

Marshall's Arm Aquatic Macro-invertebrate Survey 2010

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1. Introduction

Andy Harmer was commissioned by the Marshall's Arm Management Committee to undertake an aquatic macro-invertebrate survey of a series of water features within an area known as Marshall's Arm Nature Reserve; this included the northern and southern oxbow, the River Weaver, Two streams and a pond.

The aim of the survey was to establish the species diversity of each sample point and consequently Marshall's Arm in its entirety. This would provide useful information to feed into the existing management plan and help assess effectiveness of current management aims.

A wide range of aquatic related taxon groups was surveyed for; this was agreed with FOMA.

2. Sampling points

Six locations were used to take samples. The sample points are labelled on the map below.



3. Aquatic Invertebrate Survey

Two visits were made to each sample point. The first visit was made in early summer, followed by a visit in winter.

Netting was carried out for as long as new species were being found. The surveyor used a Dictaphone to record each new species. The Dictaphone has a facility for switching off after ten minutes of inactivity, and to warn the user it gives an audible signal. Once the surveyor heard this signal, he could then assume that the supply of invertebrates had been exhausted and move on to the next location. In reality it worked out that the best locations would receive around an hour of survey whereas the worse ones would receive twenty to thirty minutes.

All accessible habitats within 10m of each sample point were surveyed using a standard GB pond net. Most invertebrate species were identified in the field and released where caught. A small number of specimens of unfamiliar or difficult species were removed for identification under the microscope. The following species groups were included in the survey:

<i>Tricladida</i>	flatworms
<i>Hirudinea</i>	leeches
<i>Mollusca</i>	molluscs
<i>Araneae</i>	water-spider
<i>Malacostraca</i>	shrimps and hoglice
<i>Ephemeroptera</i>	mayflies
<i>Megaloptera</i>	alderflies
<i>Hemiptera</i>	aquatic bugs
<i>Lepidoptera</i>	china-mark moths
<i>Trichoptera</i>	caddis-flies
<i>Coleoptera</i>	beetles
<i>Odonata</i>	dragonflies and damselflies

A degree of subjectivity is inevitable in deciding what constitutes an aquatic species. There are many wetland invertebrates whose occurrence in Cheshire is almost certainly focused on water-bodies such as ponds and rivers but which were not or would not have been included in the survey if indeed they had been present. These include for example several species of hoverflies (e.g. *Anasimyia*, *Parhelophilus*, *Eristalinus* species) and ground beetles (e.g. *Agonum*, *Bembidion*, *Elaphrus* species). Some of the leaf beetles included in the survey have little claim to inclusion as aquatic species, although they are closely associated with wetland plants. These were included simply because of ease and consistency of recording. The terrestrial invertebrate survey for this project

is being undertaken by Rachel Hacking Ecology and will be reported upon separately.

The methodology used is closely similar to that employed in similar studies in adjacent parts of England, such as the PondLife Critical Biodiversity Survey of 1000 ponds in north-western England, carried out under contract by Jonathan Guest between 1995 and 1998, and annual studies of 160 ponds at Manchester Airport in 2002 and 2007, conducted by Andy Harmer. It also replicated the Wrexham Borough Council pilot Pond Project of 2002 and 2004 by Andy Harmer and Jonathan Guest.

An indication of the numbers of individuals of each species netted is to be given using the following system:

1	Rare
2-10	Occasional
11-99	Frequent
100 plus	Abundant

Where species are only recorded from the water-body environs, e.g. odonata in flight, then an indication will be given of the sex, life stage (e.g. adult, teneral, exuvia), and the behaviour (e.g. ovipositing, copulating) where possible.

4. Amphibians and Fish

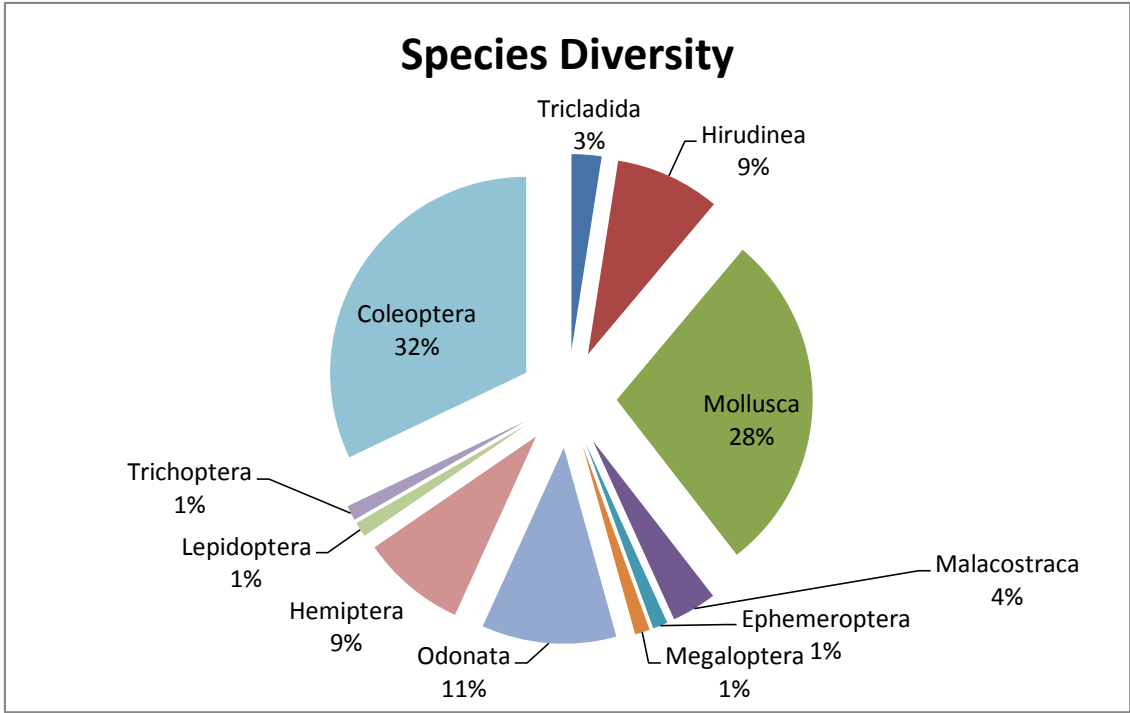
Though the remit for this study was specifically aquatic invertebrates, data on amphibians and fish was collected due to the ease of recording these co-inhabitants of the net. This is not to aim to provide any meaningful assessment of amphibians or fish, just to provide extra data rather than waste it.

5. Aquatic Invertebrate Survey Results 2007

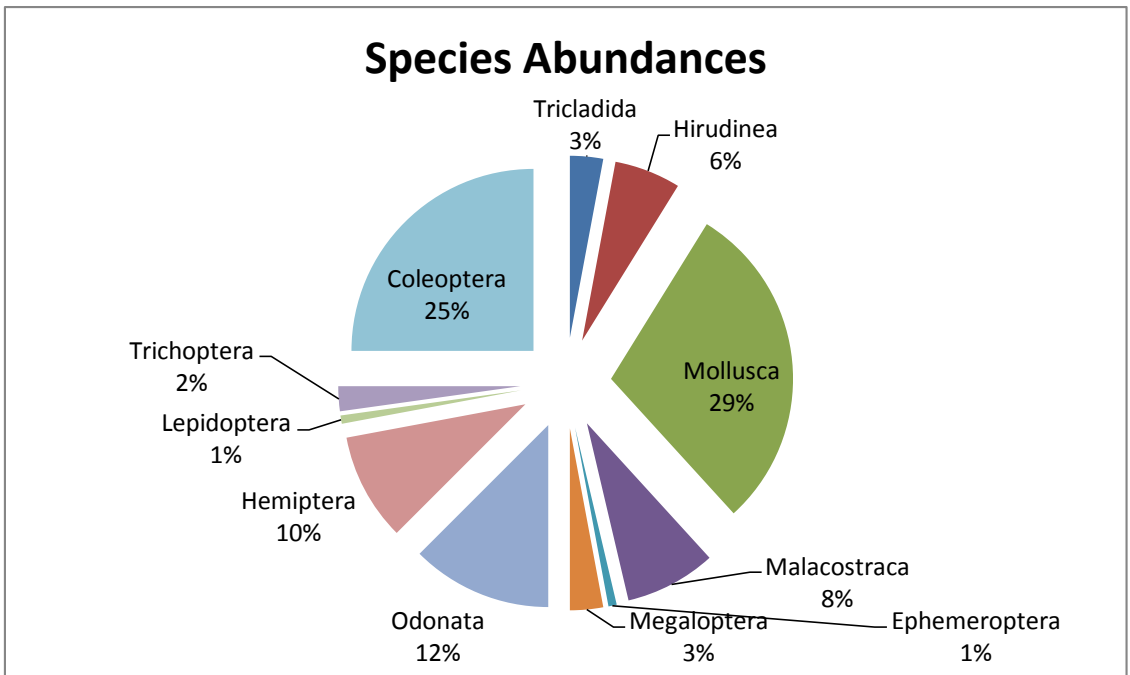
One hundred and thirty six records were gathered of eighty invertebrate taxa. These are displayed in Table A below.

Table A
Composition of invertebrate fauna recorded from the groups targeted.

Taxon group	Number of species	Number of records
<i>Tricladida</i>	2	4
<i>Hirudinea</i>	7	8
<i>Mollusca</i>	23	40
<i>Araneae</i>	0	0
<i>Malacostraca</i>	3	11
<i>Ephemeroptera</i>	1	1
<i>Plecoptera</i>	0	0
<i>Megaloptera</i>	1	4
<i>Odonata</i>	9	17
<i>Hemiptera</i>	7	13
<i>Lepidoptera</i>	1	1
<i>Trichoptera</i>	1	3
<i>Coleoptera</i>	26	34
Total	80	136



Pie-chart 1 The above pie-chart illustrates the diversity of each taxon group; for example Pie-chart 1 demonstrates that the invertebrate group Coleoptera is the most diverse group with the largest percentage of taxa, whereas Pie-chart 2 shows that the slightly less diverse group Mollusca were encountered on more occasions.



Pie-chart 2 The above pie-chart shows the percentage of data recorded for the various taxon groups.

Tricladida

Two taxa were recorded throughout the survey. This was *Polycelis nigra/tenuis*, *Dugesia polychroa/lagubris*. Both pairs of aggregates can only be separated by dissection of live animals. This was not attempted as all species are known to be common in the region.

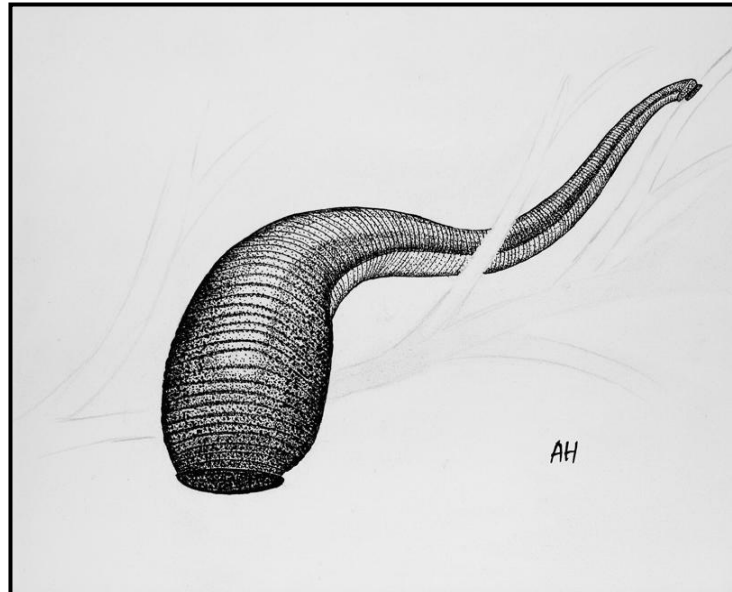
Hirudinea

Seven species of leech were recorded during this survey.

The Duck Leech *Theromyzon tessulatum* was recorded from the pond. This leech is a sanguivorous (blood feeding) parasite of water birds, usually entering the nostrils and feeding through the nasal cavity wall. This method of feeding may inadvertently assist the leech in its dispersal hence its occurrence in what can be regarded as a remote water body.

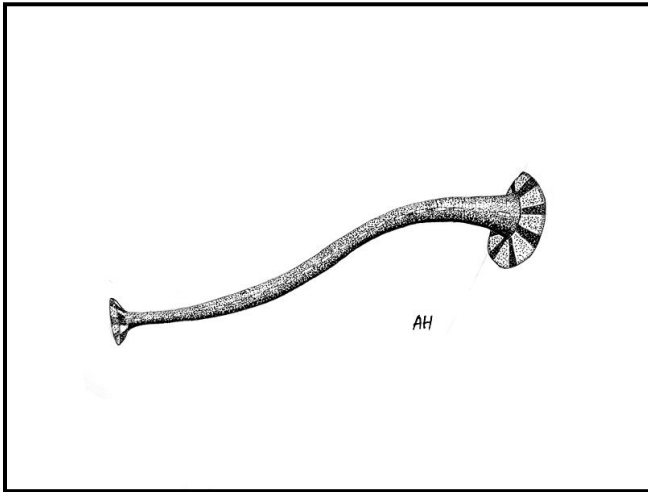
Erpobdella octoculata, regularly the commonest leech during freshwater surveys was also encountered in the pond but no other sample point.

The horse leech *Haemopsis sanguisuga* was recorded from the pond. It tends to favour features like grass mats and dense swampy margins such as occurs around the pond dipping platform. It is by far the largest leech that occurs in Cheshire, reaching up to 15cm in length. The reputation of this animal far outreaches its ability as its blunt teeth cannot pierce mammalian skin and consequently restricts its diet to creatures such as worms and snails, some of which are small enough to be consumed whole. Amphibians are parasitized by the horse leech; the smaller of which are sometimes killed due to the amount of blood drawn from them.



Horse Leech *Haemopsis sanguisuga*

Not surprisingly, the fish leech *Piscicola geometra* was recorded during the survey, at two sample points; the river and the northern oxbow. This animal attaches itself to aquatic vegetation and reaches out to passing fish. The leech will release itself from the plant once its sucker is firmly connected to the fish. Feeding will continue whilst the fish swims around, it being unable to detach the parasite hitchhiker.



The fish leech *Piscicola geometra*.

Glossiphonia heteroclita, or the Orange Leech is a leech that feeds mainly on molluscs. It was recorded from the southern oxbow. Not surprisingly the southern oxbow was found to have a diverse mollusc fauna.

The Swamp Leech *Erpobdella testacea* tends to very localised and favours ponds with dense aquatic vegetation. It was encountered in the pond.

Mollusca

The aquatic mollusc fauna at Marshall's Arm is excellent and may be unrivalled in Cheshire on any other LNR. Twenty three species of aquatic mollusc were found during the survey.

A suite of six filter-feeding bivalves was recorded; Duck Mussel *Anodonta anatina*, Swan Mussel *Anodonta cygnea*, Orb Mussel *Sphaerium corneum*, Lake Orb Mussel *Musculium lacustre*, Nut Orb Mussel *Sphaerium rivicola*, and the invasive alien Zebra Mussel *Dreissena polymorpha*.

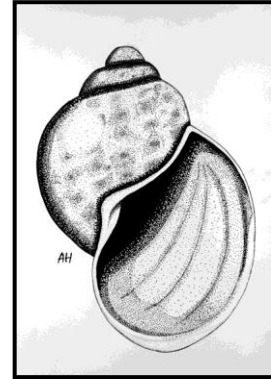
The great pond snail *Lymnaea stagnalis* was found during the survey at the pond and at the northern oxbow.

Jenkins spire snail *Potamopyrgus jenkinsi* is an alien species associated with

running water. This was encountered occasionally in the river.

The wandering snail *Lymnaea peregra* was recorded at half of the sites. It is possibly the commonest and most widespread of all aquatic molluscs in the county and even nationally.

Lymnaea peregra



The Whirlpool Ramshorn *Anisus vortex* was located at two sample points. This small ramshorn snail is often frequent where it occurs.

The Genus *Physa* was represented by a single species, *Physa fontinalis*, occurring at four sample points. It is recognised that a number of alien species have arrived in the United Kingdom in recent years and their spread is causing identification problems. This taxonomic minefield will hopefully be addressed in the near future.

The two members of Succineadae included in this survey are *Oxyloma pfeifferi* and *Succinea putris*. These wetland specialists occur wherever there is emergent vegetation with leaves broad enough to support them. They both were recorded at the southern oxbow. *O.pfeifferi* was also recorded at the southern stream sample point and the pond.

Photograph showing the differences in size, colour and shell smoothness. *Oxyloma pfeifferi* (left) and *Succinea putris* (right).



Bithynia leachii is a rare mollusc in Cheshire, much preferring the calcareous waters of southern and eastern England. This animal persists in small numbers at Marshall's Arm in the northern oxbow.

Malacostraca

The Water Hog-louse *Asellus aquaticus* and American shrimp *Crangonyx pseudogracilis* are crustaceans often found co-existing. Both are common and widespread and appear quite tolerant to a range of conditions throughout the aquatic spectrum. *A. aquaticus* occurred in all water bodies except stream sample point 2, and *Crangonyx pseudogracilis* occurred in three; co-existing in three. They are both common invertebrates, having an uncanny ability, considering the fact they cannot fly, to disperse and colonise new waters; relatively easy in connected waters such as the oxbows but seemingly just as easy with remote waters such as the pond. They are often frequent/abundant where they occur.



Water hog-louse *Asellus aquaticus*

Gammarus pulex, a freshwater shrimp that requires higher oxygen levels than the previous two species was encountered at both oxbows and the most northerly stream sample point; it being the only invertebrate recorded here.

Ephemeroptera

A single species of mayfly - *Cloeon dipterum* - was recorded during the survey which is nothing unusual for this group; most mayflies – like stoneflies - favour fast flowing, well oxygenated water. This insect was found to be present at the pond in low numbers.

Megaloptera

The mud-dwelling larvae of the alderfly *Sialis lutaria* were found at the pond. There are only two species of alder fly in Britain, and only *Sialis lutaria* occurs in the region. The adults and eggs of this species can be seen on various broad leaved reeds from early summer.

Odonata

Nine species of dragonfly and damselfly were recorded; seventeen records in total; mostly breeding records. This consisted of four species of *Anisoptera* (dragonflies) and five species of *Zygoptera* (damselflies).

Abundance codes between damselflies and dragonflies tend to differ, as large anisopterans usually exist at lower densities whereas zygopterans are more populous. This seemed not to be the case during this survey as only low numbers of damselfies were netted. It must be stressed that 'adult' records mean little in an area such as this, as a patrolling or dispersing adult may well travel along the River Weaver or even across land. Larval records are much more valuable as an indication of water quality and habitat suitability.

Colonisation by *Aeshna mixta*; the migrant hawker has occurred all over Cheshire in the last fifteen years making it arguably the county's commonest hawker. This species was found in its larval stage, therefore breeding, at both the pond and the southern oxbow.



Aeshna mixta teneral adult male

Coenagrion puella and *C. pulchellum* larvae cannot be reliably split but the latter is extremely localised in Cheshire and no sites are known local to Marshall's Arm Nature Reserve so it is safe to assume that Coenagrion larval records are *C. puella*.

Azure damselfly
Coenagrion puella



The Zygopterans recorded most frequently during the survey was the Blue-tailed Damselfly *Ischnura elegans* and the Azure Damselfly *Coenagrion puella*, both occurring at four sample points.

The Emperor Dragonfly *Anax imperator*, is another relative newcomer to Cheshire. This was only encountered in the adult stage during the survey; an adult male observed patrolling over the northern oxbow.



Emperor Dragonfly *Anax imperator*

Hemiptera

Aquatic bugs usually make up the second largest group after Coleoptera within a survey such as this but on this occasion the mollusc fauna has proved much more diverse.

Seven aquatic bugs were encountered during the survey; four classed as surface dwellers.

The bug that occurred at most sample points was Pond Skater *Gerris lacustris*,

Also recorded was the surface-dwelling bug was the water measurer *Hydrometra stagnorum*, present at both oxbows. This fragile looking insect spends its life on the water surface waiting for careless insects such as moths to crash into the water and become trapped.

The Water Cricket *Velia caprai* was recorded from the southern stream. This is a shade tolerant surface dweller which prefers running water.

Trichoptera

A single species of Caddis was netted, *Limnephilus flavicornis*. It was recorded from the pond and both oxbows. *L. flavicornis* is both widespread and common within the region.

Coleoptera

Beetles were the largest group of taxa and made up 32% of all species recorded during this survey. Among the twenty six species recorded are two that have been classed as at least Scarce by the Joint Nature Conservation Committee (JNCC).

Cercyon convexiusculus Nb 9

This small scavenger beetle was located at the southern oxbow. Its days as a 'scarce' status beetle are possibly numbered as it is widespread and often abundant where it exists. Often found in the mossy margins; a good technique is to dip a net into the depression created by the surveyor's waders.

Cercyon tristis Nb 1

This is a small scavenger beetle, very similar to *C. convexiusculus*. A singleton was located at the southern oxbow; a site with plenty of *Phragmites detritus*.

Other beetles

Agabus bipustulatus occurred at two sample points; the southern stream and the pond. This almond sized black beetle is probably the most common and widespread aquatic beetle in the county.



Agabus bipustulatus

The brown to black scavenger beetles *Anacaena limbata* and *A.globulus* occurred in 1 and two sample points respectively. Both beetles are common and widespread and often occur in good numbers.

Two *Hydroporus* beetles were encountered; *Hydroporus planus* and *H. striola*, both found in the northern oxbow.

Two Reed Beetles were encountered; *Donacia simplex* and *Sericea plateumaris*. Whilst *D.simplex* is common throughout the county at water bodies with emergent vegetation *S. plateumaris* is much more localised and its somewhat random distribution and occurrence is not yet understood.

6. Amphibians and Fish Results

It should be noted that the records below are incidental records. No meaningful survey for the amphibians and fish was undertaken.

Amphibians

Frog tadpoles were netted in the pond. Toad tadpoles were netted in the southern oxbow.

A Smooth Newt *Lissotriton vulgaris* adult female was recorded at the pond and newt eggs from what is putatively Smooth Newt were recorded (The eggs and larvae of smooth and palmate newts are not reliably separable in the field.) The Palmate Newt *Lissotriton helveticus* is extremely localised in Cheshire restricted to mainly acidic sites.

Fish

Three-spined Sticklebacks were recorded from the river and at four of the sites and Ten-spined Sticklebacks were noted at the pond.

7. Management recommendations

A management plan for Marshall's Arm LNR was drawn up in 1998 by ecologist Jonathan Guest. This should be used as a working document if the aims outlined are to be achieved. Whilst it is understood that the inability to follow the management plan may be down to limited finances and volunteers, it is obviously not ecologically sound to change the management plan every decade to suit the current conditions.

Silt Traps

If stability is to be maintained at the site then it is vital that silt traps are emptied before they reach capacity. This is perhaps the most important job at the LNR as the purpose is to halt the infilling of the oxbows with sediment. There is evidence that this is what is now happening.

Southern Oxbow

The existing management plan suggests monitoring of succession in the channel nearest to the stream inlet and action when required; it is recommended now that a stretch of around thirty metres by four metres is de-silted and vegetation removed. This action could be carried out at the same time as the silt traps are emptied. The southern oxbow will be lost in time if succession and silt deposition continues.

Pond - *Crassula helmsii*

The pond is a great asset to the reserve and has provided a number of plant species and aquatic macro-invertebrates to the list. Unfortunately the pond now has perhaps the most pernicious alien aquatic plant in the country; *Crassula helmsii*. This plant has the ability to sterilise a pond by replacing other weaker marginal plants and shading out submerged macrophytes. It can spread across the open water of a pond and even spread terrestrially away from the pond into damp areas. There is a real danger that it can spread and contaminate the other water bodies within the reserve by attaching itself to plumage or pelage of visiting wildlife, or more likely, being carried between the toes of dogs. The author is not aware of a single contaminated site that isn't subjected to dog walking activities and new colonies of this plant are always in dog entry-points into the water. The author knows of no certain remedy for this other than filling in the pond. If there are attempts to control this plant by removal then the volunteers must be extra vigilant and have safeguards in place. Advice should be sought from the Environment Agency, Natural England or an ecologist before this is attempted.

Northern stream

The management aims to let light into this area from the south is easily achievable and should be undertaken in winter.

New Features

The pond, when new, would have undoubtedly attracted different species for a number of years and these features in the landscape enable pioneer species to maintain a foothold locally. If a new water body can be created then it would certainly be a benefit to the reserve as a whole. It may be possible to use a new pond to replace the existing pond if indeed it is decided that infilling, which could be temporary, is the best way to deal with the *Crassula helmsii*. There should be no translocation of any material whatsoever to the new pond and a substantial fence around the contaminated pond would be required to deter people and dogs until it is infilled. This work should take place in winter.

POND NUMBER	Pond	Southern Oxbow	Northern Oxbow	Southern Stream	Northern Stream	River	Total
YEAR:	2010	2010	2010	2010	2010	2010	
Grid reference	SJ648722	SJ650722	SJ650719	SJ649720	SJ651725	SJ40047096	
TOTAL SPECIES FOUND	35	41	27	8	1	18	
TRICLADIDA:							
<i>Dugesia lugubris/polychroa</i>	o	o	o				3
<i>Polycelis tenuis/nigra</i>		r					1
Total Tricladida:	1	2	1	0	0	0	4
HIRUDINEA:							
<i>Erpobdella octoculata</i>			o				1
<i>Erpobdella testacea L</i>	r						1
<i>Glossiphonia complanata</i>						r	1
<i>Glossiphonia heteroclita L</i>		r					1
<i>Haemopsis sanguisuga L</i>	o						1
<i>Theromyzon tessulatum</i>	r						1
<i>Piscicola geometra</i>			o			o	2
Total Hirudinea:	3	1	2	0	0	2	8
MOLLUSCA:							
<i>Potamopyrgus jenkinsi</i>						f	1
<i>Lymnaea cf palustris</i>						o	1
<i>Lymnaea peregra</i>	o	o				o	3
<i>Lymnaea stagnalis</i>	o		o				2
<i>Lymnaea truncatula</i>			r				1
<i>Physa fontinalis</i>	o	o	f			o	4
<i>Bithynia leachii</i>		o					1
<i>Bithynia tentaculata</i>	o	o	f			o	4
<i>Anisus vortex</i>	o			o			2
<i>Armiger crista</i>	r						1
<i>Gyraulus albus L</i>		o				r	2
<i>Hippeutis complanatus L</i>	o						1
<i>Planorbarius corneus</i>	o						1
<i>Planorbis carinatus</i>	o	o	o				3
<i>Anodonta cygnea L</i>			o				1
<i>Anodonta anatina</i>			r			o	2
<i>Sphaerium corneum</i>	o						1
<i>Sphaerium lacustre</i>			o				1
<i>Sphaerium rivicola</i>						o	1
<i>Dreissena polymorpha</i>			o			o	2
<i>Oxyloma pfeifferi</i>	r	r		o			3
<i>Succinea putris</i>		r					1
<i>Viviparus viviparus</i>						o	1
Total Mollusca:	11	8	9	2	0	10	40
MALACOSTRACA:							
<i>Asellus aquaticus</i>	f	f	f	f		f	5
<i>Crangonyx pseudogracilis</i>	f	f	f				3
<i>Gammarus pulex</i>		o	o		a		3
Total Malacostraca	2	3	3	1	1	1	11

POND NUMBER	Pond	Southern Oxbow	Northern Oxbow	Southern Stream	Northern Stream	River	Total
YEAR:	2010	2010	2010	2010	2010	2010	
Grid reference	SJ648722	SJ650722	SJ650719	SJ649720	SJ651725	SJ40047096	
TOTAL SPECIES FOUND	35	41	27	8	1	18	
EPHEMEROPTERA:							
<i>Cloeon dipterum</i>	o						1
Total Ephemeroptera	1	0	0	0	0	0	1
MEGALOPTERA:							
<i>Sialis lutaria</i>	1						1
Total Megaloptera	1	0	0	0	0	0	1
ODONATA:							
<i>Aeshna grandis</i> N L	r ad						1
<i>Aeshna mixta</i>	r	o					2
<i>Anax imperator</i> RN			Ad m				1
<i>Sympetrum striolatum</i> N	o						1
<i>Calopteryx splendens</i> L						r	1
<i>Coenagrion puella</i> N	o	o	o			r	4
<i>Erythromma najas</i> N L						r	1
<i>Ischnura elegans</i> N		r	o	o		o	4
<i>Pyrrhosoma nymphula</i> N	o	o					2
Total Odonata:	5	4	3	1	0	4	17
HEMIPTERA:							
<i>Sigara dorsalis</i>		o				r	2
<i>Gerris lacustris</i>	o	o	o				3
<i>Gerris odontogaster</i>		o					1
<i>Hydrometra stagnorum</i>		o	o				2
<i>Nepa cinerea</i>	r	r					2
<i>Notonecta glauca</i>	r	o					2
<i>Velia caprai</i>				f			1
Total Hemiptera:	3	6	2	1	0	1	13

POND NUMBER	Pond	Southern Oxbow	Northern Oxbow	Southern Stream	Northern Stream	River	Total
YEAR:	2010	2010	2010	2010	2010	2010	
Grid reference	SJ648722	SJ650722	SJ650719	SJ649720	SJ651725	SJ40047096	
TOTAL SPECIES FOUND	35	41	27	8	1	18	
LEPIDOPTERA:							
<i>Cataclysta lemnata</i>	o						1
<i>Nymphula nymphaeata</i>							0
Total lepidoptera	1	0	0	0	0	0	1
TRICHOPTERA:							
<i>Limnephilus flavicornis</i>	r	o	o				3
Total Trichoptera:	1	1	1	0	0	0	3
COLEOPTERA:							
<i>Gyrinus substriatus</i>		o	o				2
<i>Haliphus ruficollis</i>	r						1
<i>Noterus clavicornis L</i>		o					1
<i>Acilius sulcatus</i>			r				1
<i>Dytiscus marginalis</i>	r						1
<i>Dytiscus spp (larvae)</i>		o					1
<i>Colymbetes fuscus</i>		r					1
<i>Agabus bipustulatus</i>	o			r			2
<i>Ilybius fuliginosus</i>		r		r			2
<i>Hydroporus planus</i>			r				1
<i>Hydroporus striola L</i>			r				1
<i>Hygrotus inaequalis</i>		r					1
<i>Anacaena globulus</i>	o	o					2
<i>Anacaena limbata</i>		o					1
<i>Cercyon convexiusculus Nb</i>		o					1
<i>Cercyon tristis Nb</i>		r					1
<i>Enochrus testaceus L</i>	r		r				2
<i>Helophorus brevipalpis</i>		o	o				2
<i>Hydrobius fuscipes</i>		o					1
<i>Donacia simplex L</i>		o					1
<i>Plateumaris sericea</i>	o						1
<i>Cyphon hilaris L</i>		r					1
<i>Scirtidae (larvae only)</i>				o			1
<i>Anisosticta 19-punctata L</i>		o					1
<i>Coccidula rufa</i>		r					1
Total Coleoptera:	6	16	6	3	0	0	31
							R = 1
Smooth Newt	Ad f						O = 2 - 10
Toad		toadlets					F = 11 - 100
Frog	tads						A = 100plus
onl							
3 sp stickleback							
10 sp stickleback	o					o	