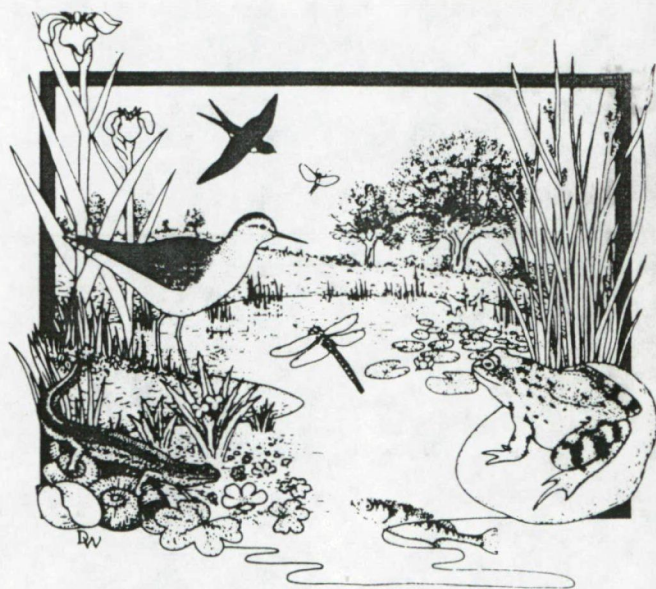


POND ACTION

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A SURVEY OF THE AQUATIC MACROINVERTEBRATES OF SIX PONDS, THE BAYS RIVER
AND THE BAYS RIVER FEN WHICH LIE WITHIN 100m OF TWO ROUTES PROPOSED FOR
THE WYMONDHAM BYPASS

A REPORT TO HERPETOFAUNA CONSULTANTS INTERNATIONAL

POND ACTION

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SUMMARY

This report describes the results of surveys of six ponds, a stretch of the Bays River and an area of the Bays River fen lying within 100m of the two proposed routes for the Wymondham by-pass.

In this survey Expectations Pond A and Willow Cottages Pond A both supported communities which were moderately rich in terms of species of macroinvertebrates (33 and 34 species respectively). Expectations Pond A also supported one local species, the hydrophilid water beetle Helochares lividus. Expectations Pond A has an aquatic macroinvertebrate community of moderate to high value to nature conservation, and Willow Cottages Pond A a community of moderate value to conservation (See Table 2).

The other ponds in the survey all supported relatively species poor communities of aquatic macroinvertebrates (between 13 and 21 species). The value of these communities to nature conservation was low.

However, the value to nature conservation of Willow Cottages Pond B may be underestimated by the present survey as it had only recently filled with water.

The Bays River and Bays River Fen supported relatively few species of aquatic macroinvertebrate (23 and 6 respectively) and these communities were of low value to conservation.

The re-survey of Willow Cottages Pond A allowed comparison of the surveys reported here to be compared with the surveys performed in November and presented in the December report. The assessment of the value to nature conservation of the aquatic macroinvertebrate communities of Rose Farm Pond and Rightup Lane Gravel Pit is not altered by the results presented here.

Vegetation maps are presented for Orange Route Pond 1 (TM 11949478), Orange Route Pond 2 (TM 12129994), Expectations A (TM 08889885) and Expectations B (TM 08769869).

1. INTRODUCTION

This report describes the results of surveys of the aquatic macroinvertebrates and wetland vegetation of six ponds, a section of the Bays River and an area of the Bays River fen. Four of the ponds lie within 100m of the Friends of the Earth alternative route for the Wymondham Bypass. Two ponds, the section of river and the area of fen lie within 100m of the route which would be followed by 'dualling'.

Aquatic macroinvertebrates were surveyed at all six ponds, the river and the fen.

Ponds within 100m of the Friends of the Earth Alternative route:

Willow Cottages Pond A (TM 11799982)
Willow Cottages Pond B (TM 11809975)

Ponds, river and fen within 100m of the route which would be created by dualling:

Expectations Pond A (TM 08889885)
Expectations Pond B (TM 08769869)
Bays River (TG 10720076-TG 10840095)
Bays River Fen (TG 10850090)

The survey results were used to assess the conservation value of the macroinvertebrate communities of the ponds.

Wetland vegetation was mapped at four ponds:

Orange Route Pond 1 (TM 11949478)
Orange Route Pond 2 (TM 12129994)
Great Expectations Pond A (TM 08889885)
Great Expectations Pond B (TM 08769869)

The vegetation maps are presented in Appendix 5.5.

2. METHODS

Survey work was undertaken on 15 February and 5 March 1990.

2.1 Vegetation mapping

Sketch maps of the ponds were based on the outlines shown on the Ordnance Survey (OS) 1:2500 scale maps. The OS outlines were checked and modified in the field. The position of marginal trees and the extent of the main communities of wetland plants was marked on the modified maps.

2.2 Aquatic macroinvertebrate surveying

Aquatic macroinvertebrates were collected by vigorous sweeping of microhabitats in the ponds using a standard pondnet (Freshwater Biological Association pattern, 1mm square mesh). Sampling continued until no new macroinvertebrate taxa were being found. Samples were sorted on site and macroinvertebrates identified in the field, where possible. Species which could not be identified immediately were preserved in 70% ethanol and returned to the laboratory for microscopic examination.

The aquatic macroinvertebrate groups recorded are listed in Table 1 (over page). A list of the keys and guides used in identification of macroinvertebrates is given in Section 4 (see page 15).

2.3 Assessment of the conservation value of the macroinvertebrate communities within the ponds

The conservation value of the aquatic macroinvertebrate communities was assessed using the criteria described in Table 2 (see page 7).

Note In this report the assessment of the conservation value of all but one of the the macroinvertebrate communities has been made using data from a single season. Work by Pond Action has shown that collecting in two or three different seasons of the year (ie spring, summer and autumn) usually results in the recording of 30-50% more species than are found in a single season. It is possible that, amongst these new species, further uncommon species could be recorded.

TABLE 1. GROUPS OF MACROINVERTEBRATES RECORDED IN THE WYMONDHAM PONDS,
RIVER AND FEN.

GROUPS IDENTIFIED TO SPECIES LEVEL

Tricladida	(Flatworms)
Hirudinea	(Leeches)
Gastropoda	(Snails and limpets)
Bivalvia (excluding <u>Pisidium</u> spp.)	(Bivalves)
Malacostraca	(Shrimps and slaters)
Ephemeroptera	(Mayflies)
Odonata	(Dragonflies and damselflies)
Heteroptera	(Water bugs)
Plecoptera	(Stoneflies)
Megaloptera	(Alderflies)
Trichoptera	(Caddis-flies)
*Coleoptera	(Water beetles)

**Adults from the following families of Coleoptera were recorded:
Gyrinidae, Haliplidae, Dytiscidae, Hydraenidae, Hydrophilidae and
Noteridae.

**TABLE 2. SYSTEM USED FOR ASSESSING THE NATURE CONSERVATION VALUE OF
AQUATIC MACROINVERTEBRATE COMMUNITIES**

CONSERVATION VALUE	DESCRIPTION OF COMMUNITY
VERY HIGH	<p>Supporting a rich community of macroinvertebrate species, including local species and/or rare (ie Red Data Book) species. Note that some sites with rare species may be relatively species-poor.</p> <p>Sites in this category are likely either to be Sites of Special Scientific Interest in their own right, or within larger SSSI's.</p>
HIGH	<p>Supporting a rich community of common macroinvertebrate species. A small number of local species present. No rare species.</p> <p>Could include sites on SSSI's or sites of local nature conservation value.</p>
MODERATE/LOW	<p>Supporting only common macroinvertebrate species. No rare or uncommon species.</p>

Within the two higher categories individual sites can be ranked on the basis of numbers of rare and uncommon species, provided that a constant amount of effort in sampling has been made.

3. THE AQUATIC MACROINVERTEBRATE COMMUNITIES OF THE WYMONDHAM PONDS

A list of the species recorded in the four ponds within 100m of the Friends of the Earth alternative route is given in Appendix 5.1.

A list of species recorded in the two ponds within 100m of the dualled route is given in Appendix 5.2.

A list of species in the river and fen within 100m of the dualled route is given in Appendix 5.3.

A summary table of the species recorded in both this study and the November study is given in Appendix 5.4.

3.1 Willow Cottages Pond A: description and discussion of the effects of season and water level

3.1.1 General description

The following features of the pond had changed since the November survey: the water level in the pond had risen approximately 1m flooding some areas of grasses and muddy bank and there was a small flow of water through the pond from the ditch in the South West corner and out via the ditch in the North West corner.

The microhabitats available for aquatic macroinvertebrates now included the flooded grassy bank and the muddy bank. Other microhabitats also present at the time of the last survey were leaf litter, willow roots and Fontinalis antipyretica.

3.1.2 Macroinvertebrates

The nature of the macroinvertebrate community of the pond was much the same with Hesperocorixa sahlbergi and Armiger crista abundant and 16 of the 21 species previously recorded being present. The five species not re-recorded had previously been recorded as single specimens and it is possible that exhaustive surveying would have found these.

The macroinvertebrate community was richer in species than that recorded during the previous survey, 34 species were recorded compared to 21 in November. A total of 17 species not found before was recorded. This increase in number of species is probably due to four main factors.

- 1) Increase in habitat diversity due to the higher water levels followed by colonisation via the ditch connection or by air. Many of the additional species of beetle recorded in the second survey might present be due to this factor.
- 2) Seasonal influences. For example, the limnephilid caddises Glyptotaelius pellucidus and Limnephilus flavicornis are highly

seasonal and rarely found in summer and autumn.

- 3) Intrinsic effects of the ditch connection. The water cricket Velia caprai, for example, is normally associated with flowing water.
- 4) Surveys of aquatic macroinvertebrates can never be truly exhaustive. A certain number of species, present in low abundance will always go unrecorded.

The number of species of macroinvertebrate found suggest that Willow Cottages Pond A should be considered to be of moderate conservation value. This is a higher estimate of value than that made after the first survey and emphasises the qualification made in section 3.1 of the December report.

3.2 Willow Cottages Pond B

3.2.1 General description

Willow Cottages Pond B is a relatively small pond of approximately 0.04 ha. The pond was dry at the time of the November survey. During this survey the water level was approximately 75cm. The banks were variable in height and usually steep (0.5-0.7m, 45-70 degrees inclination). There was a small flow of water into the pond from a ditch in the South West corner and out via a ditch in the East bank to Willow Cottages Pond A.

The microhabitats available for macroinvertebrates were flooded margins with grasses and herbs, brambles and Callitriche. The Callitriche at the time of the survey had increased in abundance and formed a mat approximately 20 cm. high covering most of the bottom of the pond.

3.2.2 Macroinvertebrates

14 species of macroinvertebrate were recorded, 11 of which were beetles. Most species were found as single specimens, though the small hydraenid beetle Ochthebius minimus was common. The macroinvertebrate community is typical of a pond which has recently filled with water after drying out, with a high ratio of beetle species to species of other taxa. The presence of the larva of the alder-fly Sialis lutaria and the flatworm Dugesia sp. are evidence of the influence of the ditches on the colonisation of the pond.

With only 14 species of common macroinvertebrate the pond would be considered of low value to nature conservation. However, as the pond had only recently filled with water this survey might well considerably underestimate its value.

3.3 Orange Route Pond 1

3.3.1 General description

Orange Route Pond 1 is a small pond of approximately 0.008ha. The pond opens out from a ditch which lies along the Northern edge of the pond. No flow was detectable in the ditch at the time of the survey. The bank on the Northern edge of the pond was 0.5m high and sloped at approximately 25 degrees. Other banks of the pond were generally higher (0.5m-0.7m) and steeper (25-45 degrees). The pond was heavily shaded and only the Northern edge was not overhung with brambles. Most of the pond was choked with leaves, twigs and dead tree branches.

At the time of the survey the microhabitats included brambles, strands of filamentous algae and small amounts of Ranunculus repens along the Northern edge, and leaves, twigs and dead tree branches which choked most of the rest of the pond.

3.3.2 Macroinvertebrates

Two species were abundant in the pond: the water slater Asellus aquaticus and the limnephilid caddis Limnephilus flavicornis. The former was associated with the leaf litter present and the latter associated with the decaying twigs and branches.

23 species of macroinvertebrate were recorded, 12 of which were beetles. The presence of the water slater Asellus meridianus, a species thought not to tolerate conditions of high organic enrichment, is indicative of the influence of the ditch along the Northern border. The community is typical of small ponds with large amounts of leaf litter.

With 23 species of macroinvertebrate the community should be considered to be of low value to nature conservation.

3.4 Orange Route Pond 2

3.4.1 General description

Orange pond 2 is a small pond of 0.04ha. The pond is connected to a ditch in the South East corner and in the North West corner. At the time of survey the ditch in the North West corner was dry and the ditch in the South East corner had very little water in it. The South West bank was approximately 1m. high, steep near the waters edge (65 degrees) but becoming shallower higher up. This bank was relatively unshaded and vegetated with grasses, nettles (Urtica dioica), willowherb (Epilobium sp.) and dock (Rumex sp.). Other banks were 1.25m-1.5m higher and steep (65 degrees). These banks were largely unvegetated with some brambles trailing down and into the water.

Microhabitats available for macroinvertebrates at the time of the survey were limited to a small amount of flooded grasses,

willowherb on the South West edge, and twigs, branches and leaf litter throughout the pond.

3.4.2 Macroinvertebrates

13 species of macroinvertebrate were recorded, 7 of which were beetles. No species were abundant though Limnephilus flavicornis was common on decaying twigs and branches, and the corixid bug Hesperocorixa sahlbergi and the button ramshorn Anisus leucostoma were common along the South West bank.

The poor number of species and the apparent absence of water slaters or freshwater shrimps in a pond with so much leaf litter might suggest that the pond dries out far more in summer than its depth (ca. 2m.) would suggest. The pond does not appear to be as influenced by the ditch connection as the other three ponds close by (Orange Route Pond 2, Willow Cottages Ponds A and B).

With only 13 common species recorded the macroinvertebrate community of Orange Route Pond should be considered to be of low value to conservation.

3.5 Expectations Pond A

3.5.1 General description

Expectations Pond A is a small pond of 0.021ha. lying 4m to the West of the All (distance to the waters edge). Ditches run into the pond in the South East corner and out of the pond in the North West corner. A third ditch, present in the North West corner, was dry at the time of the survey and walled off. The bank adjacent to the All was 2.25m high and steep (45 degrees). Other banks were variable but low (<0.5m) and shallow (10-20 degrees).

The pond formed part of the garden of a house (Great Expectations) and was managed, the marginal stand of Typha had been cut back. However, the pond was heavily silted, with 0.3-0.5m of water above approximately 1.5m of silt. The pond supported an undetermined number of Koi carp.

The pond had a number of microhabitats for macroinvertebrates. A stand of Typha 1m. wide surrounded the pond growing in water up to 30 cm. deep on up to 1m. of silt. Myriophyllum sp. and Ceratophyllum demersum were present in the Southern part of the pond throughout the pond. The bank was stony with areas of flooded grass, rush and exposed mud.

3.5.2 Macroinvertebrates

33 species of macroinvertebrate were recorded including one local species, the hydrophilid water beetle Enochrus testaceus. This species is described as Nationally Notable B (recorded from between 31 and 100 10km grid squares) by the Nature Conservancy Council. The beetle has its distribution centred on central Southern and

Eastern Britain. This species may be under-recorded and more common than its status would suggest.

None of the species was abundant though several, including E.testaceus were common. Ischnura elegans, the blue-tipped damsel, Coenagrion puella/pulchellum, the azure/variable damselfly, and Armiger crista, the nautilus ramshorn dominated the fauna of the Myriophyllum and the Ceratophyllum. The beetles Noterus clavicornis, Halipplus ruficollis and E.testaceus dominated the fauna of the stands of Typha.

The macroinvertebrate community is typical of small permanent water bodies with little leaf litter. The community has a preponderance of beetle species but with a number of more permanent water species.

Notonecta viridis, appears to be outside its normal habitat. N.viridis is normally considered to be a brackish water, coastal species. The species is occasionally found inland but is not known to breed there (A.A.Savage pers. comm.). Two specimens were found in the pond which might suggest that their presence is more than casual. The pond water has a high conductivity (ca. 1,600 microSiemens/cm.) which is due largely from salt run-off from the All might represent fairly brackish water (Rightup Lane Gravel Pit has a conductivity of 375 microSiemens /cm.) . The pond will have received a large amount of rainwater recently and the conductivity may be considerably lower than it had been in previous months.

The macroinvertebrate community is of moderate to high nature conservation value.

3.6 Expectations Pond B

3.6.1 General description

Expectations Pond B was a small pond of area 0.015ha. lying 5.5m to the West of the All (distance to waters edge). The pond is connected to three ditches, at the North, South and East corners. All three ditches were nearly dry at the time of the survey and no flow was detectable. The bank of the pond adjacent to the All was 2m high and steep (45 degrees); the other banks were variable (1m-1.5m height, 20-45 degrees in inclination).

The pond was heavily shaded, choked with leaves, twigs and dead tree branches, and most banks were overhung with brambles. A small patch of Juncus effusus and Epilobium sp. form the only other possible macroinvertebrate habitat.

3.6.2 Macroinvertebrates

13 common species of macroinvertebrate were recorded from this pond of which 7 were beetles. All species were found in low abundance.

This type of community is typical of heavily shaded and choked

ponds and is of low value to nature conservation.

3.7 Bays River

3.7.1 General description

The Bays River was a small slow flowing river (4m-5m wide; 1.5m maximum depth; 1m average depth; approximately 20cm/s). The section surveyed had a silted bottom with leaf litter for most of its length, with some sands and gravels near the bottom of the section. The right bank was heavily shaded by trees, the left bank largely open. The right bank was generally steep and quite high (65-75 degrees; 1-1.5m high). The left bank was also steep and high (45-60 degrees; 1m high) though some areas were less so. 2 small inlets ran into the section on the right hand bank and 3 on the left hand bank. No aquatic or marginal stands of vegetation were recorded from the river.

At the time of the survey the following microhabitats were available for macroinvertebrates: leaf litter and silt, sparse new shoots of Epilobium on the left bank, willow roots on the right bank and sands and gravels at the bottom of the section.

3.7.2 Macroinvertebrates

23 species of macroinvertebrates were recorded from the river of which 10 were molluscs. This type of community is common for slow flowing, lowland rivers. The number of species recorded is low and may reflect the lack of submersed macrophyte growth. Whether the absence of aquatic macrophytes was due to winter scour or some other factor it was not possible to determine.

The BMWP score for the river was 67 and the average score per taxon (ASPT) was 3.76. This is below what would be expected and suggests that the river is subject to some form of pollution.

The nature conservation value of the macroinvertebrate community of this section of the Bays River appears to be low. However, if the lack of submersed vegetation is due to scour, then, during the summer, aquatic and marginal macrophytes may recolonise and provide a greater range of habitat for macroinvertebrates.

3.8 Bays River Fen

3.8.1 General description

The area of fen sampled is on the right bank of the Bays River. The fen has five (perhaps more) small springs which flow onto the site approximately 20m from the river. There was little water flowing at the time of the survey. Four heavily silted and shaded pools (10cm. deep) are present under the willows approximately 5m from the rivers edge.

Microhabitats available for macroinvertebrates at the time of the survey included: shallow pools with silt and leaf litter and small runs of water over silt with some vegetation.

3.8.2 Macroinvertebrates

6 common species of macroinvertebrate were recorded during the survey. Two of these, the snail Potamopyrgus jenkinsi and the freshwater shrimp Gammarus pulex were common. The other four species were represented by single specimens.

The composition of the fauna reflects the small amount of water available for aquatic macroinvertebrates, though the presence of G.pulex and Asellus meridianus suggests that there is probably a small amount of surface water on the site at all times of year.

The value to nature conservation of the aquatic macroinvertebrate fauna of Bays River fen is low.

3.9 Rose Farm Pond and Rightup Lane Gravel Pit

As the nature conservation value of Willow Cottages Pond A was underestimated by the first survey it should be expected that the value of Rightup Lane Gravel Pit and Rose Farm Pond would be similarly underestimated.

It is likely that Rose Farm Pond is still of low value to nature conservation; a similar percentage increase in species numbers to that seen in Willow Cottages Pond A would yield only 17 species..

The community of Rightup Lane Gravel Pit would be enhanced by the presence of seasonal macroinvertebrates such as the caddis-flies present in Willow Cottages Pond A and mentioned in section 3.1.2. However, as there is no ditch connection and as the water level in the Pit has not risen greatly since November, it is probable that a resurvey of the pit would not find as large an increase in species numbers as seen at Willow Cottages Pond A. Nevertheless, the value to nature conservation of the macroinvertebrate community of Rightup Lane Gravel Pit is still moderate to high.

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APPENDIX 5.1 AQUATIC MACROINVERTEBRATES RECORDED IN THE WYMONDHAM PONDS
WITHIN 100m OF THE FRIENDS OF THE EARTH ALTERNATIVE ROUTE

	Willow Cottages Pond A	Willow Cottages Pond B	Orange Route Pond 1	Orange Route Pond 2
TRICLADIDA (flatworms)				
<i>Dugesia</i> (probably) <i>polychroa</i>	-	+	-	-
HIRUDINEA (leeches)				
<i>Glossiphonia complanata</i>	+	-	-	-
<i>Helobdella stagnalis</i>	-	-	+	-
GASTROPODA (snails)				
<i>Anisus leucostoma</i>	-	-	+	+
<i>Armiger crista</i>	+	-	+	-
<i>Lymnaea palustris</i>	-	-	-	+
<i>Lymnaea peregra</i>	+	+	-	+
<i>Lymnaea truncatula</i>	+	-	-	-
MALACOSTRACA (shrimps and slaters)				
<i>Asellus aquaticus</i>	+	-	+	-
<i>Asellus meridianus</i>	-	-	+	-
<i>Crangonyx pseudogracilis</i>	+	-	-	-
EPHEMEROPTERA (mayflies)				
<i>Cloeon dipterum</i>	+	-	+	-
HETEREOPTERA (bugs)				
<i>Calicorixa praeusta</i>	+	-	-	-
<i>Corixa punctata</i>	+	-	-	+
<i>Hesperocorixa sahlbergi</i>	+	-	+	+
<i>Notonecta glauca</i>	+	-	-	-
<i>Plea leachi</i>	+	-	+	-
<i>Sigara nigrolineata</i>	-	-	+	-
<i>Sigara dorsalis</i>	+	-	-	-
<i>Velia caprai</i>	+	-	-	-
MEGALOPTERA (alder-flies)				
<i>Sialis lutaria</i>	-	+	-	-

	Willow Cottages Pond A	Willow Cottages Pond B	Orange Route Pond 1	Orange Route Pond 2
TRICHOPTERA (caddis-flies)				
<i>Glyptotaelius pellucidus</i>	+	-	+	-
<i>Limnephilus flavicornis</i>	+	-	+	+
COLEOPTERA (beetles)				
<i>Acilius sulcatus</i>	+	-	-	-
<i>Agabus bipustulatus</i>	+	+	-	-
<i>Agabus chalconatus</i>	-	-	+	-
<i>Agabus nebulosus</i>	+	+	-	+
<i>Anacaena bipustulata</i>	+	+	+	-
<i>Anacaena globulus</i>	+	+	+	+
<i>Colymbetes fuscus</i>	+	+	-	-
<i>Gyrinus substriatus</i>	+	-	-	-
<i>Halplus lineatocollis</i>	+	-	+	+
<i>Helophorus brevipalpis</i>	-	-	+	-
<i>Helophorus grandis</i>	+	-	-	-
<i>Helophorus granularis</i>	-	+	-	-
<i>Hydrobius fuscipes</i>	+	-	+	-
<i>Hydroporus erythrocephalus</i>	-	-	-	+
<i>Hydroporus nigrita</i>	-	-	+	-
<i>Hydroporus palustris</i>	+	+	+	+
<i>Hydroporus planus</i>	+	+	+	-
<i>Hydroporus tessulatus</i>	-	-	+	+
<i>Hygrotus inaequalis</i>	+	-	-	-
<i>Hyphodrus ovatus</i>	-	+	-	+
<i>Ilybius fuliginosus</i>	+	-	-	-
<i>Laccophilus minutus</i>	+	-	-	-
<i>Limnebius truncatellus</i>	+	-	-	-
<i>Ochthebius minimus</i>	+	+	+	-
<i>Suphrodytes dorsalis</i>	+	+	+	+

APPENDIX 5.2 AQUATIC MACROINVERTEBRATES RECORDED IN THE WYMONDHAM PONDS
WITHIN 100m OF THE DUALLED ROUTE

	Expectations	
	Pond A	Pond B
TRICLADIDA (flatworms)		
Dugesia (probably) polychroa	+	-
HIRUDINEA (leeches)		
Glossiphonia complanata	+	-
GASTROPODA (snails)		
Armiger crista	+	+
Hippeutis complanatus	+	-
Lymnaea palustris	+	+
Lymnaea peregra	+	-
MALACOSTRACA (shrimps and slaters)		
Asellus aquaticus	-	+
Asellus meridianus	+	-
Crangonyx pseudogracilis	+	+
EPHEMEROPTERA (mayflies)		
Cloeon dipterum	+	-
ODONATA		
Ischnura elegans	+	-
Coenagrion puella/ pulchellum	+	-
HETEROPTERA (bugs)		
Corixa punctata	+	-
Hesperocorixa sahlbergi	+	-
Ilyocoris cimicoides	+	-
Notonecta viridis	+	-
Sigara dorsalis	+	-
MEGALOPTERA (alder-flies)		
Sialis lutaria	+	-

Expectations
Pond A Pond B

TRICHOPTERA (caddis-flies)

Glyptotaelius pellucidus	-	+
Limnephilus extricatus/ incisus	+	-
Limnephilus flavicornis	+	-
Limnephilus marmoratus	-	+

COLEOPTERA (beetles)

Agabus sturmi	+	+
Cercyon granarius	+	-
Enochrus testaceus	+	-
Haliphus immaculatus	+	-
Haliphus lineatocollis	-	+
Haliphus ruficollis	+	-
Helophorus brevipalpis	+	-
Hydrobius fuscipes	+	+
Hydroporus angustatus	+	-
Hydroporus discretus	-	+
Hydroporus palustris	+	+
Hygrotus inaequalis	+	-
Hyphydrus ovatus	+	-
Laccophilus minutus	+	+
Noterus clavicornis	+	-
Ochthebius minimus	+	+

**APPENDIX 5.3 LIST OF MACROINVERTEBRATES RECORDED IN THE BAYS RIVER AND
BAYS RIVER FEN**

	River	Fen
HIRUDINEA		
<i>Erpobdella octoculata</i>	+	-
<i>Glossiphonia complanata</i>	+	-
GASTROPODA		
<i>Acroloxus lacustris</i>	+	-
<i>Bithynia tentaculata</i>	+	-
<i>Gyraulus albus</i>	+	-
<i>Hippeutis complanatus</i>	+	-
<i>Lymnaea peregra</i>	+	-
<i>Planorbis contortus</i>	+	-
<i>Potamopyrgus jenkinsi</i>	+	+
<i>Valvata cristata</i>	+	-
<i>Valvata piscinalis</i>	+	-
BIVALVIA		
<i>Sphaerium corneum</i>	+	-
MALACOSTRACA		
<i>Asellus aquaticus</i>	+	-
<i>Asellus meridianus</i>	-	+
<i>Crangonyx pseudogracilis</i>	+	-
<i>Gammarus pulex</i>	+	+
EPHEMEROPTERA		
<i>Cloeon dipterum</i>	+	-
HETEROPTERA		
<i>Hesperocorixa sahlbergi</i>	+	-
<i>Sigara dorsalis</i>	+	-
<i>Sigara falleni</i>	+	-
PLECOPTERA		
<i>Nemurella picteti</i>	-	+
MEGALOPTERA		
<i>Sialis lutaria</i>	+	-

	River	Fen
TRICHOPTERA		
Plectrocnemia conspersa	-	+
Stenophylax lateralis/ sequax	-	+
COLEOPTERA		
Anacaena globulus	+	-
Haliphus lineatocollis	+	-
Potamonectes depressus elegans	+	-

LEGEND TO APPENDIX 5.4.

ABBREVIATION	SURVEY
RF	Rose Farm Pond
RU	Rightup Lane Gravel Pit
WAN	Willow Cottages Pond A November sample
WAF	Willow Cottages Pond A February sample
WB	Willow Cottages Pond B
OR1	Orange Route Pond 1
OR2	Orange Route Pond 2
EA	Expectations Pond A
EB	Expectations Pond B
BR	Bays River
BRF	Bays River Fen

**APPENDIX 5.4 SUMMARY TABLE OF THE MACROINVERTEBRATES RECORDED DURING THE
NOVEMBER AND FEBRUARY SURVEYS**

	R F	R U	W A N	W A F	W B	O R 1	O R 2	E A	E B	B R	B R F
TRICLADIDA (flatworms)											
Dugesia (probably) lugubris	-	-	-	-	+	-	-	+	-	-	-
Dugesia tigrina	-	+	-	-	-	-	-	-	-	-	-
HIRUDINEA (leeches)											
Erpobdella octoculata	+	+	-	-	-	-	-	-	-	+	-
Glossiphonia complanata	+	+	+	+	-	-	-	+	-	+	-
Glossiphonia heteroclita	-	+	-	-	-	-	-	-	-	-	-
Helobdella stagnalis	-	+	-	-	-	+	-	-	-	-	-
Theromyzon tessulatum	-	-	+	-	-	-	-	-	-	-	-
GASTROPODA (snails)											
Acroloxus lacustris	-	-	-	-	-	-	-	-	-	+	-
Anisus leucostoma	-	-	-	-	-	+	+	-	-	-	-
Armiger crista	-	-	+	+	-	+	-	+	+	-	-
Gyraulus albus	-	+	-	-	-	-	-	-	-	+	-
Hippeutis complanatus	-	+	-	-	-	-	-	+	+	+	-
Lymnaea auricularia	-	+	-	-	-	-	-	-	-	-	-
Lymnaea palustris	-	+	-	-	-	-	+	+	+	-	-
Lymnaea peregra	+	+	+	+	+	-	+	+	-	+	-
Lymnaea stagnalis	-	+	-	-	-	-	-	-	-	-	-
Lymnaea truncatula	-	-	-	+	-	-	-	-	-	-	-
Planorbis contortus	-	+	-	-	-	-	-	-	-	+	-
Potamopyrgus jenkinsi	-	-	-	-	-	-	-	-	-	+	+
Valvata cristata	-	-	-	-	-	-	-	-	-	+	-
Valvata piscinalis	-	-	-	-	-	-	-	-	-	+	-
BIVALVIA											
Sphaerium corneum	+	-	-	-	-	-	-	-	-	+	-

	R F	R U	W A N	W A F	W B	O R 1	O R 2	E A	E B	B R	B R F
MALACOSTRACA (shrimps and slaters)											
<i>Asellus aquaticus</i>	-	+	+	+	-	+	-	-	+	+	-
<i>Asellus meridianus</i>	-	-	-	-	-	+	-	+	-	-	+
<i>Crangonyx pseudogracilis</i>	-	+	+	+	-	-	-	+	+	+	-
<i>Gammarus pulex</i>	-	-	-	-	-	-	-	-	-	+	+
EPHEMEROPTERA (mayflies)											
<i>Caenis horaria</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Caenis luctuosa</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Cloeon dipterum</i>	-	+	+	+	-	+	-	+	-	+	-
ODONATA (dragonflies)											
<i>Coenagrion puella/pulchellum</i>	-	+	-	-	-	-	-	+	-	-	-
<i>Enallagma cyathigerum</i>	-	+	+	-	-	-	-	-	-	-	-
<i>Ischnura elegans</i>	-	+	-	-	-	-	-	+	-	-	-
PLECOPTERA (stoneflies)											
<i>Nemurella picteti</i>	-	-	-	-	-	-	-	-	-	-	+
HETEROPTERA (bugs)											
<i>Calicorixa praeusta</i>	-	-	+	+	-	-	-	-	-	-	-
<i>Corixa punctata</i>	+	-	+	+	-	-	+	+	-	-	-
<i>Hesperocorixa sahlbergi</i>	+	-	+	+	-	+	+	+	-	+	-
<i>Ilyocoris cimicoides</i>	-	+	-	-	-	-	-	+	-	-	-
<i>Notonecta glauca</i>	-	+	+	+	-	-	-	-	-	-	-
<i>Notonecta viridis</i>	-	-	-	-	-	-	-	+	-	-	-
<i>Plea leachi</i>	-	+	+	+	-	+	-	-	-	-	-
<i>Sigara distincta</i>	+	+	-	-	-	-	-	-	-	-	-
<i>Sigara dorsalis</i>	+	+	-	+	-	-	-	+	-	+	-
<i>Sigara falleni</i>	+	+	-	-	-	-	-	-	-	-	-
<i>Sigara lateralis</i>	+	-	-	-	-	-	-	-	-	-	-
<i>Sigara limitata</i>	+	-	-	-	-	-	-	-	-	-	-
<i>Sigara nigrolineata</i>	-	-	+	-	-	+	-	-	-	-	-
<i>Velia caprai</i>	-	-	-	+	-	-	-	-	-	-	-

	R F	R U	W A N	W A F	W B	O R 1	O R 2	E A	E B	B R	B R F
MEGALOPTERA (alder-flies)											
<i>Sialis lutaria</i>	+	+	+	-	+	-	-	+	-	+	-
TRICHOPTERA (caddis-flies)											
<i>Agraylea multipunctata</i>	-	+	+	-	-	-	-	-	-	-	-
<i>Agraylea sexmaculata</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Glyptotendipes pallidus</i>	-	-	-	+	-	+	-	-	+	-	-
<i>Limnephilus affinis</i> /incisus	-	-	-	-	-	-	-	+	-	-	-
<i>Limnephilus flavicornis</i>	-	-	-	+	-	+	+	+	-	-	-
<i>Limnephilus marmoratus</i>	-	-	-	-	-	-	-	-	+	-	-
<i>Mystacides longicornis</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Phryganea striata</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Plectrocnemia conspersa</i>	-	-	-	-	-	-	-	-	-	-	+
<i>Stenophylax lateralis</i> /sequax	-	-	-	-	-	-	-	-	-	-	+
COLEOPTERA (beetles)											
<i>Acilius sulcatus</i>	-	-	-	+	-	-	-	-	-	-	-
<i>Agabus bipustulatus</i>	-	-	-	+	+	-	-	-	-	-	-
<i>Agabus chalconatus</i>	-	-	-	-	-	+	-	-	-	-	-
<i>Agabus nebulosus</i>	-	-	-	+	+	-	+	-	-	-	-
<i>Agabus sturmi</i>	-	-	-	-	-	-	-	+	+	-	-
<i>Anacaena bipustulata</i>	-	-	+	+	+	+	-	-	-	-	-
<i>Anacaena globulus</i>	-	-	-	+	+	+	+	-	-	+	-
<i>Cercyon granarius</i>	-	-	-	-	-	-	-	+	-	-	-
<i>Colymbetes fuscus</i>	-	-	-	+	+	-	-	-	-	-	-
<i>Gyrinus substriatus</i>	-	-	+	+	-	-	-	-	-	-	-
<i>Enochrus testaceus</i>	-	-	-	-	-	-	-	+	-	-	-
<i>Halplus immaculatus</i>	-	-	-	-	-	-	-	+	-	-	-
<i>Halplus lineatocollis</i>	-	-	+	+	-	+	+	-	+	+	-
<i>Halplus ruficollis</i>	-	+	-	-	-	-	-	+	-	-	-
<i>Helochares lividus</i>	-	+	-	-	-	-	-	-	-	-	-
<i>Helophorus brevipalpis</i>	-	-	-	-	-	+	-	+	-	-	-
<i>Helophorus grandis</i>	-	-	-	+	-	-	-	-	-	-	-
<i>Helophorus granularis</i>	-	-	-	-	+	-	-	-	-	-	-
<i>Hydrobius fuscipes</i>	-	-	-	+	-	+	-	+	+	-	-

	R F	R U	W A N	W A F	W B	O R 1	O R 2	E A	E B	B R	B R F
COLEOTERA (continued)											
Hydroporus angustatus	-	-	-	-	-	-	-	+	-	-	-
Hydroporus discretus	-	-	-	-	-	-	-	-	+	-	-
Hydroporus erythrocephalus	-	-	-	-	-	-	+	-	-	-	-
Hydroporus nigrita	-	-	-	-	-	+	-	-	-	-	-
Hydroporus palustris	-	-	-	+	+	+	+	+	+	-	-
Hydroporus planus	-	-	-	+	+	+	-	-	-	-	-
Hydroporus tessulatus	-	-	-	-	-	+	+	-	-	-	-
Hygrotus inaequalis	-	+	-	+	-	-	-	+	-	-	-
Hyphydrus ovatus	-	-	-	-	+	-	+	+	-	-	-
Ilybius fuliginosus	-	-	-	+	-	-	-	-	-	-	-
Laccobius bipunctatus	-	+	-	-	-	-	-	-	-	-	-
Laccophilus hyalinus	-	+	-	-	-	-	-	-	-	-	-
Laccophilus minutus	-	-	+	+	-	-	-	+	+	-	-
Limnebius truncatellus	-	-	-	+	-	-	-	-	-	-	-
Noterus clavicornis	-	-	-	-	-	-	-	+	-	-	-
Ochthebius minimus	-	-	-	+	+	+	-	+	+	-	-
Potamonectes depressus elegans	-	-	-	-	-	-	-	-	-	+	-
Suphrodytes dorsalis	-	-	+	+	+	+	+	-	-	-	-

APPENDIX 5.5 VEGETATION MAPS

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