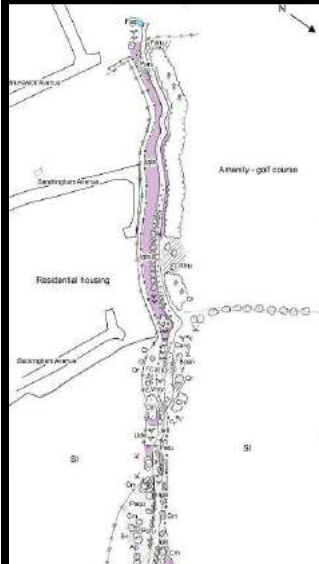


# Nellies Clough, Horwich *Habitat Management Plan*

Report for **New Chapel Residents Association**  
January 2016



## **Control sheet**

**Project No. & Title:** BOW17/618 Nellie's Clough, Horwich  
*Habitat Management Plan*

**Client:** New Chapel Residents Association

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## 1 Introduction

- 1.1 This plan was commissioned by the New Chapel Residents Association, in Horwich, with a view to understanding the condition and interest of the natural stream corridor of the northern most reach of Nellie's Clough. The intended output was a management plan that would help local residents, and possibly schools, to engage with the stream corridor and its future management and to improve it both as an amenity and a transit corridor for residents and wildlife.
- 1.2 This plan identifies the main objectives for conservation management at Nellie's Clough. The site is located between Grid References: SD 65221 11077 to SD 64840 10724. This corridor runs adjacent to farmland, the residential area and Horwich Golf Club on the outskirts of the town, east of Horwich. The document aims to provide a definite plan of prescriptions, that could be undertaken by the 'New Chapel Residents Association' and the 'Friends of Nellie's Clough' in the interest of improved stewardship of the stream corridor and to improve its amenity value for the community..
- 1.3 The Clough rises at the convergence of two footpaths: one descending from Knowles Farm, above Fleet Street, and the other being the western leg of the footpath coming down from Boardmans Farm, off Latham Row. Part of the River Douglas catchment, the open watercourse runs for some 530 metres south west from its springing, past the side of western-most properties in Buckingham Avenue and Sandringham Road and Brunswick Avenue until disappearing into culvert above Mount Street (off Chorley New Road). The culvert passes beneath the college playing fields and under Chorley New Road, thereafter following a tortuous route until and eventually connecting with Moss Brook at the rear of the former Loco' Works.
- 1.4 Flow in the Clough can be surprisingly influenced by rainfall in just its short length, depending on scale of rainfall events and the antecedent conditions. One rainfall event in July 1964 gave 57mm in 15 minutes and the resultant flow in the Clough combined with other surface water flow prompted flooding to properties in and adjacent to Mount Street, off Chorley New Road.
- 1.5 Whilst the site is privately owned partly by Horwich Golf Club and partly by the farm to the north, the Clough has a footpath running along its length and is used by the people of the surrounding neighbourhood for recreation. The Friends of Nellie's Clough have undertaken conservation and management tasks in the past such as Himalayan balsam (*Impatiens glandulifera*) removal in the northern section.
- 1.6 Many habitats within the UK, including meadows, require human intervention to persist and flourish e.g. a traditional hay meadow is mown in late summer. However, in sites such as this in relatively urban locations, where public access is available, there may be a risk of unintended over-management or unsuitable management of the habitat. This management plan focuses specifically on retaining the site as semi-natural habitat with objectives aimed at stewardship to help reduce risk of impacts.
- 1.7 The structure of this management plan first provides background detail of the site before outlining the key aims of the management plan. Objectives are then divided into primary and secondary, ranked by their importance in achieving the overall management aim. Each objective is attributed with one or more prescriptions whose rationale, action and timings are detailed in Section 4. A simple table detailing this information along with management locations can be seen in Appendix 2.

## 2 Description

### 2.1 Site Details

**Site Name:** Nellie's Clough

**Ownership:** Part owned by adjacent golf course, part owned by adjacent farm

**Managing Agent:** 'New Chapel Residents Association' and the 'Friends of Nellie's Clough' in association with the Environment Agency.

**Region:** North West.

**County:** Greater Manchester.

**O.S Grid Reference:** SD 65028 10940.

**Access:** The primary point of access to the site is via Sandringham Road and Brunswick Avenue where there is direct access to the footpath that runs along the southern edge of the Clough. There is a further access point via footpaths to the Northeastern end of the Clough.

**Area:** 1.26ha.

**Status:** No statutory designations (the closest is Red Moss SSSI approximately 1 km away).

**Physical Aspects:** The site comprises a small stream flowing through a valley that varies in both depth (up to 9 m) and gradient along the length.

**Key Features:** Semi-mature plantation woodland, scrub and tall ruderal species, ecotones with semi improved acid grassland and heathland characteristics with the presence of invertebrates, such as gatekeeper butterfly.

**Land Use:** Current use as green space with public right of way (PRoW), which connects the adjacent housing estates of Brunswick Avenue, Sandringham Road and Buckingham Road to Chorley Old Road to the north (via Fleet Street) as part of a footpath route into Horwich. It is also used as a recreational area and functions as an ecological corridor for wildlife.

An aerial view of the site can be seen in Plate 1 below and site survey plans including an overview diagram of the Nellies Clough Corridor and details of habitats and dominant species present is shown in Appendix 3. An article about the Clough can be read in Appendix 15.



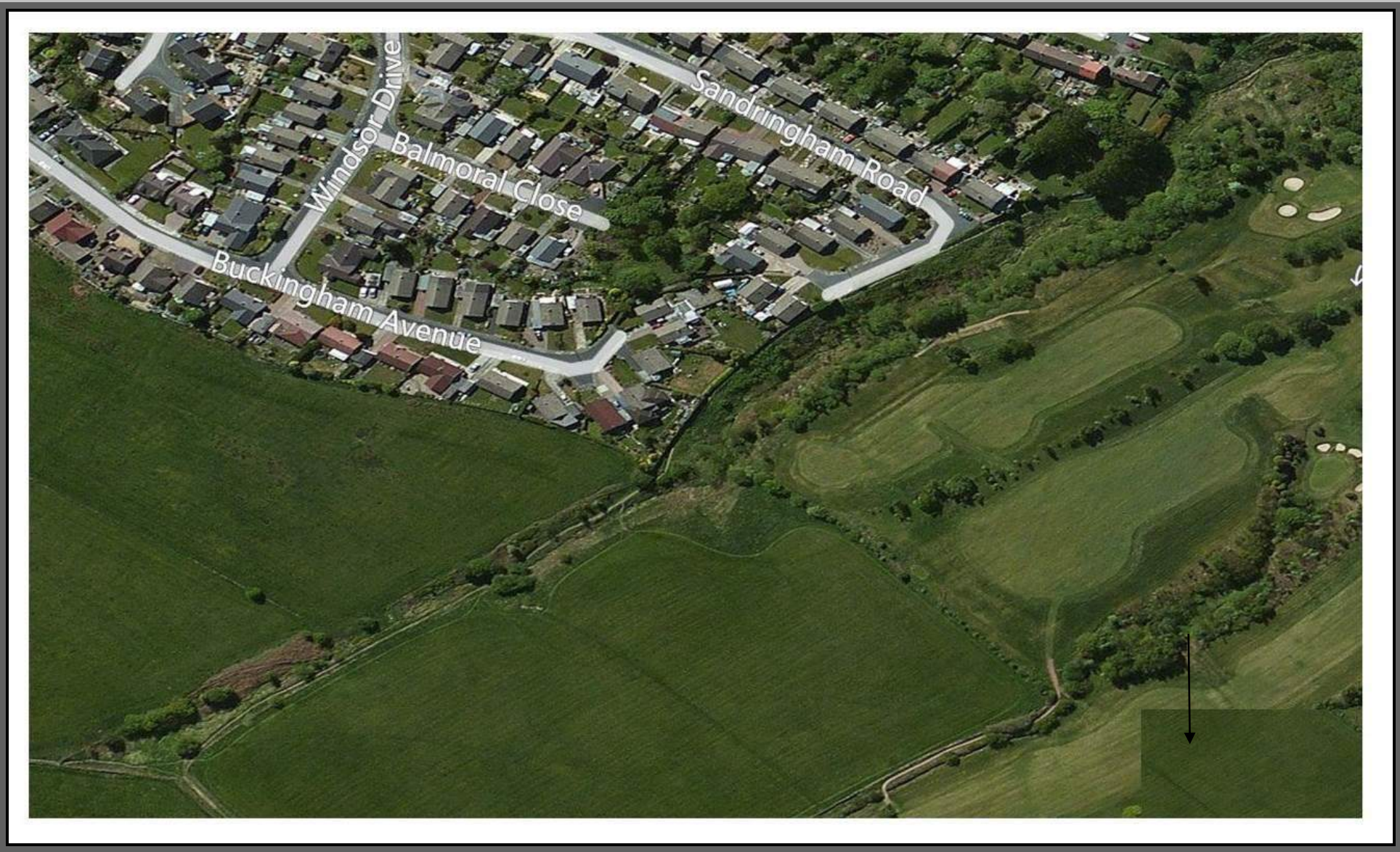
Plate 1: Nellie's Clough aerial views (provided by Bing Maps)







Plate 1a: Nellie's Clough aerial views





## 2.2 Nellies Clough in Context: its potential contribution to ecological connectivity

- 2.2.1 For wildlife and flora species, connectivity within the landscape (including peripheral urban areas) can be of great importance. The degree of connectivity is related to habitat patch size and quality of habitat as well as the separation distance.
- 2.2.2 Depending upon their condition, watercourse corridors can be especially important as areas for biological diversity because of the water and land combination. These corridors can be key links within a landscape's ecological network. Ecological connectivity, afforded by even such localised patch habitats as Nellies Clough, can make a useful contribution to the resilience of wildlife under pressures from nearby human population, development and climate change.
- 2.2.3 To illustrate this, there is clear evidence of use of the Clough by roe deer for refuge and transit, from sighting by several residents in the area (see plate 2 below). A full species list and additional information on some of the more interesting species can be seen in Appendix 12.
- 2.2.4 The habitats onsite are explained below and are shown, along with target note (TN) locations on the plan in Appendix 3.

Plate 2: Roe deer



(Image courtesy of Richard Shirres)

### *Habitats*

- 2.2.5 Nellie's Clough comprises a shallow watercourse (TN 29) flowing within a small ravine on the edge of Horwich. The Clough has a footpath (PRoW) along the length and is used for recreation, dog walking, etc. Its habitats are varied, with affinities to several different National Vegetation Classification (NVC) communities<sup>1</sup>. Habitats present include semi improved grassland to the north,

<sup>1</sup> Rodwell, J.S. (ed.) 1991. *British Plant Communities. Volume 1. Woodlands and scrub.* Cambridge University Press. And Rodwell, J. S. (ed.) 1992. *British Plant Communities. Volume 3. Grassland and montane communities.* Cambridge University Press.



with abundant tall ruderal vegetation and encroaching scrub throughout. Broadleaved plantation woodland dominates the northern bank towards the southern end of the valley. Detailed habitat plans and the location of target notes can be seen in Appendix 3. Some interesting species to be found at the Clough along with their traditional/ medicinal uses are described in Plate 24.

- 2.2.6 The northern half of the Clough is a habitat mosaic comprising tall ruderal vegetation, grassland, heathland, scrub and scattered trees. Advancing through this area from the starting point of the footpath, the dominant habitat type throughout is tall ruderal vegetation (TN's 2, 7 and 9) that has affinities with the NVC community OV27 *Epilobium angustifolium* grassland. Species present include bramble (*Rubus fruticosus* agg.), cock's foot (*Dactylis glomerata*), creeping thistle (*Cirsium arvense*), great willowherb (*Epilobium hirsutum*), Himalayan balsam, nettle (*Urtica dioica*), reed canary grass (*Phalaris arundinacea*), rosebay willowherb (*Chamerion angustifolium*), soft rush (*Juncus effusus*), soft shield fern (*Polystichum setiferum*), tufted hair grass (*Deschampsia cespitosa*) and Yorkshire fog (*Holcus lanatus*).

Plate 3: Northern section habitat mosaic



- 2.2.7 Continuing southwards along the path, the tall ruderal vegetation is interspersed with smaller areas of semi-improved grassland (TN's 1, 3, 6, 11 and 12) of which parts are moderately species rich, with an abundance of herbaceous species and varying sward height. Common species within this habitat include red clover (*Trifolium pratense*), tormentil (*Potentilla erecta*), ribwort plantain (*Plantago lanceolata*), tufted hair grass, and bent (*Agrostis* sp.). To the northern end of the site (TN's 1 and 3) the grassland has affinities with the NVC community MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland indicated by the abundance of Yorkshire fog and tufted hair grass in these areas. Around the stream at TN 6 and along the Clough banks at TN 11 the grassland is more closely aligned with MG10 *Holcus lanatus* – *Juncus effusus* rush pasture with abundant soft rush. The marshy grassland area at TN 6 also has wetland

species that indicate that the habitat could be grading into more swamp like habitat including bog stitchwort (*Stellaria alsine*), reed canary grass and marsh willowherb (*Epilobium palustre*).

**Plate 4:** Semi improved grassland (TN 3)



**Plate 5:** Marshy grassland (TN 6)



- 2.2.8 As the path reaches the centre section of the site, just to the north of the woodland, TN12 denotes another area of semi-improved grassland. Species present include bramble, cock's foot, common hogweed (*Heracleum sphondylium*), creeping bent (*Agrostis stolonifera*), creeping soft grass (*Holcus mollis*), false oat grass (*Arrhenatherum elatius*), creeping thistle, heath bedstraw (*Galium saxatile*), meadow foxtail (*Alopecurus pratensis*), meadow vetchling (*Lathyrus pratensis*), nettle, red clover, red fescue (*Festuca rubra*), reed canary grass, rosebay willowherb, vetch sp. (*Vicia* sp.) and Yorkshire fog. This area was found to have affinities with the NVC community MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community given the abundance of false oat grass along with other indicative herbs such as vetches, meadow vetchling and red clover.

**Plate 6:** Semi improved grassland (TN 12)



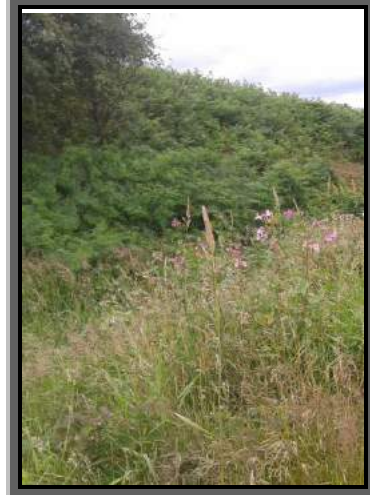


2.2.9 Whilst walking along the path in the northern section small areas can be noticed which are vegetated almost exclusively by bilberry (*Vaccinium myrtillus*) (TN7a) or bracken (*Pteridium aquilinum*) (TN5). This vegetation does not fit well to any of the published NVC descriptions. However the habitats have affinities with: H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath but with *Calluna* being absent which can occur in this community type, and H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath given the dominance of bilberry and the steepness of the slope on which the habitat stands; and with U20c *Pteridium aquilinum* – *Galium saxatile* communities respectively.

Plate 7: Bilberry (TN 7a)



Plate 8: Bracken (TN 5)



2.2.10 There are also small sections of dense scrub are also encountered at TN's 8, 10 and 13. These are dominated by bramble, cleavers (*Galium aparine*), great willowherb, rosebay willowherb and nettle with scattered Himalayan balsam. Scattered semi mature small trees are present at TN 4 including ash (*Fraxinus excelsior*), beech (*Fagus sylvatica*), elder (*Sambucus nigra*), hawthorn (*Crataegus monogyna*), oak (*Quercus robur*), rowan (*Sorbus aucuparia*) and sycamore (*Acer pseudoplatanus*).

Plate 9: Dense scrub



Plate 10: Trees (TN 4)



- 2.2.11 It is likely that previously removal of Himalayan balsam by the residents association and the friends of Nellie's Clough in 2013 has aided the establishment of a more diverse species assemblage in this northern section. However this invasive species appears to be now re-establishing itself, with floral diversity within the encroaching stands severely limited meaning the proliferation of this invasive species is causing a decline in the extent of these other habitats.
- 2.2.12 As the path moves into the southern section of the Clough it becomes apparent that most of the southern bank of the southern half of the site is vegetated by a very extensive stand of Himalayan balsam (TN's 14 and 15). The density of the balsam has excluded most other species although there is occasional rosebay willowherb, bramble, bracken, cleavers and nettle. There are also occasional small trees including hawthorn, apple (*Malus sp.*) and oak. The habitat has most in common with NVC community *Epilobium angustifolium* grassland.
- 2.2.13 Alongside the path is a strip of tall ruderal with scattered scrub and Himalayan balsam. Other species along this path edge include such as cock's foot, colt's foot (*Tussilago farfara*), common hogweed, creeping buttercup (*Ranunculus repens*), creeping soft grass, creeping thistle, forget me not sp. (*Myosotis sp.*), herb Robert (*Geranium robertianum*), nettle, red fescue, ribwort plantain, vetch sp. and Yorkshire fog. This strip has affinities with NVC community MG1b *Arrhenatherum elatius* grassland. Characteristic species which are present include cock's foot, Yorkshire fog, common hogweed, nettle, creeping thistle, red fescue, ribwort plantain and vetches, however given the absence of false oat grass the fit with this habitat cannot be said to be good. This habitat is described as an ungrazed grassland which often occurs on roadsides and verges, as in this case.

Plate 11: Himalayan balsam in southern section



Plate 12: Grassland/tall ruderal adjacent to path



- 2.2.14 Across the clough valley itself, woodland can be seen on the northern bank (TN's 21, 22, 23, 24 and 25) which appears to be young broadleaved plantation, most likely planted by the adjacent golf course to provide screening and deter people from walking onto the course. The plantation woodland is dominated by oak with ash, alder (*Alnus glutinosa*), elder (*Sambucus nigra*), pine sp. (*Pinus sp.*), rowan, hawthorn, holly (*Ilex aquifolium*) and silver birch (*Betula pendula*). The canopy varies in density, as does the cover of the ground flora and the cover of Himalayan balsam, however balsam is generally constant throughout.



The ground flora is made up of bramble, creeping soft grass, tufted hair grass, and cleavers with small patches of bluebell (*Hyacinthoides non-scripta*), red fescue, foxglove (*Digitalis purpurea*) herb Robert and hard fern (*Blechnum spicant*). The woodland has affinities with NVC community W10 *Quercus robur* – *Pteridium aquilinum* – *Rubus fruticosus* woodland given the dominance of oak and bramble and the presence of bluebells. However the woodland is a plantation and therefore cannot be said to fit well with any NVC community. From historical photographs (see plates 32 and 33) it appears that the Clough has been naturally wooded in the past.

Plate 13: Woodland

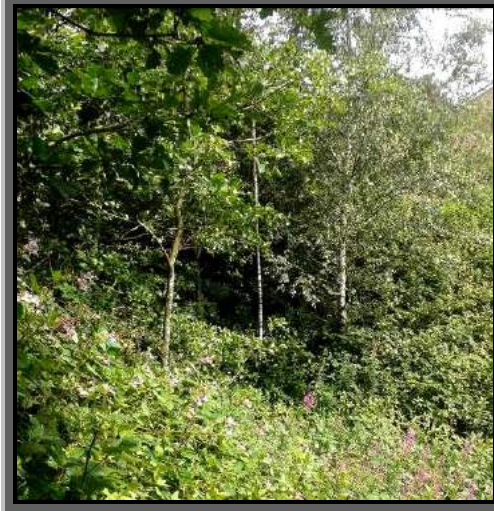


Plate 13a: Woodland (bluebells)

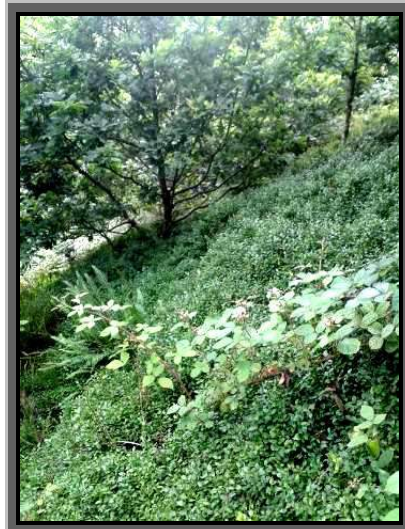


2.2.15 Within the woodland there are small clearings with heathland characteristics (TN's 26, 27 and 28) and species such as heath bedstraw, heather (*Calluna vulgaris*), bilberry hard fern and red fescue. These areas again do not fit well to any of the published NVC descriptions. However the habitat again has affinities with: H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath, and H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath given the dominance of bilberry and heather and the steepness of the slope on which the habitat stands. The habitat at TN 26 also has some affinities with H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath, having abundant heather and some wavy hair grass, albeit a very small amount. This is a characteristic sub-shrub vegetation of acid and impoverished soils at low to moderate altitudes. Influences leading to the creation of this habitat include the cool and wet climate, grazing, and the atmospheric pollution of surrounding industrial conurbations.

Plate 14: Woodland clearing with heather



Plate 15: Woodland clearing with bilberry





2.2.16 Towards the southern end of the clough an area of tall ruderal vegetation is encountered (TN 19) surrounding the watercourse and dominating much of the southern bank. This is dominated by abundant reed canary grass *with* Yorkshire fog, common sorrel (*Rumex acetosa*), creeping soft grass, soft rush, field horsetail (*Equisetum arvense*) and great willowherb. The habitat has affinities with the NVC community MG10 *Holcus lanatus* – *Juncus effusus* rush pasture given the presence of Yorkshire fog and soft rush. This type of habitat is very common on abandoned agricultural land in the upland fringes.

Plate 16: Tall ruderal vegetation (TN19)



2.2.17 A further heath-like area can be observed from here (TN20) on the northern bank of the watercourse. This area is dominated by a carpet of heath bedstraw with common sorrel, common bent (*Agrostis capillaris*), marsh hawksbeard (*Crepis paludosa*), field horsetail, red fescue and rosebay willowherb. The habitat has most in common with NVC community OV27 *Epilobium angustifolium* grassland but the more acidic species such as heath bedstraw may also indicate an affinity with heathland communities.

Plate 17: Heath bedstraw



Plate 18: Marsh hawksbeard





2.2.18 At TN 18 at the very end of the pathway there is a small area of scrub habitat with scattered small trees. Species include willow (*Salix sp.*), elder, hawthorn, cock's foot, tufted hair grass, nettle, field horsetail, bindweed sp. (*Convolvulus sp.*) great willowherb, ground elder (*Aegopodium podagraria*) and scattered Himalayan balsam.

2.2.19 Also obvious at the very southern end of the Clough is an extensive stand of the invasive species Japanese knotweed (*Fallopia japonica*).

Plate 19: Japanese knotweed



2.2.20 The water course can be difficult to see when walking the path due to the dense vegetation throughout the Clough. However the immediate banks of the watercourse (TN29) are generally dominated by Himalayan balsam and reed canary grass with only small sections that deviate from this vegetation. Such areas include the marshy section to the northern half of the site and a small area within the woodland to the southern half where the covering of balsam is much less dense and banks are generally vegetated with sparse bramble and red fescue.



Plate 20: Woodland clearing along stream

2.2.21 The watercourse itself (TN 29) is very shallow, approximately 10-20cm, and narrow, varying from 25cm wide close to the source to around half a metre in part of the southern half of the site. A cross section on the stream/clough profile to the northern and southern sections can be seen in plate 23. The flow was minimal at the time of survey and is considered to be generally low except in times of high rainfall. The immediate banks are quite steep, with the wider clough banks varying in gradient from almost flat in the northern section where they are vegetated with grassland and tall herbs, to very steep in the south where they are dominated by scrub and woodland. The substrate is silty with small boulders and pebbles in some sections, particularly in the southern half of the site. The short section of stream that runs through the Clough is isolated given that it springs at the northern end and is culverted at the southern end of the survey area. The majority of the immediate stream channel was hidden at the time of survey by dense bankside vegetation, particularly Himalayan balsam and reed canary grass. There is little in channel vegetation. Beyond the Clough itself the surrounding land uses are for grazed pasture, residential and a golf course. The path runs the length of the Clough and crosses the water course once where it passes through a small culvert.

Plate 21: Stream channel close to spring



Plate 22: Stream channel at centre of site



### *Wildlife Interest and Protected Species*

2.2.18 Following a search of online resources<sup>2</sup>, the following records of protected species were found to occur within 1km of the site;

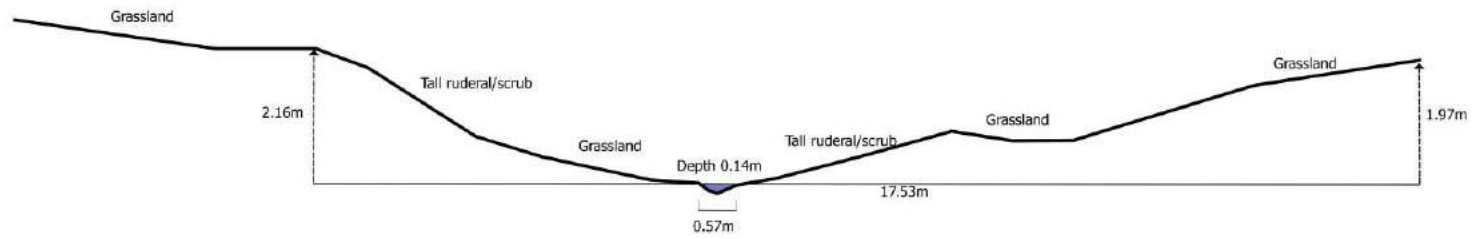
- Amphibians – great crested newt and common toad;
- Birds – grey partridge, wood warbler, lapwing, reed bunting, curlew, grasshopper warbler, ring ouzel, cuckoo, spotted flycatcher, house sparrow, tree sparrow, tree pipit and yellowhammer;
- Terrestrial mammals – water vole, red squirrel, soprano pipistrelle, noctule bat, brown long-eared bat, brown hare, hedgehog;

<sup>2</sup> With thanks to the following National Biodiversity Network (NBN) contributors: Botanical Society of Britain and Ireland, British Trust for Ornithology, Biological Records Centre, The Bat Conservation Trust, Greater Manchester Ecology Unit, RSPB, Northumberland Wildlife Trust, Butterfly Conservation, Environment Agency (Biodiversity staff), People's Trust for Endangered Species, and Lancashire Environment Record Network.



- Invertebrates – *Eugnorisma glareosa*, *Xestia agathina*, *Chiasmia clathrata*, *Hepialus humuli*, sallow, small phoenix, September thorn, oak hook-tip, cinnabar, garden tiger, mouse moth, minor shoulder-knot, white-line dart, broom moth, small heath and wall butterflies and the tormentil mining bee;
- Reptiles – adder and common lizard;
- Bony fish – brown/sea trout, European eel;
- Flowering plants – tubular water-dropwort and small-flowered catchfly.

Upper section of Nellie's Clough



Lower section of Nellie's Clough

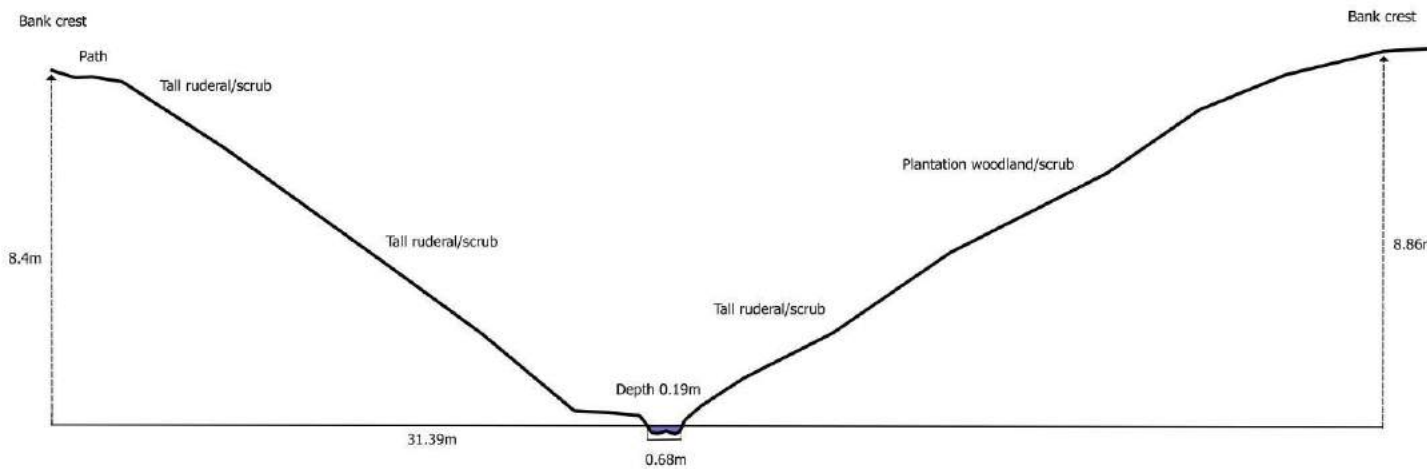


Plate 23: Nellie's Clough cross sections

2.2.19 The woodland, woodland edges and scrub are likely to provide high quality foraging areas for bats and the Clough in itself will act as a wildlife corridor facilitating the movement of bats and other wildlife through the landscape. The trees on site are generally small or immature and are not considered to provide potential roosting opportunities for bats.

2.2.20 There are records for a variety of birds within 1 km of the site all are species of conservation concern (red/amber lists). The nearby Red Moss SSSI is partly designated for its bird assemblage, particularly ground nesting birds such as snipe and teal. The current suitability of the Clough for ground nesting birds is minimal - both species prefer open habitats to improve predator detection which is lacking at Nellie's Clough, although there is some rank grassland and rush habitat present to the northern half of the site, stands of Himalayan balsam and scrub are encroaching upon these areas. It is thought that the stands of reed canary grass along the stream may provide habitat for other species of breeding bird, including reed bunting and grasshopper warbler and the woodland and scrub habitats provide habitat for species such as tree sparrow, whitethroat and blackcap. Grey heron has been seen on the site.

- Grey heron – Grey herons are unmistakeable: tall, with long legs, a long beak and grey, black and white feathering. They can stand with their neck stretched out, looking for food, or hunched down with their neck bent over their chest. They eat lots of fish, but also small birds such as ducklings, amphibians and small mammals like voles, they can sometimes be seen in fields after harvest looking for rodents. They are found around any kind of water – garden ponds, lakes, rivers and even on estuaries and when circling high up into the sky, can be mistaken for large birds of prey. They can be seen at any time of year as our grey herons do not migrate<sup>3</sup>.

Plate 24: Grey heron



(Image courtesy of Bryan Smith)

<sup>3</sup> <https://www.rspb.org.uk/discoverandenjoynature/discoverandlearn/birdguide/name/g/greyheron/>

2.2.21 The northern half of the site has a variable structure with a mixture of vegetation heights, tangled or thorny areas, mosaics, bare patches and lots of edges which makes for ideal reptile habitat, although available basking sites are limited apart from on the footpath which will be disturbed. The extent of the habitat is quite limited by surrounding farm land, residential areas and the adjacent golf course, but small habitat patches can be sufficient for lizards<sup>4</sup> and grass snakes may move along the watercourse using the wetland areas. The aspect and topography of the site are also suitable for reptiles with the variable terrain of the Clough offering south facing slopes with sunny and sheltered locations. The site also provides connectivity within the surrounding landscape.

2.2.22 The Clough provides habitat for a range of invertebrates given its variation in habitat including the watercourse, marshy grassland, heathland, scrub and woodland. Bilberry for example, which is common on site is the food plant of the green hairstreak butterfly. 'Springs and associated flushes' are listed as habitats of particular invertebrate value by the Amateur Entomologists Society<sup>5</sup>, and provide habitat for soldier flies, crane-flies, water beetles and other groups. The following invertebrate species were observed during the site survey;

- **Buff tailed bumblebee** - A large bumblebee with dark yellow stripes and a white tail. They tend to nest in disused small mammal burrows underground using soft dry materials such as grass and moss gathered into a ball to insulate the nest. It is the U.K's only observed wild winter-active bee and the colonies of this can contain over 500 individuals. Good places to see them include almost any lowland habitat of Britain and Ireland. In winter the most likely places to see this species is in the gardens and amenity shrub areas of towns and cities<sup>6</sup>.

Plate 25: Buff tailed bumblebee



(Image taken during site survey)

<sup>4</sup> Herpetological Conservation Trust, 2007, Reptile Habitat Guide

<sup>5</sup> Amateur Entomologists' Society, Guidelines to local BAP groups on the selection of priority habitats for invertebrates, <http://www.amentsoc.org/publications/online/bap-guide.html> accessed 02/11/2015

<sup>6</sup> Evans, Rebecca L. and Potts Simon. G. Iconic Bees: London - Buff-tailed Bumblebee, University of Reading and Friends of the Earth

- **Gatekeeper butterfly (*Pyronia tithonus*)** – The range of this species, also known as the Hedge Brown, is governed primarily by climate and it is not found north of Westmorland. It can be found wherever shrubs grow close to rough grassland. The primary larval food plants are grasses, including bents and fescues, and the adults particularly feed on bramble, all of which occur in Nellies Clough<sup>7</sup>.

Plate 26: Gate keeper butterfly



(Image taken during site survey)

- **Meadow brown butterfly (*Maniola jurtina*)** - One of our commonest and most widespread butterflies, and a familiar sight throughout the summer months. It can be found in almost any grassy habitat, especially grasslands where the sward is of a medium height. The larval food plants are grasses and the adults prefer species such as bramble, buttercups and thistle which can all be found at Nellies Clough<sup>8</sup>

Plate 27: Meadow brown butterfly



(Images taken during site survey)

<sup>7</sup> Information from UK Butterflies website - <http://www.ukbutterflies.co.uk/species.php?species=tithonus> accessed 02/11/15

<sup>8</sup> Information from UK Butterflies website - <http://www.ukbutterflies.co.uk/species.php?species=jurtina> accessed 02/11/15



- **Common green grasshopper (*Omocestus viridulus*)** - An insect of damp meadows and hillside pastures, it is widespread in the uplands, but declining in the lowlands. It is the earliest grasshopper to appear in the spring, hatching in April and moulting into adult form in June. Males can be seen displaying to females by rubbing their legs against their wings to create a 'song' - in this case, it is long, loud, 'churring' noise lasting 20 seconds or more, and sounding like the ticking of a free-wheeling bicycle. Grasshoppers are a food source for many animals, including bats, birds and amphibians, providing a vital link in the food chain<sup>9</sup>.

Plate 28: Common green grasshopper



(Images taken during site survey)

- **Brown hawker dragon fly** - a large hawker which is on the wing from the end of June through to September. It is a common dragonfly of well-vegetated canals, marshes and reedbeds as well as lakes and gravel pits, breeding in standing or slow-flowing water, laying its eggs in floating or emergent vegetation or timber. It can be spotted patrolling a regular hunting territory which it will defend aggressively against intruders often some distance from its breeding grounds, hawking woodland rides late into the evening. Hawkers are the largest and fastest flying dragonflies; they catch their insect-prey mid-air and can hover or fly backwards. The brown hawker is easily recognised, even in flight, by its entirely chocolate brown body with tiny yellow and blue markings. The wings are golden-orange in colour and the male has a noticeable 'waisted' appearance<sup>10</sup>.

<sup>9</sup> Information from Wildlife Trusts website - <http://www.wildlifetrusts.org/species/green-grasshopper> accessed 02/11/15

<sup>10</sup> Information from Wildlife Trusts website - <http://www.british-dragonflies.org.uk/> and <http://www.wildlifetrusts.org/species/brown-hawker> accessed 02/11/15



Plate 29: Brown hawker dragonfly



(Image from <http://www.rutlandwater.org.uk/insect-photo-gallery/>)

*Non-native invasive species*

2.2.23 Both Himalayan balsam and Japanese knotweed (*Fallopia japonica*) are present on site. Himalayan balsam is particularly prevalent throughout. Both are listed under Schedule 9 of the Wildlife & Countryside Act (1981 as amended 2010) as non-native invasive species. As such, it is unlawful to plant or otherwise cause these species to grow/spread in the wild. In addition, all arisings from Japanese knotweed, including rhizome, are classed as a contaminated waste according to the Environmental Protection Act 1990 and therefore must be disposed of appropriately.

Plate 30: Himalayan balsam



Plate 31: Japanese knotweed



(Images taken during site survey)

## 2.3 Site Assessment

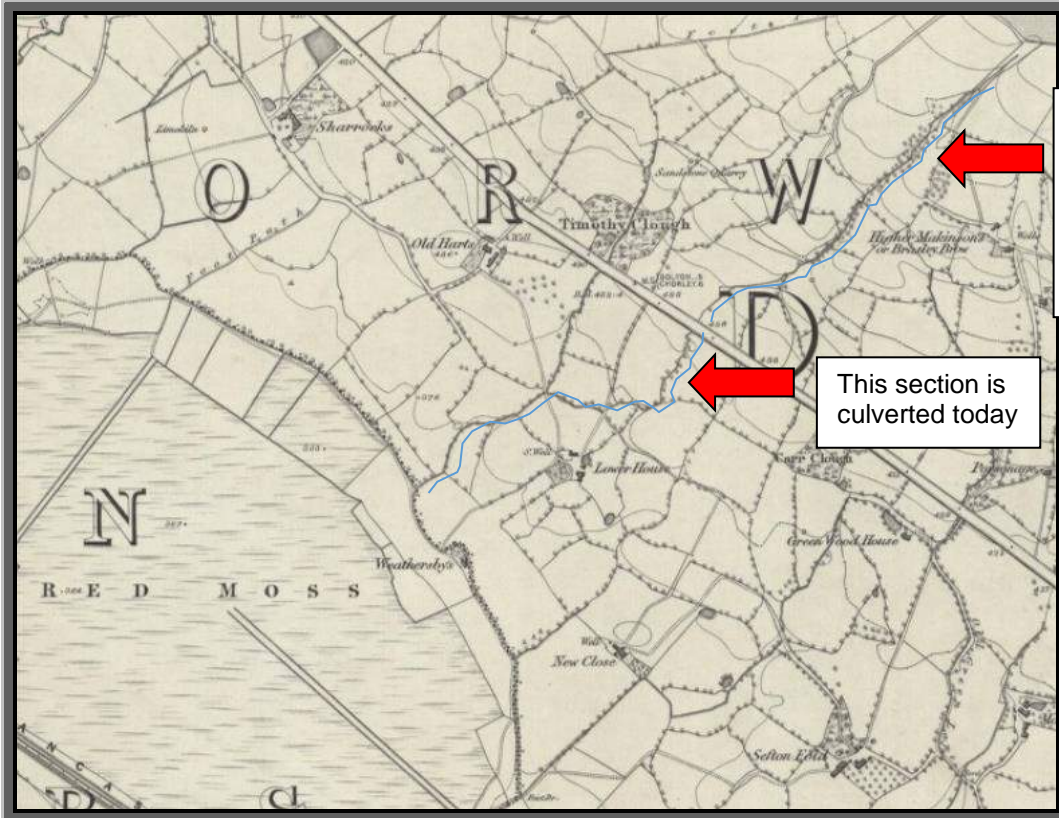
### *Present Land Use/Access*

- 2.3.1 The site is currently owned by private landowners but is open to the public and serves as a nature conservation area and green space. The footpaths are well used by walkers and dog walkers. Entrance to the site can be gained from; the north via adjacent footpaths from Fleet Street and Ridgmont park; the south via adjacent footpaths from Gloucester Avenue and Mount Street; and from Sandringham road along the central section.
- 2.3.2 The site is adjacent to the former Horwich Loco Works site which is currently the focus of development proposals for its regeneration, and according to the supplementary planning document from Horwich Council (March 2012) 'represents a key opportunity to expand the town, enhance the sustainability and vitality of the area and create better public transport links and accessibility to the M61 motorway'. The document also states that the 'Nellie's Clough corridor shall be protected by an appropriate buffer zone as agreed with the Environment Agency. Existing open water courses should remain open and opportunities taken, where feasible, to open existing culverts'. This proposed development may therefore provide an opportunity to open up the lower sections of the watercourse and improve the habitat along its whole length.
- 2.3.3 In April 2012 the 'Joint Green Infrastructure Project: Green Infrastructure & Water Framework Directive' final report produced by the AGMA Planning & Housing Commission Environment Agency North West identified that opening of the culvert at the Horwich Loco Works site; Nellies Clough Brook could have several benefits;
- Fulfilling the aims of the Water Framework Directive. The watercourse is within the River Douglas catchment (waterbody ID 112070064850) which, is classed as heavily modified with a current overall status potential of "moderate". WFD aims to work towards "good" overall status for this catchment by 2027.
  - Contributing to the habitat value of the area by, for example, improving the site as a wildlife corridor for wildlife. The site/watercourse adjoins Red Moss SSSI which is also a Local Wildlife site.
  - Reduce long-term liability for future landowners. Culverts are expensive to inspect, maintain and replace; an open channel requires no specialist methods to inspect / maintain.
- 2.3.4 This further demonstrates the benefits of improving the Clough and enhancing the habitat value of the area.

### *Past Management*

- 2.3.5 In June 2013 the northern section of the site was subject to planned Himalayan balsam removal carried out by local residents for the group 'the Friends of Nellies Clough'. The removal proved successful, however the balsam is beginning to re-establish itself and there are extensive stands present.
- 2.3.6 The following historical maps (Plates 32 and 33) help to demonstrate the changes over time in the stream that flows through the Clough. In the first map dating from 1848 the watercourse can be seen to flow from its source near Ridgmont Park all the way down the valley to join a tributary of the River Douglas and Middle Brook. In the second map, dating from 1930, the Clough is culverted beneath the mills, schools and railway works.

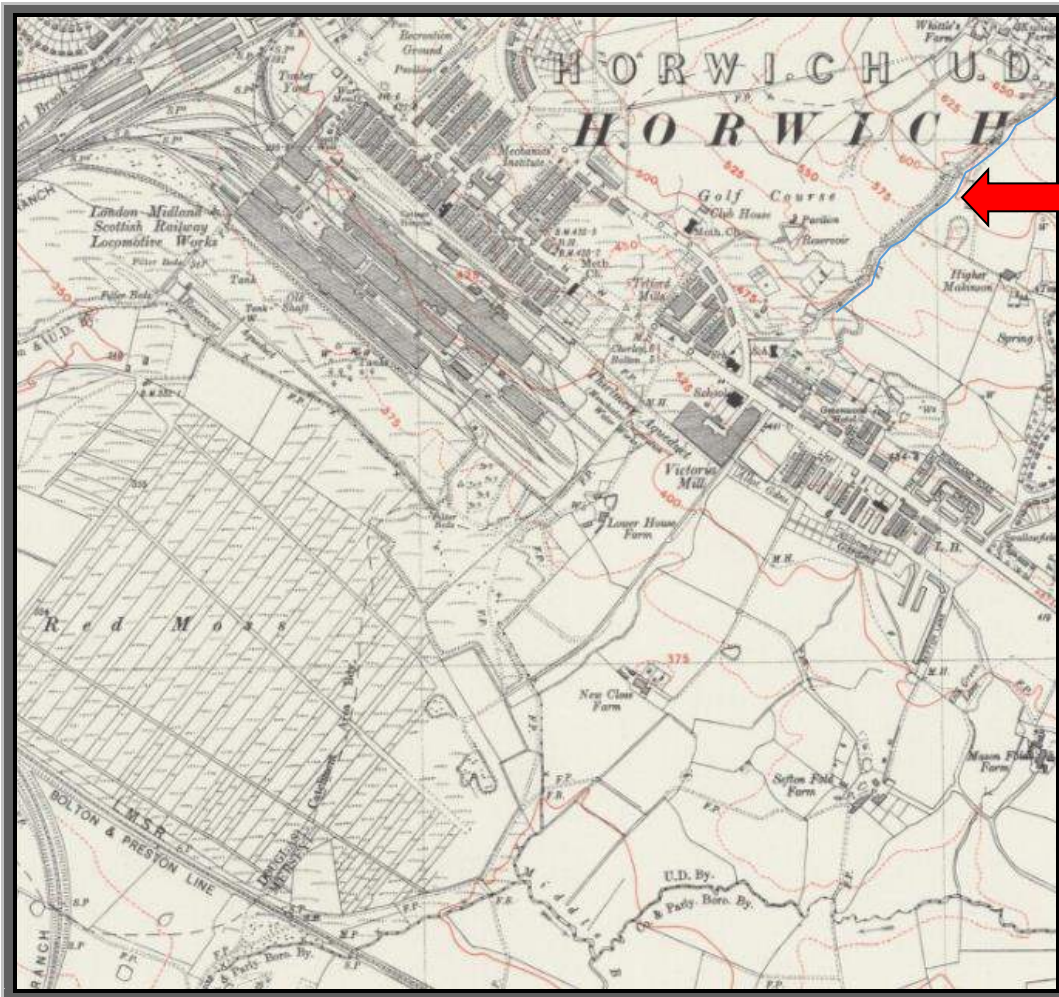




Part of Nellie's clough present today (survey area)

This section is culverted today

Plate 32: OS Six Inch England and Wales 1849 (<http://www.oldmapsonline.org/map/nls/102344021>)



Part of Nellie's Clough present today (Survey area)

Plate 33: OS Six Inch England and Wales 1930 (<http://www.oldmapsonline.org/map/nls/102344021>)





Plate 34: The fiends of Nellie's Clough (Image courtesy of Richard Shirres)



Plate 35: At work pulling Himalayan balsam (Image courtesy of Richard Shirres)

#### *Education/Interpretation*

- 2.3.7 There are currently no interpretation boards or educational information present on the site.

#### *Practical Issues/Restrictions*

- 2.3.8 Several practical issues limiting management actions have been highlighted on discussion with the Environment Agency (EA) including; the problems of waste tipping on site; the steep nature of the terrain in parts of the Clough; acquiring volunteers and funding to undertake management works; adhering to EA guidance when removing invasive species listed on Section 9 of the Wildlife and Countryside Act (Himalayan balsam and Japanese knotweed).

### **3 Management Aims**

The overall aim of this management plan is to maintain and improve the current habitat diversity of the site and, hence, its appeal as an ecological corridor. Wildlife interest at the site should also be a focus. Modest enhancement of flora for foraging, both for wildlife and humans would be desirable.

The development of primary and secondary objectives has been guided by legal compliance. Analysis of the status of species and habitats, legislatively, nationally and locally, for the site has allowed prioritisation of these objectives.

With eradication of Japanese Knotweed, the Clough has the potential to become a useful educational resource for schools; it is noted that there are two primary schools and one secondary school within 800m of Nellies Clough.

In general, it is anticipated that New Chapel Residents Association, or Friends of Nellies Clough, could be capable of instigating many of the management prescriptions advocated. But clearly some may need the assistance of the local Council and, at least, the compliance of the land owners.

## 4 Management Objectives and Prescriptions

### PRIMARY OBJECTIVES

#### 4.1 Objective 1: Reduce extent, and eradication where possible, of non-native invasive species

##### Prescription 1

##### 4.1.1 Eradication of Japanese knotweed

###### Rationale

- Japanese knotweed is a vigorous, non-native invasive species. It can spread very quickly, creating dense stands which can cause structural damage.
- Due to its non-native status, it has no natural predators controlling its spread.

###### Action

- Removal/treatment of Japanese knotweed and rhizome (where possible) under expert guidance.
- Treatment ideally needs to be undertaken for two to four growing seasons.
- Possible treatments include :
  - Glyphosate is a non-selective herbicide, suitable for use near water (in certain formulations), which is non-persistent in the soil. It is most effective July – September.
  - 2,4-D amine is a selective herbicide (it won't kill grasses), suitable for use near water (in certain formulations), which is persistent in the soil for around a month, it is effective throughout the growing season.
- For further guidance, please see Environment Agency's: '*The Knotweed Code of Practice*'.

###### Timing

- Avoid flowering 'season' to minimise risk to pollinators such as bees.

##### 4.1.2 Removal of Himalayan balsam

###### Rationale

- Himalayan balsam is a prolific annual species with high rates of regeneration.
- Due to its annual lifecycle, it dies back over winter leaving large areas of bare ground, which are then susceptible to erosion – a particularly significant problem on watercourses.
- Its growth season starts early, often earlier than many native species, resulting in Himalayan balsam outcompeting native species such as bluebell (present within the woodland to the south of the site). The impacts of Himalayan balsam are further elaborated in appendix 14.
- Eradication of Himalayan balsam here, at the springing of the water course, will prevent the spread of the species downstream and would give an opportunity to remove the species from the whole watercourse.

###### Action

- Removal of Himalayan balsam from site by hand pulling or strimming below the first node to prevent regrowth.



- If being pulled, root must be crushed.
- Arisings may be left to rot down on site in specific locations identified by the site manager.

*Timing*

- Before flowering occurs - ideally June. Do **not** carry out any removal after the seed pods have formed as accidental spread is more likely.

## **4.2 Objective 2: Maintain and increase extent of more species diverse grassland**

### ***Prescription 1***

#### **4.2.1 Management of Himalayan balsam**

*Rationale*

- Removal/management of *Himalayan balsam* will allow the extent of more diverse grassland and heathland habitats to increase, and encroachment by *balsam* to be halted.
- It will also open up the habitat, increasing its suitability for ground nesting birds such as lapwing (*Vanellus vanellus*) and grey partridge (*Perdix perdix*) which are NERC Act 2006. Section 41: Species of Principal Importance in England as well as snipe (*Gallinago gallinago*) and teal (*Anas crecca*) which are known to occur at the nearby SSSI Red Moss, and prefer more open habitats with a shorter sward than the *balsam* provides.

*Action and Timing*

- Removal of Himalayan balsam will follow the methods described in objective 4.1.

### ***Prescription 2***

#### **4.2.2 Management of scrub within grassland**

*Rationale*

- To halt the process of succession in more diverse grassland areas
- Retain specific scrub areas which have value as a nesting area for notable bird species including linnet (*Carduelis cannabina*), song thrush (*Turdus philomelos*) and dunnoek (*Prunella modularis*).

*Action*

- Removal of self-seeded scrub within grassland in the northern half of the site, e.g. bramble, hawthorn saplings and young willow, under 6 inches diameter by hand cutting.
- Any scrub greater than 6 inches diameter must be removed by trained professionals only.
- Remove the above at a ratio of 4 in 5 (inclusive of all species).
- Arisings could be used in construction of hibernacula/refugia for amphibians/reptiles (see Appendix 4).
- Some of the denser areas of scrub such as TN's 10, 8 and 13 should be retained as this provides habitat desirable for a number of bird species and scrub edge habitats provide habitat for reptiles (see Appendix 4).
- Retain the bracken stand at TN5 as it provides cover for wildlife and reptiles and habitat for invertebrates, however prevent any further

spread of the species by pulling any encroaching plants and the stand edges.

#### *Timing*

- To be removed over winter and managed thereafter.

### **Prescription 3**

#### **4.2.3 Increase Species Diversity of Grassland**

##### *Rationale*

- Plant diversity attracts insects (including butterflies and bees), arthropods (from spiders to millipedes), birds and mammals
- The advent of industrialised agriculture during the mid-20th century dramatically boosted the productivity of farmland across the UK. The cost of high yield, intensive, agriculture has been the widespread loss of wildlife and wildflower rich habitats historically associated with traditionally managed farmland<sup>11</sup>.

##### *Action*

- It may be an option to undertake supplementary planting/sowing to the northern section of the site where grassland and tall herb is the dominant habitat. Seed/hay should be sourced from the Local Wildlife Sites where possible, otherwise seed the areas using a suitable wildflower seed mix. It may be possible to involve the local community in this activity, for example in seed collection and in planting. Seeding and green hay strew require gaps in the existing sward (at least 50% bare ground, usually created by livestock or machine). This type of enhancement is therefore likely to disturb the existing sward and the benefits must be weighed against the risk of erosion or disturbance of other features for example bird habitat. The techniques are somewhat experimental and the results cannot be guaranteed.

A more sympathetic option may be to allow species, which may be present in the seed bank, to come through following management of Himalayan balsam. However, should this be considered a viable option, suitable species for planting in Appendix 10 and more information about green hay and seeding can be seen in Appendix 11. There may be scope to carry out this technique on areas which become bare following the removal of Himalayan balsam. There is also an experimental area onsite where balsam has been covered with a tarpaulin to ascertain the effect on the species. This area will now be bare ground beneath and may also be a suitable location.

- Remove Himalayan balsam to allow other species to thrive (see objective 4.1 for details).
- Create a new native species hedgerow along the northern field boundary to deter grazing livestock (see objective 4.5, prescription 6).

##### *Timing*

- Green hay strew – Hay should be cut at the usual time for that site (usually mid-July to early August) and spread as soon as possible, within 24 hours.
- Seeding – late summer or early autumn (ideally early August to mid-September).
- Himalayan balsam removal – see prescription 1.
- Hedgerow creation (see objective 4.5, prescription 6).

<sup>11</sup> Information from South Pennines Grasslands Project website, <http://www.lancswt.org.uk/south-pennines-grasslands> accessed 02/11/15

### **4.3 Objective 3: Improve public support for the conservation of Nellie's Clough and promote responsible community use**

#### ***Prescription 1***

##### ***4.3.1 Provide interpretation signs & information about the site to the public***

###### *Rationale*

- Interpretation is an instrument that facilitates the management of sites with potential attractions for visitors for the purpose of obtaining support from the public for conservation tasks. Providing information about the site will enable the communication of the values and benefits of natural and cultural heritage and allow the local community to take ownership of the site. This will help them to feel invested in the management project at Nellie's Clough and that they can help to prevent negative effects, and contribute to the processes of conservation which are being developed in the area.

###### *Action*

- Provide interpretation boards at the site detailing information regarding its history and wildlife interests.
- Promote the 'friends of Nellie's Clough' group on site to gain more support for the conservation of the area.
- Create a 'friends of Nellie's Clough' website to provide a resource for the local community to find out about and share events and wildlife sightings etc.  
NB. Although maintaining the Clough's public path does not promote wildlife it will facilitate community engagement and the practice of stewardship.

###### *Timing*

- Information should be provided throughout duration of management plan.

#### ***Prescription 2***

##### ***4.3.2 Promote public & educational engagement activities***

###### *Rationale*

- As above (see paragraph 4.3.1)
- To encourage educational/schools involvement in monitoring activities and studies.

###### *Action*

- Promote public & educational engagement activities in the form of, for example, bat/bird/hedgehog box making, wild food foraging, or kick sampling for invertebrates in the stream (see appendices)
- Planting of native fruit trees/bushes (such as raspberry, blackthorn and walnut) in selected locations would allow activities such as wild food foraging at the Clough as well as providing foraging habitat for wildlife.

###### *Timing*

- See the appendix for guidance on when to carry out specific engagement activities.
- Native trees and bushes should be planted between November and March when the ground is not frozen or covered with snow.

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## SECONDARY OBJECTIVES

### 4.4 **Objective 4: Improve structure of plantation woodland**

#### **Prescription 1**

##### **4.4.1 Thinning of young trees in plantation woodland**

###### *Rationale*

- Coverage of young trees is currently dense on the woodland edge, thinning some of these trees would allow remaining individuals to grow with a normal form, rather than growing straight up as a means of competing with adjacent trees. Thinning would also allow an understory to develop.

###### *Action*

- Removal of young trees (less than 6 inches in diameter), particularly on woodland edge.
- Any young trees greater than 6 inches diameter to be removed by trained professionals only.
- Remove the above at a ratio of 1 in 4.
- Felled material could be used in construction of hibernacula/refugia for amphibians/reptiles (see Appendix 4).

###### *Timing*

- To be removed over winter.

#### **Prescription 2**

##### **4.4.2 Coppicing of understory**

###### *Rationale*

- Coppicing creates open areas within the woodland understory, allowing wildflowers such as bluebell (*Hyacinthoides non-scripta*) to flourish.
- Coppicing would also enhance woodland structure.

###### *Action*

- Coppicing of ash and willow trees (less than 6 inches diameter) in woodland understory.
- Any understorey trees greater than 6 inches diameter to be removed by trained professionals only.
- Coppice at a ratio of 1 in 5 understory trees.
- Felled material could be used in construction of hibernacula/refugia for amphibians/reptiles (see Appendix 4).

###### *Timing*

- To be coppiced over winter whilst trees are in a dormant state.

#### **Prescription 3**

##### **4.4.3 Creation of glades within woodland**

###### *Rationale*

- Glades within the woodland would allow sunlight to reach the floor, promoting growth of ground flora.
- Such glades are important for some lepidopteran species and provide good foraging habitat for bats.



#### Action

- Removal of trees and scrub (under 6 inches diameter) to create gap in canopy where sunlight can penetrate.
- Removal of trees and scrub greater than 6 inches diameter only to be undertaken by trained professionals.
- Utilise felled material on site as hibernacula, habitat piles or dead hedging where possible.

#### Timing

- Over winter.

### 4.5 **Objective 5: Improve provision for notable species of conservation concern**

#### **Prescription 1**

##### **4.5.1 Installation of bat boxes on mature trees**

#### Rationale

- Several records and numerous features judged to be of high quality for commuting and foraging bats occur at the site.
- Many trees on site are still young with negligible potential for use by roosting bats, therefore provision of artificial bat boxes will increase roosting potential at the site whilst younger trees mature.

#### Action

- Installation of bat boxes on sheltered mature trees
- Suitable boxes include:
  - Schwegler bat boxes (e.g. 1FF model)
  - Nestbox Company boxes (<http://www.nestbox.co.uk/collections/bat-boxes>)
  - Timber built crevice boxes for species such as common and soprano pipistrelle (*Pipistrellus pipistrellus* & *P.pygmaeus*)
  - Timber built cavity boxes for species such as brown long-eared (*Plecotus auritus*)
  - Home-made bat boxes (see Appendix 5)
- Installation criteria are as follows:
  - At least 4 or 5m off the ground
  - Sheltered from strong winds
  - Positioned to receive as much sunlight as possible
  - 2 or 3 boxes clustered on same tree with different aspects (ideally south, south east and south west) to allow bats to move between to find the appropriate temperature
  - The bats approach to the box must be clear, with no obstructing branches etc
  - Domed or headless nails, not fully hammered home, or straps should be used for installation
  - Iron nails may be used on trees but copper or aluminium are recommended

#### Timing

- Any time of year.

## Prescription 2

### 4.5.2 Retain and enhance marshy grassland areas

#### Rationale

- The black darter dragonfly (*Sympetrum danae*) is a locally scarce species, known to be present on the adjacent Red Moss SSSI. It is a species of peat moss and moorland, breeding in ponds, bog pools and drainage ditches. Improving the wetland habitats onsite may provide additional habitat for this species. The common hawker (*Aeschna juncea*) is also known to be present on Red Moss<sup>12</sup>.
- This type of habitat provides potential for a wide variety of plants which occur in the swamps around the margins of slow-moving streams including reed canary-grass, water horsetail, common spike-rush and common reed. Springs such as Nellie's Clough can be host to mosses and liverworts, starry saxifrage, opposite-leaved golden saxifrage, lesser clubmoss and autumn hawkbit and also uncommon plants like alpine bartsia and marsh saxifrage. These habitats are important for nesting waders, such as curlew, snipe and redshank, and support a range of invertebrates from dragonflies to butterflies. They can also provide important homes for otters and other threatened mammals<sup>13</sup>.

#### Action

- Do not clear out natural materials from or block the flow of the watercourse
- Remove Himalayan balsam to allow other species room to flourish (see objective 4.1)
- Clear any tipped waste from the stream corridor (see prescription 4.5.5)
- Create a species rich hedgerow along the adjacent field edge to prevent poaching of the stream banks by livestock (see prescription 4.5.6)
- Move the current fence line (or install a second species rich hedgerow) to the south of the stream to protect the marshy grassland at TN6. This will prevent livestock from poaching this valuable habitat.

#### Timing

- Throughout duration of management plan

## Prescription 3

### 4.5.3 Increase suitability of Clough for ground nesting and other birds

#### Rationale

- There are records for lapwing (*Vanellus vanellus*) and grey partridge (*Perdix perdix*) in the surrounding area. These are NERC Act 2006. Section 41: Species of Principal Importance in England. Teal and snipe are also known to be present on the adjacent Red Moss SSSI.
- Clough such as this are characteristic of the uplands. Historically most of the uplands below 600 metres would have been covered by broadleaved woodland; however in many upland areas woodlands are now confined to steep-sided valleys, ravines and gills or Cloughs. Although some bird species, notably wading birds, tend to avoid woodland in the uplands, sensitive management and replanting of woodland and scattered trees can benefit certain other birds including

<sup>12</sup> Bolton Metropolitan Borough Council, 1995, Red Moss SSSI Citation

<sup>13</sup> Information from the Wildlife Trusts website - <http://www.wildlifetrusts.org/wildlife/habitats/upland-flushes-fens-and-swamps> accessed 02/11/15

redstart, pied flycatcher and wood warbler. Scrub can be important for species such as black grouse, nightjar and stonechat. However some species such as ring ouzel prefer un-wooded steep-sided gills/cloughs so maintaining a habitat mosaic is important<sup>14</sup>.

#### Action

- Reduction in stands of *Himalayan Balsam* (see primary objectives) to allow natural habitats to re-generate.
- Install nesting boxes on suitable trees (for more information see Appendix 7).
- Maintain a habitat mosaic which provides habitat for different bird species by;
  - retaining *Phalaris* present along stream margins as provision for species such as reed bunting and grasshopper warbler, which may nest in this habitat.
  - Retain marshy grassland areas (see prescription 2)
  - Retain specific scrub areas which have value as a nesting area for notable bird species including linnet (*Carduelis cannabina*), song thrush (*Turdus philomelos*) and dunnoek (*Prunella modularis*)

#### Timing

- See primary objectives for timing of Himalayan balsam removal (4.1.2).
- Throughout duration of management plan.

### Prescription 4

#### 4.5.4 Increase suitability of habitat for hedgehogs

##### Rationale

- A report by the British Trust for Ornithology (BTO) commissioned by PTES and the British Hedgehog Preservation Society (BHPS) to determine the state of Britain's hedgehogs, indicates that at a conservative estimate a quarter of the population has been lost in the last ten years<sup>15</sup>.

##### Action

- Provide artificial or natural hedgehog boxes located in a quiet undisturbed area with ground covering vegetation, preferably against a bank, wall or fence. For example three or four logs may be arranged to leave an appropriate sized hole for a hedgehog to nest in (big enough for the hedgehog and its nest) and covered with masses of twigs and leaves. See Appendix 6 for more information.
- Old logs and wood piles attract invertebrates and fungi, provide a good local food source for hedgehogs and possible nesting sites (materials from other habitat management activities could be used for this purpose).

##### Timing

- Throughout duration of management plan.

### Prescription 5

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<sup>14</sup> Gill/Clough Woodland Management Leaflet, RSPB, <http://www.rspb.org.uk/forprofessionals/farming/advice/details.aspx?id=204332> accessed 02/11/15

<sup>15</sup> Wembridge, D. 2011, The State of Britain's Hedgehogs, PTES and the British Hedgehog Preservation Society

#### **4.5.5 Remove fly-tipped waste plastic and other rubbish/ hazards from the Clough**

##### *Rationale*

- Litter with sharp edges poses an obvious hazard to wildlife, domestic pets and children alike, and should be disposed of safely. Examples include metal ring pulls from old fashioned drink cans, broken glass etc. Mammals will commonly attempt to remove food remnants from the base of discarded food cans, polystyrene or paper cups, crisp packets, yoghurt pots, cartons and other food containers. The heads or bodies of small and medium sized mammals may become trapped within these rubbish containers. In general plastic does not degrade but merely breaks down into smaller and smaller pieces. Almost 80 per cent of marine plastic comes from land sources. This is an exponentially increasing problem.
- The Clough is used as a dog walking area. Dog waste that is not cleaned up can be a nuisance to other walkers and a health hazard to children and other animals.

##### *Action*

- Remove any waste/rubbish from site
- Provide litter bins along the footpaths of a design to prevent access from wildlife species (e.g. letter box-like opening). They should not be open-topped
- Provide a dog waste bin and signs to encourage people to clean up after their dogs and promote responsible dog ownership

##### *Timing*

- Throughout duration of management plan

#### **Prescription 6**

#### **4.5.6 Provide additional foraging, nesting and commuting habitat for a variety of species by installing a new hedgerow**

##### *Rationale*

- Since 1945 there has been a drastic loss of hedgerows through removal and neglect throughout the UK. Hedgerows provide many ecosystem services which aid in the conservation and protection of farmland, woodland birds and mammals: they prevent the loss of soil by reducing wind and water erosion; act as a barrier between polluting fertilisers, pesticides and sediment and watercourses; regulate the rate of flow of water within different areas; provide sustainable drainage; reduce the amount of air pollution, and provide commuting, foraging, refuge and breeding habitat for wildlife including birds, bats, hedgehogs, small mammals and invertebrates. At Nellies Clough a hedgerow in the northern section will provide a barrier to livestock encroaching onto the Clough habitats and over grazing/poaching the ground<sup>16</sup>.

##### *Action*

- Plant a species rich hedgerow along the field boundary to the northern half of the site. The hedgerow should comprise locally native species such as blackthorn, hawthorn, sallows, wild privet, field maple, crab apple and common buckthorn. These should be allowed to grow large

<sup>16</sup> Information from Campaign to Protect Rural England website, <http://www.cpre.org.uk/what-we-do/countryside/hedgerows/in-depth/item/1646-hedgerows-for-a-living-countryside> accessed 02/11/15



enough to flower as they are an important source of nectar and pollen for many insects. Other species such as oak and elm also support many invertebrates including a number of nationally scarce leafhoppers. Climbing species such as white bryony, bramble and ivy are also important components. Species that bear fruit will also provide food for birds and small mammals.

- Many invertebrates are associated with the herbaceous plants that characteristically occur at the bases of hedges. Wide margins should therefore be retained in order to allow such plants to flourish. Under cross-compliance regulations introduced in 2005, all hedges must have a buffer margin extending at least 2 metres from the centre of the hedge<sup>17</sup>.
- For more information on creating hedgerows see Appendix 8. It may be possible to gain some funding from the Tree Council for a community project (<http://www.treecouncil.org.uk/grants>), as well a free tree pack from the Woodland Trust: (<http://www.woodlandtrust.org.uk/plant-trees/in-your-community/>).

#### *Timing*

- Plant between November and March when the ground is not frozen or covered with snow.

### **Prescription 7**

#### **4.5.7 Increase suitability of habitat for reptiles and amphibians**

##### *Rationale*

- The online search returned records for common lizard, adder, common toad and great crested newt within the OS grid square for the site, and the diverse structure of the habitats on site suggest that it may be suitable to support amphibians and reptiles.
- Reptiles and amphibians have declined rapidly in numbers and range over the last 100 years. For more information on amphibians and reptiles in the UK see appendix 9.

##### *Action*

- Construct artificial hibernacula (see Appendix 4) for use by reptiles and amphibians, as far from the footpath and other potential sources of disturbance as possible
- Use timber and arisings from other management operations as construction material.
- Installation of a native species rich hedgerow will provide foraging and commuting habitat (see above).

##### *Timing*

- Hibernacula to be constructed during spring/summer whilst newts are in aquatic phase and therefore are most likely to be in their pond(s), rather than in a terrestrial phase of their life cycle.

### **Prescription 8**

#### **4.5.8 Increase suitability of habitat for bees and pollinators**

##### *Rationale*

<sup>17</sup> Information from Buglife's Website, <https://www.buglife.org.uk/advice-and-publications/advice-on-managing-bap-habitats/ancient-and-species-rich-hedgerows> accessed 02/11/15

- Bees are a vital component in ecological networks and provide significant social and economic benefits to humans through crop pollination and maintaining the character of the landscape. Despite their importance, both to people and the natural environment, unsustainable agriculture, diseases and habitat degradation have placed significant pressures on many species of bees, causing widespread declines.

*Action*

- Construct artificial hives for use by solitary bees or nest boxes for bumble bees (See Appendix 13 and <http://www.bumblebee.org/nestboxes.htm>)  
Place them as far from the footpath and other potential sources of disturbance as possible. Bee hive making could be undertaken by local groups or schools which would also contribute to the public support objective.
- Installation of a native species rich hedgerow and increasing the diversity of grassland species will provide foraging habitat for pollinators (see above).
- It may be possible to install honey bee hives on site. The Natural Bee Keeping Trust advocate keeping bees 'for bees sake' rather than for honey production. More information can be found at <http://www.naturalbeekeepingtrust.org/>.

*Timing*

- See above for timings regarding native species planting.
- Bee hives and nest boxes for solitary bees and bumble bees should be installed in early spring.

## 5 Monitoring

5.1 Monitoring is essential to assess the efficacy of the prescribed management of habitats, however, setting targets and complex monitoring schemes can sometimes be onerous, particularly when resources may be limited.

5.2 To assess the progress of several of the management prescriptions on site, a simple method has been devised which can be implemented on an annual basis.

- Establish a fixed point of monitoring in first year
- 1m x 1m (for grassland) or 10m x 10m (for woodland) quadrat in habitat which is typical of the area to which the prescription relates (see below)
- Record all botanical species within quadrat
- Assign a rough estimate of percentage cover to each species
- Photograph the overall area, so that the structure and composition of the habitat is visible

5.3 This method of monitoring should be utilised to monitor the change in species composition/cover for the following prescriptions:

### **Maintain and increase extent of more species diverse grassland areas**

Prescription 1 – *Management of Himalayan Balsam*

Prescription 2 – *Management of scrub within grassland*

### **Improve structure of plantation woodland**

Prescription 1 – *Thinning of young trees in plantation woodland*

Prescription 2 – *Coppicing of hazel understory*

Prescription 3 – *Creation of glades within woodland*

5.4 The monitoring of the site may provide an additional opportunity to involve the local community. Volunteers may be able to assist with the habitat monitoring described above and also by recording any interesting botanical species or wildlife they come across onsite. A 'Friends of Nellie's Clough' website (see 4.2.1) will create a space for people to share their experiences of the site and their plant and wildlife records. Results of the habitat monitoring and details about forthcoming events could also be detailed on the website.

## Appendix 1. Relevant Legislation

Species	Legislation (England & Wales)	Offences	Notes on licensing procedures and further advice (England & Wales)
<b>Species that are protected by European and national legislation</b>			
<b>Bats</b> <i>European protected species</i>	Conservation of Habitats and Species Regulations 2010 Reg 41	<ul style="list-style-type: none"> <li>• Deliberately<sup>1</sup> capture, injure or kill a bat;</li> <li>• Deliberate disturbance<sup>2</sup> of bats;</li> <li>• Damage or destroy a breeding site or resting place used by a bat.</li> </ul> <p>The protection of bat roosts is considered to apply regardless of whether bats are present.</p>	<p>An NE licence in respect of development is required in England or a licence from the Welsh Assembly Government in consultation with CCW in Wales.</p> <p><i>European Protected Species: Mitigation Licensing- How to get a licence</i> (NE 2010)</p> <p><i>Bat Mitigation Guidelines</i> (English Nature 2004)</p> <p><i>Bat Workers Manual</i> (JNCC 2004)</p>
	Wildlife and Countryside Act 1981 (as amended) <sup>4</sup> S.9	Intentionally or recklessly <sup>3</sup> obstruct access to any structure or place used for shelter or protection or disturb a bat in such a place.	Licence from NE or CCW is required for surveys (scientific purposes) that would involve disturbance of bats or entering a known or suspected roost site.



Species	Legislation (England & Wales)	Offences	Notes on licensing procedures and further advice (England & Wales)
<b>Birds</b>	Conservation of Habitats and Species (Amendment) Regulations 2012	<ul style="list-style-type: none"> <li>N/A</li> </ul>	Authorities are required to take steps to ensure the preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds in the United Kingdom, including by means of the upkeep, management and creation of such habitat. This includes activities in relation to town and country planning functions.
	Wildlife and Countryside Act 1981 (as amended) <sup>4</sup> S.1	<ul style="list-style-type: none"> <li>Intentionally kill, injure or take any wild bird;</li> <li>Intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built;</li> <li>Intentionally take or destroy the nest or eggs of any wild bird.</li> </ul> <p><b>Schedule 1 species</b></p> <p>Special penalties are liable for these offences involving birds on Schedule 1 (e.g. most birds of prey, kingfisher, barn owl, black redstart, little ringed plover).</p> <p>Intentionally or recklessly<sup>3</sup> disturb a Schedule 1 species while it is building a nest or is in, on or near a nest containing eggs or young; intentionally or recklessly disturb dependent young of such a species.</p>	No licences are available to disturb any birds in regard to development. Licences are available in certain circumstances to damage or destroy nests, but these only apply to the list of licensable activities in the Act and do not cover development. General licences are available in respect of 'pest species' but only for certain very specific purposes e.g. public health, public safety, air safety. <a href="http://www.naturalengland.org.uk/Images/wlmsfaqs_tcm6-3859.pdf">http://www.naturalengland.org.uk/Images/wlmsfaqs_tcm6-3859.pdf</a> <a href="http://www.naturalengland.org.uk/ourwork/regulation/wildlife/advice/advisoryleaflets.aspx">www.naturalengland.org.uk/ourwork/regulation/wildlife/advice/advisoryleaflets.aspx</a>
<b>Reptiles (species that are not European protected):</b> <b>Adder</b> <b>Common lizard</b>	Wildlife and Countryside Act 1981 (as amended) <sup>4</sup> S.9(1) (part); S.9(5)	Intentionally kill or injure any common reptile species.	No licence is required in England or Wales. However an assessment for the potential of a site to support reptiles should be undertaken prior to any development works which have potential to affect these animals. <b>England:</b> <a href="https://www.gov.uk/reptiles-">https://www.gov.uk/reptiles-</a>

Species	Legislation (England & Wales)	Offences	Notes on licensing procedures and further advice (England & Wales)
<b>Grass snake</b> <b>Slow worm</b>			<u>protection-surveys-and-licences</u> <b>Wales:</b> <a href="http://naturalresourceswales.gov.uk/apply-and-buy/uk-protected-species-licensing/reptile-licensing/?lang=en">http://naturalresourceswales.gov.uk/apply-and-buy/uk-protected-species-licensing/reptile-licensing/?lang=en</a>
<b>Rabbits, foxes and other wild mammals</b> <b>For BAP species and Species of Principal Importance, see below</b>	Wild Mammals (Protection) Act 1996	Intentionally inflict unnecessary suffering to any wild mammal.	Natural England provides guidance in relation to rabbits (Technical Information note TIN003, Rabbits-management options for preventing damage, July 2007) and foxes (which are also protected under the Wildlife and Countryside Act 1981 from live baits and decoys, see Species Information notes SIN003 (2011), <i>Urban foxes</i> and SIN004 (2011) <i>The red fox in rural areas</i> as well as other wild mammals.  Lawful and humane pest control of these species is permitted.

<sup>1</sup>Deliberate capture or killing is taken to include “accepting the possibility” of such capture or killing

<sup>2</sup>Deliberate disturbance of animals includes in particular any disturbance which is likely a) to impair their ability (i) to survive, to breed or reproduce, or to rear or nurture their young, or (ii) in the case of animals of hibernating or migratory species, to hibernate or migrate; or b) to affect significantly the local distribution or abundance of the species to which they belong. Lower levels of disturbance not covered by the Conservation of Habitats and Species Regulations 2010 remain an offence under the Wildlife and Countryside Act 1981 although a defence is available where such actions are the incidental result of a lawful activity that could not reasonably be avoided. Thus deliberate disturbance that does not result in either (a) or (b) above would be classed as a lower level of disturbance.

<sup>3</sup>The term ‘reckless’ is defined by the case of Regina versus Caldwell 1982. The prosecution has to show that a person deliberately took an unacceptable risk, or failed to notice or consider an obvious risk.

<sup>4</sup>The Wildlife and Countryside Act (1981) has been updated by various amendments, including the Countryside and Rights of Way Act 2000 and the Natural Environment and Rural Communities Act 2006. A full list of amendments can be found at <http://jncc.defra.gov.uk/page-1377>.

Habitats & Species	Legislation (England & Wales)	Guidance
<p><b>Species and Habitats of Principal Importance for the Conservation of Biodiversity</b></p>	<p>Natural Environment &amp; Rural Communities Act 2006 S.40 (which superseded S.74 of the Countryside &amp; Rights of Way Act 2000).</p>	<p>S.40 of the NERC Act 2006 sets out the duty for public authorities to conserve biodiversity in England and Wales.</p> <p>Habitats and species of principal importance for the conservation of biodiversity are identified by the Secretaries of State for England and Wales, in consultation with NE and NRW, are referred to in S.41 of the NERC Act for England and S.42 for Wales. The list of habitats and species was updated in 2008:</p> <p>England:  <a href="http://webarchive.nationalarchives.gov.uk/20140605090108/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx">http://webarchive.nationalarchives.gov.uk/20140605090108/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx</a></p> <p>Wales: <a href="http://www.biodiversitywales.org.uk/49/en-GB/Section-42-Lists">http://www.biodiversitywales.org.uk/49/en-GB/Section-42-Lists</a></p> <p>The habitats and species listed are not necessarily of higher biodiversity value, but they may be in decline. Habitat Action Plans and Species Action Plans are written for them or are in preparation, to guide their conservation.</p> <p>Ecological impact assessments should include an assessment of the likely impacts to these habitats and species.</p>
<p><b>Biodiversity Action Plan (BAP) Habitats &amp; Species</b></p>	<p>No specific legislation, unless it is also a species or habitat of principal importance as described above.</p>	<p>The UK Post 2010 Biodiversity Framework published in July 2012 succeeds the UK BAP. Following devolution in 1998, each of the four countries of the UK have developed their own Biodiversity Strategies. In England the current strategy is <i>Biodiversity 2020: A strategy for England's wildlife and ecosystem services</i> (2011), which also reflects a change in strategic thinking following the Convention for Biological Diversity's (CBD) Strategic Plan for Biodiversity 2011-2020 and the launch of the new EU Biodiversity Strategy. The <i>Wales Biodiversity Framework 2010</i> sits alongside the Environment Strategy for Wales (2006) and Environment Strategy Action Plan (2008). The UK Post 2010 Biodiversity Framework demonstrates how the work of the four countries and the UK contributes to the Aichi Biodiversity Targets in the CBD's Strategic Plan for Biodiversity 2011-2020.</p> <p>The original UK BAP list of species and habitats, prepared over 10 years ago, was used to compile the lists of species and habitats of principal importance under sections 41 and 42 of the NERC Act 2006 which now form the focus of the Biodiversity Strategies in England and Wales respectively.</p> <p>In addition to the England and Wales Biodiversity Strategies, there are also many BAPs at the regional and local level which feed into the delivery at the country level and also identify biodiversity priorities at</p>



		the more local level.
<b>Hedgerows</b>	The Hedgerow Regulations 1997	Under the regulations, it is against the law to remove or destroy hedgerows that are classified as "important" under the regulations without permission from the local planning authority. The regulations apply if a hedgerow is in or runs alongside agricultural land, common land including town or village greens, land used for forestry or for the breeding or keeping of horses etc, a local nature reserve or Site of Special Scientific Interest. A hedgerow can be classified as 'Important' due to its wildlife and landscape value or due to its heritage value. In general, permission will be required before removing hedges that are at least 20 metres in length, over 30 years old and contain certain species/diversity of plant. The local planning authority will assess the importance of the hedgerow using criteria set out in the regulations. See Defra and Natural England websites for further guidance and information.
<b>Japanese knotweed, hybrid knotweed, giant knotweed Giant hogweed Rhododendron Himalayan balsam</b>	Wildlife and Countryside Act 1981 (as amended) S.14	It is illegal to plant these species or otherwise cause them to grow or spread in the wild. Any contaminated soil or plant material containing Japanese knotweed or giant hogweed is classified as controlled waste and should be disposed of in a suitably licensed landfill site, accompanied by appropriate Waste Transfer documentation, and must comply with section 34 of the Environmental Protection Act 1990. <i>The Knotweed Code of Practice</i> (Environment Agency, 2013) <i>Guidance on Section 14 of the Wildlife and Countryside Act, 1981</i> (Defra, 2010)

## Appendix 2. Management Schedule

Objective	Prescription	Action	Timing	Location
<b>1. Reduce extent of non-native invasive species</b>	Eradication of Japanese knotweed	Removal of Japanese knotweed and rhizome	Avoid flowering 'season'	To the very southern end of the site
	Removal of Himalayan balsam	Removal of Himalayan balsam by hand	Before flowering, ideally June	All site
<b>2. Maintain and increase extent of species rich grassland</b>	Removal of Himalayan balsam	See below	See below	See below
	Management of scrub within grassland	Removal of self-seeded scrub encroaching onto grassland at a ratio of 4 in 5	October - February	Within grassland to the northern half of the site
		Arisings to be used to construct hibernacula where possible	October - February	In suitable areas (see appendices)
		Bramble thickets providing continuity and other designated scrub areas to be retained	N/A	Northern section TN's 8, 10 and 13
<b>3. Improve public support for the conservation of Nellie's Clough</b>	Provide interpretation signs and information about the site to the public	Provide interpretation boards at the site	Throughout the duration of the management plan	Install information close to entrances
		Promote the 'friends of Nellie's Clough' group on site		
		Promote public & school engagement activities		
		Create a 'friends of Nellie's Clough' website (or space within the NCRA website)		

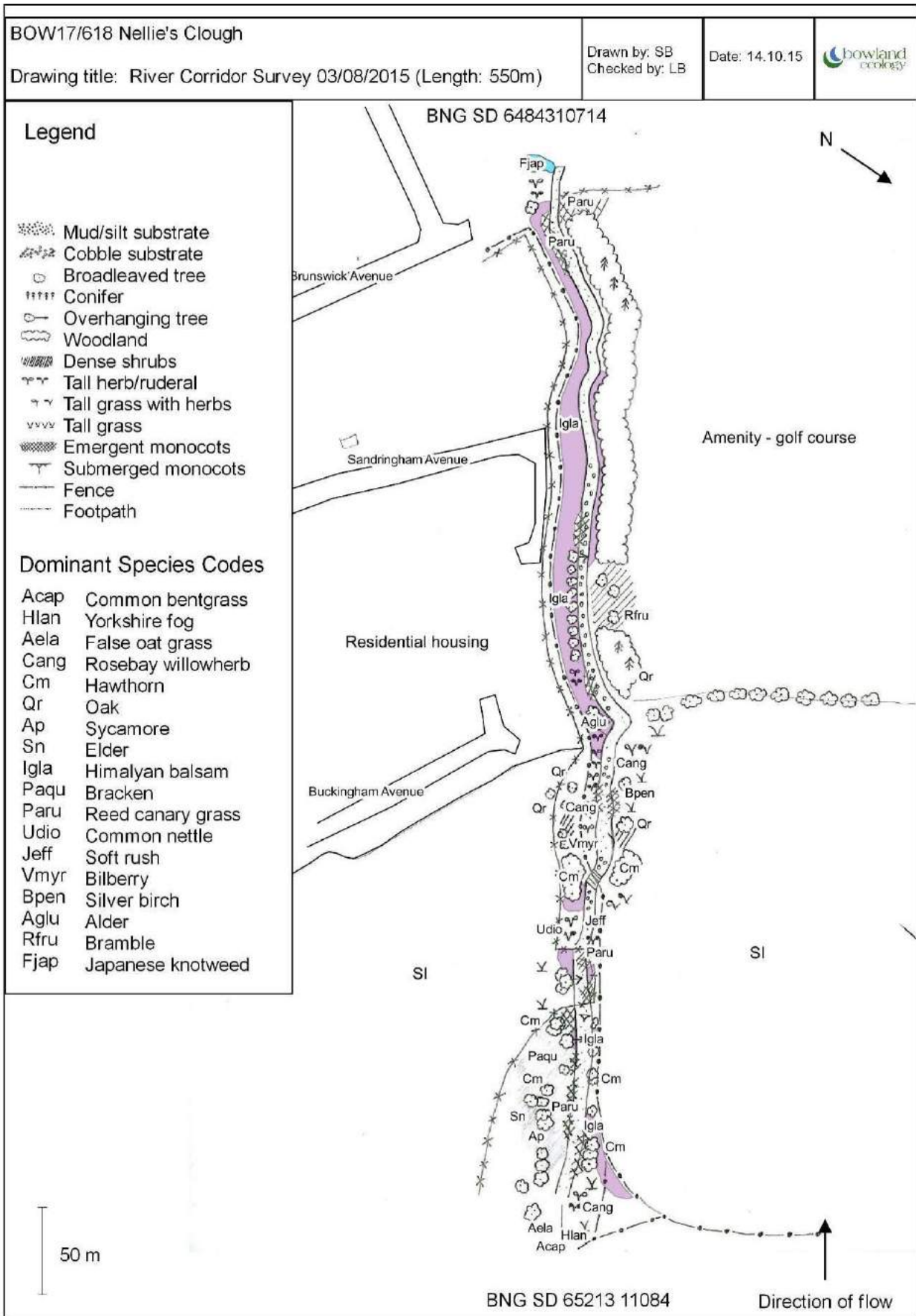
<b>4. Improve structure of plantation woodland</b>	Thinning of young trees in plantation woodland	Removal of young trees on woodland edge at ratio of 1 in 4	October - February	Within woodland areas to southern half of site
		Arisings to be utilised in hibernacula construction where possible	October - February	In suitable areas (see appendices)
	Coppicing of understory	Coppice suitable ash and willow trees within understory at a ratio of 1 in 5	November - February	Within woodland areas to southern half of site
		Arisings to be utilised in hibernacula construction where possible	November - February	In suitable areas (see appendices)
	Creation of glades within woodland	Removal of mature trees and scrub to create gap in canopy in proposed locations	October - February	Within woodland areas to southern half of site
		Utilise arisings for hibernacula and habitat piles where possible	October - February	In suitable areas (see appendices)

<b>5. Improve provision for notable species of conservation concern</b>	Providing artificial bat roosting habitat	Installation of suitable bat boxes	Any time of year	Within woodland and at TN4
	Retain and enhance marshy grassland areas	Do not clear out natural material from or block the flow of the watercourse	Throughout duration of management plan	Along water course TN29
		Remove Himalayan balsam		Across whole site
		Clear any tipped waste		Across whole site
		Create a species rich hedgerow		See below
	Increase suitability of Clough for ground nesting and other birds	Reduction in stands of <i>Himalayan balsam</i>	See above	See above
		Install nesting boxes on suitable trees	Any time of year	Within woodland and at TN4
Maintain a habitat mosaic by: <ul style="list-style-type: none"> <li>retain <i>Phalaris</i> along stream</li> </ul>		N/A	Along stream at TN29	

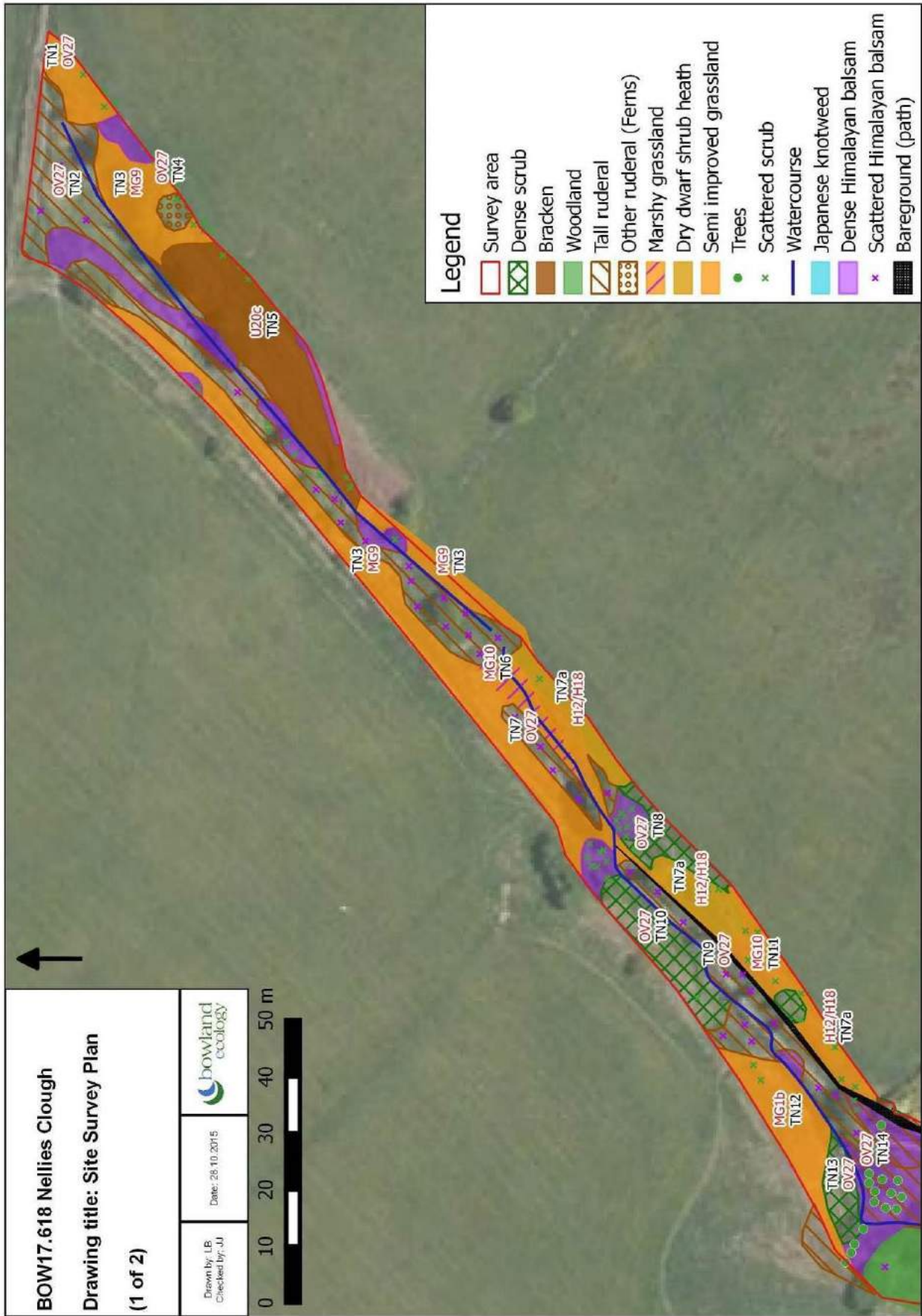


		<ul style="list-style-type: none"> <li>retain marshy grassland areas</li> <li>retain specific scrub areas</li> </ul>		TN6 and wherever marshy areas occur
				Northern section TN's 8, 10 and 13
	Increase suitability of habitat for hedge-hogs	Provide artificial or natural hedgehog boxes	Any time of year	Where cover vegetation is available for e.g. scrub areas and woodland edges
		Leave old logs and wood piles in situ to attract invertebrates and fungi		
	Remove fly- tipped and other rubbish from the Clough	Remove any waste/rubbish from site	Any time of year and throughout duration of management plan	Across the whole site, particularly along footpaths
		Provide litter bins along the footpaths		
	Provide additional foraging, nesting and commuting habitat for a variety of species by installing a new hedgerow	Plant a native, species rich hedgerow along the field boundary to the north	Between November and March	Along the northern boundary of the site adjacent to the grassland at TN3
		Wide margins should be retained in order to allow plants at the base of the hedgerow to flourish		
	Increase suitability of habitat for reptiles and amphibians	Construct artificial hibernacula using timber and arisings from other management operations	Hibernacula to be constructed during spring/summer	Where cover vegetation is available for e.g. scrub areas and woodland edges
		Installation of a native species rich hedgerow	See above	See above

## Appendix 3. Nellies Clough Survey Plans

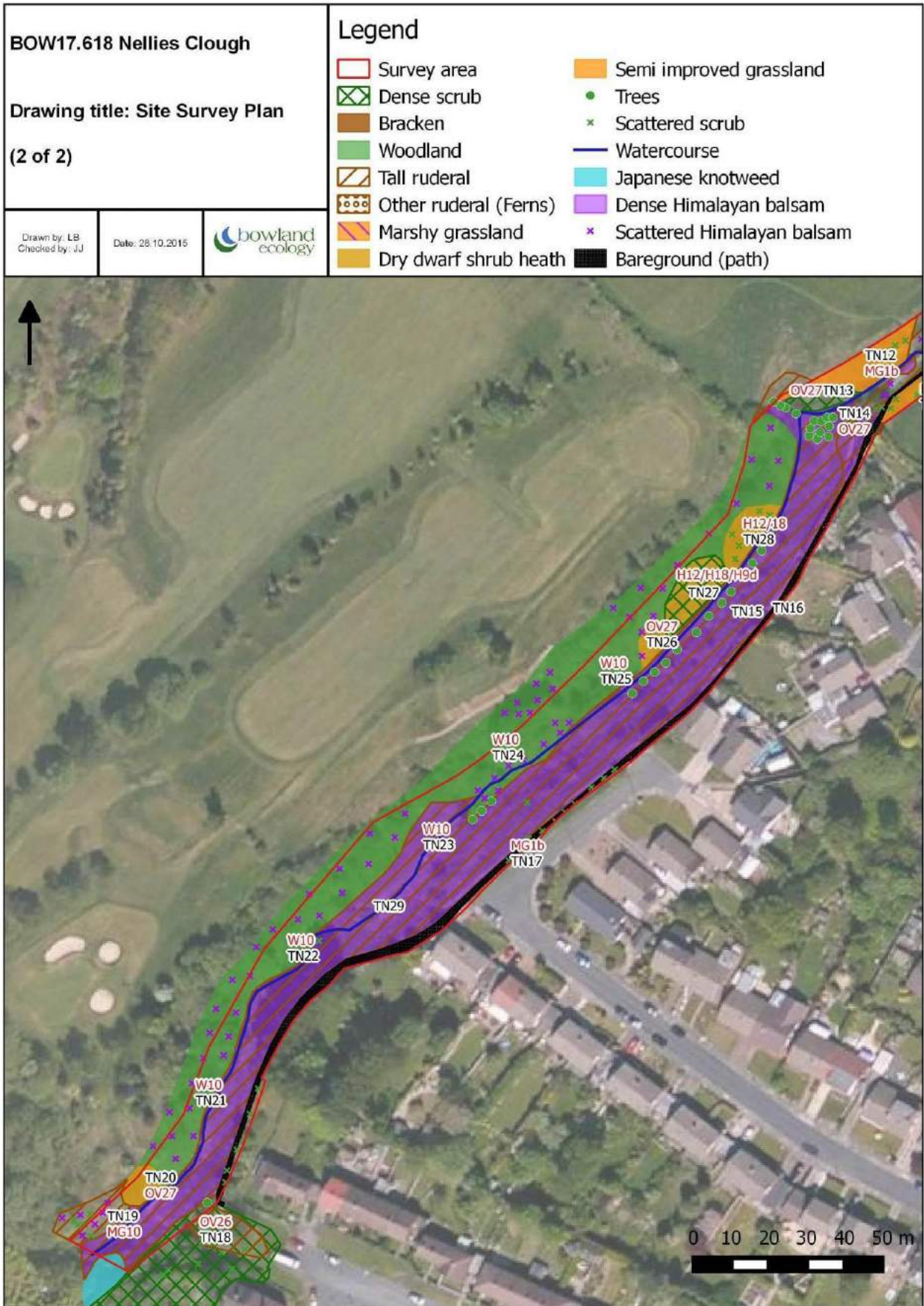






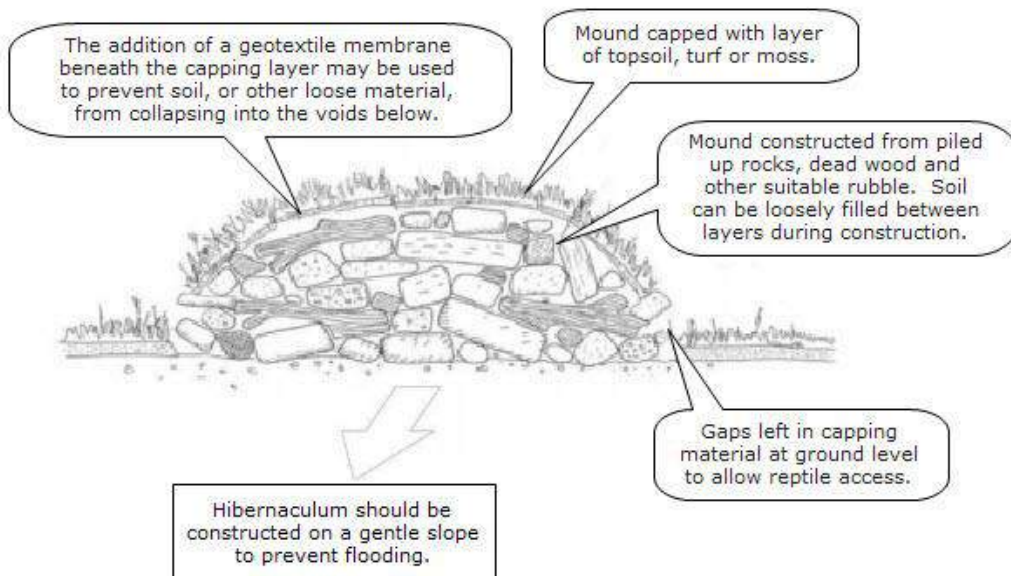
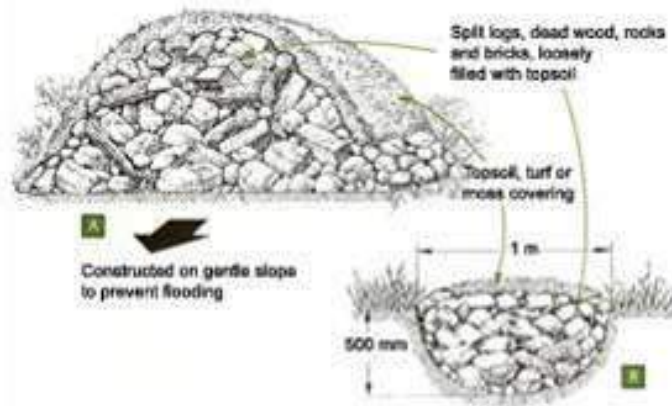
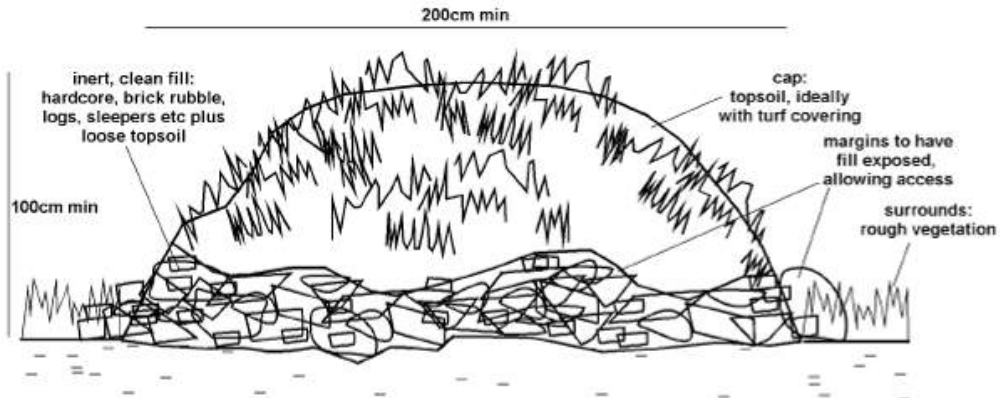








## Appendix 4. Amphibian and Reptile Hibernacula Construction Detail





# Appendix 5. Bat Box Construction Detail



## Bat Conservation Trust How to make a bat box Providing bat habitats in your back garden

Bat boxes are artificial roosts, usually made of wood or woodcrete (a mixture of wood chips and concrete). They are designed to provide bats with alternative resting places to replace natural ones in tree holes, and also to encourage bats into areas where there are few such natural sites. Bat boxes have a useful place in bat conservation, but it should be remembered that bats take to boxes less readily than birds.

### What makes a good bat box?

Recent research has shown that good insulation and avoidance of draughts are more important for attracting bats to boxes than is the material from which they are made. Bats do not like draughts, and prefer well-insulated boxes where temperature and humidity remain constant. Well-sealed joints are therefore important, as is the avoidance of large, loose-fitting front panels. The warmest areas in a box, and the areas that bats use most, is at the top – therefore a well-insulated top is important. Removable lids should be avoided, again to reduce draughts, but also to prevent disturbance or unintentional injury to bats when the box is opened. A special licence is required to disturb or handle bats in the UK, and any disturbance without a licence is illegal. For more information on bats and the law call the Bat Helpline (0845 1300 228).

All timber used in bat boxes should be rough-sawn to allow bats to cling and climb, and must also be untreated, since bats are very sensitive to the chemicals used for timber treatment. A 'bat ladder' or other landing area is essential, as is an entry slit wide enough to admit bats but narrow enough to keep out predators.

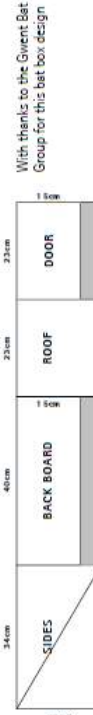
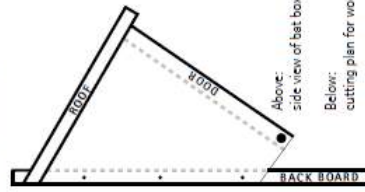
### Making a bat box

Bat boxes take many shapes and sizes; here we give the details for a simple wooden wedge-shaped design that has been known to work well.

The cutting plan above is self-explanatory, except that the acute angled ends of the triangular sides are cut off to give the entrance slot of the required width, after allowing for the thickness of the door (ie cut off higher for a wider opening). The top edge of the back board and the rear edge of the roof must be bevelled to fit. The roof and back board are next to each other on the cutting plan so that, with a tilting circular saw or jigsaw, the bevels can be cut in one go. The cutting angle is approximately 62.6°.

The front-opening door is pivoted at the bottom on two clout nails. A hole is drilled high up through one side of the box and into the side of the door. This takes a loose-fitting clout nail which holds the door firmly closed against the door stops. These are cut from 10-12mm strip and are fitted at the top and sides of the door-opening to act as a door frame and aid weather-proofing. The side door stops are cut off about 3cm short of the bottom to allow freedom of movement of the door. A small screw is fitted as a knob for opening the door.

The only other point is to ensure that the door is a loose fit to allow for the wood swelling – the door stops take care of the gaps. We recommend gluing as well as nailing to ensure that there is the minimum of heat leakage – we suggest Extratite, which is an odourless wood glue.



### Where should I put my bat box?

Boxes are most likely to be used if they are located in places where bats are known to feed. Woodland, parkland and river banks are good places, as are gardens close to ponds, rivers or parks. Sites should be sheltered from strong winds and exposed to sunlight for as much of the day as possible to increase their internal temperature. They should also be close to a hedge or tree line, as some species of bat use these to navigate and are reluctant to cross open spaces to get to and from roosts. Boxes should be positioned so that the bats' approach to them is clear of impediments such as tree branches, and should be as high as possible, not only to maximize their exposure to sunlight but also to ensure security from cats or human vandals.

Ideally, two or three boxes should be clustered, facing in different directions in order to allow bats to select a range of roosting temperatures at different times of year – preferably south, south-east and south-west. Try to avoid due west, as this is the prevailing direction of the wind (in rain).

For more information on bats, bat boxes and encouraging bats to your garden, visit [www.bats.org.uk](http://www.bats.org.uk) or call 0845 1300 228

4

## The Kent bat box

Simple to construct, self-cleaning and low maintenance.

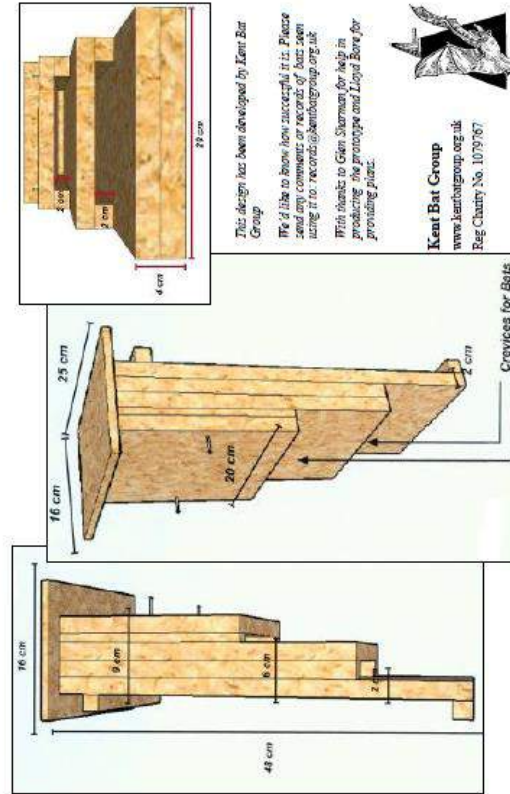
The only critical measurement is the width of the crevices—these should be no larger than suggested. Other measurements are approximate.

### Materials and construction

Box to be made from untreated rough-sawn timbers  
Timber should be c.20mm thick  
The box should be rainproof and draught-free  
Crevices can be between 15 and 25 mm wide  
Fixing may be by use of brackets, durable bands or wires

### Location

Boxes are best fixed as high as possible in a sheltered wind-free position, exposed to the sun for part of the day.  
They can be fitted to walls, other flat surfaces or trees  
A clear flight line to the entrance is important



This design has been developed by Kent Bat Group

If you like to know how successful it is, please send any comments or records of bats seen using it to: [records@kentbatgroup.org.uk](mailto:records@kentbatgroup.org.uk)

With thanks to Giles Sturman for help in producing the prototype and Lloyd Bow for providing plans.

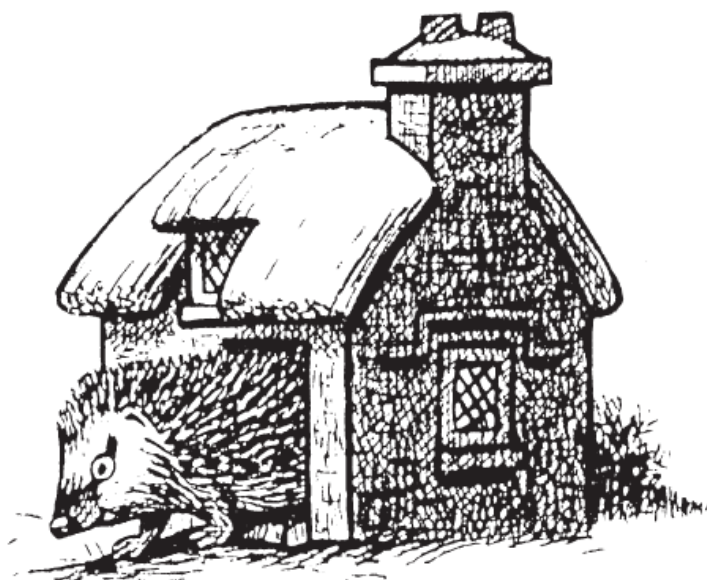


**Kent Bat Group**  
[www.kentbatgroup.org.uk](http://www.kentbatgroup.org.uk)  
Reg Charity No. 1079797

## Appendix 6. Hedgehog habitat creation detail

British Hedgehog  
Preservation Society

# Hedgehog Homes



Part of the

**Know your Hedgehog**

**series**

*PUBLISHED BY THE BRITISH HEDGEHOG PRESERVATION SOCIETY,  
HEDGEHOG HOUSE, DHUSTONE, LUDLOW, SHROPSHIRE SY8 3PL  
[www.britishhedgehogs.org.uk](http://www.britishhedgehogs.org.uk)*



## HEDGEHOG HOMES

### *IN THE WILD*

Efficient winter nests are essential if hedgehogs are to survive hibernation. Thus, in autumn, they begin to collect leaves, grass, straw, bracken, reeds etc. and use these materials for building their own nests under hedgerows, fallen logs or piles of brushwood. These "HIBERNACULA" prove to be surprisingly waterproof and good insulation against the cold.

### *IN THE NATURAL GARDEN*

Most gardens have a supply of the materials mentioned above and suitable sites for nests - under sheds, compost heaps, shrubs and piles of leaves or behind stacks of logs and under spare building materials. In these circumstances, if hedgehogs want to spend a winter here, they should be able to get on and build their own shelters. However, you may wish to provide your 'resident' hedgehog with, (or encourage any in the vicinity to become 'resident' in your garden by the provision of), a more permanent structure.

### *IN THE MORE FORMAL GARDENS AND IN OTHER ENCLOSED AREAS*

Where hedgehogs are being cared for (eg after an injury or when orphaned) they will probably need nests made for them.

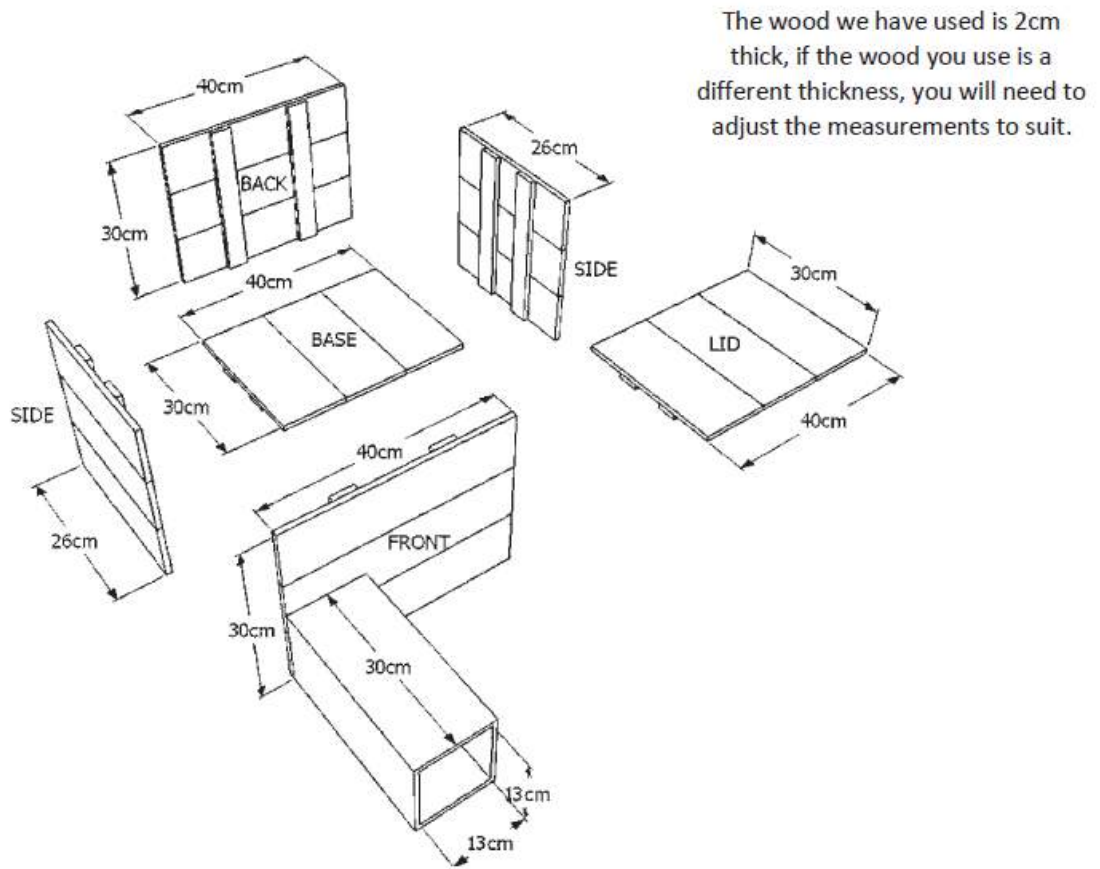
### *HEDGEHOG HOUSE - MARK I (Council Tax Band "A")*

This is a very simple affair and easy to make. Get a big, thick cardboard box and cut two side air vents about 15cm by 5cm and an entrance of 13cm square. Put some dry leaves or straw inside with clean, dry grass or straw on top and tuck the box near a hedge, if possible with the entrance facing South. The top of the box should then be covered with a small piece of plastic sheeting, for example an "opened up" old carrier bag. Twigs should be put all round to make a dome and then covered with dry grass and leaves.

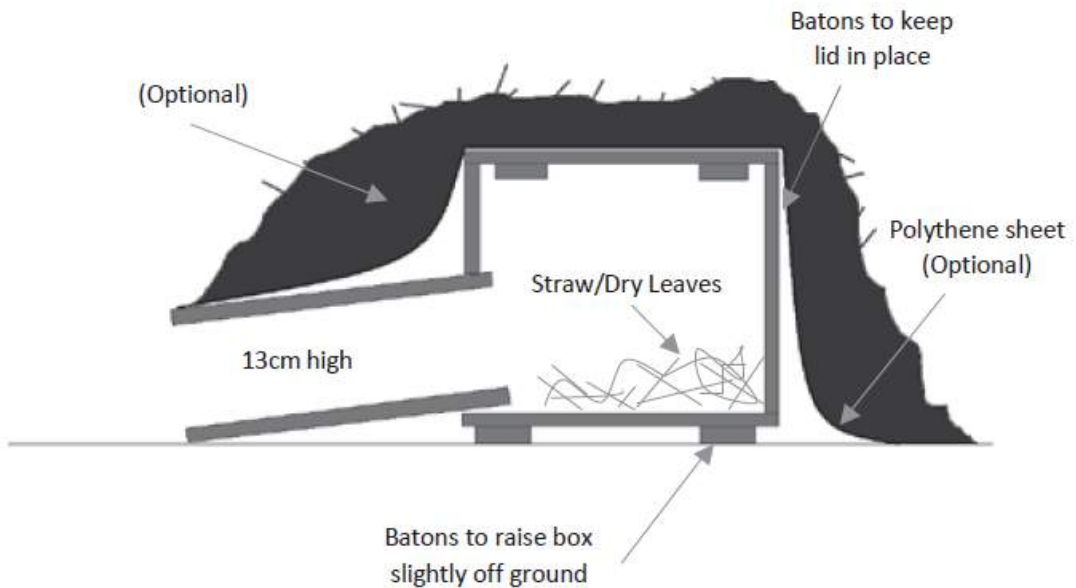
### *HEDGEHOG HOUSE - MARK II (Council Tax Band "H")*

This is a design that the Society recommends and is a more permanent type of home. Any available timber can be used (old or new) but the better it is made, the longer it will last. The wood can be treated with water based preservative but not creosoted or tanalised. Do not nail down the roof as you may need to clean the box in the future. The entrance tunnel could be constructed with old bricks placed on top of each other with a piece of slate with a brick on top for the roof. Make sure the entrance is kept clear and avoid the temptation to disturb the hedgehogs. The finished home could be covered with plastic sheeting, soil and twigs placed on top, or left as it is. Straw and any leaves left outside may be taken in and used for bedding by any prospective resident.

See illustration opposite.



The wood we have used is 2cm thick, if the wood you use is a different thickness, you will need to adjust the measurements to suit.

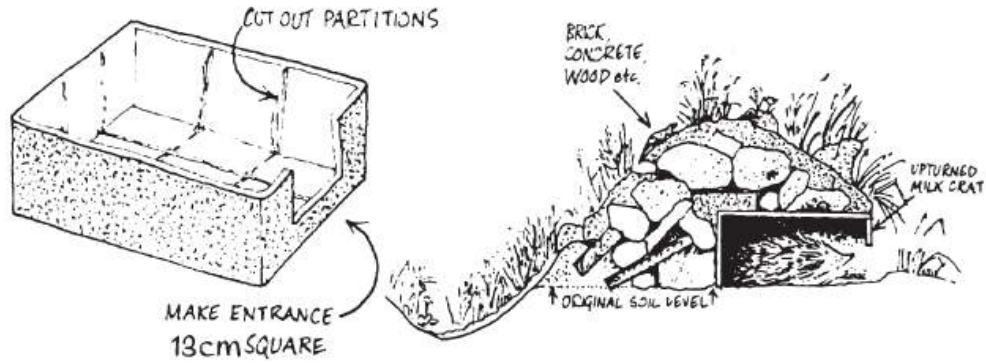


**N.B. Do not creosote or treat wood.**



**HEDGEHOG HOUSE - MARK III** (Council Tax Band "D")

A plastic storage box or an upturned milkcrate (preferably plastic) buried into a mound will probably attract hedgehogs. A hedgehog "Prefab"! Cut out any internal partitions of the crate with a coping saw or secateurs and make the entrance about 13cm square in one end of the crate, avoid leaving "rough" edges. Set the crate into your rubbish mound and camouflage it well outside. Inside you can make it more inviting to hedgehogs by half filling with dry leaves or straw.



**HELPFUL HINTS**

When you have made a hedgehog house, place it in a quiet part of your garden, preferably against a bank, wall or fence and hope that you will have a visit from a friend seeking a home. Make sure the entrance to the house does not face North or North East, thus avoiding the cold winter winds. It may then become the winter home for some lucky hedgehog. If female, she may even have her young in it in the spring. After winter use, late March/early April, it may need to be cleaned out and, to some extent fumigated or washed out. To make sure there is nobody in residence, put a small light obstruction in the entrance to see whether it is pushed away overnight, if it isn't this is an indication that the hedgehog may no longer be in residence (but take care just in case). You can clean the house using an organic Pyrethrum powder, suitable for caged birds. **DO NOT CLEAN IF A HEDGEHOG IS IN RESIDENCE.**

On no account should the hedgehog house be creosoted or "treated" as the fumes remain for a long time and can be very harmful.

There are various "ready-made" hedgehog homes on the market, including the one that can be obtained from our Hogalogue.

**WHY NOT JOIN THE BRITISH HEDGEHOG PRESERVATION SOCIETY?**

*For further information please send a s.a.e. to:-  
The British Hedgehog Preservation Society,  
Hedgehog House, Dhustone, Ludlow, Shropshire SY8 3PL  
Tel: 01584 890801 E-mail: [info@britishhedgehogs.org.uk](mailto:info@britishhedgehogs.org.uk)  
[www.britishhedgehogs.org.uk](http://www.britishhedgehogs.org.uk)*

Price 25p



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326885

## Appendix 7. Bird nest box creation detail

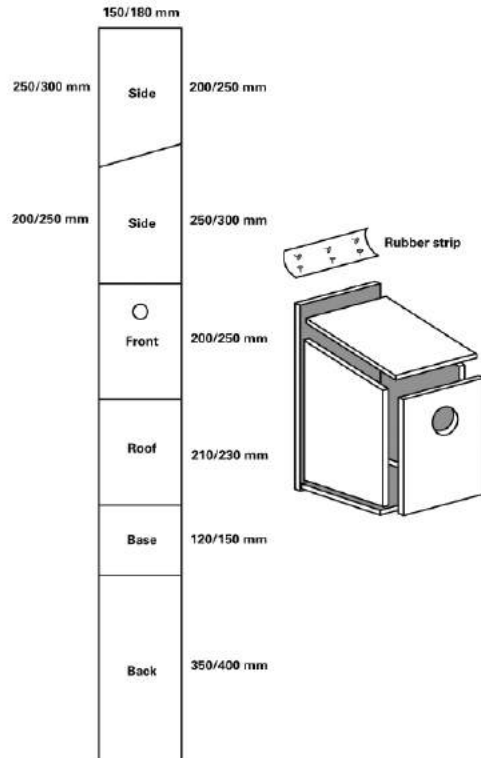


### Make a nestbox

If you'd like to help the birds in your garden, why not have a go at making your own nestbox?

Please ask an adult to help as you may need to use tools that could hurt you.

1. Natural nest holes don't come in standard sizes, so please use the following sizes as a guide. Use a plank about 150 mm wide and 15 mm thick. Use the diagram to help you.
2. The inside of the box must be at least 100 mm square and the bottom of the entrance hole must be at least 125 mm from the floor. If it is less, young birds might be scooped out by a cat.
3. Use galvanised nails or screws. The inside front surface should be rough – this will help the young birds to clamber up. A drainage hole in the base will also help to stop the box getting damp inside.
4. Hinge the lid with a strip of leather or rubber (an old piece of bicycle inner tube would do). Do not nail the lid down (because you will need to clean out the box in autumn). Instead, use a catch to keep it closed.
5. The entrance hole size depends on the type of bird you want to attract:
  - 25 mm for coal tits, marsh tits and blue tits
  - 28 mm for great tits and tree sparrows
  - 32 mm for nuthatches and house sparrows
  - A starling box needs to be 25-30% larger with an entrance 45 mm across



If you remove the top half of the front panel, the same type of box could attract robins, pied wagtails or wrens to nest. Spotted flycatchers prefer an even shallower, open-fronted box.

Softwood boxes (such as pine) can be treated with water-based wood preservatives, such as Fenceguard or Sadolin: apply only to the outside of the box, and not around the entrance hole. Whatever you use, make sure the box dries and airs thoroughly before putting it up.

PLEASE DO NOT use chemicals like wood preservatives without an adult – they can be dangerous.

RSPB Wildlife Explorers is the junior membership of the RSPB

[rspb.org.uk/youth](http://rspb.org.uk/youth)

The RSPB is a registered charity in England & Wales 207076, in Scotland SC037654. 330-0654-13-14





## Appendix 8. Hedgerow creation detail

# Hedges for Wildlife

## How to pick, plant and manage a wildlife-friendly hedge



Why have a plain ugly fence, when a green, living boundary can bring the riches of flowers, scent, berries, rich autumn colours and wildlife?

Yes, a hedge can be all that, and one made out of thorny species will deter uninvited guests too.

Hedges can define property boundaries, break the garden up into rooms, act as a windbreak and can be evergreen or deciduous.

What is more, a thick hedge that is not over-pruned will provide homes and food for many insects

and birds, who will shelter, hibernate and nest in it and feast on the flowers and berries.

Climbers can also add extra thickness and interest. This fact sheet shows you how to create and maintain a wildlife-friendly hedge.



A hedge with ivy growing in it will help wildlife

**The benefits of Ivy ... a plant for all seasons**

Being evergreen, ivy provides shelter for over-wintering butterflies and insects, as well as shelter for birds escaping bad weather. In spring and summer, birds will nest in it and during autumn, the flowers and berries provide a vital late source of food for many insects and birds. The Holly Blue butterfly will also lay its second batch of eggs on it in autumn.



ivy berries  
- R. Burkmar



### Planting a hedge

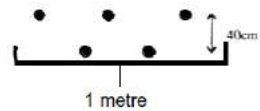
Plant between November and March when the ground is not frozen or covered with snow.

#### Prepare the site

Dig over your selected site, removing all weeds and roots. Next, mix in plenty of well rotted manure or other organic matter to provide the new hedge with plenty of food. A soil with plenty of organic matter will also hold more moisture and aid drainage. This will help prevent soils becoming waterlogged in winter and will save you having to water the hedge so much in summer. If the soil is heavy clay, add some grit and sand to improve drainage further.

#### Planting the hedge

To achieve a thick hedge, it is advisable to plant 5 plants per metre, in double staggered rows (see diagram)



Mark out the rows with lines of string and dig a hole for each plant or a trench. Place the plant in the hole (see note on back 'buying plants') ensuring the roots hang straight. The plant should be planted to the same depth as it was in the nursery. A slight change in colour will indicate the level, known as the root collar.

Back fill with soil and gently firm in with the heel of your boot. Water well. If rabbits are present, protect each plant with a tree guard or erect a rabbit proof fence.





# Appendix 9. Reptile and Amphibian Leaflet

(<http://www.arc-trust.org/pdf/british%20amphibians%20and%20reptiles%20leaflet.pdf>)

### Threats

Amphibians and reptiles have declined rapidly in both numbers and range over the last 100 or more years.

Some of the reasons are due to direct persecution, such as killing or catching, but most is due to habitat change or destruction through building, agriculture and increased roads.

There is also much less suitable and such that remains is often in small, isolated patches. Much of it has become less suitable through drainage or neglect.

The loss of both traditional management and natural processes means that there is less protection and growth to reptiles and amphibians. Growth of scrub and trees may shade an area to the extent that it becomes unsuitable for the species, just as it can be for the plants and animals of a ploughed up.

### Ecology

All British reptiles and amphibians are semi-terrestrial, their diet consists of the following:

Amphibians	Spring	Summer	Autumn
Water	Yes	Yes	Yes
Wetland	Yes	Yes	Yes
Woodland	Yes	Yes	Yes
Open	Yes	Yes	Yes
Grass	Yes	Yes	Yes
Woods	Yes	Yes	Yes
Wetlands	Yes	Yes	Yes
Woods	Yes	Yes	Yes
Wetlands	Yes	Yes	Yes
Woods	Yes	Yes	Yes

Amphibians require water for breeding. They use ponds, lakes, canals and pools by rivers, streams and ditches. They also breed in temporary pools, such as those in old, grassed and felled sites, which provide humidity, cover and food. Inland ponds occur in more open areas like dunes and heaths and, being burrows, they can survive in areas where other amphibians cannot.

Reptiles live in a wide range of habitats, which provide a combination of open sunlight and shelter in wooded ground vegetation. They commonly use heaths, dunes, meadows, hedgerows and woodland margins. Grass snakes and adders also need places to lay their eggs.

Both reptiles and amphibians use a wide range of freshwater habitats such as sand and ramsey embankments, streamlets and gardens, where these provide for the species' needs.

### How you can help

There are several ways to become involved in conserving reptiles and amphibians:

**Supporting**  
 Good identification and good records are essential for any conservation project. If you can't take the time to take part in a project, you can still help by supporting a conservation site where the different species are found. When surveyed systematically, this can also provide an insight into the populations of reptiles and amphibians in the area. After one of the best ways to see reptiles and amphibians in the wild, you can become involved with a nature survey through Amphibian and Reptile Conservation (ARC).

**Local habitat management projects**  
 Much of the conservation effort for amphibians and reptiles is directed towards grasses, streamlets, ponds, and wetland habitats. However, gardens, school grounds, allotments, parks, and road verges are also important habitats for many valuable species. This means there is scope for many people to help conserve these habitats. The ponds that you may find will be a mixture of natural and man-made. How it is managed can affect the reptile and amphibian populations. Creating ponds, leaving existing ponds, streamlets and wetlands, and planting trees and shrubs are all activities that can help create and improve habitats for amphibians and reptiles.

ARC provides practical management tasks for volunteers to help in its reserves.

Contact the ARC office at 841 Hill Road, Horwich, Bolton, W.L.10 0JH.

### Conservation

Effective conservation of reptiles and amphibians in the UK requires a variety of approaches.

Firstly, better protection for the most vulnerable species, such as the adder, is needed. This includes the protection of their habitats, such as heaths, dunes, and woodland margins. It also includes the protection of their eggs and young.

Reptiles and amphibians need to be protected from persecution, such as the killing of snakes and the destruction of their habitats. This includes the protection of their eggs and young.

Simple protective measures for reptiles and amphibians include the creation of artificial ponds and streamlets, the protection of existing ponds and streamlets, and the creation of artificial ponds and streamlets.

People need to be kept away from amphibians. Often this involves creating barriers, such as fences, and the removal of water plants and sediments. In some cases, creating new ponds as a better option.

The cover can be a problem for reptiles where it causes too much shading. In such cases, trees may need to be removed.

Draining can benefit reptiles and amphibians. This is especially true for open ground habitats, but this needs to be done carefully to avoid the risk of creating habitats for certain species.

### Our native species

All UK native species occur in England (E), Wales (W), Northern Ireland (NI), Scotland (S) and just trace in Northern Ireland (NI).

Amphibians	E, S, W, NI
Common frog ( <i>Bombina orientalis</i> )	E, S, W, NI
Palearctic frog ( <i>Rana lessonae</i> )	E, S, W, NI
Common toad ( <i>Bufo bufo</i> )	E, S, W, NI
Marsh toad ( <i>Bufo calamita</i> )	E, S, W, NI
Smooth newt ( <i>Lissotriton vulgaris</i> )	E, S, W, NI
Great crested newt ( <i>Triturus cristatus</i> )	E, S, W, NI

Reptiles	E, S, W, NI
Common lizard ( <i>Zootoca vivipara</i> )	E, S, W, NI
Slow worm ( <i>Amphisbaena alba</i> )	E, S, W, NI
Slow worm ( <i>Amphisbaena</i> )	E, S, W, NI
Adder or northern adder ( <i>Vipera berus</i> )	E, S, W, NI
Grass snake ( <i>Natrix natrix</i> )	E, S, W, NI
Smooth snake ( <i>Coronella austriaca</i> )	E, S, W, NI

\* Some scientific names of our reptiles and amphibians have recently been revised. We have included both the new names and the older versions (in brackets).

### Amphibian and Reptile Conservation

Amphibian and Reptile Conservation is a national wildlife charity committed to conserving amphibians and reptiles and the habitats in which they depend.

We do this in a number of ways including:

**Protecting and improving habitat through practical conservation management**  
 We manage 40 nature reserves, mostly in southern Britain – the only nature reserves in the world to have a dedicated staff for amphibians and reptiles. We also manage a network of 1000+ volunteer-led sites. The majority of our reserves are open to the public.

**Building awareness**  
 ARC has pioneered habitat management techniques for amphibians and reptiles. We advise landowners and managers on practical measures on their sites.

**Building reserves**  
 We provide training and advice to a variety of people on all aspects of amphibian and reptile conservation. We also provide practical advice and support to people who are willing to help at all levels.

**Research and policy**  
 Our conservation work is underpinned by a scientific approach. We undertake and encourage research to give conservation action and we need a partnership of scientists, conservationists, and landowners to ensure the success of our work and amphibian species.

### How you can help

There are several ways to become involved in conserving reptiles and amphibians:

**Become a supporter**  
 If you can't take the time to take part in a project, you can still help by supporting a conservation site where the different species are found. When surveyed systematically, this can also provide an insight into the populations of reptiles and amphibians in the area. After one of the best ways to see reptiles and amphibians in the wild, you can become involved with a nature survey through Amphibian and Reptile Conservation (ARC).

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Draining can benefit reptiles and amphibians. This is especially true for open ground habitats, but this needs to be done carefully to avoid the risk of creating habitats for certain species.

### The British Amphibians and Reptiles

Reptiles and amphibians are found in a range of habitats in Britain, from the mountains to the coast. The majority of the population is found in the south of England, where the climate is warmer and the vegetation is denser. The presence of ponds, streams, and wetlands is also important for their survival.

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### amphibian and reptile conservation

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# The British Amphibians and Reptiles



**Sand Lizard**  
Restricted to dry sandy heathland in southern England and some of the drier systems in north-west England. They are distinguished by bright green along the sides of the body. The female lays eggs in burrows, which she excavates in sand. Young hatch out in late summer. 14-16cm.

**Grass Snake**  
The largest British snake, which hounds near water where it hunts for amphibians and fish. It is distinguished by a yellow collar with a black stripe on the neck. Found throughout England and Wales. Eggs, which hatch in late summer, are laid in decomposing vegetation. 103-124cm.

**Smooth Snake**  
A species which is confined to the south coast of England. They are grey-brown in colour with poorly defined spots or bars along the upper body. The head has a dark spot and a dark stripe along the side. They are born in late summer. 45-58cm.

**Adder**  
Found throughout England, Scotland and Wales in heath, moor and open woodland. It is usually recognized by the dark zig-zag stripes down the middle of its body. The female lays eggs which are born in late summer. 40-70cm.

**Slow-worm**  
A legless species of lizard. Found in a variety of urban habitats, as well as woodland, grassland and heathland in England, Scotland and Wales. The golden-colored young are born in late summer. 40-10cm.

**Common Frog**  
The most widespread amphibian found in the UK. They are brown above, with a dark brown saddle on the back. They usually mate in a shallow stream. Breeds earlier in the year than the lesser, often in late summer or autumn. 5-10cm.

**Great Crested Newt**  
Found in England, Scotland and Wales, this large newt is recognized by its dark warty skin and orange belly, blotched with black. Males develop an impressive crest with a saw-toothed edge and a bone silver air stripe in spring. Eggs are laid singly in shallow pools of water. 10-12cm.

**Pool Frog**  
Formerly found in the Fen, of East Angles, this species is now being reintroduced to wet Norfolk fens. The upper surface is dark brown with a dark stripe along the centre of the back. 5-7cm.

**Common Lizard**  
Widespread on heath, commons, woodland edges and sand dunes. Found in the UK, the Common Lizard is distinguished by the dark brown and black spots on the sides of its body. The female lays eggs which are born in late summer. 10-12cm.

**Common Frog**  
The most widespread amphibian found in the UK. They are brown above, with a dark brown saddle on the back. They usually mate in a shallow stream. Breeds earlier in the year than the lesser, often in late summer or autumn. 5-10cm.

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**Palmate Newt**  
The smallest newt found in England, Scotland and Wales. It is distinguished by its dark brown body with a prominent dorsal fin. Males are distinguished by their webbed hind feet and tail. It is born in spring. 8-10cm.

**Yellow-bellied Salamander**  
A rare species restricted to some coastal sand dunes, upper salt marshes and heath where they breed in pools of water. The yellow-bellied salamander is distinguished by its bright yellow belly and dark brown back. 5-7cm.

**Common Toad**  
Widespread, but absent from Northern Ireland. The warty skin on the upper surface is olive green, brown or reddish-brown. The female lays eggs in a mass on the bank. The young are born in late summer. 10-12cm.

**Smooth Snake**  
A species which is confined to the south coast of England. They are grey-brown in colour with poorly defined spots or bars along the upper body. The head has a dark spot and a dark stripe along the side. They are born in late summer. 45-58cm.

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The smallest newt found in England, Scotland and Wales. It is distinguished by its dark brown body with a prominent dorsal fin. Males are distinguished by their webbed hind feet and tail. It is born in spring. 8-10cm.

amphibian and reptile conservation

www.arc-trust.org



## Appendix 10 Acceptable Species for Planting

It may be an option to undertake supplementary planting/sowing to the northern section of the site where grassland and tall herb is the dominant habitat. However, such activities may lead to erosion/disturbance to other species such as birds given the necessary soil preparation. A more sympathetic option may be to allow species, which may be present in the seed bank, to come through following management of Himalayan balsam.

If supplementary planting is deemed necessary, seed should be collected from site and either sown or propagated into plug plants. Buying seeds/plugs of individual species from retailers should be avoided where possible, this will ensure species of local provenance persist at the site. If plants are purchased, they should be UK grown and of local provenance, where possible. We recommend Landlife (Liverpool) and Cumbria Wildflowers (Carlisle) as both companies follow the Flora Locale/Plantlife Code of Practise.

Below are lists of species which are acceptable to plant/sow at different habitats on the site (with the permission of the site manager).

Hazel	<i>Corylus avellana</i>	*		*	*		*
Hawthorn	<i>Crataegus monogyna</i>	*		*	*		*
Ash	<i>Fraxinus excelsior</i>	*		*	*		*
Holly	<i>Ilex aquifolium</i>	*		*			*
Honeysuckle	<i>Lonicera periclymenum</i>	*	*	*	*		*
Crab Apple	<i>Malus sylvestris</i>	*		*	*		*
Wild Cherry	<i>Prunus avium</i>	*		*	*		*
Blackthorn	<i>Prunus spinosa</i>	*		*	*		*
Pedunculate Oak	<i>Quercus robur</i>	*		*	*		*
Field Rose	<i>Rosa arvensis</i>	*		*	*		*
Dog Rose	<i>Rosa canina agg.</i>	*		*	*		*
Elder	<i>Sambucus nigra</i>	*	*	*	*		*
Rowan	<i>Sorbus aucuparia</i>	*	*	*	*		*
Guelder-rose	<i>Viburnum opulus</i>	*		*		*	
Walnut	<i>Juglans regia</i>	*					
Wild raspberry	<i>Rubus idaeus</i>	*					

**Table 1.** Acceptable tree/shrub species

Common Name	Scientific Name	Lowland	Shaded	Unshaded	Acid	Neutral	Alkaline	Damp	Dry
Yarrow	<i>Achillea millefolium</i>	*		*		*	*		*
Marsh marigold	<i>Caltha palustris</i>	*	*	*	*	*	*	*	
Common knapweed	<i>Centaurea nigra</i>	*		*		*	*		*
Foxglove	<i>Digitalis purpurea</i>	*	*		*	*			*
Meadowsweet	<i>Filipendula ulmaria</i>	*	*	*		*		*	
Field Scabious	<i>Knautia arvensis</i>	*		*		*	*		*
Meadow vetchling	<i>Lathyrus pratensis</i>	*		*		*	*	*	*
Oxeye daisy	<i>Leucanthemum vulgare</i>	*		*		*	*		*
Bird's-foot-trefoil	<i>Lotus corniculatus</i>	*		*	*	*	*		*
Ragged robin	<i>Lychnis flos-cuculi</i>	*		*		*		*	
Purple Loosestrife	<i>Lythrum salicaria</i>	*		*		*		*	
Cowslip	<i>Primula veris</i>	*		*		*	*		*
Primrose	<i>Primula vulgaris</i>	*	*	*		*	*		*
Selfheal	<i>Prunella vulgaris</i>	*	*	*		*		*	*
Yellow Rattle	<i>Rhinanthus minor</i>	*		*		*	*	*	*
Tufted vetch	<i>Vicia cracca</i>	*		*		*			*

**Table 2.** Acceptable terrestrial plant species

Common Name	Scientific Name	Habitat
Yellow iris	<i>Iris pseudacorus</i>	Marginal
Water forget-me-not	<i>Myosotis scorpioides</i>	Marginal
Gipsywort	<i>Lycopus europaeus</i>	Marginal
Marsh marigold	<i>Caltha palustris</i>	Marginal
Meadowsweet	<i>Filipendula ulmaria</i>	Marginal
Water mint	<i>Mentha aquatica</i>	Marginal
Water plantain	<i>Alisma plantago-aquatica</i>	Marginal
Ragged robin	<i>Lychnis flos-cuculi</i>	Marginal
Lesser spearwort	<i>Ranunculus flammula</i>	Marginal
Flowering rush	<i>Butomus umbellatus</i>	Marginal
Spiked water milfoil	<i>Myriophyllum spicatum</i>	Aquatic
Rigid hornwort	<i>Ceratophyllum demersum</i>	Aquatic
Broadleaved pondweed	<i>Potamogeton natans</i>	Aquatic
Curled pondweed	<i>Potamogeton crispus</i>	Aquatic

**Table 3.** Acceptable marginal/aquatic species





## Appendix 11 Green Hay Strewing and Seeding Information

Natural England Technical Information Note TIN063

# Sward enhancement: diversifying grassland by spreading species-rich green hay

**Sward enhancement** refers to management techniques which aim to increase the botanical diversity (mainly the wildflower component) of species-poor grassland. Such work can be funded under Environmental Stewardship, in particular Higher Level Stewardship. Spreading species rich green hay is one method of sward enhancement. Other techniques of oversowing, slot seeding and planting pot-grown transplants and plugs are described in separate notes.

### Key points

- Both donor and receptor sites for green hay must be carefully selected.
- The receptor site should be prepared prior to spreading to achieve a short sward with 50% bare ground.
- Use green hay spread within a few hours of collection.
- Hay must be bedded in after spreading (for example, by trampling with stock).
- Subsequent site management is required.

### Introduction

Not all grassland is suitable for enhancement. The main requirements include low soil fertility and low/no weed burden.

Enhancement methods usually involve disturbance to the sward. The benefits of enhancement must be balanced against the risk of erosion or damage to other features for example, buried archaeology or bird interest.

Hay spreading is unlikely to be suitable where visible archaeological features are present. If in doubt consult your historic environment advisor.



Mown hay meadow in Lower Derwent Valley NNR

For more information see Technical Information Note TIN061 - *Sward enhancement: selection of suitable sites* and TIN062 - *Sward enhancement: choice of methods*.

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## Natural England Technical Information Note TIN063

## Sward enhancement: diversifying grassland by spreading species-rich green hay

The term green hay refers to herbage cut at or just before the hay stage, which is collected without prior wilting or turning and spread immediately on the receptor site. If collected from species-rich grassland and used correctly on the right sites it can be a very effective method of sward enhancement.

The main advantages of using green hay are that it is usually cheaper than purchasing commercial seed and it is a good means of ensuring that fresh seed from a local source is used. In addition a wider range of species may be contained in green hay than is available as seed.

Green hay, rather than conventional dry hay, is recommended because a much higher proportion of the seeds remains in the flower heads. Research has found that a broad range of species is present in green hay, including early flowering species such as cowslip *Primula veris*. There are also indications that using green hay is a good method of promoting colonisation by orchids.

In dry hay, many seeds are shed in the processes of drying and collecting, and what remains is mostly grass seed rather than wildflower seed. Spreading dry hay may introduce a few wildflowers (especially if the hay is carefully handled and fresh), but it is unreliable and it is not considered suitable as the main method of sward enhancement.

To be successful, the technique of spreading green hay requires very careful organisation. The receptor site must be ready to receive the hay when the donor site is cut. Green hay cannot be stored for more than a few hours before it heats up. Any heating will threaten the viability of the seeds. Once collected the green hay must be immediately transported to and spread on the receptor site.

Research to date has focused on the use of green hay to enhance hay meadows, and the method is probably easier to undertake on meadows than pastures. However, there are also encouraging results from experiments on the use of green hay to diversify pastures.

### Terminology

Green hay	Herbage cut at or just before the hay stage, which is collected immediately without prior wilting or turning.
Donor site	Grassland used as the source of green hay.
Receptor site	Grassland on which the green hay is to be spread.

### Donor site

#### Choice of site

Donor sites for green hay should be grassland with the following characteristics:

- It should be in the same locality as the receptor site and support a range of the target species that are absent or scarce on the receptor site.
- Site characteristics should be similar to the receptor site, for example, soil type, soil pH, hydrology and management (meadow/pasture).
- It must be free from pernicious weeds such as spear thistle *Cirsium vulgare*, ragwort *Senecio jacobaea* and broad-leaved dock *Rumex obtusifolius*.
- Highly competitive species such as Yorkshire fog *Holcus lanatus*, white clover *Trifolium repens* and creeping buttercup *Ranunculus repens* should not form a major part of the sward.
- It must be physically possible to cut and collect the vegetation. Steep banks may not be suitable.

It must be large enough to supply sufficient green hay for use on the receptor site. **As a guide, material cut from 1 ha should be sufficient to spread on to 3 ha.**

Possible donor sites include meadows, banks, road verges and churchyards. It is important to avoid damage to nesting birds, invertebrates and plants of interest on donor sites, particularly on sites that are not normally managed by cutting.



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## Sward enhancement: diversifying grassland by spreading species-rich green hay

It is not necessary in every case for the donor site to be species-rich. Where the receptor site is in the early stages of restoration, it may only be necessary for the donor site to contain a range of species typical of semi-improved grassland and/or which are relatively easy to establish.

It is thought that some of these (for example, red clover) are 'facilitator species' which can speed up subsequent colonisation of species that are more difficult to establish. It will often be useful for the donor site to contain yellow rattle which parasitizes more competitive species.

Further information on choice of target species is given in TIN050 – *Selecting indicators of success for grassland enhancement*.

For advice on what is an acceptable donor site for a particular hay spreading operation, contact your Natural England Adviser. Permission to take green hay will be required from Natural England if the site is a SSSI or is in an agri-environment scheme agreement.

### Frequency of use

Many grassland species typically have very poor soil seed banks, as they rely on rapid germination in the autumn or spring following seed shedding.

Green hay removes more seed than dry hay and risks reducing the diversity of the donor site. Therefore, it should not be used too frequently. As a guide, green hay should be taken from no more than one third (but preferably one fifth) of a site in any one year, and a different area should be cut each year.

### Timing of green hay collection and spreading

The sward must be left uncut and ungrazed for 8 to 12 weeks prior to collecting green hay. This will allow the plants to flower and set seed.

Where the donor site is a traditionally managed, species rich hay meadow it should be cut at the usual time for that site (usually mid July to early August). Most plants in those meadows will have completed flowering and seed development by

hay cutting time as a consequence of years of such management.

In pastures plants flower and set seed over a longer period and it is more difficult to collect the full range of species with a single cut. It may be better to try a later cutting date (for example, late August/early September) as this will allow the seed of late flowering species such as harebell (*Campanula rotundifolia*) to be collected.

Cut herbage should not be wilted or turned and should be collected as quickly as possible, certainly within 24 hours of cutting.

### Receptor site

The success of hay spreading depends on the presence of gaps in the sward which are large enough for seeds to germinate and establish free from competition. Seeds must land and then be pressed into the bare soil in the gaps, with sufficient moisture to germinate and sustain them.

### Weed control

All pernicious weeds present in the sward should be controlled prior to ground preparation. Any application of herbicide should be by spot treatment or weed wiping to avoid damaging non target species.

Spear thistle, ragwort and other weeds with wind-blown seeds should be controlled where they occur on adjacent areas, as they can quickly invade once the sward has been opened up.

### Ground preparation

In the majority of cases, ground preparation will be required prior to hay spreading. Spreading hay onto an undisturbed sward is extremely unlikely to be successful. Seed may fail to come into contact with the soil and die, and any seedlings which germinate may be out-competed by the existing sward.

The starting point is a short sward, created by cutting (with cuttings removed) or grazing. The aim is then to create 50% bare ground, using livestock (the 'hoof and tooth' method) or machinery. This may seem drastic but research

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and experience has shown this to be necessary to reduce competition from the existing sward which can occur rapidly. For example, within a few months, or even weeks the sward will recover and leaving very little bare ground to remain for seedlings to establish into.

Where livestock are used to create bare ground, cattle are most effective as their hooves more easily break up the sward. Sheep can also be effective on damp ground. As a guide there should be frequent gaps of at least 10 cm in diameter.

Where livestock are unavailable, or where the ground is too dry for them to be effective, bare ground can be created using a power harrow or set of discs.

Mechanical sward disturbance may release nitrogen from the soil and stimulate herbage growth which should be controlled – see section on subsequent management. It may also stimulate the weed seed bank, so it should only be undertaken on sites with little or no weed burden. In a few cases, notably in upland hay meadows, there may be sufficient bare ground and soil moisture following the hay cut for seed to be sown without further ground preparation. However, such cases are likely to be rare.

### Spreading the hay

Once the cut material has been collected from the donor site, it must be transported to and spread on the receptor site on the same day - ideally within an hour or two. It is essential that it does not heat up.

The hay should be spread thinly and evenly so that it does not create a mulch which will inhibit seed germination. The sward should be visible beneath the hay.

Leave the hay for at least one week in dry weather, or three weeks in wet weather, to allow seed to fall. After this period allow stock (ideally cattle) to graze the site, and trample out and bed in the seeds. Alternatively, roll the site lightly.

Remove the hay if it is smothering the sward. However, this is unlikely to occur if hay is spread in the recommended amounts.

### Successive hay spreading

Where the receptor site is in the early stages of restoration, and particularly where the donor site is itself not species-rich, it is likely that hay-spreading will need to be repeated.

On more advanced sites, if hay spreading has been undertaken correctly using a species-rich donor site, it should not be necessary to repeat the operation. Major disturbance to the sward within at least the first 2 years should be avoided, to allow plants to establish.

Some of the introduced species may take several years to appear in the sward so the success of hay spreading should not be judged too soon.

### Methods of collecting and spreading green hay (which have been used successfully)

#### Large areas

Use a direct cut forage harvester, discharging into a trailer or muck spreader. Spread the herbage with the muck spreader, or fork it out of the trailer.



Spreading green hay by muck spreader

Cut with a mower. (A mower conditioner should not be used as this will encourage seed drop at



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the donor site.) There are several methods that can be used to spread the hay:

- Fork the herbage into a trailer and fork it out onto the receptor site.
- Gently row up the herbage, then bale it with a round baler into loose bales. Bales should be tied or netted but not wrapped. (Note that green bales will be considerably heavier than bales of dry hay. To make spreading easier, the thickness of the layers forming the bales can be reduced by decreasing the forward speed of the baler whilst maintaining PTO speed.) Spread the bales by:
  - Unrolling and forking them out by hand.
  - Unrolling them, then spreading them with a hay bob/teeder.
  - Using a straw chopper.
  - Using a muck spreader.

Gently row up the herbage, then collect it with a forage harvester discharging into a muck spreader or a trailer. Spread the chopped material with the muck spreader, or fork it out of the trailer.

### Small areas

Cut the vegetation with a brush cutter or power scythe. Then either:

- Fork the herbage into a trailer and fork it out onto the receptor site.
- Row up the herbage and bale it with a mini baler. Unroll the bales and fork them out onto the receptor site.

### Subsequent management

Slugs can devastate wildflower seedlings. Following hay-spreading slug populations should be carefully monitored and slug pellets used where necessary, in accordance with statutory instructions and directions for use on the product label. For land in agri-environment scheme agreements, prior approval will be needed from your Natural England adviser.

In the period immediately after hay spreading (usually July - November), the sward should be kept short so that light can aid germination. This is best done by short periods of intensive

grazing. Alternatively the sward can be cut and the cuttings removed. Prolonged grazing should initially be avoided in order to reduce the risk of seedlings being selectively grazed.

In the first spring, it may be necessary to cut or graze the sward to avoid seedlings being shaded out by the existing vegetation. A short period of intensive grazing, or cutting (with the cuttings removed) is recommended. However, this may not be appropriate on all sites and care should particularly be taken to avoid damage to other interests on the site for example, birds and invertebrates.

Any perennial weeds which have colonised should be controlled early on, for example, by spot treatment with herbicide. Any annual weeds are likely to be controlled by the regular cutting or grazing outlined above.

In subsequent years, if the field is to be managed as a hay meadow it should be cut late (for example, after mid July), with swath turning or tedding undertaken to assist seed shedding. The cutting date should be matched to that of the donor meadow, if possible. The use of livestock, particularly for aftermath grazing, is important because they create gaps in the sward and trample in the seed, which helps the introduced species to spread.

Where the field is managed as pasture, plants must be allowed to flower and set seed by reducing the grazing pressure for a period of about eight weeks in the spring and summer.

There should be no use of inorganic fertilisers or widespread application of herbicides.

Commitment to the appropriate long term management is essential if the grassland enhancement is going to succeed and be maintained.

### Further information

Natural England Technical Information Notes are available to download from the Natural England website: [www.naturalengland.org.uk](http://www.naturalengland.org.uk). In particular see:



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## Sward enhancement: diversifying grassland by spreading species-rich green hay

- Technical Information Note TIN035: *Soil sampling for habitat recreation and restoration in agri-environment schemes*
- Technical Information Note TIN036: *Soils and agri-environment schemes: interpretation of soil analysis*
- Technical Information Note TIN038: *Seed sources for grassland restoration and re-creation in Environmental Stewardship*
- Technical Information Note TIN050 *Selecting indicators of success for grassland enhancement*
- Technical Information Note TIN060: *The use of yellow rattle to facilitate grassland diversification in agri-environment schemes;*
- Technical Information Note TIN061: *Sward enhancement: selection of suitable sites*
- Technical Information Note TIN062: *Sward enhancement: choice of methods*
- Technical Information Note TIN064: *Sward enhancement: diversifying grassland by oversowing and slot seeding*
- Technical Information Note TIN065: *Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs*

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail [enquiries@naturalengland.org.uk](mailto:enquiries@naturalengland.org.uk).

This note does not supersede prescriptions in agri-environment scheme agreements. If there is any conflict between the information in this note and your agreement please contact your Natural England Adviser.

### Authors and contributors

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Natural England Technical Information Note TIN064

# Sward enhancement: diversifying grassland by oversowing and slot seeding

**Sward enhancement** refers to management techniques which aim to increase the botanical diversity (mainly the wildflower component) of species-poor grassland. Such work can be funded under Environmental Stewardship Higher Level Scheme (HLS). Oversowing and slot seeding are two methods of sward enhancement. Other techniques of spreading species-rich green hay and planting pot-grown transplants and plug plants are described in separate information notes.

## Key points

- Suitable sites must be selected to ensure the best chance of success.
- Seed must be carefully chosen for a particular site.
- The site should be prepared prior to oversowing to achieve a short sward with 50% bare ground.
- When oversowing, seed must be broadcast on the surface and then bedded in.
- Slot seeding requires specialist machinery, which may have to be adapted, for example, to attach a band sprayer.
- Subsequent site management is important.

## Introduction

Not all grassland is suitable for enhancement. The main requirements include low soil fertility and low/no weed burden. Enhancement methods usually involve disturbance to the sward. The benefits of enhancement, must be balanced against the risk of erosion or damage to other features for example, where there is buried archaeology or bird interest. If in doubt consult your Natural England adviser.



Six-spotted burnet moth on common knapweed

For more information see Technical Information Notes TIN061 - *Sward enhancement: selection of suitable sites* and TIN062 - *Sward enhancement: choice of methods*.

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## Sward enhancement: diversifying grassland by oversowing and slot seeding

On the right sites, both oversowing and slot seeding can be very effective techniques of diversifying grassland. Oversowing is the more commonly used method, as slot seeding requires specialist machinery.

### Timing

Both oversowing and slot seeding should be undertaken in late summer or early autumn (ideally early August to mid September). This favours autumn-germinating species, and seeds of species such as cowslip *Primula veris*, which require a period of cold to break their dormancy before they germinate in the spring.

Later sowings should be avoided because of the risk of frost damage to seedlings. Spring sowings are possible, but many species will not germinate in the first year, and there is greater risk of failure due to drought.

### Seed mixes

The species chosen must be suited to the site conditions and should be appropriate for the area. Where possible seed should be of local origin ie collected from grassland close to the site where it is to be sown. Wildflower seed should always be of British native origin.

For more information see Technical Information Note TIN038 *Seed sources for grassland restoration and re-creation in Environmental Stewardship*.

For sites in the early stages of restoration, it may not be worthwhile sowing species which are more difficult to establish – see section on successive sowing.

### Weed control

All pernicious weeds present in the sward should be controlled before ground preparation. Any application of herbicide should be by spot treatment or weed wiping to avoid damaging non target species.

Spear thistle *Cirsium vulgare*, ragwort *Senecio jacobaea* and other weeds with wind-blown seeds should be controlled where they occur on

adjacent areas, as they can quickly invade once the sward has been opened up.

### Oversowing

The success of oversowing depends on the presence of gaps in the sward which are large and persistent enough for seeds to germinate and establish free from competition. Seeds must land and then be pressed into the bare soil in the gaps with sufficient moisture to germinate and sustain them.

### Ground preparation

In the majority of cases, ground preparation will be required prior to oversowing. Sowing onto a closed sward is extremely unlikely to be successful. Seed may fail to come into contact with the soil and die, and any seedlings which germinate may be out-competed by the existing sward.

The starting point is a short sward, created by cutting (with cuttings removed) or grazing. The aim is then to create 50% bare ground, using livestock (the 'hoof and tooth' method) or machinery.

This may seem drastic but research and experience has shown this to be necessary to reduce competition from the existing sward. Within a few months (or even less) the sward will recover and very little bare ground will remain. However, if there are known archaeological sites in the area, consult your historic environment advisor to ensure archaeological features are not damaged.

Where livestock are used to create bare ground, cattle are most effective as their hooves more easily break up the sward. Sheep can also be effective on damp ground. As a guide there should be frequent gaps of at least 10 cm in diameter.

Where livestock are unavailable, or where the ground is too dry for them to be effective, bare ground can be created using a power harrow or set of discs.

Mechanical sward disturbance may release nitrogen from the soil and stimulate herbage



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## Sward enhancement: diversifying grassland by oversowing and slot seeding

growth which should be controlled – see section on subsequent management. It may also stimulate the weed seed bank, so it should only be undertaken on sites with very low or no weed burden.

In a few cases, notably in upland hay meadows, there may be sufficient bare ground and soil moisture following the hay cut for seed to be sown without further ground preparation. However, such cases are likely to be rare.

### Seeding

The following seed rates are recommended:

- 5-10 kg/ha of a wildflower and grass seed mix (usually including at least 10% wildflower seed).
- 1-2 kg/ha of a pure wildflower seed mix.

Seed can be sown either over the whole field or in patches. Patch sowing may be appropriate where:

- seed is in short supply;
- certain parts of the field are being targeted (for example, areas with lighter soils); or
- there is a risk of soil erosion.

The seed must be sown on or only just below the surface. The most appropriate method is to broadcast the seed using for example, a fertiliser spreader, slug pellet applicator, grass seed box or one of the modern arable seed drills with the coulters lifted up. Slug control may be needed – see later section.

For small areas, seed can be sown by manual broadcasting using a hand-held lawn fertiliser applicator, seed fiddle or seed barrow.

Seeds of different sizes and weights may settle out or become partitioned during sowing, causing a patchy sowing distribution. A more even coverage can be obtained if the seed is bulked up with an inert carrier for example, barley meal, silver sand, fine sawdust, or poultry chick crumbs, and then sown at half rate in two directions. Light coloured carriers make it easier to see which areas have been sown.

### Bedding in the seeds

After sowing, seed must be bedded in to ensure good contact with the soil, by trampling with livestock (preferably cattle) or light rolling.

### Successive sowing

Successive sowing, which introduces new species over several years, may be a good approach since many plant species vary greatly in their ease of establishment.

TIN050 – *Selecting indicators of success for grassland enhancement* categorises species according to their ability to colonise new sites.

Those in Group 1 are relatively easy to establish. It is thought that some of these (for example, red clover) are 'facilitator species' which over time can create soil and sward conditions which speed up subsequent colonisation by species in Group 3 which are difficult to establish.

It will often be useful to sow yellow rattle (a Group 2 species) which parasitizes more competitive species, such as white clover, perennial ryegrass and Yorkshire fog but seed must be very fresh (For more information see TIN060 *The use of yellow rattle to facilitate grassland diversification*).

In the early stages of restoration the cost of sowing Group 3 species may not be justified.

Successive sowing will not be appropriate every year, as plants should be given time to establish before the sward is disturbed again. Some of the introduced species may not appear in the sward for several years, so the success of sward enhancement should not be judged too soon.

### Slot seeding

Slot seeding was originally developed as a technique for increasing the productivity of grassland by introducing species such as white clover *Trifolium repens* and ryegrass *Lolium perenne*. The method has been used with some success to introduce wildflowers.

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## Sward enhancement: diversifying grassland by oversowing and slot seeding

Slot seeding requires specialist machinery which drills seed into shallow slots, up to 15 mm deep, cut into the turf. Suitable machinery includes:

- a sugar beet drill (for example, Stanhay/Gibbs drill);
- a Howard Rota seeder; and
- a Gallagher/Aitchison Seedmatic.

Normal arable direct drills are usually unsuitable, either because they are unable to penetrate hard ground, or they bury seed too deeply. In addition, these drills are not designed to create gaps or to reduce sward competition.

It is essential to control competition from the existing sward in order for seedlings to establish and survive. The best means of doing this is by fitting the slot seeder with a band sprayer which applies a narrow strip of contact herbicide to the sward at the same time as the seed is sown.



Slot seeding with adapted Stanhay/Gibbs drill

Some machines have a rotovating attachment, which serves a similar purpose by removing the existing sward. However, rotovating may release nitrogen from the soil and stimulate the weed seed bank.

A major advantage of slot seeding is that good results can be achieved with very low seed

rates. However, the stripes of the drill lines may be visually unappealing and can take several years to disperse. The use of herbicide or a rotovator also risks the loss of desirable species from the sward.

The method is not recommended on poorly drained soils because slots can smear or fill with water, and there is a greater risk to seedlings of slug damage and damping off. It is also unsuitable where there are visible archaeological features.

### Ground preparation

Before slot seeding create a short sward by cutting (with the cuttings removed) or hard grazing. Allow the sward to green up slightly to provide a target for the herbicide.

### Seeding

Avoid undertaking the work when the ground is too hard or too wet.

A wildflower seed rate of 1-2 kg/ha is recommended. Seed should be bulked with a suitable inert carrier to aid spreading.

Where lines are widely spaced, ie >30 cm apart, consider cross drilling at half rate in two directions.

### Successive slot seeding

Successive slot seeding is not recommended because of the risk of destroying the plants already introduced.

### Slug control

Slugs can devastate wildflower seedlings and populations should be carefully monitored. Control is particularly likely to be necessary when slot-seeding as slugs will readily follow the sown strips and eat the seedlings.

Rolling can help control slugs. Alternatively, slug pellets can be used - ideally drilled into the slots at the time of seeding. Slug pellets must be used in accordance with statutory instructions and directions for use on the product label. For land in agri-environment scheme agreements, prior approval will be needed from your local adviser.



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## Sward enhancement: diversifying grassland by oversowing and slot seeding

### Subsequent management (both methods)

In the period immediately after sowing (usually September - November), the sward should be kept short so that light can help germination.

This is best done by short periods of intensive grazing. Alternatively the sward can be cut and the cuttings removed. Prolonged grazing should initially be avoided in order to reduce the risk of seedlings being selectively grazed.

In the first spring, it may be necessary to cut or graze the sward to prevent seedlings being shaded out by the existing vegetation.

A short period of intensive grazing, or cutting (with the cuttings removed) is recommended. However, this may not be appropriate on all sites and care should be taken to avoid damage to other interests on the site, for example, birds and invertebrates.

Any perennial weeds which have colonised should be controlled early on, for example, by spot treatment with herbicide. Any annual weeds are likely to be controlled by the regular cutting or grazing outlined above.

Subsequently, if the field is to be managed as a hay meadow it should be cut late (for example, after mid July), with swath turning or tedding undertaken to assist seed shedding. The use of livestock, particularly for aftermath grazing, is important because they create gaps in the sward and trample in the seed, which helps the introduced species to spread.

Where the field is managed as pasture, plants must be allowed to flower and set seed by reducing the grazing pressure for a period of about eight weeks in spring and summer.

Inorganic fertilisers or widespread application of herbicides should not be applied after sowing or seeding.

Commitment to an appropriate long term management is essential if a grassland

enhancement project is going to succeed and be maintained.

### Further information

Natural England Technical Information Notes are available to download from the Natural England website: [www.naturalengland.org.uk](http://www.naturalengland.org.uk). In particular see:

- TIN035: Soil sampling for habitat recreation and restoration in agri-environment schemes
- TIN036: *Soils and agri-environment schemes: interpretation of soil analysis*
- TIN038: *Seed sources for grassland restoration and re-creation in Environmental Stewardship*
- TIN060: *The use of yellow rattle to facilitate grassland diversification in agri-environment schemes*
- TIN061: *Sward enhancement: selection of suitable sites*
- TIN062: *Sward enhancement: choice of methods*
- TIN063: *Sward enhancement: diversifying grassland by spreading species-rich green hay*
- TIN065: *Sward enhancement: diversifying grassland using pot-grown wildflowers or seedling plugs*

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## Appendix 12 Nellie's Flora (Species List and Plant Information)

Common Name	Latin Name
Alder	<i>Alnus glutinosa</i>
Apple	<i>Malus sp.</i>
Ash	<i>Fraxinus excelsior</i>
Beech	<i>Fagus sylvatica</i>
Bent	<i>Agrostis sp.</i>
Bilberry	<i>Vaccinium myrtillus</i>
Bindweed sp.	<i>Convolvulus sp.</i>
Bluebell	<i>Hyacinthoides non-scripta</i>
Bog stitchwort	<i>Stellaria alsine</i>
Bracken	<i>Pteridium aquilinum</i>
Bramble	<i>Rubus Fruticosus</i>
Cleavers	<i>Galium aparine</i>
Cock's foot	<i>Dactylis glomerata</i>
Colt's foot	<i>Tussilago farfara</i>
Common bent	<i>Agrostis capillaris</i>
Common hogweed	<i>Heracleum sphondylium</i>
Common sorrel	<i>Rumex acetosa</i>
Creeping bent	<i>Agrostis stolonifera</i>
Creeping buttercup	<i>Ranunculus repens</i>
Creeping soft grass	<i>Holcus mollis</i>
Creeping thistle	<i>Cirsium arvense</i>
Elder	<i>Sambucus nigra</i>
Elder	<i>Sambucus nigra</i>
False oat grass	<i>Arrhenatherum elatius</i>
Field horsetail	<i>Equisetum arvense</i>
Forget me not sp.	<i>Myosotis sp.</i>
Foxglove	<i>Digitalis purpurea</i>
Great willowherb	<i>Epilobium hirsutum</i>
Ground elder	<i>Aegopodium podagraria</i>
Hard fen	<i>Blechnum spicant</i>
Hawthorn	<i>Crataegus monogyna</i>
Heath bedstraw	<i>Galium saxatile</i>
Heather	<i>Calluna vulgaris</i>
Herb Robert	<i>Geranium robertianum</i>
Himalayan balsam	<i>Impatiens glandulifera</i>
Holly	<i>Ilex aquifolium</i>
Marsh hawksbeard	<i>Crepis paludosa</i>
Marsh willowherb	<i>Epilobium palustre</i>
Meadow foxtail	<i>Alopecurus pratensis</i>
Meadow vetchling	<i>Lathyrus pratensis</i>
Nettle	<i>Urtica dioica</i>
Oak	<i>Quercus robur</i>

Pine sp.	<i>Pinus sp.</i>
Red clover	<i>Trifolium pratense</i>
Red fescue	<i>Festuca rubra</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Ribwort plantain	<i>Plantago lanceolata</i>
Rosebay willowherb	<i>Chamerion angustifolium</i>
Rowan	<i>Sorbus aucuparia</i>
Silver birch	<i>Betula pendula</i>
Soft rush	<i>Juncus effusus</i>
Soft shield fern	<i>Polystichum setiferum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Tormentil	<i>Potentilla erecta</i>
Tufted hair grass	<i>Deschampsia cespitosa</i>
Vetch sp.	<i>Vicia sp.</i>
Willow	<i>Salix sp.</i>
Yorkshire fog	<i>Holcus lanatus</i>

- References for information below: Botanical Society of the British Isles (BSBI) species accounts (<http://sppaccounts.bsbi.org.uk/>), Royal Kew Gardens website (<http://www.kew.org/science-conservation/plants-fungi>), Mabey, R. 1988, The New Age Herbalist, Gaia Books Ltd and Mabey, R. (1997), Flora Britannica, Chatto & Windus.
- Pictures taken at Nellies Clough by Laura Bennett. Bowland Ecology Ltd unless otherwise stated.



**Silver Birch** (*Betula pendula*) is one of the most familiar trees in Britain, growing here since the end of the Ice Age. Immensely useful to northern peoples, they used its wood to make wheels, hoops for casks and brooms. The tree produces an abundance of sap in spring and wine made from this sap was once taken as a medicine. Today, Birch tar oil prepared from the bark is used to treat skin problems. A major constituent of the bark, betulinic acid, has shown activity against cancerous cells and HIV. In Finland, the cultural and economic value of the species is recognised in its status as the national tree.



**Common Horsetail** (*Equisetum arvense*) is an abundant plant of disturbed ground. The plant has fine deposits of silica on its stems and leaves making it quite rough and was once used for scouring pans, hence the nickname, 'pewterwort', and as a sand paper for smoothing arrows. In prehistoric times horsetail grew as high as trees and, though much smaller, the modern descendant is a potent medicinal plant. It can be prescribed for lung damage, stomach ulcers, and is good for broken nails and lifeless hair making it a common ingredient in shampoos.



**Red clover** (*Trifolium pratense*) is a very common species found in a variety of habitats and often used as fodder for livestock. It is a nitrogen-fixer and has long been used in crop rotation systems to enrich the soil. It attracts a variety of insects including bees for honey production. Red clover has been widely used in folk medicine for conditions ranging from athlete's foot to constipation. It also contains a herbal product used in tablets taken by women during and after the menopause.



**Tormentil** (*Potentilla erecta*) is a common, native, perennial species of grasslands, heaths and moors throughout the British Isles flowering from June to September. It is strongly associated with the priority species the 'tormentil mining bee' for which there are records close to the Clough. Historically the roots were used to produce red dye used in the tanning industry and other parts of the plant used as a medicinal treatment for sore throats and conjunctivitis.





**Nettle** (*Urtica dioica*) is one of the most useful plants in Britain. Until recently it was cultivated in Scotland and Scandinavia for use in food, textiles and medicine. The leaves can be used much like spinach to make teas and soups and are excellent for anaemia due their vitamin C and iron content. It can also be used to treat arthritis and eczema, and even used in hair shampoo. The painful sensation of the familiar sting occurs when toxins histamine and acetylcholine are delivered into the skin by tiny hairs causing itching/burning. It is a food source for butterfly/moth larvae, and ladybirds benefit from aphids thriving on the leaves. The seeds produced in late summer are a food source for native birds.



**Heather** (*Calluna vulgaris*) is the sole species in the genus *Calluna* in the family *Ericaceae*. The name *Calluna* is from the Greek *kallunein* meaning "to beautify, sweep clean" in reference to its traditional use in besoms (brooms). It is an important food source for various sheep and deer as well as grouse, and a food plant for a number of lepidoptera (butterfly/moth) larvae notably the small emperor moth *Saturnia pavonia*. Bees love the flowers and heather honey is a highly valued product in moorland and heathland areas. It has a long history of use in traditional medicine as a mild sedative and treatment for urinary tract infections, gout and rheumatism.



**Hawthorn** (*Crataegus monogyna*) is Native to Britain and found everywhere apart from northern Scotland. It blooms in late spring, hence the common name mayflower. In late August the haws (berries) become a rich red. They stay on the tree for some months providing winter food for blackbirds, thrushes, redwings and fieldfares. Its dense foliage and sharp spines mean it has been used as a natural hedge or fence for thousands of years. The fruit can be made into jellies or jams, or be used to flavour spirits such as brandy. In medieval times it was bad luck to take sprigs of hawthorn blossom indoors as it foretold a death in the household. We now know that chemicals in the scent of the hawthorn are present in decaying corpses, perhaps the reason for this myth. This smell has the effect of attracting pollinators. Hawthorn is one of the most valuable remedies for the heart and circulation. A report in the *British Medical Journal* showed that the berries reduce high blood pressure caused by hardening of the arteries.





**Oak** (*Quercus robur*) Unrivalled king of the forest in Britain, English oak (pedunculate oak) is synonymous with strength, size and longevity. A recognisable characteristics is the shape of its leaves. Pale green with four or five lobes on each side, attached to the branches with almost no stalk. In contrast, the acorns are borne on long stalks known as peduncles, hence the name 'pedunculate oak'. Oak woods have diminished greatly in the UK over the last few hundred years, partly due to a fungal disease known as 'sudden oak death', but the Forestry Commission is now actively promoting woodland planting with native tree species, such as the English oak. Acorns are rich in starch and provide food for birds such as the Eurasian jay and small mammals such as squirrels. An abundance of insects live on the leaves, buds and bark, even inside the acorns. *Quercus robur* was named for its robust nature (*robur* means strength in Latin), and since iron tools were first made, people have been felling this mighty tree for its strong and durable timber. Oak has many other uses; oak bark has been used in leather tanning and in dyeing, insect galls have been used to make black ink, and the acorns are valued as food for livestock. Pig grazing rights in oak woods, known as 'pannage', have been jealously guarded through the centuries. Medicinally powdered oak bark was once used as snuff for nose bleeds and gargled for throat infections.

**Bluebells** (*Hyacinthoides non-scripta*), almost half the global population of which is found in the UK, can create a stunning carpet of woodland colour during the spring and often forms a popular, seasonal tourist attraction. At the beginning of the 20th century special 'Bluebell Trains' took tourists on excursions to see the spectacular bluebell displays in the deciduous woodlands of the Chiltern Hills in southeast England. Commonly found in British woodlands they are considered to be environmental indicators of ancient woodland and their rich nectar provides food for many butterflies and other insects. A glue obtained from bluebells was traditionally used as a means of sticking flights to arrow shafts and in book-binding. The bulb is reported to have diuretic and styptic properties and have been used in traditional medicine. Starch derived from the bulb has been used in laundering. Bluebells contain toxic glycosides and humans can be poisoned if the bulbs are mistaken for spring onions and eaten.







**Foxglove** (*Digitalis purpurea*) A popular ornamental, with tall spires of tapered, tubular, purple to pink or white flowers. The name *Digitalis* comes from the Latin for finger (*digitus*), referring to the shape of the flowers. Common foxglove is cultivated for its ornamental value and to attract bumblebees to gardens. Its flowers provide food for larvae of the foxglove pug moth and the frosted orange moth. The plant contains loliolide, a potent ant-repellent which was once used as an insecticidal disinfectant for walls in the Forest of Dean, England. Foxgloves are also a source of digitoxin, a glycoside used in the drug digitalis, which has been used as a heart stimulant since 1785. It is also well-known for its toxicity, and ingestion of the leaves (usually as a result of misidentification for comfrey) can result in severe poisoning. Despite this, they have been widely used in folk-medicine. Foxglove tea was taken for colds, fevers and catarrh, and compresses were used for ulcers, swellings and bruises. Its most common use was as a diuretic against dropsy (accumulation of fluid in the tissues), for which it was sometimes effective, but occasionally proved fatal!



**Dandelion** (*Taraxacum officinale*) are well-known, robust weeds, The heads are familiar to children as dandelion clocks, which are used to 'tell the time' by the number of blows taken to remove the fruits.

The name derives from the French '*dent de lion*', meaning 'lion's tooth', referring to the deeply toothed, green leaves. They have many uses, for example as a tonic to treat rheumatic problems. Young leaves and flowers are used as ingredients in salads and stir-fries. The flowers are also used to make dandelion wine, while the bitter root can be dried to make a substitute for coffee, a practice that was common during the rationing of the Second World War.



**Holly** (*Ilex aquifolium*) is one of our few native evergreen trees. Planted in the UK particularly for its winter berries, freshly cut holly burns fiercely and makes excellent firewood. Its white, fine-grained, hard wood is used for decorative carving. The distinctive berries provide a feast for birds (such as blackbirds and thrushes) and other animals (such as wood mice) in winter when there is often little other food. The tradition of holly decoration predates Christianity and probably began with the early pagans of Europe, who brought holly inside in the winter to keep evil spirits away.



## Appendix 13 Make a bee hive for solitary bees

# How to make a bee hotel

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### 1. Why make a bee hotel

Making bee hotels is a useful way to help bees – as well as sowing bee-friendly seeds, and providing water – and one that you can do at home.

A bee hotel provides space for solitary bees to nest in. There are around 220 species of wild bees in the UK, called 'solitary' because they make individual nest cells for their larvae. It is these solitary rather than bumble bees that will be attracted to the bee hotel we describe here. Some solitary bees are very small and black so they may not even look like what many of us think of as bees!

### 2. Materials you will need

- Untreated wood (so no varnish, stain, paint etc) OR empty plastic bottle
- A drill
- Bundles of bamboo or dead stems
- Saw, screws and secateurs
- Hook

### 3. Step-by-step guide

1. Make the box that will contain the bamboo / dead stems or blocks of wood.  
Suggested size: 20cm deep x 30cm wide x 30cm high.

The box should be open on one side, and depending on where you are going to hang it, can be open on the back too. If you're hanging it against a wall that will provide a back to the box, then you can leave this open too.

It is advisable to create a sloping roof so that the rain will roll off and protect the wood and stems inside from becoming wet.

Alternatively you could use a large, empty plastic bottle, with the top cut off so that it is open at one end.

2. Trim the dead stems to the same depth as the box or bottle. It's a good idea to include a mix of different widths of stem as different bees will want to use different sizes.  
OR  
Drill deep holes 2-10mm wide in to blocks of wood that will fill the box. The open ends of these holes should face outwards, and be smooth of splinters, and clean of sawdust, as bees will not use holes that are messy.
3. Pack your stems or blocks of wood (or combination) in to the box frame.
4. Attach the hook to the back of the box.

For an even simpler way – or if you're really short of time - just bundle together with twine or wire, 10-20 cm lengths of hollow plant stems and place them in a sunny place where they will be protected from the rain.



For instructions on how to build a bee hotel out of a plastic drinks bottle and some hollow plant tubes like bamboo, elder, cow parsley see:

<http://www.opalexplornature.org/sites/default/files/7/file/Howtomakeabeehotel-May2012.pdf>

**Where to put your box:**

In full sun, facing south or south east. Plus your box must be at least a metre off the ground, with no vegetation blocking the entrance.

It is important that the bundles of stems, or block of wood are kept dry at all times. You may need to move your bee hotel in the autumn and winter to protect the nesting bees. Move your bee hotel to somewhere dry and cold; do not store in a warm place.

**Further information:**

<http://www.buglife.org.uk/Resources/Buglife/Create%20a%20bee%20hotel%20.pdf>

[http://www.foxleas.com/bee\\_house.htm](http://www.foxleas.com/bee_house.htm)

**Read an account of how volunteers in the Birmingham (or should that be Beemingham) Friends of the Earth group made bee hotels:**

<http://www.birminghamfoe.org.uk/blog/building-a-bee-house>

**Do nest boxes benefit bumblebees?**

Various studies of bumblebee nest boxes have found between 0% and 58% of boxes provided are used by colonies but with generally low take up in the UK.

Underground bumblebee nest boxes - buried 5-10 cm underground and with a 30-80 cm long entrance pipe - are generally thought to be the most effective.

**If you'd like to make a bee hotel for bumble bees, see:**

<http://www.bumblebee.org/nestboxes.htm>



[www.foe.co.uk/bees](http://www.foe.co.uk/bees)





## Appendix 14 Himalayan Balsam

### Himalayan Balsam

#### Species Description



Scientific name: *Impatiens glandulifera*

#### [Identification sheet](#)

**Native to:** West and central Himalayas

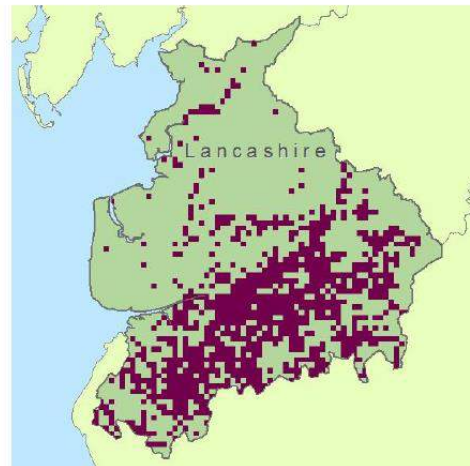
**Habitat:** In Britain, Himalayan balsam prefers moist and semi-shaded places, waste ground and thin woodland. It is particularly prevalent along streams and riverbanks, using water to disperse its seeds.

Introduced to the UK in the mid 19th century as an ornamental, this annual plant has spread rapidly. Its success is due to vigorous growth, shade tolerance, effective seed dispersal and high germination rate. The plant can grow to 2 metres in height and forms dense monoculture stands. It out competes other bank-side vegetation, decreasing biodiversity. When the plant dies in the autumn it leaves the bank bare and vulnerable to erosion. In the Ribble catchment, Himalayan balsam is widespread and extensive, particularly along the mid and lower sections of the river.

#### Distribution in Lancashire

Himalayan balsam is widespread in Lancashire but tends to be more prevalent in areas of higher population density and in the lower reaches of river systems. All the main rivers in Lancashire have been colonised by Himalayan balsam. This

map shows the 1km squared distribution within the county.



In the Ribble catchment, Himalayan balsam has been surveyed in detail along most watercourses. The map below shows the watercourses of the catchment which have been colonised by balsam (in red). This map demonstrates how Himalayan balsam spreads downstream along watercourses, using the flow of water to disperse its seeds.

#### Further Information

##### Dispersal and Reproduction

Each plant may produce up to 800 seeds which can be ejected up to 7 metres from the parent. The seeds float in water and are dispersed over large distances by streams and rivers. Seeds germinate from February onward and grow rapidly. Flowering occurs from July to October, with seeds produced from mid-July onward.

##### Known Predators

In Britain, sheep and cattle graze balsam indiscriminately, eating leaves, stems and flowers. The elephant hawk-moth and two species of aphid also feed on the plant. Trials of a rust (*Puccinia* sp.) as a potential new biological control agent are currently underway.



## **Impacts**

### **Environmental**

Balsam shades out and crowds out many native plant species. It also competes with native flowers by exploitation as it produces more nectar, attracting more pollinating insects.

### **Economic**

Having become dominant in its invaded habitat, the shallow root system can promote erosion during autumn and winter, with the subsequent destruction of bankside structure. Dense stands can impede water flow at times of high rainfall, thereby increasing the likelihood of flooding.

### **Management**

Control measures should aim to prevent flowering, and are best carried out before June for maximum effectiveness. All Himalayan balsam in an area should be controlled as any plants setting seed will result in many more plants next year. The most effective strategy for control is to start at the outer edge of the patch and work towards the centre, or on watercourses to start at the upstream extent and work down.

### **Mechanical**

- Cutting - cut at ground level using a scythe, machete, flail or strimmer before the flowering stage in June. Cutting earlier than this may promote greater seed production from plants that regrow. Cutting should be repeated annually until no more growth occurs.
- Pulling - shallow-rooted plants can be pulled up very easily and disposed of by burning, or composting unless seeds are present.
- Grazing - grazing by cattle and sheep is effective from April throughout the growing season. It should be continued until no new growth occurs.

### **Chemical**

- Glyphosate - treat with a weed wipe in mixed stands, or by foliar spray in dense stands, before flowering. If all plants are controlled, then spraying should only be required for two to three years.
- 2,4-D amine - treat during early spring at the rosette stage for effective control.

## Appendix 15: Nellie's Clough Article by Richard Shirres

### A watercourse in search of a catchment and some stewardship?

This watercourse can be seen as the western boundary for residents in the New Chapel area. The Clough rises at the convergence of two footpaths (SD 6522 1108): one descending from Knowles Farm, above Fleet Street, and the other being the western leg of the footpath coming down from Boardmans Farm, off Latham Row. The open watercourse runs for some 530 metres south west from its springing, past the side of western-most properties in Buckingham Avenue and Sandringham Road and Brunswick Avenue until disappearing into culvert. The culvert passes beneath the College playing fields and, thereafter, Nellies Clough continues a wandering journey in darkness until the rear of the Loco' Works.

Normally there is no doubt as to which particular river catchment a stream belongs to. Until very recently it had been thought it drained into the east flowing Middle Brook and, hence, was part of the River Irwell catchment. However, it is understood recent dye tests have shown the culvert outfalls into structure at the head of Moss Brook, between the rear of the Locomotive works and Red Moss. So it seems Nellies Clough is part of the River Douglas catchment, such as Pearl Brook, as is most of Horwich.

Sadly at the time of the Middlebrook development in the mid-1990s, Bolton Council neglected all opportunities to open up sections of the culverted Nellies Clough. Shaving a few metres off the boundary of the industrial 'shed' units, opposite Armstrongs, on the Middlebrook development could have enabled the formation of an attractive green corridor, instead of an ugly overly narrow footpath track. But such is the disregard of Orbit Developments and the lack of any enlightened planning from Bolton MBC.

Anyway, from its springing, walking down the footpath alongside the Clough, one can see ahead of you Red Moss, a Special Site of Scientific Interest (SSSI). This is the 48 hectare remnant of peat bog that, in 1995, Horwich residents with their 10,000 signature petition saved from obliteration. At the time, Bolton Council favoured the development of a mile long land-raising waste site, over the top of Red Moss. Only a stop, literally at the last minute, by the Secretary of State to Bolton's - then overly permissive - plan policies just before their adoption resulted in saving the Red Moss SSSI. The site is one of the most valuable bog sites in the North West. In origin, it is an ombrotrophic peat bog. This means it is fed by rain and originally would have been the main source for both the Douglas and the Irwell catchments. So there's a slight irony that the Clough points towards the peat bog that also shares some ambivalence in its ascribed catchment.

The interesting part of Nellies Clough now lies with its short uppermost open reach: starting with its springing from the underlying millstone rock strata, that dips five degrees towards the valley and Red Moss, to its disappearance into culvert some five hundred metres later. A notable feature is the ravine-like cleft in the hillside, more than 9 metres deep in places, of the middle open section. This is testimony to the action of how, over a very long period, a little stream can have a striking impact on landscape. The initial formation of this 'ravine' is probably contemporary with the formation of Red Moss bog seven thousand years ago and which one sees framed when looking down the Clough.

As for any watercourse, the Clough is an *ecotone*. Put simply, *ecotones* constitute a linear hiatus for biological diversity where, due to the coming together of land, air and water, the flora and fauna are significantly more abundant. In the face of climate change, the linear continuity of healthy watercourses contributes much needed resilience as part of an ecological network,

sometimes known as *green corridors*, these can help conserve biodiversity and mobility of wildlife. Roe deer have frequently been seen in the Clough in recent years. One may suspect also that the North –South orientation potentially creates quite a special local habitat, particularly within the ravine.

Nellies Clough is now rather neglected. Horwich Golf Club probably owns at least up to the centre of the stream adjacent to their riparian land. Some of it comes under the farm above. Trees have been planted in the Clough, some not necessarily ideal species, and are becoming so mature that they now contribute to limiting flows at times of dry weather; sometimes drying out completely. The Clough has suffered other inappropriate attempts at planting-up. Now within the last two decades particularly it is plagued by the invasive alien species, Himalayan Balsam, that dominates much of the flora during July to September against which native flora find it hard to compete and flora diversity becomes much reduced. In peak summer, in some places, it is almost as if the stream were culverted.

So your Clough needs your help. Ideally, it is hoped a limited river corridor survey can be done which will help guide future management of this habitat by local residents. Certainly Balsam pulling (Nb. but not once it is in flower – from end of June) will be much needed in years to come if the habitat is to regain some of its potential. Eventually, with better stewardship, the Clough could become quite a special place for the community.

RAS 2011

(Reference: Article produced by Richard Shirres for the New Chapel Residents Association).