

Phase 1 Habitat Survey

Centenary Riverside
Rotherham



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Whilst every effort is taken to meet the client's brief and ensure an accurate assessment of the site at the time of the survey, please be aware that no survey can ensure complete evaluation of the natural environment.

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1 INTRODUCTION

1.1 Site

Centenary Riverside, Rotherham

SK 2014 9210

The site is a Sheffield and Rotherham Wildlife Trust nature reserve located directly adjacent to the River Don, close to Rotherham town centre. Along the northern edge is an active railway line, with the Sheffield Tinsley Canal beyond.

Centenary Riverside was created on a former steelworks site in 2008/9 as part of a flood alleviation scheme. During the landscaping works, a lagoon area was excavated close to the river and a steep central bank created, leading to the northern half of the site, which is at a higher level. This upper section was seeded with a brownfield wildflower mix consisting of both native and non-native species, chosen to reflect the site's industrial history. An urban common mix of native species was seeded on the central bank. Trees and shrubs were planted along the railway edge, at the western end and around the lagoon. A list of seeded and planted species can be found in Appendix 2.

2 METHODOLOGY

2.1 Field survey

Ecologist Elizabeth McBride and LEMUR trainee Pete Tomlin visited the site on 20th August 2014.

The site was walked and the habitats were identified using the Phase 1 habitat survey methodology.

The Phase 1 Habitat Survey technique was devised by the Joint Nature Conservancy Council (JNCC) in the early 1970s. Since then, this methodology has been widely used throughout Britain. It is a standardised method of biological survey, which simply and easily classifies and codes different habitats and plant communities, recording them on maps.

Target notes were used to mark features of ecological interest and botanical species list was compiled for each section.

2.2 Limitations

Some parts of the lagoon were not accessible due to the dense willow growth.

3 RESULTS

3.1 Habitat descriptions

Figure 1 shows the habitats that were recorded during the field survey. The map is annotated with target notes (TN), which record features of particular interest. A botanical species list for each area can be found in Appendix 1.

Centenary Riverside supports a mosaic of habitats, including open water, wet woodland, unimproved grassland, tall ruderals and young plantation woodland.

Standing water and marginal vegetation

Centenary Riverside was created as part of a flood alleviation scheme, so the lower half will flood when the River Don is high. Therefore a large proportion of the site was designed to be a wetland. There are three areas of open water: the main wetland/lagoon area in the lower section of the site, a pond in the upper section and a small scrape close to Steel Henge.

The main lagoon is an unusual shape and includes an island and several large blocks, which are remnants of the site's industrial past. At the time of the survey the water on either side of the boardwalk was very shallow and a large amount of silt was visible around the edges of the wetland. Around the water's edge are stands of common reed *Phragmites australis*, bulrush *Typha latifolia* and reed sweet grass *Phalaris arundinacea*. Due to the tall willow, some areas were difficult to view and could not be accessed (TN3). However, from recent aerial photographs, they appear to support a mix of wet woodland and stands of marginal vegetation.



Photograph 1: The boardwalk and marginal vegetation in the main wetland

The pond in the upper half of the site is roughly oval in shape. The central area consists of open water, with pondweed and a patch of New Zealand pigmyweed *Crassula helmsii*, an invasive species that is spreading towards the centre from close to the southern edge. Within the water around the pond edges is some bulrush, water plantain *Alisma plantago-aquatica* and a patch of fool's water-cress *Apium nodiflorum*. On the bank is purple loosestrife *Lythrum salicaria*, great willowherb *Epilobium hirsutum*, jointed rush *Juncus articulatus* and marsh marigold *Caltha palustris*. A small amount of pillwort *Pilularia globulifera* has recently been planted.



Photograph 2: The small pond in the upper section

A new scrape has been excavated close to Steel Henge and it was holding a small amount of water during the survey and had recently been planted with pillwort. There is no other vegetation present, other than a single dock *Rumex* sp. and a small amount of grass.



Photograph 3: New scrape close to Steel Henge

Wet woodland

When the site was landscaped in 2008/9, trees were planted around the lagoon including alder *Alnus glutinosa*, crack willow *Salix fragilis*, white willow *Salix alba*, osier *Salix viminalis*, goat willow *Salix caprea* and downy birch *Betula pubescens*.

The willows have grown quickly and self-seeded into other areas, so the wetland is now surrounded by tall crack willow and osier, with some birch, alder and planted guelder rose *Viburnum opulus*. The young wet woodland is dense and impenetrable in places and also dominates the island. It is not possible to see parts of the water due to the dense willow. In places where the willow is shorter it has been classified as scrub on the Phase 1 Map (Figure 1), though in most areas it has now grown tall enough to be categorised as woodland.



Photograph 4: Wet woodland in the lower section

Tall ruderals

Tall ruderals dominate large areas, especially in the lower half of the site. Around the deckchairs close to the boardwalk is a large area of tall ruderals consisting of great willowherb and Michaelmas daisy *Aster sp.*, with smaller amounts of mugwort *Artemisia vulgaris*, ragwort *Senecio jacobaea* and nettle *Urtica dioica*. A strip of tall ruderals comprised of similar species surrounds much of the wet woodland and is growing through it.



Photograph 5: Tall ruderals cover large areas of the lower section

Close to the river is another strip of tall ruderals consisting of nettle, garlic mustard *Aliaria petiolata*, mugwort, dock, thistle *Cirsium sp.* and great willowherb and small amounts of other species such as soapwort *Saponaria officinalis*, Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica*. Tall ruderals are also growing below the trees along the river edge and in the more open areas along the river, where there is some purple loosestrife and pendulous sedge *Carex pendula*.

On the central bank and upper section of the site is a mosaic of tall ruderals and unimproved neutral grassland. Goat's rue *Galega officinalis* covers large areas of the upper section. Close to the site entrance, grassland turns to tall ruderals, with thistles, bristly ox-tongue *Helminthotheca echioides*, and goat's rue, and smaller amounts of melilot *Melilotus*, wild carrot *Daucus carota*, willowherbs and evening primrose *Oenothera sp.* Towards the north-east corner is a pile logs and thick branches, overgrown by tall ruderals.

To the south-west of Steel Henge is locally abundant goat's rue, with white clover growing below. A strip of tall ruderals is present along the bank leading down to the railway line and is narrow in places, but much wider in others. This area consists of abundant goat's rue with a variety of other species, such as perforate St John's wort *Hypericum perforatum*, Michaelmas daisy, ragwort *Senecio jacobaea*, thistle and rose campion *Lychnis coronaria*. Growing low to the ground is frequent lady's bedstraw *Gallium verum*, yarrow *Achillea millefolium*, cranesbill *Geranium sp.*, white clover *Trifolium repens*, black medick *Medicago lupulina*, cinquefoil *Potentilla sp.* and common toadflax *Linaria vulgaris*, with some common bent *Agrostis capillaris* and Yorkshire fog *Holcus lanatus*.



Photograph 6: Patches of tall ruderals in the upper section

At the western edge is a compost area surrounded by tall ruderals, with some planted saplings and areas of grassland nearby.

As with much of the rest of the site, the central bank consists of a mosaic of tall ruderals and unimproved grassland. To the east are large stands of spear thistle *Cirsium vulgare* and creeping thistle *Cirsium arvensis*.



Photograph 7: Large areas of the central bank are covered by tall ruderals

Unimproved grassland

As the grassland in the upper section was seeded with a mix called 'rusty perennial', it includes some non-native plants, plus some native species not commonly associated with this type of grassland.

Areas of grassland are interspersed with areas of tall ruderals and even the areas that have been classified as grassland include frequent tall ruderals scattered through.

There is small section of grassland close to the entrance, which consists of common bent, Yorkshire fog, fescues *Festuca sp.* and occasional tufted hair-grass *Deschampsia cespitosa*, with scattered Michaelmas daisy and some clovers and vetches *Vicia sp.* Close to Steel Henge there is frequent common bent, Yorkshire fog, Michaelmas daisy and black medick, with other species including frequent lady's bedstraw, and some great burnet *Sanguisorba officinalis*, rose campion and New England aster *Aster novae-angliae* .

Close to the pond is more Michaelmas daisy along with occasional taller species such as weld *Reseda luteola*, mullein *Verbascum thapsus*, evening primrose and nettle. On the steep central bank are tall, rough grasses such as common couch *Elymus repens*, false oat-grass *Arrhenatherum elatius*, cocksfoot *Dactylis glomerata* and Yorkshire fog, with frequent fennel *Foeniculum vulgare* and occasional field scabious *Knautia arvensis*.

Along the path edges is a strip of perennial rye-grass *Lolium perenne*, annual meadow-grass *Poa annua*, white clover, dandelion *Taraxacum officinale* and greater plantain *Plantago major*.

A mown grass path follows the edge of the river for part of the site. Close to the lagoon are the slight indentations formed by a couple of former scrapes, now grassed over and barely visible.



Photographs 8: The upper section of the site is a mosaic of unimproved grassland and tall ruderals



Photograph 9: An area of grassland with tall ruderals nearby



Photograph 10: Grassland around Steel Henge

Dry woodland and scrub

Saplings were planted in the upper section of the site during the landscaping in 2008/9. Along the slope leading down to the railway line are occasional large trees of sycamore *Acer pseudoplatanus* and willow, which were retained when the site was landscaped, along with planted saplings of oak *Quercus sp.*, hazel *Corylus avellana*, willow, crab apple *Malus sylvestris*, common alder and grey alder *Alnus incana*, and self-seeded birch and buddleia *Buddleja davidii*.

Close to the pond are more young trees of crab apple, lime *Tilia sp.*, oak, birch and rowan *Sorbus aucuparis*. Further west this becomes a small area of willow, birch and buddleia scrub, with occasional planted saplings of hornbeam *Carpinus betulus*, lime and hazel, amongst Michaelmas daisy, goat's rue and willowherb.

The sloping bank along the western edge has been planted with field rose *Rosa arvensis*, dog rose *Rosa canina*, sea buckthorn *Elaeagnus rhamnoides*, bird cherry *Prunus padus* and saplings of sweet chestnut *Castanea sativa* and birch, with self-seeded buddleia growing amongst them. Also on the bank are small amounts of berberis and burnet rose *Rosa pimpinellifolia*, with some Michaelmas daisy, reed canary grass, thistles and ragwort.

Along the river, close to the site entrance is some dense buddleia and on the central slope nearby is an area of willow, rose, birch and buddleia, with some cherry *Prunus avium* saplings.



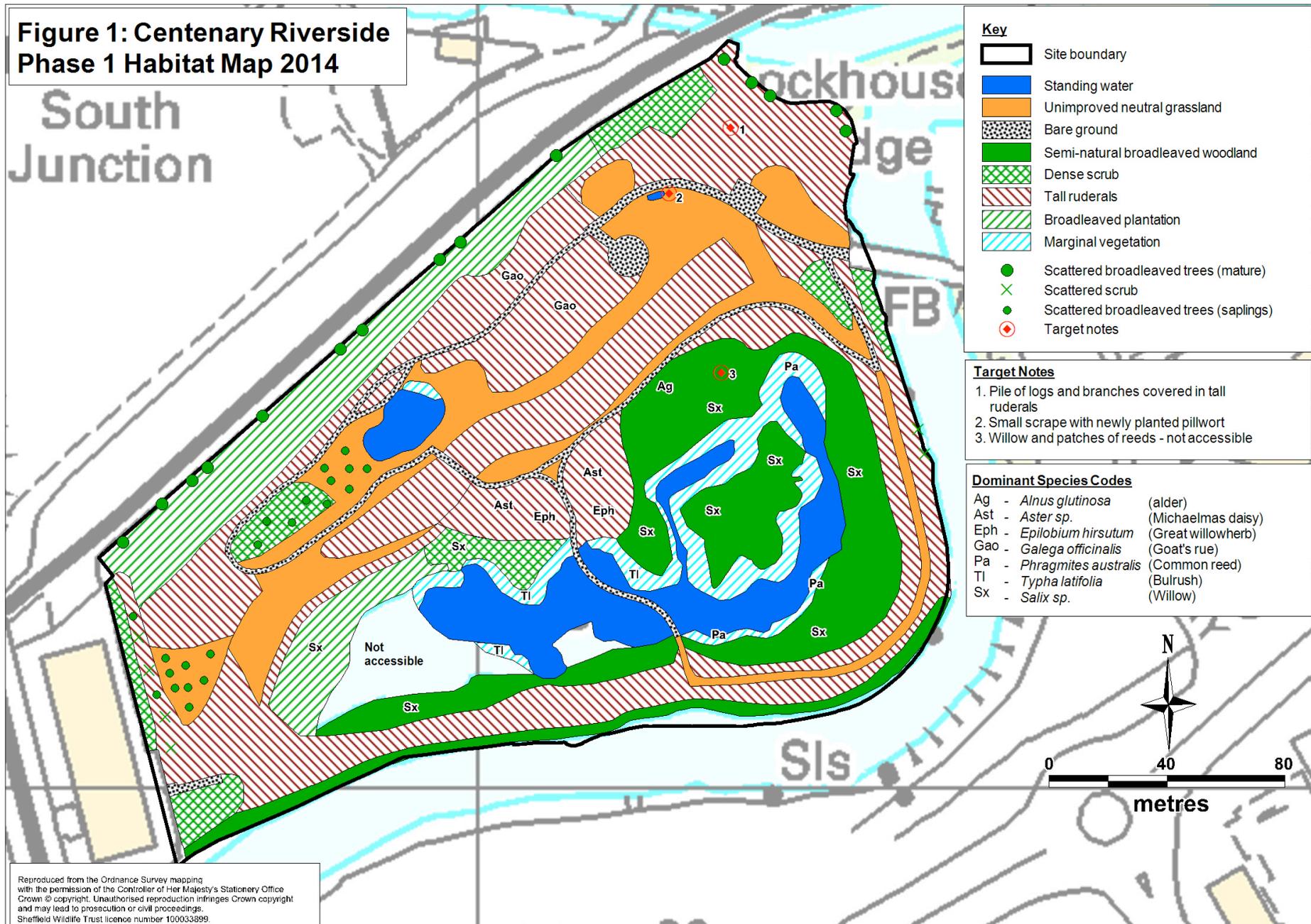
Photograph 11: The River Don looking upstream

3.2 Species

During the survey a flock of goldfinches *Carduelis carduelis* was seen feeding on the thistles on the central bank. Other bird species noted include kingfisher *Alcedo atthis*, grey heron *Ardea cinerea* and cormorant *Phalacrocorax carbo*. Dragonflies were seen flying around the lagoon and a speckled wood butterfly *Pararge aegeria* was recorded. Evidence of rabbits *Oryctolagus cuniculus* was frequent in the upper section of the site. A small rodent was briefly seen near the compost area, either a mouse or vole, and a juvenile frog *Rana temporaria* was also recorded. Many of the young alder trees close to the railway line were covered in alder leaf beetles *Agelastica alni*, which had damaged most of the leaves.



Photograph 12: Alder leaf beetles on grey alder



4 EVALUATION

4.1 Habitats

The site is diverse with regards to both habitats and species, supporting a wide variety of flowering plants. The range of tall ruderal species benefits invertebrates and some species of birds.

Due to the planting scheme in 2008/9 there is also a variety of trees and scrub at the site. Most are native species such as willow, common alder, hazel and oak, though a few are not native to this area such as sea buckthorn, grey alder and burnet rose. According to the landscape plans, 29 different species of trees and shrubs were planted at Centenary Riverside. Of these, 26 were recorded during the survey. Most appear healthy and are developing into young woodland, especially around the lagoon.

Many of the species in the seed mixes are present at the site. Some of these are non-native, such as rose campion and New England aster, whilst other species are growing well, but would be unlikely to colonise the site naturally as they are more frequently associated with calcareous grasslands, the main examples being lady's bedstraw and greater knapweed *Centaurea scabiosa*.

The 'urban common' seed mix of native species has been very successful, with 18 of the 24 species listed in the mix also found during the survey. Some of these species would be expected to occur naturally at this type of site, so it is not clear how they have arrived here, for example yarrow, evening primrose, weld and scentless mayweed *Tripleurospermum inodorum*.

The brownfield wildflower seed mix on the top meadow has been less successful, with only 11 of the 26 species recorded at the site. However, as many of the species are non-native, this could be regarded as beneficial.

In places, certain species of tall ruderals are beginning to dominate. This mainly applies to goat's rue, but possibly also Michaelmas daisy, creeping thistle and spear thistle. Large sections of the upper meadow and central bank are being taken over by tall ruderals and they are frequent throughout most of the grassland. If the plan for the site involves retaining these areas as grasslands then control of certain species may be required.

4.2 Invasive species

Japanese knotweed, Himalayan balsam and New Zealand pigmyweed were all recorded during the survey. All three species are invasive and are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as

amended), making it an offence to plant these species or otherwise cause them to grow in the wild.

The Japanese knotweed and Himalayan balsam are already being controlled and are only present in small amounts. They are likely to be a continual problem due to the proximity of the river and because there are large stands of each species slightly upstream.

The New Zealand pigmyweed is a more recent problem, but will spread quickly unless dealt with. It causes a biosecurity risk, especially if the pond is to be used for children's activities, such as pond dipping. Any equipment used in the water may be contaminated and could spread the plant to other water bodies.

4.3 Notable / protected species

4.3.1 Birds

Birds and their nests are protected under the Wildlife and Countryside Act 1981 (as amended). It is an offence to:

- Kill, injure or take a wild bird
- Take, damage or destroy the nest of any wild bird while that nest is in use or being built
- Take or destroy an egg of any wild bird

The site provides excellent habitat for wetland birds and as the areas of woodland and grassland continue to develop they will attract a greater variety of birds.

Some of the trees have potential to support nesting birds and some species of ground-nesting wetland birds are known to use the lagoon area for breeding.

4.3.2 Invertebrates

The variety of flowering plants is attractive to terrestrial invertebrates such as butterflies and bees, whilst the wetland areas will support aquatic invertebrates and those that spend their larval period in water, such as dragonflies and damselflies.

Alder leaf beetle was found in relatively large numbers on all of the alder trees close to the railway line. This species was considered to be extinct in the UK between 1946 and 2003, but has now re-established in many places. It is considered to be a minor pest and should not cause any lasting damage to the trees.

4.3.3 Mammals

Otters *Lutra lutra* are known to be present on this section of the River Don, so it is possible that they are using the water's edge at Centenary Riverside for laying up during the day.

A small rodent was seen during the survey and during previous small mammal surveys it was found that wood mice *Apodemus sylvaticus*, banks voles *Myodes glareolus* and common shrews *Sorex araneus* are using the site.

5 Recommendations

Control the invasive species at the site

Continue to monitor the site for Japanese knotweed and Himalayan balsam and treat/remove any plants found.

Take steps to eradicate the New Zealand pigmyweed in the small pond.

De-silt the lagoon

At the time of the survey the large wetlands were very shallow due to build-up of silt. Most of this will have been deposited when the river floods the site and as this will continue to occur, silt may need to be removed from some sections to prevent the lagoons from drying up during the summer months. The de-silting must be completed in a way that will minimise disruption to wildlife.

Management of the wet woodland

The planted willow has grown quickly and has become very dense around some areas of the lagoon. A rotational coppicing schedule has already been devised for the wet woodland, which will open up some areas allowing other species to compete.

Removal of trees and scrub should not take place within the bird breeding season (March to August).

Tall ruderal control

As mentioned in section 4.1, certain species of tall ruderal are locally abundant/dominant in the top meadow and on the central bank. Although wildlife will benefit from the tall ruderals at the site, if one species is dominating large areas it will prevent other species from competing and the grassland component of the site will be lost. If the current management regime of strimming the meadow and bank in late summer and raking off the cuttings does not resolve the problem, further action may be required, especially with regards to goat's rue.

Encourage suitable native species

During any future management at the site that requires removal of trees and scrub eg. thinning work, non-native species should be prioritised (eg. berberis, grey alder, sea buckthorn).

Retain deadwood where possible

Due to many of the trees being young, the main deadwood resource is provided by the stack of logs to the north-east. This should be retained as it provides habitat for a range of invertebrates, small mammals and species of fungi. Habitat piles should be created from the remains of any woodland management work.

6 APPENDICES

6.1 Appendix 1: Species list

The following species were recorded by Wildscapes during the site visit on 20th August 2014.

Top meadow

	Common Name	Scientific Name
Woody species	Sycamore	<i>Acer pseudoplatanus</i>
	Alder (sapling)	<i>Alnus glutinosa</i>
	Grey alder (sapling)	<i>Alnus incana</i>
	Berberis	<i>Berberis vulgaris</i>
	Silver birch (sapling)	<i>Betula pendula</i>
	Buddleia	<i>Buddleja davidii</i>
	Hornbeam (sapling)	<i>Carpinus betulus</i>
	Sweet chestnut (sapling)	<i>Castanea sativa</i>
	Hazel (sapling)	<i>Corylus avellana</i>
	Hawthorn (sapling)	<i>Crataegus monogyna</i>
	Sea buckthorn	<i>Elaeagnus rhamnoides</i>
	Ash (sapling)	<i>Fraxinus excelsior</i>
	Holly (sapling)	<i>Ilex aquifolium</i>
	Crab apple (sapling)	<i>Malus sylvestris</i>
	Bird cherry	<i>Prunus padus</i>
	Blackthorn	<i>Prunus spinosa</i>
	Oak (sapling)	<i>Quercus sp.</i>
	Dog rose	<i>Rosa canina</i>
	Burnet rose	<i>Rosa pimpinelifolia</i>
	Bramble	<i>Rubus fruticosus</i>
Goat willow (sapling)	<i>Salix caprea</i>	
Crack willow (sapling)	<i>Salix fragilis</i>	
Rowan (sapling)	<i>Sorbus aucuparia</i>	
Lime (sapling)	<i>Tilia sp.</i>	
Herbs	Yarrow	<i>Achillea millefolium</i>
	Mugwort	<i>Artemisia vulgaris</i>
	New England Aster - <i>September ruby</i>	<i>Aster novae-angliae</i>
	Michaelmas daisy	<i>Aster sp.</i>
	Hedge bindweed	<i>Calystegia sepium</i>
	Greater knapweed	<i>Centaurea scabiosa</i>
	Common centuary	<i>Centaureum erythraea</i>
	Red valerian	<i>Centranthus ruber</i>
	Rosebay	<i>Chamerion angustifolium</i>
	Creeping thistle	<i>Cirsium arvense</i>
	Spear thistle	<i>Cirsium vulgare</i>
	Canadian fleabane	<i>Conyza canadensis</i>
	Wild carrot	<i>Daucus carota</i>
	Teasel	<i>Dipsacus fullonum</i>
	Great willowherb	<i>Epilobium hirsutum</i>
	Fennel	<i>Foeniculum vulgare</i>

	<p>Goat's rue Lady's bedstraw Hedgerow cranesbill Cranesbill sp. Perforate St John's-wort Field scabious Prickly lettuce Common toadflax Common bird's-foot trefoil Rose campion Black medick Red bartsia Evening primrose Oriental poppy Common poppy Wild parsnip Bristly oxtongue Ribwort plantain Greater plantain Creeping cinquefoil Cinquefoil sp. Selfheal Weld Broadleaved dock Great burnet Soapwort Figwort Ragwort Hedge woundwort Tansy Dandelion Hair's-foot clover Sulphur clover Red clover White clover Scentless mayweed Coltsfoot Stinging nettle Great mullein Tufted vetch Tare sp.</p>	<p><i>Galega officinalis</i> <i>Galium verum</i> <i>Geranium pyrenaicum</i> <i>Geranium sp.</i> <i>Hypericum perforatum</i> <i>Knautia arvensis</i> <i>Lactuca serriola</i> <i>Linaria vulgaris</i> <i>Lotus corniculatus</i> <i>Lychnis coronaria</i> <i>Medicago lupulina</i> <i>Odontites vernus</i> <i>Oenothera sp.</i> <i>Papaver orientale</i> <i>Papaver rhoeas</i> <i>Pastinaca sativa</i> <i>Picris echioides</i> <i>Plantago lanceolata</i> <i>Plantago major</i> <i>Potentilla reptans</i> <i>Potentilla sp.</i> <i>Prunella vulgaris</i> <i>Reseda luteola</i> <i>Rumex obtusifolius</i> <i>Sanguisorba officinalis</i> <i>Saponaria officinalis</i> <i>Scrophularia nodosa</i> <i>Senecio jacobaea</i> <i>Stachys sylvatica</i> <i>Tanacetum vulgare</i> <i>Taraxacum officinale</i> <i>Trifolium arvense</i> <i>Trifolium ochroleucum</i> <i>Trifolium pratense</i> <i>Trifolium repens</i> <i>Tripleurospermum inodorum</i> <i>Tussilago farfara</i> <i>Urtica dioica</i> <i>Verbascum thapsus</i> <i>Vicia cracca</i> <i>Vicia sp.</i></p>
<p>Grasses, rushes & sedges</p>	<p>Common bent Creeping bent False fox sedge Crested dog's-tail Cocksfoot Tufted hair-grass Bearded couch Yorkshire fog Hard rush Perennial rye-grass</p>	<p><i>Agrostis capillaris</i> <i>Agrostis stolonifera</i> <i>Carex otrubae</i> <i>Cynosurus cristatus</i> <i>Dactylis glomerata</i> <i>Deschampsia cespitosa</i> <i>Elymus caninus</i> <i>Holcus lanatus</i> <i>Juncus inflexus</i> <i>Lolium perenne</i></p>

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	Reed canary grass Timothy Common reed	<i>Phalaris arundinacea</i> <i>Phleum pratense</i> <i>Phragmites australis</i>
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Small pond

	Common Name	Scientific Name
Woody species	Grey alder (sapling)	<i>Alnus incana</i>
Herbs	Water plantain Fool's water-cress Michaelmas daisy Marsh marigold New Zealand pigmyweed Waterweed sp. Great willowherb Broadleaved willowherb Goat's rue Purple loosestrife Red bartsia Pillwort Lesser spearwort	<i>Alisma plantago-aquatica</i> <i>Apium nodiflorum</i> <i>Aster sp.</i> <i>Caltha palustris</i> <i>Crassula helmsii</i> <i>Elodea sp.</i> <i>Epilobium hirsutum</i> <i>Epilobium montanum</i> <i>Galega officinalis</i> <i>Lythrum salicaria</i> <i>Odontites vernus</i> <i>Pilularia globulifera</i> <i>Ranunculus flammula</i>
Grasses, rushes & sedges	Marsh foxtail Yorkshire fog Jointed rush Bulrush	<i>Alopecurus geniculatus</i> <i>Holcus lanatus</i> <i>Juncus articulatus</i> <i>Typha latifolia</i>

Central bank

	Common Name	Scientific Name
Woody species	Silver birch (sapling) Buddleia Cherry (sapling) Dog rose Goat willow (sapling) Lime (sapling)	<i>Betula pendula</i> <i>Buddleja davidii</i> <i>Prunus avium</i> <i>Rosa canina</i> <i>Salix caprea</i> <i>Tilia sp.</i>
Herbs	Yarrow Lesser burdock Mugwort Michaelmas daisy Brassica sp. Hedge bindweed Greater knapweed Rosebay Creeping thistle Spear thistle Teasel Great willowherb Fennel Goat's rue	<i>Achillea millefolium</i> <i>Arctium minus</i> <i>Artemisia vulgaris</i> <i>Aster sp.</i> <i>Brassica sp.</i> <i>Calystegia sepium</i> <i>Centaurea scabiosa</i> <i>Chamerion angustifolium</i> <i>Cirsium arvense</i> <i>Cirsium vulgare</i> <i>Dipsacus fullonum</i> <i>Epilobium hirsutum</i> <i>Foeniculum vulgare</i> <i>Galega officinalis</i>

Phase 1 Habitat Survey: Centenary Riverside, Rotherham

	<p>Cleavers Hedge bedstraw Lady's bedstraw Perforate St John's-wort Field scabious Prickly lettuce Meadow vetchling Common toadflax Common bird's-foot trefoil Black medick Red bartsia Evening primrose Common poppy Bristly oxtongue Ribwort plantain Creeping cinquefoil Wild mignonette Soapwort Ragwort Dandelion Hair's-foot clover Red clover White clover Stinging nettle Tufted vetch Tare sp.</p>	<p><i>Galium aparine</i> <i>Galium mollugo</i> <i>Galium verum</i> <i>Hypericum perforatum</i> <i>Knautia arvensis</i> <i>Lactuca serriola</i> <i>Lathyrus pratensis</i> <i>Linaria vulgaris</i> <i>Lotus corniculatus</i> <i>Medicago lupulina</i> <i>Odontites vernus</i> <i>Oenothera sp.</i> <i>Papaver rhoeas</i> <i>Picris echioides</i> <i>Plantago lanceolata</i> <i>Potentilla reptans</i> <i>Reseda lutea</i> <i>Saponaria officinalis</i> <i>Senecio jacobaea</i> <i>Taraxacum officinale</i> <i>Trifolium arvense</i> <i>Trifolium pratense</i> <i>Trifolium repens</i> <i>Urtica dioica</i> <i>Vicia cracca</i> <i>Vicia sp.</i></p>
Grasses, rushes & sedges	<p>Creeping bent False oat-grass Cocksfoot Bearded couch Fescue sp. Yorkshire fog Perennial rye-grass Reed canary grass Common reed</p>	<p><i>Agrostis stolonifera</i> <i>Arrhenatherum elatius</i> <i>Dactylis glomerata</i> <i>Elymus caninus</i> <i>Festuca sp.</i> <i>Holcus lanatus</i> <i>Lolium perenne</i> <i>Phalaris arundinacea</i> <i>Phragmites australis</i></p>

Lagoon area

	Common Name	Scientific Name
Woody species	<p>Alder Birch sp. Buddleia Oak (sapling) Dog rose Bramble White willow Goat willow Crack willow Osier Guelder rose</p>	<p><i>Alnus glutinosa</i> <i>Betula sp.</i> <i>Buddleja davidii</i> <i>Quercus sp.</i> <i>Rosa canina</i> <i>Rubus fruticosus</i> <i>Salix alba</i> <i>Salix caprea</i> <i>Salix fragilis</i> <i>Salix viminalis</i> <i>Viburnum opulus</i></p>
Herbs	<p>Wild angelica</p>	<p><i>Angelica sylvestris</i></p>

	<p>Garlic mustard Mugwort Michaelmas daisy Brassica sp. Hedge bindweed Common knapweed Creeping thistle Hemlock Teasel Great willowherb Japanese knotweed Meadowsweet Fennel Goat's rue Cleavers Hogweed Dame's violet Himalayan balsam Purple loosestrife Black medick Water mint Evening primrose Bristly oxtongue Pillwort Ribwort plantain Creeping cinquefoil Figwort Ragwort Canadian goldenrod Sow thistle Hedge woundwort White clover Coltsfoot Stinging nettle</p>	<p><i>Anthriscus sylvestris</i> <i>Artemisia vulgaris</i> <i>Aster sp.</i> <i>Brassica sp.</i> <i>Calystegia sepium</i> <i>Centaurea nigra</i> <i>Cirsium arvense</i> <i>Conium maculatum</i> <i>Dipsacus fullonum</i> <i>Epilobium hirsutum</i> <i>Fallopia japonica</i> <i>Filipendula ulmaria</i> <i>Foeniculum vulgare</i> <i>Galega officinalis</i> <i>Galium aparine</i> <i>Heracleum sphondylium</i> <i>Hesperis matronalis</i> <i>Impatiens glandulifera</i> <i>Lythrum salicaria</i> <i>Medicago lupulina</i> <i>Mentha aquatica</i> <i>Oenothera sp.</i> <i>Picris echioides</i> <i>Pilularia globulifera</i> <i>Plantago lanceolata</i> <i>Potentilla reptans</i> <i>Scrophularia nodosa</i> <i>Senecio jacobaea</i> <i>Solidago canadensis</i> <i>Sonchus sp.</i> <i>Stachys sylvatica</i> <i>Trifolium repens</i> <i>Tussilago farfara</i> <i>Urtica dioica</i></p>
Grasses, rushes & sedges	<p>Creeping bent False oat-grass Pendulous sedge Cocksfoot Tufted hair-grass Spike-rush Common couch Reed sweet grass Yorkshire fog Soft rush Reed canary grass Common reed Bulrush</p>	<p><i>Agrostis stolonifera</i> <i>Arrhenatherum elatius</i> <i>Carex pendula</i> <i>Dactylis glomerata</i> <i>Deschampsia cespitosa</i> <i>Eleocharis sp.</i> <i>Elytrigia repens</i> <i>Glyceria maxima</i> <i>Holcus lanatus</i> <i>Juncus effusus</i> <i>Phalaris arundinacea</i> <i>Phragmites australis</i> <i>Typha latifolia</i></p>

River bank

	Common Name	Scientific Name
Woody species	Alder Buddleia Bramble Goat willow Crack willow Guelder rose	<i>Alnus glutinosa</i> <i>Buddleja davidii</i> <i>Rubus fruticosus</i> <i>Salix caprea</i> <i>Salix fragilis</i> <i>Viburnum opulus</i>
Herbs	Wild angelica Garlic mustard Mugwort Michaelmas daisy Brassica sp. Hedge bindweed Bittercress sp. Creeping thistle American willowherb Great willowherb Japanese knotweed Common hemp-nettle Cleavers Herb robert Wood avens Hogweed Dame's violet Himalayan balsam Prickly lettuce White dead-nettle Nipplewort Common bird's-foot trefoil Purple loosestrife Melilot sp. Evening primrose Creeping buttercup Wild mignonette Broadleaved dock Soapwort Ragwort Canadian goldenrod Stinging nettle	<i>Angelica sylvestris</i> <i>Anthriscus sylvestris</i> <i>Artemisia vulgaris</i> <i>Aster sp.</i> <i>Brassica sp.</i> <i>Calystegia sepium</i> <i>Cardamine sp.</i> <i>Cirsium arvense</i> <i>Epilobium ciliatum</i> <i>Epilobium hirsutum</i> <i>Fallopia japonica</i> <i>Galeopsis tetrahit</i> <i>Galium aparine</i> <i>Geranium robertianum</i> <i>Geum urbanum</i> <i>Heracleum sphondylium</i> <i>Hesperis matronalis</i> <i>Impatiens glandulifera</i> <i>Lactuca serriola</i> <i>Lamium album</i> <i>Lapsana communis</i> <i>Lotus corniculatus</i> <i>Lythrum salicaria</i> <i>Melilotus sp.</i> <i>Oenothera sp.</i> <i>Ranunculus repens</i> <i>Reseda lutea</i> <i>Rumex obtusifolius</i> <i>Saponaria officinalis</i> <i>Senecio jacobaea</i> <i>Solidago canadensis</i> <i>Urtica dioica</i>
Grasses, rushes & sedges	Pendulous sedge Cocksfoot Tufted hair-grass Yorkshire fog Reed canary grass Timothy	<i>Carex pendula</i> <i>Dactylis glomerata</i> <i>Deschampsia cespitosa</i> <i>Holcus lanatus</i> <i>Phalaris arundinacea</i> <i>Phleum pratense</i>

6.2 Appendix 2: Seed mixes

Brownfield Wildflower Mix (Plateau – Rusty Perennial Mix)

The following species were included in the mix seeded on the upper meadow in 2008/9. Species listed in bold blue were recorded during the 2014 survey.

	Scientific Name		Common Name
ZA048	<i>Anemanthele</i>	<i>lessoniana</i>	Pheasants Tail Grass
AB084	<i>Aster</i>	<i>novae-angliae</i>	New England Aster
CA332	<i>Centaurea</i>	<i>scabiosa</i>	Greater Knapweed
CA348	<i>Centranthus</i>	<i>ruber</i>	Red Valerian (Jupiter's Beard)
GA036	<i>Galium</i>	<i>verum</i>	Yellow/Lady's Bedstraw
GA240	<i>Geum</i>	<i>coccineum</i>	Geum
GA244	<i>Geum</i>	<i>chiloense</i>	Geum (Avens / Lady Bradshaw)
HA196	<i>Heuchera</i>	<i>sanguinea</i>	Ruby Bells
KA050	<i>Kniphofia</i>	<i>uvaria hybr.</i>	Red Hot Poker
LA098	<i>Leontodon</i>	<i>rigens</i>	Girandole?
LA310	<i>Linaria</i>	<i>vulgaris</i>	Common/Yellow/Toad Flax
LA472	<i>Lychnis</i>	<i>coronaria</i>	Rose Champion
LA468	<i>Lychnis</i>	<i>chalcedonica</i>	(Jerusalem Cross)
MA066	<i>Meconopsis</i>	<i>cambrica</i>	Welsh Poppy
OA011	<i>Oenothera</i>	<i>biennis</i>	Common Evening Primrose
PA066	<i>Papaver</i>	<i>orientale</i>	Oriental Poppy
PA209	<i>Penstemon</i>	<i>digitalis</i>	Beard Tongue
PA576	<i>Potentilla</i>	<i>atrosanguinea</i>	Himalayan Cinquefoil
PA630	<i>Potentilla</i>	<i>thurberi</i>	Scarlet Cinquefoil
PA910	<i>Primula</i>	<i>veris</i>	Cowslip
SA098	<i>Sanguisorba</i>	<i>officinalis</i>	Burnet
SA490	<i>Silphium</i>	<i>integrifolium</i>	Rosinweed
SA582	<i>Solidago</i>	<i>speciosa</i>	Showy Goldenrod
TA214	<i>Trifolium</i>	<i>rubens</i>	Red Feather
TA212	<i>Trifolium</i>	<i>ochroleucum</i>	Sulphur Clover
Emorsgate	<i>Verbascum</i>	<i>thapsus</i>	Great/Common Mullein

Based on an American Prairie wildflower seed mix to provide pink, red, orange & yellow flowers to complement the rusty appearance of Steel Henge. (Some non-native).

All seed mix purchased from Jelitto seeds.

Urban Common Perennial Mix (Flood Defence Bank)

The following species were included in the mix seeded on the central bank in 2008/9. Species listed in bold blue were recorded during the 2014 survey.

Mix 1:

Name	Common Name	% by weight	Total weight (g)
<i>Achillea millefolium</i>	Yarrow	2	150
<i>Centranthus ruber</i>	Red Valerian	5	375
<i>Centaurea scabiosa</i>	Greater Knapweed	5	375
<i>Centaureum erythraea</i>	Common Centaury	1	75
<i>Foeniculum vulgare</i>	Fennel	2	150
<i>Galium verum</i>	Lady's Bedstraw	2	150
<i>Hypericum perforatum</i>	St John's Wort	10	750
<i>Knautia arvensis</i>	Field Scabious	8	600
<i>Leucanthemum vulgare</i>	Oxe-eye Daisy	5	375
<i>Linaria purpurea</i>	Purple Toadflax	5	375
<i>Linaria vulgaris</i>	Common Toadflax	10	750
<i>Oenothera biennis</i>	Evening Primrose	30	2250
<i>Papavar rhoeas</i>	Field Poppy	1	75
<i>Reseda luteola</i>	Weld	1	75
<i>Saponaria officinalis</i>	Soapwort	5	375
<i>Tripleurospermum maritimum</i>	Scentless Mayweed	3	225
<i>Verbascum thapsus</i>	Mullein	5	375
TOTAL			7500

Mix 2:

To be collected from local sites.

Name	Common Name	% by weight	Total weight (g)
<i>Aster novi-belgii</i>	Michaelmas Daisy	25	375

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<i>Solidago canadensis</i>	Canadian Goldenrod	5	75
<i>Solidago gigantea</i>	Giant Goldenrod	5	75
<i>Leucanthemum maximum</i>	Shasta Daisy	5	75
<i>Lupinus polyphyllus</i>	Lupin	50	750
<i>Galega officinalis</i>	Goat's Rue	5	75
<i>Lathyrus latifolius</i>	Everlasting Pea	5	75
TOTAL			1500

Tree planting

According to the landscape plans, the following trees were planted at the site in 2008/9.

Wet woodland

Common alder
Crack willow
Downy birch
English oak
Goat willow
Guelder rose
Osier
White willow

Dry woodland

Ash
Beech
Bird cherry
Crab apple
Dog rose
Downy birch
Hawthorn
Hazel
Holly
Hornbeam
Rowan
Sessile oak
Small leaved lime
Sweet chestnut
Tulip tree
Wild cherry

Railway edge

Berberis vulgaris
Blackthorn
Burnet rose
Crab apple
Dog rose
Field rose

Hawthorn
Holly
Sea buckthorn
Sweet brier

6.3 Appendix 3: References

Blamey, M., Fitter, R. & Fitter, A. (2003) *Wild Flowers of Britain & Ireland*. A&C Black. London.

JNCC, (2003). *Handbook for Phase 1 Habitat Survey: A technique for environmental audit* (reprint). Joint Nature Conservation Committee, Peterborough.