

**Follow-up Ecological Survey of Freshwater Habitats
at
Bourne Valley Park (Alderney Recreation Ground)**

Report prepared for Sarah Austin of the Bourne Stream Partnership

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Table of Contents

1. <i>Summary</i>	3
2. <i>Introduction</i>	4
3. <i>Scope</i>	4
4. <i>Methods</i>	7
4.1 <i>Survey methods</i>	7
4.2 <i>Conservation assessment</i>	7
5. <i>Bourne Valley Park freshwater environments</i>	8
5.1 <i>Physico-chemical characteristics</i>	8
5.2 <i>Wetland plant results</i>	9
5.3 <i>Macroinvertebrate results</i>	9
5.4 <i>Other wildlife</i>	14
6. <i>Conservation assessment</i>	14
7. <i>Conclusions and recommendations</i>	15
8. <i>Glossary</i>	15
9. <i>References</i>	16
10. <i>Appendix 1 Wetland plant species recorded 2005 (1) and 2008 (2)</i>	17
11. <i>Appendix 2 Macroinvertebrate species recorded 2005 (1) and 2008 (2)</i>	19
12. <i>Appendix 3 Macroinvertebrate BMWP scores</i>	23

1. Summary

Assessment of the conservation value of the freshwater habitats in Bourne Valley Park (Alderney) has been carried out three years after the initial survey. Biodiversity is found to have increased both in those environments that were originally surveyed and as a whole through newly created environments. Each of the newly created features – fishing pond and daylighted stream - hold a nationally scarce species of water beetle. The main pond holds a nationally scarce species of weevil. Current management practices have increased biodiversity, but water quality issues remain.

Overall the freshwater habitats offer a mix of moderate and high conservation value.

2. Introduction

An evaluation of the freshwater habitats at Alderney Recreation Ground had been carried out in 2005 prior to a project to enhance the biodiversity and recreation value of the park as a whole (Aquilina, 2005).

This follow up survey was commissioned by Sarah Austin and Stuart Terry of Borough of Poole council to evaluate the changes in the freshwater habitats at Bourne Valley Park at Alderney (formerly known as Alderney Recreation Ground) three years on. The initial surveys were carried out in September 2005 and have been repeated in September 2008 using the same, locations, methods and surveyor. The results are thus directly comparable and can be used to evaluate the ecological benefits of the project and make management recommendations.

3. Scope

The original surveys covered wetland plants and invertebrates using standard techniques. The locations included in the original baseline survey are repeated here with the exception of the wetland area, which has dried out considerably as a result of the construction of the new fishing pond. This new pond is included for the first time as is the daylighted section of the stream which was previously culverted. See aerial photo 1 for locations. The designation of the locations follows that used in the previous report for consistency.

The site descriptions which were detailed in the original report have not been repeated here. However changes to these habitats are described as are the new locations.

The new fishing pond (SZ052938) is a kidney shaped pond of about 1700 m². It was dug next to the wetland area that was previously surveyed (2005). There are no overhanging trees or shade and an emergent and submerged flora is beginning to develop. Two fishing platforms have been installed. The banks are rather steep and this has been aggravated by wave wash to create a rather abrupt margin between land and water. It would have been better from the biodiversity point of view to have dug much shallower slopes into the pond which provide better invertebrate habitats than the current steep banks. It is recommended that the creation of a drawdown zone in at least part of the fishing pond is considered for future enhancement work.

The water quality appears to be good with a pH of 6.5 and low nutrient status (conductivity of 164 µS/cm). Water is fed into the pond from the stream via a pipe to maintain water levels, although rainfall over such an area will contribute significantly as well. The pond is in excess of 1.5 meters deep in places and does have a layer of clay and silt on the bottom. This does contribute to the turbidity of the water, especially as dogs stir it up when they swim in the pond.



Photo 1 Fishing pond looking north up Bourne Valley Park

The newly daylighted section of stream appears to be developing well with riffles and pools beginning to appear. It is rather straight but varies in substrate, flow and width along its course. There is a short piped section with an overflow weir which will promote variations in depth depending on flow and act as a balancing feature. Two new bridges allow the stream to be crossed easily by the public. Water quality (pH 6.6 and conductivity 345 $\mu\text{S}/\text{cm}$) in the stream was comparable to that in the higher streams and pond, but it would be expected that the oxygen levels in this section would be high as a result of the flow regime, riffles and weir.



Photo 2 Daylighted stream from one of the bridges



Aerial Photograph of Bourne Valley Park with survey locations. Copyright Google Earth.

4. Methods

The methods used are identical to those used in the original baseline surveys and are standard techniques for evaluating freshwater habitats and cover wetland plants and macroinvertebrates. The surveys were carried out on 12th September 2008.

4.1 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 were surveyed by walking and wading the perimeter and open water areas less than 1 m deep noting the species present. 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.

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.), 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).

4.2 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.

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, although comparison between streams and ponds is not valid. Comparison should only be made between sites with similar characteristics or between the same site over different years. 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.

5. Bourne Valley Park freshwater environments

5.1 Physico-chemical characteristics

Location	pH		Conductivity ($\mu\text{S}/\text{cm}$)	
	2005	2008	2005	2008
Main pond	7.3	6.5	371	365
North stream	6.9	6.5	266	287
South stream	7.1	6.6	213	359
Daylighted stream		6.6		345
Fishing pond		6.5		164

Table 1 Environmental parameters

The environmental parameters were measured in the field with a Hanna HI98129 Combo pH and EC meter. Comparisons between sites are perfectly valid however comparison between the same site in different years must be guarded as the 2005 survey was carried out after a long dry period and the 2008 survey after a wet summer and in particular, just after a few days prolonged rain. This will have had a flushing effect and will tend to equalise the water chemistry of all the sites. The new fishing pond is perhaps an exception, with rain water contributing to its low conductivity (lack of dissolved minerals and nutrients) more than inflow from the stream.

The major difference between 2005 and 2008 appears to be in the water chemistry of the south stream which has become more acidic and carries more dissolved solutes. This in turn is likely to have affected the main pond. However, these changes are not dramatic and are well within normal ranges.

5.2 Wetland plant results

Location	# plants 2005	# plants 2008
Main pond	18	20
North stream	0	2
South stream	5	5
Daylighted stream		11
Fishing pond		12

Table 2 Wetland plants species richness

The number of plants found in the main pond increased between the two visits by 2 with a total of 20 now being found. This is above average for the wider countryside (Lowland Pond Survey = 10, ROPA survey = 14) and would give the pond a Moderate conservation value.

The number of plants found in the fishing pond at 12 is about average which is remarkable given it is only two years old and not planted up. It was probably an advantage building the pond so close to the old wetland area, which presumably allowed species to spread in quickly eg *Potamogeton polygonifolius* which was present in the wetland.

The number of plant species in the north stream has increased from none to 2, which reflects the more open aspect to the stream as a result of the management of the woodland. The south stream appears not to have changed in total species richness but has changed in the species present. The daylighted stream which is newly created and might be expected to be species poor as a result, is in fact the richest of the three streams. This is because of its open aspect and the colonisation by plants washed downstream from the main pond (eg *Potamogeton crispus*). Some plants will have arrived via natural colonisation such as in bird faeces (especially duck). An example of this last may be Galingale (*Cyperus longus*) which is quite a rare plant if it occurs naturally, but is often planted in garden ponds. It does occur in the pond on the Bourne stream at Alder Road where it is most likely introduced.

5.3 Macroinvertebrate results

Differences between the results of 2005 and 2008 survey years are to be expected even in the absence of any management or habitat creation work. This is because of a number of factors;

- Change occurs naturally over time, whether this is successional change (permanent changes in a specific direction caused by environmental changes) or turnover ('turnover' is a natural process whereby species numbers change in the absence of environmental change through a process of random or chance events).

- Surveys are not censuses, they merely capture a representative although incomplete sample of the species present. Therefore two surveys are unlikely to come up with exactly the same results, although consistency is improved through the use of standardized methods. Assessments of the variability inherent in sampling suggest that two samples taken by experienced surveyors from the same place will be greater than 65% similar. Consequently changes in up to 35% may be effectively random.

As a consequence of the foregoing, analysis of the results is important in order to put a context on the raw data and values such as BMWP, ASPT and SRI are used to overcome such variability.

Location	Species richness 2008	Species lost 2005-2008	Species gained 2005-2008	Species in common 2005-2008
Main pond	29	15	14 (8*)	15
North stream	18	6	8 (4*)	10
South stream	14	4	4 (2*)	10
Fishing pond	20		(6*)	
Daylighted stream	22		(7*)	
			*species not found elsewhere	

Table 3 Macroinvertebrate species richness 2005 v 2008.

Overall the species richness of the main pond is above average compared with similar environments in the wider countryside (average = 26). The fishing pond is still new and developing both its flora and fauna but is nonetheless approaching the average number of species already. Both ponds would be assigned a Moderate conservation status on the basis of species richness. The presence of a nationally scarce water beetle, *Berosus affinis*, in the fishing pond enhances its conservation value (see SRI later). A nationally scarce weevil *Pelenomus waltoni*, was found in the main pond but this is not included in the standard calculations of species richness or species rarity because it is not a true aquatic species.

The newly daylighted section of stream is clearly successful and has been well designed to complement the other streams, which are different in nature. Each habitat has its unique species and the site as a whole has a good range of habitats available. Overall some 72 species of macroinvertebrate have been found between the two surveys.

9. References

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10. Appendix 1 Wetland plant species recorded 2005 (1) and 2008 (2)

English name	Latin binomial	National status	Main pond	Main pond	Fishing pond	Daylighted stream	North stream	North stream	South stream	South stream
			2005	2008	2008	2008	2005	2008	2005	2008
Common Water-starwort	<i>Callitriche stagnalis</i>	Common	1	2	2	2			1	2
Rigid hornwort	<i>Ceratophyllum demersum</i>	Common			2					
Nuttall's waterweed	<i>Elodea nuttallii</i>	Common	1	2	2				1	2
Parrot's feather	<i>Myriophyllum aquaticum</i>	Common (invasive alien)	1	2						
Curled pondweed	<i>Potamogeton crispus</i>	Common		2		2				
		Total # submerged	3	4	3	1	0	0	2	2
Common duckweed	<i>Lemna minor</i>	Common	1							
Water lily	<i>Nymphaea sp.</i>	Common (introduced)	1							
Bog pondweed	<i>Potamogeton polygonifolius</i>	Common		2	2			2	1	
		Total # floating-leaved	2	1	1	0	0	1	1	0
Water plantain	<i>Alisma plantago-aquatica</i>	Common	1	2	2	2				
Fool's watercress	<i>Apium nodiflorum</i>	Common		2						2
Pendulous sedge	<i>Carex pendula</i>	Common		2	2	2		1		2
Galingale	<i>Cyperus longus</i>	Common (introduced)				2				
Great Willowherb	<i>Epilobium hirsutum</i>	Common	1	2						
Marsh horsetail	<i>Equisetum palustre</i>	Common		2						
Meadowsweet	<i>Filipendula ulmaria</i>	Common	1	2						
Floating Sweet-grass	<i>Glyceria fluitans</i>	Common	1		2	2				
Yellow Iris	<i>Iris pseudacorus</i>	Common	1	2						
Sharp-flowered rush	<i>Juncus acutiflorus</i>	Common	1	2	2					
Jointed rush	<i>Juncus articulatus</i>	Common			2	2				

English name	Latin binomial	National status	Main pond	Main pond	Fishing pond	Daylighted stream	North stream	North stream	South stream	South stream
			2005	2008	2008	2008	2005	2008	2005	2008
Soft rush	<i>Juncus effusus</i>	Common	1	2	2	2				
Greater birdsfoot trefoil	<i>Lotus pedunculatus</i>	Common	1							
Water forget-me-not	<i>Myosotis scorpioides</i>	Common	1	2						
Water pepper	<i>Persicaria hydropiper</i>	Common	1	2						2
Common reed	<i>Phragmites australis</i>	Common				2				
Lesser spearwort	<i>Ranunculus flammula</i>	Common			2				1	
Greater spearwort	<i>Ranunculus lingua</i>	Local	1	2						
Round-leaved water crowfoot	<i>Ranunculus omiophyllus</i>	Local							1	
Watercress	<i>Rorippa nasturtium-aquaticum</i>	Common				2				
Bittersweet	<i>Solanum dulcamara</i>	Common		2						
Branched bur-reed	<i>Sparganium erectum</i>	Common	1	2						
Bulrush	<i>Typha latifolia</i>	Common	1	2	2	2				
Water speedwell	<i>Veronica anagallis-aquatica</i>	Local				2				
		Total # emergent	13	15	8	10	0	1	2	3
		Total	18	20	12	11	0	2	5	5

11. Appendix 2 Macroinvertebrate species recorded 2005 (1) and 2008 (2)

Group	Species	Common name	Notes	Main pond		Fishing pond	South stream		North stream		Daylighted stream
				2005	2008		2005	2008	2005	2008	
Flatworms	<i>Dugesia lugubris/polychroa</i>	Flatworm				2		2			
	<i>Dugesia polychroa</i>	Flatworm		1							
	<i>Polycelis tenuis</i>	Flatworm				2					
Leeches	<i>Erpobdella octoculata</i>	Leech		1	2	2	1			2	2
	<i>Erpobdella testacea</i>	Leech				2					
	<i>Glossiphonia heteroclita</i>	Leech				2	1	2			
	<i>Helobdella stagnalis</i>	Leech							1		2
	<i>Theromyzon tessulatum</i>	Leech				2					
	<i>Haemopsis sanguisuga</i>	Horse leech									
							2				
Crustacea	<i>Asellus aquaticus</i>	Water slater		1	2	2	1	2	1	2	2
	<i>Crangonyx pseudogracilis</i>	Freshwater shrimp		1	2	2	1	2	1	2	2
	<i>Gammarus pulex</i>	Freshwater shrimp									
Mollusca	<i>Bithynia tentaculata</i>	Common bithynia		1	2						
	<i>Potamopyrgus antipodarum</i>	Jenkins spire snail		1	2		1	2	1	2	2
	<i>Bathyomphalus contortus</i>	Twisted ramshorn									
	<i>Galba (Lymnaea) truncatula</i>	Dwarf pond snail							1		
	<i>Lymnaea palustris</i>	Marsh snail		1							
	<i>Lymnaea peregra</i>	Wandering snail		1	2	2	1	2		2	2
	<i>Lymnaea stagnalis</i>	Great pond snail			2						2
	<i>Gyraulus albus</i>	White ramshorn		1	2	2					2
	<i>Planorbarius corneus</i>	Great ramshorn		1	2	2	1		1		
	<i>Planorbis carinatus</i>	Keeled ramshorn		1							
	<i>Physa acuta type</i>	Bladder snail	alien	1	2	2	1	2	1	2	2
	<i>Musculium lacustre</i>	Lake orb mussel		1							
	<i>Pisidium sp.</i>	Pea mussel		1	2		1	2	1	2	2
Neuroptera	<i>Nemurella picteti</i>	Stonefly						2	1	2	2
	<i>Nemoura erratica</i>	Stonefly							1		

Group	Species	Common name	Notes	Main pond	Main pond	Fishing pond	South stream	South stream	North stream	North stream	Daylighted stream
				2005	2008		2005	2008	2005	2008	
Ephemeroptera	<i>Baetis rhodani</i>	Large Dark Olive			2	2	1	2		2	2
	<i>Cloeon dipterum</i>	Pond Olive		1					1		
Odonata	<i>Aeshna cyanea/mixta</i>	Southern/Migrant Hawker	not separable until final instar		2	2					
	<i>Anax imperator</i>	Emperor dragonfly		1							
	<i>Libellula depressa</i>	Broad-bodied chaser		1							
	<i>Sympetrum striolatum</i>	Common darter			2	2					
	<i>Cordulegaster boltonii</i>	Golden-ringed dragonfly					1	2	1	2	
	<i>Calopteryx virgo</i>	Beautiful demoiselle	local								2
	<i>Coenagrion puella/pulchellum</i>	Azure/Variable damselfly	not separable until final instar		2						
	<i>Ishnura elegans</i>	Blue-tailed damselfly				2					
Hemiptera	<i>Pyrrhosoma nymphula</i>	Large red damselfly		1	2	2	1	2			
	<i>Velia caprai</i>	Water cricket							1	2	
	<i>Ilyocoris cimicoides</i>	Saucer bug			2						
	<i>Hydrometra stagnorum</i>	Water measurer		1						2	
	<i>Ranatra linearis</i>	Water stick insect		1							
	<i>Gerris gibbifer</i>	Water skater	local						1	2	2
	<i>Gerris lacustris</i>	Water skater		1		2					2
	<i>Gerris odontogaster</i>	Water skater			2						
	<i>Corixa punctata</i>	Lesser water boatman		1							
	<i>Hesperocorixa linnaei</i>	Lesser water boatman			2						
	<i>Sigara nigrolineata</i>	Lesser water boatman									2
	<i>Notonecta glauca</i>	Water boatman		1	2						
	<i>Notonecta maculata</i>	Water boatman		1							2
	<i>Notonecta obliqua</i>	Water boatman								2	
	<i>Notonecta viridis</i>	Water boatman	local	1	2	2					
Coleoptera	<i>Gyrinus substriatus</i>	Whirligig beetle									2
	<i>Halipplus ruficollis</i>	Crawling water beetle			2						
	<i>Agabus bipustulatus</i>	Diving beetle		1							2
	<i>Agabus didymus</i>	Diving beetle						2			

Group	Species	Common name	Notes	Main pond	Main pond	Fishing pond	South stream	South stream	North stream	North stream	Daylighted stream
				2005	2008		2005	2008	2005	2008	
	<i>Agabus nebulosus</i>	Diving beetle						2			
	<i>Agabus paludosus</i>	Diving beetle								2	
	<i>Hydroporus memnonius</i>	Diving beetle		1							
	<i>Hydroporus pubescens</i>	Diving beetle								2	
	<i>Anacaena globulus</i>	Scavenger beetle		1	2		1		1		
	<i>Anacaena limbata</i>	Scavenger beetle		1	2						
	<i>Anacaena lutescens</i>	Scavenger beetle									2
	<i>Berosus affinis</i>	Scavenger beetle	nationally scarce			2					
	<i>Helochares lividus</i>	Scavenger beetle				2					
	<i>Laccobius bipunctatus</i>	Scavenger beetle		1							
	<i>Laccobius sinuatus</i>	Scavenger beetle	nationally scarce								2
Trichoptera	<i>Agrypnia varia</i>	Cased caddis			2						
	<i>Limnephilus marmoratus/flavicornis</i>	Cased caddis	too young to separate to species		2						
	<i>Micropterna lateralis</i>	Cased caddis							1	2	
	<i>Hydropsyche angustipennis</i>	Caseless caddis									2
	<i>Lype reducta</i>	Caseless caddis					1				
	<i>Plectrocnemia conspersa</i>	Caseless caddis								2	
Diptera	Chironomidae	Non-biting midge	larvae	1	2		1	2	1	2	2
	Culicidae	Mosquito	larvae				1		1		
	Dixidae	Meniscus midge	larvae		2				1	2	
	Psychodidae	Moth flies	larvae	1	2			2		2	
	Ptychopteridae	Lesser Crane-flies	larvae					2		2	
	Sciomyzidae	Snail-eating flies	larvae			2					
	Simuliidae	Blackflies	larvae				1		1	2	2
	Stratiomyidae	Soldierfly	larvae								
	Syrphidae	Hoverfly	larvae	1							
	Tipulidae	Crane-fly	larvae	1	2	2				2	2
Others	Hydracarina	Water mite		1							
	Oligochaeta	True worms					1	2	1		2

Group	Species	Common name	Notes	Main pond	Main pond	Fishing pond	South stream	South stream	North stream	North stream	Daylighted stream
				2005	2008		2005	2008	2005	2008	
Total				35	33	22	18	19	21	24	26
Total sp.				30	29	20	14	14	16	18	22

12. Appendix 3 Macroinvertebrate BMWP scores

BMWP taxa	Main pond		Fishing pond	South stream	South stream	North stream	North stream	Daylighted stream
	2005	2008		2005	2008	2005	2008	
Planariidae	5		5		5			
Erpobdellidae	3	3	3	3			3	3
Glossiphonidae		3		3	3	3		3
Hirudinae			3					
Asellidae	3	3	3	3	3	3	3	3
Gammaridae	6	6	6	6	6	6	6	6
Hydrobiidae	3	3		3	3	3	3	3
Lymnaeidae	3	3	3	3	3	3	3	3
Planorbidae	3	3	3	3		3		3
Physidae	3	3	3	3	3	3	3	3
Sphaeriidae	3	3		3	3	3	3	3
Nemouridae		7			7	7	7	7
Baetidae	4	4	4	4	4	4	4	4
Aeshnidae	8	8	8					
Libellulidae	8	8	8					
Codulegasteridae				8	8	8	8	
Calopterygidae								8
Coenagriidae	6	6	6	6	6			
Naucoridae		5						
Hydrometridae	5						5	
Nepidae	5							
Gerridae	5	5	5			5	5	5
Corixidae	5	5						5
Notonectidae	5	5	5				5	5
Gyrinidae								5
Halplidae		5						
Dytiscidae	5				5		5	5
Hydrophilidae	5	5	5	5		5		5
Phryganeidae		10						
Limnephilidae		7				7	7	
Hydropsychidae								5
Psychomyidae				8				
Polycentropodidae							7	
Chironomidae	2	2		2	2	2	2	2
Simuliidae				5		5	5	5
Tipulidae	5	5	5				5	5
Oligochaeta				1	1	1		1
BMWP	100	117	75	69	62	71	89	97
# taxa	22	24	16	17	15	17	19	23
ASPT	4.55	4.88	4.69	4.06	4.13	4.18	4.68	4.22