Ecological Survey of Huntley Quarry and Wood

Final Report

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24th August 2006

Executive Summary

- Huntley Quarry is a disused sands and gravels quarry with peripheral woodland.
- Disused quarries are noted for their range of invertebrates and early successional habitat.
- Huntley Quarry is noted for its large population of breeding sand martins, a species reliant on sandy, exposed cliffs.
- Huntley Quarry and Wood contain a number of protected, UKBAP and SBAP species including badgers, bats and solitary bees and wasps. It also contains a population of the proposed UKBAP species, the dingy skipper butterfly.
- The proposed development of Huntley Quarry and Wood, if undertaken with due care and with nature conservation at its fore, should not be detrimental in the long-term to these species of interest.
- Recommendations such as maintaining and creating the bare ground and early successional vegetation will be of great benefit to a large number of local and scarce invertebrates such as the dingy skipper.
- Any restoration of this site, as it is of importance as an invertebrate site and for sand martins, should consider these and also the wider natural environment. The value and importance of the features within disused quarries as nuclei for diversity should be kept at the forefront of the design and restoration should have an aim to retain and create such features wherever possible to keep its intrinsic value and identity.

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1 Background

1.1 Survey brief

It has been proposed that the Huntley Quarry and Wood be developed into an 18 hole-golf course. Prior to development taking place WillBeCo, on behalf of the owners, has commissioned a series of ecological surveys to investigate the possible presence of protected species, species of interest including Biodiversity Action Plan species and the habitats on the site. These surveys aim to ascertain the ecological value of the site and to establish if there are any factors that could influence the development.

2 Site Description

2.1 General information

2.1.1. Location

The site is situated in north Staffordshire, south-west of Cheadle, at OS grid reference SJ994416. The site is surrounded by agricultural grassland to the north, east, south and west.

2.1.2 History

The largest part of the site was until recently a quarry that extracted sands and gravels. During this period Hanson owned the site. Remedial restoration had taken place in the quarry including tree planting on the banks though no thorough restoration has been undertaken.

2.1.3 Geology

The geology of the site is that of Triassic Sherwood sandstone the Hawksmoor Formation. The quarry itself is designated as RIGS (regionally important geological sites), for the exposure of the Hawksmoor Formation and its close proximity to older coal measure rocks. (http://www.sbap.org.uk/sgap/pdf/SGAP.pdf)

2.1.4 Habitats

The site is dominated by post-industrial habitats. These include fast colonising species to open, bare ground and species that require low nutrients in the substrate. Low nutrient-status species include flowering plants such as orchids and bird's-foot trefoil.
The principal habitats on site are; dense broad-leaved scrub (dominated by silver birch); bare ground comprising of the sands and gravels; open water, acid grassland; mixed woodland and dry heath.

2.1.5 Social

Dog-walkers and families frequently use the site. However the main use for the site currently is as a site for off road motor-cycling, largely in the open areas of the quarry though occasional tracks do lead in to the woodland areas.

3 *Methodology*

3.1 Survey methodologies

A number of different surveys and therefore differing methodologies were used for this project and are detailed in the relevant sections.

Surveyors/Contributors

Badgers:	A. Jukes BSc (Hons) MIEEM, N.Waite BSc (Hons)
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Reptiles:	A. Jukes BSc (Hons) MIEEM, N. Waite BSc (Hons)

3.2 Site compartments

To assist in site surveying and assessment, Huntley Quarry and Wood was compartmentalised based on habitat types and features.

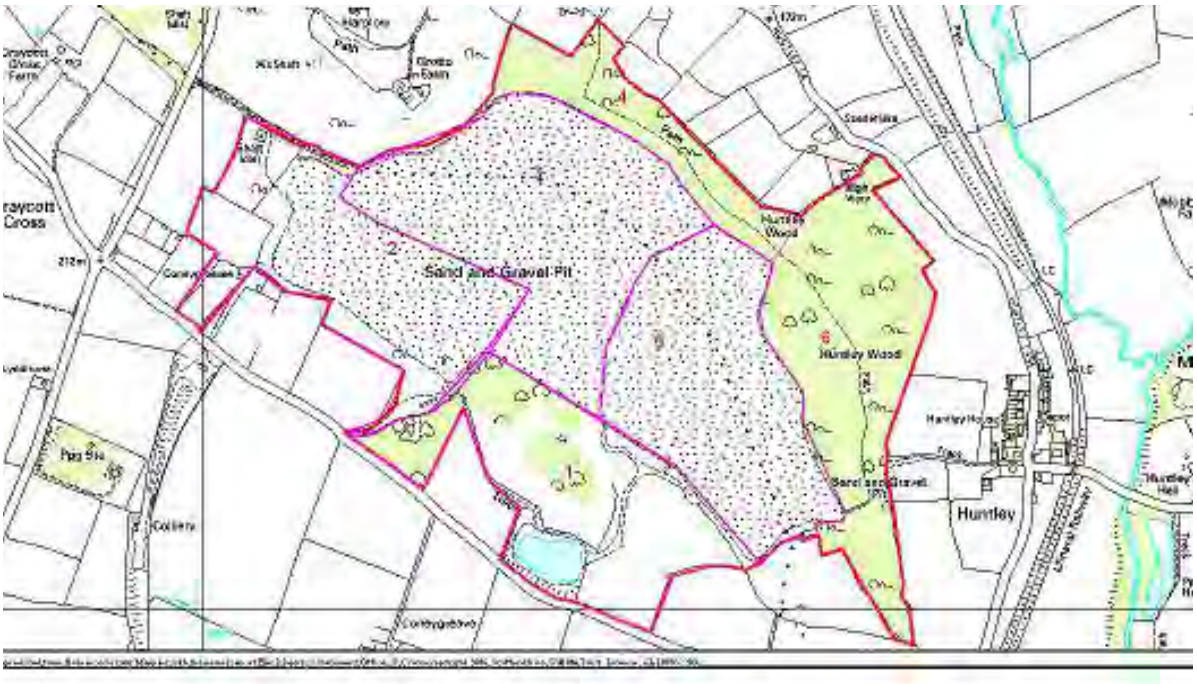


Figure 1: Huntley Quarry and Wood compartments

4 Habitat survey

4.1 Methodology

The site survey was carried out in accordance with the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey. Along with a description of habitat types on site, a detailed flora species list was compiled for each notable habitat type. Each species recorded in a habitat is given a score on the DAFOR scale. DAFOR is used to assess the abundance of a given species in a given area. These categories are often prefixed with the word 'locally'. 'Locally', as in "locally abundant", is used to describe species that are confined to, or most prominent in, a particular area.

Figure 2: DAFOR scale

D	Dominant
A	Abundant
F	Frequent
O	Occasional
R	Rare

The identified habitat types are digested using MapInfo Geographical Information System (GIS) (see habitat map in section 4.2). The use of MapInfo enables the various habitat types to be measured accurately and for further changes to the site to be monitored.

4.2 Results

Scientific Name	Vernacular	DAFOR	Location
Achillea millefolium	Yarrow	F	bare ground
Alnus glutinosa	Alder	R	ponds
Anagallis arvensis	Scarlet Pimpernel	R	bare ground
Anthoxanthum odoratum	Sweet Vernal Grass	F	grassland
Anthoxanthum odoratum	Sweet Vernal Grass	R	tall herb
Anthriscus sylvestris	Cow Parsley / Keck	R	fish pond wood
Betula pendula	Silver Birch	D	planted trees
Betula pendula	Silver Birch	F	grassland
Brassica napus	Rape	R	bare ground
Calluna vulgaris	Heather / Ling / Common Heather	F	heath scrub
Calluna vulgaris	Heather / Ling / Common Heather	O	birch scrub
Calluna vulgaris	Heather / Ling / Common Heather	F	grassland
Centaurea nigra	Common Knapweed	O	grassland
Centaurium erythraea	Common Centaury	LF	grassland
Cerastium fontanum	Common Mouse-ear	O	bare ground
Cerastium fontanum	Common Mouse-ear	F	grassland
Chamerion angustifolium	Rosebay Willowherb / Fireweed	O	grassland
Chamerion angustifolium	Rosebay Willowherb / Fireweed	D	tall herb
Cirsium arvense	Creeping Thistle	LF	grassland
Cirsium arvense	Creeping Thistle	D	tall herb
Cirsium palustre	Marsh Thistle	LD	grassland
Cirsium vulgare	Spear Thistle	O	grassland
Crataegus monogyna	Hawthorn	O	planted trees
Crataegus monogyna	Hawthorn	O	fish pond wood
Cytisus scoparius	Broom	F	heath scrub
Cytisus scoparius	Broom	F	birch scrub
Dactylis glomerata	Cock's-foot	F	bare ground
Dactylis glomerata	Cock's-foot	O	grassland
Dactylorhiza fuchsii	Common Spotted-orchid	O	grassland
Deschampsia flexuosa	Wavy Hair-grass	LA	grassland
Eleocharis palustris	Common Spike-rush	A	ponds
Epilobium palustre	Marsh Willowherb	F	ponds
Equisetum arvense	Field Horsetail / Common Horsetail	LA	grassland
Fagus sylvatica	Beech	O	planted trees
Festuca rubra agg.	Red Fescue	F	birch scrub
Galium aparine	Cleavers / Goosegrass	O	grassland
Galium saxatile	Heath Bedstraw	O	grassland
Gnaphalium uliginosum	Marsh Cudweed / Wayside Cudweed	LF	bare ground
Heracleum sphondylium	Hogweed / Cow Parsnip / Keck	O	fish pond wood
Holcus lanatus	Yorkshire-fog	D	bare ground
Holcus lanatus	Yorkshire-fog	R	birch scrub
Holcus lanatus	Yorkshire-fog	F	tall herb
Hypericum humifusum	Trailing St. John's-wort	R	grassland
Hypericum tetrapterum	Square-stalked St. John's-wort / Square St. John's Wort	R	grassland
Hypochaeris radicata	Cat's-ear / Common Catsear	F	bare ground
Hypochaeris radicata	Cat's-ear / Common Catsear	O	grassland
Ilex aquifolium	Holly	O	fish pond wood
Juncus bufonius	Toad Rush	LF	bare ground
Juncus effusus	Soft Rush	F	bare ground

Juncus effusus	Soft Rush	A	ponds
Juncus effusus	Soft Rush	F	grassland
Juncus squarrosus	Heath Rush	F	bare ground
Lathyrus linifolius	Bitter-vetch / Bitter Vetchling	O	grassland
Lolium perenne	Perennial Rye-grass / Common Rye-grass	O	tall herb
Lotus corniculatus	Common Bird's-foot-trefoil	A2	bare ground
Lotus corniculatus	Common Bird's-foot-trefoil	LA	grassland
Luzula campestris	Field Wood-rush	F	grassland
Luzula multiflora	Heath Wood-rush	O	birch scrub
Luzula multiflora	Heath Wood-rush	O	grassland
Lycopus europaeus	Gipsywort	F	ponds
Lysimachia nemorum	Yellow Pimpernel	O	bare ground
Medicago lupulina	Black Medick	O	bare ground
Persicaria maculosa	Redshank / Redleg / Persicaria	LF	bare ground
Pilosella officinarum	Mouse-ear-hawkweed	F	bare ground
Pinus sylvestris	Scots Pine	D	fish pond wood
Plantago lanceolata	Ribwort Plantain	F	grassland
Plantago major	Greater Plantain / Ratstail Plantain	LF	bare ground
Potentilla erecta	Tormentil	LF	grassland
Prunella vulgaris	Selfheal	F	bare ground
Prunella vulgaris	Selfheal	R	grassland
Prunus avium	Wild Cherry	R	fish pond wood
Quercus robur	Pedunculate Oak / Common Oak	A	planted trees
Quercus robur	Pedunculate Oak / Common Oak	O	fish pond wood
Ranunculus repens	Creeping Buttercup	O	bare ground
Ranunculus repens	Creeping Buttercup	O	fish pond wood
Ranunculus repens	Creeping Buttercup	A	tall herb
Ranunculus sceleratus	Celery-leaved Buttercup	R	ponds
Rhododendron ponticum	Rhododendron	LF	birch scrub
Rubus fruticosus agg.	Bramble / Blackberry	O	heath scrub
Rubus fruticosus agg.	Bramble / Blackberry	D	birch scrub
Rubus fruticosus agg.	Bramble / Blackberry	F	grassland
Rubus fruticosus agg.	Bramble / Blackberry	D	tall herb
Rumex acetosa	Common Sorrel	F	grassland
Rumex crispus	Curled Dock	R	bare ground
Rumex obtusifolius	Broad-leaved Dock	O	bare ground
Rumex obtusifolius	Broad-leaved Dock	LA	grassland
Sagina nodosa	Knotted Pearlwort	O	bare ground
Salix caprea	Goat Willow / Pussy Willow	R	birch scrub
Salix caprea	Goat Willow / Pussy Willow	R	fish pond wood
Salix fragilis	Crack Willow	O	ponds
Salix fragilis	Crack Willow	O	planted trees
Senecio jacobaea	Common Ragwort	R	birch scrub
Senecio vulgaris	Groundsel	R	bare ground
Silene dioica	Red Campion	R	grassland
Sorbus aucuparia	Rowan / Mountain Ash	A	planted trees
Taraxacum aggregate	Dandelion	O	grassland
Trifolium pratense	Red Clover	F	grassland
Trifolium repens	White Clover	R	bare ground
Typha latifolia	Bulrush / Great Reedmace / False Bulrush	LD	ponds
Ulex europaeus	Gorse / Furze	D	heath scrub
Ulex europaeus	Gorse / Furze	D	birch scrub
Urtica dioica	Common Nettle / Stinging Nettle	LA	tall herb

Urtica dioica	Common Nettle / Stinging Nettle	LF	grassland
Veronica chamaedrys	Germander Speedwell / Birdseye Speedwell	LF	grassland
Veronica officinalis	Heath Speedwell / Common Speedwell	O	grassland
Veronica serpyllifolia	Thyme-leaved Speedwell	F	grassland
Veronica serpyllifolia	Thyme-leaved Speedwell	F	bare ground
Vicia sepium	Bush Vetch	O	grassland

BW: Broad-leaved woodland
PBW: Planted broad-leaved woodland
PMW: Planted mixed woodland
PCW: Planted coniferous woodland
DS: Dense scrub
SS: Scattered scrub
SW: Standing water
MV: Marginal vegetation
AG: Acid grassland
ESP: Ephemeral short plants

Figure 3: Habitat map

4.2.1 Birch regeneration

Within the main quarry area, one of the dominant habitats is that of silver birch scrub and woodland. This is as a result of natural regeneration and not planting, unlike other areas on site. The most significant areas of birch regeneration are in section 3 and 5. These are of varying ages, the most northerly segment being generally of the youngest age. This segment is also the most mixed; with a high frequency of willow species and alder included within the silver birch. Generally the birch increases with age towards the south of section 3. There are also dense stands of silver birch regeneration within section 5 towards the largest of the ponds. Surrounding the main pond silver birch regeneration is frequent but patchy. This is similar to the natural regeneration found in section 2.

The ground flora can be variable. Within the younger stands, the ground flora is either that of ephemeral vegetation (that which colonises bare ground), predominately in those areas that surround the largest pond and towards the west of section 2, or heathland habitats, dominated by acid loving species such as common heather, as well as soft rush and acid grasses. The mid aged silver birch regeneration stands have predominately bare ground flora as a result of the high density at which the birch is growing. The more mature stands have mostly acid grasses, such as the bents (*Agrostis* spp.).

4.2.2 Ephemeral

Ephemeral vegetation is patchy but frequent across the site, particularly in the main quarry area. Ephemeral vegetation is dominated by species such as redshank, the willowherbs, Yorkshire fog, creeping thistle and ribwort and greater plantain.

Within this habitat there are some notable species, particularly trailing St John's wort, sand spurrey and knotted pearlwort, all of which are rare species in Staffordshire. The trailing St John's wort was found within southern segments of section 2. The knotted pearlwort and sand spurrey occurred again in parts of section 2 but also abundantly around the fishing pond in section 1.

4.2.3 Acidic grassland

Acidic grassland is a Staffordshire and UK Biodiversity Action Plan habitat. Unimproved acidic grassland is a very scarce habitat in lowland UK and it is estimated to be less than 30,000 hectares (UK BAP website) left. In Staffordshire there is only approximately 407 hectares of both unimproved and semi-improved acidic grassland left which has declined 14% between 1979 and 1995 based on information collated through the Staffordshire Biodiversity Audit (2001) and only containing information from wildlife sites.

The largest and most ecologically significant patches of acidic grassland on the site are contained to the east of section 1. Species here include eyebright, tormentil, and heath bedstraw. These areas are largely unimproved, however towards the far east where the site meets farmland, there are signs of improvement; the acid grassland species cease to dominate. This does nevertheless affect only a very small proportion of this habitat

Rosebay willowherb is abundant throughout the acid grasslands on site; however if this is not controlled it could significantly threaten the habitat's ecological significance.

4.2.4 Planted mixed and broad-leaved woodland

Planted mixed woodland is found in a large strip towards the northern most section of the quarry area. Planted broad-leaved woodland is found in smaller areas on the south of section 2 and in section 5 between the larger ponds. The dominant tree species in both habitats are pedunculate oak, silver birch, ash, rowan and hawthorn. Scot's pine is also found in abundance in the mixed woodland.

The ground flora is similar in both habitats; heathland species such as gorse and heather dominate along with the acid grasses, such as sheep's fescue. There are also areas, particularly on the northern segment of section 2, where ephemeral vegetation dominates. Bird's foot-trefoil can also be very frequent throughout these areas, particularly on the areas of younger planted trees where there are significant areas of bare ground.

4.2.5 Tall ruderal

Within the southwesterly area of section 2, and a very small area around the fishing pond, there are small patches of tall ruderal species (species which readily colonise bare or disturbed ground). The species that dominate this habitat include rank grasses, such as Yorkshire fog, bramble, rosebay willowherb and common nettle.

4.2.6 Ponds

There are four ponds on site. The largest 2 situated in section 5. The largest pond is surrounded predominately with reedmace. Amongst the reed mace there are also young alder and willow trees, with marsh willowherb, horsetails and abundant gypsywort. This is the same habitat that is found towards the north of the other large pond.
The smallest pond has less significant peripheral vegetation and the woodland is constant to the edge of the pond.

There is a fishing pond also to the very south of section 1. This pond is surrounded predominately by broadleaved woodland to the south and ephemeral and tall ruderal vegetation to the north.

4.2.7 Broadleaved woodland

The whole of section 4 and significant parts of section 1 (the west and northerly segments) are dominated by broadleaved semi-natural woodland. Native woodland is a Staffordshire Biodiversity Action Plan Habitat. The most significant tree species are silver birch and pedunculate oak, with some ash, willow species and holly.

The ground flora varies from significant areas of acid grassland, particularly in section 1, to leaf litter, bracken and or bilberry. There are also patches of bluebells towards the far east of the wood. Bluebells are indicators of ancient woodland.

4.2.8 Coniferous plantation

Within the southern segment of section 1 there is a significant area of coniferous plantation. The dominant species of wood is Scot's pine.

This is of limited ecological value as not only is Scot's pine not native to this area of the UK, but also, as a result of the high density of trees, the ground flora is very limited, and in most places bare.

Parts of the coniferous plantation are bordered by a thin row of broadleaved species, such as wild cherry and pedunculate oak.

4.2.9 Gorse scrub

Gorse scrub habitat is a significant habitat on site, with the largest expanses found in section 2. This habitat is dominated by gorse, with occasional common heather and acid grasses. The area towards the south of section 2 also contains a significant proportion of young planted broad-leaved trees.

This habitat is important for a number of nesting birds such as whitethroat.

4.2.10 Bare Ground

A significant proportion of the site is characterised by bare ground- sands, gravels and pebbles. A large expanse of bare ground is found in the northeast area of section 2 and the southwest area of section 3. Other significant areas of bare ground are found along pathways and around the largest of the ponds.

Bare ground is particularly important for a number of invertebrate groups, in particular solitary bees and wasps. On the current site, the bare sand cliffs are important for nesting sand martins.

5 Great crested-newt survey

5.1 Methodology

The site was initially visited on 3* separate occasions during May using the English Nature survey guidelines.
Surveying utilised three main methods:
Observation – the surveyor first assessed the pond or lake for great crested-newt viability and watched in suitable weather conditions for great crested-newt movement in the open water and for any newts surfacing for air.

Detecting presence using a net (day search)– for this technique the surveyor swept through all accessible areas of the waterbody several times. Each visit incorporated a minimum of 1 hour pond netting (recommended time is 15minutes per 50m of pond edge, English Nature, 2001). However, due to the unstable substrate this method had to be abandoned (see health and safety constraints).

Night search – Surveyors were unable to do night search using a torch or dip netting due to health and safety issues surrounding the site. (see below).

Bottle trapping – For this method the surveyor sets bottle traps in all areas of available open water. These traps are left over night, with suitably sized air pockets. The traps are left for no longer than 17 hours in accordance with English Nature's recommendations. This method was unable to be utilised at Huntley Quarry as the ponds were not suitable for bottle trapping and health and safety constraints increased the difficulty in setting traps.

Eft and newly emerged adult survey – Through utilising a mixture of the above methods and also setting out refugia around the open water areas it was hoped that any possible evidence of great crested-newt presence could be gained from this final element of the survey. Newly emerged newts will head for cover in the vicinity of the water and through the placement of refugia around the ponds it was hoped that a conclusion could be reached to the presence or absence of great crested-newts at Huntley Quarry.

5.1.1 Health and safety constraints

*The site was initially searched using netting with the intention of setting out bottle traps and undertaking nighttime visits to torch and net for breeding adults. The substrate of the lakes and ponds however is such that it possesses a number of issues.
Firstly the substrate is very fine resulting in prolonged clouding of the water if disturbed so hindering visual searching of the pond for newts. Secondly, and most importantly, the substrate, being of a fine material, does not give support to any wading. The surveyors on several occasions found that entering the lake even a small distance from shore was impractical and resulted in sinking knee deep in the substrate before hauling themselves out of the pond. With this in mind a thorough survey was not undertaken using the survey guidelines as laid down by English Nature (2001).

Visual inspection of the pond during suitable conditions has played a major part in the assessment of the site for its great crested-newt suitability. Some pond dipping was carried out though not in a thorough or systematic way due to the health and safety issues.

To maximise effectiveness of surveying and compensate for poor site conditions, a greater level of commitment was necessary to assess the site for great crested-newt activity. Hence a long, drawn out survey over a number of months to cover as much as possible of the newts breeding life was initiated to gain some indication to its presence or absence at Huntley Quarry.

5.2 Results

No evidence of great crested-newt could be gained from all elements of the survey throughout the year from May to the end of August. See Conclusions section of this report for reasons for the lack of evidence and assessment of the habitat conditions favoured by great crested-newts.

6 Bats

Of the 17 species of bat found in Britain, Staffordshire is known to support 10 of these. Two of these species, the pipistrelle and noctule bats, are listed on the Staffordshire Biodiversity Action Plan (SBAP) as priority species.

Bats emerge around sunset from their roost sites and generally follow the same flight path to their favoured foraging areas. Bats feed primarily on insects; pipistrelle bats will mainly catch and eat small soft-bodied insects such as midges and moths, whereas the larger noctule bats can eat hard-bodied beetles. Bats will congregate where insects are abundant, for example, on the edge of woodlands, woodland clearings, along hedgerows and around waterbodies such as ponds, lakes, rivers and canals. In late summer and autumn bats build up their fat supplies, this allows them to hibernate from October to March. Bats hibernate in trees, buildings, caves or similar places away from disturbance. By early spring their fat reserves are nearly all used up and they wake. Mating tends to take place in autumn but fertilisation does not occur until the following spring. One young is born in late June or early July, after three weeks it is fully grown and it is independent by late summer.

Recent surveys have indicated that almost all the British species of bat are in decline, with a large population fall for even the most abundant species, the common pipistrelle. Intensive agricultural practices, including removal of unimproved pastureland, hedgerows and woodlands has caused a decline in the numbers and variety of insects available for the bats to feed on. Roost sites are lost when old decaying trees with suitable holes are felled during maintenance operations. Roost sites in buildings are lost when access points are blocked, roofing work and timber treatment is carried out or cavity walls are filled with insulation. Staffordshire Bat Group works to inform relevant bodies about bats so that work can be carried out in a way that does not harm the bats.

6.1 Legal protection

All of the16/17 species of bat found in the UK and their roosts are protected under the Wildlife and Countryside Act 1981. Bats are further protected under the Habitat Regulations and the Countryside Rights of Way Act. All bats are also listed on the European Habitats Directive. It is illegal to intentionally kill, injure or take a bat, deliberately disturb a bat at a roost, as well as damaging, destroying or obstructing a roost

Noctule and pipistrelle bats are Staffordshire Biodiversity Action Plan species.

6.2 Survey methodology

Two visits were made to the Huntley Quarry and Wood to detect bat activity and assess the habitat. The lower and middle section of the site was surveyed on 10/07/05 and the upper section on 17/07/05. The survey involved the surveyor walking along the pathways and other features using an electronic bat detector and torch. The habitat was also assessed and any potential roost sites and key foraging areas identified.

On the evenings of both surveys the conditions were favourably warm, dry, clear and still. The temperature at the beginning of both surveys was above 16 C therefore insect activity was high. Bat detecting began at dusk (around 9pm) and continued for approximately 2 hours.

A bat species search was also carried out on the Staffordshire Ecological Record database.

6.3 Bat Ecology

Bats emerge just before sunset from their day roost. They generally follow the same flight path to favoured foraging areas. Bats feed on insects, species such as the pipistrelles feed on primarily soft bodied insects such as midges and small moths, whereas larger bats such as noctule will feed on harder bodied invertebrates, for example cock-chafer beetles. Foraging is concentrated in areas where invertebrates are abundant, areas such as woodland edges and clearings, sheltered pathways, along hedgerows and around waterbodies.

Mating tends to occur in autumn, with fertilisation not occurring until the following spring. The young are born singularly in late June to July and mature after around 3 weeks. The young are fully independent by late summer.

Bats build up their fat reserves during late summer and go into hibernation around October. They stay in hibernation generally until March. Hibernation sites tend to be caves, tunnels, buildings and trees. Bats have similar summer roosts, however depending less on the caves and tunnels, favouring warmer areas to rear their young.

6.4 Bat Activity at Huntley Quarry and Wood

Pipistrelle and myotis species were recorded on site. The dominant species recorded on site was the soprano pipistrelle, only one common pipitrelle was recorded not feeding but passing over, and one individual of myotis species was recorded foraging along the boundary between the quarry and wood.

The soprano pipistrelles were recorded foraging for food mostly along the boundary between the planted wood and the gorse/birch scrub on the northern area of section 3 and towards the southwestern segment of section 5, again along the pathways and on the woodland boundary.

The pathways between the segments of birch woodland and scrub in section 3 were used by pipistrelle species as transitional routes.

It is believed that it is unlikely that the bats are roosting on site because they were detected some time after they would have emerged; therefore it is most probable that the bats have travelled some distance from their roost sites. The probable roost sites are likely to be surrounding farm buildings or houses in near by Cheadle.

6.5 Habitat assessment

There are no buildings or structures on site, however there are buildings surrounding Huntley Quarry and Wood which have potential to be roost sites.

The majority of trees are unsuitable for bat roosts as they are either too “spindly” or immature. The most suitable sites are a few mature oak trees, these, on this initial survey, show no obvious signs of a bat roost.

Should a mature tree with naturally occurring cracks/holes in the tree or woodpecker holes be felled, a full emergence survey should be carried out prior to work being carried out, as bats may be roosting. Bats such as pipistrelle will move roost sites throughout the year.

6.6 Suitability for foraging

Most of the woodland is too dense for foraging, but the woodland edge provides ideal habitat. Therefore some scalloping of the woodland edge, (this may occur through parts of the development), would increase the area for foraging.

The wider pathways between scrub and woodland, where sheltered from strong winds provide the best foraging areas. These provide the highest density of flying insects. Retaining such areas will promote invertebrate populations and subsequently bat populations.

6.7 Cracks and fissures

Towards the far west of the quarry site, there appears to be some cracks and fissures in the bedrock. Should these cracks not be just as a result of shifts in the sands and gravels, they could have the potential for a bat roosting site. It appears that these are not in use as a summer roost, there could be a possibility that it may be used as a winter site. A survey towards autumn may indicate if bats do use any cracks as a hibernation site, as this is when bats begin to socialise, mate and look for places to over-winter. To confirm bat presence within any cracks a survey would have to be carried out inside the fissure system. This could be very costly and potentially dangerous for the surveyors. To avoid this, the developer could assume such fissures are hibernation sites and mitigate appropriately. To mitigate appropriately the developer should, when ‘capping’ the cracks, do so in a manner that would allow for the easy passage of bats in and out of the holes, such as a grill. Should these apparent cracks and fissures turn out to be thus and bats not currently be using them as a hibernation or summer roost, by retaining access, the potential for usage is there for the future.

7 Badger survey

7.1 Methodology

Badgers leave evidence as they travel around a site.
The perimeter* of the site was thoroughly walked to check for evidence of badger runs, latrines, snuffle holes** and guard hairs*** on vegetation and barbed wire.

*The perimeter is checked rather than internal areas because often a badger will simply be crossing a site rather than using the contents of that land. The evidence is easier to identify as a badger enters or leaves a site.
** Evidence of foraging. These are holes in the ground where the badger has searched for grubs and bulbs to eat.
*** The guard hairs are distinctive long grey, white and black coarse hairs that are shed easily on barbed wire and coarse vegetation such as twigs and bramble.

7.2 Results

7.2.1 Legal protection

Badgers are protected under the Protection of Badgers Act 1992. Under this act it is a criminal offence to wilfully kill, injure, take, possess, or cruelly ill-treat a badger, or attempt to do so, as well as disturb badgers whilst they are occupying a sett, damaging a sett, destroying or obstructing access to a sett.

Under the current legislation, a badger sett is defined as “any structure or place, which displays signs indicating current use by a badger”.

7.2.2 Badger ecology

Badgers live in sociable groups, numbering around 4 to 12 individuals. The size of setts varies considerably, from very large setts with around forty entrances, to the much smaller setts of only around two entrance holes. Badgers are extremely loyal to their setts and will continue to occupy them despite considerable disturbance. Outside of the main sett there are three other “types” of sett or collection of entrance holes, these are, in decreasing size, usage, and or their importance to the social group; annex, subsidiary and outliers.

Main setts are always in occupation throughout the winter and spring, when the setts are used for breeding and raising young.

As a result of their habitual nature, badgers will tend to use the same pathways to commute between foraging areas and the sett. Badgers will continue to try to use these pathways despite any obstacle that is situated on such a route.

Badger territories tend to be marked by latrines. These are dung filled scrape holes in the ground.

Section	Evidence
Compartment 1	**No evidence**
Compartment 2	**Tracks**
Compartment 3	**No evidence**
Compartment 4	**Active sett, outlier holes, tracks and latrines**
Compartment 5	**No evidence**
Compartment 6	**Tracks**

7.2.3 Badger activity in and around Huntley Quarry and Wood

The survey carried out on the Huntley Quarry and Wood site confirmed that badgers are present on the proposed development area, as well as the surrounding woodland.

The following evidence of badger activity was found:

- Active badger setts
- Active badger pathways
- Inactive outlying hole
- Push ups- areas where badgers have pushed up the base of fences to allow access to an area.
- Snuffle holes

7.2.4 Description of activity and evidence

The primary badger sett is situated at grid reference SK 00149 41495, within the main body of Huntley wood, towards the eastern segment. This sett consists of around 4 active holes. Sand was placed outside of the holes, to confirm usage by badgers.

Within these 4 holes, there were 2 that appeared to be in most use, due to their size and apparent usage, implied by the amount of fresh earth and bedding.

In close proximity to the main sett, at grid reference SK 00095 41444, there was a second sett. This second sett was of considerable size; however it does not appear to be in as much use as the main sett. This was indicated by significant coverage of the sett by vegetation and few well-used pathways. However, two of the larger holes of this sett showed signs of use - noteworthy quantities of fresh soil were present outside of the entrances.

No latrines were found on site, however this was as expected, as latrines are not used as much during the late summer, when breeding has already occurred - badgers are most territorial during the mating season.

Along the perimeter of the wood, particularly towards the north and east, a number of “push ups” were found. These were where badgers had lifted up the base of the fence to gain access to the surrounding farmland.

Throughout Huntley Wood there are a number of badger pathways, ranging from those that are well used to those which are not.

One badger pathway was also recorded towards the edge of south west of the main quarry area, leading into the field of semi-improved grassland. This pathway did not appear to lead into the main

quarry, but instead appeared to follow the edge of the site. Use by badgers was confirmed by a guard hair found on a section of barbed wire fence.

There is a record of a dead badger also on the road that runs along the far west of the development site. This could suggest that badgers actively use the whole site, particularly the woodland

Figure 4: Sand trap confirming occupation of badger sett

8 Birds

A full site survey was undertaken during the breeding season using a discovery rate method of recording known as McKinnon Listing. Change in the rate of discovery of new species means that one can be reasonably sure that all significant species on a site have been found. The technique only works satisfactorily for uniform habitat so the quarry itself, sectors 1, 2 3 and 5 on the map and the fringing woodland, sectors 4 and 6, were surveyed separately. This technique also allows the relative abundance for each species to be calculated. In addition historical records for the site were examined.

8.1 Species lists

8.1.1 Quarry

Species	Relative abundance
Blackbird	0.75
Blackcap	0.50
Blue Tit	0.44
Buzzard	0.06
Carrion Crow	0.19
Chaffinch	0.75
Chiffchaff	0.13
Coot	0.13
Great Tit	0.44
Greenfinch	0.06
Jackdaw	0.13
Lapwing	0.06
Little Grebe	0.06
Long Tailed Tit	0.13
Magpie	0.19
Robin	0.69
Sand Martin	0.19
Songthrush	0.75
Swallow	0.19
Tufted Duck	0.06
Whitethroat	0.13
Willow Warbler	0.63
Woodpigeon	0.56
Wren	0.69

8.1.2 Woodland

Species	Relative Abundance
Blackbird	0.9
Blackcap	0.4
Blue Tit	0.4
Carrion Crow	0.2
Chaffinch	1
Chiffchaff	0.5
Garden warbler	0.2
Goldcrest	0.1
Great Spotted Woodpecker	0.3
Great Tit	0.7
Jackdaw	0.1
Robin	0.9
Songthrush	0.5
Sparrowhawk	0.1
Willow warbler	0.5
Woodpigeon	0.2
Wren	1

8.1.3 Incidental species- not recorded within the timed survey

Jay
Wheatear

8.2 Comments on the species lists

8.2.1 General

The quarry is an artificial and highly disturbed site, with signs of extensive motorcycle scrambling and bait left out for corvids, presumably for shooting, as there were shotgun cartridges all over the site. Given this there were many birds, particularly songbirds, present and the species richness, at 24 species, quite good. This can probably be accounted for by the presence of a considerable quantity of scrub on the site. The larger fringing vegetation of the ponds was predominantly Reed mace, which is generally unattractive to small birds and probably accounts for the absence of warblers around the water. The woodland around the quarry was rather species poor but it is quite narrow and, in places, overrun with virtually impenetrable Rhododendron scrub reducing plant diversity and therefore faunal diversity including birds.

8.2.2 Relative abundance

The species in the quarry show the kind of profile one would normally associate with damp scrub. The Whitethroat were only to be found in the gorse but most of the other small passerines were virtually ubiquitous. The areas of open water held rather fewer birds than one might expect which can probably be accounted for by disturbance. The prominence of Wren, Blackbird, Robin and

Great Tit is typical of this kind of scrappy secondary woodland, the only surprise being the lack of Nuthatch and Treecreeper on the larger oaks.

8.2.3 Additional species.

Historical records show the presence of wintering Barn Owl in 2002 and Firecrest in 2001 in the wood.

8.2.4 Breeding birds.

With the exception of Swallow all of the birds recorded will breed somewhere on the site, the corvids and Buzzard using the woods rather than the quarry itself. The most valuable breeding habitat is the scrub. Particularly prominent in the quarry is the colony of Sand Martins. This was very active with 34 burrows counted on the main sand face and a further 14 on a secondary exposure.

8.2.5 Timing of breeding.

Generally, with the exception of Woodpigeon, which is something of an opportunist breeder, all of the above birds breed conventionally during the spring and early summer.

8.2.6 Birds of conservation concern.

It must be noted that all nesting birds are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended), therefore development of areas where birds nest should be carried out outside of the breeding season.

None of the birds recorded are afforded special protection by the Wildlife and Countryside Act (for example schedule 1 species), however the Barn Owl, with its one winter record, has special protection under section 1(1) of the Act. It should also be noted that Firecrest is given special protection only as a breeding bird, not as a winter visitor. Given its rather specialist breeding requirements the Sand Martin (on the British Amber list of birds of conservation concern) is vulnerable to both the current levels of disturbance and any potential site development and should be considered for mitigation action.

9 Argent and Sable Moth

9.1 Methodology

Surveys are to be carried out late May early June, when peak adult *R.hastata* are flying.

Two methods will be used when surveying for *R.hastata*; larval searches and searches for adult moths.

To survey for larvae, the surveyor will be looking for the characteristic leaf folds of *R.hastata.*

Leaf folds are most commonly found between 51-100cm above ground level on silver birch trees aged between 1.5 and 5 years old. Leaf folds are where the *R.hastata* larvae folds over one half of the leaf to provide a protective shield whilst it feeds. These folds are generally made up of one leaf, however more than one leaf has been incorporated into the fold on occasions.

Such surveying will be concentrated on areas considered by the surveyor to be suitable for the moth.

Surveying for larvae will be carried out when weather conditions are not suitable for surveying for adult moths.

Because *R.hastata* is a day flying moth, normal moth surveying techniques do not apply, therefore methods recommended for surveying butterflies will be used and adult moths will be netted for identification.

In areas of suitable habitat the surveyor will walk across the whole area recording the number of flying adults.

Surveys will be carried out only on days when there is no rain, and temperatures are above 12˚C, as recommended by Butterfly Conservation.

It is believed that the adult *R.hastata* is most active between 8am to 12pm, thus surveys will be concentrated in this time.

9.2 Distribution and Status of Argent and Sable

Argent and Sable (*Rheumaptera hastata*), is a small (forewing length 16-19mm) day flying moth, with characteristic black and white markings.

R.hastata is considered to be nationally scarce by the UK Biodiversity Action Plan, as it occurs in less than one hundred 10 x 10 km squares.

The species was once common throughout the UK (see Appendix 5), however it has recently seen a dramatic decline (for distribution in 2004, see Appendix 5).

Within the West Midlands *R.hastata* has been recorded in one site in Herefordshire and 5 sites in Staffordshire and in Shropshire.

The reasons for the decline of *R.hastata* are primarily related to habitat loss. The larvae of *R.hastata* feed predominately on the leaves of silver birch trees aged between 1.5 and 5 years old. The woodland management of coppicing provided the species with such habitat, however the practice has greatly reduced and subsequently so has the suitable habitat for *R.hastata*.

As a result of the apparent decline in *R.hastata*, in 2000 a Biodiversity Action Plan (BAP) was drawn up for the species. The principal aims of the *R.hastata* BAP are; to maintain the existing population and to enhance key populations by 2010. This is to be achieved by, amongst others, ensuring that occupied habitat is appropriately managed, increase habitat at known sites and adjacent areas, and look at designating key Argent and Sable sites as SSSIs (Special Sites of Scientific Interest).

9.3 Results

Despite suitable habitat no evidence of Argent and Sable was found on site.

10 Dingy Skipper

10.1 Methodology

The dingy skipper is a butterfly of warm, still conditions and therefore survey was targeted in these atmospheric conditions between mid-May and mid-June (its main flight period). All suitable areas of the site were surveyed for dingy skipper. Areas searched for adult butterflies included all areas of open grassland, heath and bare ground that included bird's-foot trefoil.

Larval searches later in the year (July) to confirm breeding was undertaken on areas of bird's-foot trefoil where the greatest activity of adults was identified from earlier in the year.
Larval searches involved fingertip searching of bird's-foot trefoil plants for the small, green larvae.

10.2 Results

Evidence of a dingy skipper colony was found in the open areas of compartment 2 at Huntley Quarry in the form of adults and larvae.
A total of 7 adults were seen on any one occasion and later in the year (July), three larvae were found in three separate locations.

See target note map later in this report

Figure 5: Dingy skipper © A. Jukes

11 Bees and Wasps

11.1 Methodology

The site was visited during the months April through to August on a number of occasions.

Capture using net – for this technique the surveyor waited by invertebrate burrows and attempted to catch the species on emergence.

Sweep netting – foraging areas (those containing nectar plants) and grassland and scrub habitats were sampled by using a sweep net passed rapidly to and fro against the vegetation.

Grubbing - Beetles were searched for by "grubbing" around the surface of open sandy areas. On hot days the beetles move about the surface of the ground.

All captured invertebrates were preserved in ethanol for later identification, except for Orthoptera, which were identified in the field and released.

Identification methodology

Collected and preserved specimens were identified under a binocular microscope at between X10 and X50 magnification. All identification keys used are referenced.

Reference examples of all genera were mounted and preserved under museum conditions at the Staffordshire Wildlife Trust headquarters.

11.2 Results

Scientific name	Common Name	Compartment
Order: Hymenoptera		
Family: Apidae		
Apis mellifera	Honey Bee	Huntley Quarry 2
Bombus lapidarius	Large Red Tailed Bumble Bee	Huntley Quarry 2 and 5
Bombus lucorum	White-tailed Bumble Bee	Huntley quarry 6
Bombus pascuorum	Common Carder Bee	Huntley Quarry 1 and 4
Bombus sylvestris	a bumblebee	Huntley Quarry 2
Bombus terrestris	Buff-tailed Bumble Bee	Huntley Quarry 2 and 4
Family: Andrenidae		
Andrena bicolor	Gwynne's Mining Bee	Huntley Quarry 2
Andrena cineraria	Grey Mining Bee	Huntley Quarry 2
Andrena clarkella	a mining bee	Huntley Quarry
Andrena dorsata	a mining bee	Huntley Quarry 2
Andrena haemorrhoa	Early Mining Bee	Huntley Quarry 2
Andrena nigroaenea	a mining bee	Huntley Quarry
Family: Halictidae		
Sphecodes gibbus	a cuckoo bee	Huntley Quarry 2
Sphecodes pellucidus	a cuckoo bee	Huntley Quarry 2
Family: Anthophoridae		
Nomada goodeniana	Gooden's Nomad Bee	Huntley Quarry
Nomada leucophthalma	a solitary bee	Huntley Quarry 2
Family: Megachilidae		
Hoplitis claviventris	a solitary bee	Huntley Quarry 2
Family: Formicidae	**Ants**	
Formica lemani	an ant	Huntley Quarry 2
Lasius niger	an ant	Huntley Quarry 2
Family: Vespidae	**Social wasps**	
Vespula vulgaris	Common wasp	Huntley Quarry
Family: Sphecidae	**Solitary wasps**	
Ammophila sabulosa	Red Banded Sand Wasp	Huntley Quarry 1
Cerceris rybyensis	Ornate Tailed Digger Wasp	Huntley Quarry 2
Crabro peltarius	a digger wasp	Huntley Quarry 2
Crossocerus ovalis	a digger wasp	Huntley Quarry 2
Crossocerus quadrimaculatus	4-spotted Digger Wasp	Huntley Quarry 2
Mimesa equestris	a digger wasp	Huntley Quarry 2
Oxybelus uniglumis	Common Spiny Digger Wasp	Huntley Quarry 2
Tachysphex pompiliformis	a digger wasp	Huntley Quarry 2
Family: Pompilidae	**Spider hunting wasps**	
Pompilus cinereus	Leaden Spider Wasp	Huntley Quarry 2
Order: Diptera	**Two-winged flies**	
Family: Syrphidae	**Hoverflies**	
Cheilosia grossa	a hoverfly	Huntley Quarry 3
Cheilosia scutellata	a hoverfly	Huntley Quarry 2
Chrysotoxum festivum	a hoverfly	Huntley Quarry 1 and 2
Epistrophe grossulariae	a hoverfly	Huntley Quarry
Episyrphus balteatus	a hoverfly	Huntley Quarry
Eristalis intricarius	a hoverfly	Huntley Quarry 1 and 2
Eristalis pertinax	a hoverfly	Huntley Quarry
Eristalis tenax	a hoverfly	Huntley Quarry 1

Paragus sp.	a hoverfly	Huntley Quarry 2
Platycheirus scutatus sens. lat.	a hoverfly	Huntley Quarry 5
Rhingia campestris	a hoverfly	Huntley Quarry 1 and 5
Syritta pipiens	a hoverfly	Huntley Quarry 1 and 2
Syrphus torvus	a hoverfly	Huntley Quarry 2
Syrphus vitripennis	a hoverfly	Huntley Quarry
Volucella bombylans	a hoverfly	Huntley Quarry 2
Volucella pellucens	a hoverfly	Huntley Quarry 1
Family: Asilidae	**Robberflies**	
Dioctria baumhaueri	a robberfly	Huntley Quarry 1
Leptogaster cylindrica	a robberfly	Huntley Quarry 2
Family: Stratiomyidae	**Soldierflies**	
Chloromyia formosa	a soldierfly	Huntley Quarry 2
Sargus iridatus	a soldierfly	Huntley Quarry 5
Family: Tabanidae	**Horseflies**	
Chrysops relictus	a deerfly	Huntley Quarry 4
Hybomitra distinguenda	a horsefly	Huntley Quarry 5
Order: Odonata	**Dragonflies and damselflies**	
Family: Aeshnidae	**Hawkers**	
Aeshna grandis	Brown Hawker	Huntley Quarry 5
Anax imperator	Emperor Dragonfly	Huntley Quarry 5
Family: Libulellidae	**Chasers, skimmers and darters**	
Orthetrum cancellatum	Black-tailed skimmer	Huntley Quarry 5
Sympetrum sanguineum	Ruddy Darter	Huntley Quarry 5
Sympetrum striolatum	Common Darter	Huntley Quarry 5
Order: Lepidoptera	**Butterflies and moths**	
Family: Pieridae	**Whites**	
Pieris brassicae	Large White	Huntley Quarry 1
Family: Nymphalidae	**Admirals and tortoiseshells**	
Aglais uticae	Small tortoiseshell	Huntley Quarry 2
Inachis io	Peacock	Huntley Quarry 5
Vanessa cardui	Painted Lady	Huntley Quarry 2
Family: Satyridae	**Browns**	
Coenonympha pamphilus	Small Heath	Huntley Quarry 1
Maniola jurtina	Meadow Brown	Huntley Quarry 1
Pararge aegeria	Speckled Wood	Huntley Quarry 1
Pyronia tithonus	Gatekeeper	Huntley Quarry 2
Family: Lycaenidae	**Hairstreaks, coppers and blues**	
Lycaena phlaeas	Small Copper	Huntley Quarry 2
Polyommatus icarus	Common Blue	Huntley Quarry 2
Erynnis tages	Dingy Skipper	Huntley Quarry 2
Ochlodes faunus	Large Skipper	Huntley Quarry 1
Thymelicus sylvestris	Small Skipper	Huntley Quarry 2
Family: Arctiidae	Tiger moths	
Tyria jacobaeae	Cinnabar	Huntley Quarry 1
Family: Geometridae		
Archiearis parthenias	Orange Underwing	Huntley Quarry 2
Order: Orthoptera	**Grasshopppers and crickets**	
Family: Acrididae	**Grasshoppers**	
Chorthippus parallelus	Meadow Grasshopper	Huntley Quarry 1 and 2
Myrmeleotettix maculatus	Mottled Grasshopper	Huntley Quarry 2

Family: Tetrigidae	**Groundhoppers**	
Tetrix subulata	Slender Ground Hopper	Huntley Quarry 2
Tetrix undulata	Common Ground Hopper	Huntley Quarry 5
Order: Coleoptera	**Beetles**	
Family: Elateridae	**Click beetles**	
Ctenicera cuprea	a click beetle	Huntley Quarry 1
Family: Carbididae	**Ground beetles**	
Cicindela campestris	Green Tiger Beetle	Huntley Quarry
Carabus nemoralis	a carabid beetle	Huntley Quarry 1
Miscellaneous records		
Triturus vulgaris	Smooth Newt	Huntley Quarry 2 and 4
Bufo bufo	Common Toad	Huntley Quarry 1, 2 and 5
Rana temporaria	Common Frog	Huntley Quarry 1, 2 and 5
Sopex minutus	Pygmy shrew	Huntley Quarry 5

Figure 6: Black-tailed skimmer

12 Reptile survey

12.1 Methodology

The site was initially scoped for the most productive areas in which to place refugia for reptiles such as common lizard and adder. The open areas of compartment 2 were thought to provide the most suitable habitat for these species and it was this area that was targeted with reptile refugia. The purpose of the refugia is to provide focal points for reptiles to warm up in the morning in a safe location. The placement of refugia also provides cover for other species that may not otherwise be recorded in a survey.

Reptiles were also searched for during other aspects of the survey in suitable locations such as the wet areas (for grass snake) and woodland (adders in sunny glades)

12.2 Results

No evidence of reptiles was gained from the refugia survey or targeted searching of the habitats.

Incidental records from the refugia search include common toad, common frog, common shrew and pigmy shrew.

13 Conclusions

13.1Protected species

13.1.1Badgers

Badger evidence was found on site, however the proposed development should not affect them. This is because the area proposed for development is outside the area where the sett is situated. However, use of heavy machinery may have to be restricted. No heavy machinery may be used within 30m of a badger sett. Details on the design and machinery use will need assessing before site development. There are no other issues surrounding badgers and the development at this time.

13.1.2 Bats

Although the site is used by bats for foraging, the proposed development should not affect bat activity, provided there are enough sites suitably sheltered which provide good foraging areas. The development may also encourage more bat foraging where the woodland edge habitat is increased where the development cuts into the wood, provided these areas are sheltered and do not significantly impact on the heath of the woodland habitat. Any old trees with cracks in the bark should have a full emergence survey carried out on them, prior to felling.

13.1.3 Great crested-newts

No great crested-newts were found during the survey season. It is thought that great crested-newts are not found on the site however if a great crested-newt is found during development then all work should halt and a licensed great crested-newt handler be brought in to discuss further action.

The reasons substantiating why great crested-newts are not thought to be on site after extensive survey include:

- There is little suitable aquatic flora for shelter and egg laying
- The pond to the far south east of the site is stocked with fish. Fish often predate young newts and eggs.
- There are no ponds within 500m containing records of great crested newts, which could ‘feed’ the ponds on site.
- Roads, to the north, east, south and west, as well as running water to the north, south and east surround the site. Any newts trying to populate the area would find it difficult to cross these barriers.

13.2 Species of interest

13.2.1 Dingy skipper

The dingy skipper is present on site, largely in compartment 2. The areas of highest activity (marked in pink on figure 10), are the areas where it is suggested that the developer removes the turf for translocation (see recommendations section for details on turf removal). Development of the site to a golf course need not be of great detriment to the dingy skippers as their requirements can easily be catered for around such a development. As long as basic principles that govern their habitat preferences and lifecycle are adhered to.

- Principle habitat preferences
    1. Short turf and bare ground
    2. Abundant bird's-foot trefoil in abundance (*Lotus corniculatus*)
    3. Shelter belts of scrub to minimise the effects of strong wind
    4. Some taller grassland vegetation for shelter and roosting

13.2.2 Bees and wasps

A total of 29 bee and wasp species were identified from the quarry. This is not an exhaustive total and others are highly likely to be present. A total of 40 would not be unexpected if more time was given to survey for this site as it exhibits a good range of sandy ground from horizontal plains to vertical exposures and 100% bare ground to patchy, short sward vegetation; all nesting opportunities for different species of solitary bee and wasp.

The species list does however give an indication to the site's leaning as a potential locally important invertebrate site as there are no known sites of this quality in the Staffordshire Moorlands District other than Wetley Moor, which exhibits a different species range. This site exhibits characteristic lowland heathland species such as *Oxybelus uniglumis,* a solitary wasp that feeds on small flies.

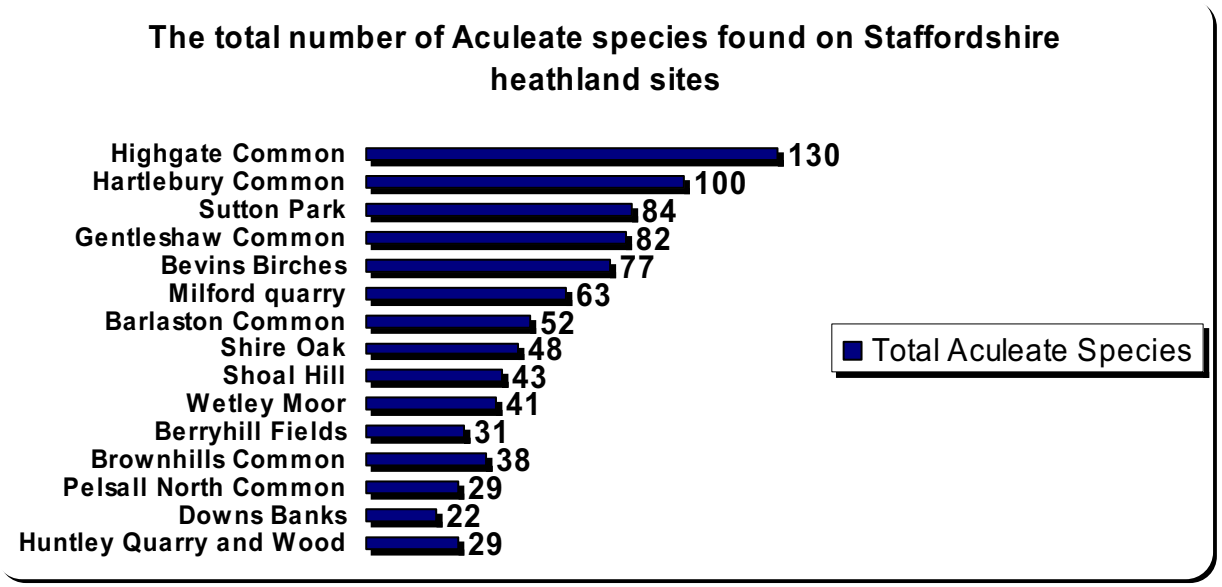


Figure 7: A comparison of bee and wasp sites in Staffordshire and Walsall MBC (adapted from Jukes, 2004)

Although Huntley Quarry does not feature high on the list, this site has not had the same level of recording effort as some of the other sites. For example, Shire Oak, was surveyed over a two year period resulting in more than 12 visits. If Huntley Quarry was surveyed over such a period then the suspected increase in species to circa. 40 could be attained. The site however should be considered as being of County importance due to its location and potential.

Figure 8: Example of good solitary bee and wasp habitat

This area, located near the sand martin cliff face is an ideal example of what solitary bees and wasps require. The sandy ground offers numerous opportunities to different species due to the varied topography and vegetation cover and is protected by a scrub belt acting as a wind break. This area provided very productive habitat, especially for solitary wasps in late summer.

13.2.3 Other invertebrates

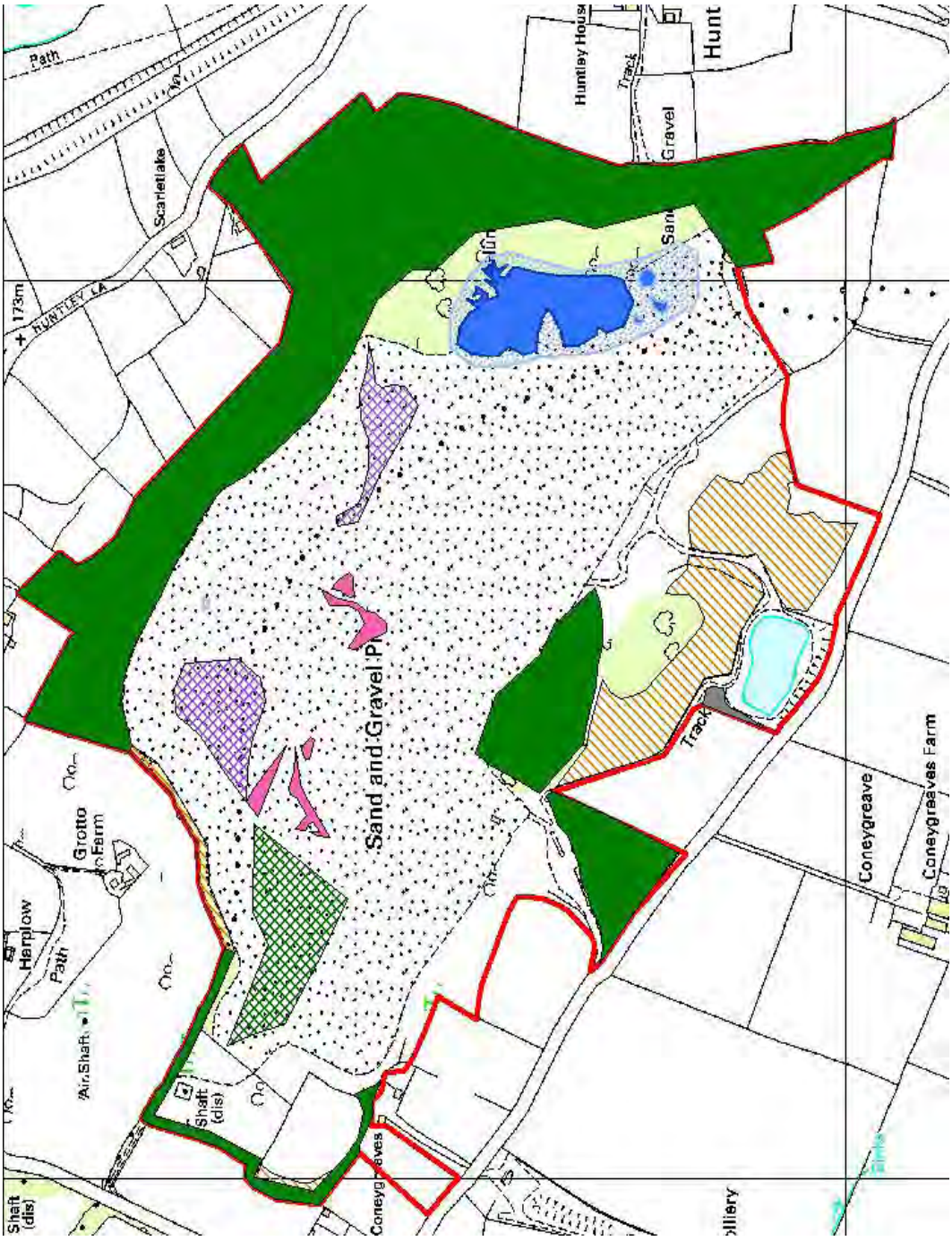
The site exhibits a good range in species from wetland associated species such as dragonflies and horseflies to hoverflies.

The hoverfly resource is fairly limited as, although there is a good scrub presence on site, it is exposed to the elements resulting in a lack of sheltered, still conditions. Creation of suitably designed fairways and conservation areas will assist with the hoverfly diversity on the site.

Unfortunately, due to the excessive motorcycle activity, pitfall traps to survey for bare ground beetle species could not be undertaken. However the most notable beetle species at Huntley Quarry is the green tiger beetle. This spectacular green and metallic purple beetle was at its peak in mid-late May and estimates numbering to the 1000s flying throughout open areas of the site. It is regarded as local in its distribution due to its habitat preferences of lowland heath and quarries with bare sandy ground and short patchy vegetation. Development of the site will initially hinder the beetle but through the creation of open, bare ground features it should not be detrimental to this species.

Figure 9: Green tiger beetle © A. Jukes

14 Recommendations



Pink: areas where dingy skipper are found in highest concentrations
Green cross hatched: area of gorse scrub

Orange striped: acid grassland for retaining and or expansion
Blue dots: areas where reed beds could be grown

Block green: areas of broad-leaved woodland of higher quality
Purple cross-hatched: areas where heathland could be expanded
Block grey: areas where trailing St John's wort and knotted pearlwort occur
Block blue: areas of open water

Figure 10: Areas/features of importance

14.1 Woodland

It is strongly recommended that the mature woodlands be kept. The majority of this habitat requires very little management, however the following practices could benefit the ecological value of the woodland.

To enhance the edge habitat along the rides and surrounding the clearances it is suggested that the habitat should follow that illustrated below in figure 11. Woodland edges graded as such are one of the most ecologically valuable areas of a woodland, providing the highest diversity of plant species, due to the transitional state of the environment in these areas. This also increases the diversity and numbers of invertebrates that feed the bats. The greater structure of wood fringe will also benefit birds. A scalloped edge would further increase the benefit of the wood to wildlife.

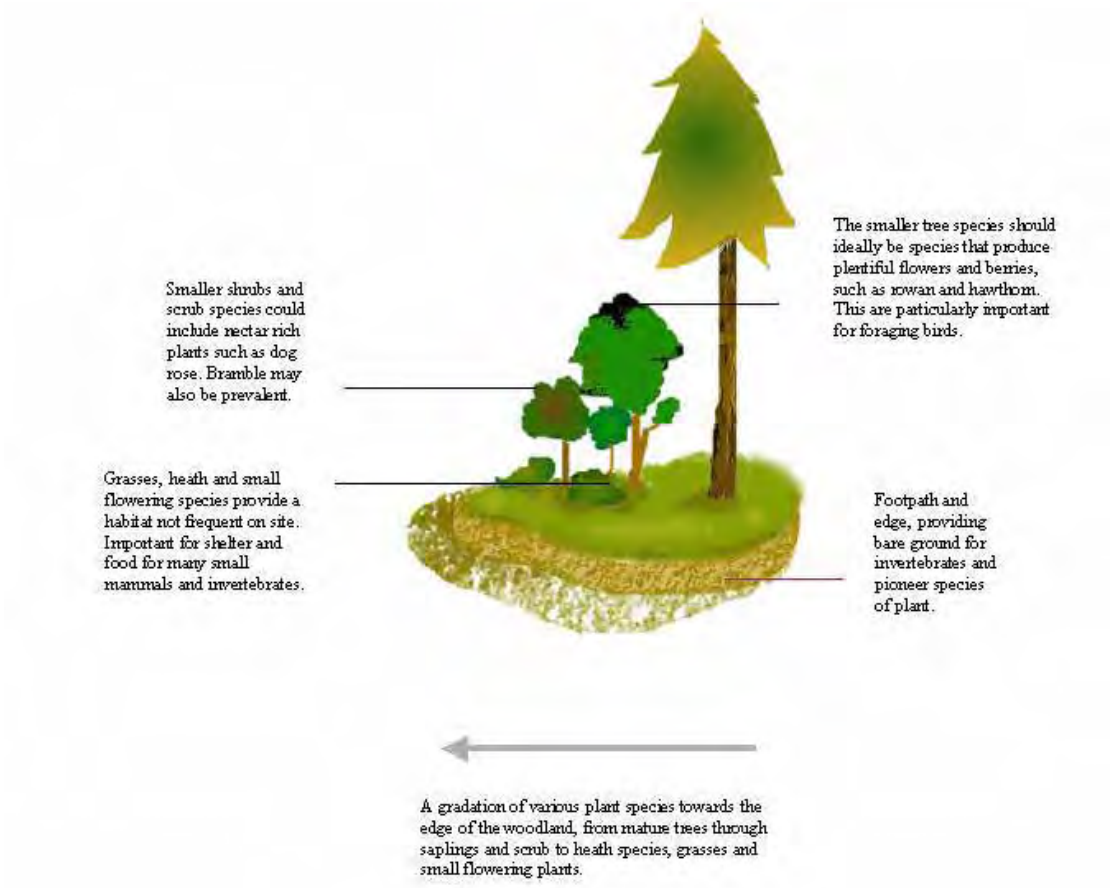


Figure 11: Illustrating the ideal profile of the woodland edge

Within broad-leaved woodland it is important to have a varied structure by retaining trees of differing ages. This occurs naturally, as senescent trees die, fall and create openings in the canopy allowing new trees to grow and establish. At present this is occurring naturally in most parts of the broad-leaved woodland. However, because of the relatively small size of this habitat, it may be beneficial to very occasionally selectively fell some mature trees to assist this cycle of growth and decay. Initially, it is suggested that the selected trees for felling be of non-native origin, such as sycamore. Once a tree has been felled it is recommended that it be left *en situ*. Where this is not possible it is proposed that the felled tree be sectioned to create a log pile. Logs should be kept as long and intact as possible; those of shorter lengths are ecologically less constructive.

Log piles and fallen trees create dead wood habitats, particularly important for invertebrates and fungi. Another noteworthy dead wood habitat is that of standing dead wood. Because of its ecological importance it is highly recommended that standing dead trees remain where possible.

To create standing dead wood, it is suggested that in areas of mixed woodland, coniferous trees be ring-barked (a method of killing unwanted trees, by severing the xylem and phloem, which run just below the bark of a tree, thus the tree, without nutrients or water, dies). Where such trees are in the near vicinity to footpaths, it is recommended that the top part of the tree be removed, leaving around 2m of standing wood. This should minimise any health and safety risk associated with standing dead wood.

The aim of "removing" coniferous trees within the mixed woodland, would not only create dead wood habitats but also improve the woodland habitat, returning it to broad-leaved woodland.

Should ring-barking be considered inappropriate for the development, it is still suggested that coniferous trees be removed from the areas of mixed woodland, by selective felling.

Felling of any tree, either coniferous or broad-leaved, should ideally be carried out outside of the bird breeding season, as nesting birds are protected under the Wildlife and Countryside Act 1981 (as amended).

Because the large areas of silver birch regeneration have only some ecological value, felling would not be extremely detrimental. Felling may also be beneficial where glades and rides are created, thus providing an important habitat for many organisms. Any trees or vegetation cleared on the site can be reused for markers, fencing, habitat piles for wildlife, and by mulching or chipping for use on pathways.

Significant areas of the ground flora within the segments of woodland are dominated by rhododendron. Rhododendron is a non-native, highly invasive species that provides little ecological value, particularly as a result of the leaf litter rendering the ground beneath the plant toxic to other plants. It is therefore imperative for the health of the woodland that this species is controlled and where possible removed.

It is noted that there are significant patches of bracken within the main body of the broad-leaved woodland. Whilst bracken is a native species and can be of some ecological value, it is recommended that the areas of bracken existing at present not be allowed to expand further, as this could lead to the exclusion of other woodland ground flora, thus reducing the value and structure of the woodland. The preferred method of bracken removal and control is by "pulling".

The creation of a "Friends of" group to involve locals and aid with maintenance of the site will be an effective way of dealing with many of the smaller, annual and frequent management and monitoring tasks.

14.2 Bare ground

Solitary bees and wasps, along with many other invertebrates, require areas to bask and in the case of the bees and wasps, areas to nest. It is therefore recommended that areas of bare ground, preferably south facing, be kept and maintained. This can be accommodated for within the design of the course and bunkers where small clifflets can be cut into the bunkers to allow nesting opportunities to solitary bees and wasps. The creation or retention of the sand martin cliff will also provide nesting and basking opportunities to solitary bees and wasps as will dingy skipper habitat.
Bare ground is also important for the rarer species of plant on site, species such as trailing St John's wort. It is therefore suggested that the developer may consider retaining or creating pathways that consist solely of the sand/gravel/pebble substrate, as already exists on site at present. These areas would then remain as bare ground, with a gradation of disturbance from highly disturbed in the centre of a pathway to less disturbed towards the edges.

Figure 12: An example of habitat succession for the fairways and green

Figure 13: An example of short turf and patchy bare ground. Ideal for a number of invertebrate groups such as bees and wasps, dingy skipper and beetles

14.3 Heath

Within the Huntley Quarry site there are small areas of heathland communities. It would be beneficial to promote this habitat where possible. Areas such as that found in the western segment of compartment 3 could be expanded by the removal of areas of scrub. On the bare ground, where scrub has been removed, heather brash should be deposited. The seeds contained in the brash should readily re-colonise the bare ground. To maintain areas of heather at varying ages it is recommended that these areas be managed by removing certain small areas of heather, on roughly a 15 to 20-year cycle. It is imperative to ensure that at all times there are areas of all different ages of heather, as each has its specific communities associated with it.

The overall aim is to provide a mosaic of micro-habitats within the heathland areas from bare ground to dwarf shrub and tall scrub.

Heathland areas are most likely to be cut by machinery, which is the principal method of management of lowland heath.

There are different mechanical devices available that provide different results.

- Flails leave cuttings behind which reduces the ability of grass and short sward flowers colonising.
- A forage harvester is more appropriate as this will collect the cuttings.

- A vertical flail will not only cut the sward but will produce ground disturbance as well, essential for many heat-loving and ground nesting invertebrates. (Kirby, 2001)

Monitoring of the management on the heathland vegetation will be important to assess the success of the management and whether adjustments to the management practices need to be altered.

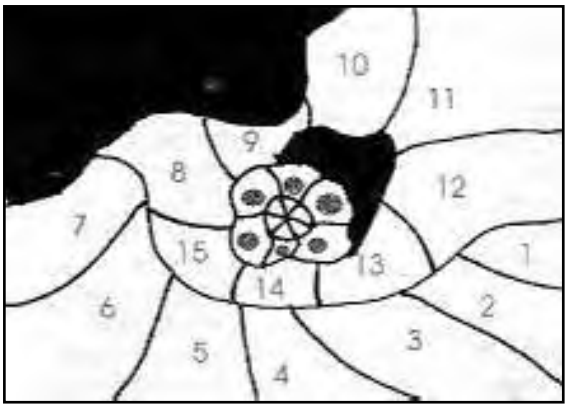


Figure 14: Example of rotation cutting on 15-year cycle
Dark shading represents areas of heather to be left to go through the natural phases of its life cycle. The smaller central shaded areas are on a shorter rotation cycle (6 years). The centre of this smaller compartment is an area of bare ground and early succession created through disturbance. (From Kirby, 2001)

Degenerate heather is an important part of a heathland and is of particular importance to invertebrates and invertebrate habitat management. Some areas should therefore be left to die out and natural heather regeneration taking place in these areas. A small area of short rotation cutting should also be included to keep the heather short and in the first two phases of growth (pioneer and building). To prevent nutrient and litter build up, cuttings should be removed where possible. This will encourage grasses and early successional flowering plants rather than bracken and shrubs into the heathland mosaic (Kirby, 2001).

Removing areas of bracken and bramble that prevent the expansion of this habitat should further encourage areas of heather and bilberry.

14.4 Acidic grassland

Acidic grassland is traditionally managed through grazing, and thus it is suggested this is ideally how such a habitat should be managed to create greatest ecological significance. A stocking rate of approximately 0.6 livestock units/ha, ideally using sheep to mimic the traditional method of management, is recommended. To prevent damage through over grazing and ground poaching (compaction through excessive use and disturbance), it is suggested that livestock grazing be confined to the summer months.

However, grazing may not be considered appropriate for the site, therefore it is suggested that the acidic grassland area, be managed through cutting. One cut of the grass should be carried out before September and the cuttings removed. Should the cuttings be left *en situ*, this would lead to the nutrient enrichment of the area and subsequent degrading of the acidic grassland community. Removed cuttings could be composted, to create an ideal habitat for grass snake egg-laying or hibernacula for other reptiles.

The largest threat to the acid grassland is the encroachment of scrub and tall herbaceous plants, particularly rosebay willowherb. It is therefore highly recommended that these plants be removed, ideally by “pulling” (removing the plant by pulling the whole plant out).

Scrub (species such as hawthorn and rowan) should ideally be reduced to allow the expansion of the acidic grassland habitat. Small areas of scrub should be left to provide habitat for nesting birds such as whitethroat.

Initial management will be quite intensive to retain what acidic grassland there is left on the site. However, the long-term management of cutting should eventually inhibit the establishment and growth of scrub and rosebay willowherb.

Due to the close proximity of the coniferous plantation to the significant area of acidic grassland, it is highly recommended that the coniferous plantation be removed, not only because Scot's pine woodland is outside of its natural range and therefore provides very little ecologically useful habitat, particularly at the density seen on site, but also because this area could be an area of conversion back to acidic grassland, considerably expanding the habitat.

14.5 Ponds

Peripheral (marginal) vegetation, species such as yellow flag, pendulous sedge, common reed, reed sweet-grass, branched bur-reed and reed canary-grass, are not only attractive but also add to the variation of the ponds, creating areas important for nesting birds and invertebrates. Care should be taken however not to remove the lesser bulrush (*Typha angustifolia*) a species regarded as rare for Staffordshire.

Smaller aqueous and semi-aqueous vegetation such as water forget-me-not, brooklime and floating sweet-grass, are imperative for breeding newts, as these species provide areas for egg laying.

Figure 15: Branched bur-reed. A good marginal plant with abundant seedheads for birds

A good structured peripheral habitat surrounding the water bodies would also encourage water shrews, particularly if watercress is planted as it has been found that they appear to favour this habitat (Mammal Society 2006 and ARKive 2006).

The areas of damp/water logged ground that surround the ponds should ideally be preserved as these not only provide invaluable terrestrial habitat for newt species but also give important foraging areas for lapwing. Lapwings are a Staffordshire BAP species.

14.5.1 Pond margins

In the creation of new ponds and to improve the existing waterbodies on site it is imperative that varied margins, bays and shallows be included.

14.5.2 Varied margin

The ponds at Huntley Quarry are large enough to contain a very varied margin and profile. The profile should be a diverse mixture of steep margins, shallow margins and undulating margins with on and off-line ponds and other wetland features to enhance the site for wildlife.

14.5.3 Shallow margins

These should be as shallow as possible with a low gradient of a minimum 1:5 – 1:15. The surface of the ground does not need to be uniform, undulating topography aides the creation of niches.

This shallow water and shoreline habitat is ideal for aquatic and semi-aquatic invertebrates. This is important for breeding waders such as lapwing and snipe. The range in water levels provides lots of opportunities for different plants and plant communities to flourish from an emergent fringe in very shallow water and damp ground to aquatic plants in the deeper water.

Figure 16 shows a shallow margin of approximately 1:15. This very shallow gradient is due to the potential draw-down between summer and winter water levels. This over exaggerated margin compensates for any lowering or raising of water levels in summer or winter by still providing shallow and deeper water for species dependant on different zones along the lake margin.

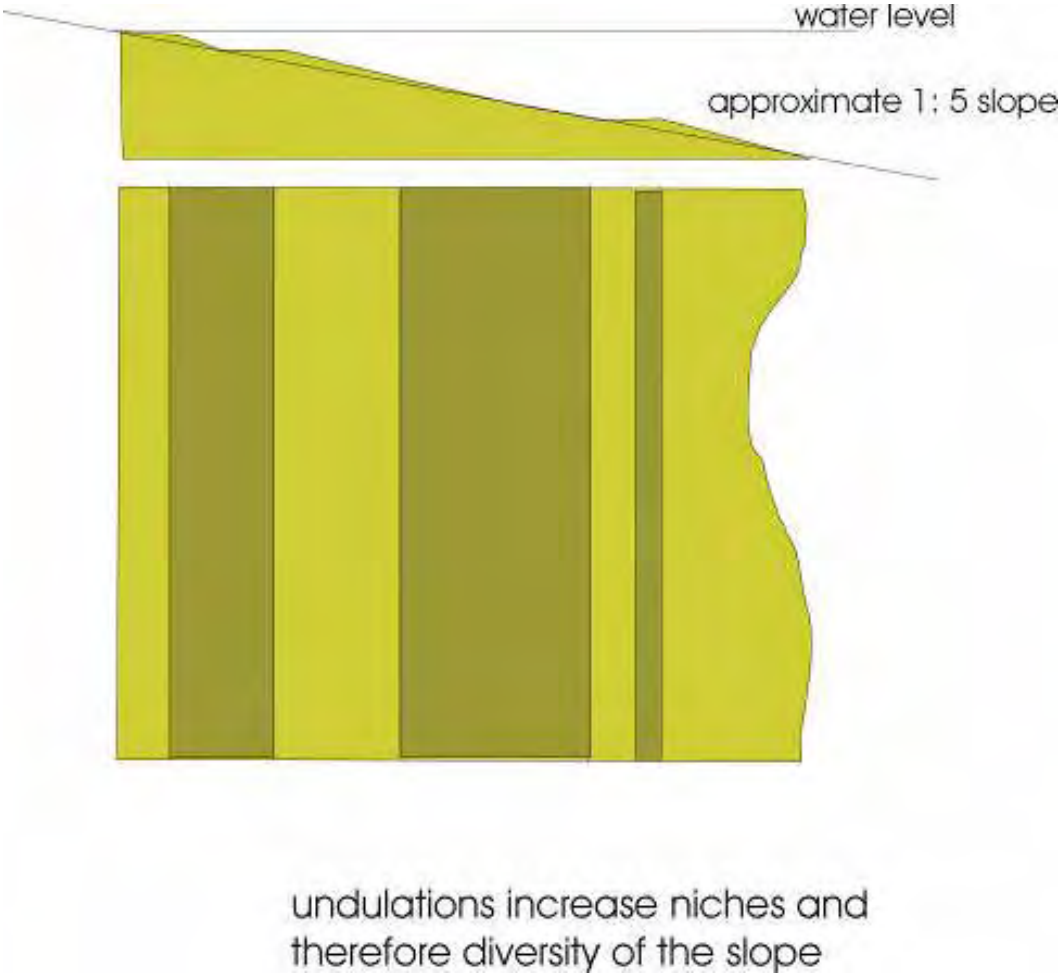


Figure 16: Varied lake margin topography

14.3.4 Steep margins

These are useful to inhibit the extent of a reedbed and allow water to stay unclogged by waterweed and reeds. Any gradient is suitable as the purpose is for no plants to grow at depth. A ratio of 1:3 is ideal as this provides a steep "drop-off" that can only be colonised by a few plants that can root in deep water, resulting in an open water habitat which is ideal for diving ducks like great crested grebe, as well as providing areas for displaying newts.

Figure 17: Steep pond or channel margin

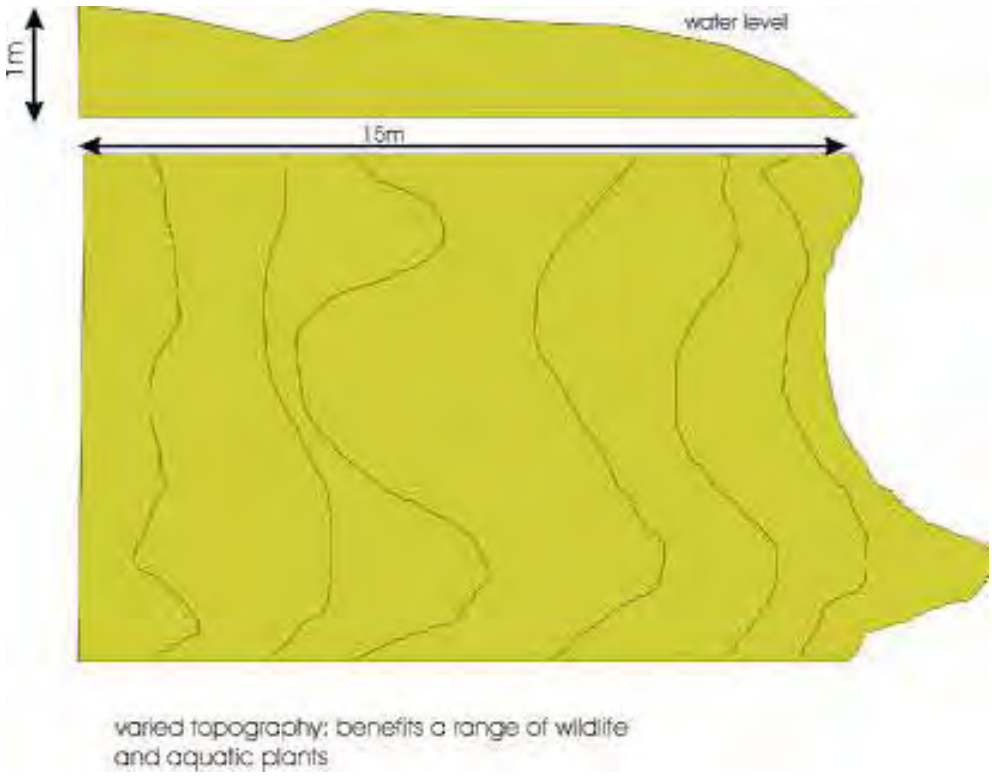
14.5.4 Undulating margin

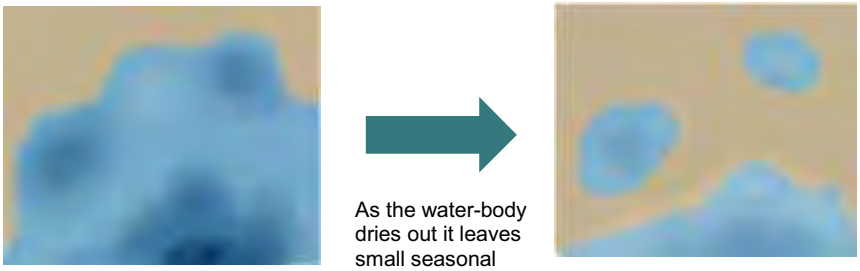
The varied topography provides niches for plants and animals along the margin. The undulations can be from shore to deep water or running perpendicular to the shoreline. Steep drop-offs can be created within a shallow margin to create a pool (see below).

14.5.5 Width of margin

The width of a margin (from shore to deep water) will be dependant upon the initial landscaping of the lake and is an essential component of the shoreline. Wherever scope allows, create as wide a margin to provide the greatest range in depths. Below (figure 18) illustrates a wide, shallow margin of 1:15 metres. As mentioned this is wide enough to allow for fluctuations in the water level and still provide habitats or aquatic animals and wading birds. Excavating a deep hole within the margin creates an area of deep water.

If the water level drops, a seasonal pond will be created with its own "perched" water table. This should retain water for a while and create further habitats on the site during low water times (figure 18).





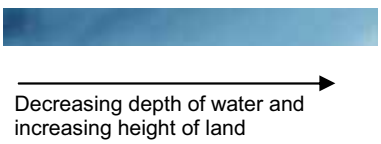


Figure 18: Shallow margin incorporating perched ponds and varied micro-topography

14.5.7 Peninsulas

"Fingers" of islands or shallow water (preferably both) extending out into the lake will be colonised by plants providing a wind break reducing wave action (fetch) across the lake.

Figure 19: Example of a peninsula profile

14.6 Reedbeds

14.6.1 Siting the reedbed

To inhibit erosion of the lake through wave action (fetch) created by the actions of the prevailing wind, as well as provide cover for nesting birds such as warblers, reed buntings, great crested-grebes and other waterfowl, the creation of reedbeds is the most effective method of control whilst increasing biodiversity of the main lake.

Should the suggested position illustrated in figure10 not be where the prevailing winds create most erosion, it is advised that reed species be planted where any such erosion occurs to defend the banks and margins.

14.6.2 Reedbed hydrology

Reedbeds require phases of high and low water depending upon the management requirements of the site. In this instance, conservation and biodiversity are the principal concerns for reedbed establishment.

14.6.3 Reedbed Ditches

Ditches within a reedbed create greater diversity and aid drawdown, which creates water movement in winter or summer. The ditches provide an interface between open water and reedbed which is important for invertebrates and birds.

The ideal reedbed ditch should have one side with a slope of 15 to 30 degrees and the other side can be near vertical. This allows the shallow side to vegetate up with other reedbed species other than common reed further increasing the diversity of the reedbed.

Ditches are ideal places to position bird hides as many reedbed species will use the ditches to feed in.

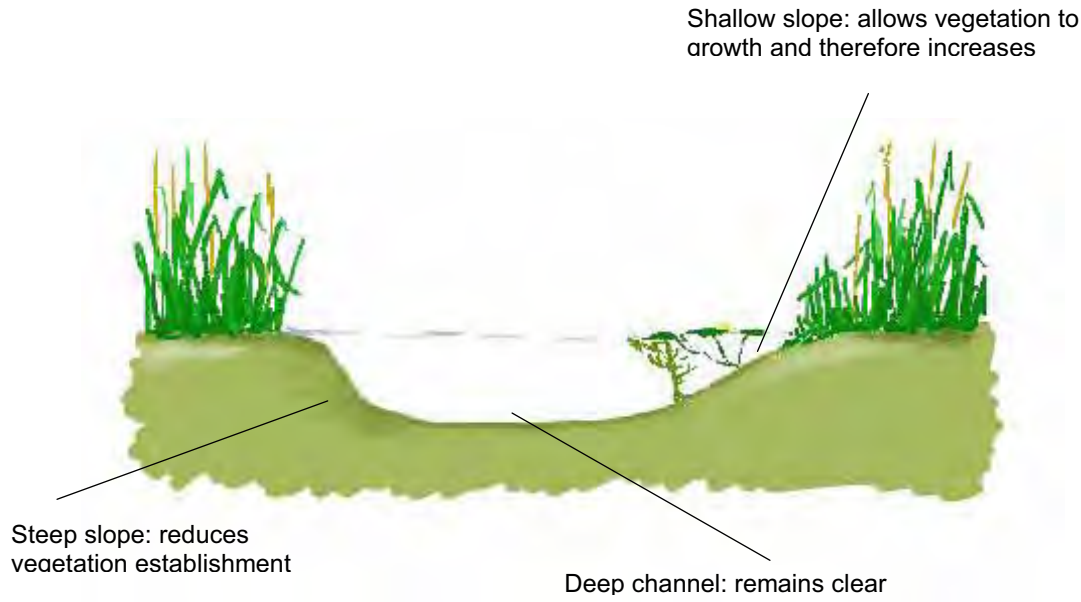


Figure 20: Reedbed ditch design

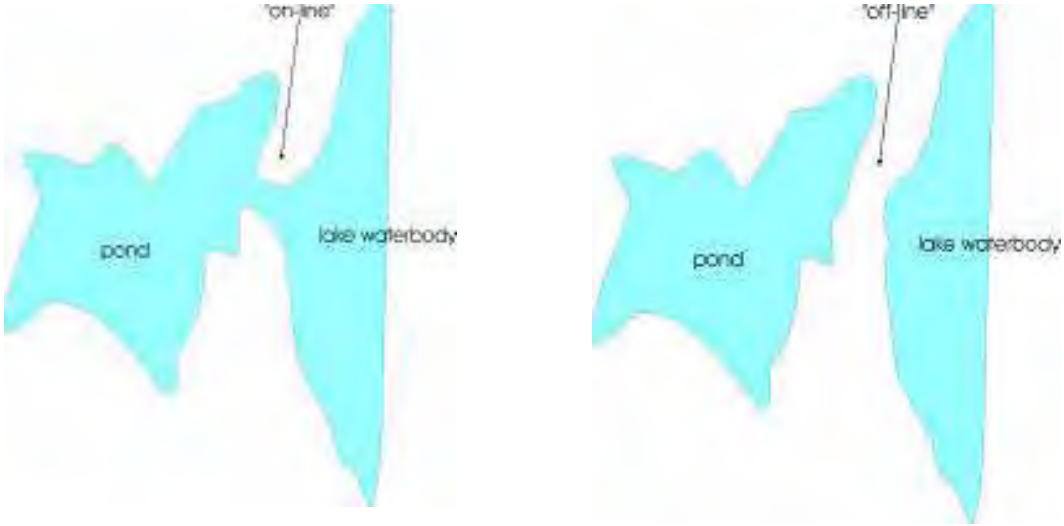
14.7 Ponds

14.7.1 Off-line and on-line ponds

These ponds refer to their connectivity with the main lake. “On-line” is a pond that is connected to the lake either via a ditch or shallow water. Off-line therefore is a pond that is a separate entity from the lake. Both can be created in a similar fashion.

14.7.2 The pond profile

Areas of shallow margins and deep water provide a range of niches for wildlife from dense emergent vegetation to open water. The positioning of the new ponds is the most critical component. If too high above the water table, they will not retain water effectively and become dry for much of the year. This is however not detrimental as a pond that does stay full all year round still has its benefits and with minor adjustments can become a scrape for wading birds.



The “off-line, on-line pond” design would be particularly appropriate for the smaller of the two existing ponds, where it has been proposed that this pond be extended in the initial plans, as illustrated below:

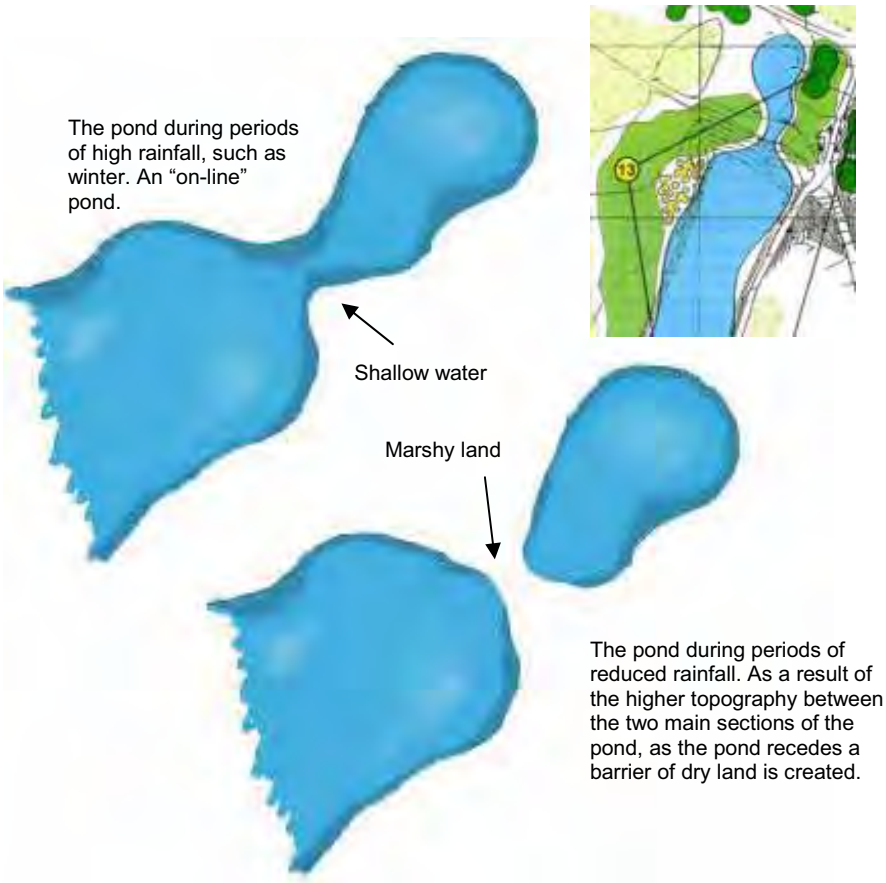


Figure 21: On and off-line ponds

14.7.3 Dragonfly ponds

These are the same as off-line ponds. On-line ponds are not so well suited to dragonflies and damselflies due to the potential for fish gaining entry is greater if connected to the lake. A pond that dries out occasionally (ephemeral or seasonal pond) is ideal for dragonflies and other groups such as amphibians. They can tolerate occasional drying out with does not harm the future populations of species but will kill any fish that get in to the pond*.

*Fish in a pond are detrimental to wildlife since they prey upon the other animals and have few predators themselves. A small pond can be completely denuded of life from a strong fish population.

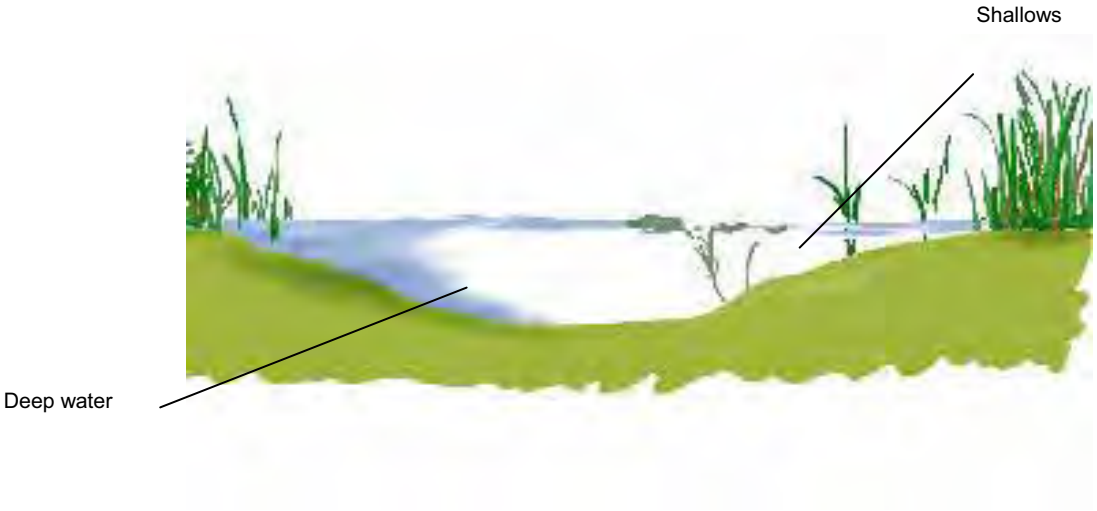


Figure 22: Pond Profile

The above illustration is that of an ideal pond profile, as should be aimed for in the creation of any new ponds on site, as well as within the modifications to existing ponds/lakes.

By incorporating all of the above within the designated areas for ponds and other water-bodies the developer can include these important features whilst not losing any additional land**.**

14.8 Bats

As referred to in a previous section, scalloping the edges of the woodlands would be highly beneficial to bats, as this creates ideal foraging habitats. To prevent the loss of significant areas of woodland and to aid the creation of a graded woodland edge it is suggested that the developer plant the scalloped edge, as opposed to using selective felling.

To encourage the bat species on site, it is suggested that bat boxes be installed on suitable trees. Such trees tend to be mature trees, where boxes can be situated so that there is a clear flight path into the box. Ideally boxes should be situated around 5m high, and preferably on trees that are along pre-existing transitional and foraging routes, or other linear courses.

It is also highly recommended that bat boxes should be included on any new buildings erected as part of the development. These should be placed as near to the eves as possible. Boxes for use as a summer roost should ideally be south facing, to create optimum conditions for rearing young. Boxes situated on north facing aspects, will most likely be used as winter roost sites. Preferably a number of boxes should be installed, on different aspects of the buildings to provide differing roost opportunities.

Surrounding the disused mine shaft, there appears to be significant cracks in the bedrock. Although small these may have the potential to be a bat roost, most likely winter roost. Should these cracks be significant fissures and not just small shifts in sand, it is recommended that the cheapest option for the developer (to employ a bat worker with enough caving experience would be costly and with significant health and safety issues) is to assume that these do contain bat roosts. This assumption would then require any such cracks to be grilled appropriately to allow bat access.

14.9 Sand Martins

The sand martin colony is most vulnerable to development, and it is recommended that efforts be made to mitigate this. It may be possible to leave the existing site *en-situ* as a landscape feature of the course; should this be impractical sand martins respond well to alternative sandstone exposures or artificial nest sites. These can either be formed from sand piles stabilised with a very little cement, to mimic natural sites, or, built structures, effectively walls with inserted nest tubes, are also often colonised.

14.10 Barn Owls

The woodland has no great value for birds but, given the protection afforded to Barn Owl by the Wildlife and Countryside Act, it would be worth checking for roost sites prior to any work taking place there between September and March.

14.11 Dingy skipper

The dingy skipper butterfly's ideal breeding habitat is dominated by bird's-foot trefoil. It is therefore advised that areas be put aside where bird's foot trefoil can dominate. Such areas are usually bare ground with sporadic acidophilic or neutral grass species. This can be accommodated for in the design of the course in the "off-fairway" areas and other locations around the site where a short grass playing turf is not required.

So as not to lose the local population of this candidate UKBAP species it is highly recommended therefore that sections of turf be removed from areas where dingy skipper activity is highest and breeding has been confirmed or probable (see figure 10) prior to development taking place on these areas, during winter or early spring and relocated and established in such "off green" areas. By using this method of translocation, the dingy skipper should hopefully be retained at Huntley Quarry.

Prior to the translocation it is essential that the receiver site is prepared and suitable for the dingy skipper larvae turfs. On-site consultation and assessment is suggested prior to actual removal and translocation of the turfs. The turfs should also not be removed until the receiver site is ready. Moving the turfs to a "halfway house" is not recommended, as this increase in handling will raise the risk of damage to the turf structure and the larvae. The donor turfs will require ring-fencing so no vehicles damage the existing breeding sites while development of the golf course is on-going and also of the receiver site once the turfs have been relocated.

14.12 Bees and wasps

As long as previously mentioned mitigation and recommendations are undertaken on site, the bees and wasps mitigation will have been catered for as their requirements are similar to species already mentioned, such as those for dingy skipper and for creating a heathland mosaic of bare ground through to tall scrub.

Other features that can be specifically created for bees and wasps or, through clever design, incorporated into the golf course are nesting scrapes. The design below in figure 23 can be a specially created feature or in some instances these can be adapted golf course bunkers, especially for species that require vertical exposures. Those requiring horizontal plains will find the high disturbance of the bunker too intensive and require scrapes for their specific purpose.

Criteria to consider are:
Aspect: Exposure to the sun for as much of the day as possible therefore south-facing
Shelter: Exposure to high winds is not desirable as this reduces the temperature of the micro-climate. The scrape incorporates a bank of excavated material that acts as a shelter and windbreak.
Positioning: To further aid the micro-climate, position the scrape near to scrub which stops wind and also provides a foraging resource for bees in the spring and wasps later in the year.
Substrate: Scrapes are best undertaken on sandy ground rather than those of high humus content.
Figures 7 and 13 provide good examples of nesting habitat. Replication of these will go towards securing the future of bees and wasps on Huntley Quarry.

Likewise, the foraging opportunities for bees and wasps should be catered for as bare ground, early succession and scrub provide the majority of the foraging potential for bees and wasps. The higher the abundance of suitable plants such as bird's-foot trefoil (dingy skipper key plant) and yellow composites "dandelion-type flowers" the more potential the site will have in attracting bees and wasps.

Early succession can be maintained on site through rotational scraping off of small patches of vegetation each year back to bare ground. This rotation should not harm the overall diversity of the site as at any one time there will be all stages of early to mid succession.

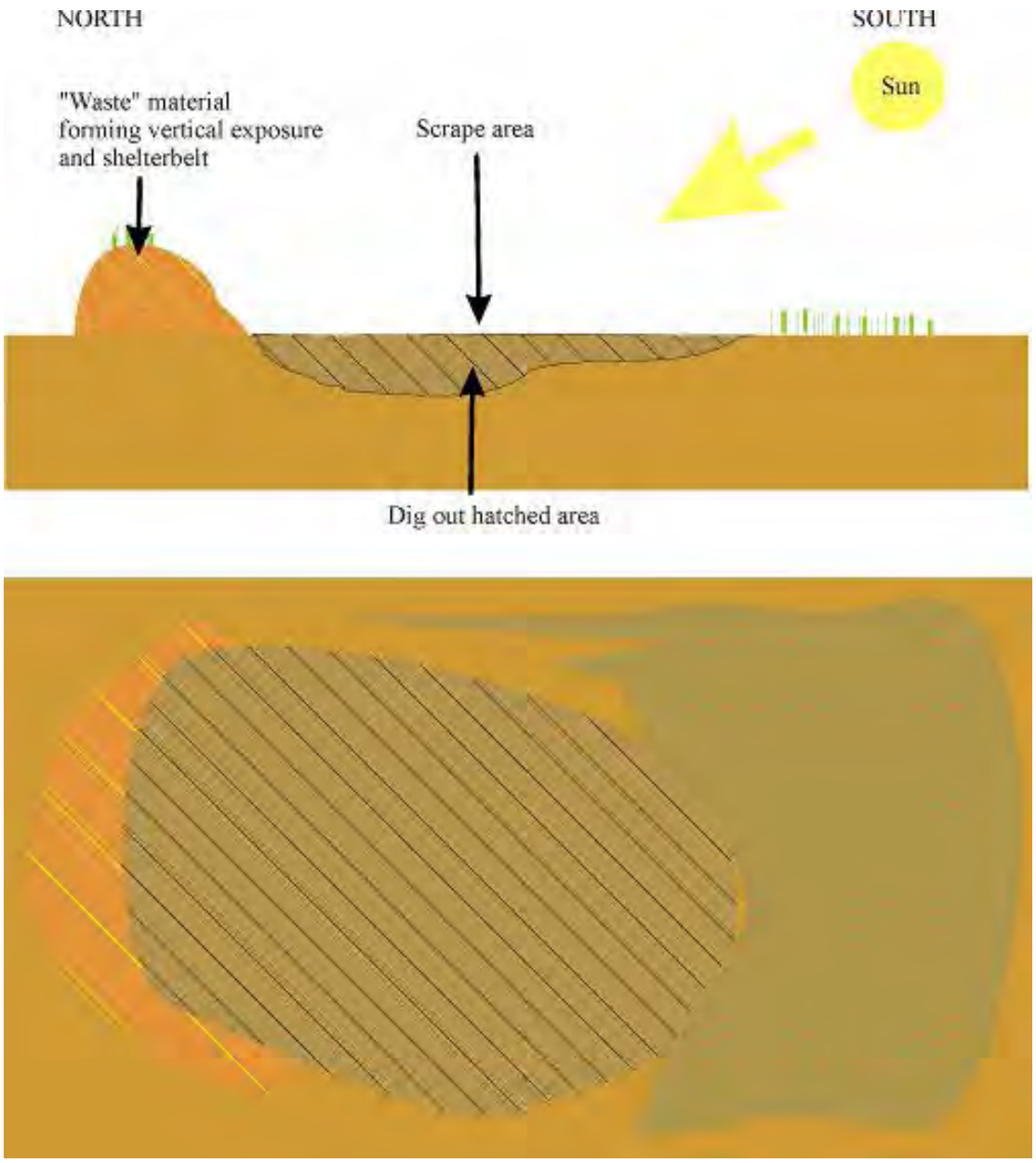


Figure 23: Example of bee and wasp scrape design

14.13 Buildings

14.13.1 Green roofs

It is suggested that any new buildings created on site have "green roofs". It is proposed that extensive roofs maybe more suitable to the site. These have a thin substrate to create grassland habitats, a habitat uncommon on site, and they require very little if any management.

Not only would the creation of green roofs provide grassland habitat, but can also reduce energy costs of heating and cooling the building. Green roofs also protect roof materials, attenuate water run off, filter airborne particles, dampen noise, improve visual appearance and can re-use materials for growing medium, e.g. crushed brick, aggregate. For more information on green roofs see websites such as www.livingroofs.org. Suppliers of green roofs include www.enviromat.co.uk, www.greenroof.co.uk, www.bauder.co.uk, and www.sarnafil.co.uk.

14.13.2 Climbing plants

To enhance any new buildings, in addition to the inclusion of green roofs it is also recommended that climbing plants be established around buildings to provide habitat for nesting birds, areas for feeding birds and invertebrates, as well as opportunities for cover and shelter. Species that are suggested for planting include dog rose, ivy and honeysuckle. These, where possible, should be of local provenance.

14.13.3 Nest boxes

It is suggested that the developer may wish to include a number of other features such as artificial bee nest boxes. The function of which is to provide a nest site in place of natural nest sites, such as old, mature hedgerows and along ragged, woodland edges with old bramble and hogweed stems with broken ends, as well as dead wood and fallen trees. Bee nest boxes are designed to attract nest-seeking bees in early spring, which will use them to rear a colony during the summer. Bee species such as the red masonry bee have been recorded readily using artificial nest boxes.

It should be noted that there are no health and safety implications of bringing these solitary bee nest boxes in to close contact with people. Solitary bees and wasps do not sting people and are therefore safe to encourage around buildings.

Other nest boxes that the developer may want to incorporate into any development design include bat boxes, hedgehog nest boxes and bird boxes.

Because bats forage within the development area the planting of night and evening flower species such as evening primrose would be beneficial, as these plants provide food sources for night flying invertebrates on which the bats feed.

14.14 General Recommendations

14.14.1 Log Piles

It is highly recommended that log piles be created from any removed woodland. These will not only provide good habitat for dead wood invertebrates and fungi, but also provide ideal areas for amphibians.

Single logs, particularly around the wetland areas would also be highly beneficial to the above organisms.

It was noted throughout the survey period that the Huntley Quarry site appear to contain a very significant population of common toad (*Bufo bufo*), it is therefore highly recommended that the creation of amphibian refugia and habitat be carried out.

14.14.2 Compost areas

Compost heaps are ideal places for grass snakes to nest. If sited near the lakes in a sunny aspect then grass snakes maybe encouraged to the site. Composting is also a green alternative to waste disposal and the resulting compost can be used in any formal garden areas of the site or sold on.

15 Monitoring

In order to establish the success of the above recommendations, and to allow for modification, it is advised that a number of monitoring schemes be implemented.

15.1 Acidic grassland

The quality of the acidic grassland should be monitored, as it is one of the most ecologically important habitats on the Huntley Quarry site.

To survey the acidic grassland, the surveyor should use a number of "permanent" quadrats (the same quadrat position should be used each year).

Within these quadrats all flora species cover, in percentages, should be recorded. Noting in particular invasive species, such as rosebay willowherb, and other species indicative of the habitat's declining quality. Vegetation surveys such as this should ideally be carried out during the summer months, in order to ensure that annual species are included.

15.2 Sand Martins

Due to the relocation of this species habitat, monitoring of its success is imperative.

By recording the number of active nest holes present in the new and/or existing cliff faces, the surveyor can establish an approximation of the sand martin population.
It is imperative to establish a baseline figure of the sand martin population prior to any development work being carried out, in order to monitor any changes in numbers

This should be carried out on a yearly basis, for 5 years before reviewing the success of the relocation, with the view to carrying out further monitoring surveys on a 5 yearly basis.

15.3 Dingy Skipper

As with the sand martins, monitoring is particularly important for this species, as re-location of the species and its habitat will be carried out.

It is advised that monitoring be carried out on an annual basis, for the first 5 years. At the end of the 5 years, the management and the success of the translocation should be evaluated. Again depending on the findings of the 5-year review, further surveys should be carried out approximately once every 5 years.

Prior to the removal of turfs containing dingy skipper, the baseline population should ideally be established, in order to allow comparison between populations before and after translocation. This can be gained through carrying out a "timed count";

- Establish the main boundaries of the adult flight area and its approximate size (measured by pacing in metres). Patchily spread sub-populations are better identified and surveyed separately.

- Count adults by walking (at a slow and steady pace) the site in a zig-zag path, covering the flight area as thoroughly and evenly as possible. It is important that the walk passes through areas of high and low butterfly density.
- Depending on colony size count the numbers seen in a fixed time period, usually between 5 and 60 minutes.
- Timed counts should be carried out only when conditions are suitable for butterfly flight- between 10am and 4pm, warm and calm, between May and the end of June

A timed count should be carried out following the translocation of turfs and the establishment of new habitat, on an annual basis.

In order to aid the understanding of the results of dingy skipper population monitoring, it would also be beneficial to monitor dingy skipper habitat.

To monitor vegetation, the percentage cover of bird's foot-trefoil should be recorded in a number of "permanent" stratified randomly placed quadrats. This should, as with the dingy skipper population monitoring, be carried out annually for at least the first 5 years so any detrimental trends or habitat degradation can quickly be noted and reversed until the site has stabilised and the management regime implemented with no negative issues or results.

15.4 Bees and Wasps

It is advised that a survey for the solitary bees and wasps found on site be carried out at years 1, 3 and 5, post development. This should aid the understanding of population dynamics on site and the success of the development, site management, as well as monitoring the species assemblages present and highlight any issues as early as possible.

In order to assess the success of the golf course and its obligations to nature conservation, it is highly recommended that a full survey of the important aspects be carried out on the site after 5 years post development.

16 Recommendations Summary

Area	Recommendation
Woodland	• Provide graded edges • Scallop edges • Use very selective felling • Retain and create standing dead wood • Create log piles • Remove rhododendron
Bare ground	• Create bare ground around pathways, the green and fairways and manage using rotation management
Heath	• Control scrub • Manage on a rotational cycle
Acidic grassland	• If possible graze at 0.6 grazing units per hectare • If grazing not possible cut once a year and assess
Ponds	• Plant peripheral vegetation • Create varied margins- depth, profile, creating peninsulas • Create on-off line ponds- creating dragonfly ponds
Reedbeds	• Create reedbeds, with channels
Bats	• Scallop woodland edges • Provide bat boxes in the woodland and on buildings • Grills for cracks in the bedrock
Sand martins	• Retain existing cliff where possible • Create artificial/new cliffs
Barn owls	• Survey prior to any development of the woodland
Dingy skipper	• Create new habitat • Move patches of existing habitat containing larvae/pupae
Bees and wasps	• Create scrapes • Adapt bunker design to incorporate features for bees and wasps • Promote the establishment of yellow composite flowers (dandelion type flowers) through bare ground scraping and maintenance of early successional vegetation • Maintain a variety of flowering scrub specie on site that provide foraging opportunities and shelter
Buildings	• Green roofs • Plant climbing plants • Install nest boxes

Monitoring	• Monitor the success of the management prescriptions

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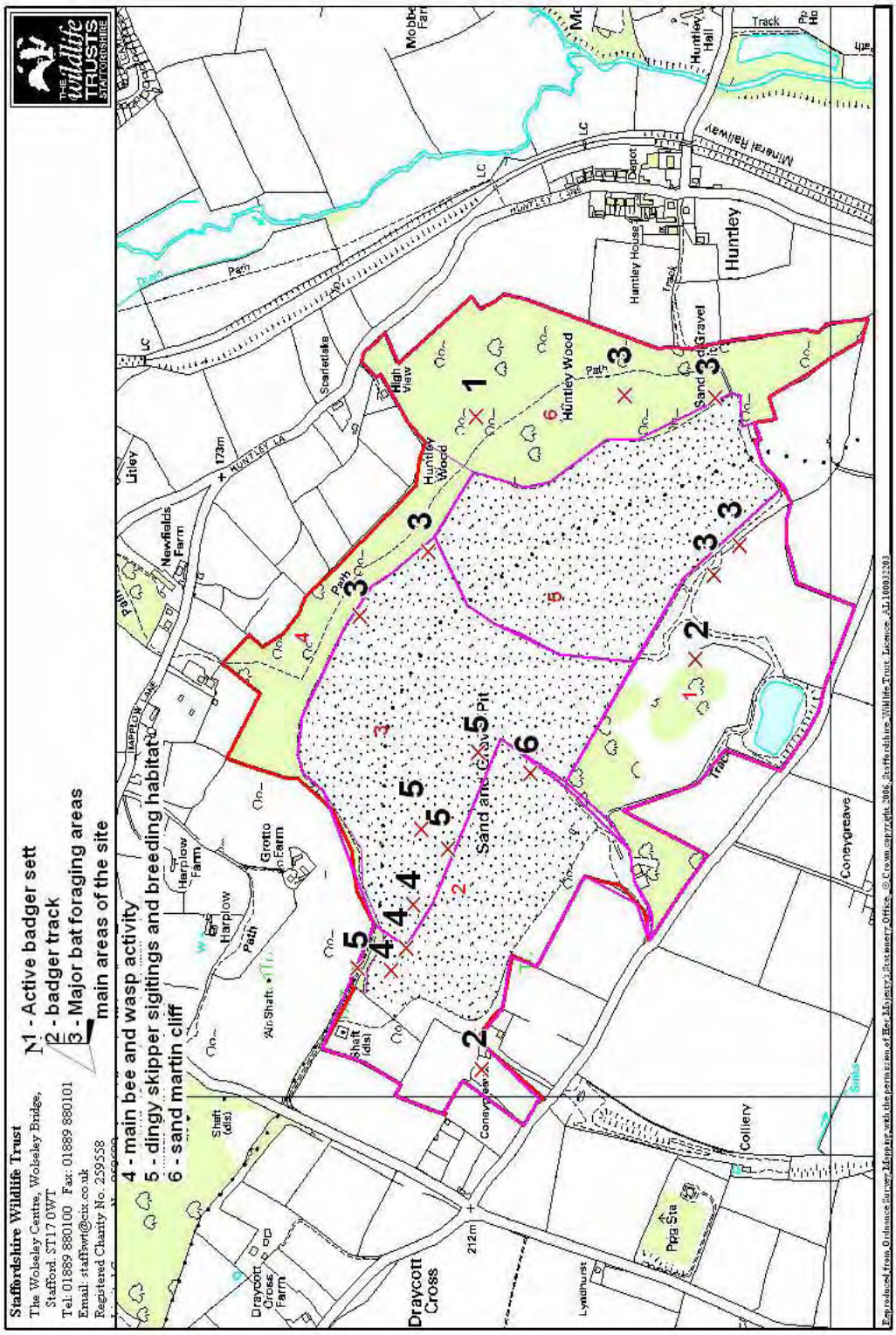
Appendices

Appendix I: Target note map



Appendix II: Bat box

The 'Tanglewood Wedge' bat-box

Although very conscious of the value of the standard bat-box which has proved itself over many years, we have been trying to improve on some of its features.

We have been unhappy about the vulnerability of the top, which due to warping and shrinking comes off too readily, unless hinged. In addition, it may have a bunch of awakening bats hanging on it, whose toes and wings can get nipped when replacing the lid. There is also the tendency for the warm air to escape too readily.

We built 5 designs, each of which appeared to be an improvement on the last. We are quite pleased with the latest design, but are doubtful if it is the last. We feel it is worth passing on for others to try and possibly take a stage further.

We call this one 'The Tanglewood Wedge' and it is born of hints and suggestions from a variety of sources for which we are very grateful. It has about the same capacity as the standard box, but the space is concentrated at the top, giving less wastage of space and heat.

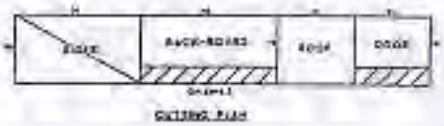
It was suggested that the slope of this box would be less likely to catch the sun and therefore it would be colder. Comparison tests against a standard box and other square boxes using digital thermometers showed this to be partially true. The Wedge was slower warming up, but caught up and passed the others in about 30 minutes. From thence, readings at 15 minute intervals throughout the day showed the Wedge to be at least 1°C ahead of the others until about an hour after sunset when they all fell to the same reading. The tests were in full sun in February. We believe that this box should be very successful in ensuring the heat generated by a cluster of bats

The other advantages are ease of construction, one-handed opening, particular ease of brief inspection, and its predator-proof and weather-tight qualities.

We give as well as nail to ensure that there is the minimum of heat leakage. We use Cascamite, which is odourless when set.

Boxes placed on a reserve in Gwent had bat-droppings in some of them within 8 weeks, but no bats were found in residence in the first season. Birds nested in adjacent square boxes and even reared young, but although an occasional bird had clearly visited certain two of the Wedges, no nesting was attempted.

A disadvantage of the Wedge is that it does not collect droppings, only the odd few which adhere to the fibres of the wood. This makes sampling difficult, but a trap could easily be devised.



CUTTING PLAN

The cutting plan 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 or jig saw, the bevels can be cut in one go. The cutting-angle is approximately 62°.

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 draught seal and aid weatherproofing. The side door-stops are cut off about 3mm 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 run four staples in the back of the box and attach it to the tree with medium fencing wire, leaving enough spare for annual adjustment.

We should be grateful for reports on the experiences of others with this box; please contact the Gwent Bat Group.

John Hawes
Gwent Bat Group

Appendix III: Bat bricks

THE NORFOLK BAT BRICK

A BRIEF DESCRIPTION AND GUIDE TO A BAT CONSERVATION AID

The Bats

There are sixteen resident species of bat in Britain of which twelve have been found in East Anglia in recent years. Of these, six species prefer underground (or at least semi-underground) sites in which to hibernate, for part of the winter.

A protective grill positioned over a bat cave

A potentially suitable tunnel site

Hibernation

All British Bats have to hibernate during the winter months when there are no flying insects for them to feed upon. Species like Daubenton will start to sleep from about mid-September until mid-March or later, depending on the prevailing weather conditions. To achieve this sound sleep and survive until the spring they typically require:

- ✓ Darkness, with little or no disturbance
- ✓ High humidity - over 90% for most species
- ✓ A steady temperature, > freezing, but below 10 degrees C. + a range of temperatures
- ✓ Freedom from potential predators
- ✓ Crevices to hide in (that's where our Norfolk Bat Bricks fit in!)

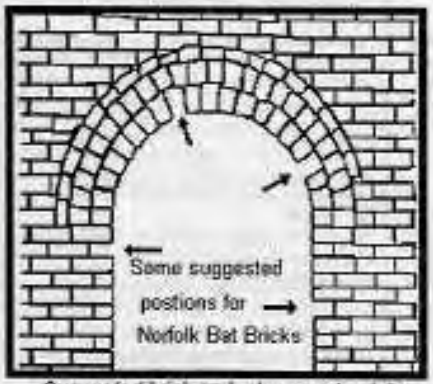
Suitable Structures

Many kinds of underground or semi-underground sites may be used by bats, including natural caves, cellars, ice-houses, brick and lime kilns, disused railway tunnels, old army buildings and a whole range of natural and man-made tunnels of many different kinds.

Why "Bat Bricks"?

Research on hibernating bats in East Anglia during the 1980s showed that some underground sites seemed environmentally suitable, but lacked crevices conducive to hibernating bats. The installation of some experimentally designed brick crevices in two sites during the autumn of 1984 quickly produced results. Development has continued in order to find the best combination of materials and aperture size.

A Norfolk Bat Brick with single Daubenton bat hibernating inside



Suggested brick arch placement points

Installation

These bricks would typically be used to replace an existing perhaps crumbling brick in a brick-built vaulted tunnel. The old brick should be carefully removed using a grinder, drill or cold chisel, taking proper safety precautions, then inserting the bat brick using an appropriate mortar (e.g. a soft lime mortar for old brickwork, or 6:1 sand:cement for modern brickwork). Modern resin based mortars can be used, but they should be used sparingly, only in the summer when no bats are present, with extra ventilation and so placed to provide a water soluble 'wick' with the original substrate. Prop the brick in place with a length of timber or an "Acro-prop" for a day or so until set, then carefully point-up around any gaps.

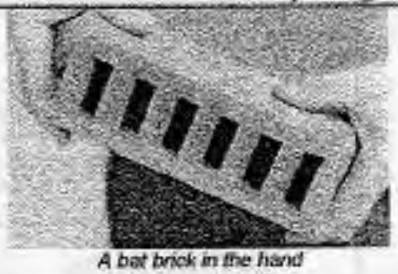
Continued overleaf .....

THE NORFOLK BAT BRICK

A BRIEF DESCRIPTION AND GUIDE TO A BAT CONSERVATION AID

What is a Norfolk Bat Brick?

These are brick-sized objects approximately 200mm x 100mm x 70mm made from an absorbent clay, roughened with sand and fired to about 1100 degrees C. to make them frost-proof. They have a series of slits of the correct size for Daubenton's, Natterer's, Brown Long-eared, Brandt's, Whiskered and Barbastelle to hide in. These are of a registered design and are *only* produced and sold by The Norfolk Bat Group.



A bat brick in the hand

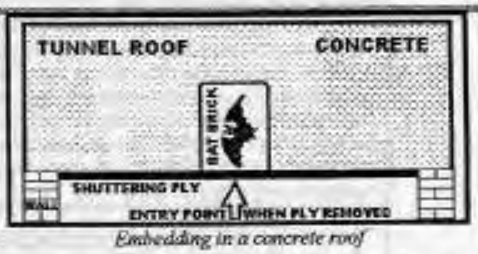
Surface mounting suggestions

Alternative Fixings

In existing concrete tunnels or sites where it is considered difficult or undesirable to excavate or damage the existing surfaces, then surface attachment is acceptable, though may not give quite such good results. Embedding the bricks into the concrete roof of a new tunnel also works well. Simply place the bat brick on the surface of the shuttering ply, having first filled all the holes with sharp sand or grit, allowing a little to spill out when placed. This stops wet concrete entering the holes and gives a rough gripping area around each bat brick after the shuttering is removed. Do seek the advice of a structural engineer before doing this, as these units might influence the structural integrity of a cast concrete tunnel roof.

How Many?

In East Anglia our largest hibernation sites contain perhaps 400 bats at peak. However at most sites one typically finds less than a dozen bats of two species. Since only 10% of bats, from a given population, are seen at any one time, each of these small sites could be 'home' to over 120 bats! 1 - 3 bats per bat brick have been seen in most occupied sites during December - February, since the first experimental ones were installed, but occasionally up to seven bats of three species will occupy a single Norfolk Bat Brick. Obviously they are going to work best where there are plenty of bats, *but* a shortage of suitable hibernating holes. Over 1000 of these items have now been made.



Embedding in a concrete roof

Our experience is that our most densely occupied underground hibernating sites have less than one bat per 3 cubic metres of air space, so something the size of say a World War II air-raid shelter with about 30 cub. M. of air-space might need no more than 10 bricks set in a variety of locations.

Cost and Delivery

The 1998 price of these items is £6.00 each and £5.00 each for 10 or more plus transport at cost. They weigh 2.5 kg each, so are expensive to post, but by a recognised carrier cost just over £1 each for the U.K. mainland. Delivery is normally 14 - 21 days when in stock, however, please note that drying and therefore firing times can be somewhat extended during the colder winter months.

Ordering

Please fax your requirements to: 01508 550850 telephone 01508 550784, or send your order to: The Norfolk Bat Group, The Barn Cottage, Wheelers Lane, Seething, Norwich, Norfolk. NR15 1EJ. Invoices will be sent, for payment within 30 days. Small orders should ideally contain a cheque.

www.norfolk-bat-group.org.uk/

Appendix IV: Bats and trees information sheet

PROFESSIONAL SUPPORT SERIES

BATS AND TREES IN ENGLAND

Some bat species rely exclusively on trees for roost sites; others use them for part of the year. This leaflet outlines legislation, which must be taken into account when working on trees.

This note is for guidance only, and should not be interpreted as law. BCT will not be held responsible for any legal action arising out of this guidance.

***Obligations relating to bats** – foresters and tree surgeons must be aware of the following regulations, as they apply to works undertaken on trees.*

The Wildlife & Countryside Act 1981
The Act applies in England, Scotland and Wales, and provides protection for all bats and their roosts and requires consultation with the appropriate Statutory Nature Conservation Organisation (SNCO) - English Nature in England, *before* carrying out activities which might harm or disturb bats or their roost – regardless of whether the bat is in the roost at the time. Similar legislation applies in Northern Ireland and the Isle of Man.

Countryside and Rights of Way Act 2000
The CROW Act applies only to England and Wales, and importantly adds the word "reckless" to the offence of damaging or destroying a place a bat uses for shelter or rest, or disturbing a bat while using a roost. This has implications for all those involved in the management of trees, because now that bats and roosts are protected from reckless (as well as intentional) destruction/disturbance, inspection of trees is necessary to ensure they are not/have not been used by bats.

EC Council Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, 1992
This sets down requirements for wildlife conservation in EU countries. All bats are in Annex IV, which includes animal and plant species of Community interest in need of strict protection. Some bat species are also in Annex II, which includes animal and plant species of Community interest whose conservation requires the designation of Special Areas of Conservation. The Directive is implemented in the UK through The Conservation (Natural Habitats, &c.) Regulations 1994. Under this, it is an offence to damage or destroy a breeding site or resting place of any bat, or to deliberately capture, kill or disturb a bat. In the UK, therefore, works to structures that would disturb bats or their roosts need to be granted a Habitats Regulations Licence if they would contravene the Habitats Regulations. In England, an application for a Licence should be made to the Department of Environment, Food and Rural Affairs (DEFRA) where bats are likely to be affected by works to trees. This application should be made well before the works are due to be undertaken to allow time for any necessary survey work.

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
Within this global convention the Agreement on the Conservation of Bats in Europe (1991) establishes a mechanism for international collaboration to conserve bats and their habitats, including foraging habitats. The UK is one of the parties to the Agreement. The Agreement has its own reporting procedures to identify activities carried out to meet its agreed plan.

Planning Policy Guidance Note 9 (PPG 9) Nature Conservation
PPG 9 gives direction to local planning authorities and others in their decision-making with respect to land use and development. In PPG9, paragraph 47 states "the presence of a protected species is a material consideration when a local planning authority is considering a development proposal which, if carried out, would be likely to result in harm to the species or its habitat ...". All bats in the UK are protected species.

***Obligations relating to trees** – foresters and tree surgeons must be aware of bats when carrying out any work to trees.*

The Hedgerow Regulations 1997
This provides for the conservation of "important" hedgerows, including constituent trees, as defined in the Regulations. The presence of a protected species (bats) is relevant and included when assessing whether a hedgerow is important. Application to remove a hedge must be made to the local planning authority under the Hedgerow Regulations. A decision on whether the hedgerow is deemed "important" will be based on consultations and research undertaken.

Forestry Commission Felling Permissions
Permission is normally required from the Forestry Commission (via a Felling Licence or approval under a Dedication Scheme) to fell growing trees (but not lopping/topping) except in the following cases: -

- If less than 5 cubic metres is felled in a calendar quarter on your property, and not more than 2 cubic metres are sold
- If the felling is part of a Plan approved by the Forestry Commission
- Felling fruit trees or trees growing in a garden, orchard, churchyard or designated public space (e.g. under the Commons Act 1899)
- Felling trees which, when measured at a height of 1.3m, have a diameter of 8cm or less. If thinnings have a diameter of 10cm or less, or if coppice or underwood have a diameter of 15cm or less
- Trees needing to be felled to implement development authorized by the Town & Country Planning Act 1990, or to enable work to be carried out by statutory undertakers
- If trees are dead or dangerous
- If trees have to be felled because of an Act of Parliament.

(If the wrong trees are felled and there is no valid FC permission, anyone involved can be prosecuted.) The FC does not make reference to bats in its permissions, so the forestry workers involved should be aware that bats/roosts may be present and make the necessary inspections, **even if** the FC has given its permission to fell trees.

Tree Preservation Orders (TPOs)
The law relating to TPOs is in Part VIII of the Town & Country Planning Act 1990 (amended by Section 23 of the Planning & Compensation Act 1991) and in the Town & Country Planning (Trees) Regulations 1999. For details see Tree Preservation Orders, a guide to the law and good practice (DETR, March 2000), chapter 6, paragraph 6.3 makes specific reference to bats.
A TPO is an order made by a local planning authority which in general makes it an offence to cut down, top, lop, uproot, wilfully damage or destroy a tree without the planning authority's permission. Anyone who has good reason to think that a tree should be preserved has a right to apply to their local authority for such an order – even if the tree is not on their property. However, the presence of a bat roost is not a reason for a TPO to be placed on a tree, nor can a TPO be used to thwart the reasonable use or development of land. The purpose of a TPO is to preserve trees for reasons of amenity and to enhance the appearance of the environment. However, these trees are often old and may have cracks, crevices and hollows that are used by bats, so inspection of trees should always be undertaken prior to the works. There are some cases where the planning authority's permission is not needed to work on a protected tree – see DETR's *Protected Trees, a guide to tree preservation procedures* – although the planning authority should still be notified of any works. Trees within well-managed woodlands are unlikely to be granted TPOs.

Highways, Rights of Way and Public Services
Local and national authorities have to cut back branches or fell trees which obscure public rights of way, street lights or sight lines along highways. Trees can be removed or cut back by railway and airport authorities, land drainage authorities, electricity, telephone, and pipeline managers.

Conflicts of Interest
Protected species legislation can conflict with human health and safety legislation. Compromises are sometimes achievable, and there have been cases where branches have been propped up and tall stumps harbouring bat roosts guyed. If a roost has to be disturbed, your SNCO should be informed and its advice followed. If a tree/branch has to be cut, sometimes the section containing the bat roost can be strapped to a sound tree nearby; bat roosting boxes on nearby trees may also help – your SNCO will advise.

Land Development and Planning
In all cases, bat conservation is most successful if considered as part of the planning process, rather than trying to save roosts when work has already been approved. Talking at an early stage to those involved can often save a bat roost, or at least minimise the damaging effect by influencing the management plans for woodlands and open space, planning policies in development plans, and planning permissions of individual developments. Successful protection can often be achieved by education and reasoned argument, particularly in the early stages of any proposed change. Recourse to the courts to try to resolve problems is an expensive and often frustrating process, and should be used as a last resort.

Trees and Boundaries
House owners should also be aware of the legislation relating to bats and trees in their garden. Branches overhanging a neighbouring property can be legally cut by the neighbour, but s/he must also have regard to the protected species legislation above and take care not to injure the tree. (The cut tree parts should legally be returned to the tree's owner, but in practice it is best to discuss the need to cut neighbouring trees with the owner first.)

References
Please enclose a SAE to the appropriate address if you require a copy of these leaflets.
Bats and Trees, a guide to the management of trees – The Bat Conservation Trust 2000
Tree Felling, getting permission – The Forestry Commission 2000
Protected Trees, a guide to tree preservation procedures – DETR 1999 (from your LPA)
Tree Preservation Orders, a guide to the law and good practice – DETR 2000
PPG 9: Nature Conservation – DOE 1994 (details of cost from HMSO)
Trees and Bats, Guidance Notes 1 – Arboricultural Association 1990 (details of cost from AA)

Contacts
English Nature, Northminster House, Peterborough, PE1 1UA
Tel: 01733 455000 www.english-nature.org.uk

Forestry Commission, 231 Corstorphine Road, Edinburgh, EH12 7AT
Tel: 0131 334 0303 www.forestry.gov.uk

Arboricultural Association, Ampfield House, Ampfield, Romsey, SO51 9PA
Tel: 01794 368717 www.trees.org.uk

Tree Advice Trust, Alice Holt Lodge, Wrecclesham, Farnham, GU10 4LH
Tel: 01420 22022 www.treeadviceservice.org.uk

Department of Environment, Food and Rural Affairs (DEFRA), European Wildlife Division, Zone 1/08, Kite Wing, Temple Quay House, 2 The Square, Bristol, BS1 6EB
Tel: 0117 372 8162

The Bat Conservation Trust, 15 Cloisters House
8 Battersea Park Road, London, SW8 4BG
Tel: 020 7627 2629
www.bats.org.uk

The Bat Conservation Trust is the only national organisation solely devoted to the conservation of bats and their habitats. Write for an information pack and membership details.

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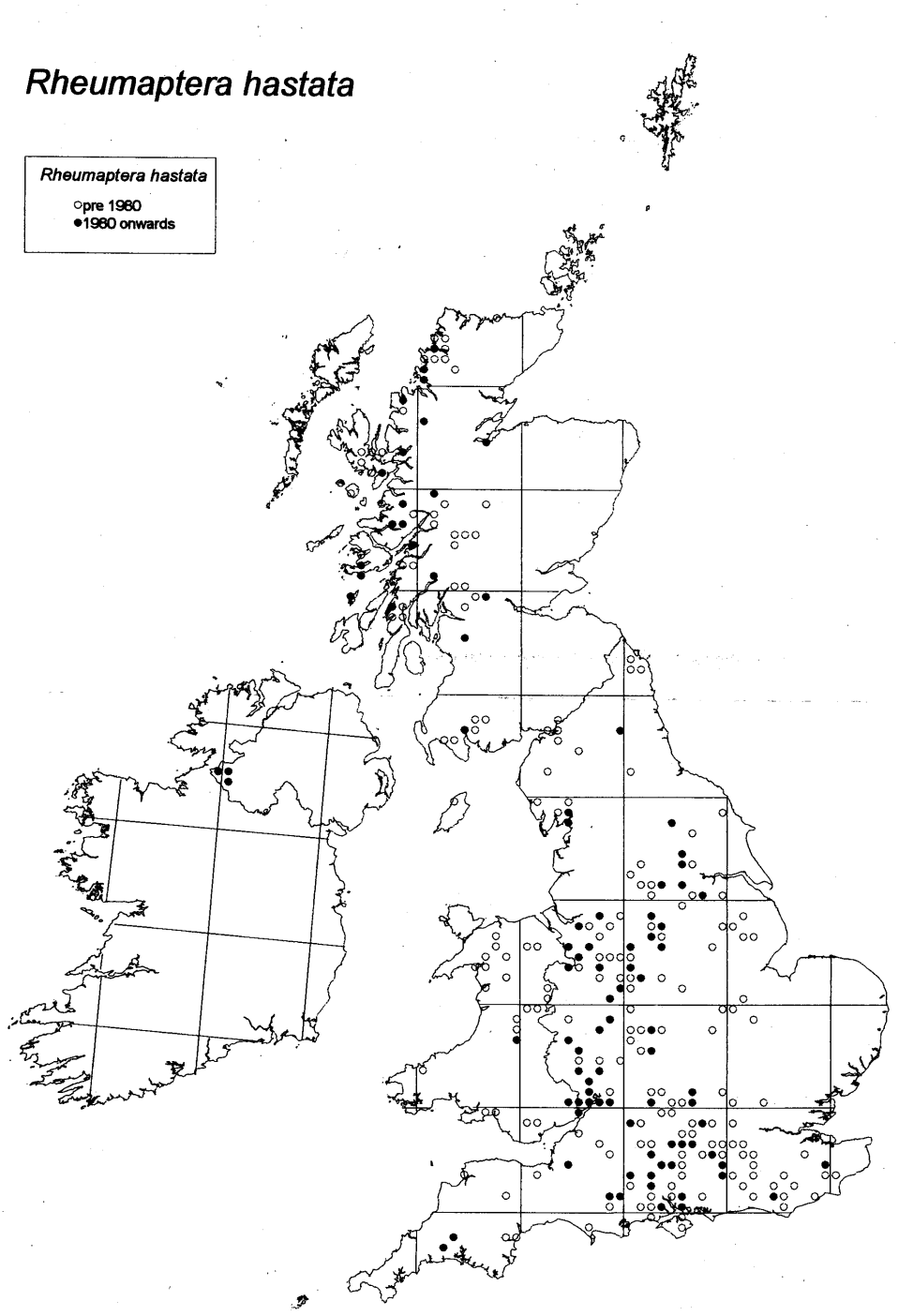
Appendix V: Argent and Sable distribution



Distribution map of R.hastata pre 1980 and "1980 onwards".
Taken from; UKBAP. UKBAP for *Rheumaptera hastata hastata* and *Rheumpatera hastata nigrescens*. English Nature, Peterborough

Distribution map of *R.hastata* to 2004.
Taken from: Wigglesworth, T., Parsons, M., and Warren, M. (2005) *Argent and Sable Rheumaptera hastata Factsheet*.

Appendix VI: Noctule (*Nyctalus noctule*)

One of our largest British bats, the noctule is widespread in England, Wales and in southwest Scotland but absent in Ireland. It is usually the first species of bat to emerge in the evening, flying above tree top height with steep dives in pursuit of its prey that comprises mainly of flies, moths, beetles, but it is nowhere common. Mixed sex colonies may be found in April, chiefly in tree holes but occasionally buildings and bat boxes. These colonies often disperse in late spring with females forming maternity colonies in trees.

1.1 Objectives

1 Objectives & Targets

To maintain current populations.
To safeguard known roost sites.
To retain and enhance suitable habitat to increase the distribution and population density.

1.2 Targets

To establish a base-line monitoring programme in line with national initiatives by the year 2000 to enable achievable targets to be set and performance to be measured.

2 Current Status

2.1 Importance

The noctule is not a common species within Staffordshire, although it is found throughout the county.

2.2 Trends

It is considered vulnerable throughout Europe and in decline although there is inadequate data to confirm this.

2.3 Extent

It is scattered throughout the county but little information exists. In Staffordshire the data is mostly for roosts near to large open water bodies, especially in ash, beech and oak trees (e.g. Keele, Copmere, Westport Lake, Knypersley, Madeley).

2.4 Distribution

Since 1970 some sixty-six records exist for Staffordshire of which thirty-seven postdate 1980. They are not concentrated in any particular area within the county and can be found throughout.

3 Current Factors Affecting the Species

$ The removal of mature and dead trees by felling from woodland, parkland and standards in hedgerows, deprives these bats of suitable summer and winter roosts and may unintentionally kill or injure them.

The food prey of this species which includes flies, large moths and beetles, has probably declined as a result of modern agricultural and other land use practices.

4 Current Action

4.1 Protection & Policy

$ The species is protected by national legislation and European treaties including the Wildlife and Countryside Act (1981) and the Conservation/Natural Habitats, Regulations 1994, the Bern and Bonn conventions and the EC Habitats and Species Directive.

They are listed in the UK=s long list of threatened/declining species.

English Nature and the Staffordshire Bat Group provide advice on bats in the county.

4.2 Management, Research & Survey

The species is included in the UK=s National Bat Monitoring Programme being developed by The Bat Conservation Trust (funded by DETR).

The species is proposed for international collaboration on migration studies and population monitoring under the Agreement on the Conservation of Bats in Europe (Bonn Convention).

The Bat Conservation Trust is carrying out research to identify roosting and foraging requirements of this species.

Staffordshire Bat Group and staff at The Potteries Museum collect data on distribution in the county, and kept at the Staffordshire Local Records Centre hosted by the Potteries Museum.

The Staffordshire Bat Group and some individuals are engaged in a number of projects including, habitat enhancement using bat boxes, talks aimed at tree surgeons and local authorities, educational activities and talks for schools and the general public, rescue and rehabilitation of sick, grounded and orphaned bats.

5 Key Habitats

Woodland, mature trees in parks and hedgerows, rock fissures and hollows, buildings, deciduous woodland, open water. Streetlights and urban areas with large floodlights are also important feeding areas where they attract insects.

6 Action Plan

6.1 Policy

Appropriate support should be provided for voluntary groups, such as the Staffordshire Bat Group, to continue monitoring of roosts, survey foraging areas affected by proposed development and the provision of advice to tree surgeons, local authority forestry officers, foresters etc. (LAs, EN, SWT)

Improve the current training procedures for bat workers and other people whose occupational activities may bring them into contact with bats. (BCT, SBG)

Adopt and develop management policies outlined in BCT=s Bats and Trees leaflet and the Aboricultural Association=s guidance note 1:Bats.

Ensure minimum tree surgery required to meet obligations (e.g. safety) to trees suitable for roosting bats. (BCT, SBG)
Ensure woodland incentive schemes (e.g. WIGs, Countryside Stewardship and other relevant agri-environment and forestry schemes) and tree management policies (e.g. TPOs) cater for the conservation needs of noctule bats.
Continue the current programme of events, walks, talks, and exhibitions to raise the awareness of bats amongst the general public. (SWT, SBG, LAs, SLRC)
Liaison with local authorities to ensure the guidelines in PPG9 are followed and considered in local

6.2 Land Management

plans and development control. (LAs SWT, EN, SBG)
Foster an awareness for the needs of noctules in Wildlife Trust reserves and site management of trees and woodland habitats (EN, EA, FWAG, LAs, SWT, SBG)
Encourage management of land near to known roosts to support foraging bats. (FWAG, SWT, SBG, EN, EA)
Ensure that appropriate survey work is carried out for any development proposal that may affect noctules. (LAs, EN, SWT, SBG)
Use bat boxes where appropriate to enhance suitable habitat e.g. coniferous woodland and woodland with few or no mature trees. The use of bat boxes on selected sites can provide a valuable tool for distribution monitoring as well as increasing roosting opportunities. (SBG, SWT)
Implement wider countryside activities which improve insect populations, especially for wetland grazing and associated habitats, including in liaison with relevant HAPs. (EN, SWT), Continue participation in the National Bat Monitoring Programmes.

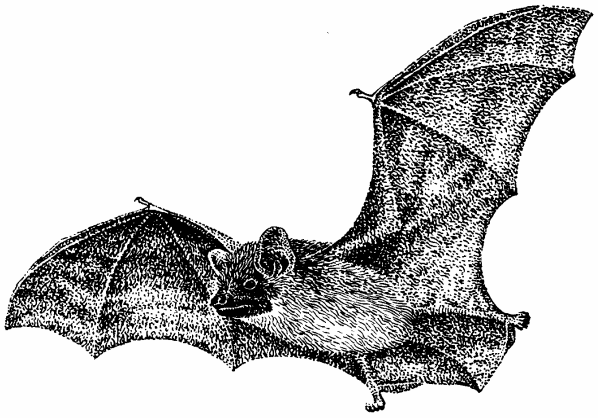
6.3 Monitoring and Research

Increase survey work to identify summer roosts. (SBG, SLRC)
Carry out a review of current collection, handling and dissemination of bat distribution and roost data with the aim to improve the current database and access to the data it holds. (SLRC, SBG)
Investigate habitat requirements and ecology in Staffordshire to assist in the formulation of management plans and enable appropriate advice. (SWT, BCT, SBG, SLRC)
As feeding areas are widespread but few roosts are known, targeting of appropriate habitat for potential roosts using GIS should be investigated. (SLRC, SBG)

7 Complementary Plans

Staffordshire Lowland Wood Pasture & Parkland HAP
Staffordshire Ancient & Semi-natural Broadleaved Woodland HAP

Appendix VI1: Pipistrelle Bat (*Pipistrellus pipistrellus* and *P. pygmaeus*)



Objectives

- To maintain all known current populations.
- To safeguard all known roost sites.
- To retain and enhance suitable habitat to increase the distribution and population density.
-

Targets

- To maintain the current population of Pipistrelle within the County from 2001 onwards.

Total Achievements To Date (November 1998 - March 2001)

- Records of Pipistrelle have now been entered onto the biological database, giving year 2000 base-line data for this species.
- 38 bat walks and 32 talks / presentations and displays have been held via various sources.
- 49 new Pipistrelle roosts have been found.
-

Current Action

Protection & Policy

- Bats and their roosts are protected by national and European legislation including the Wildlife and Countryside Act (1981) and the Conservation (Natural Habitats, etc) Regulations 1994, the Berne and Bonn conventions, CRoW Act 2000 and the EC Habitats and Species Directive.
- The Staffordshire Bat Group and the South East Staffordshire Bat Group are the lead organisations for this species.

Pipistrelle has been listed as a costed, key species in the UK Steering Group Report.

- The Bat Conservation Trust is the Lead Organisation for this species in the UK.

Management, Research & Survey

- Use of bat boxes at selected sites e.g. Cannock Chase, Hem Heath Wood, Tittensor Wood.
- English Nature, Staffordshire Bat Group and South East Staffordshire Bat Group provide advice on bats in the county.
- The species is included in the UK National Bat Monitoring Programme.
- Staffordshire Bat Group and South East Staffordshire Bat Group collect data on distribution in the county.

Action Plan

UK Lead Organisation: Bat Conservation Trust
County Lead Organisations: Staffordshire Bat Group and South East Staffordshire Bat Group

Policy

- Seek support for SBG and SEB to continue monitoring of roosts, survey of areas affected by proposed development and the provision of advice to householders. (***SBAP Partnership***)
- Continue to develop the current training procedures for bat workers and other people whose occupational activities may bring them into contact with bats. (***BCT, SBG, SEB***)
- Liaison with local authorities to ensure the guidelines in PPG9 are followed and considered in local plans and development control. (***BCT, SBG, SEB, SWT***)
- Target developers, planning authorities and other key decision makers regarding the current procedures concerning developments that may affect bats. (***BCT, SBG, SEB, SWT***)

Land Management

- Promote the use of timber treatment chemicals that are non-toxic to bats. (***Building Materials Suppliers, SBG, SEB***)
- Provide advice on the integration of bat-compatible design features in appropriate buildings. (***EN, SBG, SEB***)
- Seek to encourage sympathetic management of land near to known roosts so as to support foraging bats. (***Householders, SWT, SBG, SEB, LAs***)
- Use bat boxes where appropriate, to enhance suitable habitat e.g. coniferous woodland. (***Landowners***)
- Consider providing potential hibernacula by converting pillboxes and ice-houses on sites. (***Landowners***)

Monitoring and Research

- Continue participation in the National Bat Monitoring Programmes. Increase survey work to identify summer roosts. (***SBG, SEB***)
- Improve species determination and data collection to distinguish both phonotypes. (***SBG, SEB***)

- Carry out a review of current collection, handling and dissemination of bat distribution and roost data with the aim to improve the current database and access to the data it holds. (***SER, SBG, SEB***)
- Investigate habitat requirements and ecology in Staffordshire to assist in the formulation of management plans and enable appropriate advice. (***BCT, SBG, SEB***)

Advisory

- Increase species awareness for the public and landowners through education, promotion and events. (***SBAP Partnership***)
- Undertake 15 promotional events and walks each year promoting the conservation of Pipistrelle by 2010. (***SBG, SEB***)
- Improve the communication process for people waiting to contact national / local batline and registered bat workers. (***SBG, SEB, CT***)

Complementary UK Plans

UK Pipistrelle SAP

Appendix VII1: Ponds, Lakes and Canals

Objectives

- To maintain the nature conservation value of existing ponds, lakes and their catchment areas through favourable management.
- Increase the number of open water bodies with nature conservation potential within the county.

Targets

- Aim to establish favourable conservation management on all good examples by 2010.
- Create 200 new non-recreational (not stocked with fish) ponds on land of low conservation value by 2010.
- Restore 200 non-recreational ponds on land of low conservation value by 2010.
- Create 80 hectares of shallow, sinuous pools in four blocks of c.20ha in gravel pits. These should also include numerous small islands for breeding and wintering wildfowl.
- Restore one farm pond per Parish by 2010.
- Seek to achieve all appropriate biodiversity targets in the British Waterways Action Plan within the County.

Achievements to Date (November 1998 - March 2001)

- Five lakes have been created (various sources).
- Over eighty ponds have been created in the County by various organisations.
- Ten balancing pools of unknown quality to wildlife have been created throughout the County (data from the Environment Agency).
- Seventeen ponds have been restored through the Countryside Stewardship Scheme.

Current Action

Protection & Policy

- A number of canals, lakes and pools have been notified as SSSIs.
- A number of sites have been classified as grade 1 SBIs.
- Law protects species such as great crested newts. This protection includes their surrounding habitat.

- Pond and lake creation / restoration is targeted in various LEAPS which operate within the County.
- Standing Eutrophic Water has been listed as a costed, key habitat in the UK Steering Group Report.

Management, Research & Survey

- A number of SSSIs, Local Nature Reserves and other nature reserves are actively managed.
- DEFRA's Countryside Stewardship Scheme includes an option for pond management.
- The County Council have produced a pond pack to help creation and management of ponds and FWAG produces an advisory booklet for landowners that include a section on ponds.
- British Waterways has completed a full survey of all canals in the county with a management plan produced.
- Inventory of ponds for Staffordshire Moorlands completed by Staffordshire Wildlife Trust.
- A 'Restoring Power to the Wetlands' project (managed by Staffordshire Wildlife Trust and funded by Powergen) operates in the east of Staffordshire.

Action Plan

UK Lead Organisation: Environment Agency [Eutrophic Standing Waters]

Policy

- Ensure any examples of standing water bodies that meet the required criteria are given SBI status. (***SBI Grading Committee***)
- Ensure appropriate standing water bodies meeting the SSSI criteria are designated. (***EN***)
- Promote the use of Sustainable Drainage Systems in all new development from 2001. (***SBAP Partnership***)

Land Management

- Seek to restore and create further lakes and ponds in appropriate areas. (***Mineral Companies, EA, Developers, FoM, TNF and Landowners***)
- Promote best practices in farming and encourage the implementation of Farm Waste Management Plans. (***DEFRA***)
- Prepare water level management plans in respect of key sites. (***EA***)
- Encourage landowners to construct and sympathetically manage new pools by using agri-environment schemes such as Countryside Stewardship. (***DEFRA, FWAG, TNF***)
- Development of integrated catchment management plans. (***EA***)
- Reduce sheet piling of canals to a minimum. Incorporate mitigation works where necessary and research best mitigation techniques. (***BWB***)
- Ensure abstraction procedures do not affect key sites. (***EA***)
- Ensure the restoration of gravel pits incorporates priority nature conservation interests. (***CRP, Minerals Companies***)

Research and Monitoring

- Identify all key sites and create an inventory of all key standing water sites within the county by 2005. (***SBAP Partnership***)
- Seek to monitor the creation, restoration and management of this habitat throughout the County. (***SWT***)

Advisory

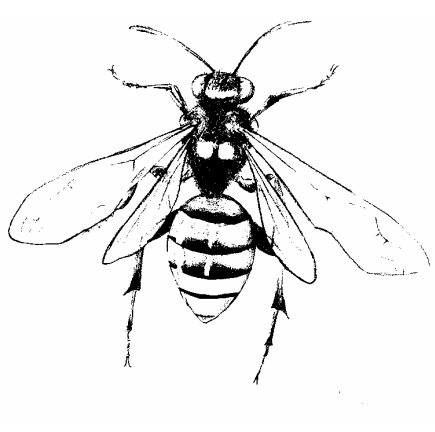
- Promote the biodiversity and landscape value of canals, lakes and pools to the public and landowners. (***SBAP Partnership, BWB***)

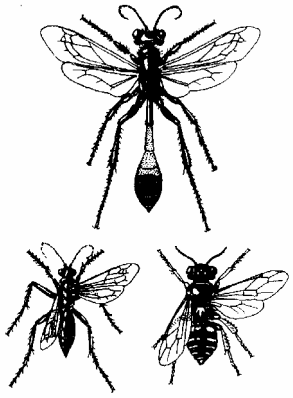
Complementary Plans

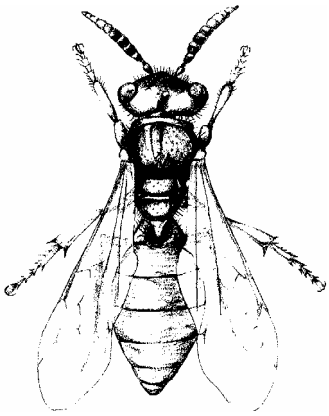
UK Eutrophic Standing Water HAP
Staffordshire Reedbed HAP
Staffordshire Streams & Rivers HAP
Staffordshire Lowland Wet Grassland HAP
Staffordshire Water Vole SAP
Staffordshire Floating Water-plantain SAP

Staffordshire Grass Wrack Pondweed SAP
Staffordshire Great Crested Newt SAP
Staffordshire Grass Snake SAP
Staffordshire Natterjack Toad SAP
Staffordshire White-clawed Crayfish SAP
Staffordshire Pipistrelle Bat SAP.

Appendix IX: Ground Nesting Solitary Bees & Wasps







Objectives

- Maintain all sites that support important populations of ground nesting solitary bees and wasps in a favourable condition.
- Where appropriate, Increase current important populations of solitary bees and wasps through site enhancement.

Targets

- Identify ten *'key sites'* and implement suitable habitat enhancement e.g. creation of scrapes and faces, by 2010.
- Maintain the populations on all known locally and nationally important sites for ground nesting solitary bees and wasps from 2001 onwards.

Achievements To Date (November 1998 - March 2001)

- A total of eight sites have currently been managed for their solitary bees and wasps.
- Ongoing survey work throughout the County identifies important sites for these species.
- A provisional checklist is expected early in 2002.

Current Action

Protection

- A number of sites of interest for solitary bees and wasps have been identified on some Staffordshire heathlands. These are classified as SSSIs or SBIs and receive some protection.
- Invertebrate Criteria have been worked out to include these species into the Sites of Biological Importance (SBI) series.
- JCB is the Champion for Solitary Bees and Wasps in Staffordshire and has provided both survey funding and site management work for these species.

Management

- Site management work has been carried out by JCB (on various sites), Cannock Chase Council and Staffordshire Wildlife Trust.
- The Staffordshire and West Midlands Heathlands Project has carried out a training day specifically for the management of sites for invertebrates.
- British Entomological National History Society has provided a grant for survey and report work.

Action Plan

Staffordshire Lead Organisation: Staffordshire Wildlife Trust

Policy

- Ensure that important bare ground sites are safeguarded during reclamation, improvement and development schemes. (***SWT***)
- Ensure appropriate sites containing populations of this species meeting the SSSI criteria are designated. (***EN***)
- Ensure any examples of sites containing populations of this species and that meet the required criteria are given SBI status. (***SBI Grading Committee***)

Land Management

- Seek to ensure that all 'key sites' for solitary bees and wasps have appropriate ongoing management. (***SWMHP and other Landowners***)

Monitoring and Research

- Produce a County Checklist of Aculeate Hymenoptera by 2002. (***SWT***)
- Survey Staffordshire for solitary bees and wasps to define their status and distribution with particular emphasis on key sites. (***SWT***)
- Monitor 'key sites' within the County by assessing the amount and quality of bare ground and associated forage habitat every five years. (***SWT***)
- Add all known sites onto the Invertebrate Sites Register. (***SER, EN***)

Advisory

- Notify organisations which may have a potential impact on these species e.g. sand quarrying companies and other landowners. (***SWT***)
- Ensure policy makers are aware of the need to retain areas of suitable bare ground. (***SWT***)

- Increase species awareness for the public and landowners through education, promotion and events. (***SWT***)

Complementary Plans

Staffordshire Lowland Heathland HAP
Staffordshire - All Grassland HAPs

Appendix X: Native Woodland

Objectives

- Maintain existing areas of important native woodland.
- Contribute to all the UK Woodland Habitat Action Plans that are relevant to Staffordshire.
- Restore degraded areas of important native woodland by promoting appropriate management.
- Re-create, or promote the natural regeneration of native woodland in areas traditionally occupied by this habitat, and not currently supporting vegetation of greater importance, in order to expand and link the existing resource.

Targets

- Maintain and enhance all good examples of woodland through appropriate management by 2010.
- Restore and / or improve 300ha (10% of County resource) of all replanted ancient woodland by appropriate natural regeneration / planting regimes by 2010.
- Increase the area of native woodland by 300ha in appropriate areas by 2010.
- Contribution to UK Upland Oak HAP; expansion of 20ha in Midlands Plateau; restoration of 20ha in Midlands Plateau by 2010.

Achievements to Date (November 1998 - March 2001)

- 22.81ha of Ancient woodland placed into management, (various sources).
- 62.24ha of woodland planted through NF Tender Schemes.

Protection & Policy

- A ‘lowland broadleaved woodland’ costed UK Habitat Action Plan is currently being prepared.
- Some sites have statutory protection through SSSI designation.
- Most known remaining good examples of woodland have been designated Grade 1 SBIs.
- The Forestry Commission exercises control in respect of tree felling under the 1967 Forest Act.
- There is a national policy in place to protect ancient semi-natural woodland.

- Some woodland is protected by tree preservation orders administered by Local Authorities.

Management, Research & Survey

- A number of conservation bodies actively manage woods for their nature conservation value.
- DEFRA and the Forest Authority provides guidance on woodland management.
- The Forestry Commission runs a number of Grants Schemes, including the Woodland Improvement Grant under the Woodland Grant Scheme and the Native Woodland Plan Pilot Project.
- EN provides specific guidance to local authorities and has produced a report entitled 'Local Authorities and the protection and management of ancient woodland' (ENRR 250).
- An England Forestry Strategy has been produced by the Forestry Commission.
- The National Forest Company and Forest of Mercia actively promote woodland planting and conservation within their areas.
- An Ancient Woodland Inventory for Staffordshire (including the Peak Park) has been produced by English Nature.

Action Plan

UK Lead Organisation: [Forestry Commission - Upland Oak]

The FC is lead organisation for those woodland types which have UK priority targets. At present this is restricted to 'Upland Oak Woodland' in the Midlands Plateau Natural Area, but may be extended following the publication of a new woodland priority UK HAP for some types of lowland deciduous woodland.

Policy

- Ensure any examples of native woodland of high enough quality are given SBI status. (***SBI Grading Committee***)
- Ensure appropriate lowland broadleaved woodland sites meeting the SSSI criteria are designated. (***EN***)
- Identify prime areas for the restoration and planting of native woodlands within the County through a partnership approach. (***FC, SCC, EN, SWT***)

Land Management

- Seek to restore and create further areas of native woodland in appropriate areas. Creation of such woodland would take place on land of low conservation value. (***FC, FE, LAs, FoM, TNF, Developers and Landowners***)
- Seek to restore and create further areas of woodland featured as UK HAPs (Upland Oak and Upland Mixed Ash) in appropriate areas in line with current guidelines. (***FC, EN***)
- Prior to approval of a WGS or Felling Licence, ensure that a suitable management

plan for appropriate native woodlands is in place that seeks to maintain the nature conservation interest. (***FC***)

- Seek to promote the uptake of the Native Woodland Management Plan Pilot Scheme to woods with known nature conservation interest, targeting landowners of SBIs. (***SCC, FC, SWT***)

Monitoring and Research

- Seek to monitor the creation, restoration and management of this habitat throughout the County. (***SWT, FC***)
- Identify the amount of Upland Oak and Upland Mixed Ash Woodland in the County. (***SWT, FC***)

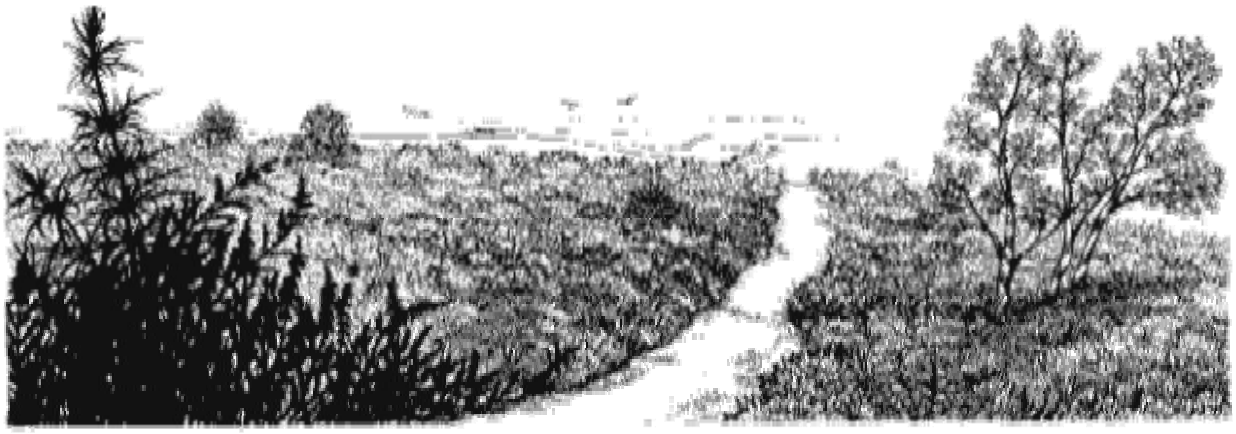
Advisory

- Promote the biodiversity and landscape value of lowland broadleaved woodland to the public and landowners. (***SBAP Partnership, TNF, FoM, FC***)
- Seek to ensure that all landowners are aware of any management grants that may be available for woodland. (***FC, FoM, TNF***)

Complementary Plans

UK 'Lowland Broadleaved Woodland HAP' (in prep)
Staffordshire Wet Woodland HAP
Staffordshire Noctule SAP
Staffordshire Pipistrelle SAP

Appendix XI: Lowland Heathland



Objectives

- Maintain the existing important areas of lowland heathland by encouraging appropriate management.
- Restore degraded areas of lowland heathland by promoting appropriate management.
- Increase the amount of lowland heathland in appropriate areas by creation and re-creation.

Targets

- Protect all known important (Grade 1 SBI or better) heathland sites from further development by 2005.
- Restore through appropriate management 800ha of heathland by 2010.
- Create and recreate 100 hectares of heathland by 2010; targeting forestry, minerals and landfill sites in appropriate areas.
- Prevent any further losses of important (Grade 1 SBI or better) areas of heathland by 2005.
- Ensure that all important heathland sites are in favourable or recovering condition by 2005.

Achievements to Date (November 1998 - March 2001)

- 64ha placed into restoration and enhancement management via the Countryside Stewardship Scheme (DEFRA), local authorities, SWT, other organisations and private landowners.
- 2.3ha of heathland has been re-created (various sources).
- Staffordshire and West Midlands Heathland Partnership reported that for the County of Staffordshire: 80ha of bracken spraying has been completed, 28ha of scrub clearance, 8ha of woodland thinning, 14ha of plantation removal and 30.2ha of turf scrapes created.

Protection & Policy

- 63% of all Staffordshire heathlands by area are currently notified as SSSIs.
- A number of sites containing unimproved lowland acidic grassland have been classified as Grade 1 SBIs.
- A programme of publicity and public events are run every year. This includes the annual 'Heath Week'.
- Protective and enhancement policies for heathland have been included within statutory local plans etc.
- Lowland Heathland has been listed as a costed, key habitat in the UK Steering Group Report.
- The Staffordshire & West Midland Heathland Partnership (SWMHP) is Lead Organisation for Lowland Heathland in Staffordshire.

Management, Research & Survey

- £¾ million has been raised through the HLF, Staffordshire County Council and English Nature for the 'Saving Cannock Chase' project. A large proportion of these funds will be towards heathland restoration, with an element of re-creation also included (5 year project).
- A number of heathland sites have been surveyed for their invertebrate, bird and herptile interest.
- Over the last decade the Staffordshire and West Midlands Heathland Partnership have helped to get a significant proportion of heathland into appropriate management.

Action Plan

UK Lead Organisation:	**English Nature**
Regional Lead Organisation:	**Staffordshire and West Midlands Heathland Partnership**

Policy

- Ensure any examples of lowland heathland that meet the required criteria are given SBI status. (***SBI Grading Committee***)
- Ensure appropriate lowland heathland sites meeting the SSSI criteria are designated. (***EN***)
- Seek changes in Common Land Legislation to enable grazing re-introduction. (***SWMHP***)

Land Management

- Seek to restore and create further areas of lowland heathland in appropriate areas. (***Developers, FoM, DEFRA, Landowners***)
- Target heathland creation in restoration plans for mineral workings, landfill sites and within commercial forestry in appropriate places. (***Mineral Companies, Landfill Companies, FE***)
- Liaise with leisure interest groups to incorporate heathland conservation into their site management or to re-direct their activities to more robust locations. (***SWMHP***)
- Ensure all heathland management plans include a consideration of sustainability issues and fire protection. (***SWMHP***)
- Seek to re-introduce grazing on all local authority owned heathland using appropriate breeds by 2005. (***SWMHP***)
- Seek to ensure all heathlands with management plans that are eligible for Countryside Stewardship Schemes are entered into the scheme. (***SWMHP, DEFRA***)
- Encourage restoration of heathland on publicly owned land with surviving heathy fragments such as for example re-establishment of heathland from encroaching scrub. (***SWMHP***)
- Liaise with forestry landholders to restore heathland from coniferous woodland. (***SWMHP***)
- Encourage heathland conservation and management on land in private ownership through active liaison and the promotion of appropriate land management grant schemes e.g. Countryside Stewardship. (***SWMHP***)

Monitoring and Research

- Re-assess the current condition of all lowland heath in Staffordshire within the next five years. (***SWMHP***)
- Develop a programme of regular site survey and monitoring of management for all managed heaths to ensure best practice and species safeguard. (***SWMHP***)
- Seek to monitor the creation, restoration and management of this habitat throughout the County. (***SWT, EN***)

Advisory

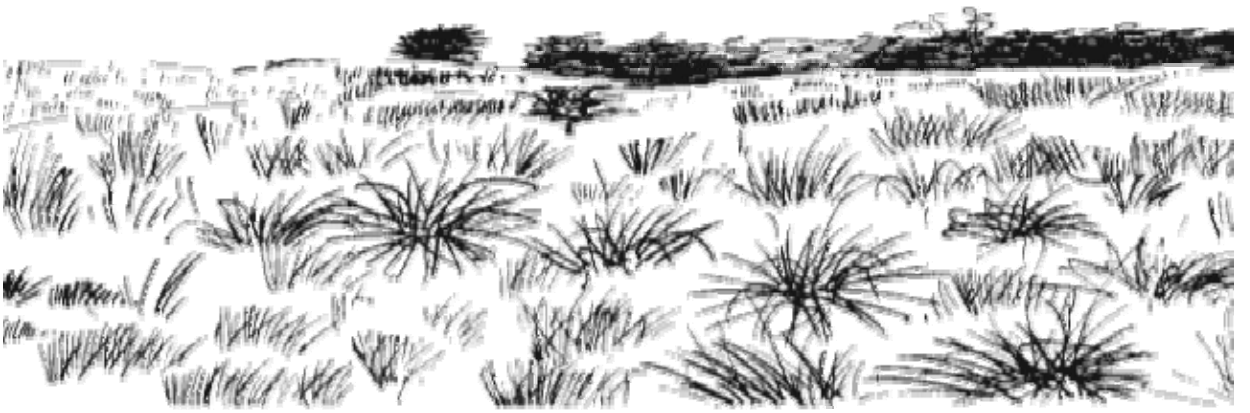
- Advise on heathland management and restoration. (***SWMHP***)
- Promote the biodiversity and landscape value of heathland to the public and landowners. (***SWMHP, SBAP Partnership***)
- Maintain ongoing liaison with relevant agencies to ensure best practice in heathland

management and re-creation. (***SWMHP***)

Complementary Plans

UK Lowland Heathland HAP
Staffordshire Grassland HAPs (Acid, Calcareous, Neutral or Wet)
Staffordshire Solitary Bees & Wasps SAP
Staffordshire Nightjar SAP
Staffordshire Woodlark SAP
Staffordshire Mosses HAP

Appendix XII: Lowland Acidic Grassland



Objectives

- Maintain the existing important areas of acidic grassland, encouraging appropriate management and promoting environmentally sensitive management of adjoining land.
- Restore degraded areas of acidic grassland by promoting appropriate management.
- Increase the amount of acidic grassland in appropriate areas by creation and re-creation.

Targets

- Prevent any further net losses of good examples of unimproved acidic grassland by 2005.
- Increase the amount of semi-natural acidic grassland by 20 hectares by 2010.
- Seek appropriate management for 120ha (30%) of unimproved acidic grassland by 2005 and 400ha (100%) by 2015.

NB: For heathland / acid grassland mosaics see Lowland Heathland Action Plan.

Achievements to Date (November 1998 - March 2001)

- See also Lowland Heathland HAP.

Protection & Policy

- Lowland dry acidic grassland has been listed as a costed, key habitat in the UK Steering Group Report.
- A number of sites containing unimproved lowland acidic grassland have been notified as SSSIs.
- A number of sites containing unimproved lowland acidic grassland have been classified as Grade 1 SBIs.

Management, Research & Survey

- Funding is for grassland management; restoration and creation are available under the Countryside Stewardship scheme.

- Ongoing research plots carried out by Staffordshire County Council to test methods of

Action Plan

UK Lead Organisation: **English Nature**

Policy

- Ensure any examples of lowland acid grassland that meet the required criteria are given SBI status. (***SBI Grading Committee***)
- Ensure appropriate lowland acid grassland sites meeting the SSSI criteria are designated. (***EN***)

Land management

- Seek to restore and create further areas of lowland acid grassland in appropriate areas. (***DEFRA, FWAG, Mineral Companies, SWMHP, Developers, FoM, TNF, Landowners***)
- Ensure that no tree planting occurs in unimproved acidic grassland. (***FC***)
- Seek to ensure that all good examples of lowland acidic grassland are appropriately managed through the uptake of agri-environment schemes. (***DEFRA, FWAG***)
- Attempt to control the spread of bracken on acidic grassland sites. (***Landowners***)
- Identify opportunities for habitat creation, giving priority to those that link existing sites. (***SWT***)
- Create acidic grassland buffer zones, where necessary, around heathland sites. (***SWMHP***)
- Identify prime areas of acidic grassland within heathland sites so that these areas can be retained and enhanced. (***SWMHP***)
- Seek to restore and create further areas of lowland acid grassland in appropriate areas. (***DEFRA, FWAG, Mineral Companies, SWMHP, Developers, FoM, TNF, Landowners***)
- Ensure that no tree planting occurs in unimproved acidic grassland. (***FC***)
- Seek to ensure that all good examples of lowland acidic grassland are appropriately managed through the uptake of agri-environment schemes. (***DEFRA, FWAG***)
- Attempt to control the spread of bracken on acidic grassland sites. (***Landowners***)
- Identify opportunities for habitat creation, giving priority to those that link existing sites. (***SWT***)
- Create acidic grassland buffer zones, where necessary, around heathland sites. (***SWMHP***)
- Identify prime areas of acidic grassland within heathland sites so that these areas can be retained and enhanced. (***SWMHP***)

Monitoring and Research

- Re-survey all good examples of unimproved acidic grassland in 2005 and 2010 to assess their condition. (***SBAP Partnership***)
- Seek to monitor the creation, restoration and management of this habitat throughout the County. (***SWT***)

Advisory

- Seek to ensure that all landowners are aware of any management grants which may be available for acidic grassland e.g. Countryside Stewardship. (***DEFRA, FWAG, EN***)
- Promote the biodiversity and landscape value of unimproved acidic grassland to the public and landowners. (***SBAP Partnership***)

Complementary Plans

UK Lowland Dry Acid Grassland HAP
Staffordshire Unimproved Neutral Grassland HAP
Staffordshire Lowland Wet Grassland HAP
Staffordshire Heathland HAP
Staffordshire Brown Hare SAP