

Little Ouse Headwater  
Project:  
Pre-restoration survey  
for aquatic invertebrates  
2013

Survey carried out by Toby Abrehart FLS



## Table of Contents

Executive Summary .....	3
1. Introduction and background .....	4
2. Methods.....	4
2.1 Field survey method and sample collection .....	4
2.2 Laboratory procedures and analyses .....	6
3. Results .....	6
4. Discussion .....	7
5. References .....	7
6. Acknowledgements .....	7
Appendices .....	8
Appendix A .....	9
Appendix B .....	14

## *Executive Summary*

The Little Ouse Headwater Project is a community driven conversation program with the aim of promoting the conservation of the fenland and habitats in the area of the Little Ouse river origin.

The Environment Agency plans to carry out channel restoration works on the Little Ouse directly adjacent to land under the management of the project. Therefore, this survey was commissioned to create a baseline set of data for the aquatic invertebrate community of the river before the works.

Samples were taken from five sites along the Little Ouse where the works will take place within the project area. Details are given of the habitat and channel characteristics as well as, species lists of the invertebrates recorded. In addition, the invertebrate community data has been used to indicate water quality and conservation value.

The Little Ouse channel increased in size downstream from site 1 to 5. This was accompanied by a decrease in the levels of detritus and an increase in the cleanliness and oxygen levels of the water as indicated by analysis of the aquatic invertebrate communities found each sampling site.

After the restoration works have taken place, a comparable survey should be undertaken to assess the effects of any subsequent changes to the river channel.



Photo: *Sialis lutaria* ©abrehartecology

## 1. Introduction and background

The Little Ouse Headwater Project (LOHP) area encompasses the source of the Little Ouse river and the project supports the conservation of the its associated fenland habitat and upper river valley landscape. The project was set up in 2002 to support the conservation of the river following the loss of much of the fenland habitat.

The Environment Agency (EA) will be carrying out restoration works on a two kilometre section of the Little Ouse within the project area. This survey was commissioned by LOHP to monitor the biological effects of the works, particularly in terms of the associated modification of the macro-invertebrate communities present in the channel sediments.

This report details the results of the aquatic invertebrate survey carried out in September 2013 prior to the commencement of works by the EA.

## 2. Methods

### 2.1 Field survey method and sample collection

- The aquatic invertebrate survey was undertaken on 27th September 2013 by Abrehart Ecology.
- Written descriptions of each sampling site and habitat type were prepared according with the Environment Agency aquatic invertebrate sampling procedure. Photographs of all sites were taken to further document the site conditions and to enable direct comparisons of the sampling sites with future monitoring surveys.
- Each sampling site location was recorded using a hand-held GPS and noted as a ten-figure grid reference coordinate.
- The vegetation of the habitat in the immediate vicinity of each sampling site was assessed and the main plant species identified. The abundance of each plant species was recorded on the DAFOR scale:
  - D – Dominant (over 70% cover)
  - A – Abundant (70-50% cover)
  - C – Common (50–30 % cover)
  - F – Frequent (10-30% cover)
  - O – Occasional (3-10% cover)
  - R – Rare (less than 3% cover)
- The presence of aquatic plants and their relative abundance within the water bodies was documented.
- Representative sampling sites were selected for the assessment of the macro invertebrate and mollusc communities. At each sampling site a single invertebrate sample was collected using a standard International Standards Organisation (ISO) “ecologist’s” hand-net. A “figure-of-eight” sweep technique was employed for a total of two minutes per site. All materials retained in the net was transferred to a 5 litre, sealable plastic sample bucket and returned to the laboratory for subsequent processing.

# Little Ouse Headwater Project Invertebrate Sampling Sites September 2013

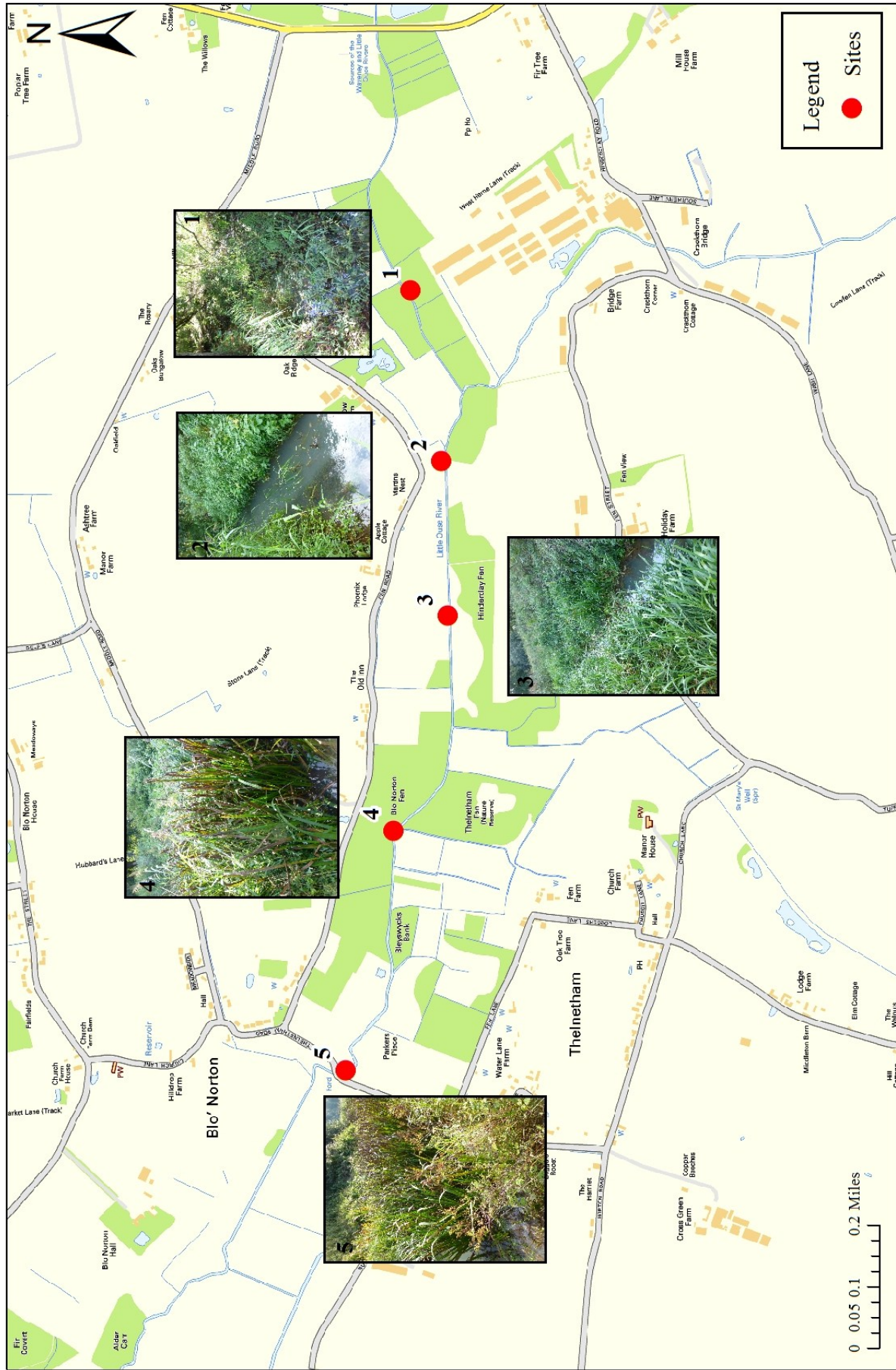


Figure 1. Location and photos of sampling sites, 27th September 2013

## 2.2 Laboratory procedures and analyses

All invertebrates were separated from the retained sediment, detritus and vegetation under 40 - 80x stereo, binocular microscopes. These were then further separated into the major taxonomic groups, preserved in alcohol (70% IMS) and referred to the appropriate taxonomist for identification.

Where possible, all specimens were identified to species level. Exceptions to this are groups that require specialist, time-consuming preparatory techniques such as head capsule dissection for chironomid larvae and prolonged clearing procedures for oligochaetes species. Such procedures are beyond the remit of the present study. In these cases, specimens are allocated to *observed taxonomic units* (OTUs).

Given that (i) the objectives of the survey were to characterise the invertebrate community of the aquatic habitats and not undertake an extensive, fully quantitative survey and (ii) the sampling methods appropriate to sampling still-water habitats are considered semi-quantitative, directly comparable quantitative units (e.g. number per metre<sup>2</sup>) could not be used to provide rigorous quantitative descriptions of invertebrate abundance. Consequently, the data for the invertebrate taxa and assemblages are presented as “numbers per species per sample”.

## 3. Results

The sampling sites selected for this survey were located on the river adjacent to land within the LOHP area (figure 1), namely The Lows, Hinderclay Fen, Blo' Norton Fen, Webbs Fen and Parkers Piece.

### 3.1 Habitat and channel characteristics

There was considerable change in the habitat and channel characteristics downstream from site 1 to site 5 (appendix A). At site 1, there was no apparent flow of water and the channel was choked with detritus, whereas downstream the channel increased in size and there was a flow of water up to 50cm deep.

### 3.2 Aquatic invertebrate samples

Analysis of the aquatic invertebrate sample results was undertaken using Site Analysis for Freshwater Invertebrate Surveys (SAFIS) program. Please refer to table 1 for the scores given by SAFIS and appendix B (table 1) for site by site species lists.

SAFIS gave four outputs which indicate the water quality based on the community of invertebrates identified in freshwater samples. Biological Monitoring Working Party (BMWP) scores and Average Score Per Taxon (ASPT) indicate the water cleanliness and oxygenation levels based on the known tolerance of invertebrate families to water pollution. The higher these values the higher the better the water quality. In this survey, the BMWP scores increased from 15.3 (poor water quality) at site 1 to 28 (moderate water quality) at site 3, it then decreased at site 4 before increasing to 53.7 (good water quality). Therefore, it can be suggested that the cleanliness and oxygen levels in the water increased along the length of the Little Ouse surveyed. ASPT will be valuable in the future for comparison with future data sets.

SAFIS also gave the Lincoln Quality Index (LQI) for each site which is similar to BMWP, however, it also takes into account the quality of the habitat (habitat poor to habitat rich). Sites 1 to 3 were rated as 'E' (moderate quality), site 4 as 'F' (poor quality) whilst site 5 was rated 'D' (moderate quality). Therefore, overall there was an increase in the water quality.

The Community Conservation Index (CCI), developed by the Environment Agency, scores samples based on the BMWP score and the rarity of the species recorded. The higher the CCI values the less common the aquatic invertebrate species recorded. There was an increase in conservation value from site 1 to 5 in this survey. Site 1 had low conservation value, whilst sites 2, 3 and 5 had moderate conservation value and site 4 had fairly high conservation value and supported several uncommon species or several of restricted distribution and/or a community of high taxon richness.

In conclusion, a decrease in the amount of detritus and an increase in the channel size was accompanied by an increase in the water quality and aquatic invertebrate species diversity/rarity of the Little Ouse.

Site	Revised BMWP score	APST revised system	LQI	CCI
1	15.2	3.8	E	9.00
2	35.9	3.59	E	10.50
3	28.0	3.50	E	13.13
4	17.8	3.56	F	15.00
5	53.7	3.58	D	11.58

Table 1. Revised biological monitoring working party (BMWP), Average Score per Taxon, Lincoln Quality Index (LQI) and Community Conservation Index (CCI) for each sampling site

#### 4. General Discussion

The results presented in this report give the baseline data for comparison with surveys undertaken after the completion of the Environment Agency channel restoration works.

#### 5. References

*This report to be cited as:*

Abrehart T.R. (2013). Little Ouse Headwater Project: Pre-restoration survey of aquatic invertebrates 2013. An ecological survey including floral and faunal observations undertaken for the LOHP by Abrehart Ecology.

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LOHP Website <http://www.lohp.org.uk/> (accessed: 04/11/2013 by R Jackson)

SAFIS v4.0, Box Valley Aqua Surveys, [www.boxvalley.co.uk](http://www.boxvalley.co.uk)

#### 6. Acknowledgements

Abrehart Ecology would like to thank Helen Smith of the Little Ouse Headwaters Project for commissioning this survey.

# *Appendix A*

*Site by site habitat  
and channel  
characteristics,  
collected 27th  
September 2013*



# LOHP Site 1

Substrate	
Bedrock	Pebbles
Boulders	Gravel
Cobbles	Sand
	Peaty debris

Channel	
Av. Width (m)	1.5
Av. Depth (cm)	10
Av. Chan Depth (cm)	5
Conductivity	823

Water Course	Little Ouse	Date Sample method	27/09/2013 Two minute sweep
Site ID	1		
Photo	106-0136 106-0137 106-0138		
Grid ref	TM0325578924		

Sewage Litter	Detritus	Odour	Turbidity	Shade	Flow	Influences	General	Bed stability	Bank structure	Habitat
None	None	None	Clear	None	Dry	Dredging	Rubbish	Solid	Predominantly bare ground	Torrent
Local	Local	Slight	Slight	Light	No flow	Weed cut	Oil film	Stable	Uniform (1 dom. Veg type)	Riffle
Widespread	Widespread	Strong	Mod	Mod	Low	Saline	Oil deposit	Unstable	Simple (2-3 dom. Veg type)	Pool
Gross	Extensive		Heavy	Heavy	Normal			Loose	Complex (>4 dom veg types)	Run
					High Spate			Soft		Glide
								Dangerous		Slack
										Ditch
										Waterfall
										Cascade
										Rapid
										Ponded reach
										Marg dead
										exposed bedrock
										Mature island
										Unveg mid bar
										Veg mid bar
										Unveg mid bar
										Veg side bar
										Silt deposit
										Sand deposit
										Trickle

	Sewage fungus	Overlay silt	Ochre	Filamentous algae	Non-filamentous algae	Macrophyte	Moss
Not present	Not present	Not present		Not present	Not present		Not present
Cover density (%)						10	
Trace							
Thin			Thin				
Thick							
Massive							

Land	
Broadleaf	Scrub
Coniferous wood	Tall
Open water	Tilled land
Sub/urban	Improved rough pasture
Rock&scree	Industrial
Orchard	Farm Buildings
Wetland	Road/railway
Moorland/Heath	
Parkland/Garden	

Notes:  
Small, no flow

Bank side botany:  
*Carex remota* (O)  
*Glechoma hederacea* (O)  
*Dryopteris diljitata* (O)  
*Rubus spp.* (O)  
*Urtica dioica* (O)  
*Fraxinus excelsior* (O)  
*Alnus glutinosa* (F)



## LOHP Site 2

<b>Water Course</b>	Little Ouse	<b>Date</b>	27/09/2013
<b>Site ID</b>	2	<b>Sample method</b>	Two minute sweep
<b>Photo</b>	106-0142 106-0143 106-0144		
<b>Grid ref</b>	TM0280878844		

<b>Channel</b>	
Av. Width (m)	1.8
Av. Depth (cm)	55
Conductivity	50
	848

<b>Substrate</b>	
Bedrock	Pebbles
Boulders	Gravel
Cobbles	Sand
	Clay
	Peaty debris

Sewage Litter	Detritus	Odour	Turbidity	Shade	Flow	Influences	General	Bed stability	Bank structure	Habitat
None	None	None	Clear	None	Dry	Dredging	Rubbish	Solid	Predominantly bare ground	Torrent
Local	Local	Slight	Slight	Light	No flow	Weed cut	Oil film	Stable	Uniform (1 dom. Veg type)	Riffle
Widespread	Widespread	Strong	Mod	Mod	Low	Saline	Oil deposit	Unstable	Simple (2-3 dom. Veg type)	Pool
Gross	Extensive		Heavy	Heavy	Normal			Loose	Complex (>4 dom veg types)	Run
					High Spate			Soft		Glide
								Dangerous		Slack
										Ditch
										Waterfall
										Cascade
										Rapid
										Ponded reach
										Marg dead
										exposed bedrock
										Mature island
										Unveg mid bar
										Veg mid bar
										Unveg mid bar
										Veg side bar
										Silt deposit
										Sand deposit
										Trickle

	Sewage fungus	Overlay silt	Ochre	Filamentous algae	Non-filamentous algae	Macrophyte	Moss
Not present	Not present	Not present		Not present	Not present		Not present
Cover density (%)					30		
Trace							
Thin			Thin				
Thick							
Massive							

<b>Land</b>	
Broadleaf	Scrub
Coniferous wood	Tall
Open water	Tilled land
Sub/urban	Improved rough pasture
Rock&scree	Industrial
Orchard	Farm Buildings
Wetland	Road/railway
Moorland/Heath	
Parkland/Garden	

**Land key:**  
Primary:  
Secondary:

**Botany**  
Norfolk side:  
*Calamagrostis canescens* (R)  
*Glyceria maxima* (D)  
*Urtica dioica* (O)  
*Galium aparine* (F)  
*Solanum dulcamara* (R)  
*Phragmites australis* (R)

Suffolk side:  
*Urtica dioica* (D)  
*Calamagrostis canescens* (R)  
*Galium aparine* (O)  
*Rubus spp.* (O)  
*Heracleum sphondylium* (R)

Water channel:  
*Sparganium erectum* (O)  
*Myosotis scorpioides* (O)

# LOHP Site 3

<b>Water Course</b>	Little Ouse	<b>Date</b>	27/09/2013
<b>Site ID</b>	3	<b>Sample method</b>	Two minute sweep
<b>Photo</b>	106-0139 106-0140 106-0141		
<b>Grid ref</b>	TM0240378827		

<b>Channel</b>	
Av. Width (m)	2
Av. Depth (cm)	50
Conductivity	848

<b>Substrate</b>	
Bedrock	Pebbles
Boulders	Gravel
Cobbles	Sand
	Clay
	Peaty debris

Sewage Litter	Detritus	Odour	Turbidity	Shade	Flow	Influences	General	Bed stability	Bank structure	Habitat
None	None	None	Clear	None	Dry	Dredging	Rubbish	Solid	Predominantly bare ground	Torrent
Local	Local	Slight	Slight	Light	No flow	Weed cut	Oil film	Stable	Uniform (1 dom. Veg type)	Riffle
Widespread	Widespread	Strong	Mod	Mod	Low	Saline	Oil deposit	Unstable	Simple (2-3 dom. Veg type)	Pool
Gross	Extensive		Heavy	Heavy	Normal			Loose	Complex (>4 dom veg)	Run
					High			Soft		Glide
					Spate			Dangerous		Slack
										Ditch
										Waterfall
										Cascade
										Rapid
										Ponded reach
										Marg dead exposed
										Mature island
										Unveg mid bar
										Veg mid bar
										Unveg mid bar
										Veg side bar
										Silt deposit
										Sand deposit
										Trickle

	Sewage fungus	Overlay silt	Ochre	Filamentous algae	Non-filamentous algae	Macrophyte	Moss
Not present	Not present	Not present		Not present	Not present		Not present
Cover density (%)							
Trace			Trace		50		
Thin							
Thick							
Massive							

<b>Land</b>	
Broadleaf	Scrub
Coniferous wood	Tall
Open water	Tilled land
Sub/urban	Improved rough pasture
Rock&scree	Industrial
Orchard	Farm Buildings
Wetland	Road/railway
Moorland/Heath	
Parkland/Garden	

<b>Botany</b>	
Norfolk side:	<i>Phragmites australis</i> (D) <i>Calamagrostis canescens</i> (O) <i>Solanum dulcamara</i> (O)
Water channel:	<i>Elodea canadensis</i> (A) <i>Callitriche stagnalis</i> (O) <i>Myosotis scorpiodes</i> (O)
Suffolk side:	<i>Dactylis glomeratus</i> (F) <i>Arrhenatherum elatius</i> (F) <i>Urtica dioica</i> (F) <i>Phragmites australis</i> (O) <i>Angelica sylvestris</i> (R) <i>Conium maculatum</i> (R) <i>Scrophularia auriculata</i> (R) <i>Rorippa nasturtium-aquaticum</i> (R)



# LOHP Site 4

Water Course	Little Ouse	Date	27/09/2013
Site ID	4	Sample method	Two minute sweep
Photo(s)	106-0145 106-0146 106-0147		
Grid ref	TMD184178969		

Channel	
Av. Width (m)	4
Av. Depth (cm)	60
Av. Chan Depth	60
Conductivity	786

Substrate	
Bedrock	Pebbles
Boulders	Gravel
Cobbles	Sand
	Clay
	Peaty debris

Sewage Litter	Detritus	Odour	Turbidity	Shade	Flow	Influences	General	Bed stability	Bank structure	Habitat
None	None	None	Clear	None	Dry	Dredging	Rubbish	Solid	Predominantly bare ground	Torrent
Local	Local	Slight	Slight	Light	No flow	Weed cut	Oil film	Stable	Uniform (1 dom. Veg type)	Riffle
Widespread	Widespread	Strong	Mod	Mod	Low	Saline	Oil deposit	Unstable	Simple (2-3 dom. Veg type)	Pool
Gross	Extensive		Heavy	Heavy	Normal			Loose	Complex (>4 dom veg types)	Run
					High Spate			Soft		Glide
								Dangerous		Slack
										Ditch

	Sewage fungus	Overlay silt	Ochre	Filamentous algae	Non-filamentous algae	Macrophyte	Moss
Not present	Not present			Not present	Not present		
Cover density (%)					80		Not present
Trace		Thin	Trace				
Thin							
Thick							
Massive							

Land	
Broadleaf	Scrub
Coniferous wood	Tall
Open water	Tilled land
Sub/urban	Improved rough pasture
Rock&scree	Industrial
Orchard	Farm Buildings
Wetland	Road/railway
Moorland/Heath	
Parkland/Garden	

**Land key:**  
 Primary:   
 Secondary:

**Notes:**  
 Mayfly larvae and *Succinia putris* recorded

**Botany**  
 Banks:  
*Phragmites australis* (D)  
*Urtica dioica* (F)  
*Calystegia silvatica* (O)  
*Iris pseudacorus* (O)  
*Epilobium hirsutum* (O)  
*Glechoma hederacea* (O)  
*Rubus spp.* (O)

**Water channel:**  
*Sparganium erectum* (D)  
*Phragmites australis* (R)  
*Lythrum salicaria* (R)  
*Lemna minor* (O)  
*Berula erecta* (R)



# LOPH Site 5

Water Course	Little Ouse	Date	27/09/2013
Site ID	5	Sample method	Two minute sweep
Photo(s)	106-0150 106-0151 106-0152		
Grid ref	TM0121479095		

Channel	
Av. Width (m)	4
Av. Depth (cm)	60
Av. Chan Depth	50
Conductivity	780

Substrate	
Bedrock	Pebbles
Boulders	Gravel
Cobbles	Sand
	Clay
	Peaty debris

Sewage Litter	Detritus	Odour	Turbidity	Shade	Flow	Influences	General	Bed stability	Bank structure	Habitat
None	None	None	Clear	None	Dry	Dredging	Rubbish	Solid	Predominantly bare ground	Torrent
Local	Local	Slight	Slight	Light	No flow	Weed cut	Oil film	Stable	Uniform (1 dom. Veg type)	Riffle
Widespread	Widespread	Strong	Mod	Mod	Low	Saline	Oil deposit	Unstable	Simple (2-3 dom. Veg type)	Pool
Gross	Extensive		Heavy	Heavy	Normal			Loose	Complex (>4 dom veg types)	Run
					High Spate			Soft		Glide
								Dangerous		Slack
										Ditch

	Sewage fungus	Overlay silt	Ochre	Filamentous algae	Non-filamentous algae	Macrophyte	Moss
Not present	Not present			Not present	Not present		Not present
Cover density (%)							
Trace		Trace	Trace		15		
Thin							
Thick							
Massive							

Land	Land key:	Botany	Suffolk side:	Water channel:
Broadleaf	Primary:	Norfolk side:	<i>Arrhenatherum elatius</i> (F)	<i>Sparganium erectum</i> (D)
Coniferous wood	Secondary:	<i>Urtica dioica</i> (F) <i>Rosa canina</i> (O) <i>Callistegia sepium</i> (O) <i>Humulus lupulus</i> (O) <i>Eupatorium cannabinum</i> (O) <i>Calamagrostis canescens</i> (O)	<i>Calamagrostis canescens</i> (O) <i>Urtica dioica</i> (O) <i>Cirsium arvense</i> (O) <i>Cirsium vulgare</i> (O) <i>Taraxacum officinale</i> (O) <i>Rubus spp.</i> (R) <i>Glyceria maxima</i> (O)	<i>Rorippa nasturtium-aquaticum</i> (O) <i>Lemna minor</i> (R) <i>Lemna minuta</i> (O) <i>Pontagneton crispus</i> (R) <i>Scrophularia auriculata</i> (R) <i>Elodea canadensis</i> (R) <i>Carex riparia</i> (O) <i>Callitriche stagnalis</i> (R)
Open water				
Sub/urban				
Rock&scree Orchard				
Wetland				
Moorland/Heath				
Parkland/Garden				

Notes:  
Fresh water vole droppings

## *Appendix B*

*Site by site aquatic  
invertebrates species  
list, samples collected  
27th September 2013*

Taxa	Site number				
	1	2	3	4	5
<b>Tricladida</b>					
Planariidae					
<i>Dugesia lugubris</i>					1
<i>Planaria torva</i>			1		
<b>Oligochaeta</b>					
<i>Oligochaetae species 1</i>			6	5	4
<b>Hirundinea</b>					
<i>Erpobdella octoculata</i>		6	6	2	16
<i>Glossiphonia complanata</i>		1	1	9	2
<b>Gastropoda</b>					
Physidae					
<i>Physa fontinalis</i>					6
Lymnaeidae					
<i>Lymnaea truncatula</i>	2				1
<i>Lymnaea stagnalis</i>					2
<i>Radix balthica</i>					2
Hydrobiidae					
<i>Potamopyrgus antipodarum</i>		3			
Planorbidae					
<i>Valvata cristata</i>					2
<i>Anisus vortex</i>		2			37
<i>Bathymphalus contortus</i>			1		15
Acroloxiidae					
<i>Acroloxus lacustris</i>					5
Helicidae					
<i>Cepaea nemoralis</i>			1	1	
<b>Bivalvia</b>					
Sphaeriidae					
<i>Sphaerium corneum</i>					4
<i>Pisidium milium</i>					7
<i>Pisidium personatum</i>	1591	1	1		
<b>Crustacea</b>					
Gammaridae					
<i>Gammarus lacustris</i>		17	71	57	131
Isopoda					
<i>Asellus aquaticus</i>	1	5	14	13	18
Ostracoda					
<i>Ostracod species 1</i>			1		1

Table 1: abundances of the aquatic invertebrate species recorded in the Little Ouse River (see figure 1) Norfolk, during the survey undertaken by Abrehart Ecology on 27<sup>th</sup> September 2013 for the LOHP

Taxa	Site number				
	1	2	3	4	5
<b>Trichoptera</b>					
Limnephilidae					
<i>Limnephilus species 1</i>			1		
<i>Baetis scambus</i>					5
<i>Centroptilum luteolum</i>			14	2	
<i>Limnephilus species 1</i>		2		1	
<b>Hemiptera</b>					
Notonectidae					
<i>Notonecta marmorea viridis</i>					3
Corixidae					
<i>Callicorixa praeusta</i>			5		1
<i>Sigara distincta</i>		3			
<b>Megaloptera</b>					
Sialidae					
<i>Sialis lutaria</i>		5			2
<b>Diptera</b>					
Chironomidae					
<i>Chironomid species 1</i>	3	7	10	15	
Chaboridae					
<i>Chaboridae species 2</i>	1	1			
Simuliidae					
<i>Simulium posticatum</i>			2		
<i>Simulium angustitare</i>				6	
Pediciidae					
<i>Pediciae species 1</i>			1		
<i>Thaumaleidae species 1</i>				1	
<i>Curculionidae species 1</i>			1		
<i>Psychodidae species 1</i>					1
<i>Hydrellia species 1</i>		2			
<b>Coleoptera</b>					
Dytiscidae					
<i>Ilybius fuliginosus</i>		1			
<i>Dryopidae species 1</i>	1				
<b>Dermaptera</b>					
<i>Forficula auricularia</i>		1			
<b>Araneae</b>					
<i>Argyroneta aquatica</i>				1	
<b>Gasterosteidae</b>					
<i>Gasterosteus aculeatus</i>			5	2	
<i>Pungitius pungitius</i>		1	2	1	
<b>Total Nos. of Invertebrates</b>	6	25	44	33	17
<b>Nos. Identified Taxa</b>	5	16	19	14	22

Table 1 cont: abundances of the aquatic invertebrate species recorded in the Little Ouse River (see figure 1) Norfolk, during the survey undertaken by Abrehart Ecology on 27<sup>th</sup> September 2013 for the LOHP





# Little Ouse Headwater Project: Pre-restoration survey for aquatic invertebrates 2013

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