

Nestlé, Dalston

Low Mill effluent treatment fields



Survey of Wildlife Interest & Recommendations for Conservation Management 2012

Carlisle Natural History Society *

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Dave Hickson (davehickson_1@hotmail.com)

Jeremy Roberts (fjr@edencroft2.demon.co.uk)

*contact: Steve Hewitt, Secretary, CNHS: 01228 618736; Steve.Hewitt@tulliehouse.org

Section 1

Introduction

Following an approach by Les Patterson (Safety, Health and Environment Advisor, Nestlé, Dalston Plant), to Dave Hickson of Dalston, a meeting was arranged with several members of Carlisle Natural History Society on 12th April 2012.

L.P. outlined the current situation with regard to fields on the west side of the River Caldew down-river from the Nestlé factory site. These fields had been used as a land-spread facility for production waste from the adjacent factory, the usage ceasing in February 2007.

More recently, the company had fulfilled the Closure Plan for this part of the site to the satisfaction of the Environment Agency, and was now looking at options for improving the general appearance and amenity of the site, whilst enhancing local biodiversity.

L.P. made clear that the project would be of necessity long-term, and that a goal for the future of the site would be as a dynamic and varied natural system which could be managed with minimal intervention, whilst delivering real improvements to the neighbourhood in terms of amenity and the visual landscape.

Since these holdings were adjacent to the Dalston-Cummersdale tarmaced cycle- and foot-path on one side and popular walking trails along the riverbank at the other side, improvements to the aspect and landscape attributes and to the diversity, abundance, and visibility of wildlife, would be readily appreciated by many members of the public.

It was agreed that members of Carlisle Natural History Society would undertake a survey of natural history interest on the site over the summer, and deliver a report in autumn 2012, with a summary of the findings and offering initial recommendations regarding conservation management for environmental improvement and enhancement of biodiversity.

Aims of the Survey

- i) To give a general description of each of the distinctive compartments of the area, with indications of the general state of these areas, and any significant species or features.
- ii) To identify areas of existing biodiversity which should be preserved and perhaps enhanced through appropriate management.
- iii) To locate and pinpoint any species of particular conservation significance and suggest ways that their populations could be protected and enhanced.
- iv) To assess the condition of the main areas that had received the production waste, and suggest appropriate use of this land going forward.

Scope of the Survey

The area was conveniently divided into recording units, A to G, the boundaries of which may be readily discernible on the ground. See maps on page 3. (**NB:** Area H is an area of willow plantations within Area D.)

At a late stage in the survey, an area (**Area I**) close to the factory, and not a part of the original remit since it was not used for effluent treatment, was included. This area had a distinctly different vegetation cover and might provide a suitable site for enhancement to encourage butterfly breeding and feeding opportunities (see page 9).

Methodology

General impressions of each of the areas were gathered over the course of the season, and these **Area Descriptions** commence on page 4. Suggestions for the management of each Area are given after each Area description, and also summarised at the end of the report.

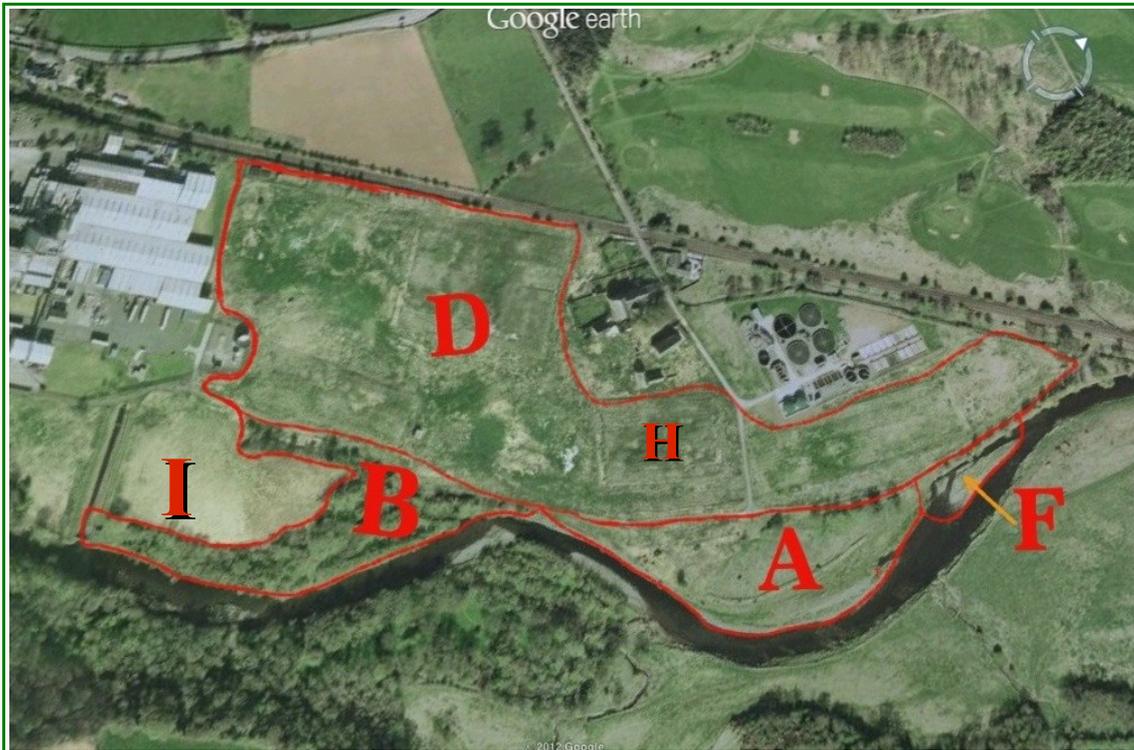
Flowering plants, including grasses, sedges and rushes, being the basis for any ecosystem, were to be especially targeted in the survey. The flowering plants were recorded within each of the above areas on a number of occasions over the season, and lists drawn up which are summarised in the **Tables** commencing on page 16, with records also of the following groups.

Bryophytes (*i.e.* mosses and liverworts) were recorded on a few visits, although less effort was expended on this group. The group does not contribute significantly to the diversity of the site, and no species of conservation significance was recorded.

Birds were recorded on the same, and other, visits, and any significant activity such as nesting, feeding, or roosting behaviour was noted.

Butterflies and other groups were recorded incidentally during the various survey visits.

Aerial views (Google Earth) of Nestlé effluent treatment fields, with Areas A to G outlined



Descriptions of Areas A—I

Areas C & D

The Nestlé holdings involved in the survey principally comprise the two large Areas C and D which are therefore described first.

These areas have been used for spraying and disposal of milk effluent. These two areas hold a vegetational community which thrives where there are high nitrogen levels in the soils. The community consists of a species-poor mix of very vigorous plants, which readily out-compete the more significant and important – but less competitive – species.

The following eight plants dominate large parts of Areas C and D, often to the exclusion of all other plants:

- Creeping thistle ~ *Cirsium arvense* (abundant)
- Great willowherb ~ *Epilobium hirsutum* (abundant)
- Nettle ~ *Urtica dioica* (abundant)
- Cleavers ~ *Galium aparine* (abundant)
- Hogweed ~ *Heracleum sphondylium* (frequent)
- Dame's-violet ~ *Hesperis matronalis* (abundant)
- Himalayan balsam ~ *Impatiens glandulifera* (abundant)
- False oat-grass ~ *Arrhenatherum elatius* (abundant)

Although in the main somewhat 'weedy' species (and some indeed seriously invasive!), all of the above plants have some wildlife value, several being of importance as a nectar source for insects at different stages during the summer.



Beneath the dense vegetation cover, the rich soils must hold a good population of soil invertebrates which is used as a feeding resource by moles, of which there appear to be relatively high numbers. According to the numbers of holes and runs, small-mammal numbers (especially Short-tailed Voles) also are evidently high. Kestrels hunt these areas for small mammals as do Grey Herons in severe weather. Barn Owls are occasionally seen, but may have problems hunting these particular areas because the vegetation is too tall and dense. Butterfly caterpillars use the Nettles and Dame's-violet as a food source.

Breeding birds are very few within the main areas of dominant vegetation. The western part of Area C supports large quantities of Dame's-violet (above), an alien cruciferous plant which has its place a provider of nectar and as a foodplant for several insect species.

Although all central areas have the species-poor communities just outlined, the peripheral areas, *i.e.* alongside the cycle-track, the river-banks, and the retaining bunds a variable distance back from the river, contain a very much greater diversity of plant species, and hence interest for wildlife. These areas presumably were beyond the areas sprayed with effluent.

Area C & D management recommendations

The biodiversity of the spray-field areas could be improved by:

- a) lowering the nitrogen and other nutrient levels of the soil, perhaps achievable by cutting the areas at least once a year and – importantly – removing the cut vegetation. (This process could take many years to achieve success and would prove to be expensive – probably prohibitively. The continued deposition of silt during floods would also tend to act against attempts to lower soil nutrient-loads.)
- b) lifting subsoil up to the surface, either by deep ploughing, or by digging ponds and creating banks or mounds with the excavated spoil, and sowing these with appropriate wildflower mixes. (The persistence of soil nutrient-loads would tend to encourage rapid over-growth of some of the ‘weedy’ species and (if ponds or wetlands were created) probably other tall and vigorous species.)
- c) scraping off the surface layer of soil, with the excess nutrient levels derived from the milk solids, into banks. Wetter areas and ponds would result if the excavation reached the underlying river-gravels.
- d) planting small copses of trees and shrubs to provide nesting- and shelter-sites for birds and as a source of berry and insect foods, while still leaving areas of rough grassland for small mammals and their attendant raptors.

This last would be a preferred option, due to relatively low cost, and minimal requirement for ongoing maintenance or later intervention. Alder (*Alnus glutinosa*), Elderberry (*Sambucus nigra*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and willows (*Salix*) would be amongst species likely to cope with – or indeed thrive upon – the present nutrient levels.

If the existing lowest sections were excavated to provide shallow ponds with large marginal wetland areas, a mosaic of trees, grasslands of varying heights, patches of marshland with Reedmace (*Typha latifolia*), Reed Canary-grass (*Phalaris arundinacea*), Branched Bur-reed (*Sparganium ramosum*), etc., and stretches of open water could be rapidly created.

Winding footpaths could be led through these areas, although vegetation would speedily encroach, and maintenance would be required in any long-term commitment. (An impermeable underlay would help to prevent existing plants pushing up rapidly through a gravel path.)

Trees such as Hawthorn, Blackthorn, Crab Apple (*Malus*), etc., would also grow well on the tops of the bunds along the northeast boundary, as also east of Area E just beyond. Such blossom-bearing trees and shrubs are valuable nectaring sources for many insect species.

Other lower parts of the site may be too wet but would favour Alder and various willow species. Other lower parts of the site may be too wet but would favour Alder and various willow species.

Comments on pond-siting and development

The lower (*i.e.* northeastern) parts of Area C appear to be close to the water-table. There may be opportunity to site a pond or ponds in this area.

A consideration here – perhaps paramount – might be the degree of nutrient remaining in the soils. This could lead to rapid overgrowth of the taller and vigorous weedy species, and indeed any introduced waterside or aquatic species. This rapid response would inevitably mean that a pond area would have a short life before being overgrown. Such overgrowth of open water by marginal vegetation is of course entirely natural and to be expected: no pond has an indefinite life in nature in the absence of some process of scouring or re-excavation. The **rate** at which this would occur would however be very much determined by the available nutrient-levels. It might be that a rapid rate was acceptable, and a re-excavation might be necessary at intervals of several years.

It is perhaps possible that much of the higher nutrient levels are restricted to the upper soil levels. This possibility would need to be tested. If these upper levels were to be scraped off, the lower soil levels and gravel may not be so high in nutrients.

The deeper the water-body, the slower is the rate of overgrowth. It is also strongly advantageous for wildlife to have water which does not freeze to the base in cold winters. However, it may be that issues of public safety would preclude deeper waterbodies within the area, since deeper water most often implies steeper banks with the inherent dangers. An option is to have large areas cleared with gently-shelving banks. These are very likely to become soft with mud, and this has a strong deterrent effect on humans to penetrate further. It is certainly the case that shallowly shelving banks into the water are very much more

useful for all forms of wildlife, as well as being inherently safer for people.

For the widest range of aquatic life, such as newts, frogs, dragonflies, etc., any pond would need to be deep enough in the centre so that it remained wet in drier summers. Although it is often a popular option to build an island within a pond, the required profile then at once impacts upon the potential depths and area of water attainable, but also – more importantly – hugely reduces the overall **volume** of water, and it is the **volume** which provides stability through reduced temperature fluctuations – see below.



An island within a smaller pond (right) greatly restricts the volume of water, unless profiles are steepened

It may be worth considering the shape of the pond for ease of access for machinery which may be required for future dredging or removal of plants. Making the greater proportion of the pond area in pure gravel with no topsoil will help minimise plant growth and extend the life of the pond. Aquatic plants themselves are important for oxygenation of water, and their growth will help clean and denitrify the water.

It is good policy not to plant trees too close to ponds, and suppress the growth of self-sown willows, etc., because shading inhibits growth of aquatic plants, and leaf-fall introduces rotting material into the water body, impacting oxygenation of the water-body.

The construction of a low-nutrient butterfly area could be considered at the same time as pond construction, because excavated spoil may be used.

A well-consolidated bank with a vertical face might be utilised by nesting Sand Martins or Kingfisher (see **Notes**, page 25). However, the risk of vandalism and unwanted attention from children at this unwardened site would be a likely risk to be considered.

Stephen Hewitt (Curator of Natural Sciences at Tullie House Museum) writes:

With respect to the invertebrate interest of the spray fields, such areas could perhaps be made more valuable to insects through limited re-profiling of the topography to create hummocks and hollows. Heaping up some of the underlying gravels and removal of topsoil would encourage ruderal plants as nectar sources and create bare areas of substrate for insect basking, hunting and oviposition. Corresponding hollows of damp grassland and pools, where possible, would also be good for a range of invertebrates and other wildlife.

David Clarke (Cumbria Recorder for the national Dragonfly Recording Scheme (administered by the British Dragonfly Society)) comments:

The re-establishment of a sizeable freshwater pool in Area D could prove a valuable wildlife asset, provided that this was a permanent body receiving rainwater and/or unpolluted groundwater. Size would be important: a surface area of at least 50m² and maximum depth of at least two metres. A relatively constant water level should be aimed for (some sort of 'trap' to prevent river flood debris getting in might also be needed – that however, that is detail).

The grading of the edges and the planting with appropriate marginal, emergent and floating plants would be a key to its success. Creation of some tree/shrub shelter from cold winds and to provide useful feeding/roosting areas for dragonflies is recommended. With these provisos it would be certain to attract a good range of the more mobile freshwater invertebrates, including up to twelve species of dragonfly. Equally, it would be attractive to amphibians, especially frogs and newts, and to many birds. Since pools of such a size and quality are rare in the north of the county, it could make a significant contribution locally. The British Dragonfly Society is another source of advice, and it would be worth getting their comments on design proposals, which I could arrange when required.

Other areas

Area A

This area lies between the river and the cycle-track near Low Mill. Around forty years ago the river course was very near to this cycle track. Sprayed milk-effluent has had a minimal effect on Area A and may have reached here by lateral ground-seepage.

Silt is deposited over almost all of this area during extremes of flooding and to some extent this enriches the soil. High floods have been frequent lately.

A bund ten to twenty metres from the river divides the area. Within the bund there is an area of semi-natural coarse grassland which is gradually becoming colonised by scrub. Outside of the bund lies riverine vegetation dominated by willow species. All of this area holds a fairly species-rich plant community which is continually developing as the woodland matures and as new silt, sand, and gravel banks are colonised along the river edge.

There are good numbers of bird species feeding and breeding both along the riverside willows and in the scrub away from the river.

Area A management recommendations

As it is an existing area of high biodiversity, currently developing naturally, it should be left unmanaged.

Area B

This area is the riverine community downstream from the canal. It has been colonised relatively naturally and contains a rich mix of woodland and aquatic plant species. Of special note is a colony of Toothwort (*Lathraea squamaria*) at NY 376507 consisting in 2012 of 132 flowering shoots. The local Alternate-leaved Golden-saxifrage (*Chrysosplenium alternifolium*) was also found here in 2012.

Area B management recommendations

This area does not require any major management input. However, what must be seriously considered is control of the highly invasive Japanese Knotweed (*Fallopia japonica*) which is becoming established.

Areas E and F

These areas consists of dynamic shingle areas which are constantly changing when the river floods. At times bare patches of gravel are produced which gradually become colonised by plant species and which at that stage are often used by nesting Oystercatchers and Common Sandpipers. The bare gravel eventually develops into willow scrub and grassland until the next major flood event which washes away almost all the vegetation, or deposits new gravel beds, allowing the cycle to begin once more. It is a highly natural ecosystem and supports communities of plants and insects which have evolved over millennia.



Plant species present can include species from anywhere upstream along the higher reaches of the river, by washed-down seed and propagating rhizomes, etc. In 2012 Area E held a large population of Ox-eye Daisy (*Leucanthemum vulgare*), which almost completely disappeared during the large floods in June of that year (below).



Shingle beds before and after June 2012 flood

Stephen Hewitt (Curator of Natural Sciences at Tullie House Museum) writes:

The sand and shingle banks on this stretch of the River Caldew are of national significance for their specialist invertebrate fauna. Exposed riverine sediments (ERS) are recognised as being valuable habitat for a number of rare and specialist insects that are of national conservation concern. Over the last decade I have worked with entomological colleagues in Carlisle Natural History Society, undertaking several detailed surveys of the invertebrate interest of river shinglebanks in Cumbria and elsewhere. Our studies have identified the Eden catchment as being one of the most significant in Britain for its ERS invertebrate communities. Furthermore, the sand and shingle deposits along the Caldew between Dalston and Cummersdale comprise one of the two most important stretches of river for ERS invertebrates in the whole Eden catchment.

These invertebrate communities require constantly shifting sediment banks created by dynamic spate rivers. An actively-mobile river floodplain provides ideal habitat requirements and so far as possible the river should be left to shift its course at this point. Compaction of the sediments is highly damaging to these specialist invertebrates that live within the interstices of the sands and gravel deposits. Trampling by people and stock, and compaction by vehicles, are all damaging. Therefore stock access to ERS deposits should be prevented and public access subtly discouraged where possible. Vehicular access and gravel extraction should be denied.

Areas E & F management recommendations

The most important consideration in maintaining these areas is not to attempt to control the river! A glance of any of the sections of riverbank which have been ‘protected’ in recent years illustrates how short-lived these interventions are – extremely expensive, and doomed to rapid undermining and collapse!

(A major problem arises from the use of huge limestone blocks in some of these bank-protection schemes is that, once undermined and liberated by the river from their raised position in the defence-works, they slump to the river-bed, where they tend to lodge firmly due to their sheer weight. These then act as barriers to the river’s free flow, and act to exacerbate the flooding and encourage further erosion.)

The River Caldew is a very vigorously-eroding river, and within quite short time-spans will range across its bed, eroding, and depositing, as it goes. Attempts to control its natural tendencies fail with alarming speed. Management of the flood-plain features needs to reflect this understanding, and make due allowance for the irresistible loss of land in one place, and accretion of new ‘land’ in another.

If the river is allowed to take its own course the constant erosion and deposition of materials produces new substrates for colonisation by both insects and plants.

Area G

Bounded by grid references NY 3883 5166, NY 3888 5168, NY 3893 5167. (The area marked on the Google Earth aerial view may be slightly misplaced due to lack of visible landmarks on the aerial view.) This area is a relatively species-rich area in comparison to the spray-fields. It is close to the pylon lines and set just back from the river. It appears to have a substrate of coarse gravels.

Area G management recommendations

As the vegetation here is not too dense and the substrate not too rich, it should be possible to enhance the biodiversity of this area, perhaps by planting wildflower plugs, or seeding suitable varieties into scarified areas, to attract butterflies and other insect groups.

Area H Willow plantations

(These lie within area D.) Although apparently planted to provide a crop, the willow stands have not been harvested, and many trees have collapsed through wind-throw on the unstable substrate. The ground vegetation here is the poorest of the whole Nestlé treatment site with a very low number of species present:

Wetted thistle ~ *Carduus crispus* (frequent)

Creeping thistle ~ *Cirsium arvense* (frequent)

Creeping buttercup ~ *Ranunculus repens* (occasional)

Himalayan balsam ~ *Impatiens glandulifera* (abundant)

Nettle ~ *Urtica dioica* (abundant)

There is little apparent use of these areas by birds or insects.

Area H management recommendations

Cutting the willow and removing the cut material would lower the nutrient level of the soils and any regeneration occurring may provide a better feeding and nesting habitat for birds.

It may be worth exploring the possibility for removal of this willow material for commercial wood-chip and biofuel use.

An option would be to remove completely the willow and replace with a mix of native tree species.

However, the existing stands do screen the sewage plant, and some further judicious planting, perhaps of native trees, including native willows, would improve the visual aspect from the Cumbrian Way footpath.

Area I

This Area was not part of the original remit, being outwith the effluent-treatment complex, and was only surveyed in October 2012. It is thus represented in the table only by those plants still recognisable in early autumn.

Following discussion with Rebecca Cranshaw about the possibilities of creating a 'butterfly meadow', perhaps with involvement of the local community and school(s), we sought a site which was i) situated closer to the community, and ii) had a suitable 'un-enriched' substrate – so important to retaining the required foodplants and nectar sources for butterflies. Our advice would be that the other Areas considered are all either too nutrient-rich, too prone to flooding, too limited in area, and/or too far from the town, to be fully suitable.

Area I consists of a somewhat raised low dome of ash (from coke?) deposited here from the factory in earlier years. It now has a complete vegetation cover, but is strikingly different from all other areas surveyed due the ash substrate, providing free drainage and low nitrogen levels, its position some metres above river-level even in flood (and so not receiving the silt-load occasioned in the other Areas during floods), and – not having been part of the earlier land-spread operations – never receiving the nutrients inputs of these areas.

Its vegetation reflects this distinct history, being in general rather open, and with no dense growth of the weedy, nutrient-demanding, species so dominant in other areas. Although there is no great variety of plants, there are a few species not known in any other Areas, or very localised there. The Hard Rush (*Juncus inflexus*) is an interesting dominant, especially of the northeastern third of the field, and of particular interest is an abundance of the Greater Bird's-foot Trefoil (*Lotus pedunculatus*), not otherwise recorded on the renovation site, an important species for nectaring of butterflies, bumblebees and other insects, and as a possible larval foodplant for Common Blue and Dingy Skipper butterflies.

Of great surprise in the initial 8th October 2012 survey was the finding of a dozen dead stalks of a species of orchid, thought to be Bee Orchid (*Ophrys apifera*). Confirmation of the identity is awaited: photos have been emailed to other botanists. Bee Orchid (if so it proves to be) is a very local (though expanding) species, with a few sites known in coastal sand-dunes in northern Cumbria. The needs of this spectacular species should be carefully addressed, and great care taken not to disturb the areas in which it grows. The main concentration had a grid reference of NY3762.8081, with a few spikes more scattered. A fuller search will be required in 2013.

Much of the Area is dominated by the usual larger and coarser grasses, but significant sections have a strong showing of finer-leaved species such as Red Fescue (*Festuca rubra*) and Common Bent (*Agrostis capillaris*). Although the survey was undertaken on this section much too late to connect with any of the grassland butterflies, it is likely that species such as Ringlet and Meadow Brown and perhaps Wall Brown breed in this area, and this should be borne in mind when any management work is undertaken: close mowing would damage the larvae of these species.

The southern half of Area I is a very gentle south- to southwest-facing slope of dry grassland. The low nutrient levels make for a valuable area distinct from all other areas of the restoration site. The build-up of leaf-litter and soil on this area has been minimal, and it should be an ideal site on which to attempt to enhance the value as a breeding area for butterflies by the encouragement of suitable foodplants for the caterpillars of e.g. Dingy Skipper and others – plants such as Bird's-foot Trefoil (*Lotus corniculatus*) and Sheep's Sorrel (*Rumex acetosella*) should thrive here.

Establishment of the plants could be attempted either by scarifying patches within the grasslands to reach the ash-layer and open up a seed-bed for planting of seeds, or – more expensive, more immediate and sometimes more effective – planting 'plugs' of established plants.

Area I management recommendations

Judicious introduction of foodplants and nectaring species could be introduced by seed into scarified 'seedbed' areas or by planting out of 'plugs' of established plants. Management requirements should not be excessive, and indeed, the needs of the grassland butterflies' larvae mediate against intensive mowing or other interventions.

Comments on groups

Flowering plants

Although the tables of plants recorded in Section 2 below seem extensive, it must be kept in mind that over a large proportion of the site – especially of course those areas which received the effluent – the communities of plants are extremely limited, often with fewer than ten or so dominant species.

Given that the species-poor areas are created by high nutrient-levels, any programme to enhance diversity has to tackle this underlying problem. Clearing of areas of soil to expose the river-gravels or subsoils below might return colonisation to an earlier stage, but it seems likely that communities of tall herbs, similarly dominant – if perhaps with a different selection of species – would rapidly develop again. Such operations would also be expensive and of short-term benefit.

A critical question to be answered is: is there a layer of **unenriched** subsoil persisting **below** the existing nutrient-enriched horizon? If such a layer has persisted, then scraping off the surface layers into banks might expose less-enriched substrates which – potentially – could provide for the development of much more varied communities which might have some chance of resisting encroachment by the dominants.

It is very noticeable that species-diversity is concentrated very obviously in the peripheral areas, and especially along the river-side paths, the banks of the river, and its shingle-beds. There might be scope to extend the areas of plant-diversity somewhat by mowing regimes (much more valuable if the cut litter is removed), and perhaps by scarification and casting of seed, perhaps gathered from the site. Planting of 'plugs' of established plants of selected species is often a more certain route to rapid establishment, but this is expensive and labour-intensive. Mowing at season's end and (preferably) removal of cuttings to prevent leaf-litter build-up would certainly be very helpful in enhancing diversity in these peripheral areas.

Area I is of interest in being the only substantial area not affected by the impacts of nutrient-enhancement from effluent. Here, it would be a more straightforward process to improve the species diversity by appropriate management, perhaps with introduction of food- and nectar-plants to enhance the attraction to butterflies and other insect groups at both larval and adult stages.

Bryophytes (mosses and liverworts)

A wide variety is not to be expected in this habitat, owing to the shortage of bare ground and competition with flowering plants. A few species were recorded on bark on some older willows and Elderberry – see Summary Tables (page 21).

Amphibians & reptiles

No amphibians or reptiles were reported in the surveys by CNHS members in 2012.

Sam Griffin comments:

Common Frog, Common Toad and Palmate Newt are all almost certain to occur. Great Crested Newt would not be beyond the realms of possibility. As we know, Slow-worm and Common Lizard occur in the wider area, and even with the enrichment issue I do feel there is a chance that low numbers could occur here. There will be opportunities to enhance the site with a view to future colonisation.

Birds

The main areas of willow plantations attract few nesting birds, and these of the common species. A large roving post-breeding flock of over a hundred small birds, including the common tit species, Goldcrests, Tree-creepers, Chiffchaffs and Willow Warblers, crossed from the riverside trees into the willow plantations on an occasion in August 2012. (Such a flock would be likely to draw in birds from a wider area – such as the extensive woodlands on the east side of the river.)

The fringing woodlands along the river, on islands within the floodplain, and along the small stream running parallel with the railway down-valley from Low Mill are excellent habitats for birds and attract many species at all times of year. The Alders are especially important in winter as seed sources for many small finches, especially Siskins and Redpolls, and the 'scrub' elements along the river and the stream have in several winters attracted remarkable numbers of small birds for feeding and roosting, even wintering Chiffchaffs.

Stonechats have on occasion wintered in the tall weeds of the main open field sites, but few birds currently find these areas attractive in or out of the breeding season. The Little Ringed Plover – a very rare bird in the county – has attempted to breed in the valley, requiring open gravel beds for nesting (even within the Low Mill sewerage treatment works in one year), and the species was seen at times on open muddy pools at the far northeast end of Area C before such areas grew over with dense vegetation. As stated earlier, Buzzard and other raptors hunt over the fields at times.

From John Miles:

Several trips were made this breeding season to look at the breeding birds around the land owned by Nestlé at Dalston. The major group of birds using the area were the warblers which migrate here from Africa. In the areas of Willow and Alder by the River Caldey Willow Warbler, Chiffchaff, Blackcap and Garden Warbler were recorded. In grassland a single Grasshopper Warbler was located, whilst where individual willows occurred in the grassland, Sedge Warbler occurred.

Many resident species were in the woodlands, including Robin, Wren, Great Spotted Woodpecker; Blue, Great, Coal and Long-tailed Tits; Song Thrush, Blackbird, Mistle Thrush and Dunnock.

Finches were well represented, with Chaffinch, Goldfinch, Greenfinch, Linnet and Lesser Redpoll. Due to the lack of mature or ageing trees with suitable natural cavities providing nest holes, the presence of both Carrion Crow and Magpie would help to secure nesting sites for Kestrel and Tawny Owl to use after abandonment of nests by those two corvid species. Buzzards were seen in the area but not thought to be nesting on this particular land. Barn Owls are often hunting the land but are short of nest sites.

As would be anticipated, the river was the focus for much bird activity, used by Dipper (right), Reed Bunting, Pied and Grey Wagtail. Mallard and Goosander were present. Wading birds were represented by Common Sandpiper and Oystercatcher. Sand Martins were nesting in the river bank. One Kingfisher was seen: this species nests upstream from the area.



The wildlife potential of a large pond to catch surplus water would be very great. It might be possible to create a 'Sand Martin bank' from the soil that is removed: the river-bank colonies of this species are prone to flooding, with the loss of eggs and chicks. (See **Notes**, page 25.)

Adding Common Reed (*Phragmites*) and Bulrush (Reedmace; *Typha latifolia*) to the pond could expand the number of Sedge Warblers. Such plants also have a proven role in the purification and clarification of water before it enters the river.

A Goosander had a remarkably large brood on the river in 2012 (right), and perhaps nested on the site (or more likely in the less-disturbed areas across the river). This species typically nests in cavities in tree-boles or stumps.



Dave Hickson comments that the length of stream running northeast from Low Mill parallel to the rail line (i.e. NY3774.5118 to NY3797.5138) is part of Nestlé's holding. It was not surveyed on the plant and wildlife survey, not being part of the spray-fields. Although a path runs between the stream and the rail line, this has become overgrown by brambles and nettles in recent years. There are many old alder trees along this stream making the stretch very attractive to range of small birds, and bird-boxes here would attract many species. Some young alders could be planted here to replace those that have recently died.

Mammals

Voles – species not identified but probably both Short-tailed Vole and Bank Vole – occur in the rank vegetation, in some years in abundance. Moles are also present in places, and Stout is present. Otter is often to be seen along the river, especially towards Dalston itself. Mink may still be present on the river.

Sam Griffin (Hesketh Ecology) has conducted bat surveys in 2008 and 2010 on properties in Low Mill, and the following is a summary of information he has very kindly provided:

In August 2008 small numbers of pipistrelle bats (the actual species not identified) appeared to be using a barn in Low Mill (due for conversion to residential property). It is uncertain if the site is still in use.

During the activity surveys Soprano Pipistrelles (*Pipistrellus pygmaeus*) were emerging from a different barn to the north (beyond the scope of the survey), a Noctule bat (*Nyctalus noctula*) was flying over the site to the east, and Daubenton's bats (*Myotis daubentonii*) were crossing the site in a north-south direction at a time and in a manner which would suggest a roost in very close proximity (presumably in the previously mentioned barn to the north).

In July 2010 a property in the hamlet was visited. The home owners reported bats in the property, roosting behind wooden cladding on the southern elevation. No emergence survey was conducted, but from the number of droppings and smell, and the reported counts of '200+' bats, it was interpreted as being a Soprano Pipistrelle roost. The cladding required replacement, which was carried out with Natural England advice to retain an access point. The householder reports (October 2012) that apparently the bats did not return in 2011, but in 2012 smaller numbers appeared. This is typical of activity following roost disturbance and numbers are likely to build up over the next few seasons. This is a significant roost site and is likely to be dependant on the high quality foraging habitat in the area.

The distinct linear habitat features provided by willow planting are significant for bats. They use features such as these to forage and commuting through a landscape. The buildings at Low Mill provide confirmed and potential roost sites for bats and the river to the south offers high quality foraging habitat.

The presence of Daubenton's bats is particularly interesting as they only rarely roost in buildings. Connectivity for the bats between the buildings and the river should be maintained and enhanced wherever possible. Even low planting, in a belt between the buildings and river, would help. Obviously ponds would be a great enhancement.

Noctule bats are not abundant in the area. These roost in trees (no roosts in buildings have ever been identified in Cumbria) so roost provision would probably be impossible (unless we could consider erecting standing deadwood poles!). However, enhancing the site for invertebrates would clearly benefit this species.

Both Soprano and Common Pipistrelles are common and widespread, but provision of ponds, planting of night-scented plants (e.g. honeysuckle, etc.) would enhance the site for these species.

Dave Hickson points out that – in relation to linear willow plantations – bats (and aerial-feeding birds such as swallows) will naturally follow 'edges' – which linear tree-features provide – as a means both of feeding and for convenient guides, and cover, across open ground. However, it is not the 'linearity' of the habitat *per se*, so much as the 'edge' that is the significant feature. If bats prefer woodland edge for hunting, then clumps of trees or small woodlands with a more 'scalloped' margin would increase the length of this woodland-edge effect, and allow hunting over a much broader area which would be advantageous. 'Scalloped' edges to plantations also help to provide sheltered 'glades' which again add to variety, and are a valuable addition, especially where sun-exposed and with a diversity of vegetational structure. Dave adds:

I personally would like to see these willow plantations removed on a rotational basis and replanted with a mixed woodland which would be more wildlife-friendly. I think that a lot of the area around the sewerage works could be given over to true woodland for screening purposes, with scrub around the edges. Visually the willow plantations are somewhat unsightly.

Large numbers of bats feed along the stream running northeast from Low Mill parallel to the rail line (i.e. NY3774.5118 to NY3797.5138). There are many old alder trees along this stream which may be used as roosts for bats and the attraction for bats could well be enhanced by putting up bat-boxes. Some young alders could be planted here to replace those that have recently died. (The area is also very attractive to range of small birds, and bird-boxes here would attract many species.) This area was not checked on our plant and wildlife survey.

Butterflies

In a generally very poor season for this group – due to the often cool and damp conditions – a few records were made of generally widespread and predictable species.

The few very large *Buddleia* bushes provided valuable feeding stations for the Vanessa butterflies (Peacock, Red Admiral, Small Tortoiseshell) in the later season.

Enhancing the area's potential for butterfly species would be a very valuable exercise, and the Areas where this might be achieved have been detailed earlier (see especially discussion under Area I). A first essential is to provide a range of plants which flower successively through the season, to supply butterflies with nectaring opportunities through the season. Clearly, the wider the range of flowers available at each stage of the season, the greater the chances to attract and hold butterflies of a wide range of species. However, an even more important goal should be to provide the conditions for the successful breeding of butterflies: under intensive agriculture and the relentless 'tidying' of the landscape, a great many once-widespread species are under increasing threat of local and even national extinction. Such conditions require the provision of the appropriate food-plants for the caterpillar stages. Many butterflies are very particular in their choice of foodplant – some, indeed, relying on a **single** plant species. Furthermore, the populations of that food-plant need to be sufficiently abundant locally to attract the egg-laying females in the first place, and also often need to be in particular situations of shelter or exposure, or in plant communities of particular structure with regard to depth and variation of ground-cover.

David Wainwright of Butterfly Conservation (www.butterfly-conservation.org) has very kindly offered the following comments, which provide much food for thought and many suggestions for the enhancement of the habitat for particular species:

Firstly, hay-meadows in the traditional sense are relatively poor butterfly habitats, at least in this country. Folk intuitively assume the opposite, because hay-meadows are seen as 'flower-rich'. The reality is often different: they often support a relatively limited range of caterpillar food-plants, and the timing of their cutting often eliminates caterpillars, or removes the parts of plants which they would otherwise eat.

Several steps can be taken to avoid the latter problem: either cut later, say mid-September onwards (although this is no good to a farmer hoping for a crop of hay), or only cut part of the site in a given year, thus ensuring some larvae survive. Even then, a meadow will usually be dominated by tall vegetation which will either eliminate low-growing plants, or render them inaccessible to egg-laying butterflies.

One possible solution is to create a more butterfly-friendly habitat than a typical hay-meadow. This can be done by ensuring that the growing medium is low in nutrient – use either subsoil, or imported material such as limestone ballast. This will reduce the dominance of tall, rank grasses and other shading plants, and will create a warmer microclimate – essential if you are to attract breeding populations of species such as Dingy Skipper, which favours a mosaic of sward heights with plenty of bare ground. This will also let caterpillar food-plants such as Bird's-foot Trefoil (*Lotus corniculatus*), Sheep's Sorrel (*Rumex acetosella*), and others maintain a foothold and encourage the species that breed upon them (e.g. Common Blue, burnet moths, Small Copper, Forester Moth and Dingy Skipper).

Of course, this type of scheme may not be what the site owners have in mind as it may be their wish to create a more traditional meadow. However, if creating butterfly habitat is the primary aim then the low-nutrient route is by far the best.

I attach various fact sheets [see **Notes**, page 25, 'Butterfly Conservation' literature] which I hope might provide further ideas. A Dingy Skipper fact sheet can be downloaded from the main Butterfly Conservation website.

Larval (caterpillar) food-plants of locally-occurring butterflies

The Priority Species, the Dingy Skipper – far from 'dingy'! – has been recorded from the site in the past, and it would be possible to manage parts of the site in the hope of attracting this species. The caterpillar food-plant is the Bird's-foot Trefoil mentioned above, which already occurs in Area F, and secondarily the Greater Bird's-foot trefoil (*Lotus pedunculatus*) which occurs abundantly in Area I. The delightful Six-spot Burnet Moth also feeds on Bird's-foot Trefoil as a caterpillar.

Both species of Bird's-foot Trefoil, and other related low-growing plants such as clovers and Lesser Trefoil (*Trifolium*) – which are already well-represented on site – and Restharrow (*Ononis repens*) are used by Common Blue butterfly.

A sward of mixed grass species at different heights is utilised by Large Skipper, Wall, Meadow Brown and Ringlet butterflies.

Nettles are the **only** food-plant for caterpillars of the conspicuous vanessid butterflies (Peacock, Red Admiral, Small Tortoiseshell), whilst the Comma utilises this but may also use some tree species.

Other 'weeds' used by butterflies as caterpillar food-plants include Broad-leaved Dock (*Rumex obtusifolius*) used by Small Copper, which also utilises Sheep's Sorrel (*Rumex acetosella*; not recorded on the site, but could be introduced to Area I).

The Orange-tip (below: mating pair) and the 'white' butterflies (especially the Green-veined White) rely on various 'crucifers' such as Garlic Mustard (*Alliaria petiolata*), Cuckoo-flower (*Cardamine pratensis*), Hedge Mustard (*Sisymbrium officinale*), Charlock (*Sinapis arvensis*), and Dame's Violet (*Hesperis matronalis*).



Orange-tip butterfly: mating pair

Enhancing the value of a habitat for insects and other invertebrates

We have spelled out in a little detail the potential for enhancement of the habitat for butterflies. It is worth at the same time considering how creating habitats for a much wider range of insects and other invertebrates can enhance the value of a habitat in terms of biodiversity; in providing pollinators for the flowering plants, and indeed in the wider locality for pollination of many cultivated crops; and also – since invertebrates support a great many other creatures from their lowly position in most food-chains.

The overriding considerations are to provide:

- i) the widest possible **diversity** of food-plants for larvae and for adults – herbs and grass species for larval foodplants, and flowering plants – from herbs to blossom-bearing trees and shrubs – as sources for nectar- and pollen-provisioning for mature insects;
- ii) a varied structure to the vegetation cover: **mosaics** of different habitats and vegetation structures – encompassing patches of bare ground, grassland, woodland, wetland and scrub – can be particularly valuable to insect diversity.

Cattle-grazing is an accepted way of creating structure in vegetation, but may not be an option on this site.

Section 2

Species recorded by Area (see maps, page 3)

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
Flowering plants										
<i>Acer pseudoplatanus</i>	Sycamore	seed-lings	✓			✓	seed-lings	seed-lings		
<i>Achillea millefolium</i>	Yarrow	✓	✓	✓		✓	✓	✓		✓
<i>Achillea ptarmica</i>	Sneezewort			✓			✓			
<i>Adoxa moschatellina</i>	Moschatel		✓							
<i>Aegopodium podagraria</i>	Ground-elder	✓	✓	✓		✓	✓	✓		
<i>Alchemilla mollis</i>	Soft lady's-mantle							✓		
<i>Alliaria petiolata</i>	Garlic mustard	✓	✓	✓		✓	✓			
<i>Allium ursinum</i>	Ramsons	✓	✓							
<i>Alnus glutinosa</i>	Alder	✓	✓			✓	✓			seed-lings
<i>Angelica sylvestris</i>	Wild angelica	✓			✓	✓		✓		
<i>Anthriscus sylvestris</i>	Cow parsley	✓	✓	✓	✓	✓	✓	✓		
<i>Arum maculatum</i>	Lords-and-ladies	✓	✓							
<i>Arctium minus</i>	Lesser burdock	✓	✓	✓	✓	✓	✓			
<i>Artemisia vulgaris</i>	Mugwort					✓				
<i>Atriplex patula</i>	Common orache					✓				
<i>Barbarea vulgaris</i>	Common wintercress	✓	✓		✓	✓	✓			
<i>Bellis perennis</i>	Daisy	✓	✓			✓				
<i>Calystegia sepium</i>	Lesser bindweed			✓						
<i>Calystegia sylvatica</i>	Large bindweed	✓	✓	✓						
<i>Campanula latifolia</i>	Giant bellflower	✓								
<i>Campanula rotundifolia</i>	Harebell	✓				✓				
<i>Cardamine flexuosa</i>	Wavy bittercress	✓								
<i>Cardamine hirsuta</i>	Hairy bittercress					✓				
<i>Cardamine pratensis</i>	Cuckooflower	✓	✓			✓	✓			
<i>Carduus crispus</i>	Wetted thistle	✓				✓	✓		✓	
<i>Centaurea nigra</i>	Common knapweed	✓	✓	✓		✓	✓	✓		✓
<i>Cerastium fontanum</i>	Common mouse-ear	✓	✓	✓	✓	✓	✓	✓		✓
<i>Chaerophyllum temulentum</i>	Rough chervil	✓	✓		✓	✓				
<i>Chamerion angustifolium</i>	Rosebay willowherb	✓	✓	✓		✓	✓			
<i>Chrysosplenium alternifolium</i>	Alternate-leaved golden-saxifrage		✓							
<i>Chrysosplenium oppositifolium</i>	Opposite-leaved golden-saxifrage		✓							
<i>Cirsium arvense</i>	Creeping thistle	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Cirsium vulgare</i>	Spear thistle	✓		✓	✓	✓	✓			✓
<i>Conium maculatum</i>	Hemlock				✓		✓			
<i>Conopodium majus</i>	Pignut		✓		✓	✓				
<i>Corylus avellana</i>	Hazel		✓							
<i>Crataegus monogyna</i>	Hawthorn	✓	✓			✓	✓	✓		
<i>Crepis capillaris</i>	Smooth hawk's-beard	✓			✓					
<i>Cruciata laevipes</i>	Crosswort	✓	✓	✓	✓	✓	✓	✓		
<i>Cytisus scoparius</i>	Broom	✓					✓			
<i>Digitalis purpurea</i>	Foxglove		✓							

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
<i>Echium vulgare</i>	Viper's-bugloss	✓				✓	✓	✓		
<i>Epilobium ciliatum</i>	American willow-herb				✓	✓	✓			
<i>Epilobium hirsutum</i>	Great willowherb	✓		✓	✓	✓	✓	✓		✓
<i>Epilobium montanum</i>	Broad-leaved willowherb		✓							
<i>Equisetum arvense</i>	Field horsetail	✓	✓	✓		✓	✓			
<i>Fallopia japonica</i>	Japanese knotweed		✓							
<i>Filipendula ulmaria</i>	Meadowsweet	✓	✓	✓		✓	✓			
<i>Fraxinus excelsior</i>	Ash	✓	✓			✓	✓			seedlings
<i>Fumaria officinalis</i>	Common fumitory	✓	✓			✓	✓			
<i>Galanthus nivalis</i>	Snowdrop	✓	✓			✓				
<i>Galeopsis tetrahit</i>	Common hemp-nettle	✓								
<i>Galium aparine</i>	Cleavers	✓	✓	✓	✓	✓	✓	✓		✓
<i>Galium mollugo</i>	Hedge bedstraw	✓	✓	✓		✓	✓	✓		
<i>Geranium dissectum</i>	Cut-leaved crane's-bill			✓	✓					
<i>Geranium pratense</i>	Meadow crane's-bill	✓	✓	✓			✓			
<i>Geranium robertianum</i>	Herb-Robert	✓	✓			✓	✓			
<i>Geum urbanum</i>	Wood avens	✓	✓	✓		✓	✓	✓		
<i>Glechoma hederacea</i>	Ground-ivy	✓	✓			✓				
<i>Hedera helix</i>	Ivy	✓	✓							
<i>Heracleum sphondylium</i>	Hogweed	✓	✓	✓	✓	✓	✓	✓		✓
<i>Hesperis matronalis</i>	Dame's-violet	✓	✓	✓	✓	✓	✓	✓		
<i>Hieracium (species)</i>	Hawkweed (species)	✓								
<i>Hyacinthoides × massartiana</i>	Hybrid bluebell	✓	✓							
<i>Hyacinthoides non-scripta</i>	Bluebell	✓	✓							
<i>Hypericum androsaemum</i>	Tutsan	✓								
<i>Hypericum perforatum</i>	Perforate St John's-wort	✓	✓	✓						
<i>Hypericum pulchrum</i>	Slender St John's-wort							✓		
<i>Hypochaeris radicata</i>	Common cat's-ear	✓				✓				
<i>Impatiens glandulifera</i>	Indian balsam	✓	✓	✓	✓	✓	✓		✓	
<i>Lamium album</i>	White dead-nettle		✓							✓
<i>Lamium purpureum</i>	Red dead-nettle	✓	✓							
<i>Lapsana communis</i>	Nipplewort	✓	✓	✓	✓	✓	✓	✓		
<i>Larix decidua</i>	Larch						✓			
<i>Lathraea squamaria</i>	Toothwort		✓							
<i>Lathyrus pratensis</i>	Meadow vetchling	✓	✓			✓	✓			
<i>Lepidium campestre</i>	Field pepperwort	✓		✓						
<i>Lemna minor</i>	Duckweed			✓						
<i>Leucanthemum vulgare</i>	Oxeye daisy	✓	✓			✓	✓	✓		
<i>Linaria vulgaris</i>	Common toadflax			✓						
<i>Lonicera periclymenum</i>	Honeysuckle	✓	✓	✓						
<i>Lotus corniculatus</i>	Bird's-foot trefoil						✓			
<i>Lotus pedunculatus</i>	Greater bird's-foot trefoil									✓
<i>Lysimachia vulgaris</i>	Yellow loosestrife	✓	✓	✓		✓	✓			
<i>Malus sylvestris</i>	Crab apple		✓							
<i>Matricaria discoidea</i>	Pineappleweed			✓			✓			
<i>Meconopsis cambrica</i>	Welsh poppy	✓	✓			✓				
<i>Medicago lupulina</i>	Black medick					✓				

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
<i>Mentha aquatica</i>	Water mint	✓	✓							
<i>Mentha arvensis</i>	Corn mint			✓			✓			
<i>Mercurialis perennis</i>	Dog's mercury		✓							
<i>Mimulus</i> (species)	Monkeyflower (species)	✓				✓	✓			
<i>Myosotis arvensis</i>	Field forget-me-not	✓		✓	✓	✓	✓	✓		
<i>Myosotis laxa</i>	Tufted forget-me-not			✓						
<i>Myosotis scorpioides</i>	Water forget-me-not	✓	✓			✓	✓			
<i>Myosotis sylvatica</i>	Wood forget-me-not	✓								
<i>Myrrhis odorata</i>	Sweet cicely	✓		✓					✓	
<i>Narcissus pseudonarcissus</i>	Daffodil	✓	✓							
<i>Odontites vernus</i>	Red bartsia				✓					
<i>Oenanthe crocata</i>	Hemlock water-dropwort	✓				✓				
<i>Ophrys apifera</i>	Bee Orchid									✓
<i>Ornithogalum angustifolium</i>	Star-of-bethlehem	✓								
<i>Papaver atlanticum</i>	Atlas poppy					✓				
<i>Papaver rhoeas</i>	Common poppy					✓				
<i>Pentaglottis sempervirens</i>	Green alkanet	✓					✓			
<i>Persicaria maculosa</i>	Redshank			✓		✓	✓			
<i>Petasites hybridus</i>	Butterbur	✓	✓							
<i>Plantago lanceolata</i>	Ribwort plantain	✓	✓	✓	✓	✓	✓	✓		✓
<i>Plantago major</i>	Greater plantain	✓		✓		✓	✓			
<i>Polygonum aviculare</i>	Knotgrass	✓		✓			✓			
<i>Potentilla anserina</i>	Silverweed	✓	✓	✓	✓	✓	✓			✓
<i>Potentilla reptans</i>	Creeping cinquefoil	✓	✓	✓	✓	✓	✓	✓		✓
<i>Potentilla sterilis</i>	Barren strawberry	✓	✓							
<i>Prunella vulgaris</i>	Selfheal									✓
<i>Prunus spinosa</i>	Blackthorn			✓						
<i>Ranunculus acris</i>	Meadow buttercup	✓	✓			✓	✓			✓
<i>Ranunculus bulbosus</i>	Bulbous buttercup	✓	✓			✓				
<i>Ranunculus ficaria</i>	Lesser celandine	✓	✓			✓	✓			
<i>Ranunculus repens</i>	Creeping buttercup	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Reseda luteola</i>	Weld	✓		✓		✓	✓			
<i>Rorippa sylvestris</i>	Creeping yellow-cress	✓		✓			✓			
<i>Rosa</i> (species)	Rose		✓			✓	✓			
<i>Rubus fruticosus</i>	Bramble	✓	✓	✓		✓	✓	✓		✓
<i>Rubus idaeus</i>	Raspberry		✓							✓
<i>Rumex acetosa</i>	Common sorrel	✓	✓	✓		✓	✓	✓		✓
<i>Rumex crispus</i>	Curled dock			✓	✓	✓	✓			✓
<i>Rumex obtusifolius</i>	Broad-leaved dock	✓	✓	✓	✓	✓	✓	✓		✓
<i>Rumex sanguineus</i>	Wood dock	✓	✓	✓	✓	✓	✓			
<i>Salix</i> hybrids	Willow hybrids									✓
<i>Salix caprea</i>	Goat willow	✓	✓			✓	✓			
<i>Salix cinerea</i>	Grey willow	✓	✓			✓	✓			
<i>Salix fragilis</i>	Crack willow	✓	✓			✓	✓			
<i>Salix purpurea</i>	Purple willow	✓	✓			✓	✓			
<i>Salix viminalis</i>	Osier	✓				✓	✓			
<i>Sambucus nigra</i>	Elder	✓	✓					✓		

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
<i>Sanguisorba officinalis</i>	Great burnet		✓							
<i>Scorzoneroides (Leontodon) autumnalis</i>	Autumn hawkbit	✓		✓		✓	✓			
<i>Scrophularia nodosa</i>	Common figwort			✓	✓		✓	✓		
<i>Senecio jacobaea</i>	Ragwort	✓	✓	✓	✓	✓	✓	✓		✓
<i>Senecio vulgaris</i>	Groundsel						✓			
<i>Silene dioica</i>	Red campion	✓	✓	✓	✓	✓	✓	✓		
<i>Sisymbrium officinale</i>	Hedge mustard	✓		✓			✓			
<i>Solanum dulcamara</i>	Bittersweet						✓			
<i>Sonchus asper</i>	Prickly sow-thistle			✓			✓			
<i>Sorbus aucuparia</i>	Rowan						✓			
<i>Sonchus oleraceus</i>	Smooth sow-thistle	✓			✓					
<i>Stachys × ambigua</i>	Hybrid woundwort			✓	✓					
<i>Stachys palustris</i>	Marsh woundwort	✓	✓	✓	✓					
<i>Stachys sylvatica</i>	Hedge woundwort	✓	✓	✓	✓	✓	✓	✓		
<i>Stellaria graminea</i>	Lesser stitchwort									✓
<i>Stellaria holostea</i>	Greater stitchwort	✓	✓	✓		✓	✓			
<i>Stellaria media</i>	Common chickweed	✓	✓	✓		✓	✓			
<i>Stellaria nemorum</i>	Wood stitchwort	✓	✓				✓			
<i>Symphoricarpos albus</i>	Snowberry		✓							
<i>Symphytum × uplandicum</i>	Russian comfrey		✓	✓						
<i>Tanacetum parthenium</i>	Feverfew						✓			
<i>Taraxacum</i> (species)	Dandelion (species)	✓	✓	✓	✓	✓	✓			✓
<i>Torilis japonica</i>	Upright hedge-parsley	✓		✓	✓	✓	✓			
<i>Tragopogon pratensis</i>	Goat's-beard			✓	✓		✓			
<i>Trifolium dubium</i>	Lesser trefoil	✓			✓	✓				
<i>Trifolium pratense</i>	Red clover	✓	✓	✓	✓	✓	✓			
<i>Trifolium repens</i>	White clover	✓	✓	✓	✓	✓	✓			✓
<i>Tripleurospermum inodorum</i>	Scentless mayweed			✓		✓	✓			
<i>Tussilago farfara</i>	Colt's-foot	✓	✓	✓		✓	✓			
<i>Ulex europaeus</i>	Gorse	✓	✓				✓			
<i>Ulmus glabra</i>	Wych elm	✓	✓				✓			
<i>Urtica dioica</i>	Nettle	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Valerianella locusta</i>	Common cornsalad			✓						
<i>Veronica arvensis</i>	Wall speedwell			✓						
<i>Veronica beccabunga</i>	Brooklime	✓	✓			✓	✓			
<i>Veronica chamaedrys</i>	Germander speedwell	✓	✓		✓	✓	✓	✓		✓
<i>Veronica catenata</i>	Pink water-speedwell					✓				
<i>Veronica montana</i>	Wood speedwell		✓							
<i>Veronica persica</i>	Common field speedwell	✓	✓							
<i>Viburnum opulus</i>	Guelder-rose					✓				
<i>Vicia cracca</i>	Tufted vetch	✓	✓	✓		✓				✓
<i>Vicia hirsuta</i>	Hairy tare	✓		✓		✓				✓
<i>Vicia sativa</i>	Common vetch	✓	✓			✓				
<i>Vicia sepium</i>	Bush vetch	✓	✓	✓		✓	✓	✓		
<i>Viola cultivar</i>	Garden Pansy cultivar					✓				
<i>Viola cornuta cultivar</i>	Horned Pansy cultivar						✓			

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
Grasses										
<i>Agrostis capillaris</i>	Common bent	✓		✓						✓
<i>Agrostis stolonifera</i>	Creeping bent	✓		✓	✓				✓	✓
<i>Alopecurus pratensis</i>	Meadow foxtail	✓	✓		✓	✓	✓	✓		
<i>Anthoxanthum odoratum</i>	Sweet vernal-grass	✓	✓				✓			
<i>Arrhenatherum elatius</i>	False oat-grass	✓	✓	✓	✓	✓	✓	✓		
<i>Brachypodium sylvaticum</i>	False brome	✓				✓	✓			
<i>Bromus hordeaceus</i>	Soft-brome			✓	✓					
<i>Bromus sterilis</i>	Barren brome	✓		✓	✓					
<i>Cynosurus cristatus</i>	Crested dog's-tail	✓								✓
<i>Dactylis glomerata</i>	Cock's-foot	✓	✓	✓	✓	✓	✓	✓		✓
<i>Elymus caninus</i>	Bearded couch						✓			
<i>Elytrigia repens</i>	Common couch	✓			✓					✓
<i>Festuca ovina</i>	Sheep's fescue	✓					✓			
<i>Festuca rubra</i>	Red fescue	✓		✓			✓			✓
<i>Holcus lanatus</i>	Yorkshire-fog	✓	✓	✓		✓	✓			✓
<i>Holcus mollis</i>	Creeping soft-grass	✓		✓				✓		✓
<i>Lolium perenne</i>	Rye-grass	✓	✓	✓	✓	✓	✓			
<i>Phalaris arundinacea</i>	Reed canary-grass	✓	✓	✓		✓	✓			
<i>Phleum bertolonii</i>	Smaller cat's-tail			✓	✓		✓			✓
<i>Phleum pratense</i>	Timothy	✓	✓	✓	✓	✓	✓			
<i>Poa annua</i>	Annual meadow-grass	✓		✓		✓	✓			
<i>Poa nemoralis</i>	Wood meadow-grass	✓					✓			
<i>Poa pratensis</i>	Smooth meadow-grass	✓	✓		✓	✓	✓			
<i>Poa trivialis</i>	Rough meadow-grass	✓		✓	✓	✓	✓	✓		✓
<i>Schedonorus (Festuca) arundinacea</i>	Tall fescue	✓				✓	✓			
<i>Schedonorus (Festuca) gigantea</i>	Giant fescue	✓	✓				✓			
× <i>Schedolium (Festulolium) loliaceum</i>	Hybrid fescue	✓								
<i>Triticum aestivum</i>	Wheat						✓			
Rushes										
<i>Juncus articulatus</i>	Jointed rush	✓								
<i>Juncus bufonius</i>	Toad rush			✓						
<i>Juncus conglomeratus</i>	Compact rush									✓
<i>Juncus effusus</i>	Soft rush									✓
<i>Juncus inflexus</i>	Hard rush	✓		✓	✓					✓
<i>Luzula sylvatica</i>	Greater wood-rush	✓								
Sedges										
<i>Carex hirta</i>	Hairy sedge			✓						✓
Ferns										
<i>Dryopteris filix-mas</i>	Male-fern									✓

Scientific name	Vernacular name	Areas								
		A	B	C	D	E	F	G	H	I
Bryophytes (mosses & liverworts)										
<i>Brachythecium plumosum</i>	Rusty feather-moss		✓							
<i>Frullania dilatata</i>	Dilated scalewort	✓								
<i>Hypnum cupressiforme</i>	Cypress-leaved plait-moss	✓	✓							
<i>Kindbergia praelongum</i>	Common feather-moss		✓							
<i>Metzgeria fruticulosa</i>	Bluish veilwort	✓	✓							
<i>Orthotricum stramineum</i>	Straw bristle-moss		✓							
<i>Radula complanata</i>	Even scalewort		✓							
<i>Ulota phyllantha</i>	Frizzled pincushion	✓								
Birds										
	Barn owl	✓			✓					✓
	Blackbird	song	song						song	
	Blackcap	song	song			song				
	Chaffinch		song						song	
	Chiffchaff	song	song			song				
	Common sandpiper					song				
	Dipper					song				
	Garden warbler	song				song				
	Great tit	song								
	Grey wagtail					song				
	Kestrel			✓						
	Long-tailed tit	song								
	Nuthatch		song							
	Oystercatcher					song				
	Reed bunting	nest								
	Robin					song				
	Sand martin					✓				
	Sedge warbler	song								
	Song thrush								song	
	Whitethroat	song		song						
	Willow warbler	song	song			song			song	
	Wood pigeon					song				
	Wren		song						song	
Butterflies										
	Green-veined white			✓			✓			
	Large white						✓			
	Orange-tip			✓						
	Peacock			✓			✓			
	Red admiral			✓						
	Small tortoiseshell			✓			✓			
	Wall						✓			

Summary of management recommendations

(repeated from Section 1: Descriptions of Areas)

Area A

As Area A is an existing area of high biodiversity, currently developing naturally, it may be left unmanaged.

Area B

This Area does not require any major management input. However, what must be seriously considered is control of the highly invasive Japanese Knotweed (*Fallopia japonica*) which is becoming established.

Area C & D

The biodiversity of the spray-field areas could be improved by:

- a) lowering the nitrogen and other nutrient levels of the soil, perhaps achievable by cutting the areas at least once a year and – importantly – removing the cut vegetation. (This process could take many years to achieve success and would prove to be expensive – probably prohibitively. The continued deposition of silt during floods would also tend to act against attempts to lower soil nutrient-loads.)
- b) lifting subsoil up to the surface, either by deep ploughing, or by digging ponds and creating banks or mounds with the excavated spoil, and sowing these with appropriate wildflower mixes. (The persistence of soil nutrient-loads would tend to encourage rapid over-growth of some of the ‘weedy’ species and (if ponds or wetlands were created) probably other tall and vigorous species.)
- c) scraping off the surface layer of soil, with the excess nutrient levels derived from the milk solids, into banks. Wetter areas and ponds would result if the excavation reached the underlying river-gravels.
- d) planting small copses of trees and shrubs to provide nesting- and shelter-sites for birds and as a source of berry and insect foods, while still leaving areas of rough grassland for small mammals and their attendant raptors.

This would be a preferred option, due to relatively low cost, and minimal requirement for ongoing maintenance or later intervention. Alder (*Alnus glutinosa*), Elderberry (*Sambucus nigra*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and willows (*Salix*) would be amongst species likely to cope with – or indeed thrive upon – the present nutrient levels.

If the existing lowest sections were excavated to provide shallow ponds with large marginal wetland areas, a mosaic of trees, grasslands of varying heights, patches of marshland with Reedmace (*Typha latifolia*), Reed Canary-grass (*Phalaris arundinacea*), Branched Bur-reed (*Sparganium ramosum*), etc., and stretches of open water could be rapidly created.

Winding footpaths could be led through these areas, although vegetation would speedily encroach, and maintenance would be required in any long-term commitment. (An impermeable underlay would help to prevent existing plants pushing up rapidly through a gravel path.)

Trees such as Hawthorn, Blackthorn, Crab Apple (*Malus*), etc., would also grow well on the tops of the bunds along the northeast boundary, as also east of Area E just beyond. Such blossom-bearing trees and shrubs are valuable nectaring sources for many insect species. Other lower parts of the site may be too wet but would favour Alder and various willow species.

Comments on pond-siting and development

The lower (*i.e.* northeastern) parts of Area C appear to be close to the water-table. There may be opportunity to site a pond or ponds in this area. (See **Notes**, page 25.)

A consideration here – perhaps paramount – might be the degree of nutrient remaining in the soils. This could lead to rapid overgrowth of the taller and vigorous weedy species, and indeed any introduced waterside or aquatic species. This rapid response would inevitably mean that a pond area would have a short life before being overgrown. Such overgrowth of open water by marginal vegetation is of course entirely natural and to be expected: no pond has an indefinite life in nature in the absence of some process of scouring or re-excavation. The **rate** at which this would occur would however be very much determined by the available nutrient-levels. It might be that a rapid rate was acceptable, and a re-excavation might be necessary at

intervals of several years.

It is perhaps possible that much of the higher nutrient levels are restricted to the upper soil levels. This possibility would need to be tested. If these upper levels were to be scraped off, the lower soil levels and gravel may not be so high in nutrients.

The deeper the water-body, the slower is the rate of overgrowth. It is also strongly advantageous for wildlife to have water which does not freeze to the base in cold winters. However, it may be that issues of public safety would preclude deeper waterbodies within the area, since deeper water most often implies steeper banks with the inherent dangers. An option is to have large areas cleared with gently-shelving banks. These are very likely to become soft with mud, and this has a strong deterrent effect on humans to penetrate further. It is certainly the case that shallowly shelving banks into the water are very much more useful for all forms of wildlife, as well as being inherently safer for people.

For the widest range of aquatic life, such as newts, frogs, dragonflies, etc., any pond would need to be deep enough in the centre so that it remained wet in drier summers. Although it is often a popular option to build an island within a pond, the required profile then at once impacts upon the potential depths and area of water attainable, but also – more importantly – hugely reduces the overall **volume** of water, and it is the **volume** which provides stability through reduced temperature fluctuations.



An island within a smaller pond greatly restricts the volume of water, unless profiles are steepened

It may be worth considering the shape of the pond for ease of access for machinery which may be required for future dredging or removal of plants. Making the greater proportion of the pond area in pure gravel with no topsoil will help minimise plant growth and extend the life of the pond. Aquatic plants themselves are important for oxygenation of water, and their growth will help clean and denitrify the water.

It is good policy not to plant trees too close to ponds, and suppress the growth of self-sown willows, etc., because shading inhibits growth of aquatic plants, and leaf-fall introduces rotting material into the water body, impacting oxygenation of the water-body.

The construction of a low-nutrient butterfly area could be considered at the same time as pond construction, because excavated spoil may be used.

A well-consolidated bank with a vertical face might be utilised by nesting Sand Martins or Kingfisher (see **Notes**, page 25). However, the risk of vandalism and unwanted attention from children at this unwardened site would be a likely risk to be considered.

Stephen Hewitt (Curator of Natural Sciences at Tullie House Museum) writes:

With respect to the invertebrate interest of the spray fields, such areas could perhaps be made more valuable to insects through limited re-profiling of the topography to create hummocks and hollows. Heaping up some of the underlying gravels and removal of topsoil would encourage ruderal plants as nectar sources and create bare areas of substrate for insect basking, hunting and oviposition. Corresponding hollows of damp grassland and pools, where possible, would also be good for a range of invertebrates and other wildlife.

Areas E & F

The most important consideration in maintaining these areas is not to attempt to control the river! A glance of any of the sections of riverbank which have been ‘protected’ in recent years illustrates how short-lived these interventions are – extremely expensive, and doomed to rapid undermining and collapse!

(A major problem has arisen from the use of huge limestone blocks in some of these bank-protection schemes: once undermined and liberated by the river from their raised position in the defence-works, they inevitably slump to the river-bed, where they lodge firmly due to their sheer weight. These blocks then act as barriers to the river’s free flow, and can only exacerbate the flooding and encourage further erosion.)

The River Caldew is a very vigorously-eroding river, and within quite short time-spans will range across its bed, eroding, and depositing, as it goes. Attempts to control its natural tendencies fail with alarming speed, as can be witnessed down the whole length of the river. Management of the flood-plain features needs to reflect this understanding, and make due allowance for the irresistible loss of land in one place, and accretion of new land in another.

If the river is allowed to take its own course the constant erosion and deposition of materials produces new substrates for colonisation by both insects and plants.

Area G

As the vegetation here is not too dense and the substrate not too rich, it should be possible to enhance the biodiversity of this area, perhaps by planting wildflower plugs, or seeding suitable varieties into scarified areas, to attract butterflies and other insect groups.

Area H

Cutting the willow and removing the cut material would lower the nutrient level of the soils and any regeneration occurring may provide a better feeding and nesting habitat for birds.

It may be worth exploring the possibility for removal of this willow material for commercial wood-chip and biofuel use.

An option would be to remove completely the willow and replace with a mix of native tree species.

However, the existing stands do screen the sewage plant, and some further judicious planting, perhaps of native trees, including native willows, would improve the visual aspect from the Cumbrian Way footpath.

Area I

Judicious introduction of foodplants and nectaring species could be introduced by seed into scarified 'seedbed' areas or by planting out of 'plugs' of established plants. Management requirements should not be excessive, and indeed, the needs of the grassland butterflies' larvae mediate against intensive mowing or other interventions.

Historical Records

The Carlisle Natural History Society has been collecting natural history records for many years. These historical data have been collated at Tullie House Museum. We are grateful to Steve Hewitt (Curator of Natural Sciences and Collections Development Manager, Tullie House) for arranging for the extraction of natural history records from the Cumbria Biodiversity Data Centre based at Tullie House.

The records were selected on the basis of their possible location in the areas under consideration in this report. For a proportion of the records, the actual localisation of the individual record (*e.g.* by accurate naming and/or precise grid-reference) is not sufficiently precise to be certain that the record does in fact relate to the Nestlé holdings. (Many records are localised to a 1km- or 2km-square of the OS National Grid.)

However, there are some areas which have an abundance of well-localised records. The most significant of these are the shingle-bed habitats, where many specialist insects, including a number of nationally rare and scarce species, have been recorded. 'Redlisted' species include the click beetle *Negastrius sabulicola*, the rove beetle *Neobisnius prolixus*, the Northern Silver Stiletto-fly, *Spiriverpa lunulata*, and the tiny dance-fly *Tachydromia acklandi*. The exact location for some of these rare species were shingle-beds actually somewhat downstream from the stretch of the river alongside the Nestlé fields, but as the river moves across its bed, the location and condition of shingle deposits change with remarkable speed, so that many large beds with these insect communities are now within the Nestlé holding in Area E, and by the downriver extent of Area C.

Valuable insect associations are also recorded for the large area of slumping banks across the river in Blackhall Wood, the upriver section of which also lies in Nestlé holdings. Nationally scarce species here include the craneflies *Gonomyia conoviensis* and *Limonia trivittata*, and the soldierfly *Oxycera pardalina*.

(See Hewitt, *et al.* (1999) River Shingle Invertebrates survey, 1999. *Carlisle Naturalist*. Volume 8, number 2, pages 11-21.)

Notes

Pond creation

There is a wealth of information on ponds on the Worldwide Web. *e.g.*

www.pondconservation.org.uk/millionponds/pondcreationtoolkit/

.... and other parts of the same site.

Artificial Sand Martin/Kingfisher nesting banks – many references available, *e.g.*

www.rspb.org.uk/ourwork/conservation/advice/sandmartins/index.aspx

www.green-space.org.uk/downloads/regions/lpgsf/Guidance/artificial_bank_creation.pdf

www.greenfuturebuilding.org.uk/products/conservation-products/sand-martin-banks-conservation

www.lincstrust.org.uk/reserves/whisby/index.php?id=57

'Butterfly Conservation' literature

A factsheet on the conservation of the Dingy Skipper butterfly:

www.butterfly-conservation.org/uploads/bc0003_Dingy_Skipper.pdf

The two PDFs below currently appear on the website, although with non-functioning links, but David Wainwright of 'Butterfly Conservation' has e-mailed them to Rebecca Cranshaw.

[www.butterfly-conservation.org/uploads/Butterfly Bank Factsheet.pdf](http://www.butterfly-conservation.org/uploads/Butterfly_Bank_Factsheet.pdf)

[www.butterfly-conservation.org/uploads/Seeding & Plug Planting Factsheet .pdf](http://www.butterfly-conservation.org/uploads/Seeding_&_Plug_Planting_Factsheet.pdf)

A further PDF, "Butterfly Scrape Factsheet" on the same page seems relevant, but also has a non-functioning link. It would be worth making enquiries of Butterfly Conservation for this PDF; the description for it reads: "Scrapes can be a simple and effective way of providing bare ground habitat, adding variation in aspect, removing nutrient enriched soils and encouraging a diversity of butterfly and moth foodplants".

Short-rotation willow coppice

A good source of information on an extensive trial of wildlife ecology in short rotation willow coppice is:

www.berr.gov.uk/files/file14870.pdf

Amongst many other pieces of useful information, the study suggests that bird numbers are highest in the second year of the willow coppice rotation (looking particularly at thrush numbers). As might be anticipated, numbers of invertebrates – the essential food for so many birds – are much higher on the edge of a plantation. From this it follows that increasing the actual length of the boundary (by breaking away from square blocks of planting) benefits wildlife.

See also Dave Hickson's website on **Dalston village, and the wildlife of Dalston and the River Caldeu** :

www.wildcaldeu.wordpress.com

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