor to very high). XXXXXX pond had an above average invertebrate species richness compared to both ponds in the wider countryside and in semi-natural landscapes. A nationally scarce species of water beetle, *Haliplus laminatus,* was present.

Water quality remains reasonable although there is a problem with nutrient enrichment which is discussed below.

Recommendations

Blanket weed is a filamentous algae which thrives in base-rich, nutrient enhanced waters especially where there is a lack of competition from other plants. Although eaten by the three *Haliplus* beetle species and the three Corixid water boatman species found, these are unlikely to provide satisfactory control over its growth.

Barley straw does not affect filamentous algae so should not be used as a control mechanism.

The suggested approach is to outcompete the algae for nutrients in the water through the use of higher plants. These can be planted in two situations:-

Submerged water weeds can be introduced which will extract nitrates from the water column itself. Choice should be limited to native local species only as horticultural alien species can be extremely invasive. Suggestions are to use Spiked milfoil (*Myriophyllum spicatum)* or Rigid hornwort (*Ceratophyllum demersum*) being careful to avoid Parrot's feather *M. aquaticum* (and also under a variety of horticultural trade names).

A reed bed could be created along the ditch from the inflow by planting up with either reeds (*Phragmites australis*) or bulrush (*Typha latifolia).* There is a Lesser bulrush (*T. angustifolia*) which is less invasive than the more usual species. There is a suggestion that reeds do not flourish in base-rich waters although I cannot find any documentary evidence for this.

Recommended suppliers for the above plants are Salix (www.salixrw.com/products/wetland_plants.htm) and British Flora (www.britishflora.co.uk). You could also contact Yarningdale Nurseries Ltd at 16 Chapel Street, Warwick, CV34 4HL (Tel: 01926 842 282) who specialise in *Phragmites australis* (from a variety of British seed sources).

References

DETR. 1998. Lowland Pond Survey 1996 Final Report. DETR, London.

Environment Agency. 1997. Procedures for collecting and analysing macroinvertebrate samples for RIVPACS. Environment Agency: Bristol

Fairclough, J, and Nicolet, P. 2008. Best practice for the identification and the assessment of UK BAP Priority Ponds. In Practice – Bulletin of the Institute of Ecology and Environmental Management. No 59, March 2008. IEEM, Winchester.

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

Appendix 1 Macroinvertebrate species recorded

Group	Species	Common name	Notes
Flatworms	*Dugesia lugubris/polychroa*	Flatworm	
Leeches	*Helobdella stagnalis*	Leech	
Crustacea	*Gammarus pulex*	Freshwater shrimp	
Mollusca	*Potamopyrgus antipodarum*	Jenkins spire snail	
	Radix balthica	Wandering snail	previously *Lymnaea peregra*
	Lymnaea palustris	Marsh pond snail	
	Planorbarius corneus	Great Ramshorn	
	Hippeutis complanatus	Flat ramshorn	
	Valvata cristata	Flat valve snail	
	Pisidium sp.	Pea mussel	
Plecoptera	*Nemoura cambrica*	Stonefly	from inflow
Ephemeroptera	*Caenis horaria*	Angler's curse	
	Cloeon dipterum	Pond Olive	
Megaloptera	*Sialis lutaria*	Alderfly	
Odonata	*Coenagrion puella/pulchellum*	Azure/Variable Damselfly	species not separable as early instar larvae
	Pyrrhosoma nymphula	Large Red damselfly	
	Sympetrum sanguineum/striolatum	Ruddy/Common darter	species not separable as early instar larvae
Hemiptera	*Microvelia reticulata*	Micro-water cricket	
	Corixa punctata	Lesser water boatman	
	Sigara falleni	Lesser water boatman	
	Sigara lateralis	Lesser water boatman	
	Notonecta glauca	Greater water boatman	
	Notonecta maculata	Greater water boatman	
	Notonecta viridis	Greater water boatman	
Coleoptera	*Haliplus immaculatus*	Crawling water beetle	
	Haliplus laminatus	Crawling water beetle	Nationally scarce
	Haliplus lineatocollis	Crawling water beetle	
	Agabus bipustulatus	Diving beetle	
	Agabus nebulosus	Diving beetle	
	Hydroporus planus	Diving beetle	
	Laccobius bipunctatus	Diving beetle	
	Helophorus brevipalpis	Scavenger beetle	
	Scirtidae	Marsh beetle	larvae not identifiable to species
Trichoptera	*Plectrocnemia conspersa*	Caseless caddis	
	Limnephilus marmoratus	Cased caddis	
Diptera	Chaoboridae	Phantom midge	larvae
	Chironomidae	Non-biting midge	larvae

Culicidae	Mosquito	larvae
Dixidae	Meniscus midge	larvae
Psychodidae	Moth fly	larvae
Sciomyzidae	Snail-eating fly	larvae
Stratiomyidae	Soldierfly	larvae
Tipulidae (*Tipula lateralis*)	Cranefly	larvae